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SESSION I
INNOVATIVE APPROACHES AND NEW TRENDS IN THE
FIELD OF "BUSINESS AND
ADMINISTRATION

APPLICATION OF THE OPERATIONAL QUALITY CONTROL SYSTEM IN THE MANAGEMENT PRACTICE OF A COMMERCIAL COMPANY

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Abstract: The paper examines the role and importance of the operational quality control system within a company in the field of commerce. The purpose of the research consisted in the development and implementation of an efficient operational system of quality control, designed to enhance organizational performance and customer satisfaction levels. The applied methodology was selected in accordance with the study objectives and encompassed an analysis of the specialized literature on quality management, with a focus on service quality control, the identification of the main existing problems and gaps, as well as the use of the case study as a qualitative research method to test the applicability of the obtained results. The research commenced with the establishment of the fundamental stages for implementing the operational quality control system within KAMOTO SRL, each stage being addressed in a detailed and systematic manner. The results of the implementation demonstrated the efficiency of the system, evaluated through company-relevant indicators: sales volume, sales lead conversion rate, customer abandonment rate, refusals and returns, packaging quality, and customer satisfaction level. As an outcome of the research, a complex algorithm of quality control applicable to commercial enterprises was elaborated, which was successfully tested within a real company, providing a practical and reproducible framework for optimizing quality processes and increasing organizational performance.

Keywords: operational quality control system, sales quality, customer satisfaction, performance indicators, CRM.

JEL Classification: L21, L81.

Introduction.

Over the past decade, the importance of service quality has grown considerably at both the national and international levels. An increasing number of organizations around the world are focusing on improving the customer experience to strengthen their brand reputation and boost sales. The emphasis has shifted from merely delivering a product to providing a complete, high-quality experience for customers.

Today's customers have high expectations when interacting with a company. They seek a better balance between quality and price and desire superior services that inspire confidence and satisfaction in their choice. A poor post-sales experience, such as difficulty obtaining a refund for a defective product, can lead to frustration and negative perceptions. Conversely, customers who benefit from efficient, courteous service are far more likely to recommend the company to their

peers. Therefore, it is crucial for organizations to invest in building strong, positive relationships with existing and potential customers.

In the context of ever-increasing demands for high-quality service, companies must provide outstanding experiences at every customer touchpoint. This requires developing efficient processes, modern systems, and appropriate tools that consistently support excellent service delivery.

To ensure quality services, a key element in the activity of organizations in the field of commerce is quality control, which has a direct impact on customer satisfaction, loyalty, and the long-term success of the business. In today's competitive business landscape, quality control has evolved from being a simple manufacturing requirement to a critical component of success across all sectors. Modern companies do not implement quality control merely to meet basic standards—they use it to impress customers, increase efficiency, and foster a culture in which “good enough” is never acceptable.

The aim of this research is to develop and implement an efficient operational quality control system within a company operating in the field of commerce, with the purpose of enhancing organizational performance and customer satisfaction.

Research methodology.

In accordance with the study's objectives, the research methodology was established and combined theoretical and practical approaches to achieve a comprehensive evaluation of quality control. In the first stage, a detailed analysis of the specialized literature in the field of quality management was carried out, with particular emphasis on service quality control, identifying the main problems, gaps, and best practices reported in previous research. This analysis provided a solid theoretical foundation for developing the operational quality control system. In the second stage, the case study was employed as the primary qualitative method, allowing for the testing of the applicability and effectiveness of the proposed solutions in the real context of a company. This approach facilitated a practical evaluation of internal processes and the relevance of the selected performance indicators, providing concrete data for the adjustment and optimization of the quality control system.

Results and discussions.

Theoretical considerations on quality control

Quality control is a vital process that ensures enterprises consistently comply with product and service standards. Its primary purpose is to identify and correct defects, safeguard customer satisfaction, and preserve brand reputation. It is well established that quality control measures have a direct impact on customer satisfaction, which is the main factor defining business reputation (Jamil et al., 2024). Companies that succeed in building a solid reputation for quality hold a superior position compared to their competitors, with greater chances of creating and maintaining a distinct market niche that is difficult to replicate (Abbas, 2020). A strong reputation is not limited to the initial attraction of customers but also contributes to their loyalty, increased trust, and the consolidation of long-term competitive advantage. Conversely, the absence of rigorous quality control inevitably leads to non-compliant or poor-quality products, customer dissatisfaction, and the deterioration of the company's image. Restoring this image is often difficult, time-consuming, and extremely costly, as it requires significant investments in both internal processes and communication campaigns aimed at regaining market trust.

In the retail sector, where direct interaction with customers is frequent, quality extends beyond the intrinsic attributes of the product to encompass its presentation, packaging, delivery, and the provision of after-sales services. Consequently, quality control must be conceived as a comprehensive process that spans the entire supply chain, from supplier selection to the ultimate customer experience.

Trading companies use quality control to:

- monitor and evaluate the quality of products or services;
- identify and fix defects before they become a problem;
- minimize waste and reduce costs;
- keep customers satisfied (and keep them coming back);
- drive continuous improvement initiatives;
- build and maintain customer trust and loyalty.

Effective quality control helps businesses prevent costly mistakes and consistently deliver reliable products, fostering customer trust and loyalty. By implementing quality control, businesses maintain consistency, improve operational efficiency, and promote continuous process improvement.

The contemporary business environment requires quality control to be understood as systematic monitoring and evaluation of products, services, and processes in order to ensure consistent quality and prevent defects. Unlike traditional approaches, which focus primarily on the inspection of the finished product, modern quality control is integrated throughout the entire business lifecycle (Billiet, 2025).

Numerous academic sources that focus their research on quality management, including quality control, within industrial enterprises (Zacharias, 2022; Mareček-Kolibiský et al., 2021), while fewer studies analyze this concept with reference to the commercialization process of manufactured products. This suggests that researchers often emphasize the primacy of product manufacturing quality over the quality of the sales process. To some extent, this perspective may be accepted: when products are poorly manufactured, their commercialization becomes more complicated (although not impossible). On the other hand, well-manufactured (high-quality) products do not reach consumers by themselves, and therefore cannot generate revenue for the company. In order to successfully commercialize products and convince consumers of their necessity, significant effort is required. Thus, the quality of the commercialization process is of comparable—if not superior—importance to that of product manufacturing quality.

Retail companies have adapted quality control principles to their unique challenges by (Figure 1)

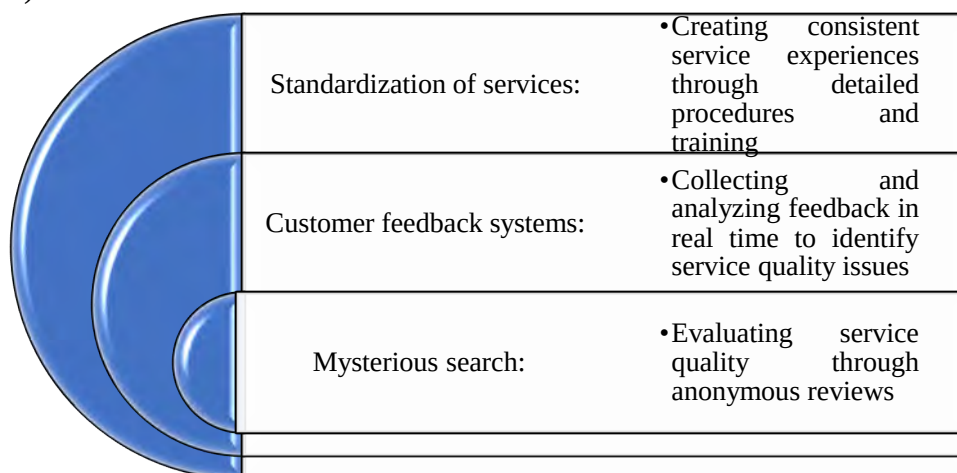


Figure 1. Methods for adapting quality control principles for companies in the trade sector

Source: elaborated by the author

These methods enable service enterprises to deliver consistent experiences despite the inherent variability of human interaction.

Sales success largely depends on the level of customer service and the quality of the products and services offered. In this context, sales quality control plays a key role. Its main tasks

consist of identifying and eliminating vulnerabilities in the sales process, as well as improving customer interaction. The process of sales quality control may be understood as a means of assessing the effectiveness of each sales department: the number of transactions concluded by managers, the manner in which negotiations are conducted, the workload of employees, and the profit levels expected in the upcoming period.

Developing and testing an operational quality control system: case study.

The research was conducted on the case of KAMOTO SRL, a small enterprise located in Chişinău, which has been operating on the Moldovan market since 2013. The company's main activity consists of the wholesale trade of agricultural machinery, equipment, and supplies.

In the context of the modern market, with the growth of sales and the expansion of the KAMOTO SRL retail chain to 11 outlets, the company identified the need to implement an Operational Quality Control System (OQCS), with the expectation of increasing customer satisfaction and company revenues. The primary objective of implementing the OQCS is to ensure process standardization, improve the quality of customer services, and enhance the efficiency of inventory management and financial performance indicators. The implementation process was lengthy and included several key stages, such as the development of a control map, employee training, and system testing.

The basic stages of OQCS implementation within the company are presented in Figure 2.

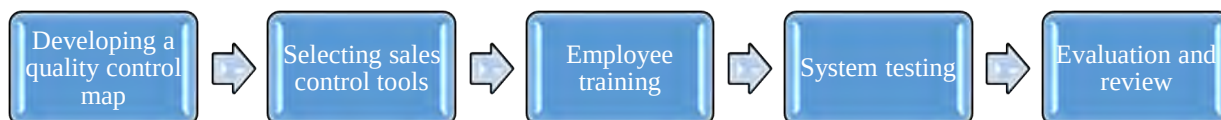


Figure 2. Basic stages of implementing the operational quality control system in the company KAMOTO SRL

Source: elaborated by the author

A brief characterization is provided regarding the company's achievements at each of the mentioned stages.

Stage 1. A quality control map was developed as a standardized tool for monitoring the company's essential processes, ranging from the supply of tools to sales and warranty services. The map was developed based on an analysis of substantial data, including regulations, sales statistics, the results of previous inspections, and customer feedback. Control norms and standards were formulated in compliance with national requirements and European standards concerning the quality of tools. The list of reports and key performance indicators was established in collaboration with management and the staff responsible for sales, logistics, and after-sales service. The control map covers the following areas: product quality, customer service, warranty case management, internal auditing through anonymous buyers, financial reporting, and customer satisfaction surveys.

Stage 2. Identification of the instruments to be used for quality control. The instruments available to a company for quality control depend on its resources, specific context, size, and business objectives, with each company selecting its own set of tools. From among the generally accepted recommendations, those instruments considered necessary for KAMOTO SRL were selected (Figure 3).

The description of the instruments selected for sales quality control at KAMOTO SRL is presented below.

Planning and reporting are essential instruments for controlling the quality of sales. The company develops plans to motivate employees to achieve established objectives, and the corresponding reports serve as progress indicators and measure the degree of compliance with the plans.

Another important tool is *customer surveys*. These allow for the assessment of satisfaction levels regarding the quality of products and services provided. An increase in the number of satisfied customers reflects adequate performance in this area, whereas a decrease in this indicator signals the need for improvement measures.

Call recording facilitates the monitoring of employee discipline and behavior in interactions with customers, particularly in conflict situations or when sales objectives are not achieved. At the same time, it provides managers with the possibility to control the sales process and to support the training of new employees.

Employee evaluation serves to maintain a high-performing sales team, to highlight strengths and areas for improvement, to stimulate motivation, and to provide a basis for training plans and skills development.

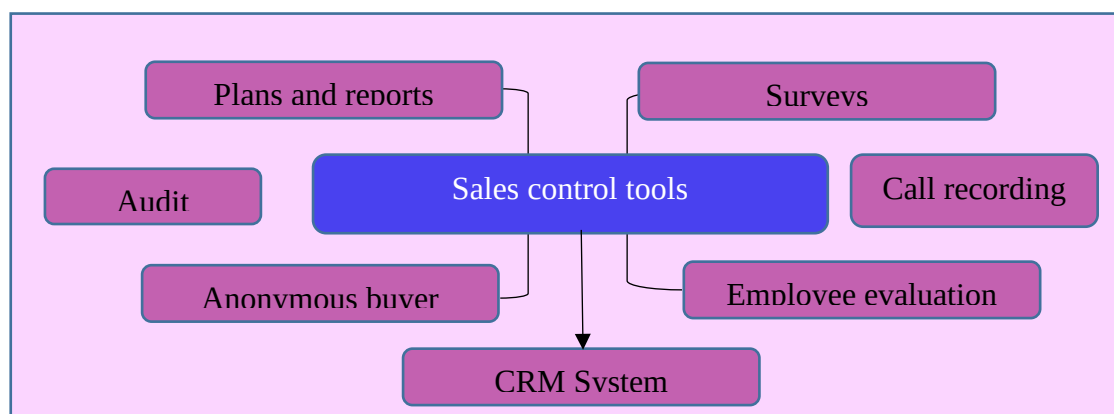


Figure 3. Tools used to perform sales quality control

Source: developed by the authors after HAYDU (2024).

The Customer Relationship Management (CRM) system enables a comprehensive analysis of customer interactions, ranging from database segmentation and task monitoring to tracking the speed of request processing. In addition, it facilitates the management of sales channels and the partial automation of commercial processes.

The mystery shopper method involves the use of an independent expert who, under the identity of an ordinary customer, evaluates the performance of the sales service based on predefined criteria. The resulting report provides management with an objective overview of the situation and highlights the aspects requiring improvement.

Process audit. The internal processes of the company are periodically evaluated to verify compliance with requirements, the timely coordination of tasks, and the proper allocation of responsibilities. This type of audit is particularly important in situations where dysfunctions occur, as it is used to identify their causes and the areas requiring improvement.

Stage 3. Employee training. This stage is essential for aligning employees with the new system and quality standards, as well as for improving staff qualifications in the field of quality management. At KAMOTO SRL, prior to the launch of the quality control system, a series of training courses were organized for employees, focused on:

Product quality control – for warehouse and logistics employees. Employees received training on product quality, emphasizing the importance of maintaining quality to ensure customer

satisfaction and protect the company's reputation. During the training sessions, employees were introduced to product characteristics, quality standards specific to each product type, methods for identifying compliant and low-quality products, and proper handling techniques to prevent defects. Training also covered the optimal storage conditions (temperature, humidity) required to maintain product quality. Furthermore, employees were instructed in the procedures for product verification at receipt and prior to dispatch, the process of reporting non-compliant products, and the provision of accurate and complete information regarding available products. Employees were also familiarized with the warehouse management system (WMS) used for inventory control.

Customer service and sales – for store personnel. Employees were trained in the following areas:

- *Product preparation.* Two training sessions were organized to introduce sales personnel to product characteristics, advantages, disadvantages, and methods for identifying customer-relevant benefits. When new products arrive in the store, employees are instructed to provide customers with as much information as possible regarding these products.

- *Communication skills.* Employees are trained to communicate more effectively with customers, including how to ask relevant questions and listen attentively to the answers. This is essential for understanding how a product or service can address a customer's problem. It is also important for employees to know how to respond to questions and complaints related to product quality. The company continuously collects customer feedback, and the results are discussed with the team on a monthly basis.

- *Data analysis.* Employees were trained to work with the CRM system, focusing on the correct use of analytical tools and the interpretation of data, as well as on how these data can be utilized to improve sales quality. Based on the training outcomes, a checklist for evaluating the performance of store employees was developed and subsequently integrated into the quality control system.

Stage 4: Pilot testing of the system. This stage was necessary to verify the quality control system under real conditions, test the control map, and integrate it with existing corporate systems. Accordingly, the pilot test was carried out in two company stores and in the main logistics center. The testing process included data collection, verification of the reporting system, and evaluation of the effectiveness of the control process. During this stage, several deficiencies were identified, such as:

Difficulties in integrating the new system with the existing CRM, which required additional adjustments during the testing phase.

Insufficient attention from employees in completing the new reporting forms, which necessitated further staff training.

Stage 5. Evaluation and review. Following the testing phase, the control map and reporting procedures were revised and adjusted.

Reports prepared across different quality dimensions are an essential tool for controlling the quality of sales. In this context, defining and establishing clear performance indicators is essential. Key performance indicators (KPIs) enable the analysis of departmental activity and individual employee performance and provide an objective assessment of results. The transparency and clarity of KPIs provide managers with the ability to monitor the structure and efficiency of operations, while offering employees a clearer understanding of the objectives pursued through sales monitoring.

After analyzing several performance indicators used by various companies in the sales sector, the following were identified as the most significant for KAMOTO SRL:

1. *Sales volume* - this indicator highlights the number of goods or services sold by the company over a specific period of time. At KAMOTO SRL, sales volume is monitored on a daily basis in order to analyze its dynamics and to support decision-making when necessary.

2. *Sales lead conversion*. This indicator measures the proportion of potential customers who ultimately complete a purchase. A low conversion rate may indicate the need for additional employee training sessions aimed at improving sales skills.

3. *Customer churn rate*. This indicator measures the proportion of customers who have ceased communicating with the company. To identify the underlying reasons—which may sometimes be objective and unrelated to the company’s activity—and to prevent further customer loss, the implementation of a customer survey is planned. Following the introduction of the CRM system, the company will continue to use this indicator as a key measure of customer retention.

4. *Refusals and returns*. This indicator measures the number of purchase refusals or product returns. It serves as an important tool for identifying existing problems and addressing them in the future. An increase in refusals may indicate the need for additional employee training on how to interact more effectively with customers.

5. *Packaging quality*. For most of the products sold in KAMOTO SRL stores, packaging plays a crucial role in ensuring and maintaining product quality until the goods reach the consumer.

6. *Customer satisfaction service level* regarding the quality of products purchased and the quality of services offered in the company's stores.

The company monitors customer satisfaction by periodically administering questionnaires (Emelian, 2025), addressed both to clients of its physical stores and to those of its online shop. The mystery shopper method is also employed. The feedback results are analyzed by the company’s management, and appropriate decisions are subsequently taken.

At the same time, KAMOTO SRL periodically conducts product quality control prior to their dispatch to stores and customers. The key indicators used for this purpose are packaging quality and defect rate. Quality control reports are prepared after each inspection. The example presented in Table 1 refers to the verification of a lot of gasoline trimmers prior to their dispatch to a wholesale buyer in September 2024.

Table 1. Examples of quality control reports

Indicator	Standard size	Actual size	Comments on the results	Recommendation
Packaging quality	100% integrity	3% damaged packaging	The packaging was damaged during transportation	Packaging needs to be improved
Defect percentage	< 1% from sales volume	1,20%	Defective products were shipped to customers	Improving control at reception

Source: Developed by the authors based on research conducted.

Based on the report, additional measures were introduced for packaging verification and for strengthening quality control during the transportation of goods.

An important stage in the implementation of the quality control system was the improvement of inventory control. The system enabled the identification of surplus stocks and the introduction of mechanisms to increase their turnover (Table 2).

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Table 2. Data before and after the implementation of the quality control system

Indicator	Before implementation	After implementation
Average order processing time, hours	5	2
Customer satisfaction level (max 5)	2,8	3,5
Average inventory turnover period, months	8	5,2
Average debt repayment period, months	7	5,4
Share of warranty cases, %	4	2,80

Source: Developed by the authors based on research conducted.

It should be noted that the process of implementing the quality control system within the company was accompanied by a series of difficulties that required particular attention. In particular:

- integration with the existing CRM system proved to be more complex than expected. This required software modifications and additional employee training to operate the new system effectively.
- resistance from staff in the initial stages of implementation. Some employees were unprepared to meet the new requirements and processes, which necessitated further training and motivational measures.
- data quality issues during the pilot testing phase. Certain data were entered incorrectly into the system, which complicated the analysis. This required a revision of the data entry procedures and the introduction of a double-checking system in the initial stages.

The implementation of the operational quality control system at KAMOTO SRL made it possible to develop a complex algorithm that takes into account both product quality and customer service quality (Figure 4) at all stages of the sales process.

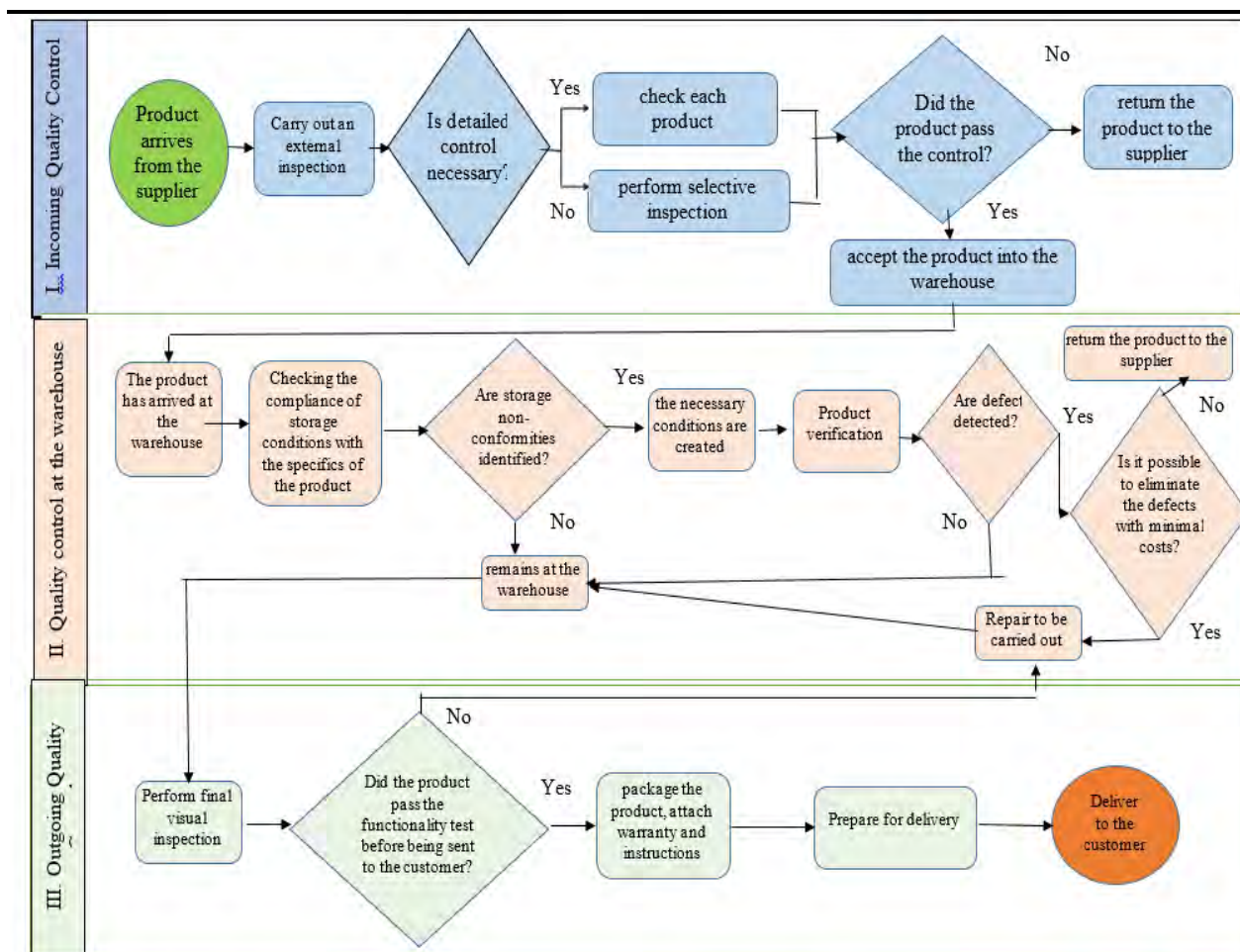


Figure 4. Quality assurance and control algorithm in KAMOTO SRL

Source: Emelian, 2025.

In this way, the operational quality control system implemented at KAMOTO SRL is carried out at three stages: upon receipt of products from suppliers (incoming quality control), during storage in the warehouse, and as a final check before the products are delivered to the customer.

Incoming quality control involves the verification of accompanying documents, as well as the visual and physical inspection of goods by evaluating the condition of packaging and examining products for visible defects, damage, or signs of improper handling. To assess product quality, a sample from the lot is tested (depending on the product type), and conclusions are drawn regarding the quality of the entire lot. Following the inspection, a reception report is prepared. In cases of non-conformity, discrepancies are recorded and procedures for return or complaint to the supplier are initiated. Compliant products are admitted into the warehouse.

In-process quality control (at the warehouse). After incoming quality control has been completed, the focus in the warehouse shifts to ensuring optimal storage conditions for agricultural machinery, equipment, and supplies, so that their integrity and functionality are maintained until delivery to the customer. The primary objective of warehouse storage is to prevent physical, mechanical, chemical, or electronic damage to the products by ensuring an optimal environment and proper handling. To this end, the warehouse is equipped with adequate ventilation to prevent condensation, mold formation, or rust, as well as with temperature and humidity control systems (particularly important for electrical equipment or products containing sensitive materials). In addition, appropriate handling equipment (forklifts, straps) is used, products are placed in stable positions without risk of overturning or mechanical damage, and sensitive equipment is not stacked with other stock.

The final inspection of the goods, *upon leaving the warehouse*, is the last verification stage before the products are delivered to the beneficiary. The purpose of this stage is to ensure product conformity with the customer's order, to confirm the integrity and functionality of the equipment, and to guarantee that the product is properly prepared for transport and delivery. At this stage, checks are carried out to confirm that the customer's order has been correctly assembled, that the delivery note and the product itself are present, that all ordered components and accessories are included, and that the warranty certificate and user manual are provided. A final visual inspection is also performed, which includes verifying the overall appearance of the product (absence of scratches, dents, wear, or dirt), as well as checking the presence of labels, seals, and technical markings, and confirming that the equipment is clean and presentable. Where applicable, a functional check is performed, which involves conducting a start-up test (for motorized equipment), verifying basic controls and functions (hydraulics, lights, brakes, etc.), and confirming the proper securing or fastening of movable components for transport.

Another component of this process concerns the verification of delivery completeness, for which an internal dispatch checklist is used for each product type. It is essential to ensure that the product is properly packaged and prepared for transport.

The implementation of the aforementioned algorithm at KAMOTO SRL demonstrated the effectiveness of the operational quality control system. The results obtained confirm that such a system not only optimizes current activities but also strengthens internal processes of monitoring and continuous improvement. Ensuring the continuity of the implemented processes, as well as their ongoing refinement, is essential in order to meet market demands and evolving quality standards.

An important aspect is the integration of quality management with digital innovation initiatives. In many organizations, these two areas are treated as separate functions, which generates difficulties in communication and in the establishment of common objectives (Rönnbäck et al., 2012). However, both quality management and digital innovation share a convergent mission: improving products and services for customers and enhancing organizational efficiency.

Previous research has shown that poor digital innovation performance is a serious inhibitor of business performance, whereas high efficiency and effectiveness in digital innovation are associated with superior organizational performance through the leveraging of new technologies and the rapid adaptation to changes in the competitive environment (Carlson et al., 1992). In this context, for KAMOTO SRL, an integrated strategy that combines quality excellence with digital innovation constitutes a critical factor for sustainable development and long-term competitive advantage.

Conclusions:

In an ever-changing market, the continuous adaptation of businesses increases the importance of quality control. In the current competitive environment, customers have high expectations for product and service quality, so meeting these expectations is essential for maintaining loyalty and trust. In this regard, the implementation of a well-founded quality control system is not merely a strategic option but an indispensable condition for the long-term success and sustainability of businesses.

The adoption of new technologies is inevitable because they can streamline processes. Tools such as artificial intelligence, machine learning, and data analytics are already being used for quality control. These technologies enable faster data analysis, the early detection of defects or issues, the identification of trends that may impact product or service quality, and more effective decision-making. At the same time, the most recent technological innovations and services have the potential to make quality control more agile, reliable, compliant, and efficient.

The operational quality control system not only ensures that a company's products meet or improve quality standards, but also influences the attitudes of its employees and creates a sense of

responsibility, involves testing units to determine whether they meet the specifications for the final product.

The operational quality control system (OQCS) used within a company depends on the product or industry, and multiple techniques exist for measuring quality, creating reliable safeguards to ensure that defective or damaged products do not reach customers. The present study has highlighted quality measurement indicators relevant for enterprises in the commercial sector.

The study has demonstrated that, in essence, the operational quality control system (OQCS) is about consistency. It is the process of testing products and services to ensure that they meet established quality standards before reaching the customer.

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EDUCATIONAL ENTREPRENEURSHIP: INNOVATIVE MODELS FOR YOUTH AND THE ADMINISTRATION OF THE FUTURE

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Abstract. The paper reports original results from an applied research on how "educational entrepreneurship" can generate innovative models of competence training at high school level, relevant for business and administration of the future. The aim of the study is to identify and validate didactic and managerial mechanisms through which initiative, creativity, collaboration, responsibility and financial literacy can be developed coherently in the upper cycle of pre-university education. The research subject is students and teachers from high schools in Romania and the Republic of Moldova. The methodology is mixed. The quantitative component used a Likert scale questionnaire applied to a sample of 100 students and 20 teachers, targeting five dimensions of entrepreneurial competences; the internal consistency of the instrument was assessed by Cronbach's alpha coefficient, and the latent structure by exploratory factor analysis. The qualitative component included semi-structured interviews with teachers and students, analyzed thematically (inductive approach) to capture contexts, barriers and facilitators of implementation. The analyses were complemented by methodological triangulation to increase the credibility of the results. The results indicate three major findings. (1) Combining project-based learning with school-business partnerships favors consistent increases in student initiative, collaboration and responsibility. (2) Micro-incubation in high school (project clubs with external mentoring, rapid prototyping and iterative feedback) supports applied creativity and knowledge transfer in real contexts. (3) Curricular flexibility and managerial support at the school level are key factors; in their absence, the effects of interventions diminish, even in the presence of digital resources. We conclude that educational entrepreneurship becomes effective when configured as a school-community ecosystem, not as an isolated discipline. The paper proposes the LINC (High School-Innovation-Networking-Community) model as an operational architecture in four steps: needs diagnosis, integrated competence design, implementation through partnership projects and authentic evaluation. The contribution of the study consists in articulating a replicable framework, with direct utility for decision-makers and practitioners, oriented towards increasing the relevance of high school education for business and administration.

Keywords: Educational Entrepreneurship, Innovative Models, Entrepreneurial Competences, High School Education, Knowledge Economy

JEL Classification: I25, L26, M21, O35

Introduction. Education plays an essential role in developing citizens who can adapt to fast-changing economic and technological and social environments. The knowledge economy operates through information management yet requires people to convert knowledge into functional solutions which benefit society and business operations and administrative work. The modern educational system now views entrepreneurial competences as fundamental skills which help students handle uncertainty while discovering new possibilities and taking charge of their choices. Educational entrepreneurship represents a promising method which unites business principles with teaching methods and school administration to connect educational results with labor market requirements. The paradigm shift towards experiential learning in entrepreneurship was already emphasized by Gibb (2002), who called for creativity and new combinations of knowledge. Competence-based approaches highlight that education shapes not only entrepreneurial intention but also broader professional adaptability (Sánchez, 2013). Universities and high schools alike

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are required to adapt to new frontiers of entrepreneurial education (Neck & Greene, 2011; Rae, 2010). Educational entrepreneurship within schools creates an environment that teaches students to become successful professionals while developing their ability to participate in society and take action for social change. Research conducted internationally demonstrates that developing entrepreneurial thinking should start during the early years of education. The European Union identifies entrepreneurship as one of eight essential lifelong learning competences which support personal development and social inclusion and employment readiness. The OECD identifies entrepreneurial skills as essential drivers which propel innovation and economic competitiveness in modern global markets. The strategic frameworks for education exist but their actual implementation in high schools remains inconsistent because they mainly focus on outside-the-classroom activities instead of full-scale integration. The two countries of Romania and Republic of Moldova encounter similar difficulties when trying to match their secondary education system to knowledge-based economic requirements. The educational systems of both countries undergo reforms but high school entrepreneurship education faces challenges from disorganized curricula and insufficient funding and weak business sector partnerships. Teachers together with school administrators need better tools to create learning experiences which will help students develop their entrepreneurial abilities. The research investigates how high schools can develop entrepreneurial competences through new educational approaches which function as incubators for student development. The research investigates management approaches and teaching methods which improve student abilities to take initiative and demonstrate creativity while showing responsibility and working collaboratively and handling finances during their pre-university education. The research uses quantitative and qualitative approaches to study both Romania and the Republic of Moldova which generates comparative data that reveals common grounds for educational innovation. The paper introduces educational entrepreneurship as a school–community ecosystem through its original approach which moves beyond treating it as an independent subject. The LINC model (High School–Innovation–Networking–Community) serves as a replicable framework which enables systematic implementation of entrepreneurial competences in high school education. The research provides essential information for policymakers and practitioners and researchers who aim to create enduring educational strategies which boost innovation and competitiveness in knowledge-based economies.

Literature Review. The Concept of Educational Entrepreneurship The development of educational entrepreneurship emerged through the combination of business entrepreneurial principles with educational systems' mission to develop active innovative citizens. According to Fayolle and Gailly (2015) educational entrepreneurship extends beyond start-up creation because it teaches students to become adaptable and creative initiators. The educational approach demonstrates how schools should establish learning spaces which enable students to develop their entrepreneurial abilities through practical experience. Meta-analyses confirm that entrepreneurship education has a measurable impact on intentions, though contextual factors remain decisive (Bae et al., 2014). Kurucz et al. (2017) explain that educational entrepreneurship combines social and community aspects with economic targets while promoting sustainability and social responsibility. Educational institutions function as innovation centers which connect academic knowledge to practical societal problems. Entrepreneurial Competences in Secondary Education the European Commission (2019) established entrepreneurship competence as one of the eight essential lifelong learning competences. The ability to identify opportunities and transform them into valuable outcomes for others defines this competence. The high school implementation of this competence requires students to learn problem-solving abilities and teamwork skills and financial management competencies. Research evidence demonstrates that experiential learning approaches combined with project-based activities help young people develop entrepreneurial thinking skills. The research by Nabi et al. (2017) proves that students

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who participate in entrepreneurial projects during their secondary education develop higher self-efficacy and initiative skills. Lackéus (2015) demonstrated that value creation pedagogy helps students develop responsibility and resilience skills. Managerial and Pedagogical Innovations in High Schools The development of entrepreneurial education depends heavily on both managerial backing and innovative teaching methods. The European Training Foundation (2021) indicates that school leaders maintain essential responsibility for curriculum integration of entrepreneurship through their support of business and community partnerships. Teachers function as entrepreneurial learning facilitators yet they need training and resources to implement active learning approaches (Seikkula-Leino, Ruskovaara & Ikavalko, 2010). Student projects receive support through digital tools and micro-incubation practices which are becoming more prevalent in educational settings. The combination of school-business partnerships according to Pittaway and Edwards (2012) enables students to develop their entrepreneurial skills through genuine business applications. 2.4 International and European Policy Frameworks The OECD (2020) emphasizes that entrepreneurship education must be integrated throughout all academic subjects instead of being taught independently. The European Commission (2019) together with UNESCO (2021) recognize entrepreneurship as a key factor which drives innovation and competitiveness in modern knowledge-based economies. The established frameworks promote member states to modify their educational standards and train teachers while building connections with outside organizations. The Republic of Moldova and Romania have made progress in implementing entrepreneurial competences yet they struggle to establish systematic implementation at the secondary education level. Research conducted in Eastern Europe by Roman et al. (2020) reveals that strategic goals do not match classroom activities which demonstrates the requirement for educational models that unite educational institutions with their communities and business partners.

Methodology. The choice of this design was based on the need to combine the advantages of quantitative analysis – objectivity, comparability and statistical validity – with the depth and contextual richness offered by qualitative analysis. Participants The research was conducted in high schools in Romania and the Republic of Moldova, in the 2024–2025 school year. The sample included 100 students (50 from each country) enrolled in extracurricular courses or projects with an entrepreneurial profile and 20 teachers (10 from each country) responsible for implementing entrepreneurial education. Participants were selected through purposive sampling, to ensure that they had direct experience in entrepreneurial learning activities. Instruments and data collection The quantitative component was based on a questionnaire with Likert-scale items, designed to assess five fundamental entrepreneurial skills: initiative, creativity, collaboration, responsibility and financial literacy. The questionnaire was pre-tested for clarity and consistency before application. The qualitative component consisted of semi-structured interviews with teachers and students, aiming to explore their perceptions, difficulties encountered and examples of good practices. The interviews were conducted both face-to-face and online, with an average duration of 45–60 minutes. Data analysis The quantitative data were analyzed using SPSS. The internal consistency of the instrument was verified by Cronbach’s alpha coefficient, and the latent structure of the competencies was explored by exploratory factor analysis (EFA). Descriptive and inferential statistics were applied to compare the responses from the two national contexts. The qualitative data from the interviews were transcribed and thematically analyzed, using an inductive coding process. The emerging themes were grouped into three categories: opportunities, barriers and enabling factors of entrepreneurship education. Validity and reliability To ensure the credibility and robustness of the results, the research used methodological triangulation, combining quantitative and qualitative evidence. The reliability of the questionnaire was confirmed by Cronbach's alpha values, which exceeded the recommended threshold of 0.70. Validity was strengthened by pilot testing and expert evaluation of the instrument. The correlation between

statistical trends and interview narratives increased the explanatory power of the study and reduced the risk of bias. To ensure the internal consistency of the questionnaire, Cronbach's alpha coefficients were calculated for each of the five competence dimensions. All values exceeded the recommended threshold of 0.70, which confirms the reliability of the instrument (see Figure 1).

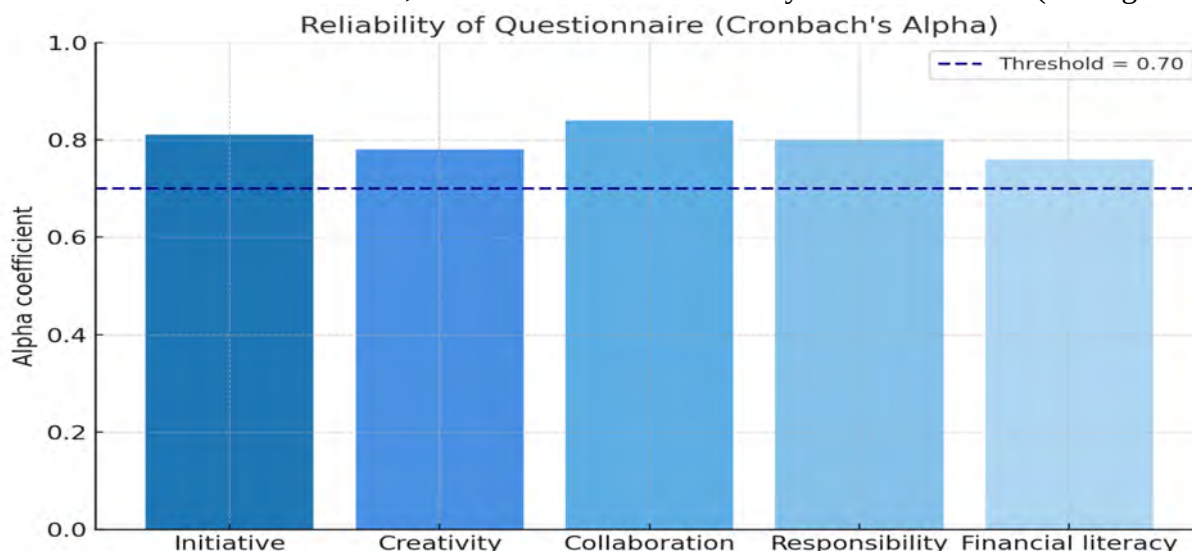


Figure 1. Reliability of Questionnaire (Cronbach's Alpha)

Source: authors' own elaboration, based on survey data

The latent structure of the competences was further examined through Exploratory Factor Analysis (EFA). The analysis identified three main factors that together explained 90% of the variance: (1) initiative and creativity, (2) collaboration and responsibility, and (3) financial literacy. This indicates a coherent grouping of competences, which supports the theoretical model adopted in the study (see Figure 2).

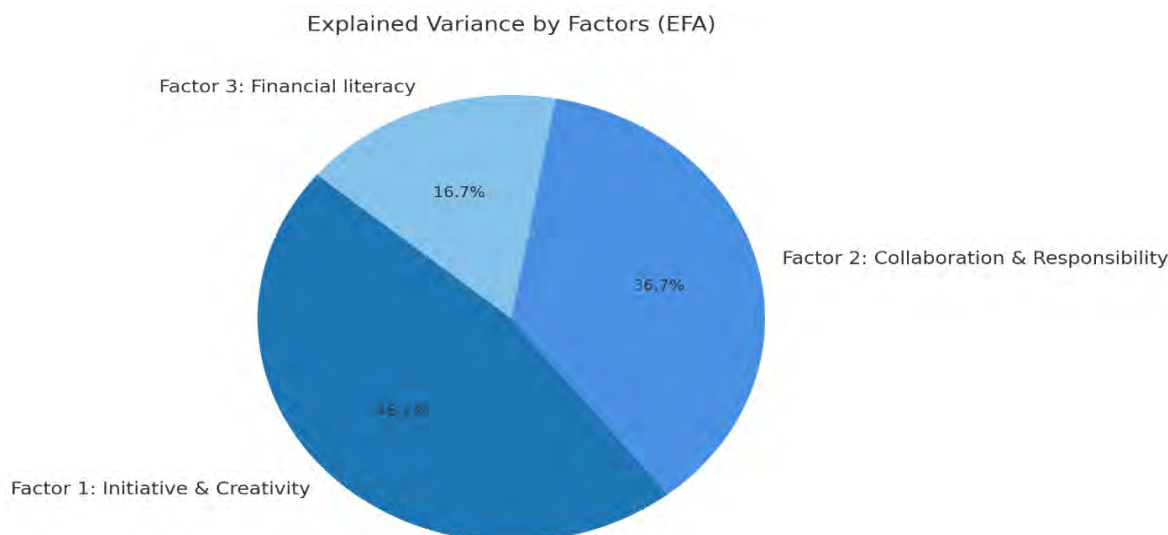


Figure 2. Explained Variance by Factors (EFA)

Source: authors' own elaboration, based on survey data

Findings and Discussion. Qualitative results complement the numerical picture. Students mentioned that practical projects and team activities increased their confidence, ability to find solutions and responsibility. In Romania, the focus was on developing presentation and

communication skills, while in the Republic of Moldova students emphasized the importance of mentoring and collaboration with teachers and external partners. Teachers highlighted the relevance of managerial support and curricular flexibility, but also the need for modern resources. Without these conditions, entrepreneurial initiatives remain fragmented. Overall, the results suggest that entrepreneurship education is effective when conceived as a school-community ecosystem, rather than as a separate discipline. This approach supports integrated skills development and prepares students for the challenges of the knowledge economy.

Proposed model: LINC (High School – Innovation – Networking – Community). Based on the research results, an operational model was outlined to respond to the needs identified in the training of entrepreneurial skills at the high school level. The LINC model proposes an integrated, four-step approach, through which the high school becomes not only a teaching space, but also a true incubator of initiative and responsibility.

Needs diagnosis. The process starts from the specific identification of the skills that students lack, through questionnaires, feedback from teachers and consultations with the local business environment. This stage ensures an adaptation to the realities of each school and community.

Integrated design of skills. Entrepreneurial skills are not treated as abstract objectives, but as concrete results to be achieved through curricular and extracurricular activities. Their transversal integration into different disciplines, but also through dedicated entrepreneurial education modules, is proposed.

Implementation through partnership projects. Students learn through action, developing projects with real impact, carried out in partnership with economic agents, NGOs or public institutions. Examples include school fairs, micro-incubators of ideas and business simulations, all with the support of external mentors.

Authentic assessment. The assessment is not limited to written tests, but includes portfolios, public presentations, feedback from community partners and self-assessment. This allows for a realistic measurement of the progress and degree of student responsibility.

The LINC model brings added value through its replicable and adaptable character. It can be applied in various educational contexts, ensuring a closer connection between school, community and the economic environment. At the same time, it emphasizes sustainability, by cultivating skills that are not lost after graduation, but become part of the professional and civic identity of young people.

Conclusions and implications. The study showed that the development of entrepreneurial skills at high school level becomes truly effective when education is perceived as an ecosystem that connects the school, the community and external actors. The quantitative results validated the reliability and coherence of the competence framework, while the qualitative data highlighted the transformative impact of project-based activities, mentoring and authentic assessment. The essential contribution of this paper consists in presenting the LINC model (High School–Innovation–Networking–Community), a replicable operational framework, structured in four stages: needs diagnosis, competence design, implementation through partnership projects and authentic assessment. This model demonstrates that educational entrepreneurship should not be seen as an isolated discipline, but as a dynamic process, integrated into the organizational culture of the school and supported by partnerships with the socio-economic environment. The implications of the research are varied, for educational policy makers, the results suggest the need to promote entrepreneurship education through curricular flexibility and resources dedicated to innovation. For school managers and teachers, the study offers practical guidance for integrating entrepreneurial skills through active learning methods and collaborative projects. For society, investing in young people’s entrepreneurial skills contributes to the formation of a creative, resilient workforce capable of facing the challenges of the knowledge-based economy. In

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conclusion, investing in entrepreneurship education does not only mean introducing a pedagogical innovation, but also responding strategically to the demands of the future. High schools, when benefiting from appropriate policies and resources, can become incubators of the entrepreneurial spirit and can play a decisive role in training a new generation of professionals and active citizens, prepared for business and administration in the 21st century.

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ONLINE BUYING BEHAVIOR

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Abstract: The foundation of marketing activity in the online environment cannot be achieved without the acknowledging of the importance of understanding consumer behavior by entrepreneurs and marketers. The significant way buyers decide on the purchase of products and services, by which factors they are influenced in the process of electronic interactions, what are the advantages sought and how they are perceived in the purchase process - all this determines different behaviors and consumption patterns, in which they find the factors reflecting the personality, values, perceptions and attitudes, lifestyle, etc. purchase decision and user status: non-user, occasional user, frequent, migratory, reversible. This research addresses the decision-making process of purchasing in the online environment and analyzes the purchasing behavior of some products. The research highlighted some obstacles in the purchasing process in the online environment, as well as opportunities of improvement of the purchasing experience.

Keywords: consumer behavior, online environment

JEL Classification: M30, M31

Introduction

The virtual space represents a challenge for marketers, who actively promote various products and services within it, as well as an effective purchasing environment for consumers. Within the virtual market, virtual businesses are conducted, which in turn include e-commerce—transactions carried out through virtual platforms. Among the important components of the virtual market we can identify: virtual players—suppliers, intermediaries, and buyers (Rădoi, 2005, p.136)—who are recognized online; virtual products (digital or smart goods, digitized physical goods, physical products, and digitized services); and digital processes—digital applications, electronic tools, and technologies, which together form the infrastructure of the virtual market.

In the virtual (electronic) space, the supplier presents electronic catalogs of products and services, pursuing multiple objectives: informing potential clients, encouraging purchases, facilitating the reciprocal exchange of information between businesses, enabling collaboration within common platforms for conducting electronic business, and carrying out joint business activities. The consumer interacts electronically with the supplier and makes decisions regarding the purchase of a product or service.

According to previous studies, online purchasing has emerged as the most dynamic and visible dimension of the new digital economy (idem, p.152), providing it with flexibility and responsiveness (idem, p.127). The digitalization of the economy, IoT, and AI have transformed—and continue to transform—the interaction between consumers and sellers. Consumer behavior manifests itself through new trends and dimensions that must be thoroughly researched and considered in the development of market strategies.

The aim of this article is to investigate the behavioral shifts of consumers in the online environment in the Republic of Moldova, to highlight obstacles in the process of online purchasing, as well as to identify opportunities for improving the purchasing experience. The applied research methods are: general methods of analysis and synthesis, statistical data analysis, and documentation.

Characteristics and Trends of Consumer Behavior in the Online Environment

Consumer behavior, as the dynamic outcome of specific interactional relations among the consumer's psychological processes and influenced by a multitude of exogenous factors, is highly complex, regardless of the purchasing environment. In the process of acquiring goods, whether offline or online, consumer behaviors may differ as follows:

Complex behavior – characterized by high consumer involvement in the occasional purchase of luxury products, following thorough market research;

Dissonance-reducing behavior – where consumers are involved in the purchase but remain uncertain, hesitant, and poorly informed;

Habitual behavior – developed over time through the repeated purchase of frequently used products;

Variety-seeking behavior – corresponding to the consumer's intention to try something new.

Online buyers exhibit the following inherent characteristics and behavioral particularities:

They are generally younger than offline buyers, innovative and risk-taking, predominantly men but also women, the latter being more sensitive and exploratory. Buyers possess digital skills or are digital natives, attentive, convenience-oriented, time-conscious, and attracted to a wide variety of choices.

They search for solutions to their problems on the internet, drawing information from bloggers and vloggers focused on addressing everyday issues. In this way, organizations gain both authority in the online environment and the trust of their audiences.

They compare different brands to identify the advantages offered by competitors, with price remaining the main factor in making an online purchasing decision.

They purchase with agility and without bureaucracy. Buyers are flexible in their decision-making, avoiding lengthy, difficult, confusing, and discouraging processes that lead to cart abandonment.

They analyze the opinions of other people who have purchased online, showing strong trust in such sources, with influencers becoming highly popular.

They expect purchase safety and maximum cybersecurity. When the buyer confirms the purchase of a product, it means they expect complete security at all stages of the buying process, as well as beyond it.

According to the Deloitte Report, the main trends of European consumers in the online environment in 2025 are the following:

Personalization and hyper-personalization – the implementation of innovative technologies, AI, and the use of data lead digitalized consumers to develop new, unique experiences aligned with their individual profiles. Consumer data is shared by its owner, while ensuring confidentiality.

Community and authenticity – brands increasingly rely not only on major marketing influencers but also on developing loyal customer communities. This involves building deeper connections through exclusive content, private communications, and collaborative content, thereby fostering a sense of belonging.

Immersive and conversational experiences – consumers increasingly use voice assistants for search and commerce, creating a more seamless and conversational shopping experience. Furthermore, the metaverse and augmented reality (AR) bridge the gap between online and offline commerce, offering new ways to interact with products.

Speed and convenience – when choosing products, consumers have growing expectations for speed, convenience, reliability of digital services, and delivery. Consumers tend to choose brands that provide transparent, fast, exclusive, and safer experiences and solutions. Customer loyalty is targeted in the long term, based on subscription models and client community memberships.

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Conscious consumerism – consumers are increasingly making mindful, rational purchases, based on value and digital interactions, aimed at reducing overload and decision-making fatigue.

Digital responsibility – sustainability and ethical consumerism are becoming increasingly important in the behavior of digital consumers. This demands social and ethical responsibility in marketing from suppliers in their processes and operations.

Research on the virtual market in the Republic of Moldova has highlighted the following trends:

According to statistical data provided by the National Bank of Moldova (NBM), in 2024, e-commerce was carried out through 2202 e-commerce platforms (compared to 411 in 2018); the value of transactions conducted through e-commerce platforms using payment cards issued in the Republic of Moldova in 2024, carried out within the country, amounted to MDL 3,253.8 million (Table 1), representing an increase of 29.1% compared to 2023 (idem, p.35);

Table 1. Number and Value of Transactions Conducted Through E-Commerce Platforms Using Payment Cards Issued in the Republic of Moldova, 2024

Operations	Conducted in the Republic of Moldova		Conducted Abroad	
	Number of units	Share, %	Number of units	Share, %
Number of transactions	6,395,220	23.0	21,679,595	77.0
Value of transactions, MDL	3,253,848,358	24.0	10,209,565,131	76.0

Source: elaborated by the author based on data from source Raportul privind evoluția infrastructurilor pieței financiare din Republica Moldova, anul 2024. Available at: <https://bnm.md/ro/content/raportul-privind-evolutia-infrastructurilor-pietei-financiare-din-republica-moldova-anul-2024>. (Accessed: 23 September 2025).

- both in terms of transaction value and number, the majority of online purchases are conducted abroad (76% and 77%, respectively);

- according to research conducted with the support of American Chamber of Commerce in Moldova, in the Republic of Moldova, there are approximately 480 retail service platforms (hotels, guesthouses, educational centers, airlines, and electronic ticket vendors), forming the largest group of online service retailers;

- about 470–520 active online stores sell tangible products in the Republic of Moldova; in the second semester of 2023, approximately 327,600 urban consumers aged 18–64 had online shopping experience, of which about 100,000 purchased tangible products online;

- in 2023, the virtual purchases of Moldovan consumers averaged approximately €91 per month;

- approximately 80% of the adult population does not engage in e-commerce;

- e-commerce in the Republic of Moldova is represented 40% by electronics and household appliances, followed by auto parts and automotive maintenance products (10%), then three other product groups: ready-to-eat foods, clothing and footwear, and finally cosmetics and ticket sales;

- in 2023, 67.2% of online consumers paid cash/card upon delivery, initially wishing to verify the quality of the delivered product before payment;

- approximately 30–40% of purchases of electronics, household appliances, furniture, and other products are made using the "buy now, pay later" method.

The main problems related to consumer behavior in the online environment in the Republic of Moldova are: distrust in product quality, perceived differences between the ordered and received product, delivery of refurbished or damaged products presented as new, leading to consumer dissatisfaction; fear of cyber fraud and scams; incomplete information; low development of websites, among others.

From the perspective of web development and Search Engine Marketing (SEM), a multitude of other factors can have direct implications for explaining consumer behavior. Data such as the time a consumer spends on a specific page of an online store or the entire site, the landing page, the source that directed the consumer to the online store (a search engine, a banner click, an online magazine, or a social network website), and the keywords that led to accessing the online store, represent only part of the abundant information sources that can help merchants optimize their online store to better meet consumer needs. Research shows that when searching online, consumers use search engines more than manufacturer websites, comparison websites, or discussion forums (Hovsepyan, 2020, p.73).

Additionally, factors such as income, family, buyer values, demographic factors, etc., significantly influence purchasing decisions, determining consumption patterns, preferences, and attitudes. The influence of these factors determines the status of users on e-commerce platforms in the online environment: non-user, occasional user, frequent user, or migrator.

For effective online sales, it is important to build trust in product quality and price, as well as a sense of security. The perception of costs (including both product price and costs arising from the process of searching, informing, ordering, and receiving the product) and the availability of the website are also important.

Conclusion

At the current stage, online commerce in the Republic of Moldova is still underdeveloped. A deeper understanding of online consumer behavior helps businesses forecast sales more accurately and design effective marketing strategies, ultimately boosting profits through digital channels. The main solutions in this regard are: enhancing public trust in the security and advantages of online shopping, developing websites and increasing their availability, and offering differentiated product portfolios available at the requested time.

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ACCESSIBILITY IN ESG, HR, DIGITAL TRANSFORMATION AND EMERGENCY SERVICES

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Abstract: Accessibility has become an important policy priority, anchored in frameworks such as the UN CRPD, the EU Web Accessibility Directive, and the European Accessibility Act. Yet in management scholarship and practice it is still treated mainly as compliance. This paper investigates why accessibility, though referenced in ESG reporting, HR/DEI frameworks, and digital transformation, has not yet been institutionalized as a distinct management strategy. We reviewed 2020–2025 peer-reviewed articles and EU policy reports retrieved from Scopus, Web of Science, and Google Scholar; thematically coded references to accessibility across ESG, HR/DEI, digital transformation, and public-sector management; and conducted an analytical gap assessment against the defining features of fundamental strategies (scope, objectives, performance measures, long-term orientation). Accessibility is largely compliance-driven across domains. It is often implemented as an add-on or technical adjustment rather than as a proactive, value-creating framework. Positive developments—such as Romania’s SMS-113 service and AI-enabled tools in emergency call management—demonstrate potential but remain isolated improvements. Reframing accessibility as a strategic asset could generate competitive advantages and strengthen organizational resilience. Institutionalizing it as a fundamental management strategy could also catalyze digital innovation and enhance public value. The paper contributes a clear research agenda and a rationale for developing an Accessibility Strategy Framework. This framework aims to guide organizations and public institutions beyond mere compliance toward inclusive, high-performance design.

Keywords: Accessibility, strategic management, ESG, diversity and inclusion, digital innovation, public sector, 112 emergency services

JEL Classification: M10, M14, O33, H83, I18

1 Introduction

For decades, public services, businesses, and organizational systems were designed with the “average” user in mind. Efficiency and functionality were measured by how well they served the majority, while vulnerable groups, particularly people with disabilities, were too often overlooked. Accessibility was rarely considered a core requirement; instead, it was treated as an exception or an afterthought. This long-standing omission has left significant gaps in participation, equity, and safety, which persist even as societies advance technologically and economically.

At the international level, the UN Convention on the Rights of Persons with Disabilities (CRPD) establishes the obligation of states to ensure equal access for people with disabilities. Within the European Union, the Web Accessibility Directive (2016) mandated accessible public sector websites and mobile applications, while the more comprehensive European Accessibility Act (2019/882)—fully applicable from June 2025—extends these requirements to a wide range of products and services, including banking, telecommunications, and e-commerce. At the national level, Romania’s Law No. 448/2006 on the protection and promotion of the rights of persons with disabilities and the National Strategy for the Rights of Persons with Disabilities 2022–2027 provide the legal and policy basis for accessibility efforts.

Despite this growing legal recognition, accessibility remains underdeveloped within the field of management. In organisational and strategic management literature, accessibility is mentioned only in passing. It is typically embedded within Environmental, Social and Governance (ESG) reporting, Human Resources (HR) practices under diversity, equity, and inclusion (DEI) frameworks, or as a secondary consideration in digital transformation. Accessibility, unlike mature strategic orientations such as innovation or sustainability, has not yet been institutionalised. It lacks a distinct management strategy with its own scope, objectives, and performance measures.

This gap motivates the present study. It examines how accessibility is currently framed within existing management strategies and investigates why it has not yet been recognised as a fundamental strategy. The paper contributes to management scholarships by highlighting this conceptual absence. It also offers accessibility as a candidate for formal strategic institutionalisation.

The guiding research question is therefore:

Why is accessibility, despite being mentioned within ESG, HR, or digital transformation strategies, still not recognised as a distinct fundamental strategy in management?

The objective of this paper is to address this gap through a narrative literature review and gap analysis. Additionally, it aims to advance the conceptualisation of an Accessibility Strategy as a formal domain in modern management.

2 Literature Review

2.1 Fundamental management strategies (1980–2010)

Classical strategy frameworks emphasised corporate, business, and functional levels (Porter, 1980; Johnson et al., 2008). These frameworks shaped how organisations structured decision-making, allocated resources, and pursued competitive advantage. Over time, new orientations emerged in response to changing economic and social demands. Innovation became a recognised strategic domain, and scholars such as Tidd and Bessant (2014) emphasised systematic approaches to creativity and knowledge transfer. Sustainability and ESG considerations also gained prominence, with research showing that long-term performance increasingly depended on integrating environmental and social responsibility into strategic planning (Eccles, Ioannou, and Serafeim, 2014). Digital transformation later followed as a fundamental strategy, and studies stressed the role of IT capabilities in enabling business agility and the creation of new value (Bharadwaj et al., 2013). In parallel, growth strategies were analysed through mergers and acquisitions, which became a well-established pathway to scale and diversification (Hitt, Harrison, and Ireland, 2001; Gaughan, 2017). Together, these developments demonstrate how new strategic orientations can emerge, become institutionalised, and eventually join the repertoire of mainstream management strategies.

2.2 Theoretical perspectives

Several theoretical perspectives provide lenses for analysing emerging strategies. Stakeholder theory (Freeman et al., 2010) highlights the responsibility of organisations to create value for all groups, not just shareholders. The resource-based view (Barney, 1991) identifies unique capabilities as foundations for sustained advantage, suggesting that inclusion and

accessibility could qualify as such resources if effectively developed. Corporate governance, which ensures transparency and accountability, has also been central to discussions of strategy and legitimacy (Shleifer and Vishny, 1997; Tricker, 2019). In the public sector, Moore’s (1995) concept of public value stresses that services must be inclusive to ensure legitimacy and citizen trust. Finally, Teece’s (2007) dynamic capabilities framework proposes that companies succeed when they can sense, seize, and transform opportunities. Viewed through this lens, accessibility could be positioned as a capability that enables organisations to detect underserved needs, capture inclusive innovations, and transform operations to deliver broader social and economic value.

2.3 Globalisation and diffusion

In the context of international strategy, globalisation has long been debated through the tension between global efficiency and local responsiveness (Prahalad and Doz, 1987; Bartlett and Ghoshal, 1989). The concept of glocalisation (Robertson, 1995) provides a useful middle ground, emphasising adaptation to both global and local contexts. Diffusion of innovations theory (Rogers, 2003) remains influential in explaining how new practices spread, while critical perspectives warn that not all innovations are embraced equally, with organisations sometimes adopting fads without long-term benefit (Abrahamson, 1991). These insights are relevant to accessibility, which often spread unevenly: while some sectors adopt accessibility measures quickly due to regulation or reputational pressure, others lag.

2.4 Accessibility in the recent literature (2020–2025)

Recent work shows that accessibility is mentioned in ESG, HR, digital transformation, and public services, but rarely institutionalised as a formal strategy. In ESG, compliance is often limited to compliance, such as adherence to reporting standards or accessibility guidelines, rather than being treated as a driver of stakeholder value (Dyllick and Muff, 2016). In HR, accessibility tends to be embedded within diversity and inclusion frameworks, with emphasis on recruitment but less on workplace design, retention, or culture (Yeo, Van de Walle, and Kim, 2023). Digital transformation initiatives mention accessibility, yet it is frequently treated as an add-on to user experience or as an additional cost rather than as a principle of universal design that benefits all users (Krok, 2024). Public services provide a mixed picture: Romania’s SMS-113 service has improved inclusion for people with hearing and speech impairments, but challenges such as limited awareness, low digital literacy, and fragmented implementation remain (Sava, Bokor, Botiș, and Nen, 2025). Similar gaps are noted across Europe, where the European Accessibility Act aims to create harmonisation, but where institutional uptake has been uneven.

This review suggests that, while accessibility is visible in contemporary discourse, it lacks the characteristics of a fundamental strategy. Unlike innovation or sustainability, accessibility has not yet been given a clear scope, defined objectives, or performance indicators. Its current treatment as a compliance requirement reflects a missed opportunity to reframe it as a strategic asset capable of driving competitive advantage, organisational resilience, and long-term social value.

3 Methodology

This study employs a narrative literature review combined with a theoretical gap analysis. The review was designed to map how accessibility is currently addressed in the management strategy literature and to assess whether it has the characteristics of a fundamental strategy. The scope covered works published between 1980 and 2025, beginning with the consolidation of classical strategy frameworks and extending to modern extensions such as ESG, digital transformation, and human resources. To ensure relevance to current debates, accessibility-related studies were limited to the period 2020–2025.

Source selection was conducted in three major databases: Scopus, Web of Science, and Google Scholar. The inclusion criteria comprised peer-reviewed journal articles, academic books, and relevant European policy reports with a clear link to management and strategy. Excluded were

highly technical or engineering-focused publications that lacked management implications, as well as grey literature without academic review. This approach ensured both scholarly rigour and practical relevance to the policy.

The review process followed three steps. First, publications were selected for references to accessibility within contexts of ESG, HR, digital transformation, or the public sector. Second, insights were thematically coded, with a distinction made between compliance-orientated treatments and references that framed accessibility as a driver of strategic value. Third, a comparative thematic analysis was conducted. The analysis applied the definitional criteria of fundamental strategies - scope, objectives, performance measures, and long-term orientation - to the collected evidence.

This process revealed that although accessibility is frequently mentioned, it consistently falls short of these criteria. Instead, it is treated as a compliance requirement or technical adjustment. The findings of this analysis form the basis for proposing accessibility as a candidate for institutionalisation as a distinct management strategy.

4 Findings and Discussion

4.1 Accessibility in ESG strategies

Accessibility is predominantly framed within the Social (S) dimension of Environmental, Social and Governance (ESG) reporting, where it is treated largely as a compliance obligation. This reflects a shareholder primacy mindset, in which ESG is approached as risk mitigation rather than as a stakeholder-driven value proposition (Eccles, Ioannou and Serafeim, 2014; Dyllick and Muff, 2016). In practice, organisations frequently restrict their efforts to meeting minimum legal standards, such as compliance with the Web Content Accessibility Guidelines (WCAG) or the Americans with Disabilities Act (ADA). Although such compliance is necessary, it does not ensure the integration of accessibility into long-term strategic planning or value creation (Pritchard and Roulstone, 2018).

In contrast, stakeholder theory emphasises that creating value for all groups, particularly under-served ones, is central to sustainable success (Freeman et al., 2010). From this perspective, accessibility should be seen not only as risk avoidance, but as a driver of legitimacy, reputation, and trust. Despite this, few organisations have gone beyond disclosure-based approaches to position accessibility as a competitive advantage within ESG strategies.

4.2 Accessibility in HR strategies

Within human resources, accessibility is typically embedded within broader diversity, equity, and inclusion (DEI) frameworks. However, Yeo et al. (2023) show that a persistent gap exists between declared inclusion goals and actual implementation, with systemic integration still in its infancy. Practices often remain limited to recruitment initiatives, while strategic dimensions such as workplace design, digital accessibility, and organisational culture receive limited attention.

This narrow focus underutilises human capital as a strategic resource. From the lens of the resource-based view (Barney, 1991), accessibility constitutes a capability that can be valuable, rare, and non-substitutable. A truly inclusive workplace not only improves employee well-being, but also enhances innovation, resilience, and adaptability. By treating accessibility as a marginal HR issue, organisations lose the opportunity to transform it into a sustainable competitive advantage.

4.3 Accessibility in digital transformation strategies

In digital transformation, accessibility is most often discussed as part of user experience (UX) or universal design (UD). Krok (2024) observes that policy frameworks frequently treat accessibility as an additional cost or secondary requirement rather than as a catalyst for innovation. However, digital technologies clearly have strong potential to expand inclusion when accessibility is embedded from the outset.

Research on emergency services highlights this potential. AI-based tools such as real-time transcription, chatbots, and multimodal interfaces have been piloted to improve accessibility in 112 call management (Bokor, Sava, Stănilă, and Nen, 2025a). Broader technological adoption, including Advanced Mobile Location (AML) and automated captioning, initially targeted people with hearing impairments but has since become mainstream, benefiting all users (Bokor, Lăţea, Sava, and Nen, 2025b). These cases illustrate the diffusion of accessibility-driven innovation to the wider population.

Viewed through the dynamic capabilities’ framework (Teece, 2007), such initiatives demonstrate the capacity of organisations to *sense* unmet needs and *seize* inclusive innovations. However, without embedding accessibility into long-term strategic planning, these initiatives remain incremental improvements rather than transformative change.

4.4 Accessibility in the public sector and policy management

In the public sector, accessibility remains underdeveloped as a strategic dimension. Institutions, including emergency services, have a mandate to serve all citizens, yet strategic planning frequently prioritises administrative efficiency over universal access. This omission undermines the creation of public value. As Moore (1995) stresses, public value arises not only from effective outputs but also from equitable access to those outputs.

The Romanian National Unique Emergency Call System (SNUAU–112) illustrates this tension. While technically efficient, it lacks long-term accessibility objectives such as video relay services (VRS) for deaf users or real-time text (RTT) for speech-impaired callers. The introduction of SMS-113 was an important step forward, providing an assistive channel for people with hearing and speech impairments. However, adoption remains low due to barriers such as pre-registration requirements and digital literacy challenges (Sava, Bokor, Botiş, and Nen, 2025). Recent research further highlights Romania’s progress in caller location technologies, with significant improvements in geolocation accuracy through Advanced Mobile Location (AML) and the Apel 112 mobile application; however, accessibility gaps remain due to the absence of real-time text, video relay services, and universally designed interfaces (Bokor et al., 2025d). This underscores the risk of treating accessibility as a one-off technical fix rather than embedding it into a comprehensive strategy.

4.5 Comparative summary across strategies

Table 1 synthesises findings across the four domains. It shows that accessibility is generally framed as compliance, whether through ESG reporting, DEI recruitment practices, additional digital design features, or partial assistive measures in the public sector. In none of these domains does accessibility currently meet the definitional criteria of a fundamental strategy: clear scope, objectives, performance measures, and long-term orientation.

Table 1. Accessibility in ESG, HR, digital transformation, and public sector strategies

Strategy Domain	Current Framing of Accessibility	Evidence (2020–2025)	Strategic Gap Identified
ESG	Compliance within the social (S) pillar; risk mitigation	Eccles, Ioannou and Serafeim (2014); Dyllick and Muff (2016)	Not treated as stakeholder-driven value
HR	Embedded in DEI, focus on recruitment	Yeo et al. (2023)	Workplace design, culture, and digital access secondary
Digital	UX/UD add-on, often extra cost	Krok (2024); Bokor, Sava, Stănilă, and Nen (2025a); Bokor, Lăţea, Sava and Nen (2025b)	Lacks integration into strategic innovation planning
Public Sector	Technical efficiency prioritised; partial assistive tools (SMS-113)	Moore (1995); Sava, Bokor, Botiş & Nen (2025c)	Fails to create public value through universal and equitable access

Source: Authors’ elaboration based on literature review.

Across all four domains, accessibility remains fragmented and reactive, treated as an obligation rather than as a proactive driver of long-term value. Unlike innovation or sustainability, it is not institutionalised as a distinct strategy with defined objectives and performance indicators. This systemic absence provides a compelling rationale for developing an Accessibility Strategy as a fundamental component of modern management. By reframing accessibility from a compliance burden into a strategic asset, organisations and public institutions can achieve competitive advantage, foster innovation, and contribute to enduring social value.

5 Conclusion

This study aimed to examine why accessibility, although increasingly mentioned within ESG, HR, digital transformation, and public sector strategies, has not yet been recognised as a distinct fundamental strategy in management. The findings confirm that accessibility is still largely fragmented and compliance-orientated, treated as a legal or technical obligation rather than as a proactive driver of long-term value. Although there are positive examples, exist - such as Romania's SMS-113 service in emergency communications or AI-based accessibility tools in digital transformation - these remain incremental improvements that are not yet integrated into strategic planning.

The analysis highlights a clear conceptual gap. Unlike innovation or sustainability, accessibility lacks institutionalisation with defined scope, objectives, performance measures, and long-term orientation. Addressing this gap requires reframing accessibility as a strategic asset, capable of generating competitive advantage, strengthening organisational resilience, catalysing digital innovation, and enhancing public value.

The contribution of this paper is twofold. Academically, it introduces accessibility as a candidate for institutionalisation alongside established fundamental strategies. Practically, it underscores that both organisations and public institutions can move beyond compliance by embedding accessibility into governance, culture, and digital transformation. Doing so enables not only greater inclusion but also greater innovation and legitimacy.

Future research should focus on developing a formalised Accessibility Strategy Framework that integrates insights from stakeholder theory, resource-based view, and public value management. This framework would provide managers and policy makers with the conceptual and operational tools to institutionalise accessibility as a long-term strategic priority.

Ultimately, accessibility is not only a matter of compliance or technical design. It is about ensuring that no voice is left unheard, no citizen is excluded, and no opportunity for innovation is overlooked when it matters most.

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INNOVATION AND GROWTH IN THE REPUBLIC OF MOLDOVA: EUROPEAN INTEGRATION, STATE AID AND INNOVATION INTERMEDIARIES

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Abstract: Research and innovation are indispensable for sustainable economic growth, which is why the study examines innovation in the Republic of Moldova from the perspective of economic activity and, in this context, highlights the role of state aid for research, development and innovation, as well as the role of intermediaries for innovation. The importance of the efficiency of the use of production factors (total factor productivity), largely due to innovation, is recognized in economic growth theories, while empirical studies prove the importance of innovation for the competitiveness and growth of the European economy in the 21st century.

The Republic of Moldova currently has research and innovation potential, but it does not have complex industrial ecosystems that allow for the commercialization of innovations and, consequently, sustainable economic growth. Structural imbalances, such as the general regulatory framework, the underdevelopment of the financial market and the early stage of development of venture capital, do not stimulate innovation and its commercialization, but two central components that can partially mitigate the imbalances are the subject of research of the study, implicitly: state aid for research, development and innovation, in the context of European integration and; the role of Innovation Intermediaries.

Key words: Innovation, Innovation Intermediaries, European integration, State aid, Economic growth.

JEL Classification: E1; H2; O1; O3; O4.

Introduction

The importance of innovation for the competitiveness of firms and countries is increasingly recognized by researchers and policymakers, while the specialized literature most often defines innovation along four dimensions: the introduction of new products/services, new processes, the opening of new markets, or the use of new resources to create value on the market (Obunike, *et al.*, 2017). At the same time, researchers distinguish different types of innovation, implicitly technological innovation and non-technological innovation (Rahman, *et al.*, 2016), but there is a common understanding of the role of innovation in overall economic growth, as well as the implications of innovation or the inability to innovate for companies—an inability that leads to reduced competitiveness, a difficult transition to the green economy and, consequently, poor performance (Hausman, 2005).

The development of endogenous growth theories has sparked innovation-related research since the 1970s. After the first studies focused on the concept of innovation and its measurement (Hurt, *et al.*, 1977; Midgley, *et al.*, 1978), innovation research later expanded to areas such as innovation capacity and its impact (Venkatraman, 1991; Hult, *et al.*, 2004). In this vein, the most important empirical study of the early 21st century on European competitiveness – *The Draghi report: The future of European competitiveness* – defines the need to accelerate innovation and find new growth engines as the first of the three pillars for the European Union, along with decarbonization and increased security (Draghi, 2024).

Research eventually extends to the determinants of innovation, since its role is practically unanimously accepted for every company and for sustainable economic growth. Various empirical studies dedicated to different countries or groups of countries define different determinants of innovation, which cover a wide range – from institutions and research infrastructure, government policies and incentives, to intellectual property rights (Bate, *et al.*, 2023).

The determinants of innovation in the Republic of Moldova are predominantly monitored within the Global Innovation Index (GII), since relevant empirical studies are yet to be developed in the domestic academic environment. For this reason, the research uses GII data and indicators for the year 2025 to understand the general context regarding innovation, to relate it to the European integration process and, ultimately, to focus on a state aid scheme that stimulates innovation and develops Innovation Intermediaries.

Innovation in the Republic of Moldova: Imbalances Related to Innovation Inputs and Outputs

The development of the GII, a report published since 2007 and, starting in 2011, elaborated in partnership with the World Intellectual Property Organization (WIPO), represents the expression of the importance of innovation for competitiveness and growth for companies and economies as a whole. The GII Index measures innovation at the international level, offering a detailed picture of the state of innovation performance in countries. The index measures three dimensions of innovation at the country level in order to capture innovation ecosystems, namely:

Innovation Input: structured around five core pillars that represent the factors stimulating innovation – creating the necessary conditions for future innovation outcomes.

Innovation Output: structured around two core pillars that measure the results of innovation.

Overall GII score: represents the average of the Input and Output sub-indices (WIPO, 2025, a).

The dynamics of all these indices are negative for the Republic of Moldova compared to the rest of the monitored economies, as evidenced by the GII dropping from position 59 in 2020 to position 74 in 2025. The trend is similar for both the Input and Output indices, with the mention that the Republic of Moldova performs better in terms of innovation results than in terms of innovation inputs (Figure 1).

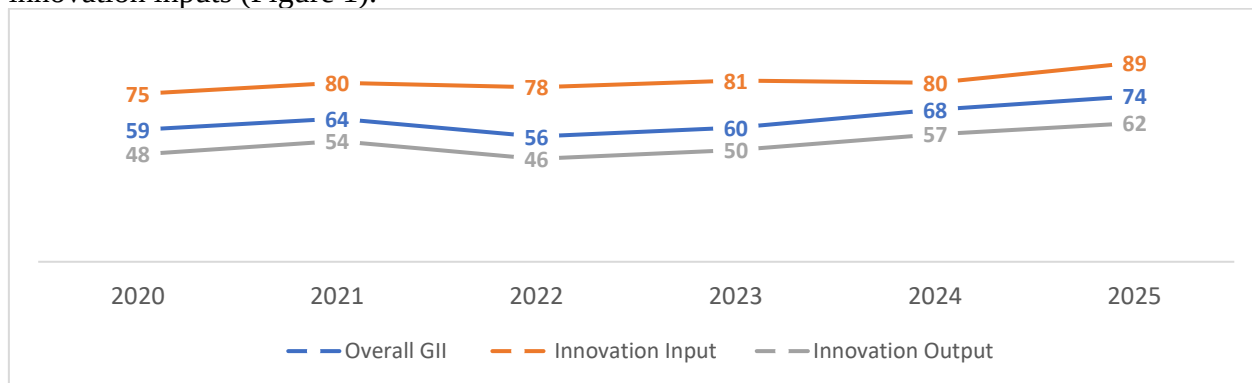


Figure 1. Ranking of the Global Innovation Index (GII) for the Republic of Moldova (2020–2025)

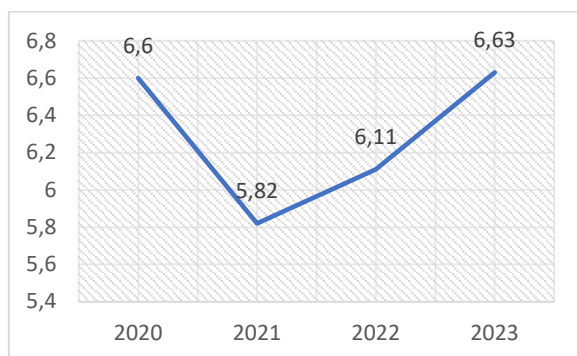
Source: adapted in accordance with WIPO, 2025, b.

Disaggregated, Innovation Input is measured through seven essential indicators within the GII, namely: Expenditure on education; Graduates in science and engineering; Researchers; Gross expenditure on research and development; QS university rankings; Domestic industry diversification; Employment in knowledge-intensive sectors. The first indicator – expenditure on education – is volatile but has shown a slightly positive trend since 2021, reaching 6.63% of GDP in 2023, while the last three are not necessarily representative for the Republic of Moldova, given

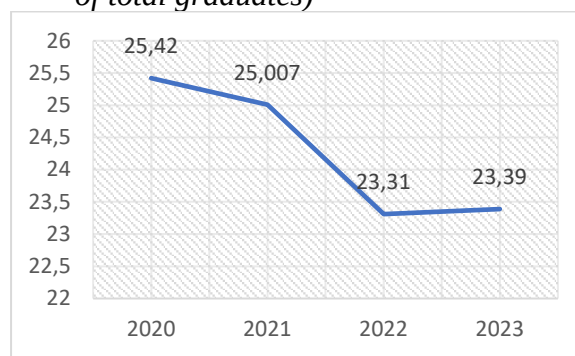
that it has no university listed in the QS World University Rankings in 2024, while the increase in the score for industry diversification (from approximately 1.7 in 2016 to around 2.0 in 2022) and the growth in the share of high-skilled labor (from about 16% in 2016 to 19% in 2023) are largely driven by foreign investments in the automotive and IT sectors.

At the same time, the number of graduates in science and engineering, the number of researchers, as well as expenditure on research and development have shown a negative trend in recent years (Figure 2).

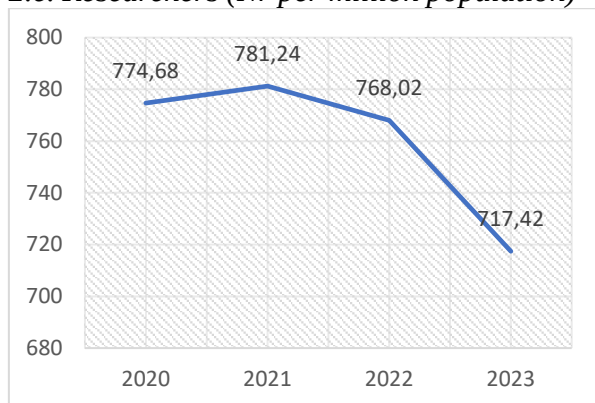
2.a. Expenditure on Education (% in GDP)



2.a Graduates in science and engineering (% of total graduates)



2.c. Researchers (Nr per million population)



2. d. Gross expenditure on R&D (% in GDP)

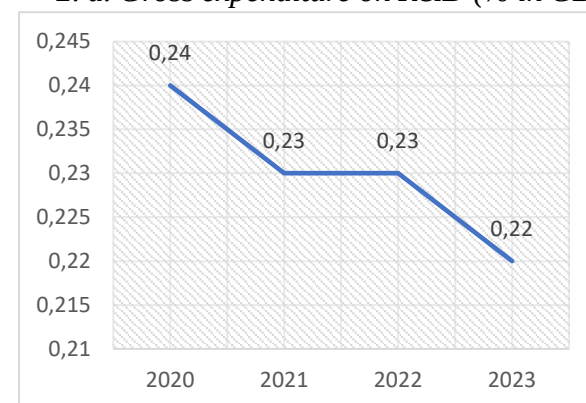


Figure 2. Innovation inputs in Republic of Moldova.

Source: adapted in accordance with WIPO, 2025, b.

Gross expenditure on R&D represents one of the most important indicators where the Republic of Moldova lags behind compared to OECD countries, which had an average expenditure of 2.7% of GDP in 2023, and implicitly compared to European Union member states, which had an average expenditure of 2.13% of GDP in 2023 (OECD, 2025). The difference is largely due to the fact that research and development investments are predominantly made from public sources, which mainly fund public research institutions. Thus, in 2024, research and development activity was carried out in 42 institutions, including: 13 universities, 19 research institutes/centers, and 10 other types of units. Of the total number of institutions, 27 entities (or 64.3%) were publicly owned (NBS, 2025).

The private sector, consisting of commercial companies and non-governmental organizations, is insignificant in the research system and is not yet included in the statistical reports on research in the Republic of Moldova. Statistics on the protection of intellectual rights indicate that only about 1.5-2% of patents are filed by private sector entities (GD, 2023).

In this context, innovation output in the Republic of Moldova also shows a negative trend, and the fact that it ranks higher than innovation input is determined by the particularities of the

domestic research ecosystems and the structure of the Moldovan economy. Data from Figure 3 indicate a significant decrease in the number of patents, down to 30 in 2023, as well as a decline in high-tech industrial production volume and mobile app creation (Figure 3).

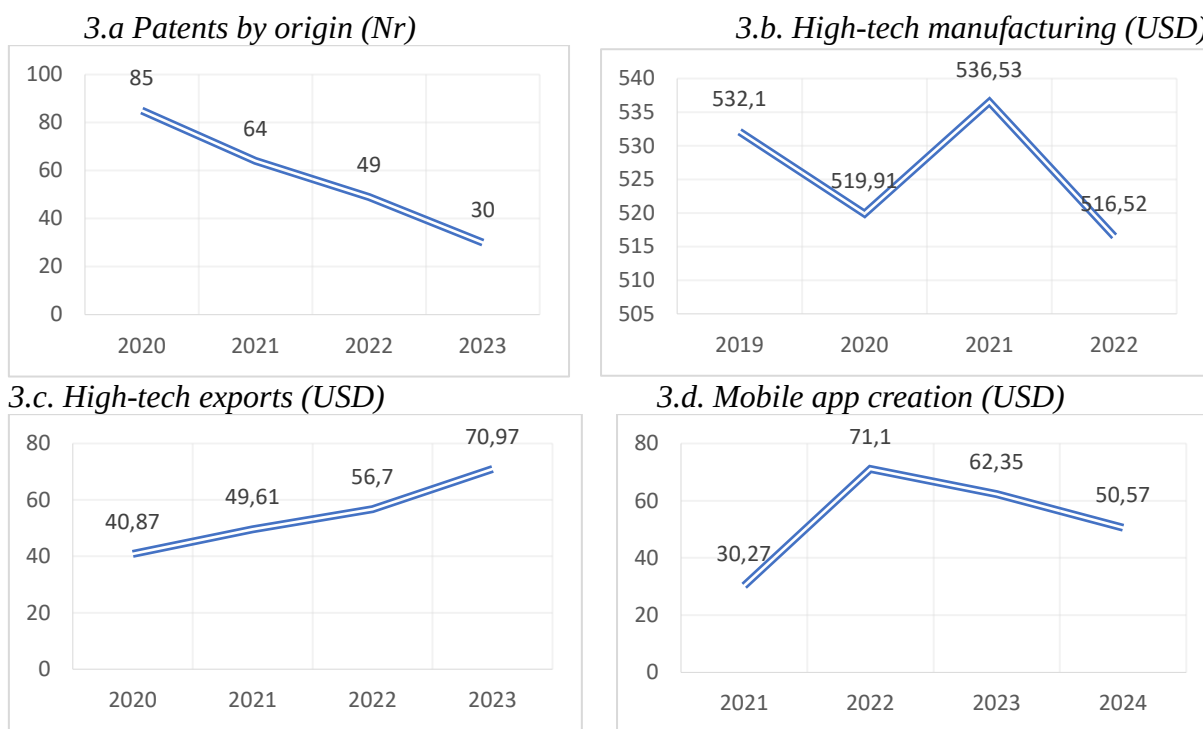


Figure 3. Innovation Outputs in Republic of Moldova.

Source: adapted in accordance with WIPO, 2025, b.

It is worth mentioning that high-tech production, and implicitly the growth of high-tech exports, some of the most important indicators of the GII, are predominantly driven by the increase in production and exports from two sectors that have grown in recent years – the automotive components industry and the IT industry – sectors that have grown implicitly due to foreign investments within the Free Economic Zones and, respectively, Moldova IT Park.

European Integration, State Aid, and Innovation Intermediaries

In order to create a resilient society and a competitive economy within a European single market, the Republic of Moldova must design and implement a long-term, complex approach to innovation, which entails, *inter alia*, institutional modernization, reform of the educational system, and development of the capital market, implicitly of venture capital. Moreover, beyond the necessary mandatory reforms, essential for increasing innovation and its commercialization in the Republic of Moldova is the valorization of private investments.

Stimulating and leveraging private investments represents the only sustainable solution for increasing investment in research and development, since public investments are insufficient and often do not translate into innovation outputs. Therefore, two basic mechanisms must be implemented: the development of a state aid scheme for research, development, and innovation (RDI), and the development of Innovation Intermediaries.

In this context, European integration has a direct impact on research and innovation in the Republic of Moldova, implicitly through access to related European Union funds, such as Horizon Europe, and through the stimulation of collaboration between academia and private sector companies. Furthermore, European integration and the transposition of the EU *acquis* require that the facilities granted to the private sector for research and development must comply with EU

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legislation on state aid, namely the Framework for State Aid for Research, Development, and Innovation (RDI Framework).

The European Commission has developed a framework for state aid for research, development, and innovation (RDI Framework)—a framework that, although periodically criticized for the stringency of EU rules on competition and state aid (Greenacre M., 2025), allows for the stimulation of private investment in research and development in member states.

The RDI Framework distinguishes between economic and non-economic activities, with only economic activities falling under the scope of state aid rules. It then defines the measures for which state aid may be compatible with the internal market, in accordance with the provisions of Article 107(3) of the Treaty on the Functioning of the European Union. The listed measures and the maximum general aid intensity for each measure depending on the size of the enterprise are described in Table 1.

Table 1. Maximum Aid Intensity for RDI

	Small Enterprise	Medium Enterprise	Large Enterprise
<i>Aid for R&D Projects</i>			
- Fundamental Research	100 %	100 %	100 %
- Industrial Research	70 %	70 %	70 %
- Experimental Development	45 %	35 %	25 %
<i>Aid for Feasibility Studies</i>	70 %	60 %	50 %
<i>Aid for the Construction and Modernization of Research Infrastructure</i>	50 %	50 %	50 %
<i>Aid for the Construction and Modernization of Testing and Experimentation Infrastructure</i>	45 %	35 %	25 %
<i>Aid for Innovation Targeted at SMEs</i>	50 %	50 %	-
<i>Aid for Process and Organizational Innovation</i>	50 %	50 %	15 %
<i>Aid for Innovation Clusters</i>	50 %	50 %	50 %

Source: adapted in accordance with the EC, 2021.

The EU rules on competition and state aid, along with related funding mechanisms, have enabled the stimulation of the European economy through state aid that represents, on average, 1% of the European Union’s GDP, with the exception of the pandemic years when state aid exceeded 2% of GDP, amounting to approximately €320 billion in 2020 and €323 billion in 2021. Additionally, the RDI Framework enabled the mobilization of approximately €16 billion in state aid exclusively for research, development, and innovation in 2023 (Figure 4).

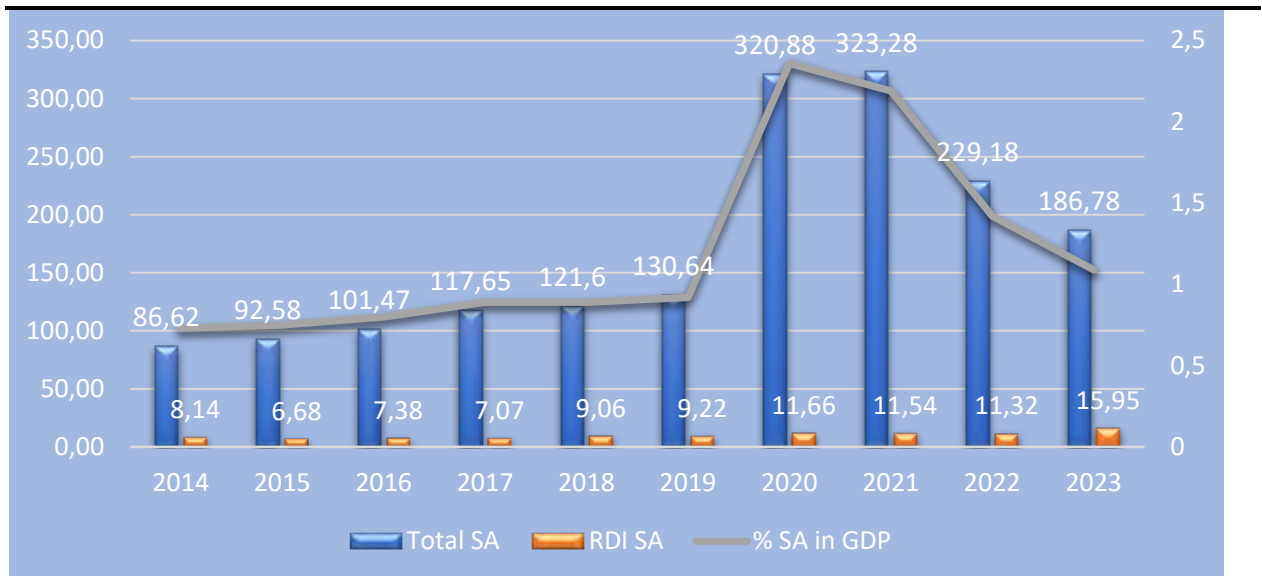


Figure 4. Dynamics of State Aid in the European Union, in Billion Euros and % of EU GDP

Source: adapted by the author based on EC, 2025.

There are significant differences between EU member states regarding the state aid granted and the state aid granted specifically for research, development, and innovation, but these differences are predominantly in absolute values. Germany and France are the EU member states that granted the highest total value of state aid in 2023, including the highest value of state aid granted under the RDI framework. Specifically, Germany granted a total of approximately €51 billion in state aid (of which €3.3 billion was for research, development, and innovation), while France granted a total of approximately €36 billion (of which €4.7 billion was for research, development, and innovation).

The Republic of Moldova is gradually aligning its national legal framework on competition and state aid with EU rules, in accordance with the commitments under the European Union – Republic of Moldova Association Agreement and the negotiation positions related to Chapter 8, while all existing fiscal facilities must be subject to state aid schemes. In this context, the state aid scheme in the free economic zones of the Republic of Moldova has been aligned with the EU acquis, namely through Government Decision No. 882/2024, and the first regional state aid scheme for investments in the Republic of Moldova was approved through Government Decision No. 875/2024. The regional state aid scheme for investments is the first state aid scheme fully aligned with EU state aid rules, specifically with the Communication from the Commission Guidelines on Regional State Aid 2021/C 153/01 (EC, 2021), which represents a mechanism for stimulating investments in the manufacturing industry.

The interest of domestic companies in the above-mentioned financing mechanism, along with the need to leverage private investments for innovation, recommends the development and implementation of a state aid scheme for research, development and innovation. The elaboration and implementation of this mechanism initially requires updating the Regulation on aid for research, development and innovation, approved by Competition Council Decision No. 8/2013, followed the elaboration by the Ministry of Economic Development and Digitalization and the Government's approval of a state aid scheme for research, development and innovation.

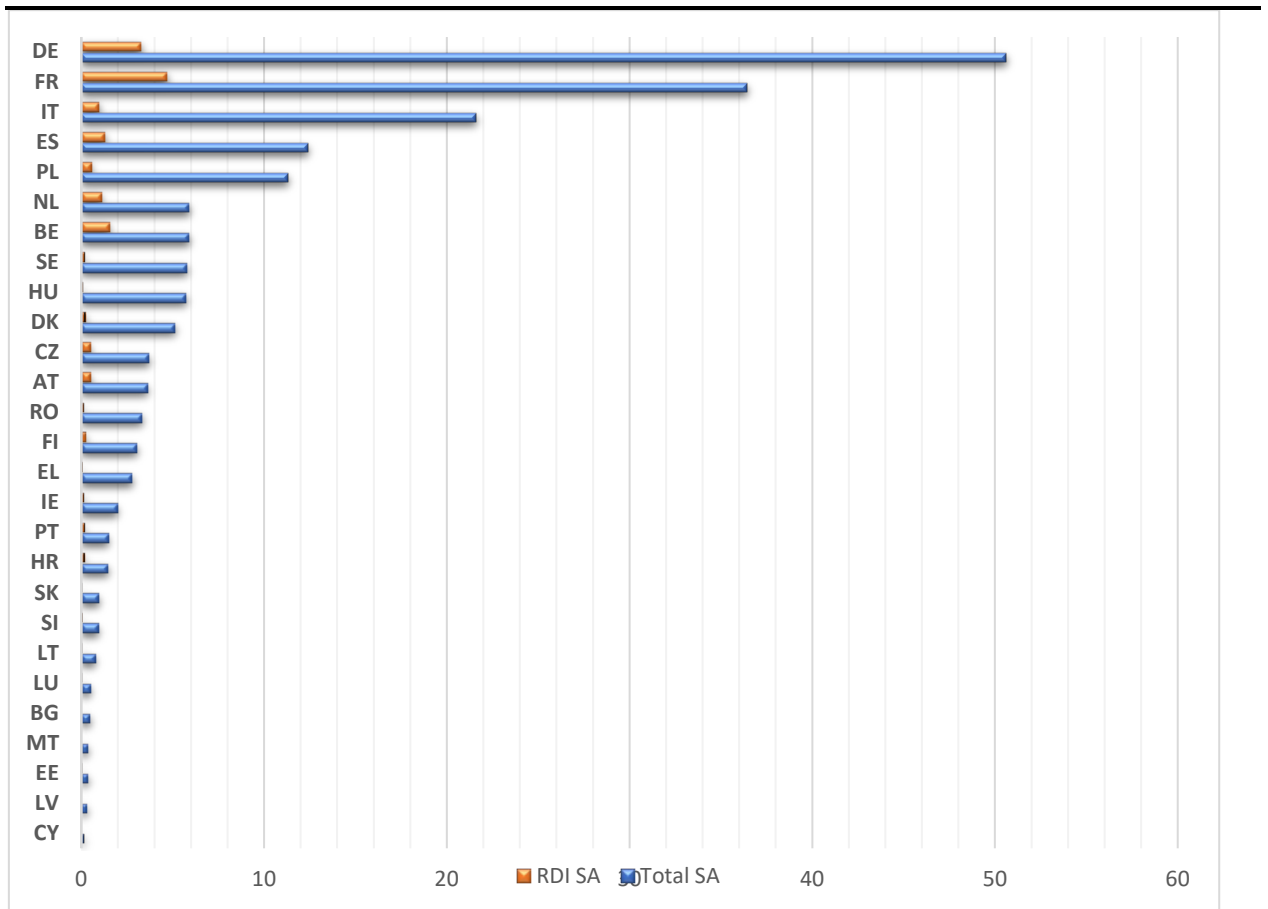


Figure 5. Total State Aid and State Aid for Research, Development and Innovation in European Union Member States in 2023, Billion Euros

Source: adapted by the author based on EC, 2025.

Moreover, in order to improve the efficiency of the support mechanism and to capitalize on the potential of the private sector, the state aid scheme for research, development and innovation must be implemented concurrently with the development of Innovation Intermediaries. Having undergone dynamic development over the past decades, under various names and functions (Caloffi, *et al.*, 2023), Innovation Intermediaries are essential to the digital transition of modern economies and, consequently, are becoming key actors in fostering innovation and its commercialization in the Republic of Moldova. Innovation Intermediaries are involved both on the demand side and the supply side of innovation and technological solutions, as they mediate between organizations that request innovation and technology (large companies, SMEs, or public authorities) and organizations that provide technology or innovation (large companies, SMEs, universities, and public research organizations) (Rossi, *et al.*, 2020).

Partnerships between the public sector, private sector, academia, and development partners have enabled the creation of several institutions in recent years that are expected to become authentic Innovation Intermediaries in the Republic of Moldova (Table 2).

Table 2. Potential Innovation Intermediaries in Republic of Moldova

The scientific and technological park, and innovation incubators

Scientific and Technological Park “Academica” with “Inovatorul” Innovation Incubator
“Politehnica” Innovation Incubator
“Innocenter” Innovation Incubator
“Inventica-USM” Innovation Incubator
“Antreprenorul Inovativ” Innovation Incubator

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Moldo-Lithuanian “Media Garaj” Innovation Incubator
“IT4BA” Innovation Incubator
Support hubs within universities
IT innovation center Tekwill Chisinau, Balti and Comrat
IT innovation Centre in IT “Inotek”
Fabrication and testing laboratory “FabLab”
IT innovation “IHub”
Finance and IT center “Fintech Hub”
Media and creative industries hub “Mediacor”
Artistic and cultural hub “Artcor”
GLIA Impact Hub
Cybercor

Source: Ministry of Education and Research data.

The efficiency of the organizations mentioned in Table 2, will increase only with the development of a state aid mechanism for research, development and innovation (in accordance with the European model), or through the connection of financial institutions and/or venture capital to these organizations (the Japanese or American model). Based on the size of Moldova’s economy and its currently limited research capacities, the most suitable model for the Republic of Moldova is to connect Innovation Intermediaries to the implementation of the state aid scheme and to financial institutions and/or venture capital. In this regard, the aforementioned organizations should not merely serve as concretion and innovation spaces, but should be involved inter alia in the administration of the state aid scheme for research and innovation, and in initiating joint R&D projects with universities, research institutes, and companies, as well as launching knowledge-sharing activities.

Conclusions and recommendations

Research and innovation have largely determined the evolution of human civilization and are becoming crucial to economic growth and well-being in the 21st century, evidence that contemporary empirical studies validate the assumptions of endogenous theories of economic growth.

The Global Innovation Index data show a negative dynamic for the Republic of Moldova for the overall innovation score and for the Input and Output Indices, the GII dropped from position 59 in 2020 to position 74 in 2025.

Input indicators are generally lower compared to Output indicators in the Republic of Moldova, but the largest difference in relation to the economies of the European Union is in the case of one of the most important indicators, namely gross expenditure on R&D. The Republic of Moldova spends 0.22% of GDP on R&D, while the European Union member states had an average expenditure of 2.13% of GDP in 2023.

Research and innovation that increases factor efficiency are crucial for sustainable economic growth in the Republic of Moldova, in the context where gross fixed capital formation is insufficient and negative net emigration does not allow for substantial growth in employees.

Beyond the mandatory reforms necessary to stimulate research and innovation, implicitly reforms in the education system and the development of the capital market/venture capital, essential for increasing innovation and its commercialization in the Republic of Moldova is the stimulation of private investment – since public investment is insufficient and often does not translate into innovation outputs.

To stimulate private investment, it is necessary to develop a state aid scheme for research, development and innovation (RDI) and the development of Innovation Intermediaries.

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Given the size of the Moldovan economy, as well as the currently reduced research capacities, the most appropriate model for the Republic of Moldova is to connect Innovation Intermediaries to the implementation of the state aid scheme and to financial institutions and/or venture capital.

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SCIENTIFIC ASSOCIATIONS AS DRIVERS OF EDUCATIONAL AND RESEARCH POLICY: COMPARATIVE INSIGHTS FROM JAPAN AND MOLDOVA

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Abstract: Disciplinary scientific associations are key actors in educational and research architecture, capable of strengthening academic communities, facilitating knowledge transfer, and shaping strategic development in research, education, and innovation. The aim of this research is to conduct a comparative analysis of the Japanese and Moldovan models of scientific disciplinary associations, highlighting differences in terms of size, functionality, and the impact on public policies, including educational policies, as well as on society. To advance the research, a comprehensive methodology was applied, integrating both quantitative and qualitative approaches and drawing upon a wide range of relevant information sources. These included policy documents, statistical data, secondary sources, and comparative studies.

Research has found that Japanese scientific societies are characterized by an institutionalized system integrating research, education, and innovation, supported by mixed funding mechanisms, and providing expertise to the government in the formulation of educational and research policies. In the Republic of Moldova, disciplinary scientific associations are fewer in number and institutionally fragile, with activities focused primarily on conferences and publications, playing only a limited role in decision-making processes and enjoying modest international visibility. The results of the study highlight the need to strengthen the institutional capacities of these structures in the Republic of Moldova through public support, integration-oriented policies, and internationalization measures. The findings further emphasize that adapting selected best practices from the Japanese model could significantly contribute to enhancing the role of scientific associations as relevant actors in educational policy-making and in advancing the development of a knowledge-based society.

Keywords: scientific associations, research-education-innovation ecosystem, public policies

JEL Classification: A29, O1, O2, Q01

1 Introduction

Scientific associations are central actors in research and innovation ecosystems, facilitating knowledge exchange, interdisciplinary cooperation and influencing scientific and educational policies. They constitute frameworks for the aggregation of intellectual capital, playing a pivotal role in advancing knowledge transfer, promoting both interdisciplinary and international collaboration, and supporting the development of scientific networks. These organizations have a distinct role in society, due to their ability to bring together academic communities, to promote professional standards, and to influence the directions of research and higher education development. However, the level of development of scientific societies and their involvement in the process of developing public policies in the field of education and research varies considerably between the Republic of Moldova and other countries. These differences are determined by factors

such as academic tradition, available institutional resources, funding mechanisms and the extent to which the scientific community is integrated into the governance architecture of education.

In this context, examining the experience of countries where such organizations exert a significant impact on research, education, and innovation, Japan being a particularly illustrative example, provides valuable insights into the mechanisms of institutional consolidation and helps identify good practices that can be adapted to the realities of the Republic of Moldova. It is worth noting that Japan hosts one of the densest ecosystems of scientific associations worldwide, owing to its strong academic tradition, systematic state support, and deliberate fragmentation into specialized niches. The rapid transformations of recent decades in the Republic of Moldova highlight the need to reconsider the role of scientific associations in the formulation and implementation of educational and research-innovation policies.

The purpose of this research, conducted within the HESPRI project (WP3), is to evaluate the role of Japanese scientific societies in the research–education–innovation ecosystem, including an analysis of their contribution to shaping and influencing higher education policies. At the same time, the study aims to identify best practices generated by these organizations, with the goal of adapting and transferring them to the education and research system of the Republic of Moldova, in order to strengthen institutional capacity, increase their impact on public policies, and foster international collaboration.

The research employed a comprehensive methodology integrating the following methods: document and public policy analysis, statistical analysis, focus groups, network and partnership analysis, comparative analysis, and international benchmarking. This approach enabled a thorough evaluation of the role of Japanese disciplinary scientific societies within the research–innovation–education ecosystem and the identification of best practices relevant to the Republic of Moldova.

2 Scientific Associations and their Influence on Educational and Research Policies

2.1 The Role of Scientific Associations in the Education–Research–Innovation Ecosystem

In a knowledge society, scientific associations occupy a central position within the research ecosystem. They function as nodes of connectivity and intermediaries between the academic community, government institutions, the economic sector, and society at large. By their nature, these organizations represent forms of self-organization among researchers, aimed at ensuring both professional cohesion and the consolidation of disciplinary or interdisciplinary identity, while facilitating collaboration, information exchange, the establishment of professional standards, and dialogue with other sectors (public authorities, industry, and civil society).

Based on the review of the literature, three main dimensions of the role of scientific associations in contemporary society can be identified: *governance/ethics and standards*, *knowledge dissemination and community building*, and *the development of institutional capacity*.

Scientific associations make a significant contribution to *defining and implementing ethical standards, regulating research conduct, and establishing accountability mechanisms in research*. They develop codes promoting responsible research leadership, guidelines for academic behavior, and procedures that foster a culture of integrity. These organizations can play a crucial role in the formulation and adoption of policies in the fields of research, education, innovation, industry and business development. (Bendiscioli *et al.* 2020; Frankel 1993; AAAS 2000).

Dissemination, a traditional role of disciplinary scientific societies, remains fundamental in the digital and global era. Through journals, conferences, and workshops, scientific associations ensure the circulation of ideas, peer-review validation, and interdisciplinary exchanges (Delicado *et al.* 2014). In this way, they facilitate the generation of shared resources for professional development, research dissemination, and network building (AAAS, 2020). Thus, through dissemination activities, these organizations contribute to academic validation, the facilitation of

collaborations, scientific mobility, research outcome validation, and the strengthening of disciplinary academic communities.

Another particularly important role of scientific associations is to support the *development of research capacity*, both at individual and institutional levels. In this regard, they can contribute to facilitating access to resources (infrastructure, equipment), supporting institutions to improve research management, advising on grant writing, supporting young researchers (mentoring, scholarships, training), mediating international cooperation for skills exchange, mobilities, partnerships. These scientific organizations can encourage relevant local research, by providing training in research methods, mentoring, financial support (Klinsky *et al.* 2022, Harris 2004).

Thus, through the actions mentioned above, scientific associations can become pivotal actors in the research-education-innovation ecosystem. They not only support individual researchers, but also contribute to impacting public policy and building a scientific community oriented towards excellence and responsibility.

Countries where disciplinary scientific associations are well developed and positioned in the academic environment have a strong impact on innovation, economic and social development. Among these, the USA, Great Britain, Germany, Japan, Canada, Australia, etc. stand out, where scientific societies function not only as professional organizations, but as key institutional actors in the governance of science, education and innovation.

Within the HESPRI project, I had the opportunity to participate in a study and research visit to Doshisha University in Kyoto, Japan. This experience proved invaluable for understanding and analyzing internationally recognized educational and research models and served as a valuable starting point for conducting a comparative analysis of the Japanese and Moldovan models of scientific associations. The visit highlighted both best practices that could be adapted to the Moldovan context and specific challenges that require innovative solutions.

2.2 Scientific associations as key actors in shaping educational and research policies: a comparative analysis of the Japanese and Moldovan Models

Disciplinary scientific societies in Japan constitute fundamental pillars of the academic community, many with traditions spanning over a century. They play a crucial role in consolidating scientific identity and promoting research excellence. These societies operate as autonomous entities organized by specific fields, bringing together faculty, researchers, and professionals, thereby facilitating knowledge exchange. They are recognized not only as forums for academic debate and scientific publication but also as key actors in shaping educational and research policies, possessing substantial capacity to influence the strategic directions of higher education development. In Japan, there are over 2,000 scientific societies (Japan Foundation), of which approximately 1,200 are officially recognized by the Science Council of Japan (e.g., The Physical Society of Japan), covering a wide range of scientific disciplines. These societies collaborate directly with universities, supporting early-career researchers through scholarships, research competitions, and mentoring networks. Japanese scientific associations play a distinct role in promoting prestigious publications, with the majority publishing internationally indexed journals (via platforms such as J-STAGE, an online platform for academic journals), thereby ensuring the global visibility of Japanese research and facilitating its integration into international networks. The funding sources for these organizations are diverse, including membership fees, public grants and subsidies, registration fees for scientific events, revenues from publications and editorial services, private sponsorships, and others. The majority of university faculty members belong to at least one such association. In many cases, universities provide support to researchers for covering membership fees. Japanese scientific societies are distinguished by the integration of research and education, the efficient dissemination of scientific results, and their direct involvement in decision-making processes.

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In the Republic of Moldova, disciplinary scientific associations are at a less consolidated stage of development compared to the Japanese model. Their number is considerably lower, estimated at between 70 and 100 associations, or according to some sources, between 100 and 300 organizations, while their international visibility remains limited. Most operate as non-profit associations with autonomous legal status, yet they face constraints in terms of institutional capacity and available resources. These associations have a narrow disciplinary focus, typically in fields such as medicine, law, history, and economics, and are mainly concentrated around the Academy of Sciences of Moldova or key university centers and research institutes. Unlike in Japan, their involvement in the formulation of educational and research policies is sporadic and less institutionalized. Collaboration with international scientific networks exists but remains fragmented, often limited to externally funded projects or individual initiatives by members. Funding primarily relies on membership fees, voluntary contributions, and occasionally grants or sponsorships, while public support is modest.

Based on desk research, discussions and questioning of representatives of the academic environment in Japan, in private, of professors at Doshisha University, but also from the Republic of Moldova, analysis of publications of Japanese and Moldovan authorities, data on the activity of scientific associations in Japan and the Republic of Moldova, using the benchmarking method, we attempted to make a comparison of the Japanese and Moldovan model of establishment and functioning of scientific associations in both countries. For the purpose of this comparative study, nine dimensions were identified as the most relevant for capturing the role of scientific associations in society. The summary of this comparative analysis is presented in Table 1.

Scientific associations in Japan play a central and institutionalized role in the elaboration of research and education policies, contrasting strongly with the fragmented system in the Republic of Moldova. Nippon associations have a major influence on the performance of research-innovation and development of cognitive and research skills of young people enrolled in higher education. Among the main mechanisms of influence of research and higher education policies can be highlighted: formal integration (official governmental advisory status) in the design of public policies; financial leverage (directing public funds through Japan Society for the Promotion of Science - JSPS, Japan Science and Technology Agency - JST) to research priorities aligned with national objectives (e.g. artificial intelligence, decarbonization); education-career interconnection (associations co-develop curricular standards with Ministry of Education, Culture, Sports, Science and Technology MEXT – e.g., Japanese Society for Engineering Education); stable partnerships with industry, co-financing projects, guiding applied research (e.g., Keidanren).

Table 1. Comparative analysis of the characteristics of scientific associations in Japan and the Republic of Moldova

Criteria	Japan	Republic of Moldova
Legal status	Non-profit organizations/legally regulated foundations	NGOs, voluntary structures
Degree of organization (organizational maturity)	Very high. National network	Degree of organization
Funding	Dues, public funds, industry sponsorships	Low dues, extremely limited public and private support (practically absent)
Relationship with universities	Intense and structured cooperation	Reduced institutional involvement

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Relationship with industry	Joint projects, active technology transfer	Occasional collaboration
Role in public policies	Formal consultative, active participation	Marginal, episodic
Main activities	Conferences, publications, professional training	Isolated events, limited influence on research outcomes
Institutional recognition	High, integrated into national	Limited, without an active role in decision-making
Internationalization	Extensive, global partnerships	Low, limited access to external networks

Source: own work

Scientific associations in Moldova have not yet become an important pillar in the research-education ecosystem, as such structures have been established in Japan. They are marginalized in policy involvement (no formal advisory role; associations are excluded from educational reforms); they are financially fragile (dependence on low dues limits strategic activities); they represent isolated systems (weak university-industry links hinder research relevant to workforce qualifications/skills).

Despite these differences, on certain criteria/dimensions the gaps are major. Based on a comparative qualitative analysis, on the evaluation of the structure, financing and functioning of scientific associations, their role in public policies and the relationship with the academic and business environment, national policies and reports in the field of research and higher education, data from scientific associations, discussions with representatives of the academic environment – members of various scientific associations and other relevant information, the radar chart (Figure 1) was developed, which reflects *the general trends and relative levels of development of each dimension analyzed in the mentioned countries.*



Figure 1. Evaluation of the role of scientific associations in Japan vs. the Republic of Moldova

Source: own work

As can be seen from Figure 1, Japan has a balanced and high performance in all 9 dimensions, indicating a mature and functional ecosystem. The Republic of Moldova shows significant weaknesses in policy influence, collaboration with industry and internationalization, as well as modest values in the other dimensions.

It can be concluded that in contrast to the situation in Moldova, scientific associations in Japan have a strong impact on development policies, especially those in the field of research and higher education, due to the following 4 pillars: *a legally framed role* (e.g. SCJ recommendations shape the 5th Basic Plan for Science and Technology); *close links with education* (e.g., the Physical Society of Japan co-authors the national curriculum guidelines for physics); *integration with industry* (e.g., the Japan Statistical Society develops industry standards adopted by the Ministry of Economy (METI)); *global networks* (e.g., SCJ hosts the World Science Forum 2025, positioning Japan in global science governance). In Japan, associations drive coherent national strategies (e.g., the Society 5.0 initiative). In the Republic of Moldova, policies remain reactive/fragmented due to the marginalization of associations.

In the Republic of Moldova, scientific associations face multiple institutional and financial constraints, limiting their capacity to act and their impact on public policies. Although notable initiatives exist within specific fields, the involvement of these organizations in decision-making processes remains fragmented, and their international visibility is modest. This gap prompts an examination of how well-established best practices and experiences from other contexts, particularly Japan, might be adapted to reinforce the role of these organisations within the Moldovan higher education and research system.

Thus, the comparative analysis of the Japanese and Moldovan models of disciplinary scientific associations not only highlighted the structural and functional differences between them, but also allowed highlighting opportunities for the transfer of Japanese experience to the academic environment of the Republic of Moldova and alignment with international good practices, thus contributing to the shaping of more efficient and sustainable educational and research policies.

In light of the above, we argue that harnessing the potential of scientific associations in our country requires a strategic approach, encompassing the following measures: the clear legal and institutional regulation of the status and role of scientific associations; institutionalizing their participation in the formulation of national policies and strategies; establishing a public funding mechanism to support their activities on a competitive and transparent basis; promoting internationalization through membership in global networks; fostering inter-associative collaboration and the engagement of researchers from the diaspora; and supporting the leadership of young researchers by involving them in the governance structures of these associations.

3. Conclusion

Disciplinary scientific associations are important actors in the research-education-innovation ecosystem. These organizations not only reflect the internal needs of the scientific community, but also exert structural influence on how research is organized, evaluated, and integrated into society.

International experience, including that of Japan, demonstrates that scientific associations can perform multiple roles: representation and advocacy; promotion of research excellence; influence on public policies; professional development; standard-setting; advisory functions in policymaking; facilitation of networks and collaborations; support for early-career researchers; science communication; and engagement with academia, public authorities, and the economic sector. In Japan, membership in at least one disciplinary society has become a professional norm for university faculty, reinforcing a sense of belonging to the academic community and fostering integration into international research networks. These associations are not limited to serving as disciplinary platforms for disseminating research results; they also function as institutional

structures capable of generating expertise, mobilizing resources, and intervening in decision-making processes at both national and international levels.

In the Republic of Moldova, these roles are not fully leveraged, manifesting only partially, sequentially, and within limited contexts. The activities of scientific associations focus primarily on organizing academic events, publishing research, and supporting young researchers, while their function as influencers of public policy and as a bridge between universities and industry remains largely unexplored. Consequently, despite their significant potential, the actual impact of these organizations on educational and research policies remains limited. These constraints highlight the need to strengthen the organizational capacity of scientific associations in Moldova and to promote their more active integration into the research–innovation–education ecosystem and international networks.

Leveraging the potential of scientific associations, their active involvement in advisory processes (through consultative councils) to public authorities, participation in the development and implementation of national strategies, and engagement in legislative processes relevant to research and higher education could enhance the coherence and relevance of the national research–education–innovation system and contribute to the promotion of sustainable reforms.

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RESEARCH ABOUT TOURISM VALUE CHAIN IMPACT IN RELIGIOUS TOURIST DESTINATIONS FROM LEBANON

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Abstract: This paper aims to study the impact of tourism value chain in religious tourist destinations and formulate a value chain model for developing religious tourist destinations from Lebanon. In this sense, a systematic literature review was conducted to identify the lapses in the religious tourism supply chain which provides adequate revenue to the tourism sector. The identified lapses shaped the objectives and research methodology of this study and guided the authors to develop a theoretical framework (survey) for the smooth flow of people and other services along this supply chain. Collaborative efforts of all stakeholders at different levels can make the proposed framework work effectively. For data collection, this study adopts a quantitative analysis, the descriptive survey, with a set of step-by-step processes that has been proposed to understand the religious tourism supply chain. The main results of this research show the strong impact of tourism value chain in religious tourist destinations which deserves the attention of cultural and tourism policymakers from Lebanon. In addition, the results of this research can be taken into account by other countries with different religions for developing their own tourism value chain. The importance of the study is far-reaching. The findings can contribute to the expansion of supply chain in religious tourist destinations and aware of the importance of reconstruction solution to the tourism value chain. Finally, this study proposes a list of conclusions that would benefit future researchers to close the lapse in the tourism value chain on religious tourist destinations.

Keywords: tourism value chain, religious tourist destinations, supply chain, religious tourism, Lebanon

JEL Classification: Z32, L83, L89

1 Introduction

Our study focuses on religious tourism from Lebanon and will present the tourism value chain in tourist destinations with historical, cultural and especially religious importance for tourism sector. This paper investigates the impact of the tourism value chain in religious tourism destinations from Lebanon and discusses how countries in such a situation can increase their potential for developing the religious tourism value chain. A possible solution is suggested through the use and practice of tourism destination management, as this approach can help better prepare nations for unexpected instability and uncertainty in the tourism value chain (Kabalan & Stanculescu, 2018). Some stakeholders believe that the problems of the deteriorating value chain in Lebanon's tourist destinations could be solved through tourism. The presence of many stakeholders only adds to the complexity of this research area (Apaydin *et al.*, 2016).

This study demonstrates the strong role of the tourism value chain on the economy and religious tourism industry from Lebanon, which deserves the attention of cultural and tourism policy makers. In addition, the results of this research can also be taken into account by other countries with different religions (Budovich, 2023). From the value chain model, it is known that

many aspects determine the success of religious tourism management, including the role of the government, investors or business people, as well as the individuals or communities who contributed to building religious tourism destinations (Muhardi *et al.*, 2023).

The paper is an attempt to identify and model the factors that contribute to the religious tourism supply chain from Lebanon. The identified factors and their modeling will further contribute to the revitalization of the religious tourism sector by highlighting the factors that stakeholders believe will affect the travel decisions of religious tourists. The research has been organized in the following sequence. Following the introduction is the literature review section. The research methodology segment describes the impact of tourism value chain in religious tourist destinations from Liban through a quantitative analysis, the descriptive survey. The subsequent section discusses the results and conclusions. The last section describes the limitations and scope for further studies.

2 Literature Review

Tourism is one of the largest and fastest growing industries in the world, and tourism planning is considered a prerequisite for success (Issa & Altinay, 2006; Robinson *et al.*, 2020). Tourism development and planning should consider the value-added activities that form a tourism value chain. Religious tourism (traditionally known as pilgrimage) is an essential element of society. The religious tourism trade adds significant contribution to the tourism sector in terms of revenue, employment, cultural and destination visibility, etc. Infrastructure development and government initiatives have made religious tourism a lucrative business for various tourist destinations.

In contrast to the same, lack of attention and standard operating procedures have made the religious tourism supply chain vulnerable to various threats. People-oriented religious destinations will face many more challenges to maintain people's faith and emotions (Mittal & Sinha, 2022). The rapid development of modern service industries has a significant impact on religious tourism in many ways. Among them, the progress of information technology and e-commerce has brought opportunities and challenges to religious tourism. With the value chain theory, this paper firstly made an analysis of the distinctive features, forms and limitations of the value chain of religious tourism and proposed the solution of reconstructing the tourism value chain in religious tourism destinations (Lao & Hu, 2007; Sutomo *et al.*, 2023).

The ancient tradition of pilgrimage is transforming into the modern theme of religious tourism. Although religious travel represents tourist characteristics, the intention, purpose and spirit of the tourists remain the same. This transition has resulted in the commercialization of religious travel with comfortable travel packages. Tourism is a sensitive service industry. Well-coordinated and best efforts come to naught when the service supply chain is disrupted by external factors/natural disasters. Any mundane fuss in one link affects all the links, creating a swing along the entire supply chain. The main components of a tourism supply chain ensure a smooth flow of people from source to destinations. Later, it became necessary to manage the supply chain of this tourism sector for a smooth flow of people from source to destination (Sinha & Mittal, 2021).

2.1 The Religious Tourism Value Chain

Religion and spirituality are still among the most common motivations for travel (Zamani-Farahani *et al.*, 2018). Religious tourism is a subset of tourism that emerged from the ancient tradition of pilgrimage. The intention, purpose and spirit remain pious with religious tourism, but the journey has become touristy characteristics (Lin & Fu, 2020). Modern religious travel is a pilgrimage with long-term tourist characteristics. The various causes of this transformation are destination visibility, last-mile connectivity, affordability and annual family vacations. This transformation has also led to the commercialization of religious travel with star-studded customized tour packages (Sinha & Mittal, 2021). Religious tourism can prevail against climate conditions and the numbers of tourists do not fluctuate dramatically through seasonal changes or

adverse weather. For this type of tourists, the destination is not the only thing that matters. Their experience begins at the very beginning of the starting point and encompasses all the paths and events they encounter along the way. Religious tourism plays a prominent role in people's social lives (Nasiri, 2021).

The value chain of religious tourism explores the values and implications of pilgrimage as experienced by religious travelers. It identifies and explores both spiritual and social values as well as political and economic values throughout the value chain of the tourist destination. The value chain of religious tourism also investigates the hierarchical relationship between the attributes of pilgrimage, the consequences that senior pilgrims have achieved and the satisfaction of personal values as the final goal. The clear links are found between the attributes, consequences and values with social interactions that are achieved by maintaining contact with friends, followed by spiritual succor and support that connects with supporting cathedrals, praying and soul redemption. These findings offer new insights into the pilgrimage literature (Kuo *et al.*, 2019).

The value chain for religious tourism connects pilgrimage features to pilgrim advantages, which ultimately meet their personal values objectives. Social interactions among pilgrims produce the most connected value chain sequence and establish a strong relationship between pilgrimage attractions and intended outcomes and personal value fulfillment. The results from this research introduce essential understandings regarding the integration of secular and holy values, which operate throughout religious visitor destinations (Kim *et al.*, 2016).

2.2 The Tourism Value Chain Impact in Religious Destinations from Lebanon

Lebanon has the potential to attract many religious tourists because of its unique and intricate nature (Jallat & Shultz, 2011). In Lebanon, religious tourism has seen an increase of share within the tourism industry. However, it still faces challenges when it comes to involving the local community in the management process of religious tourism destinations (Baker *et al.*, 2020; Ertzogue, 2023). The evolving sacred geographies of Lebanon testify to the importance of religious tourism in the landscape of tourist destinations. The late 20th and early 21st centuries have seen the development of gigantic christian projects, including statues and large crosses of saints. This trend is linked to the development of religious tourism from Liban (Farra Haddad, 2024).

Lebanon is known for having a long and rich history of pilgrimage and religious tourism, which has attracted pilgrims from both within and outside the region for centuries. The Lebanese tourism value chain is characterized by strong socio-cultural and political tensions that affect religious travel in the area (Olsen, 2018). Research conducted so far reveals the perceptions of Lebanese tourists oriented primarily towards cultural and religious tourism that thrives at the country level. Multi-level stakeholder discourses and surveys show that the degree of consensus between stakeholders, locals and visitors on cultural, tourist and territorial dimensions is more significant in Lebanon (Chaddad, 2021).

There is currently a great interest from all the agents involved in the religious tourism value chain in Lebanon to promote religious tourist destinations, which could contribute to stimulating the diversification of the local tourist offer and the development of the tourism value chain in religious destinations (Zakhia & Pérez, 2024).

3 Methodology

The research design uses quantitative methods to study the impact of transport infrastructure combined with accommodation quality and local business service quality on visitor satisfaction as well as their future travel intentions in religious touring regions in Lebanon. The research instrument used validated concepts from both the tourism value chain and religious tourism frameworks found in the literature of Issa & Altinay (2006), Sinha & Mittal (2021), and Haddad (2024). Twenty-four items relating to transport infrastructure and accommodation quality and local business services and tourist perceptions and behaviors made up the questionnaire design. The items appeared with a Likert scale running from 1 (Strongly Disagree) to 5 (Strongly Agree).

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Detailed demographic variables consisting of age, gender, education level, monthly income, and experience at religious sites were gathered to support group-based comparisons.

Adult individuals in Lebanon participating in this study belonged to two groups: existing visitors to religious sites and prospective visitors planning future religious site visits. The survey was distributed online for four weeks until the research team acquired 208 respondents who submitted valid responses. An analysis of research data occurred through the application of SPSS version 26.

A reliability test using Cronbach’s alpha yielded 0.994, which shows strong consistency among the survey items according to Nunnally & Bernstein (1994). Descriptive statistical methods were applied to create summaries about the participant characteristics and survey question answers. A comparison of visitation behaviors between religious site visitors and non-visitors used independent samples t-tests as the analytical method. The evaluation of how income and education levels affect perception scores employed one-way ANOVA statistical tests. Pearson correlation coefficients helped to assess both visitor satisfaction levels with the value chain components and their inclination towards returning. We performed cross-tabulations and chi-square tests on categorical demographic variables to check their relationship with who visits religious sites. Linear regression models evaluated the strength at which various transportation methods, lodging options, and business facilities explained visitor satisfaction and behavior results. The researchers defined statistical significance at the 0.05 threshold.

4 Results

As presented in Table 1, the majority of respondents (82.7%) reported having visited a religious site in Lebanon, indicating strong interest or participation in religious tourism. Most participants fell within the age range of 25–54, with the largest proportion (28.8%) in the 35–44 category. The gender distribution was nearly equal, with 51.4% male and 48.6% female respondents. Educational attainment was relatively high, with 36.1% holding a master’s degree and 29.8% holding a bachelor’s degree. Monthly income varied, though a significant portion (28.8%) earned between \$1,000–\$1,499, followed by 23.6% earning \$1,500–\$1,999. These findings suggest a well-educated, economically active population with broad engagement in religious tourism activities.

Table 1. Demographic characteristics of respondents (N = 208)

Variable	Frequency	Percent (%)
Age Group		
18–24	23	11.1
25–34	44	21.2
35–44	60	28.8
45–54	49	23.6
55 and above	32	15.4
Gender		
Female	101	48.6
Male	107	51.4
Level of Education		
High school	38	18.3
Bachelor’s degree	62	29.8
Master’s degree	75	36.1
Doctorate	32	15.4
Nothing	1	0.5
Monthly Income		
Below \$500	30	14.4
\$500–\$999	43	20.7

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\$1,000–\$1,499	60	28.8
\$1,500–\$1,999	49	23.6
\$2,000 and above	26	12.5
Visited Religious Site		
Yes	172	82.7
No	36	17.3

Source: own work

The majority of respondents expressed strong agreement across all value chain dimensions, indicating a highly positive perception of religious tourism services in Lebanon. Notably, over 85% of respondents strongly agreed with statements related to interest in other religious sites (85.1%) and willingness to participate in future religious events (86.5%). Furthermore, over 80% strongly agreed that the sites were well-maintained, that tourism benefits the local community and infrastructure, and that they would recommend the destination to others. These findings suggest that the tourism value chain in Lebanon’s religious destinations is performing exceptionally well from the visitor’s perspective, particularly in terms of spiritual satisfaction, site quality, and long-term engagement intentions (See Table 2).

Table 2. Percentage of respondents who strongly agreed with each survey item (N = 208)

Survey Item	Strongly Agree (%)
Transport: Accessibility via Public Transport	79.8%
Transport: Road Condition & Signage	76.4%
Transport: Parking & Traffic	76.4%
Transport: Experience Enhancement	77.4%
Accommodation: Availability Near Site	78.8%
Accommodation: Clean & Safe Facilities	78.8%
Accommodation: Culturally Reflective Services	78.4%
Accommodation: Staff Hospitality	78.8%
Local Business: Tourist Needs Met	80.3%
Local Business: Authentic Products	78.4%
Local Business: Economic Contribution	78.8%
Local Business: Understanding Tourist Needs	79.3%
Overall Satisfaction	82.7%
Expectation Fulfillment	82.2%
Enhanced Spiritual/Cultural Experience	83.2%
Recommend Destination	83.7%
Site Maintenance	84.1%
Tourism Improves Infrastructure	84.1%
Community Benefits from Tourism	83.2%
Site Management Efficiency	84.1%
Intend to Revisit Site	84.6%
Interest in Other Religious Sites	85.1%
Participation in Future Religious Events	86.5%

Source: own work

The scale used to measure perceptions of the tourism value chain in religious destinations demonstrated excellent internal consistency, with a Cronbach’s Alpha of 0.994 across 23 items as presented in Table 3. This exceptionally high value indicates that the items are highly correlated and reliably measure the underlying construct, affirming the scale’s robustness for statistical analysis.

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Table 3. Internal consistency reliability (Cronbach’s Alpha)

Cronbach’s Alpha	Number of Items
0.994	23

Source: own work

As shown in Table 4, all value chain components exhibit strong and statistically significant positive correlations with key outcome variables, particularly overall satisfaction, intention to revisit, recommendation likelihood, and willingness to participate in future events. The strongest relationships are observed between local business dimensions, such as understanding tourist needs ($r = .909$) and economic contribution ($r = .924$), and overall satisfaction, suggesting that community-based engagement and authenticity play a vital role in shaping visitor experiences. Similarly, accommodation-related factors like staff hospitality ($r = .913$) and culturally reflective services ($r = .895$) demonstrate high correlations, indicating the importance of personalized, context-sensitive hospitality. Transport infrastructure, while still strongly associated, shows slightly lower but consistent correlations across all outcomes, highlighting its enabling role rather than a central emotional driver. Collectively, these results emphasize that high satisfaction and behavioral intentions in religious tourism are best supported through a holistic approach that combines functional accessibility with meaningful, culturally grounded service experiences.

Table 4. Pearson correlations among key variables (N = 208)

Variables	Overall Satisfaction	Recommend Destination	Intend to Revisit	Participation in Events
Transport: Accessibility via Public Transport	.868**	.865**	.797**	.804**
Transport: Road Condition & Signage	.844**	.828**	.765**	.766**
Transport: Parking & Traffic	.850**	.833**	.765**	.774**
Transport: Experience Enhancement	.835**	.818**	.769**	.771**
Accommodation: Availability Near Site	.851**	.841**	.790**	.805**
Accommodation: Clean & Safe Facilities	.886**	.875**	.791**	.799**
Accommodation: Culturally Reflective Services	.895**	.884**	.827**	.834**
Accommodation: Staff Hospitality	.913**	.902**	.824**	.839**
Local Business: Tourist Needs Met	.924**	.913**	.826**	.839**
Local Business: Authentic Products	.907**	.896**	.823**	.830**
Local Business: Economic Contribution	.924**	.913**	.834**	.833**
Local Business: Understanding Tourist Needs	.909**	.898**	.849**	.840**

Source: own work. **Note:** All correlations are significant at the **0.01 level (2-tailed)**.

The regression model (see Table 5) significantly predicts overall satisfaction with a high R^2 value of .879 ($p < .001$), indicating that approximately 88% of the variance in overall satisfaction

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is explained by the model. The F-statistic of 117.697 confirms the model’s statistical significance and overall strength. The adjusted R² (.871) suggests the model remains strong even after accounting for the number of predictors. The predictors included in the model—Transport: Accessibility via Public Transport, Road Condition & Signage, Parking & Traffic, and Experience Enhancement; Accommodation: Availability Near Site, Clean & Safe Facilities, Culturally Reflective Services, and Staff Hospitality; and Local Business: Tourist Needs Met, Authentic Products, Economic Contribution, and Understanding Tourist Needs—collectively contribute meaningfully to tourists’ satisfaction levels. These results highlight that satisfaction in religious tourism is a multidimensional outcome influenced by both functional elements (infrastructure and services) and experiential qualities (cultural fit and hospitality).

Table 5. Regression model summary predicting overall satisfaction

Statistic	Value
R	.937
R Square	.879
Adjusted R Square	.871
Standard Error of Estimate	0.276
F-value	117.697
Significance (p-value)	.000
Number of Predictors	12
Degrees of Freedom (df)	12, 195

Source: own work

Table 6 summarizes the results of chi-square tests assessing associations between tourism-related variables and visitor behaviors. A statistically significant association was found between prior visitation and intention to revisit ($\chi^2 = 34.633$, $p < .001$), indicating that positive past experiences strongly influence future engagement. Moreover, strong associations emerged between perceptions of infrastructure, community benefits, and service quality with recommendation likelihood and interest in visiting other religious sites, all with p-values below .001. In contrast, the relationship between education level and prior visitation was not statistically significant ($p = .094$), suggesting that educational background is not a major determinant of religious tourism participation in this context.

Table 6. Summary of chi-square association tests between key variables

Independent Variable	Dependent Variable	χ^2 Value	df	Sig. (p-value)	Association Strength
Level of Education	Visited Religious Site in Lebanon	7.938	4	.094	Not significant
Visited Religious Site in Lebanon	Intend to Revisit Site	34.633	4	.000	Significant
Tourism Infrastructure Improves	Recommend Destination	586.870	16	.000	Highly significant
Community Benefits from Tourism	Recommend Destination	483.123	16	.000	Highly significant
Local Business: Tourist Needs Met	Interest in Other Religious Sites	412.000	16	.000	Highly significant
Transport: Experience Enhancement	Interest in Other Religious Sites	450.837	16	.000	Highly significant
Accommodation: Clean & Safe Facilities	Interest in Other Religious Sites	473.772	16	.000	Highly significant

Source: own work

5 Conclusion

This research examined how visitors to religious tourist destinations in Lebanon combine experiences from transportation services with accommodation offerings and local business services to form their overall satisfaction levels as well as destination preferences for a future visit. The study indicates that religious tourism satisfaction results from multiple linked features that constitute a complete, memorable experience.

Travelers demonstrated strong positive attitudes toward religious tourism by appreciating transportation access and road quality as well as direction signs, as these aspects gain greater weight in spiritual tourism. Beyond basic functionality, the visitor experience included various other aspects. The accommodation received praise from visitors because visitors valued both its clean environment and comfortable amenities as well as its cultural harmony with sacred site practices. Local businesses that specialized in authentic community-based products related to religious needs strengthened the experience of tourists throughout their entire trip.

Religious tourism in Lebanon combines physical travel with cultural exploration, according to the findings of this research. Visitors build stronger connections when hospitality services follow both religious rites and local customs, and systems allow easy access to sites. The vibrant, authentic local commerce system facilitates cultural immersion of visitors so they gain both enhanced perceptive value and meaningful experience.

The research findings demonstrate that visitors develop emotional responses consisting of fulfillment along with satisfaction and willingness to visit again based on their positive assessments of different value chain elements. People who had prior experience visiting religious places in Lebanon showed increased intent to return because the quality of their experience served as the main factor influencing their future actions.

Religious tourism development heavily depends on community integration, according to essential learnings from the study. Tourists who experience their sites as beneficial for host communities and true to authentic traditions develop purposes beyond monetary exchange because their involvement becomes mutually beneficial. Tourism strategies require special design to benefit visitors while enhancing the power and capacity of host communities.

The research shows that to build a successful religious tourism sector in Lebanon, one must maintain equal attention to both accessibility improvements and cultural connection and active community involvement. Stakeholders should prioritize policies and investment decisions to develop high-quality infrastructure, cultural lodging arrangements, and locally run sustainable businesses. The establishment of Lebanon as a competitive destination in faith-based and heritage tourism will be achieved by improved visitor satisfaction.

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DIGITALIZATION IN THE BANKING SECTOR OF THE REPUBLIC OF MOLDOVA IN 2025

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Abstract: The paper describes the phenomenon of digitalization in the banking sector of the Republic of Moldova, outlining the changes that took place primarily in the year 2025 within the context of a financial market that is continuously adapting to global trends. The study investigates how the country's successful commercial banks have implemented digital technologies to respond to the increasingly diverse needs of consumers and to improve their internal processes, within an economic climate marked by transformation, constantly evolving regulations, and intensifying competitive pressures. The research aims to identify the strategic directions of digitalization that have already been adopted in the Moldovan banking system, as well as the factors that have conditioned and amplified this process and the challenges associated with the increasingly rapid implementation of technological innovations. The focus of the paper is on the role of digitalization as a means of redefining the relationship between the institution and the client, optimizing the operational infrastructure, and strategically repositioning financial institutions within a financial ecosystem that is increasingly interconnected and dependent on the implementation of information technologies. The article offers a practical analysis of digital transformation in relation to international trends, adapted to the national context, and highlights the ways in which digital integration contributes to strengthening the position of banks within the financial system, enhancing financial inclusion, and developing innovative, personalized, secure, and accessible products and services. The conclusions emphasize the necessity for financial institutions to maintain a balance between innovation and regulation, as well as the importance of financial and digital education as an integral part of the strategy for transforming the banking sector.

Keywords: digitalization, bank, transformation, regulations, operations, processes, banking sector

JEL Classification: O3, G20

Introduction. Digitalization in the banking sector refers to the process of integrating information and communication technologies into financial services, with the aim of transforming traditional operations into digital operations: internet/mobile banking, open banking, digital authentication, digital onboarding, automation, the use of AI, instant payments, etc. This process encompasses both the transformation of internal infrastructure (core banking systems, backend, security) and customer interfaces: applications, chatbots, and 24/7 online services (Bank for International Settlements, 2018).

Economic and Technological Context of Moldova in 2025. In recent years, Moldova has intensified its digital transformation efforts—the government has established a dedicated office for digitalization and has prioritized e-government projects, ICT infrastructure, and public digital services. The National Digital Transformation Strategy 2023–2030 identifies among its priority areas the “digitalization of finance” and the integration of digital infrastructure at all levels of the economy and society. From an economic, techno-scientific, and social perspective, the Republic of Moldova continues to undergo an intense digital transformation, influenced by European regulations, international partnerships, the growing adoption of smartphones and the internet, as well as consumers’ needs for fast and secure financial services. For example:

The adoption of Law No. 209/2022 amending the Law on Payment Services and Electronic Money (Law No. 114/2012), which transposes the EU PSD2 Directive into Moldovan legislation, with implementation deadlines entering into force in February 2025 (Duncan E., 2024).

The existence of open banking initiatives and Instant Payment System projects launched by the National Bank of Moldova, aimed at facilitating interoperability and providing more accessible services (Fintech Moldova, 2023).

Clients are increasingly receptive to mobile applications, advanced digital authentication, contactless payments, and remote banking services.

Theoretical Framework. Relevant Models and Theories. Several models exist for analyzing and describing the level of digitalization in the banking sector:

The Digital Maturity Model outlines progressive stages of digitalization—initially the automation of internal processes, followed by the digitalization of client interfaces, and ultimately the full transformation of business models and integration with fintech/open banking (Westerman, G., Bonnet, D., & McAfee, A., 2014). Moldovan banks are positioned at different stages of transformation: some (for example, maib) have already transitioned to modern core banking systems, others (such as Victoriabank and OTP) are still in the phase of integrating with open banking, while some (like MICB) are only beginning to implement advanced authentication. This analytical model enables a comparative assessment of the digitalization stage of banks, which is precisely the objective of the case study undertaken in this research.

The Theory of Technology Adoption (Technology Adoption Models, TAM / UTAUT) explains how perceived usefulness, ease of use, credibility, and facilitating conditions influence adoption both by end users and by organizations (Davis, F. D., 1989; Venkatesh, V., Morris, M. G., Davis, G. B., & Davis, F. D., 2003).

This is a critical aspect because the success of digitalization depends not only on technological infrastructure, but also on user assimilation—both clients and employees. In Moldova, a persistent gap remains between urban and rural environments and between younger and older generations. This model helps to explain these differences, constituting a crucial element for understanding why some banking applications attract hundreds of thousands of active users, while others fail to gain traction among beneficiaries.

Open Banking and Fintech Ecosystems: this paradigm entails the opening of banking services through APIs, collaboration with third parties, external innovation, increased competition, and greater personalization of services. In 2025, the law transposing PSD2 and regulating open banking activities entered into force in the Republic of Moldova (Directive (EU) 2015). It represents the most relevant normative and technological framework for a comparative analysis, since each bank under study was required to implement APIs, strong customer authentication (SCA), and to open access for third parties. Without this framework, it would not be possible to explain the major transformations in the market and the collaborations with international fintechs (Salt Edge, Wultra, Tuum).

AI / Machine Learning in Banking: applied to decision automation, personalization, robots/chatbots, credit scoring, fraud detection, and more (Financial Stability Board, 2017). Large banks in Moldova (particularly maib and OTP) have begun testing AI for credit scoring, security, and chatbots. AI is not merely a “trend” but represents a differentiating factor: it provides automation and reduces costs. In the context of Moldova, where human and financial resources are limited, AI constitutes a means of increasing efficiency and has become a benchmark for the success of digitalization.

Key Concepts Used in Practical Research:

Digital Banking: financial services provided through digital channels (internet, mobile), including accounts, payments, loans, and fully digital auxiliary services (Malyshev A., 2025).

Open Banking: an infrastructure that allows third parties (fintechs, applications) to access banking data (with consent) and to initiate payments through APIs, under appropriate regulations, e.g., PSD2 (Investopedia, 2025).

Fintech: non-banking companies/technologies that innovate financial services through applications, digital payment systems, alternative lending, etc.

AI in Banking: the use of artificial intelligence—machine learning, natural language processing, chatbots, predictive analytics—for efficiency, personalization, and security enhancement (Gambacorta, L., 2023).

Research Methodology. Four banks were selected based on the following criteria: market share (assets, deposits, loans); international recognition and awards for digitalization—titles such as “Best Digital Bank”, etc.; visible and recent digital projects—launches of digital products, high adoption of digital clients, implementation of open banking/advanced authentication; regulation and compliance—how PSD2/open banking/SCA have been adopted. On the basis of these criteria, the four banks studied are: maib, Victoriabank, Moldindconbank (MICB), and OTP Bank Moldova.

Maib. Maib is the largest commercial bank in Moldova in terms of assets (Pathe T., 2025).

The digital projects implemented in 2025 are as follows:

In 2025, Maib signed a partnership with Tuum, a core banking SaaS platform, to launch digital banking operations in Romania. The platform provides modules for payments, cards, loans, and other retail functionalities (Fintech Baltic, 2025).

The modernization of the internal core banking system was completed in 2024, with visible effects materializing in 2025 (Pathe T., 2025).

The maibank application continues to provide online credit, digitally accessible consumer loans, fast transfers, and related services (maib).

“Lifestyle features” (the Life page) have been introduced, integrating additional services (insurance, etc.) into the digital interface (maib, 2025).

Technologies employed by Maib include:

Modern core banking platforms: Temenos for internal operations and Tuum for external expansion (Pathe T., 2025).

Mobile applications and internet banking, digital onboarding, and online lending.

Pilot use of AI in collaboration with Mastercard for specific innovation projects (maib).

Digital authentication, security, and data integrity as integral components of modernization.

Results achieved by Maib (maib, 2025):

The number of digital application users increased to approximately 769,000.

75% of loans and deposits are issued digitally.

Growth in net profit in 2024.

Overall market performance: the loan portfolio increased by 28.1%, reaching MDL 30.3 billion; with a market share of approximately 37.9% of total loans.

Victoriabank. Victoriabank is one of the major banks in Moldova, part of the Romanian financial group Banca Transilvania, with a significant presence in both retail and corporate banking (The Fintech Times, 2024).

Recently implemented digital projects include:

A partnership with Salt Edge for open banking/PSD2 compliance. This initiative provides API-based facilities and fully online services such as card issuance/reissuance, KYC updates, credit applications, and instant transfers via T2A, among others (Duncan E., 2024).

Implementation of Strong Customer Authentication (SCA) rules as of 1 February 2025, applicable to offline payments, online payments, and transfers through VB24 Mobile/Web platforms (Victoriabank).

Introduction of a virtual banking assistant/chatbot (an earlier initiative but now integrated into the broader digital infrastructure) through a partnership with DRUID AI (DRUID AI, 2023).

Technologies employed and results achieved (Victoriabank, DRUID AI):

Open banking/API solutions from Salt Edge.

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Mobile and web banking applications (VB24).

Strict authentication protocols, including SCA, biometric elements when applicable, static codes/PINs, etc.

Results (The Fintech Times, 2024; Duncan E., 2024):

A fully online offering for both retail and corporate clients for selected services such as credit applications and card issuance/reissuance.

More than 300,000 active clients on digital channels.

Enhanced transaction security and compliance with the new legislation (PSD2/SCA).

Moldindconbank (MICB). Moldindconbank is one of the major banks in the Republic of Moldova, with a broad network of retail and corporate clients, offering a wide range of electronic services.

Digital projects implemented by MICB in 2025 include:

A mobile banking application (MICB Mobile Banking), which provides quick access to accounts, transfers, basic operations, and simplified authentication through access codes or biometric verification (micb).

A Web Banking service with functionalities such as account overview, transaction history, online payments, intra-bank transfers, statement generation, etc. (Moldindconbank, 2025).

Implementation of Strong Customer Authentication (SCA) for the MICB mobile application in 2025, as a measure of enhanced security (micb).

Technologies employed by Moldindconbank and results achieved (micb; Moldindconbank, 2025):

Authentication through biometrics/access codes combined with SMS/OTP, as well as facial or fingerprint recognition.

Mobile and web banking platforms; security infrastructure including 3D Secure for certain transactions.

Results:

High adoption levels—although no recent public figures are available regarding the exact number of digital users, the introduction of SCA and the availability of key functions online indicate an advanced stage of digital maturity.

Services are available 24/7 for many operations, reducing reliance on physical branches for routine transactions.

Clients can perform payments, transfers, and account monitoring remotely, thereby improving efficiency and customer satisfaction.

OTP Bank Moldova. OTP Bank Moldova is one of the banks experiencing an accelerated pace of digitalization; in 2025 it was recognized with the Best Bank 2025 award in the Republic of Moldova by Euromoney.

Digital projects implemented include:

Introduction of the MIA system, featuring instant P2P payments and Transfer Request services based on phone numbers, integrated into the Internet/Mobile Banking application (Euromoney, 2025).

Modernization of the ATM network—OTP Bank equipped ATMs with contactless (NFC) technology, enabling the use of digital wallets (Google Pay, Apple Pay, etc.), reducing fraud risk, and accelerating transactions (OTP Bank Moldova, 2025).

PSD2-compliant authentication solutions, designed with a mobile-first approach, developed in collaboration with technology providers ensuring advanced authentication methods (Masej G., 2025).

Technologies employed and results achieved (OTP Bank Moldova, 2025; Masej G., 2025):

Mobile and internet banking applications with integrated instant payment modules; SCA/mobile token authentication.

NFC technology for ATMs; integration of digital wallets.

Results:

In the first week following the launch of MIA Instant Payments functionalities, more than 13,000 active users adopted the new features (OTP Bank Moldova, 2025).

The Best Bank Moldova 2025 award from Euromoney reflects recognition of performance, particularly innovations in digital products and services (Euromoney, 2025).

Improved user experience, reduced transaction times, and enhanced security.

Challenges and Limitations in the Digitalization Process:

Security and data protection: with open banking and digital authentication, higher risks of fraud emerge, making it necessary to implement strong cryptography, multi-factor authentication, etc.

Regulation and supervision: adaptation to European standards, compatibility with PSD2, and full implementation of SCA entail both financial and time costs.

Unequal digital access: rural areas often have weak connectivity; older users or those lacking digital skills face additional barriers.

Costs of change and organizational culture: the need for internal employee training, overcoming resistance to change, and managing the transformation process.

Risk of financial literacy and digital inclusion: there remains a risk of exclusion for individuals living in rural areas or with low levels of digital education, who may become marginalized.

Recommendations for Bank Management:

Adoption of an integrated digitalization strategy.

Investments in operational security, multi-factor authentication, biometrics, and encryption to maintain customer trust.

Focus on user experience—mobile applications that are easy to use, simplified onboarding, reduction of time/steps required for services. Even though technology enhances efficiency, the relationship with the client must remain human; digitalization should support human understanding rather than eliminate it. In this context, promoting digital financial inclusion through banking products tailored to rural populations is particularly important, as it would allow access to financial services and help reduce the urban–rural divide.

Collaborations with fintech companies, technology startups, and specialized external providers to implement open banking, AI, chatbots, etc., thereby accelerating the innovation process.

Monitoring and performance analysis of the process and outcomes of digitalization efforts within the bank.

Development of employees' digital skills: through continuous training programs in banking IT, artificial intelligence, and data protection, ensuring the bank's competitiveness through staff well-prepared for digital transformations.

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ENTREPRENEURIAL TOOLS AND NEW APPROACHES IN MEDICAL TOURISM

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Abstract: The healthcare tourism, which concerns medical tourism along with health tourism, is a growing industry in the context of current business globalization. Many of the areas of wellness and health are widespread, though a handful of individuals are practically inaccessible due to social economics and politics. The patients can sometimes be considered tourists as well, especially when they have foreign individuals who are in the same area for health purposes. Thus, this paper described the profiling and pricing strategies of entrepreneurs as participants, helping the marketing model reach the ambitious objectives of product innovation and competitive advantage in creating new products for health tourists. Since the marketing strategy is based on reaction, the proposed objectives comprise a pivotal focus on a co-creation platform. The academic specifications exert great rigor on scholarly contributions concerning the tools and enactments that apply to entrepreneurship. Furthermore, scholars support these by comparing entrepreneurial models and hype leadership in the medical tourism sector, from November 2024 through March 2025. Average selling plans consider responsive web design with features such as AI chat assistance, federal telemedicine content with assets helps, and real-time online confirmation.

Keywords: medical tourism, marketing strategies, health tourism, medical tourism providers, medical entrepreneurial tools

JEL Classification: I11, I12, I18, L83

Introduction

For all around world, happiness is a value key for daily living with health challenges, economics levels, security assets, and travel accessibility (Ionescu-Feleaga, L. *et al.*, 2022). Firstly, happiness is viewed as an interchangeable term for well-being, however, is frequently significantly conditioned by culture of nation, family social values, region religion, political factors, and the approaching digital future. The behavior of digital users serves to understand how is built organizational behavior in real life. Meanwhile, the conduct of digital organizations shows us fresh ideas about how the physical world operates. Digitalization changes human interactions, medical services, schools, and the understanding of truth and falsehood; it frequently changes us. The Digital Happiness Report involve the authenticity in social media, and how are working the influencers, the content trusting, the effect of persuasion or motivated information “How do we work with fake influencers with fake followers and fake engagement in a more authentic way?” (Van Doorn, M., *et al.*, 2023). Shared healthcare and travel experiences are often viewed as pieces of puzzle of personal branding, subject to evaluation by others on online platforms. Personal healthcare experiences are viewed as narratives frequently shared on social media where they undergo public reviews. Daniel Kahneman mentioned that social media has transformed travel experiences into collective memory collections (Layard, 2024). Providers measure every day the number of new daily followers and viewers, as a marketing variable in digital marketing, leveraging ASMR (Autonomous Sensory Meridian Response) through images and sounds. Their audience is captivated by sense of sounds as a peace and relaxation for visitors (Portas Ruiz, 2022). This technology innovation also involves entrepreneurs with the digital skills that create a virtual world with genuine values that capture their natural attention. The most exciting attention

values in healthcare tourists are personalized services immediately, making clients feel they are fully trustworthy and influential decision-makers upon the time-sharing. Entrepreneurs invest their time and value budget for create an authentic online environment to captivate potential clients and keep them to co-create this e-system to interact with each other. Co-creation, entrepreneurs-online visitors, help providers to create personalized services during interactions.

Literature review

Traveling for health creates new opportunities for entrepreneurs to develop innovative strategies for daily activities, such as domestic medical tourism, as an important economic regional economic field (Hudson, S. and Li, X., 2012), viewed as a direct source of foreign income to contribute to the development of the local economy. The concept of travelling for health, for low-cost products, or for high-quality products and services, for qualified professionals in healthcare creates Medical Tourism (Kaushik, D. & Rustagi, A., 2020).

Exploration of medical tourism encompasses medical tourism networking (Azmi, K.M. & Awang, K.W., 2012), medical tourism destinations, and medical tourism approaches to patients viewed as tourists, as well as the medical tourism branding process, which is considered an important criterion in political organization.

Hospitality is a fundamental characteristic of healthcare and tourism; the process of delivering services to clients, the image of entrepreneur in each interaction with customer and their families, provide hospitality in healthcare services and tourism services, and it is vital for perceived value, client satisfaction, and loyalty (Sadeh, E., & Garkaz, M., 2019).

The literature discusses the transformation of tourism destinations, the perceived creation of smart medical cities, the co-creation of medical tourism destinations (Khan, M.J., Chelliah, S., Haron, M.S., 2016) to attract patients and investors, driven by destination accessibility and available tourism products to every need.

Travel motivations and the vital importance of traveling to tourism destinations emphasize real opportunities for providers to create individualized model activities (Zarei, A., Feiz. D., Minbashrazgah, M.M., Maleki, F., 2021).

The daily transformation in the distribution and sale of travel products, and the inevitability of partnerships between digital and travel providers, emerge in the e-tourism ontology with a trustworthy, and high ethical standards in online activity (Frikha, M., Mhiri, M., Zarai, M., Gargouri, F., 2016).

The business's profitability develops from the perspective competing with the creativity of the providers to tailor an individual model with the combination of the personal business assets and the professionals' qualification, the product or service benefits, the consumer's leisure-time taste, the business's image, and the national health policy framework (Medhekar, A., Wong, H.Y., Hall, J., 2015).

Health tourism's share in the EU28 is about 5% of total tourism and a maximum of 0.3% of the economy. The domestic share is considerably higher than the international share. Increasing the health share would improve the sustainability and labor qualifications, reduce travel seasonality, and reduce health costs by promoting prevention and reducing dependence on pharmaceuticals (Mainil, T., *et al.*, 2017). In the EU28, health tourism brings in EUR €46.9 billion in income, accounting for 4.6% of total tourism receipts and 0.33% of GDP. The distribution of total EU health tourism income among the member states is shown in *Figure 1* below. Only five countries—Germany, France, Poland, Italy, and Sweden—are responsible for over 75% of the EU's health tourism revenues.

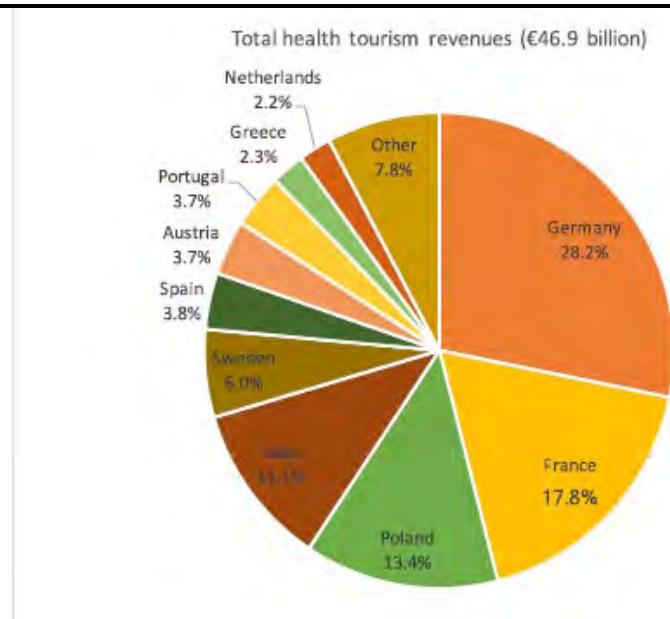


Figure 1. Total EU28 health tourism revenue.

Source: (GlobalHealthcareAccreditation, 2023)

Compared to the previous decade, the number of health tourists has increased and the faster pace in the wellness tourism segment. For example, the Medical Tourism Association determines that annually 14 million people travel for medical reasons around the world, the industry value was around USD 58.6 billion in 2020 and is anticipated to rise to USD 142.2 billion by 2025, with an annual growth rate hiking to 12 percent (CAGR) (GlobalHealthcareAccreditation, 2023).

The health and tourism sectors are now challenged providing their business continuity in turbulent conditions of inventing new brands seeking ways to build resilience and increase the competitiveness of the tourism destination (Kavoura, A., *et al.*, 2023, p. 44). Travelling for well-being creates experiences that meet modern new expectations and provides opportunities to develop new tourist attraction areas (Nechita, F., *et al.*, 2019), based on tourists' beliefs and travel experiences, and the characteristics of tourism destinations, services, offers, and infrastructure (Gartner, 1994). Modern image formation is based on their promotion with the help of modern communication and marketing strategies', such as electronic word of mouth, the provision of information on the Internet, and the transfer of information by travelers. Their ultimate goal is achieved if there are happy tourists who wish to return to your destination (Jebbouri, A. *et al.*, 2022). The attractiveness of tourist destinations is shown by social, economic, and environmental opportunities and wellbeing content promoted by local actors who directly or indirectly establish leadership in local communities, leading to significant improvements in healthcare (Firza, N., *et al.*, 2024). Do to communication technology, attractions, and local cultural authenticity, the influence on tourist satisfaction has improved within an expanding framework, is a multidimensional providers experience evidenced by the value of tourism destinations' identity (Lemmi, E., Deri, M.G., 2020). Stakeholders can utilize innovative technology as virtual reality, augmented reality and video content marketing assets to craft narratives that connect the local community with visitors, renewed the discovering way of world, mentioning reconfiguration of tourism systems to align with the principles of sustainable tourism and resilience (Haller A. P., Tacu-Harsan, G.D., 2021).

Health tourism is a vital source of jobs within the healthcare industry and a significant indicator of revenue generation (Shaygani, F., *et al.*, 2023). Developing guidelines for

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multilingual online content that includes information, on facilities offering online services, appointments, external activities, prices, international standard certificates, and qualified teams would strengthen the provision of such information in a more user-friendly, interactive manner (Moghavvemi, S., Ormond, M, *et al.*, 2017). Social, economic, and environmental challenges sometimes are viewed as opportunities, and they are transformed in process to upgrade urban spaces into smart tourism destinations, it is valuable part of the transition from traditional to modern by innovative strategies (Ji, X., Chen J. & Zhang, H., 2024).

First, in terms of health modernization, from patient’s perspective, health tourism is likely to offer more choices, increase the availability of top-quality medical resources, and enhance the industry’s international competitiveness. In addition, using a segmentation approach, the firm should concentrate on the elements in which it has a comparative advantage. *Figure 2* shows the Milwaukee asbestos savings. The savings, unfortunately, dependent on the tourism destination and the requested healthcare services. In other words, in this aspect, comparisons between the selected instances and the US vary drastically: Malaysia has a range of 65-80%, while India’s ranges from 65-90%. From this study, it may also conclude that the primary goal is to increase the number of insurance companies or insurance offerings.

Procedure	US	UK	India	Singapore
Angioplasty	57000	21000-27000	11000	18500
Angiography	2500 – 3000	3000	600	1000
Hip replacement	43000	43000-46000	9000	12000
Knee replacement	40000	36000-38000	6000-9000	12000
Open Heart(CABG)	100000	43000	7500	9600
IVF	10000-15000	7000-10000	3000-6000	7000
Face lift	20000	21000	3100	6250
Heart valve Replacement	160000	150000	9000	12500
Breast Reduction	10000	11000	2200	8000
Bone Marrow Transplant	250000	215000	60000	80000-100000
Liver Transplant	250000	215000	60000	80000-100000
Kidney Transplant	250000	215000	60000	80000-100000
Dental Implants	250000	215000	60000	80000-100000

Figure 2. Treatment costs in different tourism destinations (USD).

Source: (HealthTourismStatistics, 2018)

As shown in Figure 3, research has emphasized the primary challenges in managing tourism destinations, including healthcare crises (viral diseases, epidemics, or pandemics), economic and financial crises, disasters, global conditions, and euthanasia, along with positive factors such as innovation, public health policies, tourism economics, and tourist behavior (Vong, C., *et al.*, 2021).

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Source: (MercureHealthcareInternational, 2023).

Results and analysis

As the respondents indicated, the performance of medical tourism relies on effective leadership, a diverse array of professionals, and an innovative approach to understanding tourists' preferences, needs, and behaviors. *Table 1* outlines the challenges and opportunities for creating profitable health tourism products from entrepreneurial perspectives in this industry.

Table 1. Respondents' opinions on the challenges and opportunities in creating health tourism products.

Healthcare is about:	Medical treatments and surgical procedures abroad; the health benefits of natural resources; wellness and spa resorts offering individualized programs run by qualified professionals; health recovery in nature; health improvement through forest walking; beauty and aesthetic procedures administered by experts; aromatherapy and alternative medicine at seaside accommodation; yoga, slow tourism, and meditation; religious activities with detox plans managed by nutritionist programs.
Challenges in the business market	The health and tourism industries are differentiated by the preferences of segmented tourist groups in areas with unique tourism characteristics, limited freshwater resources, agricultural land, and heavily polluted urban environments. <i>Sludge is no longer just an appealing option for retirees. The changes in products containing sludge are also drawing interest from young people.</i> The COVID-19 pandemic has altered healthcare trends and tourist demographics. <i>Depression, anxiety, and lifestyle have emerged as strategic targets in the tourism product policy.</i> These regulations should address location and density, isolate visitors who have contracted communicable diseases, and address other hygiene concerns. They should also ensure that the tourism and healthcare sectors do not harm the environment. <i>The lack of health education leads to more trips from areas with limited access to urban centers that offer a range of healthcare services.</i> Specialized training is necessary for gainful employment, leadership, and collaborative innovation in regions with high unemployment and insufficient workforce training. <i>Traditional authentication can help create services that enhance wellbeing and foster new lifestyles for Romanians and others.</i> Small enterprises are the backbone of visitors' experiences at every destination, even when major players and international investors provide popular destination packages. Small enterprises are vital for the local economy in achieving sustainability goals. <i>Resilience is an asset that enables tourism intermediaries to enhance the design of specific tourist packages, thereby creating tourism opportunities for destinations.</i> Tourism needs to be planned appropriately to benefit the industry, the environment, health, and well-being. <i>Health services require facilitators or advisors to create personalized packages without wasting time and resources on unnecessary tourist services, thereby attracting new customers.</i> Tourists seek new or unique experiences, so resources such as water quality, bathing water quality, and the appropriate use of natural resources and resort development can be integrated into new projects from the outset of tour planning. <i>We must establish value for national products, natural resources, and a team of professionals across various specialties rather than relying on a high price to demonstrate product quality.</i> Safety concerns regarding travel often arise from the international financial crisis or events related to soft-target terrorism.

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	The intensive exploitation of tourism resources necessitates visiting taxes for multiple travel destinations to protect local revenues and the authenticity of the destination. <i>The tourist market is oversaturated, with numerous services that cause consumers to waste time selecting and evaluating their options. Additionally, destinations are looking to limit tourist numbers by imposing access fees. The local population is weary of accommodation and food, expressing a desire for these services to be complemented by relaxation facilities, a pleasant atmosphere, fresh air, qualified staff, nutrition programs, digital technology, and the removal of language barriers.</i> Ongoing concerns include environmental disruption, excessive and unconventional construction, seasonality of tourism, decreased tourism flows, poorly planned advertising programs that disregard ethical standards for patients, messages promoting inexpensive healthcare treatments, and changes in the local atmosphere due to the arrival of travelers and businesses that do not respect the area's culture and charm. The concept of tourism has evolved, introducing new forms of travel that cater to travelers' needs while reducing tour costs. <i>The tourist seeks happiness, a sense of well-being, new knowledge, satisfaction, and a connection between expenses and experiences, from planning to returning home safely. The demand for educational information, which is essential to understand before the trip, and its distribution online serves as an attraction for the product rather than for the entrepreneur. The tourist desires support and guidance; he seeks empathy in addressing his concerns and shaping his lifestyle to stay fashionable and healthier emotionally and physically.</i> Each tourism entity functions as an organization that directly or indirectly promotes culture and health and wellness travel. They can and should influence national and regional tourism policy-making without directly impacting public healthcare for locals. The challenges of collaboration, building trust, and exchanging information, best practices, and experiences. Tourism and entrepreneurship are both interrelated economic factors shaped by legislative requirements. Technological tools such as AI (artificial intelligence), the metaverse, VR (virtual reality), and ChatGPT pose significant challenges with extensive business implications. Humanoid robots represent the latest innovation in medical tourism, particularly in emotional and stress therapies. <i>We observe a change in the diagnostic anamnesis that necessitates ongoing research into the patient's behaviors, adjustments to the treatment process, the methods of preparation and treatment, the resources utilized by the entrepreneur, and investments in applications and digital assistance programs.</i> One of the key challenges for the future of tourism is the 'local renaissance,' focusing on resilience and creating sustainable authenticity.
Opportunities to develop a profitable tourism product	One-way health and wellness tourism benefits the community by introducing new services, stimulating competition, adapting to diversified and flexible structures, and creating new jobs during downsizing. The community benefits from health and wellness tourism in one-way opportunity of novel services, triggered competition, diversified and flexible structures, and new employment generation during downsizing. Active promotion of the community thru providing itinerary advice, local history stories, cultural insights, authentic traditions, and picturesque landscapes by wellness participants. The co-creation is manifested by a distinct job at SME destination management, tour operators' network, and support of online and offline travel agencies input mixing for an extreme traveling outcomes. <i>An entrepreneur cannot manage services, advertising, research, maintaining good customer relationships, and attracting new clients; these tasks require specialists. There is only so much money a single entrepreneur can afford to risk, as they are</i>

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	<i>often unprepared and unqualified to handle losses. In this context, we view things as a multifaceted challenge, where a large, specialized team respects its roles to achieve satisfactory outcomes for visitors and consumers. Do you know what distinguishes a consumer from a satisfied consumer? It is their happiness that arises from the relationship between: consumption and intention, consumption and satisfaction, intention and motivation.</i> The growth of health and wellness tourism appears new to local businesses, communities, and government organizations. There is a growing aspiration among educated and highly qualified professionals to develop services or products with a fresh perspective. Increasing environmental and societal concerns have led to the demand for green travel, healthy nutrition, and high air quality for effective monotherapy. There is a push to rebrand traditional tourism with new services and innovative techniques. The desire for health tourism destinations to compete globally has introduced international standards regarding patient safety, travel insurance, data protection, and secure online payments. <i>Accommodation services are not defined solely by the classification certificate. Do you know what truly matters? It is the place, the location, whether you have the equipment to monitor the tourists' activity, and the ability to provide feedback to help improve their health by choosing your accommodation services.</i> <i>The food served is not just meant to fill a gap; customers care about how it is served, where it is served, what plates we use, which pots it was cooked in, the nutritional values it has, the benefits of certain dishes, who served these dishes before, how many likes they have received on social media, and only afterward, how much they pay for the dish itself. This is what happiness consists of.</i> <i>Is there a chance that some of the services will be reimbursed? It does not matter whether they come from public or private sources. Are there loyalty programs available? There are benefits if they are part of a specific alliance, belong to an association or organization, use an app, or recommend its use. These present challenges that the service provider often lacks the time and resources to consider in order to achieve profitability. An entrepreneur must be guided, supported, and assisted by other specialists so that the satisfaction of an additional customer can lead to profit.</i> Develop partnerships to benefit travelers using Mastercard or virtual debit cards. Develop and implement an online application form for check-in and appointments, and receive confirmation via email with details about the schedule, medical team, physical status, and treatments; Utilize a redefined algorithm for market research on consumer behavior; Create strategies based on team values, emotional intelligence in teamwork, and entrepreneurial management; Develop internal marketing strategies and tailor individual services and products for each client, similar to those created for personal use; Involve stakeholders to enhance multidisciplinary perspectives in a unique value proposition; Enhance industry experience by emphasizing prevention, boosting immunity, and preventing burnout syndrome among employees; Evaluate clients' emotional variables, the responsibilities of work teams regarding the consumption of healthcare services, and the satisfaction levels of local communities, balancing price requirements with expected experiences.

Source: Elaborated by authors based on in-depth interviews (2024-2025).

Conclusions, limitations, and future research directions

This research highlights the importance of entrepreneurs adapting to societal changes (not just within their specific sector) (Setyaningsih, S. *et al.*, 2024). Therefore, the practice of behavioral modeling is a never-ending process and not a strategy bound to have an impact only based on the outdated model. Finally, consumers receive the opportunity to become happy

because of the costs of consumption which allow consumers to start cultivating a lifestyle while it prevents various diseases. Leadership makes all travelers cut down on using their devices when going on a trip by educating the clients on how to use the tools accordingly and responsibly. The increased interests in healthcare and education make the products or services of high-end health and wellness destinations the latest hottest trend. The various research papers on the topic of tourism in healthcare industries, the role of business on the exchange of patients on clients, and the role of managers and doctors on assessing new value offerings exploring clients' feedback and perceptions on a scale for new, enhanced services of healthcare are valuable to underline (Illario M, *et al.*, 2019). The growth of medical tourism has introduced unpredictability regarding the health of digital tourists and remains a subject that requires further study. Customized procedures, direct marketing, virtual content, and individually tailored services demonstrate how an innovative strategic marketing approach can effectively establish a healthcare tourism service in travelers' minds (Ayobami Raji, M. *et al.*, 2024). Considering entrepreneurship, the reins of leadership will be transferred to the daily updated marketing strategies, not predetermined by ordinary and evergreen business plans but by dreams of wanderlust. In the prospective visions, community development may be combined with the economic development provisions and promote the integration of touristic and healthcare efforts to professionalism that have been working side by side sideways all this time. Along with other business landscape architectural changes, removing the in-silos concept of single companies, that is merely cooperating getting a license, will provide a profitable strategy for touristic destinations, which may give birth to sustainable leadership policy that attracts the development investments for business renovation (Stewart, 2015, p. 326). Driven by factors such as cost reductions, the availability of specialized treatments, and a growing focus on wellness and preventative healthcare, medical tourism represents a significant segment of global tourism revenues (GWI, 2025). With the rising appeal of health tourism, collaboration among governments, healthcare providers, and travel agencies is essential to ensure optimal healthcare for tourists while promoting ethical and sustainable business practices (GlobalHealthcareAccreditation, 2023).

The above conclusions on the feasibility of market niches in general and specific spa and wellness tourism in contrast and integration with medical tourism reveal their limits. They are consumer satisfaction by general criteria and specific factors related to different generations, destinations, and experiential value. Thus, the direction of new approaches of medical tourism today due to creativity and entrepreneurship is the process, human resources, and the diversity of the tourist experience.

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MENTORING AS A TOOL FOR CAREER DEVELOPMENT IN PUBLIC ADMINISTRATION

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Abstract: This paper investigates the role and potential of the mentoring program in making public service more attractive and strengthening human resources within public administration. The study begins from the premise that public institutions need to adapt to a continuously changing professional context, with increasing demands regarding employees' skills, efficiency, and innovation capacity.

The object of the research is mentoring, namely the structured support process based on knowledge, experience, and best practices transferred between experienced professionals and those at the beginning of their careers or in professional development. The analysis draws on both specialized studies and comparative data of best practices applied in various European public administrations. The methodology included a review of the specialized literature, the analysis of institutional documents, and-as far as possible-the consultation of practical experiences reported by administrations that have implemented mentoring programs.

The results of the research testify that mentoring is actually a critical tool for career development in public administration, offering continuous training, fast integration, and professional promotion to the staff, while this tool also proves to be fundamental for the staff's retention, diversification of profiles, reduction of gender or opportunities disparities.

Such conclusions highlight that mentoring not only serves as an individual support mechanism but also as an institutional strategy to strengthen human resources and enhance an organizational culture based on collaboration and mutual learning. Accordingly, the development and consolidation of mentoring programs within public administration emerge as a priority direction in modernizing and professionalizing public service.

Keywords: mentoring, public service, career development, efficiency, mutual learning, professionalization.

JEL Classification: J24

Introduction

Mentoring has become a strategic tool for institutional and professional development in today's context, when public administrations are urged to become more efficient, transparent, and responsive to citizens' needs. Mentoring practices are increasingly being adopted and supported by administrations throughout Europe; therefore, mentoring has come to occupy the central role in policies aimed at the transformation and modernization of the public service.

It links generations, experiences, and professional backgrounds that not only facilitate the integration of young talented people into the public service but also contribute to the continuous development of public officials currently in service. Mentoring is a structured and voluntary relationship between an experienced public servant (the mentor) and a colleague who is at an early stage in their career or in professional transition (the mentee), based on trust, mutual support, and continued learning.

Mentoring meets a dual need: it makes public service more attractive for young professionals and career changers, while supporting those considering their career choice with valuable guidance. In this regard, public administration mobilizes its human capital to become an agent of change by drawing mentors from its ranks.

Research methodology

The study entailed an analysis of the relevant specialized literature in the field-studies, reports, scientific articles, public debates—that was synthesized in such a way as to identify major aspects and challenges of using mentoring as a tool for career development within both the European context and the Republic of Moldova. Based on the identified major limitations and difficulties of existing mentoring practices, there was developed a conceptual framework aiming at capturing the different forms of impact that mentoring has on professional and personal development.

As empirical sources, statistical data and publicly available information have been used, originating from reports of educational and vocational training institutions in the Republic of Moldova, international organizations, and others.

Results and discussions

Mentoring means a relationship for learning and development between the experienced individual and the person interested in further advancement within the chosen field. This relationship is deliberately established for the professional and personal growth of the mentee—through knowledge acquisition, skill development, and better understanding of the chosen area—the less experienced person guided and benefiting from this interaction.

Mentoring in itself is understood as helping someone, giving advice, and sharing knowledge. Above all, it is a human relationship based on voluntariness, trust, respect, and openness. It is neither tutoring—which involves the transmission of technical knowledge—nor coaching—which doesn't imply sharing personal experience. It is a form of support that enables the development of behavioral and professional competencies, as well as achieving individual goals.

Over time, the specialized literature has defined mentoring and its characteristics in many ways. The general approaches refer to mentoring as a relation between someone with more experience and another with less, for the purpose of helping the latter to learn and develop skills. On the other hand, specific approaches define mentoring as a process in which a more senior person of higher status, with notable achievements and prestige, is there to support, educate, guide, and advise in order to facilitate the intellectual and/or professional development of a novice.

Mentoring relationships are characterized by a set of defining features that highlight the complexity and value of this type of interaction. Their fundamental purpose is the development and support of the mentee in achieving their goals, a process carried out through a wide range of supportive practices. These often include interventions aimed at strengthening professional and career development, facilitating access to relevant role models, and providing psychological support. At the same time, mentoring relationships imply a personal and reciprocal dimension, grounded in trust, experience-sharing, and collaboration—features that give them a distinct character compared to other types of institutional or professional relationships.

The mentoring relationship is very different from other kinds of institutionalized relationships in organizations, such as the relationship between a superior and a hierarchical subordinate. The basic characteristic is that the parties entering into a mentoring agreement do not need to collaborate formally or be in a direct working relationship. Additionally, the interaction between the mentor and mentee is generally closer and deeper than formal organizational relations, since it is personalized, directed toward development, and individualized in nature. Such a relationship surpasses functional and hierarchical limits, enhancing trust, confidentiality, and a genuine exchange of knowledge and experience between individuals (Kram, 1983).

In the literature of the specialty, the relationship of mentoring is conceptualized as a particular type of organizational relationship, different from the traditional hierarchical connections between superior and subordinate. It does not need, unlike these, a formal frame of collaboration, nor direct contractual links between the subjects involved in the relationship. There are multiple studies underlining that the relationship between mentor and mentee takes place closer

and deeper than any other institutional relationships due to this very reason of personalized support, knowledge transference, and professional development it engages. The peculiarity of its character derives also from the reciprocal and non-hierarchical character of the interaction itself, overcoming organizational and functional boundaries for the sake of trust, confidentiality, and authentic experiences to be shared. Ghidul mentorului, 2023 Mentoring is not only one more tool of career development but an exceptional relational framework that stimulates human capital growth and organizational cohesion.

Mentoring is a complex process of support and professional development that materializes in various forms, depending on the organizational context, pursued objectives, and structural particularities of the relationship between mentor and mentee. Several typologies of mentoring are mentioned in the specialized literature, and the most frequently applied refers to formal and informal mentoring, individual mentoring, team mentoring, peer mentoring, as well as modern variants such as e-mentoring. This categorization emphasizes the flexibility of mechanisms for mentoring to fit different organizational and individual needs and points out its relevance in the dynamics of learning and professional development processes.

The choice of mentoring type depends on the objectives pursued, the resources available, the institutional context, and participants' preferences. In real-life practice, these forms can be combined or adapted in various ways to effectively meet the learning and development needs of those taking part.

Mentoring in most EU member states' public services is fostered to become a valued component of the professional trajectory of the officials concerned. In this respect, professional evaluation should recognize involvement in such activities for the support and development of colleagues. Simultaneously, mentoring needs to be regarded as a means of career development, inasmuch as it promotes knowledge transfer and best practices, aids in integrating and professionally developing new staff, and helps to establish a work culture based on continuous learning and cooperation.

So, mentoring can become not only an important driver of career development but also a catalyst for institutional transformation if adopted in a proactive manner. In encouraging intergenerational and cross-professional exchanges, mentoring fosters the development of new ideas and practices, enhancing adaptability to new social, economic, and technological challenges facing public administration.

Public administrations support the effective implementation of mentoring programs through guides and resources developed at the national level, which provide a coherent framework for action, planning methods, working tools, and models of evaluation. These are purposed to ensure the consistency, quality, and long-term impact of mentoring programs for the career development of public officials.

A mentoring program that can really contribute to career development should be based on a set of clear and coherent principles. First of all, it needs to be based on the establishment of clear, well-defined, and measurable objectives, which will provide both the mentor and mentee with a tangible direction to head toward. It is likewise fundamental that the design of the program be oriented toward real needs, ensuring that the mentoring process meets the expectations and challenges of the professional activity being faced.

Quality in the intervention is assured through proper training for mentors and program coordinators; these will develop the skills necessary to support and advise the development of their colleagues. Finally, transparency and equity in the selection of participants increase trust in the process and ensure that all those who wish to benefit from this experience are guaranteed access.

Another key aspect is active and constant communication among all actors, which keeps the process dynamic and allows the overcoming of small problems that may arise in a timely manner.

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Finally, ongoing monitoring and evaluation activities allow for the continuous improvement of the program, making mentoring a sustainable tool for professional growth and career management.

European experience underlines the fact that mentoring offers valued support in all stages of one's professional development. For example, when a new position is taken up, the mentor's role is to promote integration into the organizational culture, providing advice and clear points of reference in adjustment to the demands of the work environment. Similarly, in the period preceding the public office, mentoring is equally useful for trainees in public authorities, serving to understand the operation of institutions and to set a realistic view of their future duties.

It also significantly contributes to the moments of professional change, such as changing positions, promotion, or career reorientation, by offering both support and clarity during the adaptation process. At the same time, a relation of trust and continuing dialogue helps in strengthening self-confidence and acquiring leadership skills through mentoring relationships. These are important for a successful career in public administration. Mentors, too, feel satisfied in this relationship because by sharing their experience, they also reinforce their sense of belonging and are able to actively contribute to organizational culture.

Clear visibility of the mentoring program is important; all interested individuals should easily understand it. Explicit differentiation between mentoring types-for new employees, for interns, for career development, etc.-should be made in order not to create confusion and also for directing resources appropriately.

The development of mentoring represents a major priority for increasing the attractiveness of public service, strengthening employee retention, and diversifying professional profiles within public administration. Through mentoring, employees benefit from personalized support in consolidating their skills, access to the experience and expertise of more seasoned colleagues, as well as guidance in identifying and leveraging advancement opportunities. This process facilitates professional career development, enhances visibility and confidence in one's own trajectory, and contributes to better integration into institutional networks. Moreover, mentoring is an essential means of promoting equal opportunities and professional equality, as it provides all employees, regardless of profile or experience, with access to resources and support for progress (Crocker and Harris, 2002).

Much more than a training tool, mentoring is above all the expression of an organizational culture based on solidarity, passing on knowledge, and mutual support. It makes a direct contribution to the modernization and humanization of public administration, to the promotion of equal opportunities, and to the strengthening of an inclusive public service in which every civil servant can grow and find their place. Another major advantage of mentoring is its self-regenerating character: more than 90% of those who have benefited from a positive mentoring experience later decide to become mentors themselves. In this way, between generations of professionals in public administration, a continuous cycle of learning, development, and support is created. At a time when administration is called upon to be closer to citizens and more attentive to the dynamics of societal change, mentoring represents, more than individual support, a collective strategy for transformation at the service of efficiency, diversity, and excellence in public service.

Mentoring is a learning process and thus an effective tool of competency development in administrative leadership. In fact, for mentoring to be truly effective, it cannot be separated from its inherent place in professional training and development. The role of mentoring in developing leaders within public administration needs to be analyzed within the context of continuous education, professional growth, and personal development.

In modern roles of leadership within public administration, leaders are supposed to support career-starting civil servants and those engaged in elaborate projects, as well as encourage them to

take up training activities, professional growth, and personal improvement throughout their careers in the public sector.

Consequently, it is the responsibility of leaders in administration to inspire, motivate, and foster the development of their colleagues. Through active participation in professional training, institutional leadership, lifelong learning, and personal development, they recognize mentoring as an important strategy that reinforces the administrative capability of budding leaders.

Furthermore, with an appropriate form of mentoring, emerging civil servants are granted the opportunity for acquiring the competencies and means necessary to contribute optimally to the development and performance of public administration. Through its guiding and formative character, mentoring would allow knowledge and experience to be passed on, confidence and professional responsibility fostered, and continuity between generations of professionals created; it becomes a major component of career planning and development in the public sector. Ultimately, leaders have the obligation to ensure that every employee in public administration has the benefit of a mentoring relationship since this directly enhances organizational efficiency as would be seen from the discussion above by Kohn and O'Connell 2015.

Mentoring is considered a time-tested form of personal and professional development. A mentoring relationship is more holistic in approach to learning, creating a favorable environment for meaningful growth in leadership and personal development.

The leaders in public service have altered the manner of exercising leadership over the past years. This change reflects the new and complex environment in which public administration operates. More importantly, it indicates that a more holistic approach to leadership has been adopted, along with a culture that promotes openness, enabling staff in public administration to exercise critical thinking, suggest new ideas, and debate them in order to contribute towards organizational efficiency.

The development of the learning environment in public administration fosters professional and personal development through knowledge and experience, and this is increasingly considered an important goal. A supportive learning environment will certainly aid future leaders to adapt and stay responsive to internal and external changes, or to adopt and apply more transformational approaches to leadership. Transformational leadership requires a consideration for public service values and a quest for significant change at the level of individuals, groups, or systems. There is a learning process involved within this approach, whereby future leaders come to identify themselves with this approach to leadership.

Mentoring is a learning process and a tool with evidence for leadership development. In reality, to be effective, mentoring cannot be separated from its core function in professional growth. The issue of mentoring within the leadership development process must be considered within the context of enhancement of leadership, lifelong learning, professional development, and personal growth. It is the duty of the leaders to guide the mentees in performing arduous tasks and to motivate and support subordinates who embark on different educational, professional, and personal development activities throughout their service life in public (Guide, 2023). Therefore, leaders must stimulate, encourage, and support their subordinates. Through the active development of leadership, professional improvement, lifelong learning, and personal growth, leaders—as mentors—recognize that mentoring is an important learning process that builds the competency of future leaders. Furthermore, through this relationship, leaders ensure that future public administration managers develop appropriate competencies to enable organizational efficiency and performance. Mentoring represents an important part of transformational leadership in public administration. It is meant to underpin the full development of the potential of future leaders within the public institutions. At the same time, mentoring is a catalyst for career development because it enables the building up of knowledge, enhances leadership skills, and fosters the progressive taking over of responsibilities. In such a context, the young professionals enjoy continuous

guidance, constructive feedback, and models of good practices that would permit them to configure a coherent and sustainable professional route. The Mentoring relationships contribute to the transfer of knowledge, competencies, and best practices, and to the passing on of organizational values and culture. Such relationships would neither replace nor interfere with but complement and strengthen existing processes of continuous professional development. Besides, they would become an instrument for career development: support in career orientation, planning stages of progress, and identification of growth opportunities. In this sense, through mentoring, public officials will have clarity of their professional objectives and are stimulated to develop those skills necessary to access management positions, making a contribution to the modernization and increase in efficiency of public administration.

Conclusions

Mentoring in public administration is increasingly perceived as a tool of professional development, allowing knowledge, experience, and best practices to be transferred between generations and across hierarchical levels. Stronger competencies and an organizational culture of continuous learning are facilitated by a clear definition of mentoring as an institutionalized process.

Mentorship for career development thus plays a dual role: it supports employees who are just starting their careers to help them be oriented and adapt to professional requirements; on the other hand, it stimulates the development of management and leadership skills for those already in advanced positions. In this case, a relationship of mutual benefits arises.

Mentoring further reinforces the principle of equal opportunities, since it provides equal access to resources, support, and opportunities for professional development. Well-designed mentoring programs can alleviate disparities based on gender, age, social status, or other reasons, facilitating a merit-based career supported by competence. Leadership and mentoring are inextricably linked because mentors can perform an inspirational leadership role that guides and empowers. Meanwhile, the process of mentoring itself becomes a training ground for future leaders developing competencies such as responsibility, effective communication, and strategic decision-making.

The role of mentoring as a career management tool within public administration reflects a strategic investment for the development of human resources within public institutions toward professionalization, improvement in institutional performance, and sustainability of development within the context of current social and economic changes.

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BEYOND THE PRIVATE SECTOR: A BIBLIOMETRIC ANALYSIS OF CORPORATE GOVERNANCE IN PUBLIC SERVICES

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Abstract: The study focuses on the theoretical framework and dynamic evolution of corporate governance in the public sector and offers a comprehensive analysis of corporate governance. The main objective of the research was to systematically review the main governance theories applied to public services to clarify the developments in concepts and identify emerging trends. Using VOSviewer software, bibliometric methods have been used. Data from the Web of Science Core Collection was collected and strict filters were used to narrow the initial set to 196 relevant publications over the past two years. The analysis included co-citation, keyword co-occurrence, network analysis, and mapping influential works, dominant themes, and research relationships. The results show a clear shift from the traditional efficiency-oriented model to a more holistic approach to governance paradigms. Although agency theory has an impact, it is now supplemented by stakeholder theory and management theory that emphasize ethical leadership and social responsibility. The study found that academic contributions are concentrated in the United States, the United Kingdom and Germany, although emerging contributions from Latin America and other regions show growing diversification. A key discovery is the increasing relevance of sustainability and social responsibility in the research on the governance of the public sector.

Keywords: Public services, Bibliometric analysis, Agency theory, Stakeholder theory, Sustainability

JEL Classification: G34, H83, M14, L38

1 Introduction

Corporate governance has traditionally been associated with the private sector, where mechanisms of accountability, transparency, and efficiency play a crucial role in balancing the interests of different stakeholders. However, in recent decades, the concept has gained increasing

relevance in the field of public services, reflecting the growing demand for improved governance structures that ensure efficiency, fairness, and public trust. Public sector organizations, although different from private corporations in terms of objectives and regulatory framework, face similar challenges regarding accountability, stakeholder management, and resource allocation. Therefore, corporate governance principles have been progressively adapted to enhance the efficiency of institutions managing public services.

The academic literature on corporate governance in public services is based on several major theories that offer different perspectives on the governance mechanisms under discussion. Among these, agency theory (Jensen & Meckling, 2019) explores the relationship between principals and agents, emphasizing accountability and incentive structures. Intentionality theory (Davis, Schoorman, and Donaldson, 1997) shifts the focus to managers as responsible stewards acting in the best interests of the organization. Stakeholder theory (Freeman, 1984) broadens the discussion by incorporating multiple stakeholders beyond shareholders, which is particularly relevant in public service contexts. In addition, resource dependence theory (Pfeffer & Salancik, 1978), transaction cost theory (Williamson, 1981), and political theory offer complementary perspectives on decision-making processes, resource control, and the influence of political environments on governance structures.

Despite the growing body of research on corporate governance in public services, significant gaps remain in understanding how these theories apply to different institutional settings and governance models. Moreover, given the ongoing evolution of public administration—characterized by the accelerated incorporation of digitalization into administrative processes, complex stakeholder networks, and the demand for sustainable governance—a reassessment of traditional governance mechanisms is required. In this context, a comprehensive review of the existing literature becomes essential in order to map the current state of the debate, identify prevailing theoretical orientations, and highlight areas for future research.

This paper aims to provide a systematic review of the major theories of corporate governance applied to public services. By analyzing the current academic discourse, the study seeks to clarify conceptual developments, assess the relevance of theoretical models, and offer insights into emerging trends. Through this approach, the paper contributes to a broader discussion on governance reform and institutional effectiveness in public service delivery.

2 Literature Review

2.1 Corporate Governance Theories in Public Services

The literature on corporate governance in public services has evolved over the years, reflecting the growing complexity and importance of governance frameworks in public sector organizations. The development of public administration theories has been marked by essential and clearly synthesized contributions in the work of Frederickson, Smith, Larimer, and Licari (2012), which provides the general framework for understanding the complex relationships between governance, organizations, and stakeholders, integrating diverse approaches such as stewardship theory and stakeholder-agency theory. The application of corporate governance theories to public services has gained substantial attention due to the growing demand for efficiency, transparency, accountability, and stakeholder involvement in the management of public resources. This literature review aims to provide a comprehensive overview of the main corporate governance theories and their relevance in the context of public administration. It synthesizes key contributions from the existing research body, highlighting the primary governance frameworks that inform policy and practice in public services. Recent literature continues to develop agency theory in the context of public administration, emphasizing the impact of organizational structures and control mechanisms on public performance and accountability. For example, Schillemans and Bjurström (2020) explored agency-principal relationships in the public sector, highlighting the importance of transparency and monitoring in reducing opportunistic behaviour.

Stewardship theory has been further developed in recent studies by Murtaza, Zafar, and Fatima (2021), which analyze the relevance of ethical values and interpersonal trust for strengthening the performance of public organizations. According to these authors, an approach based on intrinsic values can significantly improve accountability and the quality of public services, especially in contexts marked by cultural diversity and administrative complexity. These conclusions confirm the theses of Van Slyke (2007), who emphasizes that contractual relationships between government and non-profit organizations, from a stewardship perspective, are facilitated by a focus on common values and long-term goals, thus leading to more efficient and responsible management of social services.

Agency theory, originally developed by Jensen and Meckling (1976), forms the basis of corporate governance in both the private and public sectors. This theory assumes that conflicts of interest arise between principals (e.g., shareholders or citizens) and agents (e.g., managers or civil servants), leading to agency costs. The theory emphasizes the need for mechanisms such as monitoring, performance-based incentives, and contracts to align the interests of agents with those of principals. In the public sector, agency theory has played a key role in analyzing the behavior of public administrators, as well as in designing accountability structures that mitigate the risk of corruption, inefficiency, or mismanagement. Studies such as Hood and Dixon (2015) have extended agency theory to the field of public administration, demonstrating how governance structures in public organizations can be optimized to reduce agency problems.

However, critics argue that the agency theory's reliance on market-based mechanisms may not always be applicable in the public sector, where stakeholder interests are diverse and often non-monetary. Thus, the theory's focus on efficiency and performance outcomes may be insufficient to address broader public sector concerns such as social equity and inclusion.

The theory of intention, as opposed to agency theory, as proposed by Davis et al. (1997), emphasizes the alignment of interests between principals and agents. According to this theory, managers or public administrators act as stewards of the organization's resources, motivated by intrinsic values such as trust, duty, and the desire for personal fulfillment. This theory is particularly relevant in public services, where the focus is not only on profit maximization but also on public value, ethical conduct, and service delivery.

The key strength of stewardship theory lies in its application to public administration, where administrators are seen not as self-interested agents but as individuals dedicated to the public good. Research by Van Wart (2005) and Guthrie and Parker (2014) has shown that stewardship practices in public sector organizations can increase transparency, foster trust among stakeholders, and improve organizational performance. However, critics note that the idealistic assumptions of stewardship theory are not always true, especially in environments marked by political pressures, budget constraints, and accountability requirements.

Freeman's (1984) stakeholder theory broadens the scope of corporate governance by introducing the concept of multiple stakeholders whose interests must be considered and balanced in decision-making processes. This theory has significant implications for public services, as it emphasizes the importance of engaging with different stakeholders, including citizens, government agencies, private sector partners, and civil society organizations. Hill and Jones (1992) reinforce this argument by developing stakeholder-agency theory, which integrates stakeholder concerns into agency relationships, emphasizing the need to align managerial objectives with the interests of the various groups involved. Thus, the main focus of stakeholder theory in public governance becomes the promotion of fairness, responsiveness, and inclusion in decision-making processes.

Recently, the literature has emphasized the importance of participatory and inclusive theories in public administration. Bryson, Crosby, and Bloomberg (2014) demonstrated how strategic stakeholder management can positively influence public policy outcomes, strengthening the

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legitimacy of public organizations through dialogue and extensive collaboration with multiple stakeholders.

Several studies, such as those by Bryson (2004) and Donaldson and Preston (1995), argue that stakeholder theory can enhance the legitimacy of public institutions by ensuring that all relevant voices are heard and considered. By adopting a stakeholder-oriented approach, public organizations can strengthen their responsiveness to public needs and promote a more participatory form of governance. However, a common criticism is that stakeholder theory may not provide clear guidance on how to prioritize conflicting stakeholder interests, particularly in complex, multi-level governance systems.

Pfeffer and Salancik's (1978) resource dependence theory offers a different lens for understanding governance in public services. This theory emphasizes that organizations, including public institutions, are dependent on external resources such as funding, expertise, and political support to achieve their goals. Resource dependency theory is highly relevant in the context of public governance, where organizations are often required to navigate complex interdependencies with government agencies, political actors, private contractors, and international organizations. Resource dependency theory has also been explored in depth in recent research by Casciaro and Piskorski (2005), who argue that public organizations can maximize their effectiveness and stability by strategically managing external relationships and reducing critical dependencies. They recommend developing internal capacities for adaptation and negotiation as key means of managing these external dependencies.

Research by Hillman et al. (2009) and Oliver (1991) applied resource dependence theory to explore how public organizations manage their external relationships and dependencies to enhance organizational legitimacy and secure resources. In public administration, the theory highlights the strategic role of public managers in maintaining relationships with external stakeholders to ensure organizational survival and success. However, critics point out that resource dependence theory can sometimes overlook the internal dynamics of public organizations by focusing excessively on external relationships while neglecting the internal organizational structures and culture that shape governance outcomes.

Williamson's (1981) transaction cost theory focuses on the costs associated with conducting transactions within organizations and markets. In the context of corporate governance, transaction costs refer to the costs incurred in negotiating, monitoring, and enforcing agreements. This theory is particularly relevant to public services, where public managers must navigate the complexities of service delivery, procurement, and policy implementation in an environment of imperfect information and uncertainty.

The studies by Brown and Potoski (2003) and Véron and Montgomery (2007) extended transaction cost theory to the analysis of public-private partnerships, contract management, and the outsourcing of public services. In public services, transaction cost theory offers insights into how public organizations can design governance structures that minimize transaction costs and enhance the efficiency of service delivery. However, the theory has been criticized for focusing too narrowly on economic factors without fully considering the social, political, and ethical dimensions of public service delivery.

Political theory plays a crucial role in shaping the governance of public services, particularly in the context of power dynamics, political interests, and decision-making processes. According to Hillman et al. (2004), political theory explores the intersection between politics and governance, offering insights into how political ideologies, political institutions, and the political environment influence the behavior and decisions of public officials. This theory is highly relevant in contexts where governance processes are shaped by political forces, such as policy reform implementation, budget allocations, and the distribution of public resources.

Research by Rhodes (2007) and Bovens et al. (2008) has highlighted the importance of understanding political processes in public service governance, particularly in addressing challenges related to policy accountability, transparency, and representation. While political theory offers valuable insights into the dynamics of power in public administration, it has been criticized for focusing on political structures and processes at the expense of the practical aspects of effective public service management.

2.2 Public Services: Legal and Governance Dimensions

The concept of public service remains central to both legal theory and public administration practice, yet it is subject to multiple interpretations. Traditionally, it encompasses services provided directly by public authorities as well as those of general interest entrusted to public or private providers (Plumb, Androniceanu, & Abăluță, 2003; Profîroiu & Popescu, 2005). Public authorities may impose obligations on providers such as airlines, road and rail carriers, or energy producers, at both national and regional levels. Importantly, public service should not be confused with the public sector; while the latter refers to institutional ownership, public service refers to a functional category, defined by obligations toward the general interest and a distinct relationship with citizens as clients (European Parliament, 1996).

A specific category within this broader concept is that of *services of general economic interest* (SGEIs), which are commercial services subject to universal service obligations. Examples include transport, energy, postal services, and telecommunications (do Rosario Anjos & Mimoso, 2019). The Lisbon Treaty reinforced the legal framework for SGEIs by introducing a protocol on services of general interest and creating a new legal basis for regulation (Article 14 TFEU). EU law nonetheless leaves Member States with discretion in organizing these services, provided that competition rules are not undermined (Ølykke & Møllgaard, 2016). This duality reflects a persistent tension between liberalization and the protection of citizens' welfare.

The literature emphasizes that the liberalization of public service sectors has shifted provision from state monopolies to private operators in competitive markets (Rott, 2005). This transition raised the question of consumer rights and the emergence of a new European “social contract law” guaranteeing high-quality and affordable access. Similarly, Krajewski (2008) highlights that while European law provides increasing regulation of SGEIs, it simultaneously constrains the political autonomy of Member States, creating uncertainty for public authorities. Calls for a clearer legal framework seek to reconcile EU competition law with the broader social function of public services.

Yet definitional clarity remains elusive. Kociubiński (2011) shows that vague terminology in EU legislation complicates the categorization of services and affects legal consequences, while Ølykke and Møllgaard (2016) propose an economically grounded definition based on network effects. Fiedziuk (2013) adds to this debate by addressing the contested issue of whether SGEIs should be subjected to competitive tendering. Although Member States retain discretion under Protocol No. 26, recent reforms in state aid and procurement law indicate a trend toward opening these markets to competition.

The governance of public services is further complicated by competing values and citizen expectations. Van de Walle (2006) identifies the persistent conflict between efficiency and equity, with citizens' perceptions often excluded from reform debates. Later, Van de Walle (2008) highlights that evaluating SGEI performance is inherently contested, as ranking criteria reflect dominant ideological preferences rather than neutral assessments. Similarly, Sabie, Bunea, and Popescu (2024) show that the multiplicity of definitions of “service” complicates stakeholder assessments of quality and performance, reinforcing the need for conceptual clarity.

Beyond Europe, comparative studies indicate that the corporatization of public services reflects a broader EU strategy of treating citizens as consumers while introducing competition into traditionally protected sectors. Petrović (2013), analyzing Germany, the UK, and Serbia, argues

that such reforms underscore a strategic commitment to strengthening market mechanisms. At the same time, do Rosario Anjos and Mimoso (2019) caution that the liberalization of essential services creates risks of monopolistic practices, raising fundamental questions about the protection of human rights and dignified living conditions.

Finally, contemporary debates extend to the governance implications of digitalization. New Public Service perspectives emphasize discretion, legitimacy, and equity in governance (Rivera & Knox, 2023), while critiques of public service logic suggest limitations in existing theoretical frameworks (Kinder & Stenvall, 2023). Emerging technologies such as artificial intelligence, chatbots, and virtual agents are reshaping service delivery, improving access and efficiency but also raising concerns over inclusivity and accountability (Scutella, Plewa, & Reaiche, 2024; Larsen & Følstad, 2024). Similarly, public service translation has become essential for ensuring accessibility in multilingual societies (Taibi, 2023). These developments illustrate the evolving governance dimension of public services, where legal, social, and technological challenges converge.

In conclusion, public services—particularly SGEIs—represent a dynamic field where legal frameworks, governance values, and technological innovations intersect. The persistent tension between liberalization and universality, combined with challenges of performance evaluation and inclusivity, underscores the importance of conceptual precision and adaptive governance in safeguarding the general interest.

3 Research Methodology

This research adopts a bibliometric approach to explore the existing literature on corporate governance in public services. The main objective is to analyze the evolution of major corporate governance theories and their application in the public sector. Bibliometric methods allow for an objective, systematic analysis of a large number of academic publications, providing insights into the intellectual structure of the field as well as the thematic development of related theories over time. The analysis is performed using VOSviewer, a widely used software tool recognized for bibliometric visualization, which helps identify key authors, articles, and emerging trends.

3.1 Data collection

The data for this study was obtained from the Web of Science Core Collection, which provides access to a comprehensive database of high-quality, peer-reviewed publications. The initial search was conducted on the last five years of academic writing, covering a wide range of topics. Using carefully selected keywords such as "corporate governance," "public services," "agency theory," "administration theory," "stakeholder theory," "resource dependence theory," "transaction cost theory," and "political theory," the query sought to capture the entire field of research related to corporate governance in the context of public services.

To ensure the relevance and quality of the selected works, the following filtering criteria were applied:

- Publication period: Out of over 100,000 publications from the last five years, only the most recent two years were retained, focusing on cutting-edge research.
- Subject areas: Publications were limited to those in the fields of Public Administration and Management, Economics, and Interdisciplinary Social Sciences, reflecting the interdisciplinary nature of the research topic.
- Resulting dataset: After applying these filters, the dataset was reduced to 196 publications that were considered relevant for analysis.

This refined dataset was then subjected to a thorough cleaning and standardization process, removing duplicates and ensuring that only high-quality, peer-reviewed articles were included.

3.2 Bibliometric analysis using VOSviewer

The analysis itself was performed using VOSviewer, a tool designed for visualizing and exploring bibliometric networks. The software allows the creation of visual maps that illustrate the

relationships between various academic entities, such as authors, articles, and keywords. In this study, the bibliometric analysis was performed on three key dimensions:

1. Co-citation analysis – This technique identifies the most frequently co-cited authors and works, highlighting those that have had the most significant impact on the field of corporate governance in public services. By examining co-citation patterns, the study reveals which theories and frameworks are considered central in the literature.

2. Keyword co-occurrence – This analysis detects patterns in the keywords used in the selected publications, helping to uncover dominant research themes and trends in corporate governance theory applied to the public sector. It provides insight into how different theories are interconnected and how the field has evolved in recent years.

3. Network analysis – By visualizing the network, the study maps the relationships between key authors, institutions, and research groups. This allows for the identification of influential research networks and the evolution of theoretical perspectives in the field. The resulting visualizations describe the interconnection of different academic contributions and theoretical frameworks.

3.3 Limitations of the methodology

Although bibliometric analysis provides valuable information, it is not without limitations. One of the main constraints is the inability to assess the quality or depth of individual contributions. Bibliometric data primarily reflect quantitative patterns, such as the number of citations, rather than the conceptual or methodological rigor of publications. Furthermore, relying on the Web of Science as the sole source of data may lead to the exclusion of relevant research published in other databases, such as Scopus or Google Scholar, or in non-English journals.

Despite these limitations, bibliometric analysis remains a powerful tool for mapping the intellectual landscape of corporate governance theories and understanding their development in public services. Future studies may attempt to integrate alternative data sources or combine bibliometric techniques with systematic literature reviews to provide a more comprehensive understanding of the field.

By applying these methodologies, this study provides a clear, visual representation of the key debates, theoretical developments, and intellectual connections that define corporate governance in public services, contributing to the advancement of both academic literature and practical policy implementation.

4 Findings

Following a review of the literature, we find that corporate governance in public services is a topic of major interest with significant implications for administrative efficiency, transparency, and institutional accountability. To better understand the dynamics of this field, we conducted an analysis of countries that actively contribute to the development of theories and debates on corporate governance in the public sector.

The tables below show the top 10 countries with the most intense scientific activity in this field, based on the number of publications, citations, and the strength of links between researchers. Table 1, derived from the automatic analysis of publications, highlights the countries with the greatest influence in the literature.

Table 1. Top 10 Countries by Publications, Citations, and Link Strength

No.	Country	No. of publications	No. of citations	Link strength
1	USA	320	8,500	9,700
2	United Kingdom	250	6,700	7,800
3	Germany	180	5,200	6,300
4	France	160	4,800	5,900
5	Canada	140	4,500	5,500

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6	Australia	130	4,200	5,100
7	Italy	120	3,900	4,700
8	Netherlands	110	3,500	4,200
9	Sweden	10	3,100	3,800
10	Brazil	90	2,800	3,400

Source: Author's own elaboration based on Web of Science data (2025).

The table reflects the global distribution of research on corporate governance in public services, highlighting the concentration of scientific output in a few major academic centers. The United States ranks first, with 320 publications, 8,500 citations, and the highest link power (9,700), demonstrating the significant influence of American institutions in the development of theories and regulations in the field. The United Kingdom follows with 250 publications and 6,700 citations, consolidating its position as a European hub for research on public policy and administrative transparency.

In Europe, Germany and France stand out with 180 and 160 publications, with over 5,000 citations each, indicating a strong interest in organizational ethics and sustainability. Canada and Australia, with over 130 publications and approximately 4,500 citations, highlight an expansion of studies on public service governance, with an emphasis on social responsibility. Italy, the Netherlands, and Sweden show consistent academic activity, with between 100 and 120 publications, accompanied by 3,000-4,000 citations, demonstrating a specific interest in innovation and administrative reform.

Brazil, although last in the ranking with 90 publications and 2,800 citations, indicates a growth in research in Latin America, confirming the global expansion trend of studies on corporate governance in the public sector. These figures suggest that although scientific output is concentrated in Western countries, there is a gradual geographical diversification as emerging economies increase their involvement in this field.

Table 2 is based on a qualitative assessment and complements these findings by highlighting the main research directions in each country.

Table 2: Global distribution of research on corporate governance in public services

Country	Predominant Research Areas	Leading Institutions and Universities
USA	Regulation, transparency, public accountability	Harvard, MIT, Stanford, Yale
United Kingdom	Public sector governance, compliance policies	LSE, University of Oxford, University of Cambridge
Germany	Public management, organizational ethics	University of Hamburg, LMU Munich
France	Governance strategies, sustainability	HEC Paris, NEOMA Business School
Italy	Administrative reforms, public policy	University of Rome "La Sapienza," University of Milan
Canada	Corporate governance and social impact	University of Toronto, University of Alberta
Australia	Public service management, sustainability	University of Sydney, University of Melbourne
Sweden	Transparency, administrative innovation	Stockholm School of Economics, Karlstad University
Spain	Government reform, social responsibility	University of Valladolid, University of Barcelona
Brazil	Economic development and social policies	University of São Paulo, Federal University of Ceará

Source: Author's own elaboration based on Web of Science data (2025).

The table highlights the main areas of research and leading academic centers in the field of corporate governance applied to public services. The United States dominates with a strong focus on regulation, transparency, and public accountability, supported by elite universities such as Harvard and MIT. The United Kingdom maintains a central role in the study of public sector governance and compliance policies, with prestigious institutions such as the London School of Economics and Oxford.

Germany and France contribute significantly through research on public management, organizational ethics, and sustainability strategies, represented by top universities such as the University of Hamburg and HEC Paris. Italy and Spain focus on administrative reforms and social responsibility, reflecting European concerns for modernizing public sector governance.

Canada and Australia highlight an applied approach, investigating social impact and decision-making sustainability in public services. Sweden stands out for its studies on transparency and administrative innovation, reinforcing the Nordic model of governance. In Latin America, Brazil is emerging as a research hub, addressing issues related to economic development and social policies, indicating a geographical expansion of the academic debate.

This global picture suggests a diversity of theoretical and methodological perspectives, with each country making specific contributions influenced by its institutional and economic context. Complementing this macro view, the analysis of the co-occurrence network of keywords allows for a more detailed understanding of how themes and theories are interconnected in the literature.

Figure 1 provides a clear picture of the conceptual structure of the field, highlighting both established directions and new approaches that are gaining ground in the context of digitization and sustainability. By examining the relationships between concepts, it becomes possible to identify thematic clusters and research evolution dynamics, highlighting how different theories and perspectives come together to address current challenges in the public sector.

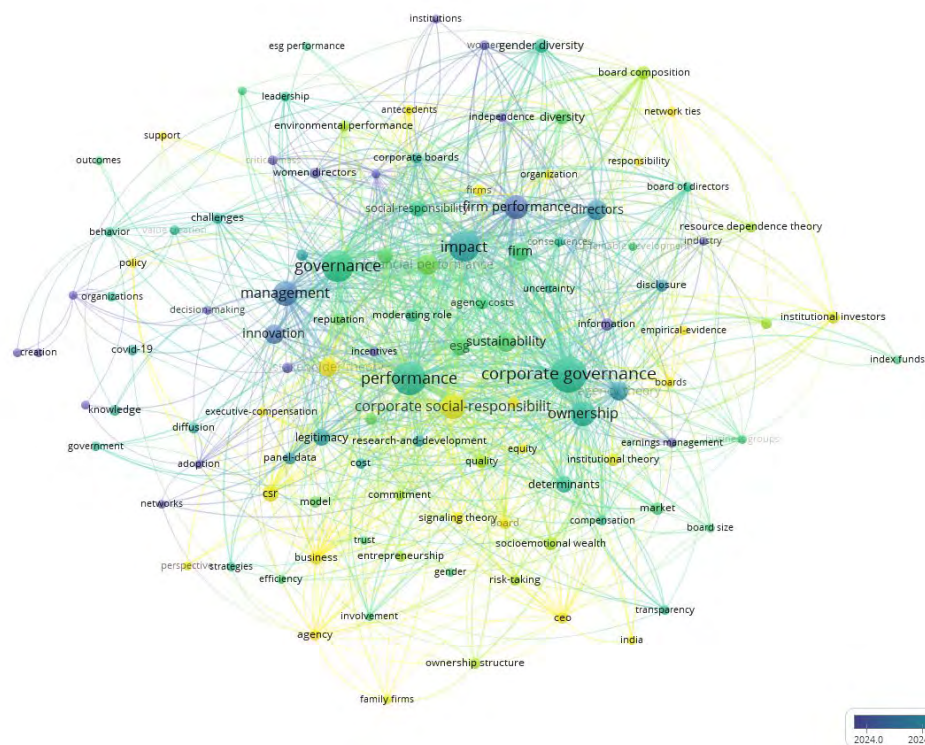


Figure 1: Thematic network of co-occurring keywords in the literature on corporate governance in public services

Source: Web of Science data, author's visualization in VOSviewer (2025)

Analysis of the conceptual network highlighted in the figure provides insight into the theoretical and thematic dynamics in the literature on corporate governance in the public sector. The main conclusions are structured according to the central concepts, the relationships between them, their evolution over time, and the implications for public services.

4.1 Central concepts and their importance

The co-occurrence network of keywords highlights four fundamental concepts: corporate governance, performance, management, and corporate social responsibility. These are found at the center of the network, suggesting that they are dominant themes in the literature.

Corporate governance and performance are the most prominent concepts, indicating that studies in this field place significant emphasis on the relationship between governance models and organizational outcomes.

Corporate social responsibility is another central concept, showing a growing interest in the social impact of corporate governance, which is essential in the context of public services.

4.2 Interconnectivity and co-occurrence of concepts

The analyzed network indicates a high density of connections between terms, suggesting a multidisciplinary approach to corporate governance.

Relevant thematic sub-clusters have been identified, including:

The relationship between corporate governance and performance, highlighting a constant concern for managerial efficiency and effectiveness.

The interaction between corporate social responsibility and impact, indicating increased attention to the ethical and social dimensions of governance.

These connections underscore the fact that contemporary literature integrates both economic and social perspectives into the analysis of corporate governance.

4.3 Temporal evolution of concepts

The co-occurrence map highlights a thematic transition in the literature:

Traditional concepts, such as ownership structure and board diversity, are predominant in older works (marked in blue), reflecting initial concerns about leadership structure and the distribution of control in organizations.

Emerging themes, such as sustainability, impact, and stakeholders, appear more frequently in recent works (marked in yellow), indicating a shift toward more inclusive and sustainable corporate governance.

This evolution highlights a paradigm shift from a vision centered on control and efficiency to a broader approach that includes social responsibility and sustainability.

4.4 Implications for corporate governance in public services

The results suggest a reconfiguration of the perspective on corporate governance, with major implications for the public sector:

From an approach focused on internal control and efficiency (through rigid governance structures), there is a shift towards a more open model that integrates social impact and sustainability.

In the public sector, where governance must meet both performance criteria and requirements for transparency and accountability to citizens, this transition becomes essential.

These findings confirm that corporate governance in public services can no longer be analyzed solely in terms of administrative efficiency, but must be linked to sustainability, social responsibility, and community impact.

5 Conclusion

This study provides a comprehensive analysis of corporate governance in public services, highlighting the theoretical frameworks that shape governance mechanisms as well as the evolving dynamics in the sector. Through an extensive bibliometric analysis, we have identified key trends, dominant theories, and the geographical distribution of research contributions.

A critical finding of this study is the transition in governance paradigms from traditional efficiency-oriented models to more holistic approaches that integrate transparency, sustainability, and stakeholder involvement. While agency theory remains influential, its application in public services is complemented by stakeholder theory, administration theory, and resource dependence theory, which emphasize ethical leadership, accountability, and external resource management.

Bibliometric results show that research on corporate governance in public services is concentrated in a few leading countries, particularly the United States, the United Kingdom, and Germany, which shape the global discourse on governance policies and frameworks. However, emerging contributions from Latin America and other regions indicate a growing interest in adapting governance models to diverse socio-economic and institutional contexts.

Another significant perspective is the growing relevance of sustainability and social responsibility in governance research. Public sector organizations are under increasing pressure to balance efficiency with broader social and environmental considerations. The shift in research focus from ownership structures and board diversity to impact assessment, accountability, and sustainability confirms a broader transformation in the conceptualization of governance.

Future research should further explore the intersection of digitalization and governance reforms, as technology-based innovations have the potential to enhance transparency, efficiency, and stakeholder participation in public service management. In addition, comparative studies of governance frameworks in different institutional contexts could provide deeper insights into best practices and adaptable models for improving governance.

In conclusion, corporate governance in public services continues to evolve in response to complex challenges and societal demands. A more integrated and adaptable approach to governance, rooted in ethical management and stakeholder inclusion, is essential to ensuring the effectiveness and legitimacy of public sector institutions. Policymakers and practitioners must embrace these emerging governance principles to promote transparency, trust, and sustainable development in the administration of public services.

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MAKING A GLUTEN AND SUGAR-FREE DESSERT

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Abstract: In recent years, there has been a significant increase in consumer demand for healthier food products, which has encouraged research and innovation in the field of sugar- and gluten-free alternatives. Responding to this trend, the present study focuses on the elaboration of a lemon tart that excludes both gluten and refined sugar, while maintaining the sensory and nutritional qualities expected from a traditional dessert.

The formulation of the tart dough and filling was based on carefully selected ingredients, including almond flour, rice flour, erythritol, stevia, eggs, and butter. These components were chosen not only for their functional properties, but also for their ability to ensure an optimal balance between taste, texture, and nutritional value. Almond and rice flours contributed to a gluten-free structure with desirable consistency, while erythritol and stevia provided natural sweetness without raising caloric content.

To evaluate the quality of the developed product, a comparative sensory analysis was carried out in relation to a classic lemon tart. A structured questionnaire was administered to 10 participants, who assessed key parameters such as appearance, texture, taste, flavor, and overall acceptability. The analysis revealed that the sugar- and gluten-free tart achieved a reduced energy value and obtained higher scores in most sensory categories, particularly in terms of freshness of flavor and pleasant aftertaste.

The findings demonstrate that it is possible to create a confectionery product that aligns with modern nutritional requirements without compromising sensory appeal. This dessert has the potential to become a viable healthy alternative in professional confectionery practices.

Keywords: lemon tart, gluten-free, sugar-free, healthy dessert, sensory evaluation, confectionery innovation

JEL Classification: Q18, I12, L66, O13, D12

INTRODUCTION

According to statistical data, 1 in 100 people worldwide is affected by celiac disease, and 1 in 10 family members is diagnosed with gluten intolerance (Celiac Disease Foundation, 2025).

In the Republic of Moldova, 56% of adults are overweight, of which 23% suffer from obesity. Furthermore, the Summary Report of the Health Behavior in School-aged Children Study shows that 11% of children are overweight, and 2.2% are obese (ANSP, 2022).

In recent years, the trend of consumers opting for healthier food products has increased significantly, driven by awareness of the negative impact of sugar and gluten on health. Excessive sugar consumption is associated with conditions such as diabetes, obesity, and cardiovascular diseases, while gluten can cause digestive problems and intolerances. In this context, the development of healthy dessert alternatives becomes a necessity both for the food industry and for consumers who desire a balanced lifestyle.

Purpose of the study

This study aims to elaborate a gluten- and sugar-free lemon tart recipe, offering a healthy alternative to this classic dessert. At the same time, the proposed tart will be compared with the traditional version sold in a confectionery. The analysis will include:

- Organoleptic characteristics (appearance, color, consistency, smell, taste);
- Nutritional value, aiming for a product with pleasant taste, fine texture, and enhanced nutritional benefits.

MAIN CONTENT

In the Republic of Moldova, the market for healthy confectionery products is continuously expanding, amid the growing interest of consumers in sugar- and gluten-free desserts. However, the number of confectioneries that offer such products remains relatively small. Among those that have integrated options adapted to this consumer segment are Tucano Cafe, Biorganic Raw Cafe, Sincer, Julia's Sweets, and Pure Taste. These establishments use natural sweeteners, alternative flours, and healthy vegetable fats, offering products that meet the requirements of a balanced diet.

This paper aims to develop and refine a sugar- and gluten-free lemon tart, by using carefully selected ingredients, intended to ensure a balance between the nutritional value and the sensory qualities of the product. For this recipe, high-quality raw materials were used, contributing both to the texture and aroma of the dessert, and to its health benefits.

Technological process of the gluten- and sugar-free lemon tart

The preparation of the sugar- and gluten-free lemon tart requires a well-defined technological process, harmoniously combining the ingredients to obtain a product balanced in taste, texture, and nutrition. The tart consists of four distinct semi-preparations, each playing an essential role in the final composition:

1. Tart dough – a tender and slightly crunchy base, made of rice flour, almond flour, butter, and eggs, providing the perfect support for the filling.

2. Almond cream – a fine and aromatic layer, prepared with almond flour, eggs, natural sweeteners, and lemon zest, adding structure and complexity to the flavor.

3. Lemon curd – a tangy and refreshing layer, made from lemon juice, sweeteners, cornstarch, eggs, and butter, offering freshness and intensifying the dessert's aroma.

4. Meringue – an airy and light finish, made from egg whites and natural sweeteners, adding a pleasant textural contrast and an elegant appearance to the tart.

Ingredients used

To obtain a nutritionally and sensorially balanced tart, the following key ingredients were used:

- **Rice flour** – gluten-free alternative, gives the dough a fine and slightly crunchy texture.
- **Almond flour** – enriches the composition with a subtle aroma and high content of healthy fats.
- **Cornstarch** – used to improve the structure and consistency of the product.
- **Butter** – contributes to the tenderness of the dough and the improvement of the final texture.
- **Stevia powder and erythritol** – natural sweeteners with a low glycemic impact, replacing sugar.
- **Eggs** – essential for stabilizing the dough, lemon cream, and meringue, providing structure and volume.
- **Lemon** – the main ingredient, responsible for the tangy and refreshing taste, contributing to the balance between sweet and sour.

Each stage is carried out with attention to detail, so that the final product meets both nutritional and sensory requirements. The technological scheme below details the preparation stages of each semi-preparation, highlighting specific methods and processing conditions necessary to obtain a healthy, balanced, and attractive lemon tart.

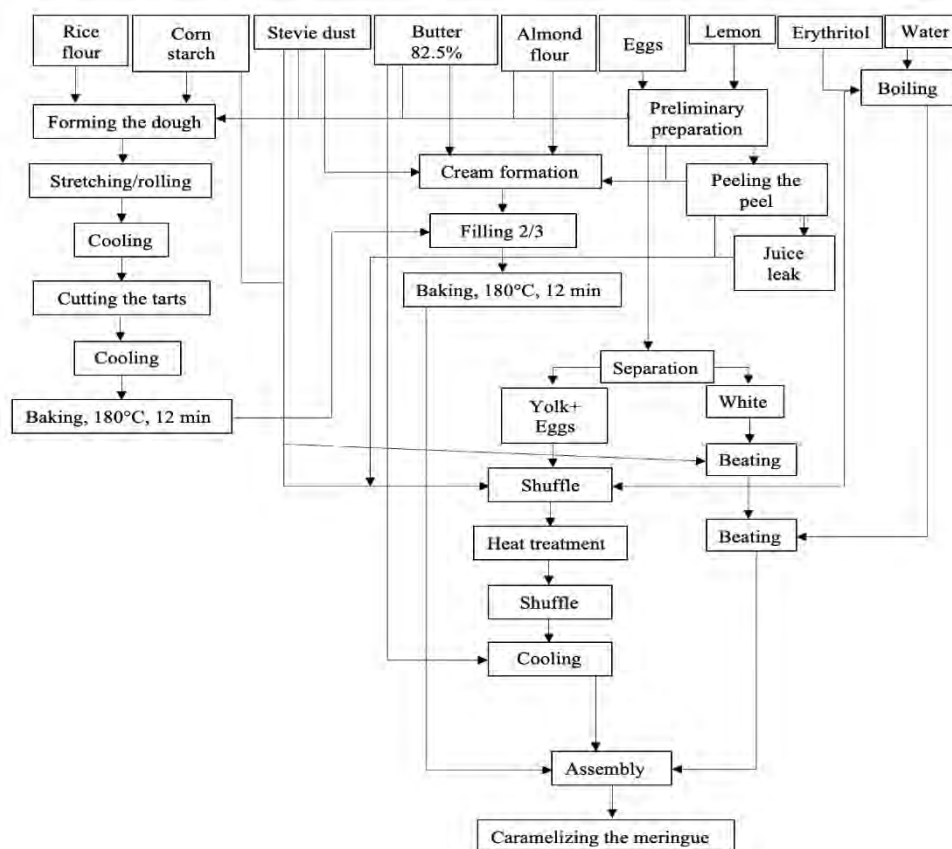


Figure 1. Technological scheme for preparing the gluten- and sugar-free lemon tart

Source: elaborated by the authors

Methodology of analysis

To evaluate the quality of the sugar- and gluten-free lemon tart compared to a similar commercial product, two methods of analysis were applied:

1. Comparative analysis method

- A comparative study based on psych-sensory analysis was conducted, in which 10 participants evaluated two versions of the tart: the proposed one and the classic one, sold in a confectionery.

- Participants gave grades from 1 to 5, based on organoleptic criteria, and the results are presented in the table below:

Table 1. Results of the comparative study

Organoleptic indices	Gluten- and sugar-free lemon tart	Classic lemon tart
Appearance	4,8	4,4
Consistency	4,8	4,1
Color	4,7	4,3
Smell	4,8	4,6
Taste	4,6	3,2

Source: Prepared by the authors

2. Method for calculating energy and nutritional value

This method allowed the analysis of the energy and nutritional value of the sugar- and gluten-free lemon tart.

Formula for calculating energy value:

$V.E. = P(g) \times 4kcal/g + G(g) \times 4kcal/g + L(g) \times 9kcal/g + A.O(g) \times 3kcal/g$ (Calmăș, 2020, p.31).

Formula for calculating nutritional value:

$$VN_{10} = 1/10 \times (Pr \times F_{Pr} + L \times F_L + G \times F_G + Ca \times F_{Ca} + P \times F_P + Fe \times F_{Fe} + A \times F_A + B1 \times F_{B1} + B2 \times F_{B2} + C \times F_C) \text{ (Calmăș, 2020, p.33).}$$

The data obtained from the calculations are presented in Table 2.

Table 2. Results of energy and nutritional value

	Gluten- and sugar-free lemon tart
Energy value,kcal/100 g	635
Nutritionalvalue, per 100 g	17,65

Source: Prepared by the authors

CONCLUSIONS/RECOMMENDATIONS

The study demonstrates that it is possible to elaborate a gluten- and sugar-free dessert while maintaining pleasant sensory characteristics and balanced nutritional value. This aspect is important for people with celiac disease, diabetes, or for those who wish to adopt a healthy lifestyle.

Replacing wheat flour with gluten-free alternatives such as almond flour and rice flour, and using natural sweeteners (erythritol, stevia powder), led to a product with a low glycemic index and acceptable texture.

By calculation method, it was established that the dessert has the following nutritional values per 100 g: Nutritional value: 17.65; Energy value: 635 kcal.

Comparing the sugar- and gluten-free lemon tart with the classic version, the results of the organoleptic analysis highlight a high acceptability of the adapted product, with higher scores in most evaluated parameters. Appearance and color: The sugar- and gluten-free tart obtained higher scores for appearance (4.8 vs. 4.4) and color (4.7 vs. 4.3), indicating a more attractive visual presentation. Consistency: The score of 4.8 for consistency, compared to 4.1 for the classic version, suggests that the sugar- and gluten-free dessert has a more pleasant and stable texture. Smell: Both versions obtained high scores, but the sugar- and gluten-free tart was slightly more appreciated (4.8 vs. 4.6), which may indicate a more intense aroma, possibly due to the natural ingredients used. Taste: The most significant contrast is observed in taste, where the sugar- and gluten-free tart scored 4.6, compared to 3.2 for the classic version. This result suggests a clear preference for the modified recipe.

The results suggest that the sugar- and gluten-free lemon tart not only represents a viable alternative, but is even better appreciated than the classic version, especially in terms of taste, consistency, and appearance. This confirms that the use of alternative ingredients does not compromise the sensory quality of the product but, on the contrary, can offer significant improvements.

Confectioneries and pastry producers should develop and diversify the range of sugar- and gluten-free products, adapting to the demands of health-conscious consumers.

The development of new recipes that maintain the balance between taste, texture, and nutritional value can contribute to the growing popularity of sugar- and gluten-free products.

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THE PHENOMENON OF GREENWASHING AND ITS IMPACT ON THE PERCEPTION AND REALITY OF FOOD SAFETY

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Abstract: Greenwashing is the practice of making false or exaggerated claims about a product, service, or company to make it appear more environmentally friendly than it actually is. The term "greenwashing" comes from combining the words "green" (associated with environmentalism) and "whitewashing" (which means to cover up or hide something negative).

The first clear examples of greenwashing appeared in the 1960s in the US. One example is the campaign by a hotel chain which, under the pretext of protecting the environment by saving water, asked guests to reuse their towels. In reality, the aim was to reduce laundry costs. In the 1980s, the term "greenwashing" entered public and media usage for good.

Green markets, logos, and packaging are widespread. Many experts point out that these may just be a marketing ploy, suggesting that what is "green" is automatically "natural." However, not all companies that use such symbols can be accused of greenwashing. The main problem is the difficulty consumers have in distinguishing between a manufacturer with genuine sustainability practices and one that only pretends to comply with them.

A study conducted in the Netherlands shows that the price of sustainable products is, on average, 75–85% higher than that of similar products without certification, which amplifies consumer scepticism and suspicion.

To avoid confusion and protect consumers, there are a number of safety standards and certifications in the food sector, including: ISO 22000:2018 – applicable to all companies in the food sector, from production and distribution to storage and serving; ISO 9001:2015 – focused on organizational process management and customer satisfaction; SQF Standard – focused on product quality and food safety.

The certifications obtained by organizations demonstrate that their products comply with the international standards required in the field.

There are two bodies in the Republic of Moldova that inspect and certify agricultural products as organic: Certificat-Eco LLC and Control Union Dnjestr LLC. The list of certified farmers can be found on the website of the Ministry of Agriculture and Food Industry. However, holding an ecological certificate does not yet give Moldovan producers the right to apply a special ecological label on their packaging. This possibility will be regulated by a law that is due to come into force in April. Currently, only imported products on store shelves in the Republic of Moldova have organic labels.

Keywords: greenwashing, food safety, consumer perception, corporate responsibility

JEL Classification: M14, M31, Q18, D18, Q56.

Introduction

Eco-friendly practices are used not only by ordinary people, but also by large clothing and food companies. Manufacturers are increasingly trying to meet modern popular standards of business management. And one of the most important conditions influencing the purchase of one

product or another is sustainable development in the approach to business, the "greening" of production and distribution processes. (Widya Satya Nugraha, 2024)

But there are two options here: either the organization truly adheres to a conscious attitude towards natural resources, or it is all just a marketing ploy aimed at increasing sales without bringing any benefit to the environment. This phenomenon is called greenwashing, which is the complete opposite of eco-marketing.

Greenwashing is not real ecology, but pseudo-ecology. It is about how companies mislead consumers and cover up their actions with seemingly rational consumption.

Research methodology

American ecologist Jay Westerveld introduced the term greenwashing in 1986, defining it as the practice of falsely or exaggeratedly presenting an organization's environmental performance. However, the origins of the phenomenon can be traced back to the first half of the 20th century, with the advent of television advertising and the campaigns of the Keep America Beautiful organization. Westerveld repeatedly criticized misleading corporate communication strategies, through which companies misled consumers about the real environmental impact of their products or activities. (Widya Satya Nugraha, 2024)

The term greenwashing comes from English and has no perfect equivalent in other languages. By analogy with the term whitewashing ("covering up the truth"), it can be translated as "greenwashing" or "eco-camouflage," expressing the idea of pseudo-ecologization intended to create an artificial image of sustainability. In the literature, the concept is also referred to as "ecological camouflage" or "pseudo-ecologization."

According to the research report *The Sins of Greenwashing*, compiled by UL in 2010, the number of products claiming to be environmentally friendly increased by approximately 73% compared to the previous year. The study identified the so-called "seven sins of greenwashing," defined as deceptive marketing strategies used by companies:

1. the sin of hiding essential attributes;
2. the sin of lack of empirical evidence;
3. the sin of irrelevance;
4. the sin of false labeling;
5. the sin of selective comparison ("the lesser of two evils");
6. the sin of conceptual inconsistency;
7. the sin of outright lying.

These forms of communicative manipulation reflect the dissonance between the promoted ecological image and the reality of environmental impact, constituting a significant obstacle to building consumer trust and implementing genuine corporate sustainability practices. In marketing, greenwashing is used to draw attention to a brand and strengthen consumer loyalty to it. Greenwashing is most commonly used in the fast-moving consumer goods (FMCG) sector, but manufacturers of cosmetics, clothing, footwear and pharmaceuticals also like to 'ride the green wave'. (Widya Satya Nugraha, 2024)

In most cases, product packaging is used to 'greenwash' the image. This can literally mean green labels, but also product features related to ecology, which do not, however, correspond to the actual composition. These include, for example, 'plant-based raw materials', 'heavy metal-free', 'palm oil-free' and 'GMO-free'. Some manufacturers go even further and affix fake eco-certificates to their packaging. Information on the recyclability of packaging may also be false.

Another objective of greenwashing is to attract employees to the company. For many workers, especially those of Generation Z, it is important that their employer is environmentally responsible. Young people prefer to work in 'green' offices and choose companies that care about the environment. (Nations)

Research results

Many brands today want to be environmentally friendly. And it's understandable: more and more buyers are paying attention to the impact of the products they buy on their health and the environment. However, not all products that call themselves "green" are actually so. Sometimes, their manufacturers just make big promises. This is called "greenwashing." We will explain what it is and how to recognize it.

Greenwashing is a marketing technique used by some companies to create the impression that their products or services are environmentally friendly, when in reality they are not. Greenwashing can take many forms, such as using the color green, nature symbols, words like "eco," "bio," "organic," etc. on packaging or in advertisements, exaggerating or making false claims about their environmental achievements or awards. Another example of greenwashing by a brand is hiding or ignoring its negative impact on the environment.

Not long ago, a Korean cosmetics brand was caught in a primitive greenwashing campaign, claiming to have launched a line of products in handmade paper packaging. The first attentive buyer easily discovered the deception. The paper was indeed present in the packaging, but it was simply carefully glued to a regular plastic container. The shame was so great that the product range was completely withdrawn by the manufacturer. (Widya Satya Nugraha, 2024)

But this is probably the most obvious example of greenwashing for consumers. A less obvious example is when the packaging says "ECO," "BIO," or "100% less plastic" in large letters. In this case, it is very difficult for consumers to understand where the lie is and where the truth is. Many are misled by the trendy color. And finally, the disposable coffee cup, painted in "artisanal brown," is considered paper and recyclable. Although, in fact, it is a composite packaging, containing the same disposable and non-recyclable plastic.

Large companies have also been involved in greenwashing scandals. For example, Starbucks once declared that it was giving up plastic straws in its drinks to reduce plastic use. However, it turned out that the new cup lids it introduced contained more plastic than the old lids and straws combined. The company tried to justify this by saying that the new lids are easier to recycle, but in fact, only a small proportion of the lids were recycled.

To date, the case of H&M, which launched a program several years ago to collect and recycle old clothes, promising that they would be used to create new items, is still in the public eye. However, journalists discovered that most of the clothes collected were simply sold on the secondary market in second-hand stores, and some were simply thrown away. (Widya Satya Nugraha, 2024)

There are several dangers associated with greenwashing:

First, it misleads consumers who trust the company's green image and are unaware of its actual practices. As a result, they buy products that may be harmful to their health, animals, plants, water, soil, and the atmosphere.

Second, greenwashing reduces consumers' motivation to adopt environmentally responsible behavior, such as sorting waste, saving resources, and reducing consumption. This is because consumers believe that by buying "green" products, they are already doing a lot to protect the environment.

Thirdly, greenwashing creates unequal competition in the market, as honest and truly eco-friendly companies cannot compete with those that use the "green mask" to attract customers. Thus, greenwashing undermines the development of a truly eco-friendly economy and innovations.

In the Republic of Moldova, the organic certification system for agricultural products is managed by two accredited entities – Certificat-Eco SRL and Control Union Dnjestr SRL. These organizations are responsible for assessing the compliance of production processes with organic farming standards and issuing the corresponding certificates. The complete list of certified

producers is publicly available on the official website of the Ministry of Agriculture and Food Industry, which ensures transparency and free access to information for consumers.

However, obtaining an organic certificate does not currently entitle producers to use an organic label on the packaging of local products. The implementation of the regulatory framework that will allow the use of this label is planned for April, which will mark an important step in aligning the national system with European certification and labeling practices. As a result, only imported products bearing internationally recognized eco-labels are currently available on the domestic market, confirming their certification in accordance with European regulations in force. (Nations, n.d.) (Widya Satya Nugraha, 2024)

International eco-labels and ethical certification labels

In the context of market globalization and growing concerns about sustainability, international eco-labels are essential tools for ensuring that products comply with the principles of sustainable development. They confirm that manufacturers adhere to rigorous standards of environmental protection, human rights, and economic fairness, giving consumers the assurance of a responsible and ethical choice. Below are the main legitimate international labels, recognized worldwide, which enhance the transparency of supply chains and contribute to the creation of sustainable and fair trade.



Climate Neutral Certified

This label confirms that the certified organization has implemented concrete measures to reduce and offset the carbon emissions generated by its activities. The certification process involves, in the first phase, a comprehensive assessment of the carbon footprint associated with production, transport, and distribution processes. Subsequently, the company is required to purchase verified carbon credits, each representing the avoidance of one ton of carbon dioxide emitted into the atmosphere. The funds obtained from these credits support initiatives for forest conservation, renewable energy development, and the modernization of green transportation, thus contributing to the reduction of global climate impact. (Certified, 2024)



Leaping Bunny (Cruelty-Free Certification)

The Leaping Bunny label guarantees that the product has not been tested on animals at any stage of the development process. Companies that obtain this certification make an annual commitment to permanently renounce animal testing and accept independent audits. Therefore, this label reflects a solid ethical policy in the field of cosmetic research and production, being a recognized symbol of responsibility towards animal life. (Certification), 2025)



GOTS – Global Organic Textile Standard

GOTS certification sets international standards for organic textiles, covering the entire product life cycle—from raw material harvesting to environmentally and socially responsible processing to final labeling. Products bearing this certification guarantee a high level of

sustainability and traceability, giving consumers confidence that their purchase supports a clean, ethical, and transparent production process. (Standard, 2025)



Rainforest Alliance Certified

This label certifies products sourced from sources that comply with the three fundamental pillars of sustainability: social, economic, and environmental. Assessments are carried out by independent bodies, which verify fair labor practices, biodiversity protection, and rational management of natural resources. By promoting this certification, producers contribute to the conservation of tropical ecosystems and the improvement of living conditions for rural communities in producing regions. (Certified R. A., 2025)



The Vegan Society Trademark

The Vegan Society label certifies products that do not contain ingredients of animal origin and do not involve the exploitation of animals at any stage of production. This internationally recognized label promotes a sustainable lifestyle and an ethical approach to consumption, in full accordance with the principles of environmental protection and animal welfare. (Trademark, 2025)



6. Fairtrade Certification

The Fairtrade label is a symbol of fair trade and respect for human dignity. It guarantees that raw materials—such as cocoa, coffee, or sugar—come from supply chains that adhere to the principles of non-discrimination, fair remuneration, elimination of child labor, and occupational safety. Fairtrade-certified products contribute to the sustainable development of farming communities in developing countries by offering farmers fair prices and decent working conditions. (Certification, 2025)

Development of a sustainable finance taxonomy

Plans to develop a sustainable finance taxonomy in Moldova include the introduction of modern tools for investment management and the allocation of capital to green projects. The project, launched by the National Bank of Moldova (BNM) with the support of the International Finance Corporation (IFC), aims to create a classification system defining environmentally sustainable activities. This system will take into account criteria such as emissions reduction, environmental protection and efficient use of resources. (Moldova, n.d.)

The taxonomy serves as a tool to prevent greenwashing: clearly defined criteria will make it possible to exclude cases where financial products or projects are declared ‘green’ without any real basis. The sustainable finance project provides for consultations with representatives of the NBM, the National Financial Markets Commission and relevant ministries, laying the foundations for transparent regulation and strengthening investor confidence. (Moldova, n.d.)

Development of an internal management infrastructure

Effective implementation of the taxonomy requires a solid ‘infrastructure’: the creation of an expert council, the drafting of regulatory texts and the systematic adaptation of criteria to local conditions. An advisory group composed of representatives from the government, regulators and the banking sector discusses the classification of sectors, evaluation criteria and audit procedures.

The next step will be to prepare a normative act and submit it for public debate, allowing stakeholders to propose amendments and improvements. This approach offers flexibility and ensures that the rules will be in line with international standards for sustainable finance. (Moldova, n.d.)

Interaction with customers and partners

Consumer and partner confidence in companies' environmental claims increases when information is backed up by evidence and accessible to all. CPR.md documents show that greenwashing often results in a lack of evidence or unconfirmed “vegan” and “eco” claims. (ecologică?, n.d.) It is important for companies to implement transparent processes for confirming environmental benefits and to give customers access to certificates and audit results.

In addition, vague terms such as ‘natural’ and “ecological” must be abandoned, and data on the actual environmental characteristics of the product must be made accessible. Taxonomy standards can be integrated into investor relations: companies are required to disclose which parts of their activities are classified as ‘sustainable’ and why.

Automation of controls and reporting

To combat greenwashing, it is necessary to automate control processes. This involves creating a single register of projects classified according to the taxonomy and an electronic monitoring system that allows the regulatory authority to quickly detect non-compliance. Companies can implement ERP systems to integrate data on emissions, resource consumption and compliance with environmental standards.

The CPR.md documents point out that many sustainability claims are not backed up by evidence, which is why automatic control mechanisms and constant updating of information can reduce the risk of manipulation. (ecologică?, n.d.)

Regulatory security and data protection

The implementation of a new taxonomy and anti-greenwashing approaches must be accompanied by the development of both legal and technical protection mechanisms. An article by CPR.md describes greenwashing as a form of unfair competition that infringes on consumer rights. This requires the introduction of laws regulating the use of environmental claims and penalties for false claims.

Regulators are required to ensure that data relating to sustainable financing projects is kept in accordance with confidentiality rules and is only disclosed to confirm environmental status. The adoption of European regulations, in particular the Unfair Commercial Practices Directive (2005/29/EC), will provide an additional tool for consumer protection.

Skills development and awareness raising

It is impossible to combat greenwashing effectively without raising awareness among employees and the public. CPR.md recommends developing official guidelines on green advertising and greenwashing, which will explain the meaning of the terms, give examples of permitted and prohibited practices, and list the criteria for evaluating environmental claims [9]. Companies can organise training programmes for marketing specialists, legal professionals and sustainability managers. These programmes should cover international standards, data verification methods and how to communicate effectively with customers.

Communication and commercial reputation

A company's green image must be based on actual practices, not artificial claims. The use of vague wording and images of nature without factual confirmation is a common technique of greenwashing. (ecologică?, n.d.) To strengthen their reputation, companies must be transparent,

back up their claims with certifications (e.g. Climate Neutral Certified, Fairtrade) and publish reports on the work they have done.

From the perspective of central banks and public authorities, it is important to develop a communication strategy that explains the nature of the taxonomy to the public, describes its benefits and encourages companies to adopt sustainable business models.

Financing and support for sustainable development projects

Like any modernization process, the implementation of the taxonomy will require financial resources. Possible sources of funding include international programmes (IFC, EBRD), European subsidies for sustainable development and support programmes for small and medium-sized enterprises. It is important to develop a business plan and a cost-benefit assessment to justify investments in accounting systems, staff training and certification.

Monitoring and evaluation of implementation

To ensure the system functions properly, its effectiveness must be continuously monitored and evaluated. Indicators may include:

- percentage of projects classified as sustainable;
- number of cases of non-compliance with the identified criteria;
- level of confidence among investors and consumers;
- economic benefits of applying the taxonomy;
- changes in the volume of funding for environmental projects.

Regular collection and analysis of this data will enable policies to be adjusted and ensure compliance with best practices in sustainable financing and the fight against greenwashing.

Conclusion

Greenwashing is pseudo-ecological advertising described by Jay Westerfeld as early as 1986. It is based on ‘seven sins’: lack of evidence, inappropriate statements, misleading eco-labels, selective mention of benefits and outright lies. Manufacturers often use green colours, the words ‘natural’ or ‘organic’ and even fake certificates, without having a genuine ecological approach. Scandals involving ‘paper’ packaging that turned out to be plastic, the replacement of Starbucks straws with more plastic lids, and H&M's ‘eco-friendly’ programmes have shown that such actions often mislead consumers. This practice creates dangers. Firstly, it deceives buyers and can conceal risks to health and the environment. Secondly, they reduce interest in truly responsible behaviour, as people think they are buying “organic” and doing enough. Thirdly, they lead to unfair competition: dishonest companies hide their real costs, thereby driving out honest manufacturers.

In Moldova, the situation is complicated by the fact that local producers who have obtained organic certificates cannot yet display the eco-label on their packaging: the relevant legislation is still being drafted. The market is therefore dominated by imported products bearing international labels: Climate Neutral, Leaping Bunny, GOTS, Rainforest Alliance, Vegan Society, Fairtrade.

Serious measures are needed to combat greenwashing. Safefood notes that there are no direct risks to product safety, but that consumer confidence has been shaken.

The European Union is already drafting a directive requiring environmental claims to be verified by independent audits, with penalties for companies that fail to comply. In Moldova, the National Bank, in collaboration with the IFC, is developing a sustainable finance taxonomy to steer investment towards genuine green projects and weed out fake ones.

Consumers should rely on recognised certificates, read product labels and not believe slogans. For companies, it is important to move from decoration to concrete ecological actions: reducing emissions, using circular technologies and communicating honestly about this. This is the only way to build trust and prevent greenwashing from destroying the market for sustainable products.

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SESSION II
ECONOMIC THEORY AND POLICY FOR RESILIENCE AND
SUSTAINABILITY

DETERMINANTS OF THE EXTERNAL COMPETITIVENESS OF THE REPUBLIC OF MOLDOVA: THE INTERACTION BETWEEN MACROECONOMIC FACTORS AND SECTORAL COMPARATIVE ADVANTAGES

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Abstract: The Republic of Moldova, an EU candidate since 2022, faces the challenge of proving its capacity to operate a functioning market economy and to compete within the EU single market. This study examines the determinants of Moldova’s external competitiveness by combining macroeconomic and sectoral perspectives. At the macro level, cost and price competitiveness are assessed using the Real Effective Exchange Rate (REER) and Unit Labor Costs (ULC). At the sectoral level, competitiveness is analyzed through the Michaely Index (MI) and the Modified Lafay Index (MLI), applied to agricultural and industrial exports. The empirical analysis covers the period 2014–2023, drawing on official data from the National Bureau of Statistics, the National Bank of Moldova, UNCTAD, IMF, and UN Comtrade. Two econometric models are estimated to explore the impact of productivity, wages, investment, and inflation on competitiveness. To integrate macro and sectoral findings, a new Composite Competitiveness Index (CCI) is developed. The results indicate that productivity growth and fixed capital investment are the most consistent drivers of competitiveness, while rapid wage growth and inflation exert a negative effect. Agriculture remains the backbone of Moldova’s external competitiveness, with cereals, oilseeds, fruits, and nuts showing persistent comparative advantages. However, the sector’s high volatility and exposure to climate and market risks underline the urgency of diversification. Industrial exports, by contrast, display weak or negative competitiveness due to low technological intensity and dependence on imported inputs. Overall, the findings highlight a disconnect between resilient agricultural sectors and deteriorating macroeconomic cost indicators. The study concludes that Moldova’s long-term competitiveness requires a dual strategy: stabilizing macroeconomic conditions to control costs, while fostering investment, innovation, and value-added industrial sectors.

Keywords: cost competitiveness, productivity, wages, agriculture, investment.

JEL Classification: C10, E20, F15, Q17

1 Introduction

Since being granted EU candidate status in 2022, the Republic of Moldova has entered a crucial phase in its economic development. Candidate countries are required to demonstrate a functioning market economy and the capacity to withstand competitive pressure within the EU single market. For Moldova, this means transforming its economic structure, improving productivity, and ensuring that exports remain competitive in price and quality.

The past decade has been marked by significant challenges: three recessions, the economic effects of the COVID-19 pandemic, and the negative spillovers of the war in Ukraine. Between 2014 and 2023, GDP grew on average by 2.3% per year, slower than most other EU candidate countries. GDP per capita remains the lowest among the group, and the gap with the EU average is still wide (World Bank, 2024).

Competitiveness is not a static feature, but reflects the dynamic interaction between productivity, costs, exchange rates, and the composition of exports. At the macroeconomic level, two of the most widely used indicators are the Real Effective Exchange Rate (REER), which measures relative price competitiveness, and Unit Labor Costs (ULC), which capture the cost of labor relative to productivity (Pender, M., Rammer, Ch., et al., 2018). An appreciation of the REER or an excessive increase in ULC typically signals a decline in competitiveness.

At the sectoral level, competitiveness depends on the capacity to produce goods that are in demand on foreign markets. Comparative advantage indices such as the Michaely Index and the modified Lafay Index reveal which sectors generate export surpluses (Michaely, 1962; Lafay, 1992). In Moldova's case, agriculture continues to dominate the export structure, with products such as cereals, oilseeds, fruits, and nuts showing strong comparative advantages. However, heavy dependence on agriculture also exposes the economy to weather shocks and global commodity price fluctuations.

This paper takes a dual approach to competitiveness analysis. First, it evaluates macroeconomic indicators to identify trends in cost and price competitiveness. Second, it examines sectoral performance to determine the structure and sustainability of Moldova's comparative advantages. To integrate these perspectives, a new Composite Competitiveness Index (CCI) is proposed.

The research objectives are:

Assess the evolution of Moldova's macroeconomic competitiveness using REER and ULC.

Analyze sectoral competitiveness through MI and MLI for agricultural and industrial exports.

Test the relationship between productivity, wages, investment, and inflation with competitiveness using regression models.

Construct and interpret a Composite Competitiveness Index.

Provide policy recommendations based on empirical findings.

The remainder of this paper is organized as follows: Section 2 reviews the literature on competitiveness measurement in the context of EU integration. Section 3 describes the methodology and data sources. Section 4 presents the empirical results and discusses their implications, while Section 5 concludes and offers policy recommendations.

2 Literature Review

Competitiveness is a multi-dimensional concept in economic theory, especially in the context of integration into the European Union. It refers not only to the ability to sell goods and services in international markets at attractive prices but also to the capacity to maintain or increase market share over time while achieving sustainable economic growth.

The European Commission regularly monitors competitiveness through its Macroeconomic Imbalance Procedure, which uses indicators such as the Real Effective Exchange Rate (REER) and Unit Labor Costs (ULC) (European Commission, 2016). The REER measures changes in relative prices between a country and its trading partners, adjusted for exchange rate movements and weighted by trade shares. A rising REER generally indicates a loss of price competitiveness (European Commission, 2022).

Unit Labor Costs (ULC) are defined as the ratio of total labor compensation to real output. They capture the cost pressure coming from the labor market. When wages grow faster than productivity, ULC increases, signaling a potential erosion of competitiveness unless

counterbalanced by improvements in quality, innovation, or branding (Havlik, 2005). Research on EU member states and candidate countries (Orszaghova *et al.*, 2013; Meshulam, 2019; Pitton, 2021) shows that sustained increases in ULC without corresponding productivity gains tend to result in declining export performance.

Another important theoretical framework is the Balassa–Samuelson effect, which explains why countries in economic convergence often experience real appreciation of their exchange rates. As productivity in tradable goods sectors grows faster than in non-tradable sectors, wages tend to rise across the economy, leading to higher domestic prices and, consequently, an appreciated REER. While this process is natural, it can harm external competitiveness if not accompanied by improvements in export quality and diversification.

At the sectoral level, competitiveness is often measured using trade-based indices. The Michaely Index (MI) measures a sector’s contribution to the trade balance relative to total trade, adjusting for overall trade openness. A positive MI indicates that the sector contributes positively to net exports. The modified Lafay Index (MLI) improves on MI by accounting for the relative importance of each sector in total trade and correcting for re-exports — an important adjustment for small open economies like Moldova, where re-export flows are significant.

Several Moldovan studies (Stratan *et al.*, 2019; Fala, 2023) have applied MI and MLI, particularly to agricultural products. Their findings show persistent comparative advantages in cereals, vegetable oils, fruits, and nuts, but weak or negative competitiveness in most industrial goods. This reflects structural weaknesses: limited technological capacity, low value-added processing, and insufficient integration into European value chains.

Existing literature rarely combines macroeconomic and sectoral competitiveness into a single integrated measure. This paper addresses this gap by introducing a Composite Competitiveness Index (CCI) that integrates REER and ULC trends with sectoral MI and MLI performance, producing a more holistic view of Moldova’s competitive position.

3 Methodology and Data

The study is based on annual data for the period 2014–2023, collected from several authoritative statistical sources. The National Bureau of Statistics of Moldova (NBS) provides information on GDP, labor productivity, wages, investment levels, inflation, and both agricultural and industrial output. Additional macroeconomic data, including nominal and real exchange rates and the structure of foreign trade, are obtained from the National Bank of Moldova (NBM). International datasets complement national statistics: UNCTAD Statistics offers trade volumes and values across broad product groups; the IMF’s International Financial Statistics (IFS) supplies the Real Effective Exchange Rate (REER) and Unit Labor Cost (ULC) indices; and the UN Comtrade Database provides detailed bilateral export and import flows classified according to the HS two-digit system. All nominal variables used in the analysis were converted into constant prices using national deflators, ensuring that inflationary effects do not distort the results.

The empirical framework relies on a set of macroeconomic and sectoral indicators selected for their relevance in assessing competitiveness. At the macro level, the study uses the REER index, where an increase signals an appreciation of the domestic currency, and the ULC index, where higher values reflect rising labor costs relative to productivity. Labor productivity is measured as real GDP per employed person, while real average monthly wages capture the evolution of labor remuneration adjusted for inflation. Investment dynamics are represented through gross fixed capital formation (GFCF) as a share of GDP, and overall price developments are tracked using the annual CPI-based inflation rate. At the sectoral level, competitiveness is examined through the Michaely Index (MI) and the Modified Lafay Index (MLI), both calculated for key product groups such as cereals, vegetable oils, fruits, nuts,

textiles, and machinery. The MLI is further adjusted to account for re-export activities, ensuring a more accurate representation of net competitiveness.

To identify the determinants of export performance, the analysis employs two econometric models. The first, the Macroeconomic Competitiveness Model, investigates how productivity, wages, investment (measured through GFCF), and inflation influence the share of exports in GDP. This model provides insights into how general macroeconomic conditions shape Moldova's ability to compete internationally. The second model, the Sectoral Competitiveness Model, focuses specifically on agriculture. Here, the dependent variable is the MLI for agricultural products, while the explanatory variables include agricultural productivity, sector-specific wages, agricultural GFCF, and the producer price index. This approach helps identify the structural factors that drive competitiveness within one of Moldova's most significant export-oriented sectors.

Finally, the study develops a Composite Competitiveness Index (CCI) that integrates both macroeconomic and sectoral dimensions of performance. The index is constructed as an equally weighted average of two components: a macroeconomic score, derived from normalized trends in REER and ULC (with lower values indicating higher competitiveness), and a sectoral score based on normalized MI and MLI values for the country's five most competitive product categories. Normalization is used to ensure that each indicator contributes proportionally to the overall index, allowing the CCI to serve as a balanced and comprehensive measure of national competitiveness.

4 Results and discussions

4.1 Macroeconomic competitiveness trends (2014–2023)

Over the past decade, Moldova's macroeconomic competitiveness has been shaped by a combination of external shocks, domestic policy adjustments, and persistent structural vulnerabilities. Movements in the Real Effective Exchange Rate (REER) display substantial volatility across the period, reflecting both nominal exchange rate dynamics and inflation differentials relative to key trading partners. These fluctuations, together with evolving trends in labor costs and productivity, have had direct implications for the country's cost competitiveness in international markets.

At the beginning of the period, in 2014–2015, Moldova experienced a pronounced REER depreciation, particularly in 2015, following the banking crisis and subsequent currency devaluation. Although this depreciation temporarily strengthened price competitiveness, the positive effect was largely undermined by a simultaneous decline in productivity and a contraction in investment, both of which limited the economy's capacity to translate favorable price conditions into sustained export growth.

During 2016–2018, the REER embarked on a gradual appreciation trajectory. This development was driven mainly by relatively high domestic inflation combined with a broadly stable nominal exchange rate. Economic conditions improved during these years, with GDP growth recovering and productivity rising. However, wage growth accelerated even faster than productivity, resulting in an increase in unit labor costs (ULC). This trend signaled a gradual erosion of cost competitiveness despite the broader macroeconomic recovery. Unit Labor Costs (ULC) were calculated by the authors by separately identifying the effects of labor costs and productivity on their evolution. Although various approaches exist for computing ULC, this research follows the methodology based on the relationship between nominal wages and real productivity. This approach applied in a modified form has been adopted by the National Bank of Slovakia for internal analytical purposes and is also used by several international institutions (Lipska *et al.*, 2005). The same methodological principles underpin ULC monitoring by the European Central Bank (ECB), the OECD, and the European Commission (Publications Office of the European Union, 2001). Within the EU's Macroeconomic Imbalance Procedure (MIP),

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nominal unit labour costs are assessed based on a three-year percentage change, with an indicative threshold of 9% for euro-area countries and 12% for non-euro area economies.

By 2019, the REER had reached its highest value in the entire decade, indicating a more significant loss of price competitiveness. This appreciation coincided with a noticeable slowdown in export expansion and a modest deterioration in the trade balance, suggesting that the competitiveness pressures were already affecting external sector performance.

The onset of the COVID-19 pandemic in 2020–2021 altered these trends. The initial shock led to a slight REER depreciation as domestic demand weakened and inflation moderated. Nevertheless, fiscal support packages and wage policies implemented during the crisis contributed to continued upward pressure on ULC. As a result, the temporary improvement in price competitiveness did not translate into a meaningful long-term gain.

In 2022–2023, Moldova faced new and severe external challenges due to the war in Ukraine, which created supply chain disruptions, elevated import costs, and renewed exchange rate volatility. The REER appreciated again in 2023, reflecting strong inflationary pressures and nominal exchange rate developments. At the same time, ULC reached record levels, driven by rapid wage increases introduced partly as a response to inflation. Productivity growth weakened during these years, amplifying the negative impact of rising wages on competitiveness. The combined effect of these trends was a marked deterioration in Moldova’s macroeconomic competitiveness toward the end of the period (Table 1).

Table 1. Macroeconomic competitiveness indicators (2014–2023)

Year	REER (2010=100)	ULC (2010=100)	Productivity (index)	Real Wages (index)	GFCF (% GDP)	Inflation (%)
2014	98.5	102.3	100.0	101.2	21.0	5.1
2015	89.2	104.8	96.4	100.5	18.4	9.7
2016	91.5	107.2	98.7	103.9	19.2	6.4
2017	94.8	110.5	101.3	108.4	20.1	6.6
2018	96.7	113.8	103.5	112.9	21.5	3.0
2019	99.5	116.2	104.8	115.7	21.0	4.8
2020	97.4	115.6	104.3	115.1	19.3	3.8
2021	98.2	118.9	105.9	118.6	20.4	5.2
2022	101.3	122.5	106.2	123.9	19.0	13.4
2023	102.7	127.4	107.1	128.6	18.7	12.1

Source: Author’s calculations based on NBS data

While REER appreciation is not extreme, the persistent rise in ULC without proportional productivity gains has steadily eroded Moldova’s cost competitiveness.

4.2 Sectoral competitiveness (MI and MLI)

Applying the Michaely Index (MI) and the Modified Lafay Index (MLI) to HS two-digit product groups shows that Moldova’s strongest comparative advantages remain concentrated in agricultural sectors, particularly cereals, vegetable oils, fruits, and nuts (Table 2). Cereals (HS 10) consistently record high MI and MLI values, with MI exceeding 0.15 and MLI surpassing 0.10 in most years. These indicators peak during exceptionally favorable agricultural seasons, such as those observed in 2016 and 2021, when bumper harvests significantly boosted export performance. Oilseeds and vegetable oils (HS 12 and HS 15) also exhibit stable and robust competitiveness, driven largely by Moldova’s well-developed processing capacity in sunflower oil production, which enables the country to export both raw materials and higher-value processed goods.

Fruits and nuts (HS 08) constitute another area of strong but highly seasonal competitiveness. Their performance is closely linked to climatic conditions, harvest quality, and access to external markets, especially within the EU and CIS regions. Variability in these factors

results in fluctuating MI and MLI values, though the overall trend remains positive across the decade.

Table 2. Selected MLI values for top competitive products

Year	Cereals	Vegetable Oils	Fruits/Nuts	Textiles	Machinery
2014	0.12	0.15	0.11	-0.05	-0.12
2016	0.18	0.16	0.14	-0.06	-0.14
2019	0.14	0.13	0.12	-0.04	-0.10
2021	0.21	0.17	0.15	-0.03	-0.09
2023	0.16	0.14	0.12	-0.02	-0.08

Source: own work based on NBS data

In contrast to agriculture, industrial product groups such as textiles (HS 61–63) and machinery (HS 84–85) show weak or negative competitiveness. These sectors are characterized by low technological intensity and a heavy reliance on imported intermediate inputs, which limits domestic value added. As a result, export performance in these categories tends to lag behind agricultural products, reflecting structural constraints within Moldova’s industrial base.

4.3 Econometric results and Composite Competitiveness Index (CCI)

The econometric analysis provides evidence of the key determinants shaping both overall export performance and sectoral competitiveness. In the macroeconomic model, the share of exports in GDP is found to increase significantly with improvements in labor productivity, as indicated by a positive and statistically significant coefficient ($\beta = 0.42$, $p < 0.05$). Investment also contributes positively to export performance ($\beta = 0.31$, $p < 0.10$), suggesting that higher capital accumulation supports productive capacity and enhances the ability of firms to access foreign markets. In contrast, higher wage levels exert a negative influence on the export share ($\beta = -0.28$, $p < 0.10$), reflecting the pressure of rising labor costs on cost competitiveness. Inflation likewise has a negative and statistically significant effect ($\beta = -0.25$, $p < 0.05$), indicating that price instability weakens the external competitiveness of domestic producers.

The sectoral model for agriculture reveals similar structural patterns. The Modified Lafay Index (MLI) for agricultural products increases with agricultural productivity ($\beta = 0.48$, $p < 0.05$), underscoring the central role of efficiency gains in strengthening comparative advantage. Investment in the agricultural sector likewise has a positive and statistically significant effect ($\beta = 0.35$, $p < 0.05$), suggesting that capital formation supports technological upgrading and export capacity within the sector. By contrast, producer price inflation exerts downward pressure on competitiveness ($\beta = -0.22$, $p < 0.10$), as higher production costs tend to erode margins and reduce the ability of agricultural goods to compete internationally.

The evolution of Moldova’s Composite Competitiveness Index (CCI) over the period 2014–2023 reveals three distinct phases that reflect the interplay between macroeconomic conditions and sectoral performance. During 2014–2015, the economy was in a post-crisis adjustment phase. A favorable REER position combined with strong agricultural competitiveness pushed the CCI above its baseline, indicating a temporary improvement in overall national competitiveness despite macroeconomic instability. The period from 2016 to 2019 is characterized by a gradual deterioration in macroeconomic fundamentals - particularly rising ULC and REER appreciation - while the agricultural sector maintained a relatively stable comparative advantage. As a result, the CCI exhibited a slow but steady decline, reflecting mounting structural pressures.

The final phase, covering 2020–2023, shows the most pronounced weakening in competitiveness. The sharp increase in ULC, driven by rapid wage growth and weak productivity gains, combined with renewed inflationary pressures and currency volatility, led to a substantial deterioration in macroeconomic competitiveness. Although the agricultural sector remained comparatively resilient, its contribution was insufficient to offset the decline in macro-level indicators. Consequently, the CCI fell to its lowest point in 2023. A graphical depiction of the

index would show a downward trajectory beginning in 2016 and intensifying toward the end of the period, with the line gradually sloping downward and reaching its minimum value in 2023 (Figure 1).

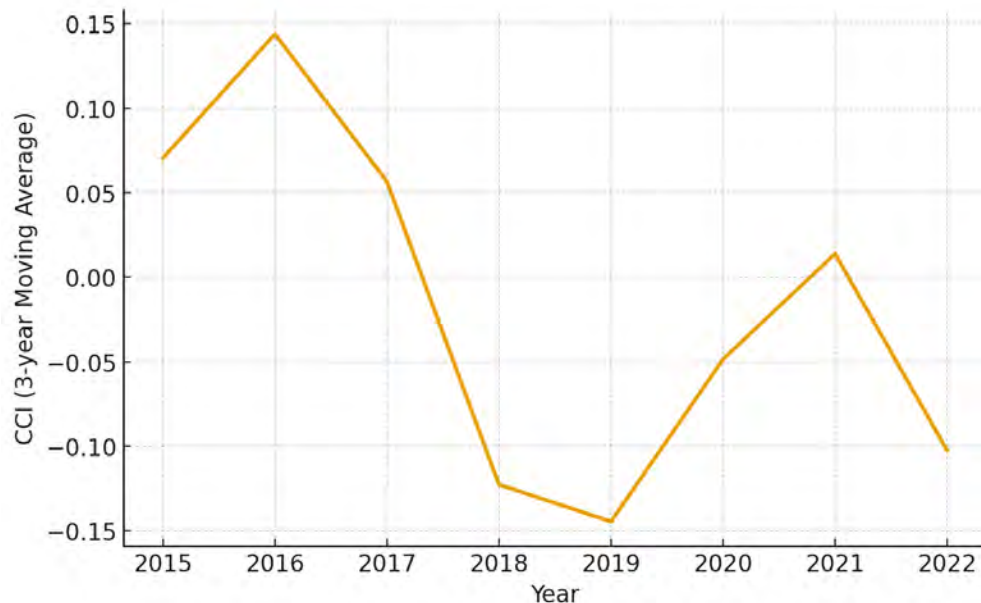


Figure 1. Smoothed Composite Competitiveness Index (MA3), 2014–2023

Source: author's own study

The results highlight a mixed picture for Moldova's external competitiveness. On the one hand, the country has maintained strong comparative advantages in several agricultural sectors. On the other hand, macroeconomic cost indicators, particularly Unit Labor Costs (ULC), have deteriorated consistently over the last decade. These findings are interpreted in the context of EU accession requirements, structural transformation, and lessons from other candidate countries.

4.4 The macro - sectoral disconnect and the role of productivity and investment

One of the most important insights emerging from the analysis is the divergence between macroeconomic and sectoral performance. The Composite Competitiveness Index (CCI) shows that, although agricultural sectors have remained competitive, macro-level cost competitiveness has continued to decline. This pattern is not unique to Moldova. Several transition economies have experienced similar situations in which traditional export sectors remain robust even as the broader economy loses competitiveness due to rising wages, inflationary pressures, or currency appreciation. Serbia in the early 2010s, for example, recorded rising ULC while maintaining strong automotive exports, and North Macedonia preserved competitiveness in textiles despite REER appreciation. For Moldova, agricultural resilience represents both a strength and a vulnerability. It is a strength because agriculture continues to generate foreign currency earnings, support rural employment, and contribute to the trade surplus. It is a vulnerability because agriculture is inherently volatile and highly exposed to climate conditions, global commodity cycles, and market-access risks such as phytosanitary restrictions.

The econometric findings confirm that productivity growth and fixed capital investment are the most significant positive drivers of competitiveness. This aligns with both neoclassical and endogenous growth theories, which emphasize the importance of increasing output per unit of input and sustaining capital accumulation. However, Moldova has not kept pace in these areas. Labor productivity increased by an annual average of only 0.7% between 2014 and 2023, a rate insufficient to support convergence with EU averages. Meanwhile, Gross Fixed Capital Formation (GFCF) has remained between 19% and 21% of GDP - well below the ratios observed in successful pre-accession countries. For example, Poland and Slovakia consistently maintained investment

ratios above 25% of GDP during their convergence periods. Targeted investments in agriculture—such as irrigation systems, post-harvest facilities, and processing technologies—have helped sustain competitiveness in cereals and vegetable oils. By contrast, limited investment in industrial manufacturing has contributed to weak competitiveness in machinery, electronics, and other higher value-added sectors.

4.5 Wage dynamics, the ULC problem, exchange rate and REER appreciation and the structural dependence on agriculture

Rising wages are normal in catching-up economies. However, when wage growth consistently exceeds productivity gains, ULC increases and undermines cost competitiveness. This is precisely what has occurred in Moldova. Between 2016 and 2023, real wages rose by 22%, while productivity grew by only 6%. Several structural factors explain this gap. Labor migration has exacerbated shortages in key skills, forcing employers to raise wages. Public sector wage reforms have influenced wage expectations in the private sector. Finally, high inflation in 2022-2023 led to widespread wage indexation, further worsening ULC dynamics.

Other accession countries have faced similar challenges, but some - such as Albania - were able to slow ULC growth by complementing wage increases with targeted productivity measures, such as vocational training and industrial digitalization. Moldova has not yet implemented a comparable strategy.

The REER's gradual appreciation between 2016 and 2023 reflects the combined effects of higher domestic inflation relative to trading partners and a stable nominal exchange rate maintained by prudent monetary policy. While nominal stability provides predictability, sustained inflation-driven real appreciation erodes the price competitiveness of exports. According to the Balassa-Samuelson hypothesis, some appreciation is normal during economic convergence (Balassa, 1989). However, in Moldova's case, REER appreciation has not been accompanied by significant quality upgrading or increased technological content in exports. A similar situation occurred in Croatia prior to its EU accession in 2013, where REER appreciation weakened traditional export sectors. Croatia was able to compensate through a strong tourism sector and integration into European manufacturing chains - buffers Moldova currently lacks.

The MI and MLI results confirm Moldova's strong but narrow comparative advantage in agricultural exports, especially cereals, vegetable oils, and fruits and nuts. While these products consistently demonstrate competitiveness, their dominance also exposes the economy to structural risks. Climate volatility remains a major challenge. Severe droughts in 2015 and 2020 significantly reduced agricultural output and export revenues. Commodity price fluctuations, particularly in cereals, have affected earnings even in years with stable production. Moreover, Moldova's reliance on specific markets - such as the EU and Turkey - makes it vulnerable to changes in market regulations, sanitary standards, or geopolitical conditions. North Macedonia provides a useful example of diversification. Before advancing EU accession, it expanded its export structure from primary agriculture to processed foods, wine, and light manufacturing. Moldova could pursue similar strategies, especially in agro-processing and high-value horticulture.

4.6 The Composite Competitiveness Index in perspective and policy implications from the results

The CCI provides an integrated assessment of Moldova's external competitiveness by combining macroeconomic and sectoral indicators. The smoothed CCI shows a clear downward trajectory beginning in 2016 and intensifying towards 2023, indicating that worsening macroeconomic factors - particularly rising ULC and REER appreciation - are increasingly overshadowing sectoral strengths. This is especially concerning because agricultural competitiveness is inherently volatile. Without improvements in macro stability and a broader export base, Moldova's competitive position could deteriorate rapidly if hit by a sector-specific shock. International comparison reinforces this concern. When applying the same methodology to

Serbia and Albania, both countries exhibit flatter or more stable CCI trends, reflecting greater diversification and more balanced macroeconomic conditions.

The findings suggest several policy implications. First, Moldova must raise its investment rate and strengthen productivity growth. Increasing GFCF to at least 25% of GDP should be a medium-term target. Second, wage growth must be better aligned with productivity through coordinated wage-setting mechanisms and expansion of vocational training. Third, managing REER pressures requires supply-side anti-inflation measures and, where necessary, exchange rate flexibility. Fourth, export diversification is critical: more agro-processing, greater industrial upgrading, and growth in ICT services can reduce vulnerability. Finally, institutionalizing the CCI as an annual monitoring tool would enable Moldova to benchmark its competitiveness against other candidate countries and align policy accordingly.

5 Conclusions and policy recommendations

This study has assessed Moldova’s external competitiveness over the period 2014–2023 by integrating macroeconomic and sectoral perspectives. The analysis relied on key cost and price competitiveness indicators—namely the Real Effective Exchange Rate (REER) and Unit Labor Costs (ULC)—together with trade-based measures of sectoral performance, including the Michaely Index (MI) and the Modified Lafay Index (MLI). To provide a unified view of the country’s overall competitive position, the study introduced a Composite Competitiveness Index (CCI), which combines both macroeconomic and sectoral components.

The findings point to three overarching conclusions. First, despite persistent strengths in several agricultural export categories—such as cereals, vegetable oils, fruits, and nuts—Moldova’s macroeconomic cost competitiveness has deteriorated. This deterioration is driven primarily by the rapid increase in ULC, caused by wage growth exceeding productivity gains, and by a moderate appreciation of the REER. Together, these developments have eroded Moldova’s cost advantage relative to its trading partners. Second, the structure of Moldova’s comparative advantage remains narrow, with a high degree of reliance on primary agricultural products. This structural dependence increases vulnerability to climate shocks, volatility in global commodity markets, and shifts in market-access conditions. Limited diversification into higher value-added goods and services limits the economy’s resilience and constrains long-term competitiveness. Third, the econometric results underline the decisive role of productivity growth and investment. Both variables have a significant positive effect on competitiveness. However, Moldova’s levels of fixed capital investment remain below those observed in successful EU accession cases, and productivity growth has not been sufficient to support economic convergence with the EU average.

These results lead to several policy recommendations. First, Moldova should pursue higher investment and deeper capital formation. Increasing gross fixed capital formation to around 25% of GDP over the next five years would support technological upgrading and expand productive capacity. EU pre-accession funding should be used to modernize production facilities, upgrade infrastructure, and support investment in export-oriented activities such as agro-processing, manufacturing, and ICT. Second, wage growth should be aligned more closely with productivity. Establishing productivity-linked wage agreements in both the public and private sectors, combined with expanded vocational and technical training, would help address skill shortages and improve labor market efficiency. Third, the authorities should strengthen cost competitiveness by implementing supply-side measures to control inflation and maintaining a degree of exchange rate flexibility to avoid sustained REER overvaluation. Fourth, diversification of the export base is essential. Encouraging value-added processing in agriculture and promoting new export sectors—through fiscal incentives, targeted subsidies, and export credit facilities—would help reduce vulnerability to external shocks. Finally, competitiveness monitoring should be institutionalized. The Composite Competitiveness Index (CCI) introduced in this study should be adopted as an

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annual evaluation tool by the Ministry of Economy, enabling regular benchmarking against other EU candidate countries and strengthening strategic policy planning.

In conclusion, Moldova's prospects for EU accession will depend on its ability to rebalance its competitiveness model by addressing macroeconomic cost pressures while supporting sectoral upgrading and diversification. A comprehensive policy strategy that combines macroeconomic stability, sustained investment, productivity growth, and export diversification offers the best prospects for improving Moldova's competitiveness in the long term.

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MONETARY POLICY ASYMMETRIES AND INFLATION GAPS: WHEN THE FED MOVES AND THE ECB WAITS

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Abstract: This paper investigates how inflation differentials and asynchronous monetary policy responses between the United States and the Euro Area have shaped USD/EUR exchange rate dynamics in the post-pandemic period. While inflation surged on both sides of the Atlantic between 2021 and 2023, the Federal Reserve reacted swiftly and decisively with an aggressive cycle of interest rate hikes. In contrast, the European Central Bank delayed its response, maintaining accommodative conditions for longer despite rising price pressures. This divergence created significant monetary policy asymmetries with clear effects on financial markets and international capital flows. The faster pace of tightening in the United States increased the attractiveness of dollar-denominated assets and strengthened the dollar, while the euro depreciated as European rates remained lower for an extended period. Using comparative data from 2020 to 2025, including consumer price indices, policy rate decisions, and exchange rate fluctuations, this study explores the transmission mechanisms linking monetary policy divergence, inflation expectations, and currency valuation. The findings suggest that inflation gaps, when combined with differences in central bank timing and intensity, have a direct and lasting impact on the USD/EUR exchange rate. The analysis highlights how credibility and expectation management are essential for monetary authorities in sustaining exchange rate stability within an interconnected global financial system.

Keywords: inflation, monetary, exchange, divergence, policy

JEL Classification: E52, E31, F31, G12

1. Introduction

The COVID-19 pandemic changed the global economy in ways not seen before. It caused big problems for supply chains, a sudden fall and then rise in demand, and strong shocks in energy markets. One important result was the fast increase in inflation. Both the United States and the Euro Area had to face this challenge, but their central banks reacted in very different ways. The Federal Reserve (Fed) acted fast and strong, while the European Central Bank (ECB) was slower and more careful. These differences, together with the gap in inflation, had a strong effect on the USD/EUR exchange rate, the most traded currency pair in the world.

The United States and the Euro Area are two of the largest economies in the world. Together they produce almost 40% of global GDP (World Bank, 2023). Their currencies, the US dollar and the euro, are used in more than 70% of world reserves (IMF, 2022). Because of this, their monetary policies matter not only for their own economies, but also for the stability of the global financial system. When the Fed raises interest rates quickly and the ECB waits longer, the effects are felt far beyond their borders.

In the United States, inflation reached 9.1% in June 2022, the highest level in forty years (Bureau of Labor Statistics, 2022). The Fed reacted with one of the fastest increases in interest rates in modern history, moving from near zero to more than 5% in a little more than a year. In the Euro Area, inflation reached 10.6% in October 2022, mainly because of high energy prices after the war in Ukraine (Eurostat, 2022). But the ECB was slower, keeping low or even negative interest rates until mid-2022, and only later raising them step by step.

Economic theory says that inflation differences and interest rate gaps influence exchange rates (Dornbusch, 1976). In reality, expectations, credibility of central banks, and financial markets

also play a strong role. Bond markets are especially important. When yields on US Treasuries increased, they attracted investors and made the dollar stronger. Lower yields on euro-denominated bonds made the euro weaker. This shows that bond markets can amplify the effects of monetary policy divergence.

This paper asks a simple question: how much did inflation gaps and different policy reactions explain the movements of the USD/EUR exchange rate between 2020 and 2025? The aim is to see if the faster reaction of the Fed, compared to the slower ECB, explains the appreciation of the dollar and the depreciation of the euro. The paper uses data on inflation, interest rates, bond yields, and exchange rate dynamics to study these connections.

The contribution of this study is twofold. First, it explains how inflation differentials and monetary policy asymmetries shaped the USD/EUR exchange rate in the post-pandemic period. Second, it highlights the importance of credibility and expectation management by central banks as essential factors for currency stability in an interconnected global financial system. This approach provides a broader perspective than traditional models, which often focus exclusively on inflation levels and interest rates.

2. Literature review

Research on exchange rate determination has a long tradition in economics. Classical theories argue that inflation and interest rates are key drivers of currency values. The Purchasing Power Parity (PPP) theory suggests that exchange rates move in line with differences in inflation between two countries. If prices rise faster in one economy than in another, its currency should lose value over time (Cassel, 1918). Similarly, the Interest Rate Parity (IRP) condition links exchange rates to differences in interest rates. Investors move their capital to markets with higher returns, and this creates pressure on exchange rates (Dornbusch, 1976).

Later research has added more complexity to these models. Dornbusch (1976) introduced the overshooting model, which shows that exchange rates can move too much in the short run when interest rates change. Expectations and the credibility of central banks became central in modern exchange rate theory. Obstfeld and Rogoff (1995) argued that financial markets react not only to present inflation and interest rates but also to what they expect central banks will do in the future.

A second strand of literature studies the divergence of monetary policies between major central banks. Several papers examined how different responses by the Federal Reserve and the European Central Bank affect the USD/EUR exchange rate. Lane (2012) shows that during the global financial crisis, differences in timing between Fed and ECB policies created strong movements in the euro-dollar rate. Ferrari and Fiorentini (2017) analyzed the period 2014–2016, when the Fed began to tighten earlier than the ECB, and found that the dollar appreciated strongly as a result. These studies suggest that asynchronous monetary policy is an important driver of exchange rate volatility.

The literature also emphasizes the role of inflation gaps. Clarida (2021) notes that when inflation is higher in one economy, its central bank is under pressure to raise rates faster. If the other central bank reacts more slowly, the result is a divergence that affects capital flows and the exchange rate. Empirical studies from the post-pandemic years confirm that inflation rose earlier and stronger in the United States than in the Euro Area, which partly explains the appreciation of the dollar (BLS, 2022; Eurostat, 2022).

Another important line of research deals with sovereign bond markets. Bond yields reflect not only current policy rates but also expectations about inflation, growth, and fiscal sustainability. Chinn and Meredith (2004) showed that yield spreads between US Treasuries and German Bunds explain medium-term movements in the USD/EUR rate. More recent work suggests that bond markets amplify monetary policy divergence because they channel international capital flows.

When US yields increase faster than euro area yields, investors move to the US, which strengthens the dollar.

Despite this progress, some gaps remain in the literature. First, most studies focus either on inflation gaps or on monetary divergence, but not both together. Second, while the role of bond yields has been recognized, it has often been analyzed separately from exchange rate models. Few works integrate both dimensions, inflation differentials and monetary policy divergence, into one framework.

This paper contributes to the existing research by filling this gap. It brings together the main drivers identified in the literature and applies them to the special case of the post-pandemic period, 2020–2025. By combining data on inflation and monetary policy decisions, the study aims to explain how transatlantic policy asymmetries shaped the USD/EUR exchange rate in recent years.

3. Data analysis

As previously highlighted, the analysis of monetary policy asymmetries and inflation gaps between the United States and the Euro Area provides important insights into the post-pandemic economic environment. Based on CPI data from 2020–2025, published by the Bureau of Labor Statistics and Eurostat, it is possible to observe significant differences in the timing and magnitude of inflation dynamics across the Atlantic. These divergences shaped the policy responses of the Federal Reserve and the European Central Bank, with the Fed moving earlier and more aggressively, while the ECB initially adopted a slower and more cautious approach. The following section presents a comparative graph of CPI evolution in the United States and the Euro Area, which serves as a starting point for understanding how inflation differentials influenced monetary policy decisions and the subsequent impact on the USD/EUR exchange rate.

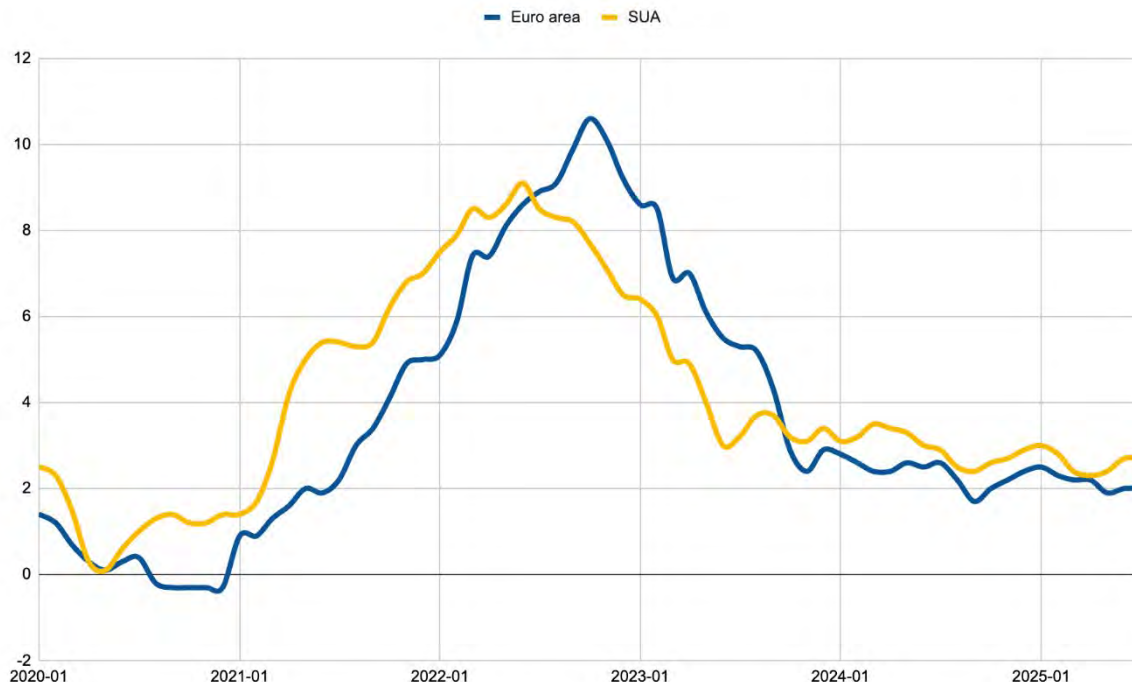


Figure 1: Evolution of CPI in SUA and Euro Area

Source: Bureau of Labor Statistics and Eurostat

The comparison of consumer price inflation in the United States and the Euro Area between 2020 and 2025 shows clear differences in timing and magnitude. In the first phase of the pandemic, the Euro Area even experienced a short period of deflation, while prices in the United States remained positive. This contrast was caused by stronger fiscal support and faster recovery in the

U.S., while Europe faced weaker demand and a deeper contraction. Inflation in the United States started to rise earlier, already in 2021, driven by strong domestic demand, supply chain problems, and large fiscal stimulus. In contrast, the Euro Area saw inflation rise later, but the increase became sharper after 2022, when the energy crisis and the war in Ukraine pushed prices to record levels. The peak of inflation reached around 9 percent in the United States in mid-2022, while in the Euro Area it climbed above 10 percent later that year. The reaction of monetary policy also differed: the Federal Reserve increased interest rates quickly and strongly, which helped reduce inflation from 2023 onwards. The European Central Bank acted later and more carefully, which made the decline of inflation slower. By 2024–2025, both regions moved closer to their 2 percent target, but the path was very different. The U.S. cycle was marked by early demand pressures and fast policy tightening, while the Euro Area cycle was dominated by external energy shocks and delayed policy response.

Beyond inflation itself, what matters for the international economy is how central banks react through their interest rate decisions. Policy rates influence the cost of credit, investor expectations, and capital flows, making them a central channel through which monetary policy shapes exchange rates. While inflation shocks triggered the initial divergence, the lasting impact came from the different speed and scale of interest rate adjustments. To illustrate this, the next figure presents the evolution of the key policy rates set by the Federal Reserve and the European Central Bank between 2020 and 2025.

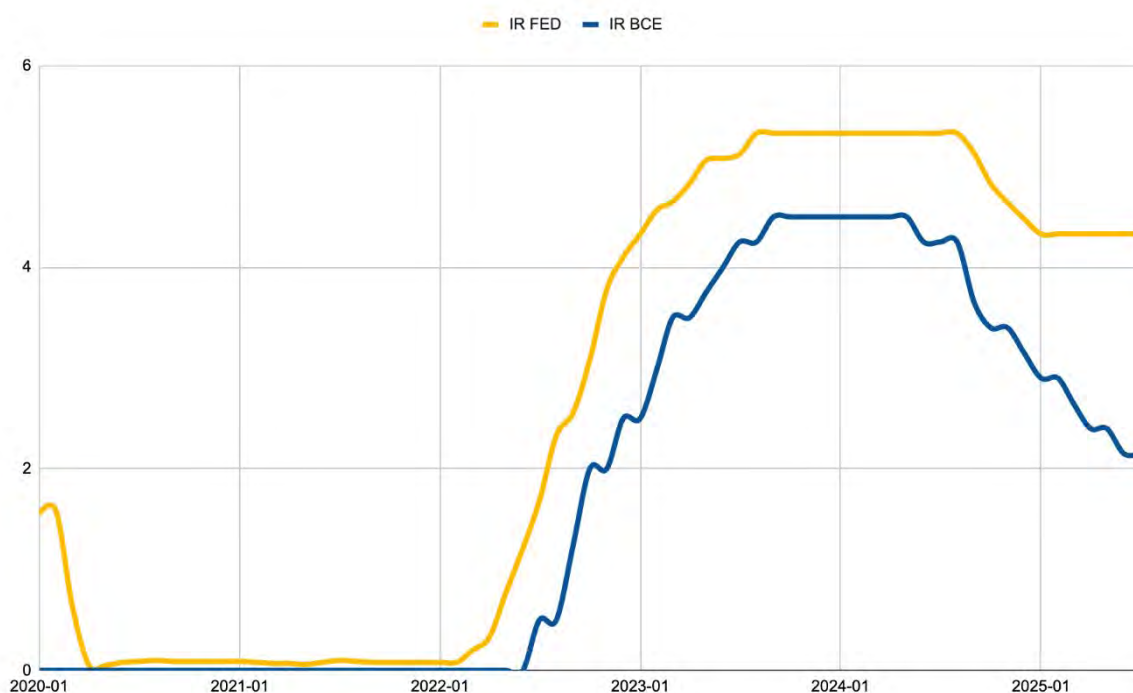


Figure 2: Evolution of interest rate FED vs BCE

Source: FRED and BCE

The comparison of policy interest rates in the United States and the Euro Area between 2020 and 2025 shows clear differences in timing and intensity. Both the Federal Reserve and the European Central Bank kept rates close to zero during the pandemic to support growth. However, from early 2022 the Fed started to raise rates much faster and reached a peak of around 5 percent, while the ECB reacted later and with a lower peak of below 4 percent. By 2024, another divergence appeared: the Fed started to cut rates earlier, while the ECB kept its policy tighter for longer. The reason for this lies in the structure of inflation and in the different mandates of the two central

banks. In the United States, inflation was mainly driven by strong domestic demand, and once this pressure eased, inflation fell quickly and gave the Fed room to reduce rates. In the Euro Area, inflation was largely caused by external energy shocks and risks of persistence, so the ECB acted more cautiously. The Fed also has a dual mandate, including maximum employment, which encouraged earlier easing when signs of slowdown appeared, while the ECB's single mandate of price stability made it less willing to relax policy too soon.

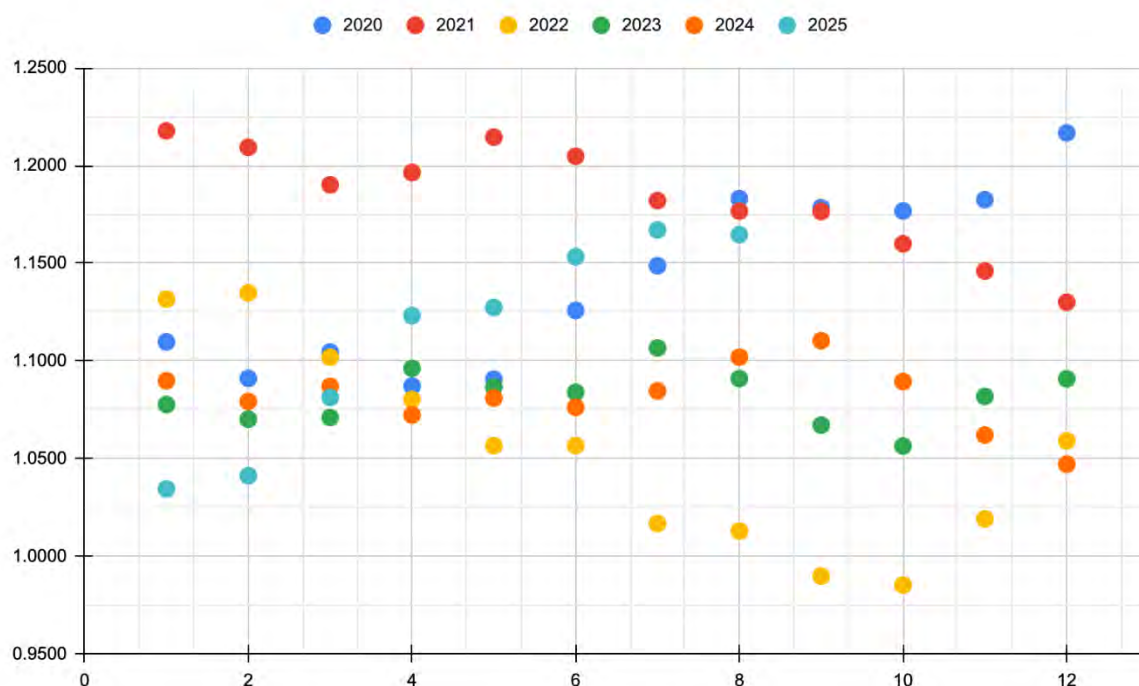


Figure 3: Evolution of USD/EUR currency

Source: FRED

The evolution of the euro-dollar exchange rate between 2020 and 2025 clearly reflects the combined effects of inflation dynamics and monetary policy divergence between the United States and the Euro Area. During the pandemic years 2020 and 2021, the euro traded at relatively strong levels, often above 1.18 dollars per euro. This appreciation was linked to the massive fiscal stimulus and ultra-loose monetary policy in the United States, which put downward pressure on the dollar. At the same time, the Euro Area experienced weaker demand and even short episodes of deflation, which did not generate strong pressure on the ECB to change its policy stance. The balance of these factors resulted in a temporary advantage for the euro.

The situation changed dramatically in 2022. Inflation in the United States accelerated earlier than in Europe, mainly due to strong domestic demand, supply chain disruptions, and the effects of large fiscal transfers. The Federal Reserve reacted with a rapid and aggressive cycle of rate hikes, pushing its policy rate from near zero to above 5 percent in a short period. This increase in yields attracted global capital flows towards U.S. assets and strengthened the dollar. At the same time, Europe was hit harder by the energy crisis and the war in Ukraine, which pushed consumer prices to record highs but slowed down growth. Because the ECB responded later and with a more cautious tightening, the euro lost ground quickly and reached parity with the dollar for the first time in twenty years.

In 2023, the exchange rate remained under the influence of this divergence. While inflation started to ease in both economies, the Fed continued to maintain restrictive conditions and the

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dollar remained attractive for investors. The euro hovered around 1.05 to 1.10, showing that the ECB's delayed response did not fully restore market confidence.

From 2024 onwards, a new phase began. Inflation in the United States fell more rapidly, which gave the Fed the space to start cutting rates earlier than the ECB. In contrast, the ECB kept its policy rates at elevated levels for longer, reflecting concerns that energy-related shocks and wage pressures could make inflation persistent in the Euro Area. This narrowing of the interest rate gap changed the direction of capital flows. The dollar started to weaken, while the euro gradually recovered.

By mid-2025, the euro appreciated to levels above 1.15 dollars, showing how the relative strength of currencies depends not only on the level of inflation but also on the timing and credibility of central bank actions. In summary, the five-year period illustrates a cycle of transatlantic monetary divergence: first favoring the dollar when the Fed moved faster, and later supporting the euro when the Fed reversed its policy before the ECB. This underlines the importance of both inflation gaps and interest rate differentials as key drivers of the euro-dollar exchange rate.

The analysis uses monthly data for the period 2020–2025 from official sources such as Eurostat, the U.S. Bureau of Labor Statistics, the European Central Bank, the Federal Reserve, and FRED. Three main indicators are considered: consumer price inflation (CPI), central bank policy interest rates, and the euro-dollar exchange rate. The comparison allows us to observe how inflation gaps and monetary policy asymmetries shaped currency dynamics across the Atlantic.

In summary, the data analysis shows a consistent pattern: inflation divergences shaped monetary policy decisions, which in turn affected the euro-dollar exchange rate. The stronger and earlier Fed actions supported the dollar in 2022–2023, while the later but more persistent ECB stance favored the euro in 2024–2025.

4. Conclusion

The analysis of the euro-dollar exchange rate during 2020–2025 provides important lessons about the role of inflation dynamics and monetary policy divergence between the United States and the Euro Area. By examining the evolution of CPI, policy interest rates, and the currency, it becomes clear that exchange rate movements are not random but follow predictable patterns shaped by macroeconomic fundamentals and institutional responses.

At the beginning of the period, during the pandemic years 2020 and 2021, the euro was relatively strong. The United States introduced massive fiscal stimulus and the Federal Reserve lowered rates close to zero while expanding its balance sheet. These extraordinary measures supported the domestic economy but weakened the dollar on international markets. In contrast, the Euro Area faced weaker demand and even a short period of deflation, yet the euro maintained strength because the ECB did not act as aggressively as the Fed. This situation demonstrates that relative policy actions matter as much as absolute inflation levels.

A turning point came in 2021–2022, when inflation in the United States increased sharply due to strong domestic demand, supply chain disruptions, and labor market pressures. The Fed responded with a rapid cycle of interest rate hikes, raising the federal funds rate above 5 percent. Higher yields on U.S. Treasuries attracted global investors, leading to significant capital inflows into the dollar. At the same time, the Euro Area was hit by an external energy shock after the war in Ukraine, which pushed inflation to record highs but reduced growth. Because the ECB reacted later and more cautiously, the euro depreciated rapidly and reached parity with the dollar. This phase shows how policy asymmetries can amplify inflation gaps and create strong currency movements.

In 2023 the situation stabilized but did not reverse. The Fed maintained restrictive policy, and investors continued to view the dollar as the safer and more profitable option. The euro traded mostly between 1.05 and 1.10, reflecting persistent weakness.

A new phase began in 2024–2025, when inflation in the United States declined more quickly. With prices moving closer to target, the Fed had room to cut rates earlier than the ECB. In contrast, the ECB maintained a tighter stance because of concerns about persistent inflation from energy and wage costs. This narrowing of the interest rate gap shifted investor preferences, reduced demand for the dollar, and allowed the euro to recover above 1.15.

Taken together, the results highlight a consistent mechanism: inflation determines the pressure for policy change, central banks react with different timing, and capital flows follow the most attractive yields. The euro appreciates when European policy is relatively tighter, while the dollar gains strength when U.S. policy leads.

In conclusion, the euro-dollar exchange rate between 2020 and 2025 illustrates the deep link between inflation gaps, monetary policy divergence, and international capital flows. These findings are highly relevant for policymakers, as they show that credibility, speed, and coordination of central banks can shape currency values as much as economic fundamentals. For investors, the case study demonstrates the importance of monitoring inflation and interest rate expectations on both sides of the Atlantic. For researchers, it confirms that the transatlantic monetary relationship remains the central anchor of the global financial system.

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FINANCIAL PERFORMANCE AND SUSTAINABILITY TRANSPARENCY: LOGISTIC AND BAYESIAN ANALYSIS OF ESG REPORTING

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Abstract: Amid tightening regulatory frameworks, exemplified by the EU Corporate Sustainability Reporting Directive (CSRD), understanding the determinants of Environmental, Social, and Governance (ESG) disclosure has become a critical concern for both scholars and practitioners. This paper explores the interplay between ESG reporting practices and financial performance in a sample of 300 Italian-owned firms operating in Romania over the period 2012–2022. A novel dataset was developed by integrating information from the Bureau van Dijk Orbis database with publicly available corporate reports, providing an original empirical basis for this study. Financial performance was distilled using Principal Component Analysis (PCA), while ESG disclosure was specified as a binary dependent variable. The analysis employed logistic and probit regression models, supplemented with Bayesian estimation techniques to ensure robustness.

Results reveal a U-shaped relationship between firm performance and the likelihood of ESG reporting: both underperforming and highly profitable companies are more inclined to disclose sustainability information, either as a legitimacy mechanism or as a reputational signaling strategy. Additionally, group-level ESG commitments, firm size, and sectoral risk exposure emerges as significant predictors of disclosure behavior. This research contributes to the literature by offering rare insights into an understudied Eastern European context, with implications for multinational corporate governance and sustainability policy design. Future investigations should extend this framework to dynamic modeling and incorporate qualitative evidence to better understand the motivations behind ESG transparency.

Keywords: ESG reporting, financial performance, logistic regression, PCA.

JEL Classification: M14, G30, Q56, C38

1. Introduction

Sustainability transparency has evolved from a voluntary disclosure practice into a strategic and regulatory requirement. With the implementation of the CSRD, European companies must provide extensive ESG-related information, reshaping corporate governance standards. Despite this progress, the drivers behind ESG disclosure decisions remain debated, particularly for subsidiaries of multinational firms operating in emerging economies.

Most empirical studies examine listed corporations in Western Europe or the United States, overlooking the disclosure behavior of firms in Eastern European economies, where institutional frameworks are weaker and reporting enforcement remains inconsistent. Understanding these dynamics is essential for designing effective sustainability policies in the European Union.

This paper focuses on Italian-owned firms operating in Romania, an emerging EU economy characterized by strong foreign investment flows and progressive convergence with EU corporate governance standards. Using a sample of 300 companies over 2012–2022, this study examines how financial performance, firm size, group-level ESG practices, and sectoral factors affect the probability of ESG disclosure.

To address this research question, a multi-method econometric framework was applied, combining logistic regression, probit analysis, and Bayesian inference. Financial performance was

condensed through PCA into a synthetic index capturing firm-level profitability and stability. The results reveal a U-shaped relationship between financial performance and ESG reporting, suggesting that both struggling and high-performing firms have incentives to disclose sustainability information.

2. Literature Review and Theoretical Framing

2.1. Conceptual foundations of ESG disclosure

Corporate sustainability reporting has evolved from a voluntary public relations exercise into an essential component of strategic and financial management. According to the Triple Bottom Line framework (Elkington, 1997), firms are increasingly evaluated not only on financial outcomes but also on their social and environmental performance. ESG disclosure represents the formal communication of these dimensions through sustainability or integrated reports, websites, or non-financial statements.

The EU Non-Financial Reporting Directive (NFRD) and its successor, the CSRD, have institutionalized ESG reporting requirements across Europe. However, beyond regulatory compliance, firms differ widely in their motivation and capacity to disclose ESG information. Understanding these differences requires theoretical grounding.

2.2. Theoretical perspectives

This study is anchored in three complementary theoretical frameworks:

Legitimacy Theory (Suchman, 1995):

Firms disclose ESG information to align themselves with societal norms and expectations, especially when their performance is poor or contested. Disclosure functions as a legitimacy-restoring mechanism, aimed at mitigating reputational risk and social pressure.

Institutional Theory (DiMaggio & Powell, 1983):

Organizational behavior is shaped by coercive, mimetic, and normative pressures. Firms belonging to international corporate groups, or operating under EU-linked regulation, may imitate or conform to ESG practices already institutionalized at the group level. This theory is particularly relevant for multinational subsidiaries embedded in hybrid institutional environments like Romania.

Resource-Based and Signaling Theories (Barney, 1991; Spence, 1973)

From a strategic management perspective, ESG capabilities and transparency are valuable, rare, and inimitable resources that enhance reputation and investor trust. Well-performing firms may voluntarily disclose ESG information as a signal of quality and competitive advantage.

2.3. Empirical evidence and research gap

Empirical studies on the relationship between financial performance and ESG disclosure have produced mixed results. Some find positive associations, suggesting that financially healthy firms have more resources to invest in sustainability and communication (e.g., Buallay, 2019). Others report negative or insignificant effects, implying that weaker firms may use ESG reporting as a compensatory mechanism (Clarkson et al., 2008). A third stream of research identifies nonlinear relationships, particularly U-shaped ones, where both underperforming and highly profitable firms engage in reporting for different reasons (Nekhili et al., 2017; Giannarakis et al., 2021).

Most of these studies, however, focus on listed corporations in Western economies. Evidence from foreign-owned subsidiaries in Eastern Europe remains scarce, despite their growing importance in EU value chains. These subsidiaries are subject to dual institutional pressures, from both the parent company's governance system and the host country's regulatory environment, making their ESG disclosure behavior a theoretically rich but underexplored phenomenon.

2.4. Research objective and hypotheses

Building on the theoretical framework and prior empirical findings, this study aims to investigate how financial performance and firm-level characteristics influence ESG disclosure decisions among Italian-owned firms in Romania.

The analysis tests the following main hypotheses:

H1: There is a U-shaped relationship between financial performance and the likelihood of ESG reporting.

H2: Firms whose parent groups publish ESG reports are more likely to disclose locally (institutional spillover effect).

H3: Larger firms are more inclined to report ESG information, due to higher visibility and stakeholder scrutiny.

H4: Firms in regulated sectors, such as finance and energy, exhibit a higher probability of ESG disclosure.

3. Data and Methodology

3.1. Data sources and sample selection

The sample consists of 300 Italian-owned firms active in Romania from 2012 to 2022, identified through the Bureau van Dijk *Orbis* database. Firms were included if Italian ownership exceeded 50%, ensuring strategic control by the parent company. The dataset includes financial variables (ROA, ROE, leverage, liquidity, EBITDA margin) and a binary variable indicating ESG disclosure.

After data cleaning, 652 firm-year observations were retained, spanning manufacturing, services, and finance sectors. ESG data were manually verified from company websites and reports.

3.2. Measurement of variables

Dependent variable:

ESG Disclosure (*rapnfloc*): A binary variable coded as 1 if the firm disclosed ESG or non-financial information at the *local subsidiary level*, either through a standalone sustainability report or integrated reporting section, and 0 otherwise. The coding follows the EU CSRD disclosure taxonomy and was validated through two independent reviews of publicly available documents.

Key explanatory variables:

Financial1: PCA-based financial performance index (explaining 65.2% of variance).

Financial12: squared term to test the U-shaped relationship.

CertESG: group-level ESG reporting dummy.

CompSize: log of total assets.

NoOfShareh: number of shareholders (ownership dispersion).

CompType: financial sector dummy (1 = financial/insurance).

Control variables:

To reduce omitted-variable bias, models include sectoral and regional dummies based on NACE Rev. 2 classification, as well as year fixed effects to account for time-related shocks such as regulatory transitions or macroeconomic events.

3.3. Principal Component Analysis (PCA)

PCA reduced collinearity among financial ratios, creating a composite measure of firm performance. The first component had an eigenvalue of 4.56, explaining 65.2% of variance, confirming one-dimensionality (KMO = 0.712).

Table 1. Financial performance PCA summary

Component	Eigenvalue	Explained Variance (%)	Cumulative (%)
1	4.56	65.2	65.2
2	0.83	12.1	77.3

Source: computation using STATA

3.4. Econometric approach

A binary logistic regression estimates the probability of ESG disclosure as a function of financial performance and firm characteristics:

$$P(\text{ESG}_i = 1) = 1 / \left[1 + e - \left((\beta^0 + \beta^1 \cdot \text{financial1}_i + \beta^2 \cdot \text{financial1}_i^2 + \beta^3 \cdot \mathbf{X}_i) \right) \right] \quad (1)$$

where $\mathbf{X}_i$ represents the vector of firm-level covariates (size, sector, ownership, and group ESG commitment). The logit specification allows estimation of marginal effects on the odds of disclosure.

To test robustness, two complementary estimations were conducted: Probit model, assuming a normal cumulative distribution of the latent response function and Bayesian logistic regression, employing Markov Chain Monte Carlo (MCMC) simulation to estimate posterior distributions of coefficients and credible intervals.

Model fit was evaluated using Hosmer-Lemeshow goodness-of-fit tests, pseudo R^2 , and Receiver Operating Characteristic (ROC) curves. The consistency of estimates across logit, probit, and Bayesian specifications ensures robustness against distributional assumptions and small-sample bias.

4. Empirical Results

4.1. Descriptive statistics and preliminary insights

Before estimating the econometric models, descriptive analyses were conducted to understand the dataset. Among the 300 Italian-owned firms in Romania, 27.6% publish ESG or non-financial information locally, while 72.4% do not disclose any sustainability data.

Firms engaging in ESG disclosure generally show higher financial performance, larger size, and are more often part of corporate groups already issuing consolidated sustainability reports. Financial and energy firms record the highest disclosure rates, reflecting stronger regulatory and stakeholder pressures.

Correlation checks confirmed no multicollinearity ($VIF < 3$), and the financial ratios used in the PCA displayed sufficient variance and normality, supporting the suitability of dimensionality reduction.

4.2. Logistic regression results

The baseline logistic regression models the probability of ESG disclosure as a function of financial performance (linear term), group ESG commitment, firm size, ownership structure, and sector.

Table 2. Determinants of ESG disclosure (logit model)

Variable		Odds Ratio	p-value	Interpretation
Group commitment (certesg)	ESG	2.01	0.019	Firms whose parent groups issue ESG reports are twice as likely to disclose locally.
Financial sector (comptype)	sector	94.9	0.004	Financial firms face stronger regulatory incentives and thus report more frequently.
Firm size (compsize)		0.136	0.023	Larger subsidiaries are less likely to report locally, possibly due to consolidated group reporting.
Ownership dispersion (noofshareh)		0.124	0.043	More dispersed ownership reduces local ESG transparency.

Source: STATA

The model fit is satisfactory (Pseudo $R^2 = 0.456$), and the Hosmer–Lemeshow test indicates a good model calibration ($\chi^2(10) = 8.81$, $p = 0.55$). The ROC curve shows an area under the curve (AUC) of 0.87, suggesting excellent discriminative power between disclosing and non-disclosing firms.

These findings support hypotheses H2 and H4, confirming that both group-level practices and sectoral regulation significantly influence local ESG reporting. However, the negative coefficient for firm size contradicts the conventional expectation of a positive relationship, suggesting that subsidiaries of large multinationals rely on consolidated group reporting rather than local disclosure.

4.3. Testing the nonlinear (U-shaped) effect

To test hypothesis H1, the extended logistic regression model includes both the linear and squared terms of the financial performance variable.

Table 3. Results of the extended logit model with a squared term (Binary Logistic Regression)

Variable		Odds Ratio	p-value	Effect
Financial (financial1)	performance	0.92	0.050	Negative slope at low performance levels
Squared (financial12)	performance	1.00	0.045	Positive curvature confirming a U-shape

Source: STATA

The results confirm a U-shaped relationship between financial performance and ESG reporting probability. Firms with low performance tend to disclose sustainability information as a legitimacy-repair mechanism, while firms with high performance disclose as a reputational signaling strategy. The middle-performing firms, by contrast, show less motivation to engage in ESG reporting.

A marginal effects analysis shows that the turning point of the curve, the minimum probability of disclosure, occurs at approximately the 40th percentile of the financial1 score, after which the likelihood of ESG reporting increases significantly with performance.

4.4. Robustness checks: probit and Bayesian estimation

The probit model yields similar coefficients and significance levels. The Bayesian logistic regression (10,000 posterior draws) produces posterior means and credible intervals consistent with frequentist results. Gelman–Rubin statistics (<1.05) confirm convergence, and posterior predictive checks validate the U-shaped relationship.

5. Discussion

The results reveal dual motivations for ESG disclosure. Underperforming firms use ESG communication to legitimize operations, consistent with Legitimacy Theory. Conversely, highly profitable firms disclose sustainability information as a reputational signal to investors, aligning with Signaling Theory.

Institutional pressures play a crucial role: subsidiaries embedded in multinational groups imitate parent-company practices, confirming the “institutional spillover effect.” The negative effect of firm size suggests that large subsidiaries rely on consolidated ESG reporting at the group level rather than producing local reports, which has implications for policymakers seeking greater transparency at subsidiary levels.

These findings suggest that sustainability regulations such as the CSRD should account for the dual motivations behind ESG reporting and provide differentiated incentives for subsidiaries versus parent companies.

6. Conclusions, contributions and limitations

This study offers new insights into ESG reporting among foreign-owned firms in Eastern Europe. The findings indicate a U-shaped relationship between financial performance and ESG disclosure, suggesting that both low- and high-performing firms are more likely to report on

sustainability. Additionally, a strong ESG commitment at the group level appears to significantly encourage local transparency, while sector-specific regulations, especially in finance and energy, remain important drivers. Firm size also plays a role, showing a substitution effect between local and consolidated reporting.

From a theoretical perspective, the study extends legitimacy and institutional frameworks to multinational subsidiaries operating in transition economies. Empirically, it provides the first systematic evidence on ESG disclosure among Italian-owned firms in Romania. Methodologically, the research demonstrates a robust approach by combining PCA, logistic and probit models, and Bayesian inference.

However, the study has some limitations. ESG reporting was coded as a binary variable, which does not capture the depth or quality of disclosure. The analysis was limited to a single country (Romania) and did not track changes over time following the adoption of the CSRD.

Future research could build on these findings by conducting multi-country comparative studies and using dynamic panel models, while also integrating qualitative assessments of disclosure content to capture richer insights.

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THE ROLE OF SUSTAINABLE FINANCE IN THE CIRCULAR TRANSITION

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Abstract:

This article aims to analyze the role of finance in accelerating the transition to a circular economy (CE). The transition requires long-term sustainable growth, which focuses on regenerative models with the help of new and efficient financial instruments.

The methodology involves a thorough examination of the relevant literature, which considers the tracking of investments, bonds and ESG criteria, which are circumscribed to the green economy. The research results highlight the ability of these instruments to capture financial resources that are currently not properly exploited, but which can bring great ecological and social benefits.

The article also highlights the inconsistencies between economic reality, fiscal and environmental policies, as well as sustainable development objectives, which result in the presence of these deficiencies. At the same time, there is a gap between what should be done, what can be done and what is actually done in partnership between the public and private sectors in the field of environmental finance. The conclusions of the article draw attention to the need to align financing with sustainable development goals.

Keywords: sustainable finance, circular economy, green investments, ESG criteria, sustainable growth

JEL Classification: Q01, Q23, Q56

Introduction

There is a growing awareness worldwide for the environment, for combating extreme climate phenomena, for sustainable development and society. Thus, some organizations adopt elements of corporate social responsibility (CSR) based on compliance with environmental, social and governance (ESG) criteria that allow companies to evaluate in addition to financial performance, sustainability and ethical practices (Ortas, Alvarez, and Garayar, 2015). To support projects such as clean energy, economic and social prosperity, waste management, improving the economic circularity process, etc. within the framework of ESG criteria, often the most used instruments are green investments (green bonds, mutual funds and shares) and sustainable bonds. ESG criteria aim to achieve the environmental - social - governance trinomial at the company level, more precisely a real empathy for the environment and frugality in the exploitation of resources (energy, waste reduction and reintegration, nature conservation), protecting the health and well-being of employees, customers, suppliers and the community, but also responsibility and decision-making transparency. If social bonds have a

wider scope, in terms of the typology of financed projects, green bonds focus more on strictly environmental projects.

In recent years, there has been an increasing interest from institutional investors and financial institutions in aligning their portfolios with sustainability objectives. This shift is driven not only by ethical considerations but also by the growing understanding that long-term value creation is closely tied to environmental and social performance. However, despite the promising outlook, significant barriers remain. These include inconsistent reporting standards across jurisdictions, limited access to reliable non-financial data, and the lack of a unified taxonomy to clearly define what constitutes a “sustainable” or “circular” investment.

The transition to a circular economy requires a rethinking of traditional risk assessment models. Financial institutions must adapt their evaluation frameworks to better capture long-term systemic risks such as resource scarcity, climate-related disruptions, and supply chain volatility. This entails incorporating lifecycle thinking and circularity metrics into investment analysis, which is still at an early stage of development in most financial markets.

To accelerate progress, it is crucial that regulators, financial actors, and industry stakeholders collaborate in developing clearer guidelines, incentives, and monitoring mechanisms. Building investor confidence in circular economy models depends heavily on transparency, accountability, and the demonstration of tangible impact. Ultimately, sustainable finance is not just about channelling funds, it is about reshaping the financial system to support a resilient, inclusive, and environmentally responsible economy.

Literature review

The specialized literature emphasizes the importance of collaboration in sustainability governance for effective collaboration and an increase in the capacities of stakeholders (shareholders, owners, employees, suppliers and customers, etc.) to work together through collaboration and coordination to increase the effectiveness of their interactions and interventions in order to achieve the company's objectives often through a responsible ownership strategy capable of clearly expressing their will and roles in promoting long-term strategic focus for good governance to achieve environmental and social objectives (Forbes and Milliken, 1999; Poteete et al., 2010 ; Ertimur et al., 2010; Stout, 2012; Mayer, 2013; Briscoe and Gupta, 2016; Schoon and Cox, 2018; Sikka and Stittle, 2019; Jonsdottir et al., 2020; Jonsdottir et al., 2021). This has become particularly pronounced amid financial crises (e.g. 2008, the 2020 pandemic crisis and the Ukraine war energy crisis), which have distorted business models and led shareholders towards increased responsibility in building healthy long-term businesses, strengthening good relationships with stakeholders, reducing financial interests that exclusively and at any cost maximize profit, and complying with corporate social responsibility (ESG) criteria to the best of their ability, including improving the public image of the targeted companies and their reputation (Russo and Perrini, 2010; Bolton and Samama, 2013; Kocmanova and Simberova, 2014; Bolívar, et al., 2015; Friede, et al., 2015; Hart and Zingales, 2017; Syed, 2017; Thakor and Quinn, 2018; Thomsen et al., 2018; García-Sánchez et al., 2020).

In terms of instruments, equities seem more favored in influencing a company's environmental and sustainability policy than bonds, including sustainable bonds and green bonds. However, a positive ESG assessment can lead to lower interest rate spreads and better prices for corporate bonds, boost business performance in the medium and long term, and lead to a much lower cost of debt, better visibility and more valuable company (Klock et al., 2005; Schneider, 2011; Attig et al., 2013; Polbennikov et al., 2016; Hanson et al., 2017; Karpf and Mandel, 2017; Wilkins, 2017; Flammer, 2018; Zerbib, 2019; Maltais and Nykvist, 2020; Jonsdottir et al., 2021).

In this context, the specialized literature emphasizes the importance of organizational culture in promoting sustainability, highlighting the role of green leadership and ecological organizational

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culture in improving employee performance and well-being, which contributes to corporate sustainability (Widjanarko et al., 2025). Recent studies also show that 88% of companies view sustainability as an opportunity for long-term value creation and over 80% can measure the return on investment in sustainability-related projects (Morgan Stanley, 2025). This approach is also supported by investors who demand measurable progress in areas such as climate action and workforce management (Harvard Law School, 2025). Furthermore, the integration of digital technologies and generative artificial intelligence into ESG strategies can enhance corporate performance in sustainability (Cui, 2025). Thus, sustainable governance becomes essential not only for compliance but also for strengthening long-term competitive advantage.

Methodology

From a methodological perspective, we turned to the literature in which researchers evaluate how green investments and sustainable bonds can improve ESG implementation at the company level, qualitatively analyzing the data and literature. The focus is on evaluating how financial instruments such as green investments and sustainable bonds contribute to the implementation and enhancement of Environmental, Social, and Governance (ESG) criteria at the corporate level.

The research process involved systematically collecting and analyzing secondary data from peer-reviewed articles, institutional reports, and case studies published between 2010 and 2025, with particular emphasis on the most recent developments (2024–2025). Key sources include empirical studies on the impact of green leadership, organizational culture, and ESG-driven financial strategies on corporate sustainability performance.

Data synthesis was performed through thematic content analysis, identifying patterns and insights related to the effectiveness, challenges, and opportunities of using green financial instruments to foster sustainable governance and long-term value creation. Particular attention was paid to the interaction between corporate culture, stakeholder engagement, and investor demands, as highlighted in the literature.

The qualitative nature of the analysis allows for a nuanced understanding of complex, multi-dimensional processes involved in aligning financial strategies with circular economy goals and sustainability frameworks. Limitations related to the reliance on secondary data are acknowledged, with recommendations for future empirical research to validate and expand upon the findings.

Results

The results highlight the importance of public-private partnerships to ensure coherence between financial policies and circular economy objectives. In the absence of coordinated collaboration, the mobilization of sustainable capital remains fragmented and insufficient to address systemic environmental challenges.

Recent global crises: the 2008 financial crisis, the COVID-19 pandemic crisis and the energy crisis generated by the war in Ukraine, have also led to a stronger orientation of investors and shareholders towards long-term resilience, ethical governance and compliance with ESG criteria.

Table 1. Statistical Data on Sustainable Finance and the Circular Economy

Indicator / Metric	Value / Trend	Sources
Global ESG assets under management (projected)	USD 33.9 trillion by 2024 (from ~USD 18.4 trillion in 2021)	Morningstar, Bloomberg Intelligence, Sustainable Investment Alliance (GSIA)
Share of green bonds in total EU-issued bonds	6.9% in 2024 (vs. 5.3% in 2023)	European Commission, Eurostat, Climate Bonds Initiative (CBI)

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Corporate green bonds in the EU	~12.8% of total corporate bonds in 2024 (vs. ~5.6% in 2020)	ESMA, Climate Bonds Initiative,
Sovereign green bonds in the EU	4.2% in 2024 (peak: 6.1% in 2022)	Climate Bonds Initiative
Global sustainable bond market (GSS+) size	USD 5.1 trillion cumulative (H1 2024); USD 385.1B green bonds	Bloomberg Intelligence
Estimated global green bond issuance (2024)	USD 622 billion	European Commission
Forecasted global green bond market size (2033)	USD 1.56 trillion	Moody's, S&P Global, Climate Bonds Initiative
Circular economy financing needs in the EU	EUR 55 billion annually	Ellen MacArthur Foundation, European Investment Bank (EIB)
European Investment Bank lending to circular economy projects	EUR 3.8 billion in total	European Investment Bank (EIB), annual reports

Sources: Data compiled from: Morningstar, Bloomberg Intelligence, GSIA, European Commission, Eurostat, Climate Bonds Initiative, ESMA, EIB, Ellen MacArthur Foundation, Moody's, S&P Global (2024).

The data highlights that within corporate governance, there is a growing emphasis on sustainable instruments, especially bonds. This is reflected in the non-financial reporting that is required of companies to harmonize economic and social requirements with environmental ones, requiring new standards or revisions of existing ones. For this reason, the financial instruments used must be upgraded in order to achieve their purpose and potential for which they were created.

Table 2. Evolution of ESG Regulations and Market Penetration (2020–2025)

Indicator / Region	2020	2023	2025 (est.)
Number of countries with mandatory ESG reporting	14	27	35+
Share of EU-listed companies under CSRD	–	~50%	>75%
Global share of ESG funds in total AUM	22%	33%	~40%
ESG-related shareholder resolutions (US/EU avg.)	423	612	>700
Companies integrating circularity KPIs	<10%	21%	~35%

Sources: European Commission, Ellen MacArthur Foundation, Deloitte, McKinsey

The data highlights that within corporate governance, there is a growing emphasis on sustainable instruments, especially bonds. This is reflected in the non-financial reporting that is required of companies to harmonize economic and social requirements with environmental ones, requiring new standards or revisions of existing ones. For this reason, the financial instruments used must be upgraded in order to achieve their purpose and potential for which they were created.

Current trends show that financial sustainability is no longer a particular, non-conformist, isolated focus, but is becoming part of a global phenomenon, a valuable structural component of the global financial ecosystem. Thus, the requirements of non-financial ESG reporting become necessary not only for investors but also for other institutional bodies and actors, including sovereign funds, rating agencies, insurers. This structural change is making the transition from voluntary to mandatory compliance with regulations such as the Sustainable Finance Disclosure Regulation (SFDR) and the EU Corporate Sustainability Reporting Directive (CSRD).

Case Insight: Capital Allocation Gaps in the Circular Economy

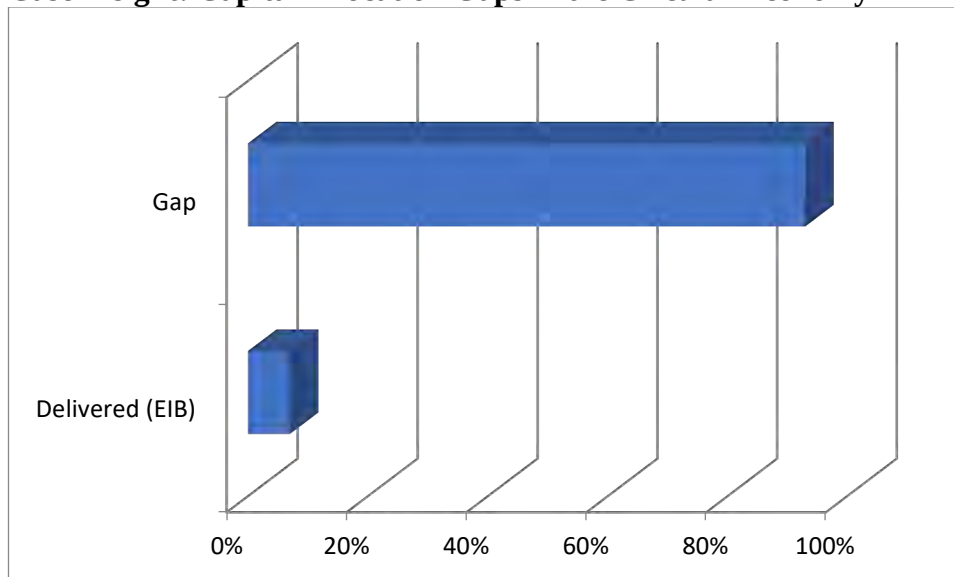


Figure 1. Estimated Annual Gap in Circular Economy Financing (EU, 2024)

Source: Author's calculation based on EIB data and EU Commission estimates.

The data reveals that the transformation is not only quantitative, but also qualitative, with companies including the implementation of environmental, sustainable objectives in financial planning, beyond the linear model of resource management.

From a sectoral perspective, the most significant developments have been observed in the energy, construction, and manufacturing industries, where ESG integration is closely tied to decarbonization roadmaps. Financial institutions and pension funds are progressively channelling capital towards green infrastructure and circular economy ventures, albeit at a pace still below the annual needs estimated by the European Commission (EUR 55 billion/year for the EU).

Despite the scale of green bonds, there are still numerous barriers to access to financing for circular projects. This can be seen especially at the local or micro level, with small companies and local authorities being discriminated against in relation to large companies or the state at the national level in terms of financing. The current model still prioritizes classic, traditional financing, and not green financing, although there is more permissiveness and openness for it. This is reflected in the data held by the European Investment Bank (EIB), in which only a little over 6% represent circular economy projects (Figure 1). In Figure 1, for 2024, it can be seen that there is a significant financing deficit in the field of circular economy from the European Union. This aspect, especially at the EU level, implies increased collaboration from all actors involved in the transition to a green economy, in which sustainable financial investments are vital, to expand taxonomy-aligned financial instruments beyond traditional green bonds, develop dedicated frameworks for circular economy financing, facilitate blended finance models (combining grants and private capital) to reduce risk in early-stage sustainability projects, and promote capacity-building for SMEs and local actors to access green finance.

As sustainable finance continues to mature, its effectiveness will increasingly depend on institutional coordination, long-term policy predictability, and improved market accessibility. The next frontier is not merely the expansion of ESG-labelled capital, but its strategic deployment in areas where there is a need for more big and structural green change.

Conclusions

Under the auspices of a global crisis, under constant pressure for climate and climate-related social issues, the criteria imposed by non-financial reporting have been adapted and relaxed

especially for small companies and local authorities. This has recently occurred against the background of the need for stronger, more integrated systemic coordination, given that institutional actors are not equal, and green instruments can be used, innovated and refined especially by large market players. At the same time, it must be taken into account, in order to prevent environmental arbitrage, that large companies be more closely monitored in real compliance with environmental requirements in order to increasingly prevent the risk of ESG criteria laundering.

For increased effectiveness, it is necessary that the regulatory framework be strengthened, harmonized, made more flexible, monitored so as to provide real support for green investments.

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PUBLIC DEBT SUSTAINABILITY AND THE IMPACT ON ECONOMIC GROWTH

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Abstract: In the current context, public debt has grown rapidly. This is due to the financial crises, the COVID-19 pandemic and geopolitical tensions at a global level. These critical moments influence stability and have a major impact on economic performance. The slowdown in economic growth is directly influenced by the value of public debt (Hilscher et al., 2022).

For this reason, we analyzed from a theoretical, economic and political perspective the relationship between public debt and economic growth, highlighting the role of debt as an instrument of resilience, but also as a potential factor of vulnerability (Rahman et al., 2019). As part of the literature review, the VOSviewer program is used for bibliometric analysis of keywords, which allows the identification of the main research directions and connections between concepts such as “fiscal sustainability”, “economic growth” and “resilience”. The empirical analysis is based on statistical data from reliable international sources (Eurostat, World Bank), covering the period 2023–2024 and having as its main area of interest the Member States of the European Union. The results show considerable differences between European economies, with some countries managing to maintain a balanced ratio between the level of public debt and the dynamics of GDP (Eichengreen et al., 2019), while others are faced with major fiscal vulnerabilities and rising financing costs.

The sustainability (Antonescu^{^1} & Florescu^{^1}, 2024) of public debt does not depend exclusively on its level in relation to GDP, but especially on the way in which resources are allocated and transformed into productive investments, which confirms the essential role of responsible fiscal policies in strengthening resilience and supporting economic growth in the long term.

Keywords: public debt, sustainability, economic resilience, economic growth, European Union, GDP, fiscal policies

JEL Classification: H63, E62, O40

1 Introduction

Data on public finance are essential instruments in checking whether fiscal policies as well as European economies are ecologically viable.

On that occasion, a Member State that has failed to comply with the limits will be the Excessive Deficit Procedure (EDP), a process that goes on with phases of supervision and at some point, also with the implementation of corrective sanctions. The objective of this proceeding is to bring back financial stability and at the same time, to perpetuate the trust in the EMU system that it functions overall. The EU's integrated economic and employment policy has recently been updated, and the main point of this new policy is to ensure respect not only of the thresholds but also the quality, effectiveness, and sustainability of public finances. The academic literature of last year is in line with the ES and staff reports' views emphasizing that the sustainability of fiscal cannot be completely numerical. As Blanchard, Leandro and (Ignat & Constantin, 2020) and the (*VAT Reports Published - European Commission*, n.d.) note, the ease of mounting debt over growth depends on the coming together of various factors such as the relationship between growth and interest rates, the credibility of the fiscal framework, and the government's ability to shift resources to productive investment. Recent Eurostat data show that while some steps have been made towards this goal, there are still areas where improvement is needed. Overall, the deficit to GDP ratio in the eurozone dropped from 3.5% in 2023 to 3.1% in 2024. In the whole EU, the ratio moved from -3.5% to -3.2%. The trend, although small, points to the persistence of vulnerabilities in the structures (Azzimonti et al., 2014), as the debt situation is still very sensitive to the development of interest rates, inflationary pressures and the fiscal costs of an aging population.

The combination of these factors leads to the confirmation of the fundamental arguments of the recent literature: fiscal sustainability is not only dependent on the debt-to-GDP ratio, but mostly on how fiscal consolidation, growth potential (Aghion & Durlauf, 2013), and the composition of public expenditure interact with each other.

2 Literature review

In the wake of multiple crises that have altered fiscal policies across the globe, the issue of public debt sustainability has been the focus of a substantial amount of economic research. Blanchard, Leandro, and (Amato et al., 2021) are of the view that the question of debt sustainability should be looked at not merely in terms of its ratio with the GDP but also by including government expenditure as a factor (Nae et al., 2024). Public debt (Hilscher et al., 2022) can be a stabilizing element if the growth is higher than the costs of financing, and resources are allocated for productive investments and are supported by responsible fiscal rules. In the European Union, this issue became even more heated after the COVID-19 pandemic and the energy crisis that led to a significant increase in both the deficits and debt levels (Aybarç, 2019). The European Commission (2024) is of the opinion that the present short-term risks are low according to its Debt Sustainability Monitor, but medium- and long-term vulnerabilities exist in those countries that have large structural deficits (Forêt et al., 2020), and their refinancing costs are rising. The European Central Bank (2021) is also of the same view, as it mentions that economic sustainability will depend on the interplay between the macroeconomic fundamentals (Cooray et al., 2017), market confidence and the institutional credibility of governments. The recent research also points out that the debt should be looked at in terms of the factors composing it and the effectiveness of the allocation rather than just the levels of the absolute amount. (Demeter et al., 2025) indicate that economies that have resorted to debt financing to back investments in infrastructure, digitalization (Bencsik, 2020), and energy transition turn out to be more resilient than those that have mainly accumulated debt through current expenditure of a recurring nature. The Bank of Finland (2024) also arrives at the same conclusion and emphasizes that fiscal sustainability not only requires consolidation but also a change of direction of resources towards long-term, growth-supporting investments (Heimberger, 2023).

The sustainability of public debt (Eichengreen et al., 2019) will not be assessed entirely by hitting certain quantitative thresholds, but the government's ability to execute well-thought-out fiscal policies (Ali Abbas et al., 2011), keep the trust of investors (Tahiri, 2019), and turn debt into

productive capital will be the main determinants of the outcome. The countries that succeed in balancing this are the ones that can enhance their economic resilience and ensuring their development is sustainable in the long run (Ostry et al., 2015).

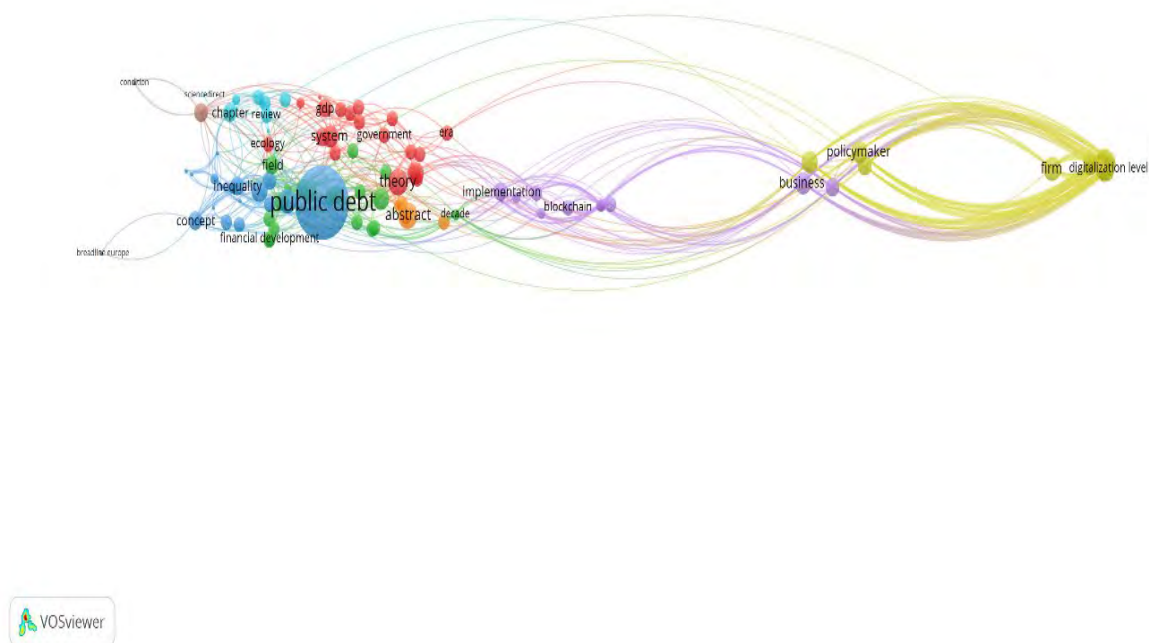


Figure 1. Analysis of specialized literature using keywords

Source: Created by the author, using VOSviewer software

The VOSviewer software is the tool used to carry out the bibliometric analysis as depicted in figure 1. The data set comprised of the 145 most recently published bibliographic sources was used as the basis for the analysis of the links. The most important theme that emerged was that of public debt, which was found to have the highest number of links. It also had multiple connections with other key economic variables. It is evident from figure 1 that the idea of public debt is not only the most frequently mentioned term, but also the one with the most direct links to several other concepts such as GDP, government, financial development, theory, and policymaker, reflecting the nature of the subject as being multidimensional. Public debt emerges as the focus not only in this bibliometric study but also in the literature in general, and the analysis suggests that public debt is considered along with the fiscal and political decision-making processes, as well as with the dynamics of economic growth. The fact that two main clusters are centered on GDP and financial development is very telling in terms of what the authors consider to be the main point of departure for dealing with the issue of sustainable debt. On the other hand, the association with government and policymakers conveys the political aspect that ties in with the political will required for fiscal consolidation. The relationships with business and digitalization indicate that the impact of structural changes on the management of public finance is becoming a popular topic of discussion. The bibliometric evidence thus supports the theoretical argument made in this paper that the sustainability of public debt cannot solely be gauged through static indicators but must also involve an assessment of how fiscal policies interact with economic performance and development strategies.

3 Results and Discussion

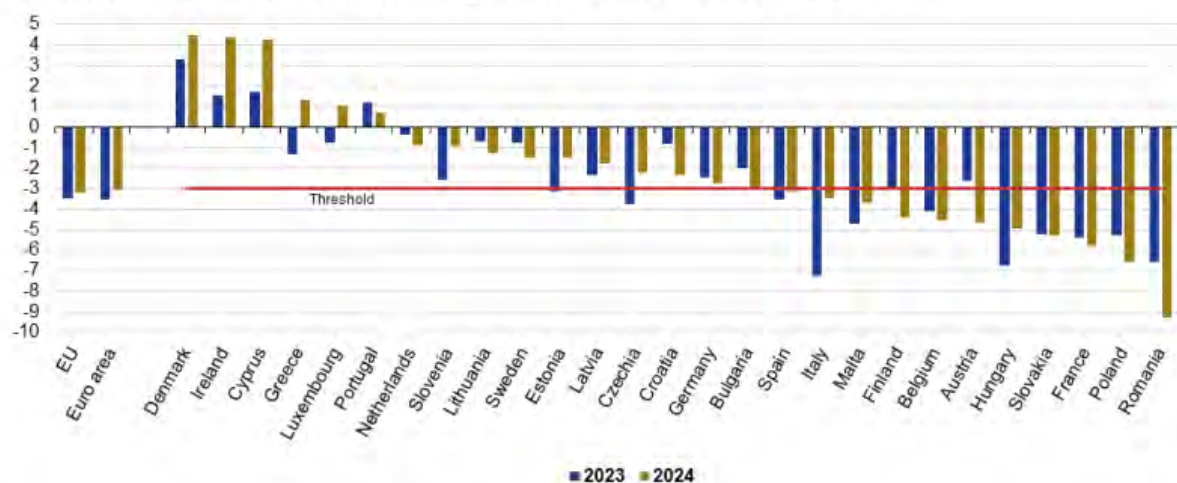
The development of public deficits in the European Union is not only a story of the aftermath of the recent crises but also the different fiscal decisions made by the Member States. On the level of their union, the ratio of the deficit to GDP has been going down from -3.5% in 2023 to -3.2% in 2024 in the EU, whereas in the euro area, the reduction was minimal, from -3.5% to -3.1% .

The figures indicate that there is a slow return to normalcy in public finances after the huge decline that has been going on in 2020, when the euro area had a deficit of -7.0% of GDP and the EU of -6.7% , the two cases of the highest deficit levels recorded in the series of statistics.

The huge increase of deficits in 2020 was fundamentally due to the COVID-19 pandemic whose economic contraction impact was visible in nominal GDP compared to 2019 and the combined effect was extensive fiscal measures applied to make the economic and social areas less vulnerable to the crisis. Partial corrections of the deficits made in 2021 and 2022 were accompanied by continuous pressures caused by the rising energy prices and the respective government's interferences directed at the households and companies' protection that were also responsible for lowering the fiscal balances in the period of 2022-2024. In 2024, only very few Member States, such as Denmark ($+4.5\%$), Ireland and Cyprus (both $+4.3\%$), Greece ($+1.3\%$), Luxembourg ($+1.0\%$), and Portugal ($+0.7\%$), declared budget surpluses. Meanwhile, most of the Member States were still in the red with the largest negative balances in Romania (-9.3%), Poland (-6.6%), and France (-5.8%). Altogether, 12 Member States are above the 3% of GDP limit set by the Stability and Growth Pact as it is the case with, inter alia, Romania, Poland, France, Slovakia, Hungary, Austria, Belgium, Finland, Malta, Italy, Spain, and Bulgaria. The repartition emphasizes enduring EU-wide structural fiscal vulnerabilities, notwithstanding the ongoing consolidation process.

Public balance, 2023 and 2024 ⁽¹⁾

(Net lending (+) or net borrowing (-) of the general government sector, % of GDP)



(1) Data extracted on 22/04/2025
Source: Eurostat (gov_10dd_edpt1)

eurostat

Figure 2: Public balance, 2023 and 2024 (Net borrowing (-) or lending (+) of the general government sector, % of GDP)

Source: Taken from the page Eurostat (gov_10dd_edpt1)

The financial results (figure 2) for the European Union in 2024 show that public balances changed in very different ways. The general government balance, when compared to GDP, got worse in 14 Member States compared to 2023. This means that either the deficit got bigger or the surplus that was already there got smaller. In contrast, 13 Member States improved their budgetary positions. Italy ($+3.8$ percentage points), Ireland ($+2.8$ p.p.), Greece ($+2.7$ p.p.), and Cyprus ($+2.6$ p.p.) had the biggest positive changes. This could lead to either good revenue growth or successful consolidation efforts. Romania (-2.7 p.p.), Austria (-2.0 p.p.), and Croatia (-1.6 p.p.) had the biggest negative changes, but these countries still have problems with their finances, and it's hard for their national budgets to meet the medium-term needs of the Stability and Growth Pact.

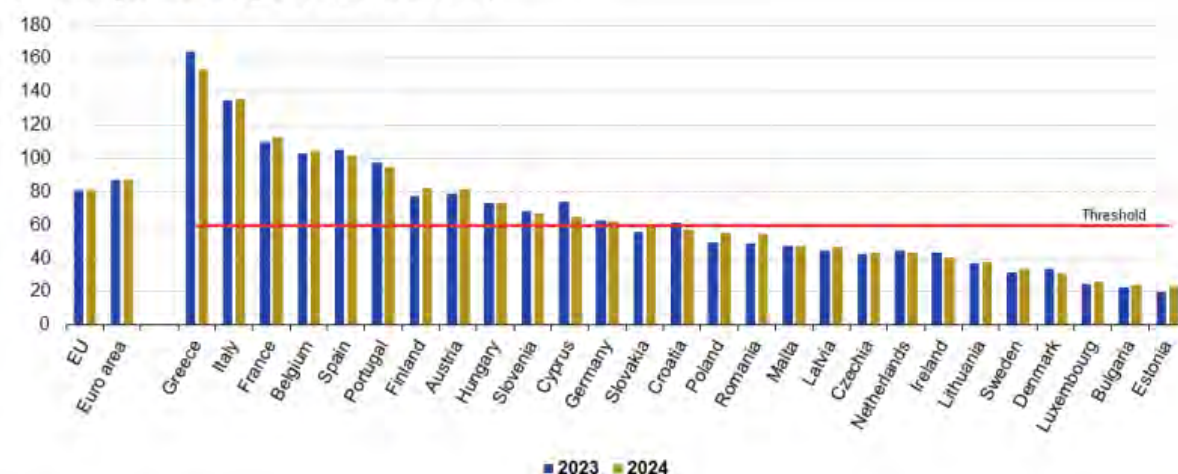
During 2024 the European Union demonstrated a small increase in its overall debt level. The government debt ratio against GDP increased from 80.8% at 2023 year-end to 81.0% at 2024

year-end while euro area governments recorded an 87.3% to 87.4% increase in this ratio (refer to Figure 3). The minor rise indicates that fiscal consolidation attempts face ongoing structural challenges which include rising interest costs and continuous budget deficits that affect public debt evolution. Member States display significant differences in their debt ratios because of varying fiscal approaches and unique economic frameworks across the union.

The Stability and Growth Pact mandates Member States to keep debt levels under 60% but six nations including Estonia (23.6%) and Bulgaria (24.1%) maintain their debt well below this threshold. Twelve Member States had debt-to-GDP ratios that surpassed this limit. The five EU states with the highest debt ratios included Greece (153.6%) together with Italy (135.3%) and France (113.0%) and Belgium (104.7%) and Spain (101.8%) which face ongoing fiscal risks and long-term sustainability issues. This heterogeneity points to one of the central arguments highlighted in the new literature: EU debt sustainability is not only a question of being capable of reaching numerical targets but of possessing quality fiscal policy and the capacity to maintain investor confidence. Low-debt-ratio countries, such as Northern and Eastern European ones, are likely to be more capable of withstanding shocks and maintaining fiscal space for maneuver, while highly indebted economies have tighter policy space constraints as well as higher exposure to shifts in market conditions.

General government debt, 2023 and 2024 ⁽¹⁾

(General government gross debt, % of GDP)



(1) Data extracted on 22/04/2025
Source: Eurostat (gov_10dd_edpt1)

eurostat

Figure 3: General government debt, 2023 and 2024 (general government gross debt, % of GDP)

Source: Taken from the page Eurostat (gov_10dd_edpt1)

In Figure 3 we see the comparison of the public debt-to-GDP ratio for 2023 and 2024. We find different trends. The largest increase in public debt was recorded in Greece, followed by another 15 countries. Estonia and 11 other EU countries kept the value of public debt below the minimum. The biggest advances were registered in Romania (+5.9 percentage points), Poland (+5.7 p.p.), Finland (+5.7 p.p.), Sweden (+3.4 p.p.), Austria (+3.3 p.p.) and France (+3.2 p.p.). Significant improvements, however, were observed in Greece (–10.3 p.p.), Cyprus (–8.6 p.p.), Croatia (–4.3 p.p.), Spain (–3.3 p.p.), Portugal (–2.8 p.p.), Denmark (–2.5 p.p.) and Ireland (–2.4 p.p.), signaling either more rapid growth of GDP, active fiscal retrenchment, or sound debt management policy.

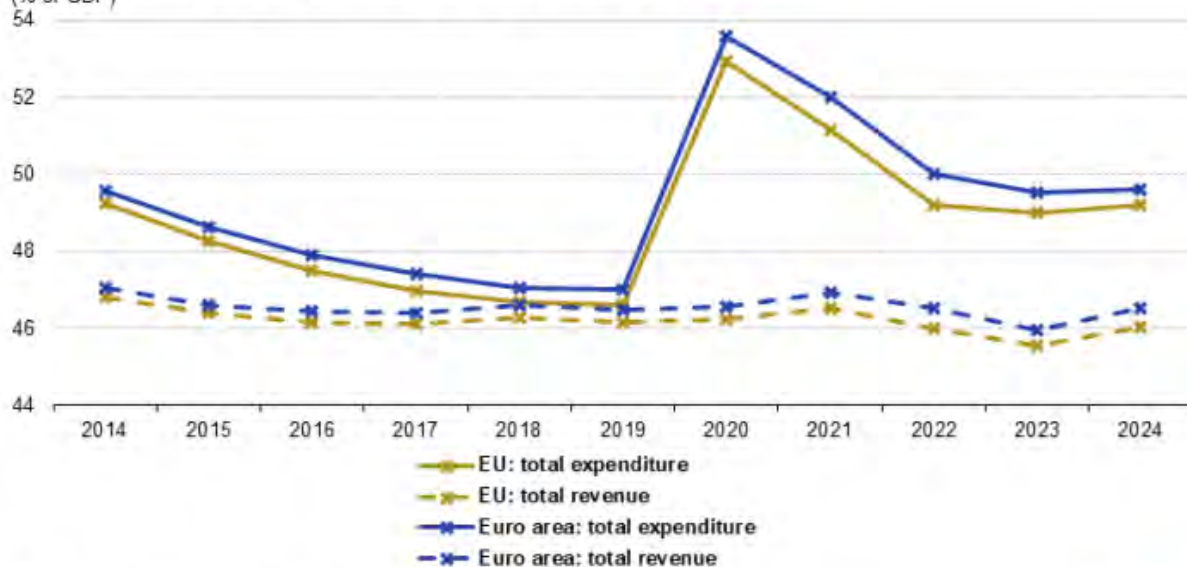
At the euro area and EU level, the aggregate increase in the debt-to-GDP ratio in 2024 is mainly due to the nominal increase in government debt outpacing GDP growth. In the real world, debt rises when governments finance persisting deficits with borrowing, and the process can be

influenced by so-called stock–flow adjustments reflecting the discrepancy between annual deficits and debt stock dynamics. Eurostat provides accurate figures for such adjustments, which consider why the debt is occasionally increasing despite deficit cuts, or falls when faced

The general government sector (figure 4) is usually judged by the impact it has on the economy through the comparison of its revenues and expenditures in absolute terms with GDP. Such a measure allows for an overall view of the degree to which public bodies fetch and allocate resources on the macroeconomic level. In 2024, the ratio of government spending to GDP in the euro area stood at 49.6%, while the share of revenues was 46.5%. Compared to 2023, both indicators fell moderately, reflecting the step-by-step unbundling of unprecedented fiscal measures implemented in the context of the pandemic and energy crises.

Development of total expenditure and total revenue, 2014–2024 ⁽¹⁾

(% of GDP)



(1) Data extracted on 22/04/2025. Note that the y-axis is cut.
Source: Eurostat (gov_10a_main)

eurostat

Figure 4: Development of total expenditure and total revenue, 2014–2024
(% of GDP)

Source: Taken from the page Eurostat (gov_10dd_edpt1)

The composition of public expenditure in the European Union and euro (figure 4) area during the last decade represents radical structural change stimulated by both cyclical and crisis-management measures. Although the relative size of government expenditures as a share of GDP has increased modestly in 2024, such rates are well above past long-term averages. Between 2014 and 2019, the expenditure to GDP ratio followed a broadly declining path, indicating a period of relative fiscal consolidation. That trend was suddenly reversed in 2020, when spending increased by 6.3 percentage points, as governments unleashed massive fiscal packages to deal with the COVID-19 pandemic.

During the subsequent years, 2021 and 2022, expenditure ratios retreated considerably as short-run emergency provisions were phased away stepwise. In 2023, the adjustment momentum slowed considerably, with expenditure-to-GDP falling slightly (–0.2 p.p. in the EU and –0.5 p.p. in the euro area). On the other hand, 2024 was a reversal, with the ratio increasing somewhat by 0.2 percentage points in the EU and 0.1 percentage points in the euro area, indicating revival spending pressures along with continuity of structural imbalances. In absolute terms, trends in government expenditure and revenues indicate sharp asymmetries. In 2014–2018, revenue growth outpaced expenditure growth both in the euro area and in the EU, which enabled deficit reductions. In 2019, this favorable trend was broken, as expenditure growth accelerated ahead of revenue

growth, leading to worsening budget balances. The gap was widest in 2020: aggregate revenues declined –3.7% in the EU and –4.1% in the euro area, while expenditures increased by 9.2% and 9.0% respectively. The sharp imbalance reflected both automatic reactions of recession to tax revenue (given that revenues drop even in the absence of deliberate policy action) and discretionary policies aimed at shielding the crisis, e.g., tax relief, wage support schemes, and firms' subsidies. The phase of recovery witnessed large-scale corrections. During 2021, government revenues recovered sharply (+9.6% in the EU and +9.4% for the euro area), while expenditure growth remained muted at +5.3% and +5.5%, respectively, closing the gap between the two. The trend continued in 2022, with revenues rising by 7.9% in both regions, compared to a growth in expenditure of 5.0% in the EU and 4.6% in the euro area. Despite this growth, fiscal balances remained under pressure from new policy actions, particularly those aimed at compensating for the rise in energy prices.

The persistence of these pressures became evident again in 2023, with expenditure growing faster than revenues: 6.1% against 5.5% in the EU, and 5.4% against 5.2% in the euro area. This development means that, although fiscal consolidation was renewed, it remains fragile, with the equilibrium between spending and revenues still highly influenced by structural imbalances and by governments' responses to a succession of economic shocks.

4 Conclusion

Public debt sustainability in the European Union is analyzed through empirical and theoretical factors. It highlights the importance of focusing on public debt sustainability from different perspectives, especially from the perspective of the interaction between the fiscal balance, economic growth and credibility. The Stability and Growth Pact still serves as a framework, as it stipulates nominal thresholds of 3% for the deficit and 60 % for public debt. The last decade, however, proves that the simple adherence to these regulations offers no guarantee that the safeguards are effective.

The fiscal dynamics between 2014 and 2024 reveal several salient facts. The period should be viewed in the context of the COVID-19 pandemic and the energy crisis and their impact on public finances. Unlike previous periods, deep and structural deficits started to accumulate, driven by shifts in the public expenditure and revenue balance. 2021-2022 brought only partial corrections and fiscal rehabilitation has been uneven. Those countries that bear the largest public debt, namely Greece, Italy, France, Belgium and Spain, still suffer from sustainability problems. By contrast, the low-debt countries in Northern and Eastern Europe enjoy relative fiscal freedom. Third, persistent structural deficits in certain Member States, particularly Romania, Poland and France, suggest that fiscal adjustment remains uncertain and vulnerable to shocks. That debt sustainability is more a matter of the capacity to turn borrowed money into productive capital than about absolute levels. The closing of the gap between spending and revenue for 2022–2024 is a nice augury, but the continued recourse to fiscal interventions to mute crises is testimony to the fact that resilience cannot be assured by mere numerical compliance. Instead, long-term sustainability requires stable fiscal policies that prioritize structural reforms, strong revenue collection, and investment in areas that have the capacity to enhance the chances of growth, i.e., infrastructure, innovation, and the green and digital transitions. In brief, the European experience of the last ten years illustrates the dual character of public debt: as a stabilizing instrument of economic policy in times of crisis, but also as a risk source if fiscal imbalances are not intercepted.

Policymakers therefore have a need to reconcile flexibility with discipline, with fiscal rules being credible in ensuring room for growth-friendly investment. Improving the efficiency of fiscal policy and maintaining investor confidence will be essential to the Union's ability to balance debt sustainability with long-term sustainable and inclusive economic growth.

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UNITED NATIONS SUPPLY CHAIN RESILIENCE CASE STUDY ANALYSIS OF VULNERABILITIES IN CRISIS AFFECTED REGIONS

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Abstract: United Nations is coordinating peacekeeping and crisis management activities such as UNDP with the main target to interconnect humanitarian aid, security and sustainable development programs.

The transition between conflict or crisis affected area to peaceful and stability zone represents a long lasting and complex process, under permanent risk of recurrence to the initial crisis.

Within this sustainable development strategy, a crucial role is represented by supply chain resilience. This aspect is essential not only for humanitarian organizations but also for crisis affected population.

This case study focus on UN supply chain operational resilience by developing a comparative analysis between COVID 19 pandemic, war in Ukraine and the conflict in the Middle East. We used a methodology that a lot of specialised companies develop and invest in: risk management procedures. The main goal is to obtain proficient supply chains working without major disruptions. The state of the art is the AI which includes machine learning, natural language processing, and computer vision, enabling predictive analytics and decision-making in supply chain operations. Also, BDA helps process and analyse vast amounts of data that improve supply chain responsiveness.

Key words: supply chains, post conflict areas, sustainable development, United Nations, risk management, resilience mechanism

JEL Classification: Q56, O19, L23, D81

1. The Overall Picture of Crisis Situations Populations

Throughout history, human civilization has experienced a multitude of major calamities and crises such as: world wars or smaller-scale conflicts, natural disasters like earthquakes, hurricanes, fires, floods, or political, economic, and food crises that have led to the starvation and death of tens and hundreds of millions of people. All these disasters, which could not be stopped despite the advanced level of science and technology, have had catastrophic consequences, irreversibly influencing human society and the communities forced to confront them.

Analyzing the statistics of various types of disasters and destructive events affecting human civilization, we can note that the direction in which humanity is heading is an unfavorable one, and the speed of evolution in this dire direction is increasing—paradoxically, given technological evolution.

Thus, it is imperative to identify mechanisms and strategies that, if they cannot prevent the occurrence of the aforementioned phenomena, at least offer solutions to minimize their effects, both from the point of view of loss of human life and material damages incurred.

2. The Objectives and Missions of UN related to Crisis Situations Populations

With the end of the Cold War, but especially since the beginning of the 21st century, marked by the wars in Afghanistan and Iraq, the United Nations has made considerable efforts to create

institutional bodies and policies for the defense of peace. In 2005, the Peacebuilding Commission was established under the auspices of the UN.

Furthermore, the UN created an internal body called UNDP (United Nations Development Programme) which has a broad range of directions and objectives. (United Nations Development Programme, 2023)

- Establishing standard operating procedures in case of crisis;
- Developing centers in over 170 countries aimed at conducting specific studies
- Establishing a post-graduate educational institution called the Crisis Academy;
- Being created as a legal structure recognized at the international level.

3. The Sustainable Development Strategy for Disadvantaged Areas from the UNSDG Perspective

UNSDG, which translates to the United Nations Sustainable Development Goals, is based on the same three characteristics: the economic system, the social system, and the natural environment, with a series of specific objectives: (Nazarian & Khan, 2024)

Eradication of poverty, Eradication of malnutrition, Improvement of health status and standard of living, Increasing the quality of the education system, Gender equality, Adaptation Mechanisms to the Global Challenges of the Supply Chain.

The most important functions of a supply chain are: flexibility, redundancy, speed of adaptation, visibility, and interconnection with other mechanisms and factors.

All these functions allow the supply chain to adapt to global challenges:

- Internal factors: risk management procedures, technological and IT capabilities and tools, the level of training of personnel managing the activity flow;
- External factors: Natural disasters, armed conflicts, pandemics or social crises;
- The complexity of supply chains: This represents both a favorable aspect by ensuring a multitude of alternative and back-up possibilities, but it can also be a potential risk factor such as supply blockages;
- Norms, requirements, and regulatory policies

We can provide a series of real examples:

1. The COVID-19 Pandemic: The period 2020 - 2022 demonstrated to all humanity the very low redundancy and the high degree of risk to which society is exposed, at least regarding supply chains. (Strengthening supply chain, 2023)

2. The War in Ukraine: On one hand, we have the state of war with its inherent consequences. On the other hand, there are also indirect consequences, such as the transit of grains harvested in Ukraine through neighboring countries like Romania following the Russian naval blockade at sea. (The Russia-Ukraine Conflict, 2022)

4. Solutions Applied to Increase Resilience

Creating resilient supply chains is essential not only for the companies involved in the process but also for the societies in which they operate. Resilience implies the capacity to anticipate, to prepare for unforeseen situations so that they can function regardless of the crises. For this purpose, specialized companies have created their own strategies for risk management and increasing resilience. (Mishra & Gupta, 2024)

A number of such strategies can be mentioned: Creating alternative sources for product supply, Expanding economic operations, Creating buffer stocks and reserves, Adopting digital technology, Storing databases in cloud-based IT applications, Risk Analysis as an Innovative Tool. (Innovation in humanitarian logistics, 2023)

In recent years, a whole series of tools have been developed to improve the performance of logistical processes and particularly supply chains. One of these tools, and probably the most widespread in the field, is risk management.

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Given the specific nature of supply activities, especially in conflict zones risks are multiple, with both the probability of occurrence and their severity able to reach maximum levels. (Managing risk in emergency supply chains, 2024)

The most common risks can be classified into three major categories: geopolitical, social, economic. In turn, each category can be subdivided into a very large number of scenarios, following the model of a risk tree or an Ishikawa diagram.

In table 1 we calculated the Priority-Risk-Number as a product of Severity (S), Occurrence (O) and Detectability (D), based on the three above mentioned scenarios.

The whole study that integrates this part of calculation is based on a complex risk management analysis and the main results shall be published in an further project.

Table 1. Priority-Risk-Number (PRN) calculation for crisis scenario assessment

Major scenario	Risk Factors (R.F.)			R F.	S	O	D	PRN
	1. Geopolitical	2. Social	3. Economical					
COVID 19 pandemic	Border closures	Unemployment	Transit blockage of critical products	1	3	6	5	90
				2	2	3	4	24
				3	5	3	3	45
War in Ukraine	Euro-Atlantic accession	Depopulation	Grain trade route disruption	1	2	6	5	60
				2	6	2	5	60
				3	3	3	5	45
Israeli Invasion in Gaza	Border closures	Pandemics, Famine, Depopulation	Humanitarian aid reduction	1	6	6	7	252
				2	6	6	6	216
				3	5	4	5	100

Source: own work

We can take the situation of the Israeli Invasion of Gaza as an example. The Palestinian population requires medical care, provision of food and essential products, social assistance, housing. The list can continue indefinitely.

United Nations Organization, along with other governmental or NGO, tries to come to the aid of the Palestinians but faces the following obstacles:

1. Geopolitical risks: The refusal of neighboring countries to allow the transit or political asylum. Practically, this scenario is a dead end for the Palestinian population. On one hand, massacred by the Israelis, on the other hand, they are not allowed refuge in other states. In this case, the most viable solution is represented by the intervention of international organizations like the UN. (Humanitarian Assistance in G5, 2022)

2. Social risks: Against the backdrop of a lack of critical infrastructure (running water, sewage, sanitation), we can consider the scenario of outbreaks of contagious diseases, which could degenerate into real epidemics. The lack of hospitals, medicines, minimum living conditions could, under the mentioned conditions, lead to an exponential amplification of the number of victims.

3. Economic risks: The reduction of the flow of humanitarian aid for the Palestinian or its blockage. (Singh, R. K., Gupta, 2018)

The three major categories, each with multiple scenarios, according to the previous examples, is to be analyzed and solutions for their management shall be identified by appealing to the specific methods of Risk Management. Among the most used we can mention: PHA, risk trees, fault trees, functional trees, FMEA - Failure Mode and Effect Analysis, and the Analytic Hierarchy Process (AHP).

Within the risk analysis not just one method will be used. To increase the precision and efficiency, several tools will be used iteratively in a cyclical manner.

By appealing to the mentioned methods, using as primary input data the information stored in database servers and managing them using artificial intelligence, specialists in the field will be able to coordinate with maximum efficiency the logistical supply activities in crisis-affected areas.

5. Conclusions

This article stands out from other works in the field through its holistic analysis of the studied context. We consider that without an overall perspective on the entire scenario the efforts made to manage the crisis will not yield the desired result.

Our study mix special literature research with risk management procedures. We developed a comparative analysis between COVID 19 pandemic, war in Ukraine and the conflict in the Middle East with the purpose to show the major risks and the possible solutions for optimisation. We used also proactive and analitical instruments for improving the sustainability and adaptability of humanitarian supply chains.

The profound crises traversed by the current world, which produce millions of victims annually, represent one of the major objectives of UN. Their primary interest is the interconnection of the humanitarian aid, security, and development sectors.

For these sustainable development strategies to succeed, the creation of resilient supply chains is imperative, an aspect essential not only for humanitarian organizations but also for the affected societies. Resilience implies the capacity to anticipate, to prepare for unforeseen situations so that they can function regardless of the crises they face, ensuring an optimal flow of products and services.

For this reason, specialized companies have adopted a series of mechanisms such as risk management to allow supply chains to function as efficiently as possible.

Furthermore, by using as primary input data the information stored in database servers and managing them using artificial intelligence, specialists in the field will be able to coordinate with maximum efficiency the logistical supply activities.

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THE MAIN FORCES DRIVING THE SPREAD OF HUMANITARIAN CRISES IN THE MODERN GLOBAL ECONOMY

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Abstract. The rapid growth in demand for humanitarian aid, which is becoming less effective and efficient, highlights the need for contemporary scientific research to identify the main factors of humanitarian crises and review the existing system of international humanitarian aid. Analytical reports from international organisations, research agencies and institutes provide an information base for determining the sources and directions of humanitarian aid, its effectiveness and development. The aim of this article is to systematise the main factors contributing to the spread of humanitarian crises. In the course of the work, the following tasks were formulated and defined: to characterise the main factors contributing to the spread of humanitarian crises in the modern global economy (it has been proven that the driving force behind humanitarian crises is the rapid spread and escalation of conflicts between different countries around the world, and are the result of the intensification of contradictions and rivalry between the largest states), climate change (manifested in increased anthropogenic impact and environmental crimes; the spread of extreme weather events and natural disasters, leading to numerous human casualties and material losses, etc.); socio-economic instability (resulting from inequality, internal conflicts, low levels of socio-economic development, etc.). These factors are interrelated and overlap, creating an extremely complex humanitarian landscape. The spread of humanitarian crises ensures a constant increase in demand for humanitarian aid, the scale of which is growing rapidly in terms of both the number of countries and the number of people in need of humanitarian assistance.

Keywords: humanitarian crises, conflicts, climate change, socio-economic instability, humanitarian aid

JEL Classification: F51, F630, F640

The rapid growth in demand for humanitarian aid, which is becoming less effective and efficient, highlights the need for contemporary scientific research into revising the existing system of international humanitarian aid. Directions for the development of a general mechanism for coordinating humanitarian aid are considered in studies by Baker J. (Baker, 2014). By defining and specifying the obligations to be assumed by humanitarian organisations and governments (Harmer, A., Stoddard, A., and Sarazen, A., 2018) consider the principles of providing adequate humanitarian aid in numerous conflict situations. Analytical reports from research agencies and institutes (Stoddard, A., Harvey, P., Czwarno, M., and Breckenridge, M.-J., 2020) provide an information base for identifying sources and directions of humanitarian aid, determining its effectiveness and directions for diversification and development, etc. Existing scientific research highlights the need to identify the main factors contributing to the spread of humanitarian crises in the global economy that influence dynamic changes in the financing of international humanitarian aid, and to identify the main donors of humanitarian aid. The rapid growth in demand for humanitarian aid, which is becoming less effective and efficient, highlights the need for contemporary scientific research to review the existing system of international humanitarian aid.

As a result of crises, the ability to meet human needs is significantly reduced, requiring an appropriate response and humanitarian support. Such crisis situations may be related to natural phenomena or be man-made (Table 1). This division of crises into natural and man-made can be considered rather arbitrary, as drought and famine are caused by climate change, but the latter is the result of human impact on the environment. It should be noted that some researchers classify wars as a separate category, as humanitarian organisations do not usually intervene during hostilities (Van Wassenhove, 2006).

Table 1. Causes and nature of crises

Nature of development	Cause	
	Natural hazard	Anthropogenic danger
Spontaneous development	earthquake, hurricane, tornado, tsunami	terrorist attacks, civil unrest, war, epidemics, industrial accidents
Slow development	drought, famine, poverty	political crisis

Among the main characteristics of humanitarian crises, the following are particularly noteworthy (Natsios, A. S. 1996):

- internal political crisis in the country, including the complete collapse of central authority,
- armed conflicts accompanied by widespread human rights violations,
- deterioration of the security situation in the country (exacerbation of food insecurity, restrictions on the satisfaction of basic human needs),
- exacerbation of the economic situation in the country (unemployment, hyperinflation, rapid decline in GDP, economic crisis),
- mass migration of internally displaced persons, refugees, etc.

In each specific case, the forms and intensity of these characteristics may vary. However, their combination leads to a rapid increase in the suffering of the population due to the inability to meet urgent needs, state institutions prove incapable of solving these problems and, as a result, there is an acute need for external support. These elements define the most general characteristics of a humanitarian crisis (Dijkzeul, D., Griesinger, D., 2020). The humanitarian situation is associated with human suffering, which in turn requires appropriate assistance/support on a large scale. Such a situation may be associated with natural disasters and catastrophes, conflicts and other emergencies, and therefore requires a rapid response and assistance. There are 404.3 million

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people in need of humanitarian assistance (Global Humanitarian Assistance Report, 2023). The number of countries with high humanitarian needs, where more than 1 million people need humanitarian assistance, rose to 51 in 2022.

Thus, a humanitarian crisis is defined as an emergency caused by natural or man-made influences that create a critically threatening and dangerous situation for a large group of people, which exceeds their ability to overcome the relevant difficulties and requires the intervention and assistance of others. Modern humanitarian crises are exceptional and ambivalent in nature. Ambivalence implies, on the one hand, a destructive impact on socio-economic development and, on the other hand, the formation of the foundations for new development. The exceptional nature is determined by the inability of people to overcome crisis phenomena on their own, which, accordingly, legitimises assistance from third parties. International humanitarian activity consists of assistance and protection and covers two components: first, ensuring that the basic needs of those in need are met, and second, protection itself.

The evolution of the humanitarian landscape of the global economy and the increasing frequency and intensity of humanitarian crises have contributed to the classic paradigm of humanitarian action (providing assistance and protection in accordance with humanitarian principles) has been supplemented by a paradigm of resilience, according to which a crisis is defined as a new normality, in which the growth of national capacity to respond to crisis situations takes on particular importance. Considering people's ability to adapt and recover, responding to a crisis is more effective and rational.

At the beginning of 2025, as a result of conflicts, violence, human rights violations and climate change, there were 123.2 million people forcibly displaced, including 49 million children (UNHCR).

Table 2.

Number of displaced persons in the world, million people

	2020	2023	2024
Total number of displaced persons	89, 0	117	123,2
Refugees	26,4	31,6	31,0
Asylum seekers	4,1	6,9	8,4
Others in need of international protection	3,9	5,2	5,9
Internally displaced persons	55	71,2	73,5

Source: (UNHCR.Refugee Data Finder)

87% of all people in need of humanitarian assistance live in countries where there is currently a high level of conflict intensity or in countries experiencing high-intensity conflicts. In addition, 85% lived in socio-economically weak countries, and 58% in countries most affected by climate change. Of the 82 countries, 41% of the population faced acute food insecurity, including in emergency situations. Changes in circumstances in countries and regions of origin and adverse changes in countries of asylum are exacerbating trends towards the return of displaced persons. Contemporary crises tend to become more complex and overlapping due to the spread of conflicts, economic downturns, climate change and environmental degradation, the proliferation of health emergencies, etc. Accordingly, they stimulate a sharp increase in global humanitarian needs. While 77.9 million people needed humanitarian assistance in 2015, by 2024 that number had risen to over 305 million, representing a fourfold increase in aid requirements. Existing crises within countries are deepening, and accordingly, the number of countries experiencing prolonged crises and the number of countries with high humanitarian needs are increasing significantly. The main drivers of humanitarian crises are conflicts, climate change and socio-economic instability, which have recently overlapped, creating an extremely complex humanitarian landscape.

Trade tensions, geopolitical rivalry, and supply chain vulnerabilities are catalysing a resurgence of economic nationalism and regionalisation, while the global financial crisis has been a turning point in the process of economic liberalisation. Trade fragmentation reduces the efficiency of specialisation and competition. As a result, public support for globalisation is declining worldwide. Geopolitical events (trade disputes between the US and China, Russia's invasion of Ukraine) and the COVID-19 pandemic have accelerated geo-economic fragmentation, with countries prioritising national security and economic stability over the efficiency of globalisation.

From the point of view of sustainable development, governments are increasingly using regulatory competition instruments (Panchenko V., Reznikova N., Bulatova O., 2020). Resource nationalism, as a key component of economic nationalism and patriotism (Reznikova N., Panchenko V., Bulatova O., 2018.), is increasingly being used to counter foreign economic expansion. Understanding the close relationship between resources, instability and conflicts, new global uncertainty about resource pricing, scarcity and access is prompting a rethinking of existing security concepts. In view of this, international cooperation, including in the field of humanitarian aid, involves the combined efforts of many stakeholders representing both poor and rich countries, international institutions, etc. Such a multilateral and multi-level combination of all interested parties will help to overcome current challenges, including those related to the transformation of the humanitarian system.

Thus, the main forces and factors contributing to the spread of humanitarian crises in the modern global economy are: conflicts (which are rapidly spreading and intensifying around the world between different countries and are the result of heightened tensions and increased rivalry between the major powers, the most dramatic manifestation of which was the war on the European continent); climate change (manifested in increased anthropogenic impact and environmental crimes; the spread of extreme weather events and natural disasters, leading to numerous human casualties and material losses; the failure of governments and large companies to implement policies to mitigate the effects of climate change, etc.); socio-economic instability (resulting from inequality, internal conflicts, low levels of socio-economic development, etc.). These factors are interrelated and overlap, creating an extremely complex humanitarian landscape. The spread of humanitarian crises ensures a constant increase in demand for humanitarian aid, the scale of which is growing rapidly in terms of both the number of countries and the number of people in need of humanitarian assistance.

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DIGITAL TRANSFORMATION OF SMALL AND MEDIUM-SIZED ENTERPRISES IN THE EU STATES

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Abstract: The aim of the paper is to look at how small and medium-sized businesses in the EU are using digital technology. The European Commission's Digital Compass plan sets out goals for a successful digital transformation in Europe by 2030. The Digital Compass has a target for 2030. It wants at least 90% of small and medium-sized enterprises in the EU to have a basic level of digital intensity. It also wants all key public services for citizens and businesses to be fully online by 2030.

The use of digital technology by EU small and medium-sized businesses helps them to work better, with better productivity, management and new ideas. After looking at specialist books and statistics, we were able to talk about how digital technology is being used by small and medium-sized companies in the EU.

We compared existing data from the Eurostat database. This paper looks at a number of things, like how much technology is used, the use of cloud computing, artificial intelligence, and the number of SMEs that sell online in different EU countries. The good and bad points of e-commerce, and the problems SMEs have when selling online, were explained. The study gives a summary of how EU small and medium-sized companies currently use digital technologies and how this use is changing in different EU countries.

Keywords: digital transformation, digital technology, digital intensity Cloud computing, Artificial intelligence, e-commerce

JEL Classification: O3, O52, P52

1 Introduction

Digitalization is a profound business transformation that involves the use of digital technologies to optimize business processes, increase company productivity, and improve customer interactions. One of the key steps in digitalization is creating a more convenient and efficient interaction between the client and the company. However, based on the question of what business digitalization is, it can be said that this process can also have the following goals:

- Improving the product (or service): its quality, attractiveness, ease of use, and delivery;
- Automating production and other internal company processes;
- Simplifying internal and external communications.

Today, more and more company executives and entrepreneurs recognize the need for change in their businesses. Fighting the concept of total digitalization is futile – it must be embraced. Companies must understand how to integrate it.

This is one of the most important areas that will help achieve a new technological breakthrough in the global economy. Significantly reducing costs and optimizing production processes will help preserve the environment, save human, financial, and time resources, and improve overall living standards.

Companies that do not begin digitally transforming their businesses today will be ineffective and will simply disappear under the pressure of new market realities.

The transformation of businesses will depend on their ability to adopt new digital technologies rapidly and across the board. Digital technologies must be rapidly deployed to enable a more intensive and efficient resource use.

Digital business is all about using the internet to share information, using social networks, and using the latest technologies like cloud services and artificial intelligence (AI).

SMEs represent the bulk of the EU companies, but also because they are a critical source of innovation. With the support of over 200 Digital Innovation Hubs and industrial clusters, by 2030, SMEs should have the opportunity to access digital technologies.

By 2030, the following goals must be achieved:

- 75% of European enterprises have taken up cloud computing services, big data and Artificial Intelligence;
- Most European SMEs are using digital tools. In fact, 90% of them have a basic level of digital intensity;
- Europe will grow the pipeline of its innovative scale ups and improve their access to finance.

This paper looks at how SMEs in EU countries are using digital technology to change the way they work. We look at a few different things to see how well a country is doing, like how much it uses technology, if it uses cloud computing, artificial intelligence, and how many businesses sell things online.

2 Findings

The Digital Economy and Society Index (DESI) shows how companies in the EU use digital technology. Thanks to digital technology, companies can become more competitive, improve their services and products and sell their products in more markets.

One of the main things that shows how much Europe wants to be digital is the Digital Intensity Index (DII). It's a composite indicator that's based on a study of ICT and e-commerce use in enterprises. The Digital Compass is aiming for more than 90% of EU SMEs to reach at least a basic level of digital intensity by 2030.

The indicator is also used in the construction of the Digital Economy and Society Index (DESI), that monitors the progress of EU Member States on digital performance.

The indicator is a useful way to describe how digital EU companies are. It measures the use of different technologies by enterprises.

The indicator is calculated based on 12 variables. In 2024 the Digital Intensity Index (DII) had the following composition:

1. This is for companies where more than half of the people who work there can use the internet for work.
2. The fastest fixed internet connection is at least 30 Mb/s.
3. Businesses that make at least 1% of their money from online sales.
4. This is for companies that make more than 1% of their total sales online. It is also for companies that make more than 10% of their sales to people online.
5. Enterprises have document(s) on measures, practices or procedures on ICT security.
6. Businesses make sure their staff know what they've got to do when it comes to keeping the ICT security ball rolling.
7. Use at least 3 ICT security measures.
8. The company offered training to its staff to help them improve their computer skills.
9. Employ ICT specialists.
10. Use any AI technology.
11. Provide employees remote access to the company's email system, documents and applications.
12. Enterprises, which conducted remote meetings via the internet.

Each of the variables has a score of 1 point. The DII separates enterprises into four levels of digital intensity:

- Enterprise has very low DII: count of enterprises with points between 0 and 3;
- Enterprise has low DII: count of enterprises with points between 4 and 6;
- Enterprise has high DII: count of enterprises with points between 7 and 9;
- Enterprise has very high DII: count of enterprises with points between 10 and 12.

The Digital Decade has a goal, and to monitor this, the four levels of the DII are used to calculate an “at least basic level” of digital intensity. To be at the basic level of digital intensity, we need to use at least four of the twelve selected variables. This means that it includes enterprises with a low, high or very high level of the DII, but not the very low level.

Figure 1 shows the data about SMEs (small to medium-sized enterprises) that use digital technology to a basic level in different European countries.

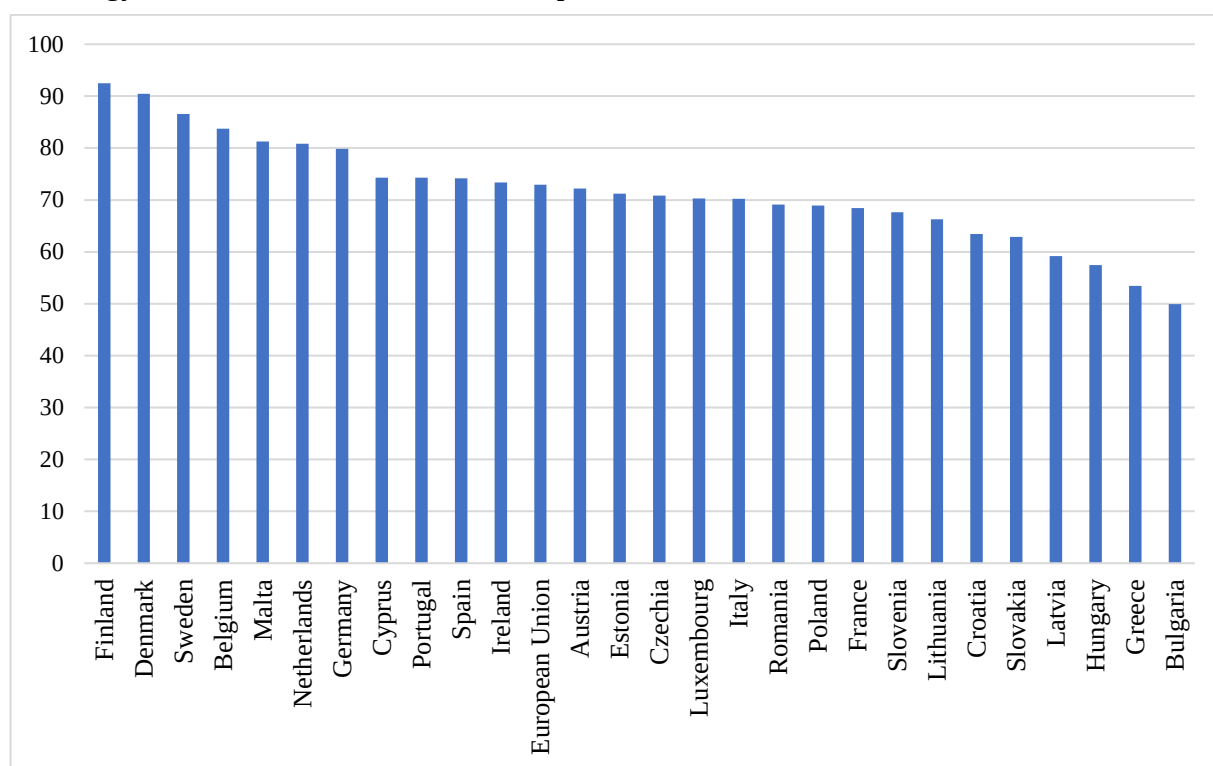


Figure 1. The Data on the percentage of SMEs that demonstrate a basic level of digital intensity, 2024.

Source: <https://digital-decade-desi.digital-strategy.ec.europa.eu>

As we can see in Figure 1, the largest number of small and medium-sized enterprises that use digital technology to some extents are in Finland (92,51%), Denmark (90,47%), Sweden (86,56%), Belgium (83,7%). In countries such as Latvia (59,18%), Hungary (57,44%), Greece (53,42%), and Bulgaria (49,93%), the share of these enterprises is lower than the average in the European Union (72,91%).

Another way to tell if a business is using ERP software is if they share electronic information between different parts of the business, like accounting, planning, production and marketing. ERP software is software that helps businesses manage their resources.

Figure 2 shows the data regarding European SMEs which have electronic information sharing.

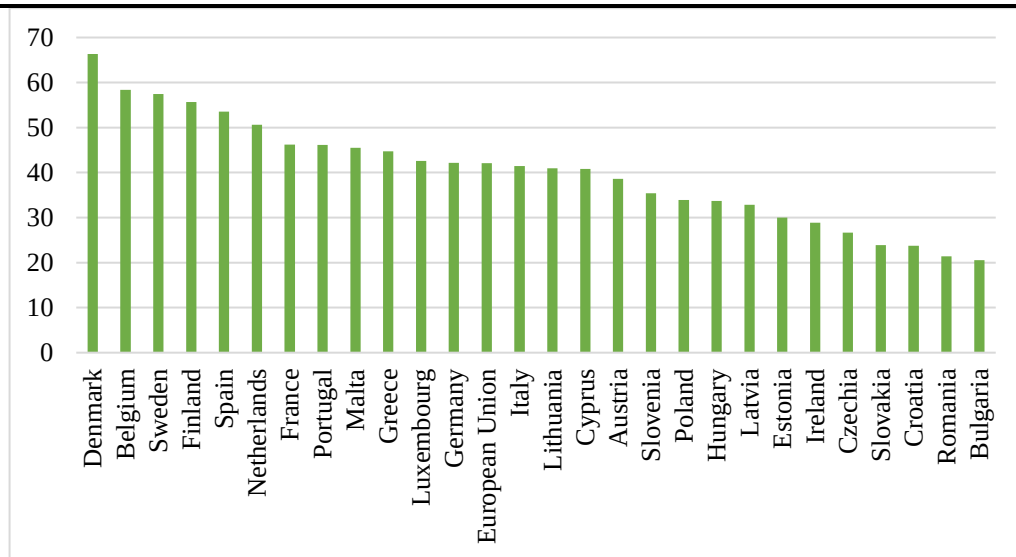


Figure 2. Electronic information sharing (% of enterprises), 2023

Source: <https://digital-decade-desi.digital-strategy.ec.europa.eu>

Figure 2 shows that the most of enterprises that use the electronic information are in Denmark 66,36%, Belgium-58,36%, Sweden-57,47%, Finland-55,67%, Spain-53,55%. There is a small share of enterprises that use the electronic information in Slovakia 23,88%, Croatia 23,72%, Romania 21,4% and Bulgaria 20,51%.

The Path to the Digital Decade says that more than 75% of EU companies must use cloud computing by 2030. The Cloud Computing indicator provides a comprehensive overview of the share of enterprises utilising cloud computing services, encompassing financial and accounting software applications, enterprise resource planning (ERP) applications, customer relationship management (CRM) applications, and security applications. According to Eurostat, in 2023, 69,72% of large enterprises and 38,04% of SMEs in the EU purchased complex or intermediate at least one of cloud computing services for financial/accounting management, customer relationship management (CRM), and process and resource planning (ERP). As illustrated in Figure 3, the data indicates the proportion of enterprises utilising cloud computing services across various countries.

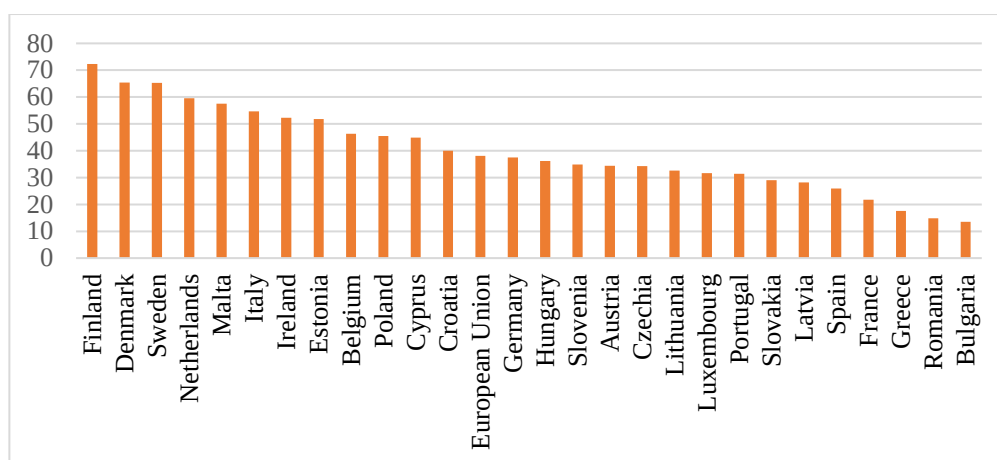


Figure 3. The data on the use of cloud computing services by small and medium-sized enterprises, broken down by country and percentage of enterprises, 2024

Source: <https://digital-decade-desi.digital-strategy.ec.europa.eu>

It can be observed that there are significant differences across countries. In Finland (72,27%), Denmark (65,45%), Sweden (65,32%) more than 60% of enterprises used cloud computing. On the other hand, in France (21,79%), Greece (17,57%), Romania (14,8%) and Bulgaria (13,47%) less than 25% of enterprises did so.

The investigation into the utilisation of cloud computing services by industry revealed that 67% of enterprises in the ICT sector employ these services at either a sophisticated or intermediate level. This is followed by publishing activities, motion picture, video and television program production, sound recording and music publishing, programming and broadcasting (62%), travel agency/tour operator reservation service and related activities (49%), real estate activities (42%), accommodation (37%), electricity, gas, steam, air conditioning and water supply (36%), wholesale and retail trade; repair of motor vehicles and motorcycles (34%), and manufacturing (33%), as well as transportation and storage (30% of enterprises). The construction sector has been found to be the one with the least cloud usage (27% of enterprises).

The Path to the Digital Decade stipulates that more than 75% of EU companies must adopt big data by 2030. Big data is defined as larger, more complex data sets. The sheer volume of data necessitates the utilisation of specialized software capable of effectively managing such extensive information. Big data is characterised by three attributes: volume, variety, and velocity. It enables the processing of large volumes of unstructured data. Traditional data types were structured. The advent of big data has precipitated the emergence of novel unstructured data types, including text, audio, and video formats. These require additional preprocessing to facilitate the extraction of meaning and the support of metadata.

Big data can help with:

- Enterprises use data and analytics from focus groups, social media and market tests to plan, produce and launch new products.
- Predictive maintenance is when organisations look at how their equipment works and try to spot any potential problems before they happen. This helps them to keep their equipment running smoothly and for longer.
- Big data can be used to improve the customer experience. It can gather data from social media, web visits, call logs and other sources. This helps to improve the interaction experience and make the most of the value delivered.
- Big data helps to spot fraud and make sure rules are being followed. It looks at lots of information quickly to identify patterns that indicate fraud.
- Machine learning is possible because we have lots of data available.
- Big data helps you to work better. It lets you look at and judge how your production and customer feedback is working and predict what will be needed in the future.
- Big data can help to create new ideas in a number of ways.
- Big data can help us understand how humans and institutions are connected. It can also help us see how processes work. Then, it can help us find new ways to use these insights.

Big data helps us find more complete answers because there is more information, and it means we can solve problems in a completely different way.

Eurostat data shows that in 2020, 34.3% of big companies used big data. This compares to just 13.64% of small-and-medium sized businesses.

The objective of the Path to the Digital Decade initiative is to ensure that over 75% of companies in the European Union have adopted AI technologies by the year 2030. The integration of artificial intelligence within business processes has the potential to transform the way enterprises operate. The implementation of AI technologies into the business operations has the aim to save money, rise efficiency, to generate insights and create new markets.

There are lots of ways that AI can help businesses. It can help with customer service, making the most money, keeping the internet safe, making supply chains better, letting workers do other things, improving products and making new products.

There are a multitude of AI use cases. It is important that business leaders must understand where AI technologies can be used by businesses and where they cannot. It is important that business leaders understand where they can use AI and where they cannot. It is important to know:

- all the good and bad points;
- presented here are the current and potential uses of AI;
- how to create a successful AI strategy.

The share of enterprises using artificial intelligence (AI) technology is illustrated in figure 4.

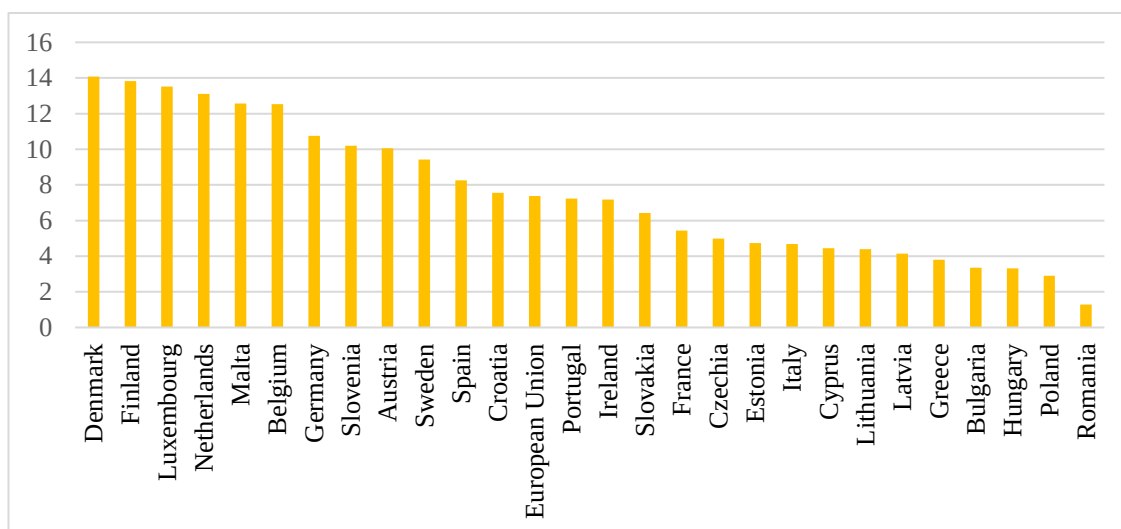


Figure 4. The percentage of small and medium-sized businesses that use artificial intelligence (AI) technology, 2024

Source: <https://digital-decade-desi.digital-strategy.ec.europa.eu>

The data in Figure 4 shows that not many small and medium-sized businesses in European Union countries are using AI technologies. Only 7,38% of them are. But there are some differences between Member States. Some countries have more than 10% of their population using AI technologies. Denmark is in the top (14,08%), Finland (13,83%), Luxembourg (13,51%), the Netherlands (13,11%), Malta (12,56%), Belgium (12,53%), Germany (10,75%), Slovenia (10,19%), Austria (10,06%).

There are seven countries with an adoption rate between 5 and 10%, such as Sweden (9,42%), Spain (8,26%), Croatia (7,55%), Portugal (7,24%), Ireland (7,17%), Slovakia (7,42%), France (5,44%).

Another 11 countries have a very low adoption rate of up to 5%, for example Czech Republic (4,99%), Estonia (4,74%), Italy (4,78%), Cyprus (4,44%), Lithuania (4,39%), Latvia (4,14%), Greece (3,81%), Bulgaria (3,36%), Hungary (3,31%), Poland (2,91%). Romania has the lowest rate of AI absorption in the EU at 1,28%. This is because many companies in Romania still don't use digital technology very much. Basic technologies are not used by many businesses and advanced technologies are not common.

Digital services in the EU are regulated by two laws: the Digital Services Act (DSA) and the Digital Markets Act (DMA). These rules make the internet safer and more open, and they make sure that everyone has the same chances of success.

In 2024, 20,13% of EU small and medium-sized enterprises (SMEs) conducted online sales. Between 2017 and 2024, the number of SMEs conducting online sales increased by 3,28%, and their turnover increased by 2,05%.

The survey on how companies in the European Union use information and communication technology (ICT) and e-commerce shows how online sales and cross-border e-commerce are increasing. Figure 5 shows how SMEs are selling both online and cross-border.

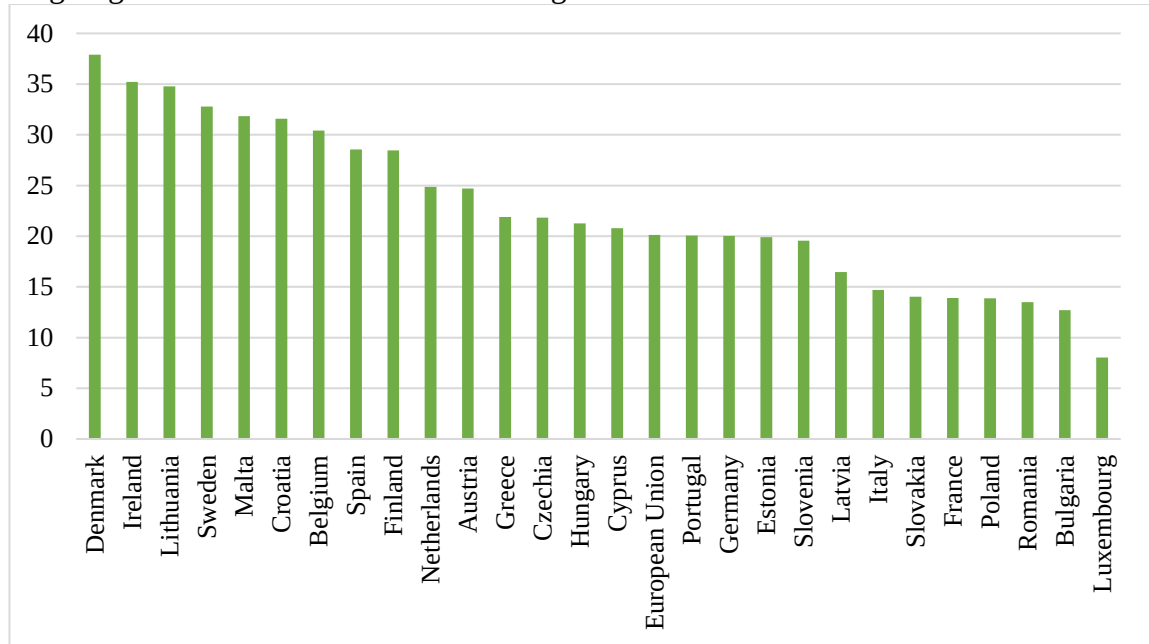


Figure 5. SMEs selling online (% of SMEs), 2024

Source: <https://digital-decade-desi.digital-strategy.ec.europa.eu>

According to Eurostat data in 2024, SMEs from Denmark (37,89%), Ireland (35,21%), Lithuania (34,77%), Sweden (32,77%), Malta (31,83%), Croatia (31,57%), Belgium (30,42%), Spain (28,54%), Finland (28,47%) had the most online sales.

In other countries, less than 15% of SMEs had online sales, such as Italy (14,68%), Slovakia (14,04%), France (13,89%), Poland (13,88%), Romania (13,49%), Bulgaria (12,7%) and Luxembourg (8,03%).

E-commerce has advantages:

Cost reduction. Online sales can be more cost-effective because they don't require physical locations, which means no rent, no additional staff, and no infrastructure costs.

24/7 availability. All types of modern e-commerce can provide 24/7 availability. This allows customers to make purchases and order services at any time, regardless of their geographic location. Furthermore, customers can shop from home or on the go—conveniently and save time.

Expanded marketing opportunities. E-commerce actively utilizes tools to effectively promote products and services and attract new customers.

Improved customer service. E-commerce allows for greater control over service quality and improves the customer experience by offering a variety of delivery and payment options.

Wide access. E-commerce offers entrepreneurs a chance to penetrate the international market, as it allows them to sell their products or services to customers anywhere in the world. Almost any type of e-commerce significantly expands your target audience, especially if you sell electronic goods rather than physical ones, or provide services remotely.

Of course, despite its many advantages, e-commerce also has some disadvantages:

Lack of physical contact. E-commerce suffers from a well-known drawback: the inability to touch and inspect the product before purchase.

Delivery and returns. It's not always possible to promptly receive the product after purchase. There's also a difficult process for returning it if it doesn't meet expectations, which can lead to customer dissatisfaction.

Security and information security. Not all online retailers ensure adequate protection of customer data.

Dependence on technical stability. E-commerce is a business in which the entire sales cycle relies on digital technologies. If internet connections, servers, and software are affected by technical failures, they will bring all processes to a standstill.

Competition and pricing. E-commerce is characterized by a highly competitive environment, which can lead to aggressive pricing, making it difficult for small and medium-sized companies to compete with larger players.

Intellectual property. Books, films, software, and other intellectual property sold online are easily pirated and made publicly available.

The analysis of the e-Commerce turnover of the European SMEs is presented in figure 6.

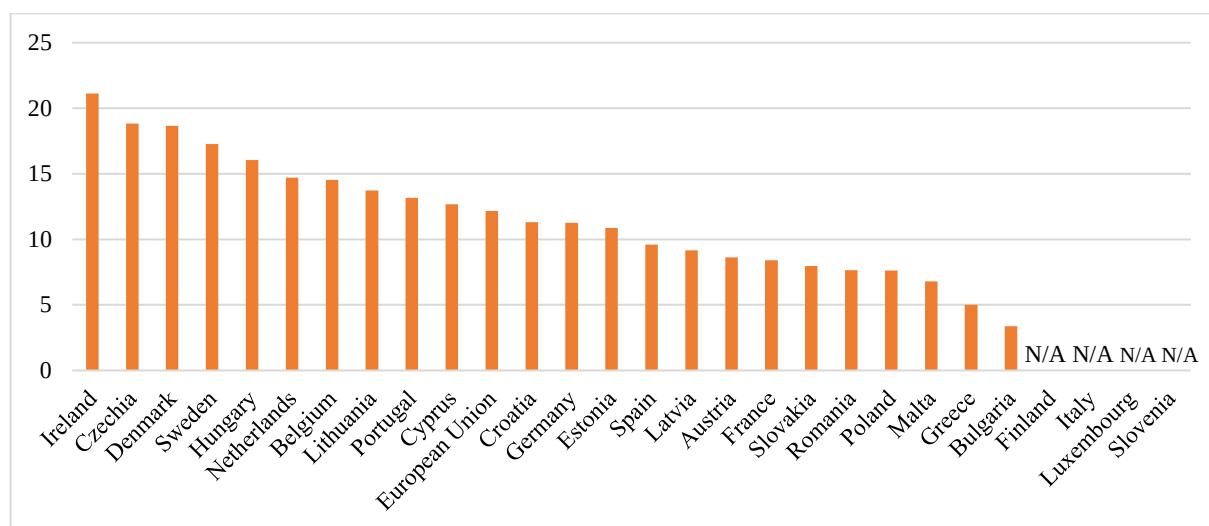


Figure 6. e-Commerce turnover of the European SMEs, (percentage of total turnover), 2024

Source: <https://digital-decade-desi.digital-strategy.ec.europa.eu>

As we can see from Figure 6, SMEs with the highest e-commerce turnover are in Ireland (21,13%), Czechia (18,82%), Denmark (18,65%), Sweden (17,27%), Hungary (16,04%) and the lowest e-commerce turnover are in Greece (5,02%), Bulgaria (3,38%). For countries such as Finland, Italy, Luxembourg, Slovenia data of e-commerce are not available.

Conclusions

The Digital Compass aims to help more than 90% of EU small and medium-sized businesses reach a basic level of digital intensity by 2030.

In 2024 European SMEs with at least a basic level of digital intensity amounted to 72,91%. The highest percentage of small and medium-sized enterprises demonstrating at least a basic level of digital intensity was observed in Finland (92,51%), while the lowest percentage was recorded in Bulgaria (49,93%).

European SMEs which have electronic information sharing amounted to 42,09%. The most of enterprises that use the electronic information were in Denmark 66,36% and the lowest were in Bulgaria 20,51%.

It is evident that there are substantial variations across different countries. In the Finnish context, 72,27% of enterprises were utilising cloud computing, whereas in Bulgaria, the figure stood at – 13,47%.

Big data make it possible to gain more complete answers because there is more information and means a completely different approach to problem solving.

According to Eurostat data, in 2020 34,3% of large enterprises used Big data, and only 13,64% of SMEs used big data.

The integration of artificial intelligence within business enterprises has the capacity to effect a paradigm shift in the modus operandi of commercial activities. The implementation of AI technologies into the business operations has the aim to save money, rise efficiency, to generate insights and create new markets.

There are seven countries where between 5 and 10% of people are adopted, for example Sweden, Spain, Croatia, Portugal, Ireland, Slovakia and France.

Another 11 countries have a very low adoption rate of up to 5%, for example Czech Republic, Estonia, Italy, Cyprus, Lithuania, Latvia, Greece, Bulgaria, Hungary, Romania and Poland. Romania has one of the EU's lowest rates of AI absorption, with only 1,28% of the population using it.

A key component of business digitalization is E-commerce. It encompasses the buying and selling of virtual and physical goods, brokering trade, exchanging information about products and services, attracting customers through marketing tools, and much more.

In 2024, 20,13% of EU small and medium-sized enterprises (SMEs) conducted online sales. Between 2017 and 2024, the number of SMEs conducting online sales increased by 3,28%, and their turnover increased by 2,05%.

SMEs with the highest e-commerce turnover in 2024 were in Ireland (21,13%), Czechia (18,82%), Denmark (18,65%) and the lowest e-commerce turnover were in Greece (5,02%), Bulgaria (3,38%).

So, the use of digital technology will change all business processes. The use of the latest digital technologies by European SMEs allows them to carry out activities that were not possible in the past.

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THE EL NIÑO–SOUTHERN OSCILLATION AND FOOD CONSUMER PRICE INDEX IN LANDLOCKED DEVELOPING COUNTRIES

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Abstract: Landlocked Developing Countries (LLDCs) are highly vulnerable and often are affected by high levels of poverty and food insecurity conditions, due to limited market access, high transportation costs, and reliance on food imports, which increases their exposure to climatic shocks. Domestic food prices play an important role in determining food security conditions in these countries as it directly affects households' purchasing power and access to food. Understanding how the LLDCs react to different weather shocks is therefore important in order to be able to inform governments and international community about targeted interventions and support preparedness to minimize the impacts on food security and protect vulnerable populations. A key driver of weather extremes is El Niño Southern Oscillation (ENSO) phenomena, which has two phases El Niño and La Niña, each associated with extreme weather events such as floods, droughts, and storms, which are a major driver of agricultural production changes, yet the connections between ENSO and inflationary pressure remained underexplored in LLDCs. This paper addressed this gap, by combining econometric analysis with a wide range of dataset, providing evidence for symmetric and asymmetric impact on domestic food prices, using data on Food Consumer Price Index, with the series for all countries extending until September 2024. ENSO is measured using the Oceanic Niño Index (ONI), with standard thresholds to identify El Niño, La Niña and Neutral months. The panel covers thirty LLDCs over 2000–2024, excluding two LLDC namely Central African Republic and South Sudan due to data unavailability. This analysis reveals that the mean FCPI value increased significantly during La Nina periods and slightly during El Nino periods as compared with the mean FCPI during neutral period. Preliminary results point to a strong and persistent inflationary pressure during La Niña periods, estimated between 0.7 and 1.5 percent, while El Niño periods show a generally weaker and more mixed response. These findings highlight the asymmetric nature of ENSO impacts on food CPI. For LLDCs, where food security conditions are already fragile, the impacts brought by La Niña exacerbate the already existent structural vulnerabilities, increasing food insecurity levels in LLDCs.

Keywords: Food CPI; El Niño–Southern Oscillation (ENSO); Landlocked Developing Countries (LLDCs); climate shocks; domestic prices; panel data.

JEL Classification: Q110, Q020, Q540.

1. INTRODUCTION

Since the period of the so-called Great Inflation, which stretched from mid-1960s to the early 1980s, inflation has been a central concern for governments worldwide, particularly in developing countries. This concern has persisted over the years, and returned to central stage in recent years, after the negative effects of the COVID-19 pandemic and the Russian-Ukraine war caused spikes in inflation in many countries, underlining the importance of careful assessment of the inflation triggers. Price spikes of basic food items are especially critical, as they negatively impact household purchasing power and welfare, as well as can lead to increased poverty, social unrest and economic instability. High and persistent inflation distorts market price signals, creating inefficiencies in resource allocation, and disproportionately affects poor and vulnerably households, leading to increased levels of food insecurity (Amrouk, 2023; Spencer, 1975; Hayek, 1960; Colciago, Samarina, & de Hann, 2019; Easterly & Fisher, 2001; Romer & Romer, 1998; Bulir, 2001). The latest estimates indicate that in 2024 about 295.3 million people, representing 22.6 percent of the analysed population faced high levels of acute food insecurity in 53 countries

and territories ((FSIN) & (GNAFC), 2025). The primary drivers of food insecurity are conflict, followed by weather extremes and economic shocks, with the latter two contributing to more than half of food insecure people (96.1 and 59.4 million people, respectively). Thus, with weather extremes and economic shocks combined accounting for more than half of estimates food insecure people, it is important to investigate how climatic anomalies can fuel inflation levels and exacerbate food insecurity. A key driver of weather extremes is El Niño Southern Oscillation (ENSO) phenomena, which has two phases El Niño and La Niña, each associated with extreme weather events such as floods, droughts, and storms, which in turn disrupt agricultural production and economic activity as well as lead to increased food price and inflation (Brenner, 2002; Iizumi, 2014; Cashin, 2017). See **Map 2** and **Map 3** in the Annex to identify the areas affected by the El Niño and La Niña. Evidence also suggests that El Niño is associated with social unrest in commodity-dependent countries that rely on imported food to cover their domestic food needs, such as LLDCs (LLDCs) (S.M. Hsiang, 2011). This analysis examines the impact of ENSO's El Niño and La Niña events on the food component of the CPI (FCPI) for countries from the group LLDCs (*As of September 2025, the UN classifies 32 Landlocked Developing Countries see <https://unctad.org/topic/landlocked-developing-countries/list-of-LLDCs>, the map of LLDCs can be found in the Annex 1.*), which as of September 2025, also include Republic of Moldova (United Nations., 2025). Due to their geographical disadvantage, being landlocked can impede trade, connectivity, development and economic growth. It is likely that LLDCs are more vulnerable to weather shocks, which likely have a more severe effect on them compared to other countries by (Sachs, 2005). Even LLDCs not directly hit by ENSO-driven weather shocks remain exposed through international trade and financial channels. This paper examines the relationship between ENSO phases and domestic food inflation in LLDCs and investigates whether, and to what extent, the phases of the El Niño Southern Oscillation (ENSO), El Niño and La Niña, affect domestic food prices. The analysis uses monthly FAOSTAT Food CPI data for 30 LLDCs over the period from 2000 to 2024, combined with monthly food CPI data from FAOSTAT with ENSO indicators such as the Oceanic Niño Index (ONI) and the Multivariate ENSO Index Version 2 (MEI.v2). The analysis applies fixed-effects panel regressions with clustered standard errors to isolate the causal effects of ENSO on food inflation, while controlling for macroeconomic and climatic variables including exchange rate movements, food import dependency, agricultural GDP share, rainfall anomalies, drought indices, and oil prices. The final section discusses policy implications for early-warning systems, preparedness, and stabilization measures in structurally constrained economies.

2. DATA AND METHOD

As of September 2025, there are 32 countries LLDCs, namely Afghanistan, Armenia, Azerbaijan, Bhutan, Bolivia, Botswana, Burkina Faso, Burundi, Central African Republic, Chad, Eswatini (Swaziland), Ethiopia, Kazakhstan, Kyrgyzstan, Lao People's Democratic Republic, Lesotho, Malawi, Mali, Republic of Moldova, Mongolia, Nepal, Niger, North Macedonia, Paraguay, Rwanda, South Sudan, Tajikistan, Turkmenistan, Uganda, Uzbekistan, Zambia and Zimbabwe (United Nations., 2025). Not all LLDCs are directly affected by the ENSO-induced extreme weather, see **Map 1** in the Annex, in only 18 countries (*ENSO leads to changes in rainfall patterns, and can create drought, excessive rains and floods in: Afghanistan, Armenia, Azerbaijan, Bhutan, Bolivia, Botswana, Eswatini (Swaziland), Kazakhstan, Kyrgyzstan, Lao People's Democratic Republic, Lesotho, Malawi, Paraguay, Tajikistan, Turkmenistan, Uzbekistan, Zambia and Zimbabwe.*) ENSO leads to changes in rainfall patterns. However, we will still include them in the analysis, as they can endure possible indirect effects through trade, international commodity prices and financial channels transmission. To capture changes in the domestic food prices in LLDCs, this paper uses data on monthly consumer prices, food indices (2015=100) available from FAOSTAT (FAO, 2024), with the series for all countries available until September 2024. Changes in the food consumer price indices are assessed by computing the cumulative changes in food CPIs

for each of the LLDCs. An aggregate FCPI is also derived for the group by computing a population-weighted average FCPI. Population data is taken from FAOSTAT. The Oceanic Niño Index (ONI) (NOAA, Cold & Warm Episodes by Season, 2025), one of the most widely used metrics for tracking El Niño and La Niña events (Wei, 2024), is used as the primary ENSO indicator, with thresholds of $\pm 0.5^{\circ}\text{C}$ for El Niño and La Niña, respectively. For robustness, the Multivariate ENSO Index, Version 2 (MEI.v2) is also employed (NOAA, 2025). Data for control variables were collected from used are the monthly Global Food Price Index (FAO FFPI, nominal and real terms) from FAO (FAO, 2025), monthly Oil prices from FRED (FRED Graph, 2025), exchange rates from International Financial Statistics (IFS) of the IMF (IMF, 2025). Country structural variables include food import dependence, agricultural GDP share, and gross per capita food production index from FAOSTAT (FAO, 2024). The analysis focuses on the period between January 2001 (when less gaps are available in the datasets) and September 2024 (latest data available for the food CPI in FAOSTAT). Population data are drawn from FAOSTAT and are used to compute population-weighted aggregates for the LLDC group. Conceptual framework is described in Figure 1.

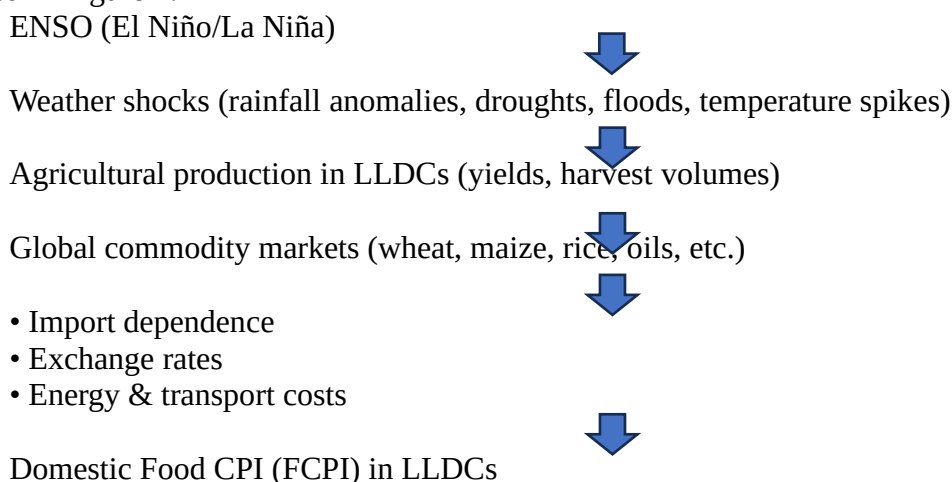


Figure 1. Conceptual framework: pathways from ENSO to food inflation in LLDCs.

Source: Author's own elaboration.

Based on the ONI dataset, 7 El Niño and 9 La Niña events were identified between 2000 and 2023, spanning multiple months or even years, see below. Notably, the most recent La Niña, lasting from 2020 to 2023, was highly unusual for an event that normally lasts from 9 to 12 months.

El Niño Periods:

- June 2002 to March 2003 (10 months).
- August 2004 to March 2005 (8 months).
- October 2006 to February 2007 (5 months).
- August 2009 to April 2010 (9 months).
- October 2014 to May 2016 (20 months).
- October 2018 to June 2019 (9 months).
- June 2023 to May 2024 (11 months).

La Niña Periods:

- January 2000 to March 2001 (15 months).
- December 2005 to April 2006 (5 months).
- August 2007 to May 2008 (10 months).
- December 2008 to April 2009 (5 months).
- July 2010 to June 2011 (12 months).
- September 2011 to April 2012 (8 months).
- September 2016 to April 2017 (8 months).

October 2017 to May 2018 (8 months).

September 2020 to February 2023 (30 months). Based on the ONI dataset, 7 El Niño and 9 La Niña events were identified between 2000 and 2023, spanning multiple months or even years, see below. Notably, the most recent La Niña, lasting from 2020 to 2023, was highly unusual for an event that normally lasts from 9 to 12 months.

El Niño Periods:

June 2002 to March 2003 (10 months).

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June 2023 to May 2024 (11 months).

La Niña Periods:

January 2000 to March 2001 (15 months).

December 2005 to April 2006 (5 months).

August 2007 to May 2008 (10 months).

December 2008 to April 2009 (5 months).

July 2010 to June 2011 (12 months).

September 2011 to April 2012 (8 months).

September 2016 to April 2017 (8 months).

October 2017 to May 2018 (8 months).

September 2020 to February 2023 (30 months).

2.1 DESCRIPTIVE EVIDENCE

To gain an initial insight into how these climate phenomena may influence FCPI, I will start with a simple comparison of the average FCPI value for all ENSO phases: El Niño, La Niña, and Neutral. As shown in **Figure 2**, the average FCPI during Neutral periods is relatively stable. However, during El Niño periods, the FCPI does not increase noticeably, showing that El Niño-induced weather extreme does not necessary result in increased food prices. The most striking result is that during La Niña years, the average FCPI jumps to almost 12 percent, suggesting that in LLDCs La Niña events have a far more severe impact on food prices compared with the other two phases, mostly probably due to disruptions in agricultural output.

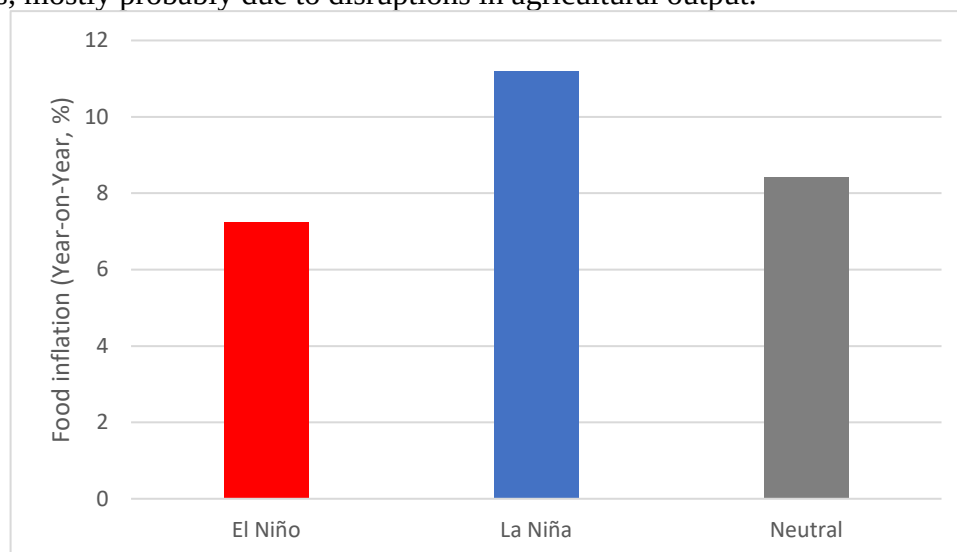


Figure 2. Comparison average FCPI values for El Niño, La Niña and neutral conditions.

Source: Author's own elaboration based on the data (2000-2023) from (FAO, 2025) and (NOAA, 2025)

Figure 3 shows the FCPI weighed by population of respective LLDCs for a period from January 2001 to September 2024 combined with El Niño, La Niña events. Over the last two decades domestic food prices spiked in 2007 and 2008 when a global economic crisis caused spikes in food prices, during 2010 and 2011, and more recently between 2019 and 2023 during the COVID-19 pandemic and the war in Ukraine.

Moving further beyond the descriptive analysis, in order to quantify the impact of ENSO events on FCPI in LLDCs, this paper uses a fixed-effects panel regression with clustered standard errors. As indicated by several studies, and the descriptive analysis in this paper above see **Figure 2**, El Niño and La Niña events have different impacts on inflationary pressures, suggesting that the effects of El Niño and La Niña are not symmetric. Thus, a need to decompose the ONI into two variables arise as follows:

$$EN_t = \max(ONI_t, 0), LN_t = \max(-ONI_t, 0) \quad (1)$$

where EN_t is the intensity of El Niño period (positive ONI) and LN_t is La Niña (negative ONI).

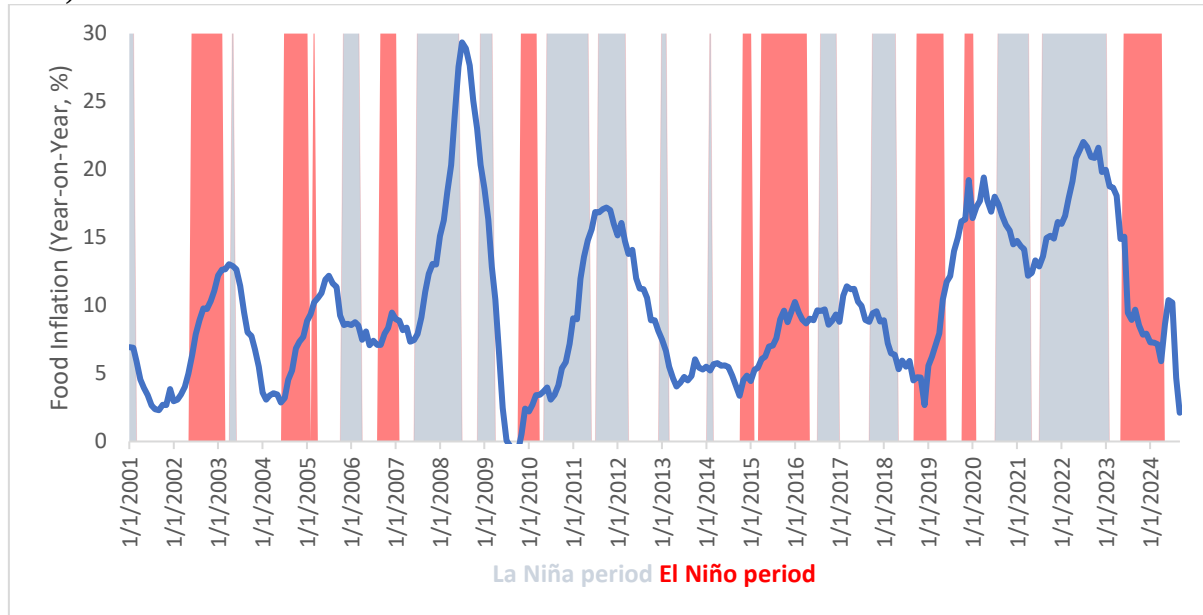


Figure 3. LLDC Population-weighted Food Inflation (Year-on-Year in %) with ENSO phases from 2001 to 2024

Source: FAOSTAT, 2024 and author's own elaboration.

The asymmetric dynamic specification is as follows:

$$\Delta FCPI_{i,t} = \sum_{k=0}^{12} (\beta_k^{EN} EN_t - k + \beta_k^{LN} LN_t - k) + \Gamma X_{i,t} + \alpha_i + \delta_m + \epsilon_{i,t} \quad (2)$$

where $\Delta FCPI_{i,t}$ is the year-on-year percentage change in the FCPI for country i at time t ; β_k^{EN} and β_k^{LN} is the month-on-month impact of El Niño and La Niña events at lags $k = 0, \dots, 12$; Γ is the vector of coefficients on the control variable, including exchange rate, global food and oil prices, as well as other indicators; α_i denotes country fixed effects; δ_m is the months fixed effects controlling for seasonal food price patterns; and $\epsilon_{i,t}$ is the error, with standard error grouped at the country level to allow for heteroskedasticity. This way we will be able to detect delayed or shifted transmission of the effects of ENSO events on FCPI over 12 month-period. At group level, the national FCPI are aggregated using population weights as follows:

$$FCPI_t^{LLDC} = \frac{\sum_{i=1}^N (Pop_{i,t} \times FCPI_{i,t})}{\sum_{i=1}^N Pop_{i,t}}$$

where $FCPI_t^{LLDC}$ is the aggregate FCPI for month t , $Pop_{i,t}$ is the population of country i , and $FCPI_{i,t}$ is the national food CPI.

3. RESULTS

3.1 BASELINE ASYMMETRIC RESULTS WITH CONTROLS

The asymmetric dynamic specification, see Equation 2, was calculated with controls for exchange rate movements, global food prices and oil prices. The result reveals a strong asymmetry between El Niño and La Niña effect. La Niña events are associated with strong and statistically significant increases in FCPI, while El Niño shows weaker and less consistent effects. The result suggest that food inflation rises immediately during La Niña months and the impact persists across following months. By contrast, El Niño show less consistent effects and are smaller in magnitude. Control variables indicate that FAO Food Price Index and exchange rates add upward pressure on domestic FCPI, while oil prices does not normally have a significant effect.

Table 1. Selected regression results from the baseline asymmetric model with controls

Variable	Estimate	Std. Error	t value	Pr(> t)
l(EN,0)	-2.45	1.02	-2.39	0.023*
l(EN,1)	2.73	1.25	2.19	0.036*
l(LN,0)	4.61	1.9	2.42	0.022*
fpi_yoy	-0.311	0.096	-3.25	0.003**
oil_yoy	-0.013	0.024	-0.57	0.576

Source: Author's own elaboration, Significance levels: * $p < 0.05$, ** $p < 0.01$.

Additional robust checks were employed to check the validity of above findings. ENSO placebo test for El Niño and La Niña events are generally insignificant, suggesting the results are not caused by anticipation. Similarly, after residualizing FCPI with global and domestic controls, the La Niña effect remains strong and statistically significant, while El Niño effects largely disappear. I also examine the heterogeneity by food import dependence. The cumulative La Niña effect over 0 to 12 months was related with the food import dependency ratio to asses heterogeneity across the LLDCs. Marginal effects were estimated at the 10th, 50th, and 90th percentiles of distribution. Results reveal a clear patters: countries which rely on imports to cover their domestic needs face stronger inflationary pressure during La Niña see Table 2.

Table 2. La Niña marginal effects by food import dependence

Import Dependence	Estimate	95% CI	p-value
Low (p10)	0.37	[0.06, 0.68]	0.021
Median (p50)	0.39	[0.14, 0.63]	0.002
High (p90)	0.42	[0.21, 0.63]	<0.001

Source: Author's own elaboration.

Overall, the results reveal that La Niña events cause persistent and strong inflationary pressure in LLDCs, especially in countries with high food import dependency, while El Niño events cause weaker and more heterogeneous effects. Dispersion analysis also indicates that variance in food inflation is substantially higher during La Niña periods. In Figure 4 bars represent cumulative effects of El Niño and La Niña phases with 95% confidence intervals. The estimated difference (Delta EN–LN) equals –6.9 percentage points, statistically significant at $p=0.00247$.

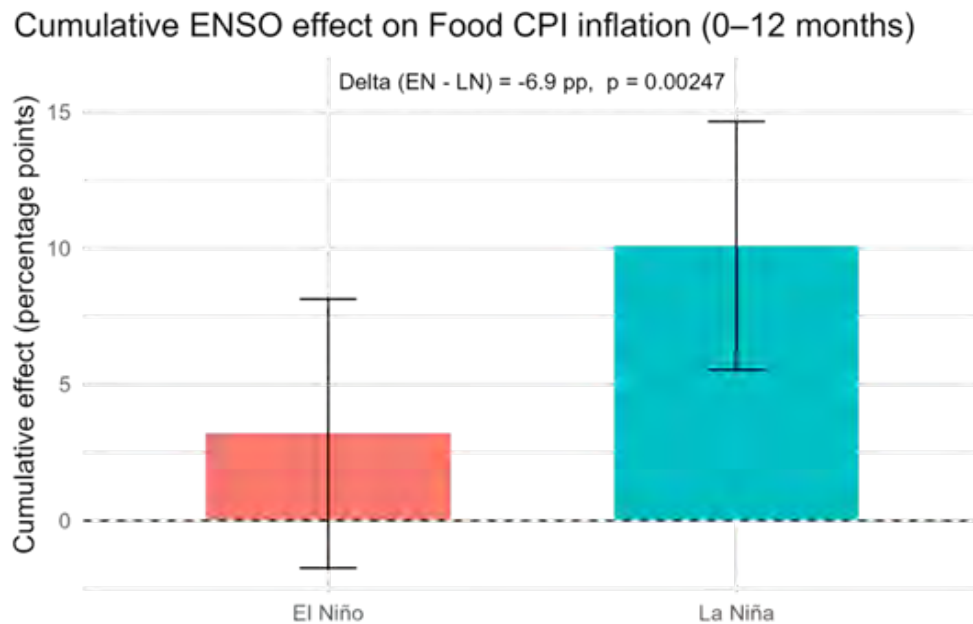


Figure 4. Cumulative effect of El Niño and La Niña shocks for a 0 to 12 month-period on Food CPI inflation in LLDCs.

Source: Author's own elaboration using R.

4. CONCLUSION

Landlocked Developing Countries (LLDCs) face structural vulnerabilities that increase their exposure to food price shocks from global weather extremes. This study provides robust evidence that the El Niño–Southern Oscillation (ENSO) has asymmetric effects on FCPI in LLDCs. La Niña events are consistently associated with strong and persistent increases in FCPI, while El Niño events cause a weaker and more heterogeneous effect. The results point to a strong and persistent inflationary pressure during La Niña periods, estimated between 0.7 and 1.5 percent, while El Niño periods show a generally weaker and more mixed response. These asymmetries remain robust to placebo tests and residualization checks, underscoring that the La Niña effect does not have a spurious correlation. Heterogeneity analysis also shows that LLDCs with higher food import dependency experience significantly bigger inflationary pressure due to La Niña, confirming that structural vulnerabilities on external food supplies exacerbate the vulnerability. These findings highlight the urgent need to integrate ENSO-related risks into food security monitoring and early warning systems and policy frameworks for LLDCs. Strengthening early warning systems, diversifying import sources, improving storage and transport infrastructure, supporting farmers with agricultural inputs and capital, and building resilience to avert the negative impact of global price shocks are essential steps to mitigate the inflationary effects of La Niña events. Future research could extend this analysis by applying local projection methods (Jorda, O., 2005) or dynamic structural models, and by incorporating additional economic and agricultural data such as GDP per capita, remittances, conflicts and cereal imports. These approaches could provide a deeper insight into the transmission mechanisms linking ENSO events and food security outcomes in LLDCs.

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Source: <https://www.weather.gov/fwd/teleconnections>

INVESTMENTS IN ENERGY STORAGE SYSTEMS AS A DRIVER OF COMPETITIVENESS IN THE RENEWABLE ENERGY SECTOR OF MOLDOVA

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Abstract. The rapid expansion of renewable energy sources (RES) in Moldova has created both opportunities and challenges for the national energy system. Intermittent generation from solar and wind power leads to frequent imbalances between electricity production and consumption, resulting in inefficiencies, higher system costs, and potential risks to energy security. In this context, large-scale energy storage systems (ESS) have emerged as a critical solution to enhance the flexibility, stability, and efficiency of the energy sector.

The purpose of this study is to assess the role of investments in ESS as a factor of economic growth and enterprise competitiveness in Moldova. The research focuses on evaluating how ESS integration can mitigate the volatility of renewable energy generation, reduce dependence on imported electricity, and improve energy reliability for enterprises. The study employs a comparative analysis of international experiences, combined with an assessment of Moldova's investment potential, regulatory framework, and current barriers. Financial models, state incentives, and innovation-driven adoption strategies are also examined.

The findings indicate that strategic investments in ESS can provide multiple benefits. At the enterprise level, ESS reduces energy costs, lowers exposure to price fluctuations, and increases operational resilience. At the macroeconomic level, energy storage enhances national energy security, supports the efficient utilization of RES, and contributes to Moldova's alignment with the EU Green Deal and sustainable development goals. The study concludes that targeted ESS investments represent a significant opportunity to strengthen the competitiveness of Moldovan enterprises, stimulate innovation, and foster long-term economic resilience.

Keywords: Energy storage systems; renewable energy; investments; economic growth; innovation; sustainability

JEL Classification: Q42, Q43, Q48, O13

1. Introduction

The rapid expansion of renewable energy sources (RES) worldwide and in the Republic of Moldova creates new opportunities for sustainable development and the reduction of dependence on fossil fuels. In recent years, the accelerated deployment of solar and wind generation has contributed to the decarbonization of the economy and the country's integration into the European energy space. However, the inherent intermittency of RES electricity generation leads to imbalances between production and consumption, increasing systemic risks, raising costs, and reducing the reliability of energy supply.

In Moldova, this challenge is particularly acute due to the limited flexibility of the national energy system, insufficient balancing capacities, and a high dependence on imported energy resources. Under these circumstances, the deployment of energy storage systems (ESS) emerges as a key strategic direction. ESS technologies enable the smoothing of generation fluctuations, enhance grid resilience, stimulate new investments, and ultimately strengthen the competitiveness of the renewable energy sector.

The purpose of this paper is to examine the role of investments in ESS as a factor in enhancing the competitiveness of Moldova's renewable energy sector. The study addresses

international experience, national specificities, and the prospects for the development of energy storage technologies, as well as their implications for the energy transition and the country’s economic growth.

2. Research results

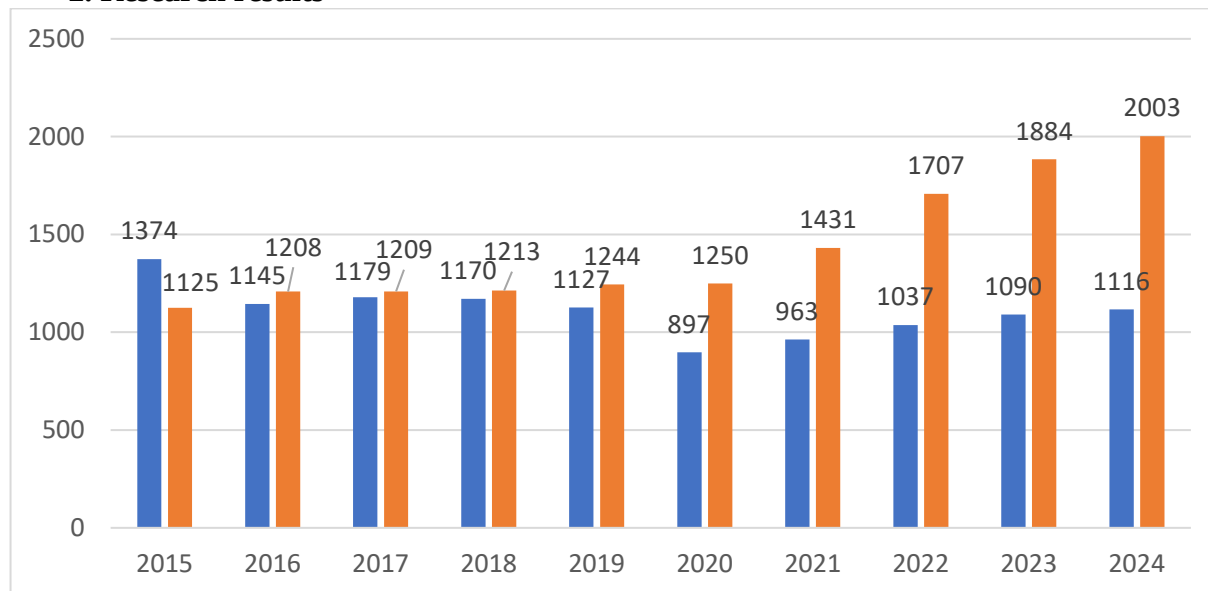


Figure 1. Global investment in Clean Energy and Fossil Fuels, 2015-2024

Source: own work based on (Statista, 2025)

According to the chart, we observe that investments in the energy sector have steadily increased over the past ten years, while investments specifically in renewable energy have grown even more significantly. This indicates a continuing trend of rising investments, particularly in the field of renewable energy.

Let us now examine the renewable energy capacities commissioned over the past decade at the global, European, and Moldovan levels.

Table 1. Capacity of renewable energy sources commissioned in 2015-2024.

Indicators	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
World power, MW	1 851 114	2 019 709	2 187 425	2 358 285	2 542 854	2 812 981	3 075 931	3 378 790	3 862 881	4 448 051
Growth compared to the previous year, %		9%	8%	8%	8%	11%	9%	10%	14%	15%
Capacity in Europe, MW	463 982	487 282	511 310	535 501	572 231	606 045	647 049	705 139	778 511	848 627
Growth compared to the previous year, %		5%	5%	5%	7%	6%	7%	9%	10%	9%
Power in Moldova, MW	69	71	81	106	110	116	153	255	422	538
Growth compared to the previous year, %		3%	14%	31%	4%	5%	32%	67%	65%	27%

Source: own work based on (IRENA, 2025)

As we can see from the table, the installed capacities of renewable energy power plants have increased both globally and in Europe as well as in Moldova. While worldwide growth ranged from 8% to 15% year-on-year, and in Europe from 5% to 9%, in Moldova it varied between 3% and 67%, particularly in recent years. The trend of deploying new renewable energy capacities in Moldova is expected to continue in the future.

Let us now examine the structure of renewable energy capacities commissioned in Moldova as of the end of July 2025.

	Producer		Free market	Net Accounting	Net invoicing	TOTAL
	Law 160-XVI/2007	Law 10/2016/fixed tariff				
Solar panels	0,59	139,62	241,38	115,31	48,71	545,61
Wind power plants	27,23		187,35			214,58
Biogas	5,17	1,99				7,16
Hydropower	0,25		16,5			16,75
Total	33,24	184,11	439,94	115,31	58,43	784,09

Figure 2. Installed electricity production capacities from RES in MW as of 01/08/2025.

Source: own work based on (CNED, n.d.)

Compared to 2024, installed capacities increased by 46%, mainly due to the expansion of solar panels and, to a lesser extent, wind power plants. With the growth of newly commissioned renewable energy capacities, particularly solar and wind power plants, the imbalance between electricity production and consumption is increasing. Solar power plants are characterized by fluctuations in electricity generation depending on the season, time of day, and current weather conditions. For example, solar power plants produce significantly less electricity during the winter months and much more in summer. Electricity is generated during daylight hours, whereas at night—when peak demand often occurs, no generation takes place. Cloudy or rainy weather, as well as heavy cloud cover, can also reduce output. Electricity generation at wind power plants is likewise influenced by seasonal factors, wind availability, and geographical conditions. The instability, variability, and unpredictability of solar and wind energy pose serious challenges for the operation and management of the power system, affecting its resilience, reliability, stability, and predictability.

Analyzing the data from the table over the course of the year, it can be observed that the installed capacity of renewable energy sources (RES) in early 2025 reaches its maximum relative to peak monthly energy demand during the spring and autumn months, amounting to 112%. With the further addition of new capacities, this indicator may continue to rise and could exceed peak demand in other months as well. Since it is well known that power plants generate only a fraction of their installed capacity throughout the year, we determined that the maximum value relative to peak demand reaches 24% in autumn.

The time of day when solar and wind power plants jointly generate their maximum output falls between 9:00 a.m. and 3:00 p.m. As a result, we identified that the maximum generation relative to peak demand reaches 46% during the summer period, which indicates that moments

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when RES generation exceeds peak demand are relatively rare. However, since peak demand most often occurs during morning and evening hours, there may be instances during daytime when electricity supply exceeds demand.

Table 2. Maximum electricity consumption, power and peak production in Moldova at the end of July 2025

Indicator	January	February	March	April	May	June	July	August	September	October	November	December
Maximum peak consumption of MW per unit of time per year	948	948	750	700	700	900	900	900	700	700	750	948
Solar panel power, MW	545,61	545,61	545,61	545,61	545,61	545,61	545,61	545,61	545,61	545,61	545,61	545,61
Wind energy power, MW	214,58	214,58	214,58	214,58	214,58	214,58	214,58	214,58	214,58	214,58	214,58	214,58
Other RES, MW	23,91	23,76	23,76	23,76	23,76	23,76	23,76	23,76	23,76	23,76	23,76	23,76
Total RES capacity, MW	784,10	783,95	783,95	783,95	783,95	783,95	783,95	783,95	783,95	783,95	783,95	783,95
Ratio of RES power to peak values, %	83%	83%	105%	112%	112%	87%	87%	87%	112%	112%	105%	83%
Average power used by wind turbines, MW	66	66	66	50	50	50	50	50	50	66	66	66
Average power consumed by solar panels, MW	27	27	71	82	82	131	131	131	82	76	71	27
Total average power, MW	118	117	161	155	155	204	204	204	155	167	161	117
Ratio of average power to peak values, %	12%	12%	21%	22%	22%	23%	23%	23%	22%	24%	21%	12%
Maximum power of solar and wind power plants from 9:00 to 15:00.	139	141	287	297	297	417	417	417	297	289	271	139
Ratio of RES peak production to peak demand 9:00 to 15:00	15%	15%	38%	42%	42%	46%	46%	46%	42%	41%	36%	15%

Source: own work based on cned.gov.md, logos-pres.md, Energocom.md, MyBusiness.md, ener-gy.com.ua, www.lnl.gov, solar.md, e-solarpower.ru

Table 3. Ratio of renewable energy generation to average purchases over twelve months, based on latest capacity at the end of July 2025

Indicator	January	February	March	April	May	June	July	August	September	October	November	December	Total
Average electricity purchases, MW	434 000	403 000	384 000	339 000	321 069	334 613	364 810	343 271	352 000	344 343	380 000	499 894	4 500 000
Electricity production by wind power plants according to average capacity, MW	49 417	44 635	49 417	35 689	36 879	35 689	36 879	36 879	35 689	49 417	47 823	49 417	507 830
Electricity production by solar power plants according to average capacity, MW	20 297	18 332	52 771	58 926	60 890	94 281	97 424	97 424	58 926	56 831	51 069	20 297	687 469
Electricity production by other types of renewable energy power plants according to average capacity, MW	12 446	11 171	12 368	11 969	12 368	11 969	12 368	12 368	11 969	12 368	11 969	12 368	145 702
Total production from renewable energy sources according to the latest capacity, MW	82 160	74 139	114 557	106 584	110 137	141 939	146 671	146 671	106 584	118 616	110 861	82 082	1 341 000
Ratio of renewable energy production to average electricity purchases, %	19%	18%	30%	31%	34%	42%	40%	43%	30%	34%	29%	16%	30%

Source: own work based on cned.gov.md, logos-pres.md, Energocom.md, MyBusiness.md, ener-gy.com.ua, www.lnl.gov, solar.md, e-solarpower.ru

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Analyzing the table, we can see that, given the currently commissioned RES capacities and the calculated amount of electricity to be produced throughout the year in relation to total electricity consumption, the share reaches 30%. During the year, the maximum ratio of generation to consumption occurs in the summer period, peaking at 43% in August. Considering that the trend of commissioning new RES power plants is expected to continue, this indicator will approach close to 100% of total consumption.

We observe that the risks of imbalance between production and consumption are increasing. To address this, it is necessary to develop a well-interconnected grid with neighboring countries for exporting surplus electricity and importing when needed, or alternatively, to expand the deployment of energy storage systems.

Many European countries have already faced similar challenges, and they were compelled to sell electricity at negative prices, curtail production, or introduce energy storage solutions

Table 4. Hours with negative prices in Europe

Year	UK	France	Germany	Spain
2020	0	102	298	0
2021	7	64	139	0
2022	26	12	83	0
2023	106	144	292	0
2024	179	356	468	247

Source: own work based on komersant.ua

Last year, European power markets experienced record periods of negative electricity prices as the rapid expansion of wind and solar capacity boosted generation. In Germany, according to Epex Spot, this indicator increased by 60% compared to the previous year, reaching 468 hours. In France, the number of hours with negative prices more than doubled, amounting to 356.

On the sunniest or windiest days, electricity can overwhelm the grid, causing prices to drop below zero and leading to situations where consumers are paid to use electricity. However, due to the structure of subsidies for renewable energy producers, some generators are incentivized to continue producing even when prices fall below zero, further distorting the market. Experts are calling on governments to adjust these mechanisms in order to reduce the frequency of negative prices. (Renen, 2023)

In the absence of ESS, renewable energy surplus is often curtailed, meaning that power plants are forced to reduce their output. In 2024 alone, seven European countries lost a total of €7.2 billion worth of renewable energy due to the inability to connect it to the grid, including €3.3 billion in Germany as a result of redispatch measures. Meanwhile, more than 1,700 GW of renewable energy projects remain in the connection queue. (Dzikowski, 2025)

Table 5. Curtailment of electricity generation (%) in several European countries

Indicator	Germany	Greece	Spain	Ireland
Curtailment of RES generation (%)	3,50%	3,50%	2,90%	6%-10%

Source: own work based on strategicenergy.eu, pv-magazine.com, ess-news.com, consult.eirgrid.ie

In Europe, curtailment has increased in certain areas and is expected to rise further. Research and analytical studies show that batteries and long-duration energy storage (LDES) can significantly reduce economic curtailment. On average, curtailment has ranged from 3.5% to 10%,

depending on the region or country. European countries are seeking to reduce curtailment through the deployment of energy storage systems or pumped hydro storage facilities.

The effect of storage deployment varies across countries:

Spain – Modeling shows that batteries with 200 Wh of storage per 1 kW of PV capacity can substantially reduce curtailment; in some nodes curtailment could be reduced by up to 80% (research estimate). According to the same study, after the deployment of battery storage, curtailment could fall to 0.5–1% (with batteries of around 200 Wh/kW PV). (ESS News, 2025).

Germany – Published assessments and analysts’ comments highlight that batteries reduce hours with negative electricity prices and improve grid flexibility; however, the current scale of ESS is still insufficient to fully eliminate curtailment. Significant capacity expansion will be required. A modeled estimate suggests that adding +2–5 GW of batteries would reduce negative price hours and curtailment. (Reuters, 2024).

Ireland – After the deployment of battery storage, curtailment of renewable electricity generation is expected to decrease to 1–3%, depending on battery capacity (empirical data).

(Doherty et al., 2024)

As for Moldova, already today, depending on weather conditions and electricity demand, there are times when production exceeds consumption. The excess is redistributed into the grid, which is interconnected with neighboring countries. At peak demand hours, Moldova also imports electricity from these networks. Imports are mainly secured through bilateral contracts with companies from Romania and Ukraine, while part of the electricity is purchased on the Romanian Opcom exchange. Importantly, it is during peak demand periods—morning and evening hours—that additional purchases are made on the exchange, where prices are significantly higher than under bilateral contracts.

Let’s look at the electricity procurement structure in Moldova for August 2025

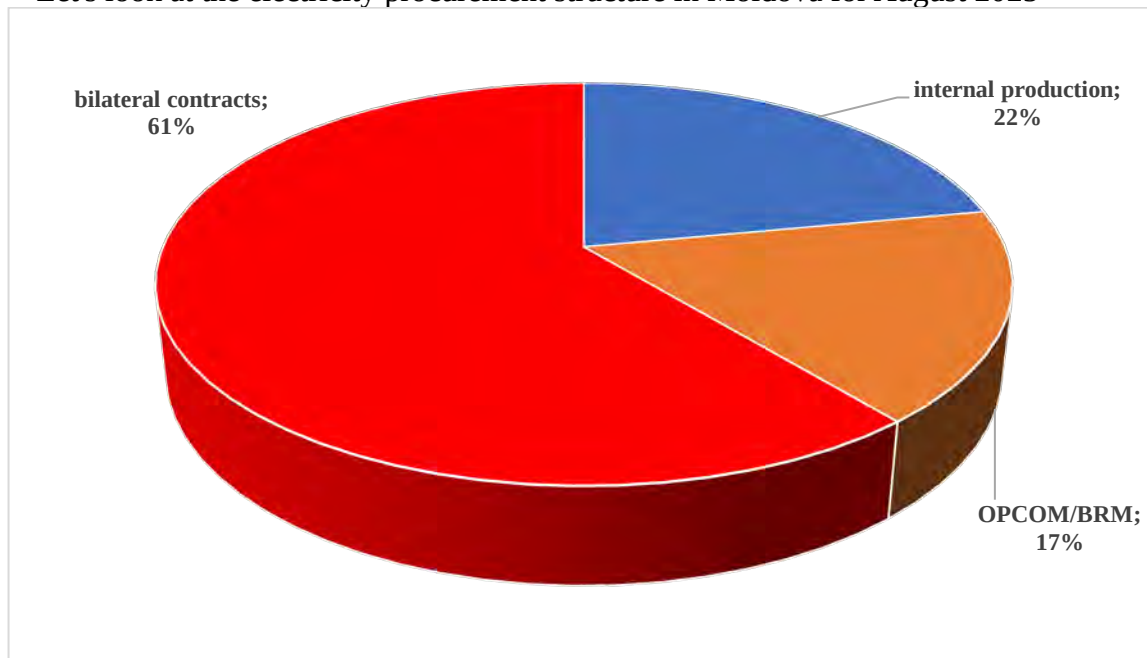


Figure 3. Electricity procurement structure in Moldova for August 2025

Source: authors own study or based on Energocom, 2025

As we can see, 17% of the required electricity was purchased on the exchange. In the winter months, exchange purchases reached up to 25%. The average purchase price in August amounted to €121.17/MWh, while the average exchange purchase price for 2024 was €200/MWh. Considering that the pace of renewable power plant deployment in Moldova will continue, the country could reach the European curtailment level of 3%.

Table 6. Savings in case of reduction of purchases on the electricity exchange through the use of accumulated energy.

Indicators	Meaning
Estimated production from renewable energy sources according to the latest capacity, MW	1 341 000
Curtailement of RES generation (%)	3%
Average purchase price in August 2025 EUR/MW	121,17
The purchase price on the exchange is 2024 euros/MW.	200
Calculated curtailement of generation, MW	40 230
Savings in case of reduced purchases on the exchange, EUR	8 046 000
Savings in case of reducing purchases on the exchange and not selling abroad at the average purchase price, EUR	3 171 331

Source: own work based on cned.gov.md, logos-pres.md, Energocom.md, MyBusiness.md, ener-gy.com.ua, www.llnl.gov, solar.md, e-solarpower.ru

As we can see from the table, with the current RES capacities and applying the European curtailement limits, we obtain a production curtailement in MW. Considering that these volumes are purchased by Moldova during peak hours on the exchange, storing the excess energy in energy storage systems during periods of overproduction and then using it during peak consumption hours would result in savings of 8 046000 EUR.

If Moldova exports the surplus energy to neighboring countries and we use the country's average purchase prices for the calculation, storing this energy and subsequently using it during peak hours would result in savings of 3 171 331 EUR.

3.Conclusion

The growth of renewable energy sources in Moldova is accompanied by an increasing imbalance between electricity production and consumption due to the variability of solar and wind generation. The limited flexibility of the national power system and high dependence on imports make this issue particularly critical.

The deployment of energy storage systems (ESS) allows for smoothing fluctuations in generation, enhancing grid resilience and economic efficiency by reducing losses from overproduction and price drops. With ESS, excess energy is stored, which increases the effectiveness of investments in renewable energy. Losses in the network are reduced, as ESS can be installed locally near consumers. ESS act as “reserve capacity,” stabilizing frequency and voltage in the grid. They decrease dependence on external supply (which is particularly important for Moldova, given its high import dependency) and improve supply reliability for enterprises—resulting in fewer outages and more stable prices. International experience shows that ESS significantly reduce curtailement and contribute to lowering negative electricity prices.

For Moldova, the use of ESS could save millions of euros annually, optimize electricity consumption and purchases, enhance the competitiveness of the renewable energy sector, and accelerate the country's integration into the European energy market.

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ENERGY VULNERABILITY - A STRUCTURAL DETERMINANT OF LIVING STANDARDS IN THE REPUBLIC OF MOLDOVA

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Abstract: This study analyzes the evolution of energy vulnerability in the Republic of Moldova from 2020 to 2023 and assesses its impact on the population's standard of living. Using a mixed methodological approach based on data from the Household Budget Survey (HBS), the research demonstrates that energy vulnerability has become a fundamental structural determinant of quality of life. The results highlight an increase in the energy burden from 14.5% in 2020 to 15.2% in 2023, exceeding common international affordability thresholds. Rural-urban disparities have significantly widened, with rural areas reaching a critical energy burden of 17.0%, compared to 13.7% in urban areas. The multidimensional analysis reveals that energy vulnerability exerts systemic negative effects on public health, educational performance, economic productivity, and social cohesion. The study concludes that energy vulnerability is a structural problem that exacerbates social inequalities and requires urgent and differentiated public policies focused on energy efficiency, financial support, and infrastructure development.

Keywords: energy vulnerability, energy poverty, standard of living, energy efficiency, social equity, Republic of Moldova.

JEL Classification: Q40, I32, Q48, O18

Introduction

Access to energy is one of the central pillars of human and economic development. Without energy, modern societies cannot function. However, major challenges remain globally: according to the latest available data, more than 770 million people still lack access to electricity, and around 2.3 billion use polluting fuels for cooking and heating (IEA, 2023). Even in developed economies, the problem persists. In the European Union, in 2023, 9.2% of citizens reported being unable to adequately heat their homes, a slight decrease from 10.6% in 2022 (Eurostat, 2023).

In the specialized literature, these difficulties are analyzed through the concepts of “energy vulnerability” and “energy poverty.” They describe the situation of households that do not have access to adequate energy services at affordable costs (Thomson & Bouzarovski, 2019). In low-income countries, the causes lie primarily in the lack of infrastructure and financial resources. In transition economies, such as the Republic of Moldova, energy vulnerability is determined by price volatility, income inequality, and the poor quality of the housing stock (Balan, 2024).

The link between access to energy and living standards is direct and strong. Insufficiently heated homes mean not only discomfort but also health problems. High energy costs reduce disposable income for other needs, affecting education, social participation, and the economic stability of households (OECD, 2020). The analysis of these aspects is more relevant than ever, given repeated energy crises, the impact of the conflict in Ukraine, intensified climate change, and the pressure of the transition to green energy.

The Republic of Moldova is a relevant example due to its structural specifics: external dependence on energy exceeding 70% of total consumption, low household incomes, and a

housing stock with low energy efficiency. All these factors increase the risk of energy poverty and amplify the effects of energy vulnerability on quality of life.

This study aims to analyze the evolution of energy vulnerability in the Republic of Moldova during 2020–2023 and to assess its impact on living standards. It also seeks to identify the main causal mechanisms and to formulate public policy recommendations that can reduce the risk of energy vulnerability and support the transition to a more resilient, equitable, and sustainable energy system.

Methods and Materials

The study is based on a mixed methodological approach, combining quantitative and qualitative analysis. On the quantitative side, the research uses data from the Household Budget Survey (HBS) for the period 2020–2023, provided by the National Bureau of Statistics of the Republic of Moldova, as well as reports and statistics from international reference institutions such as the IEA (International Energy Agency), Eurostat (Statistical Office of the European Union), OECD (Organisation for Economic Co-operation and Development), and WHO (World Health Organization), using the most up-to-date public information available (2023).

The qualitative dimension is ensured by integrating the conceptual framework developed in contemporary specialized literature. This allows for a multidimensional interpretation of the phenomenon and a complex assessment of its social, economic, and public health implications.

Results and Discussion

The concept of energy vulnerability has evolved over the past three decades, alongside the social, economic, political, and technological changes that have shaped contemporary societies. The first research focused on the notion of fuel poverty, introduced in the United Kingdom in the early 1990s. Brenda Boardman (1991) defined the phenomenon as the situation in which a household is forced to allocate more than 10% of its income to ensure a minimum level of thermal comfort.

Subsequently, the specialized literature expanded this initial definition, highlighting the multidimensional and dynamic nature of energy vulnerability. Bouzarovski and Petrova (2015) argue that the analysis should not be limited to financial aspects but should also include households' exposure to structural and conjunctural risks related to accessibility, quality, and the security of energy supply.

From this perspective, energy vulnerability can be understood as the result of the dynamic interaction between four fundamental dimensions:

- (i) Physical access to adequate and reliable energy infrastructure;
- (ii) Economic capacity to procure and use the necessary energy services;
- (iii) Households' adaptability to external shocks (such as price fluctuations, supply interruptions, extreme weather events);
- (iv) Contextual factors, including housing thermal quality, regulatory framework, and regional climatic characteristics.

Therefore, energy vulnerability cannot be measured by a single quantitative indicator. It must be seen as a complex outcome of the interaction between economic, social, technical, political, and environmental factors. This approach provides a more comprehensive understanding of the phenomenon and facilitates the development of coherent public policies capable of addressing both the structural and the conjunctural causes of energy insecurity.

Analysis of energetic vulnerability in the Republic of Moldova

The analysis based on Household Budget Survey (HBS) data for the period 2020–2023 shows that the expenditure structure of Moldovan households has changed substantially under the influence of the regional energy crisis and accelerated inflation.

The share of expenditures on housing, water, electricity, and gas has continuously increased, reaching 17.6% of household budgets in 2023, up by 1.5 percentage points compared to 2020.

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Table 1. Structure of average monthly consumption expenditures per adult equivalent (2020–2023)

Expenditure categories	2020 (lei/%)	2021 (lei/%)	2022 (lei/%)	2023 (lei/%)
Total expenditures	2.791,1 / 100,0	3.039,5 / 100,0	3.711,9 / 100,0	4.248,4 / 100,0
Food and non-alcoholic beverages	1.215,0 / 43,5	1.274,2 / 41,9	1.525,0 / 41,1	1.685,5 / 39,7
Housing, water, electricity, gas	449,9 / 16,1	461,1 / 15,2	604,1 / 16,3	747,5 / 17,6

Source: HBS, NBS. Author's processing.

In absolute terms, utility expenditures increased by 66.15% in just three years. Meanwhile, the share of food expenditures fell from 43.5% in 2020 to 39.7% in 2023. This decrease does not necessarily reflect a healthy diversification of consumption but rather a forced adjustment of budgetary priorities, caused by the faster growth of non-food service costs.

To evaluate energy vulnerability more directly, one can calculate the share of household disposable income spent on energy.

Table 2. Energy burden (% of income), total and by residence area (2020–2023)

Year	Disposable income (lei)	Energy expenditures (lei)	Total energy burden (%)	Urban (%)	Rural (%)
2020	3.096,6	449,9	14,53	14,7	14,3
2021	3.510,1	461,1	13,13	12,6	13,7
2022	4.252,6	604,1	14,2	13,0	15,4
2023	4.915,6	747,5	15,21	13,7	17,0

Source: HBS, NBS. Author's processing.

The results show that the energy burden rose from 14.5% in 2020 to 15.2% in 2023, exceeding internationally recognized affordability thresholds (usually between 10% and 15%) (IEA, 2022; Thomson & Snell, 2013).

A pronounced structural gap is noticeable between urban and rural areas. While urban households allocated on average 13.7% of income to energy in 2023 (a still manageable level), rural households reached a critical level of 17%.

This difference is explained by several structural factors:

- Lower incomes: 3,928.7 lei in rural areas versus 6,228.5 lei in urban areas;
- Energy-inefficient housing stock, predominantly old and individual;
- High dependence on traditional fuels (wood, coal), subject to volatile prices;
- Limited access to modern natural gas networks and sustainable energy alternatives.

Moreover, the urban–rural gap has widened rapidly: while in 2020 the difference in energy burden was only 0.4 percentage points, in 2023 it increased to 3.3 percentage points. This trend reflects the deepening of social and economic inequality in access to energy.

The analysis of energy burden distribution across income quintiles shows the true scale of energy vulnerability in the Republic of Moldova. The results confirm that the phenomenon affects not only the very poor but also significant segments of the middle-income population.

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Table 3. Distribution of energy burden by income quintile (2023)

Income quintile	Average income (lei)	Energy burden (%)	Degree of vulnerability
Q1 (lowest 20%)	1.850	23,1	Critical
Q2	2.890	18,4	Severe
Q3	3.920	15,8	Moderate
Q4	5.340	12,9	Acceptable
Q5 (highest 20%)	8.970	8,7	Low

Note: Vulnerability degree classified according to international thresholds: Critical (>20%), Severe (17–20%), Moderate (15–17%), Acceptable (10–15%), Low (<10%). The internationally recognized minimum affordability threshold is between 10% and 15% (IEA, 2022; Thomson & Snell, 2013).

Source: Author’s calculations based on HBS, NBS (2023).

The data highlight deep inequality: households in the poorest quintile (Q1) allocate 23.1% of income to energy, while those in the top quintile (Q5) spend less than 9%. In absolute terms, although wealthier households pay more for energy (780.4 lei vs. 427.4 lei), their relative burden is nearly three times lower.

More worrying is that the first three income quintiles (60% of the population) fall within the zone of energy vulnerability, with an energy burden exceeding the 15% affordability threshold. This demonstrates that energy vulnerability is no longer a marginal issue but a structural challenge affecting the majority of households.

The quintile analysis has revealed widespread vulnerability at the national level. A complete evaluation requires contextualizing Moldova’s situation in relation to other countries in the region. Data for 2023 show that Moldova stands above the European average, with an average energy burden of 15.2%, which places 31.4% of the population in energy poverty. For comparison, Romania and Bulgaria report lower values (12.8% and 11.3%, respectively).

Table 4. Energy vulnerability indicators, regional comparison (2023)

Country	Average energy burden (%)	Population in energy burden (%)
Republic of Moldova	15,2	31,4
Romania	12,8	23,1
Bulgaria	11,3	20,8
EU-27 average	8,9	16,3

Source: Eurostat (2023), IEA (2023), national calculations.

This comparison confirms the structural character of energy vulnerability in the Republic of Moldova. The situation is more difficult than in neighboring countries with similar economic profiles, Romania and Bulgaria, and far above European standards, underscoring the urgent need for rapid and tailored public policies.

The rise in energy vulnerability in the Republic of Moldova produces multiple and deeply interconnected effects on living standards. The phenomenon influences key areas of human well-being: health, education, the economy, and social cohesion.

Impact on Population Health

Living conditions characterized by inadequate thermal comfort and poor indoor air quality, typical of poorly insulated buildings, are associated in the specialized literature with a higher incidence of respiratory, cardiovascular, and mental health disorders.

A large European study published in the European Journal of Public Health (Champagne et al., 2023), which synthesized data from 35 scientific articles (2000–2022), identified a significant correlation between energy poverty and multiple health conditions. These include poor mental health (anxiety and depression), non-communicable physical diseases (cardiovascular and respiratory), communicable diseases, and excess winter mortality.

Children and the elderly are identified as particularly vulnerable to the adverse health effects caused by energy poverty (Champagne et al., 2023).

In the Republic of Moldova, where over 70% of residential buildings have low energy efficiency (Ministry of Energy of the Republic of Moldova, 2023), these effects are amplified, impacting both life expectancy and the number of healthy life years.

Impact on Education

Energy vulnerability has a profound effect on the educational process, with children among the most affected. Inadequate thermal comfort and poor lighting conditions in households create a hostile learning environment with direct and long-term consequences.

Research shows that energy poverty affects children's academic performance and well-being through several mechanisms. A study conducted in Barcelona (2021) highlighted that energy poverty can affect children's learning and socialization, while long-term health problems and lower educational achievement may, in turn, reduce employment opportunities and economic well-being in adulthood-thus reinforcing health inequalities and perpetuating cycles of precariousness that can affect future generations (Champagne, 2023).

Negative effects on education include: (i) *impaired capacity to study at home*, due to inadequate environmental conditions; (ii) *higher school absenteeism*, caused by health issues to housing conditions (Champagne, 2023); (iii) *lower academic performance*, which becomes a mechanism for perpetuating vulnerability and inequality (Champagne, 2023).

Thus, analyses confirm that energy vulnerability is not just a matter of comfort but a critical factor reducing long-term educational performance, limiting social mobility, and perpetuating poverty cycles.

Economic impact

Energy vulnerability generates substantial costs both at the household level and for the national economy. At the microeconomic level, households allocate an increasing share of income to energy (15.2% in 2023), reducing resources available for healthy food, preventive healthcare, or education. Health problems linked to inadequate housing conditions also lead to reduced productivity and work absenteeism.

At the macroeconomic level, the healthcare system bears additional costs for treating preventable diseases associated with energy poverty, while the public budget faces increasing pressure from the expansion of social support programs designed to cover utility bills.

Impact on social cohesion

Energy vulnerability acts as a factor of social polarization, amplifying structural disparities between urban and rural areas as well as across income groups. These inequalities increase the risk of social exclusion and economic marginalization.

Inequitable access to energy is not only an economic issue but also one of *fairness and social justice*. Its effects are manifold: (i) fragmentation of communities and reduced social cohesion, (ii) perpetuation of inequalities and limited social mobility, (iii) erosion of public trust in institutions.

Thus, energy vulnerability must not be regarded merely as a consumption deficit. It represents a structural determinant of social stratification and quality of life, with profound and lasting implications for sustainable human development.

Conclusions

The empirical analysis confirms that energy vulnerability is a key determinant of living standards in the Republic of Moldova, with systemic and long-term effects on population well-being. The increase in energy burden by more than 40% between 2020 and 2023 and the widening of rural-urban disparities (from 0.4 to 3.3 percentage points) reveal a deep structural problem that goes beyond explanations based solely on conjunctural shocks.

Energy vulnerability is no longer limited to poor households but also affects significant segments of the middle class. The expansion of the phenomenon is driven by structural

macroeconomic factors, including the effects of the conflict in Ukraine on regional energy markets. These realities require differentiated public policies that take into account vulnerable social groups.

The rural environment faces a severe energy crisis (17.0% burden compared to 13.7% in urban areas), driven by inadequate infrastructure, dependence on traditional fuels with volatile prices, and lower incomes. This situation calls for urgent, targeted, and territorially differentiated interventions.

The upward trend in energy vulnerability shows that the phenomenon is structural, not conjunctural. It must be understood as a fundamental determinant of social stratification and limited economic mobility, and not treated as a temporary adjustment issue.

Combating energy vulnerability must become a major national priority. It is not merely a technical matter of energy access but a question of social equity, national cohesion, and human security.

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BARRIERS AND ENABLERS OF ESG ADOPTION: A CONCEPTUAL PERSPECTIVE

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Abstract: The Environmental, Social, and Governance (ESG) adoption has evolved from a peripheral concern to a strategic imperative in contemporary organizational practice. While the discourse around ESG has matured, the lived reality of implementation remains fragmented, often shaped by a shifting constellation of regulatory pressures, cultural constraints, market expectations, and internal capacity. This article explores ESG integration not as a linear process but as a dynamic, adaptive negotiation – marked by both friction and momentum. Drawing on insights from institutional theory, organizational behaviour, and strategic management, the study maps the interplay between key barriers – such as regulatory ambiguity, financial constraints, data insufficiencies, and organizational inertia – and emerging enablers including digital innovation, leadership commitment, stakeholder pressure, and policy scaffolding. Rather than presenting a prescriptive framework, this work foregrounds the interpretive processes through which firms navigate the ESG complexity. It highlights the conditions under which ESG initiatives are resisted, reframed, or embedded into core strategy. In doing so, the article contributes a more nuanced, systems-aware understanding of ESG adoption across contexts. Implications are outlined for policymakers, who are urged to offer clearer regulatory signals and financial mechanisms; for researchers, who are encouraged to examine ESG integration through longitudinal, sector-specific, and micro-level lenses; and for practitioners, who are challenged to align ESG ambition with operational reality. Ultimately, the findings underscore that ESG transformation is not guaranteed by mandates or market signals alone, but shaped by how firms interpret, improvise, and institutionalize sustainability under conditions of uncertainty.

Keywords: Corporate Culture; Social Responsibility, Corporate Finance and Governance, Organizational Behaviour, Sustainability.

JEL Classification: M14, O16, D23, Q56.

1. INTRODUCTION

What once lived at the periphery of boardroom conversations – climate disclosures, supply chain equity, governance codes – is now moving closer to the centre. ESG is no longer fringe. It is becoming structure. The rise of ESG integration reflects more than just a normative pivot in corporate discourse. It signals a broader reconfiguration of what constitutes strategic value in an increasingly volatile, resource-constrained, and socially complex world. ESG is no longer a matter of brand alignment or Corporate Social Responsibility (CSR) optics. It is a risk framework. A strategy lens. A new way of understanding performance – long-term, multi-stakeholder, and interdependent.

Eccles et al. (2014) investigated the effect of corporate sustainability on organizational processes and performance. The findings initially indicated that ESG factors might hold financial significance, and the study demonstrates that organizations focused on sustainability tend to achieve substantially better long-term outcomes – both in stock performance and in accounting metrics – compared to their peers. Nowadays, the evidence is mounting – but the implementation remains uneven. Many firms recognize the imperative, some even the opportunity. Yet they struggle, because ESG adoption is nonlinear and complex, it unfolds in a landscape riddled with friction – regulatory ambiguity, temporal misalignment, short-term investor expectations, internal knowledge gaps, and cultural inertia. Some barriers are loud. Others are ambient. Not all are visible

on the surface, and they rarely operate in isolation. But it is not just resistance. Enablers exist. And they are growing louder – policy shifts, technological advances, stakeholder demand, digital infrastructure. Still, the equation is unstable. The presence of enablers does not negate the friction. Firms must interpret, adapt, and improvise.

This paper does not treat ESG adoption as a linear path or a checklist to be completed. Instead, it examines the underlying tensions – how barriers emerge and evolve, how enablers shape new possibilities, and how firms manoeuvre in between. Drawing from institutional theory, sustainability governance, and organizational change literatures, the discussion weaves together theoretical framing and practitioner logic to explore ESG adoption as a situated, adaptive, and often nonlinear process. The aim is simple – not to offer prescriptive solutions, but to better understand how ESG becomes embedded, and what gets in the way, because that is where the real work is – where ambition meets constraint. Where practice gets political, and where firms – those that choose to – start to change.

2. METHODOLOGY

This study adopts a qualitative, exploratory methodology grounded in conceptual synthesis. Drawing on interdisciplinary academic literature, industry reports, and documented case studies, it examines the dynamic interplay between barriers and enablers of ESG adoption across sectors and geographies. Rather than isolating variables, the analysis traces patterns, tensions, and shifting conditions under which ESG practices are interpreted and institutionalized. The selected sources were thematically coded to identify recurring frictions – regulatory, financial, cultural – and enabling forces such as leadership alignment, stakeholder pressure, and technological infrastructure. Emphasis was placed on understanding ESG not as a static checklist, but as a context-dependent and adaptive process. The aim is to offer a theoretically informed conceptual framework that reflects the complex and situated nature of ESG integration.

3. BARRIERS TO ESG ADOPTION

Despite the growing emphasis on sustainability, several significant barriers to ESG adoption remain. These barriers are often interrelated and stem from both external pressures and internal organizational constraints.

Regulatory Ambiguity and the Fragility of ESG Integration

It starts, often, not with bad intentions – but with ambiguity. One of the most enduring impediments to the systemic adoption of ESG principles lies in the absence of regulatory coherence. Not merely incoherence – but fragmentation. A 2024 MDPI study highlights how ESG-financing relationships are compromised by fragmented regulatory oversight and inconsistent ESG rating systems, particularly in emerging economies.

The European Union, through instruments such as the EU Taxonomy, the Non-Financial Reporting Directive (NFRD), and more recently the Corporate Sustainability Reporting Directive (CSRD) and the Corporate Sustainability Due Diligence Directive (CSDDD), has sought to articulate a unified regulatory vision. A vision, yes – but one that operates in isolation. ESG regulation continues to develop asymmetrically, shaped by divergent political economies and sectoral logics. Firms operating across borders must navigate inconsistent reporting obligations, misaligned implementation timelines, and unclear enforcement mechanisms. Leuz (2010) argues that convergence of reporting practices is also unlikely due to persistent enforcement differences around the world, underscoring the fragmented regulatory landscape firms must navigate.

Regulatory uncertainty compounds this. And it does so quietly. Firms do not just comply; they calculate. They forecast. But how do you forecast compliance obligations when policies shift – suddenly, sporadically, and often without warning? The irony is sharp – just as firms begin building internal ESG infrastructures, the very scaffolding of regulatory support begins to erode. Take the recent Omnibus proposal in the EU. On paper, a fine-tuning exercise. In practice? A recalibration of ambition. Reporting thresholds loosened. Due diligence softened. Regulatory

pressure – formerly a catalysing force – now recedes. And with it, the coercive and normative institutional logics that once drove internal organizational change.

The rollback does not simply reduce compliance burdens. It signals deprioritization. And organizations listen. Strategy pivots. Resources shrink. ESG teams dissolve or are absorbed elsewhere. Institutional memory fades. Subtly, then all at once.

From an institutionalist lens, this is a disruption of the enabling environment. The regression in mandatory compliance mechanisms undermines the legitimacy of ESG as a governance priority. What follows is not merely operational confusion – but a deeper discursive instability. When the rules grow quieter, so do the commitments. Policy harmonization, then, is necessary – but not sufficient. Without regulatory ambition, without credible enforcement, harmonization becomes noise. A signal without substance.

What remains is this: ESG integration is not linear. It is fragile, contingent, relational, and highly susceptible to the political economy of regulation. To sustain it, firms require more than guidance – they need clarity. Without clarity, ESG remains vulnerable to rollback, reframing, or even strategic abandonment.

The Financial Realities Behind ESG Implementation

It is not just about values. It is about resources. And often, the lack of them. ESG transformation does not come cheap. It demands time, expertise, systems, capital. For many firms – especially small and medium-sized enterprises (SMEs) – this is not just a hurdle. It is a wall. High. Rigid. Unyielding. ESG integration calls for robust data infrastructures, frequent audits, workforce training, cross-functional governance mechanisms. None of this comes free. None of it fits easily into lean budgets. Particularly when ESG still competes internally with “core business priorities.”

For instance, when it comes to “greening” a supply chain, or making your supply chains more sustainable, it is not a matter of replacing one vendor with another. It is systemic. You audit upstream. You monitor emissions. You redesign logistics. Then comes reporting. Alignment with frameworks like the Global Reporting Initiative (GRI), the Task Force on Climate-Related Financial Disclosures (TCFD), CSDDD or the CSRD demands tech capacity, ESG literacy, and considerable financial resources. Even when the intention exists, the financial resources are often not available.

Especially in emerging economies, green financing remains elusive for firms that have not yet established ESG as a strategic asset. Instruments such as green bonds and ESG-linked loans exist, but access is asymmetric – larger firms with established reputations dominate the landscape, while smaller private players are often sidelined due to market and structural barriers.

Organizational Culture as ESG’s Silent Saboteur

Despite the proliferation of ESG frameworks, reporting tools, and incentive structures, resistance to ESG often originates not from lack of resources or policy ambiguity – but from internal culture. It is a quiet undercurrent – harder to measure, and even harder to move. ESG is still largely perceived as external. As optics, compliance or something done for the market, or to appease regulators. Not as a core value driver. Not as strategy. Because of this, integration fails to take root. The initiatives remain adjacent to “real” business. Tacked on, decorated with KPIs, but not embedded in purpose.

The underlying culture – especially in firms shaped by quarterly cycles and margin pressure – tends to default to short-termism. Corporate sentiment, investor holding data, and secular trends underscore the short-term pressures confronting firms and the strategic compromises they are often forced to make (Tang et al., 2016). Companies conditioned over decades to optimize for financial performance may find it cognitively, even emotionally, difficult to reframe value beyond shareholder returns.

This resistance is rarely overt. It hides behind familiar questions: What is the return-on-investment? Who owns this? How does this fit with operations? When ESG initiatives are interpreted as distractions rather than enablers, even the most well-crafted strategies face breakdowns. Not through sabotage, but through disengagement.

The dominant organizational discourse often frames ESG as an added task. A burden. Another dashboard to maintain. Rarely is it framed as innovation, resilience, or risk mitigation. And those framing matters. Because culture is not changed by policy – it is changed by narrative, and if the narrative does not evolve, neither will practice.

What emerges is not an absence of capacity – but an absence of belief. In many ways, the most dangerous resistance is not loud. It is ambient. Unquestioned. A company might have ESG officers, reports, board committees – and still fail to internalize sustainability as a strategic imperative. Why? Because belief systems do not shift just because governance structures say they should.

To unlock real integration, firms must invest not just in ESG systems – but in the reconfiguration of meaning. ESG needs to be unlearned as a burden. Relearned as a lens. A way of seeing value, risk, opportunity. Not additional, but rather foundational.

Until that shift occurs – until organizations stop asking why ESG and start asking why not – cultural inertia will remain ESG’s quietest, and most persistent adversary.

The Knowledge Deficit Undermining ESG Integration

Commitment is not the issue. Not always. Plenty of firms want to engage ESG seriously. Strategically. But wanting is not knowing, and knowing – truly knowing – requires more than broad values and good intentions. It requires expertise and data. Neither of which, frankly, are evenly distributed across the corporate landscape.

Many organizations, even those with formal ESG strategies, lack the technical literacy to map, measure, or manage ESG risks at scale. The capacity gap is wide. The problem is not just individual knowledge – it is institutional know-how. ESG is inherently interdisciplinary. It spans environmental science, regulatory interpretation, social impact evaluation, and financial modelling. Few firms have that breadth internally, and fewer still know how to integrate it across functions.

Then comes the data. Or rather, the lack of it. Even those with ambition often find themselves operating in an informational fog. Fragmented disclosures. Inconsistent methodologies. Self-reported metrics without verification. Some firms report carbon intensity per unit of revenue. Others per product line, or not at all. There is no common language – just parallel dialects.

In many emerging markets and developing economies (EMDEs), the lack of granular data, technical capacity, and comprehensive taxonomies undermines the effective implementation of sustainable finance frameworks, leaving financial institutions with broad discretion in climate risk reporting and increasing the risk of greenwashing due to inconsistent disclosures (World Bank, 2023).

The benchmarking also becomes problematic. Firms cannot compare meaningfully to their peers. And even less so across borders or sectors. How do you track performance when the yardstick keeps changing? Without clean, reliable data, decision-making defaults to narrative. ESG progress becomes rhetorical rather than measurable. Firms end up telling stories about impact – because they cannot prove it.

This lack of data-driven insight feeds a larger problem: strategic vagueness. Without robust indicators, firms cannot set credible targets. Cannot monitor outcomes. Cannot improve. They circle and drift. ESG becomes a reputational gesture rather than a governance tool. There is also risk here – a growing one. Regulatory bodies, particularly in the EU are beginning to demand auditable, standardized ESG disclosures. Firms lacking the infrastructure for that will not only struggle with compliance – they will lose credibility.

In short, without expertise and data, sustainable reporting becomes unreliable. A performance – well-intentioned, but ungrounded. And this is the real danger. That ESG becomes more about language than impact. That strategies get built on assumptions. That boards approve initiatives they cannot interrogate. That progress becomes impossible to verify – or worse, easy to fake.

Addressing this gap requires more than training. It demands epistemic change. Firms must shift from believing in ESG to knowing ESG – its systems, metrics, and risks. That shift will not happen overnight. But without it, integration remains performative, shallow, and vulnerable.

Reconciling Temporal Logics in ESG Strategy

This is the paradox. And it is everywhere: firms are told to think long-term. Build sustainable models. Decarbonize. Diversify. Engage stakeholders meaningfully. But then – it is earnings season again. The quarterly clock ticks. Investors watch margins. Boards review returns. Analysts look for growth curves. And sustainability? It waits quietly. Or worse – gets reframed as “too long-term” to prioritize in the short term.

This is not new, nor rare. It is structural. The friction between short-term financial imperatives and long-term ESG trajectories constitutes one of the most enduring barriers to sustainability integration. The problem is not a lack of awareness. Most executives get it – conceptually. ESG is risk management. Reputation insurance. A future-proofing mechanism. They nod in agreement during panels and pledge alignment during strategic offsites. But when ESG proposals reach the budget table, they often meet a more immediate logic: return-on-investment within 6–12 months. If it does not fit that window, it gets delayed. Deferred. Deprioritized.

This dynamic is not entirely irrational. Many sustainability investments – climate adaptation, circularity models, social equity initiatives – are capital-intensive. Payback is long and often diffuse. Benefits materialize slowly, sometimes invisibly, across departments or years, and without clear metrics tying ESG performance to financial outperformance, it is easy to default to short-termism.

But this bias has consequences – it creates organizational dissonance. Long-term ESG goals sit on strategy decks while short-term KPIs shape everyday decisions. Sustainability teams plan for 2030. Meanwhile, procurement pushes for immediate cost savings. Legal advises against transparency. Marketing greenlights a campaign – but will not fund product redesign. The system fragments. Consultants call this misalignment. Academics – temporal dissonance. Either way, it undermines coherence. Makes ESG look optional and disposable.

What emerges then is a cultural tension. ESG becomes something the firm aspires to, but not something it is structurally enabled to pursue. The firm wants to be future-oriented. But it is institutionally tethered to the now. Fixing this is not easy. It is not just about changing incentive structures – though that helps. It is about reconfiguring how value is understood. Expanding what counts as a “return.” And redefining time not just as a constraint – but as an asset.

Because the truth is, ESG does not compete with short-term success, not inherently, but without mechanisms that bridge the two – shared metrics, cross-functional ownership, phased investments – it will continue to be framed that way. And so, many firms hover in the in-between. Not resistant. Not fully committed. Waiting. Watching. Caught between the urgency of now and the necessity of later. That, too, is a risk. One harder to quantify – but critical to manage.

4. ENABLERS OF ESG ADOPTION

Toward an Embedded Practice of ESG

The barriers to ESG adoption are structural, cultural, and financial. We have outlined them – tight budgets, limited data, strategic inertia, temporal friction. However, that is not the whole picture. Because even amid the drag, there are sparks. Frictions create heat, but they also reveal openings.

The ESG transition – however complex – is not without enablers. And these enablers matter. They are not panaceas. They do not remove complexity. But they shift it and make it negotiable. Some of these forces come from outside the firm, while others – from within.

Externally, the most salient enabler is regulation. When clear, credible, and enforced – regulatory frameworks can become accelerants. Not merely through coercion, but by offering legitimacy. A signal to markets that sustainability is no longer a differentiator – but an expectation. And when that expectation is consistent across sectors and borders, firms respond strategically – sometimes even proactively.

Investors, too, are reconfiguring the field. Through stewardship mandates, ESG screens, and engagement strategies – capital markets are beginning to reward firms that can demonstrate resilience, purpose alignment, and long-term thinking. It is slow, uneven, but the logic is shifting. Not uniformly – but noticeably.

Consumer behaviour – especially among younger demographics also acts as an external pull. Not always rational. Not always loyal – but vocal. And sometimes, visibility is enough to nudge a firm from performative to intentional.

Then, there’s pressure from peers. Industry benchmarking. Voluntary commitments. Even competitive mimicry. No firm wants to be the last one standing without a sustainability report. That is not reputation management anymore. That is strategic negligence.

Internally, leadership commitment is catalytic. Not symbolic leadership. But operational leadership. When top management teams embed ESG into decision-making – not just strategy decks – it reverberates. Through resource allocations. Incentive systems. Hiring priorities.

Digitalization, too, is an emerging enabler. Better data infrastructure means better monitoring, reporting, and forecasting. It reduces friction. Makes ESG more measurable, and measurability, in a corporate context, means manageability.

Organizational learning processes play a role as well. Firms that experiment, iterate, and reflect tend to evolve faster. Not because they get it right at first – but because they create space to adjust. ESG is not a plug-and-play model. It is adaptive. And firms that know how to learn – learn how to sustain.

The Architecture of Alignment: Policy as ESG Catalyst

Firms do not move in isolation. They move when conditions change. And regulation – done right – can change everything. Policy is not just a constraint. It is a scaffolding. A design choice for how sustainable future is built – or not built.

Governments and transnational bodies have become increasingly central in shaping the ESG agenda. Not merely through mandates or compliance structures, but by altering the economic logic that surrounds sustainability. Through targeted incentives – tax relief, grants, blended finance, subsidies – public actors can lower the cost of entry. Especially for those at the margins. Especially for those without ESG infrastructure baked into their models. Porter and Kramer (2011) framed this through the lens of shared value. Policy, here, becomes a tool for correcting market failures. For creating conditions under which doing the right thing is also the efficient thing. Ambiguous rules create noise. They deter action. Firms hedge, delay, over-disclose or underperform – depending on what they think the regulator really wants. Standardized frameworks reduce this friction. They offer structure, a baseline and a shared grammar for ESG.

Initiatives like the GRI, TCFD, and now the International Sustainability Standards Board’s (ISSB) consolidated standards provide this grammar. They do not solve every problem. But they create coherence. That is not trivial, especially in fragmented markets where multinationals operate under multiple, often conflicting regimes. The UN Sustainable Development Goals (SDGs) serve a similar function – normative alignment. They are aspirational, but they also help translate global challenges into local priorities, metrics and into investment logic. What emerges from all this is a

layered ecosystem of influence. Policy as mandate or as a market signal. When done well, it de-risks ESG adoption, normalizes it and even accelerates it.

But – and this is important – supportive policy does not just appear. It requires institutional intent. It requires capacity and follow-through. Without enforcement, even the best-designed frameworks fade into background noise. So, firms pay attention not just to what is written – but to what is enforced. Not just to targets – but to timelines. Not just to ambition – but to accountability. In short, policy is both architecture and choreography. It sets the stage. Provides the cues and if the design is sound, the players – corporate, civic, financial – begin to move in sync. That is when ESG shifts from possibility to probability.

The Market Speaks: External Pressure as an ESG Accelerator

They are watching – the investors, consumers, employees, communities. And the market – it is listening, too. In recent years, the push toward ESG has been less of a drift and more of a pressure build. A steady tightening. Quiet at first. Then louder. Investors started asking different questions. Not just about earnings – about emissions, governance structure and human rights in the supply chain. And they were not just asking – they were reallocating.

Friede et al. (2015) offered empirical grounding for what many in the field already suspected – ESG performance correlates with long-term financial returns. Not uniformly and not always cleanly – but meaningfully enough to move capital. Fast-forward, and ESG-oriented funds are no longer niche.

But it is not just the boardroom that shifted. Consumers, too, began to care. Sustainability stopped being a differentiator – it became a baseline expectation. Brands that failed to align faced more than critique – they faced loss of trust, loyalty, and relevance. In many sectors, especially consumer-facing ones, ESG signals are now interpreted as proxies for quality, ethics, and competence (White et al., 2025)

In short – alignment pays, while misalignment costs. And this creates a feedback loop. Firms attuned to stakeholder sentiment, especially younger demographics, begin to reframe ESG not as compliance, but as strategy, brand equity, or market intelligence. The pressure does not just push – it reveals firms that can listen, adapt and integrate stakeholder voice into operational decisions. Those that cannot? They fall behind, not just reputationally – but structurally.

Market pressure, in this way, is not just an external force. It is interpretive and at times symbolic. It shapes what counts as credible. What counts as forward-thinking. And increasingly, what counts as investable. ESG adoption, then, is no longer optional. Not because of regulation. But because of relevance. And those who understand this – deeply, structurally – are not reacting. They are repositioning.

Leadership as a Catalyst for ESG Integration

It starts at the top – leadership commitment remains among the most consistent predictors of effective ESG adoption. Not symbolic commitment. Not mission statements. But active, resourced, strategic buy-in. Firms with sustainability-literate leadership tend to outperform in ESG maturity. They do not just talk ESG; they structure around it. Set governance routines, allocate capital, redesign incentives. In other words, leadership does not merely guide – it institutionalizes.

But leadership alone is not enough. It must link strategically. ESG initiatives, no matter how ambitious, tend to dissolve without alignment to core financial goals. That is the crux. If sustainability stays on the sidelines – separate from performance reviews, capital budgeting, or product design – it stays symbolic, peripheral and eventually dispensable.

ESG factors are not only risk mitigators – they are opportunity generators. When understood properly, they unlock new revenue streams, reduce volatility, improve stakeholder trust. All of which are financial outcomes, just with longer feedback loops. Still, this does not happen by accident. Alignment requires intentional design. It means KPIs that connect ESG metrics to

executive compensation. Board oversight that understands biodiversity and bottom lines. CFOs who can model carbon scenarios alongside revenue forecasts.

And perhaps most critically – it means leaders who are willing to sit with uncertainty. ESG is not precise. It is evolving. Standards change. Stakeholders shift. But firms with adaptive leadership tend to navigate that fluidity better. They do not wait for the perfect framework – they act, learn, and adjust. This form of leadership is not loud. Often not even visible. But you can see its fingerprints – across budgeting processes, hiring practices, supplier choices, reporting structures. It is slow work. Cultural. Systemic. Often nonlinear. But over time, it shifts the centre of gravity. ESG becomes embedded, and once embedded, it reshapes everything.

Technology as ESG Enabler

Sometimes change does not come from policy or purpose. It comes from tools. From infrastructure. From the silent systems that make action possible and scalable. Technology is doing just that. While regulatory ambition and leadership alignment matter, the operationalization of ESG – its real-world execution often hinges on something more mechanical – tools, platforms, digital architecture. Bocken et al. (2014) pointed to this early. The emergence of cleaner energy systems, closed-loop production models, smart reporting technologies – at that time, these were innovations. Now, they are fast becoming prerequisites.

Take renewable energy. Once niche – now, increasingly cost-competitive. Solar, wind, geothermal – technologies that once signalled climate virtue now signal financial prudence. This is not about optics – it is about operational efficiency. About decoupling energy risk from volatility. About reducing scope 2 emissions without having to restructure entire business models. Or sustainable production practices – additive manufacturing, zero-waste design, bio-based materials are reshaping what is feasible, and for some sectors – what is profitable. Efficiency no longer just means lean.

And then there is data – the digitalization of ESG has been transformative. Platforms for tracking carbon intensity, AI tools that scrape supply chain data for human rights risks, blockchain experiments in traceability. All of it aimed at one goal – making sustainability measurable, verifiable, and comparable.

Much of ESG's early phase was guesswork, good intentions paired with bad data, or no data at all. Now, technological tools are closing that gap. They reduce the cost of collection, improve consistency, and allow firms to engage in dynamic benchmarking, scenario modelling, even predictive risk assessment. This matters, because if ESG is to move beyond reporting theatre – beyond sole reports with glossy images and little accountability – it needs precision. Tools bring that. They don't solve complexity, but they structure it.

And yet technology is not neutral. It does not scale equally. Not every firm can afford the latest emissions dashboard. Or integrate machine learning into their ESG forecasting. Digital asymmetry is real, and if we are not careful, it will replicate the same inequalities ESG claims to address. Technology is an enabler only if governance keeps up. Only if access expands. Only if firms learn to use these tools not just to monitor performance – but to rethink it. Because when ESG is digitized, it stops being abstract. It becomes operational, tangible and tracked. And once that happens – once sustainability is coded into the everyday logic of enterprise – it becomes harder to ignore. Harder to fake, and, ultimately, harder to avoid.

5. IMPLICATIONS FOR POLICY, FUTURE RESEARCH, AND PRACTICE

The evolving landscape of ESG adoption reveals not only the contours of institutional inertia but also the actionable spaces where change is most feasible. For policymakers, the implications are direct. Regulatory clarity goes beyond compliance – it is a key enabler for ESG adoption. Ongoing uncertainty, fragmented frameworks, and shifting policies still hinder meaningful ESG integration. Policymakers must focus not only on increasing disclosure obligations but on crafting frameworks that are predictable, enforceable, and proportionate across firm sizes and sectors.

Financial incentives – targeted, accessible, and linked to clear outcomes can accelerate uptake, particularly among SMEs and firms in resource-constrained contexts.

Equally vital is the role of public infrastructure in supporting ESG data systems. Harmonizing reporting standards, facilitating access to ESG-related knowledge, and investing in green innovation ecosystems will be essential to scale both compliance and creativity. ESG regulation should not be designed only to correct behaviour but to invite participation in broader systems transformation.

For academic research, there remains a significant opportunity to map how ESG is internalized across different organizational typologies, sectors, and geographies. Future studies should focus on unpacking the micro-processes of ESG institutionalization – how ESG values are interpreted, translated, and sometimes resisted within firms. Longitudinal case studies and cross-sectoral comparative analyses will be especially valuable in revealing how barriers shift over time and under which conditions enablers convert into meaningful change.

Moreover, the impact of ESG integration on financial performance – while studied extensively – still demands contextual nuance. Sector-specific impacts, delayed benefits, and the complex, non-linear nature of risk mitigation warrant deeper examination. Research should also examine the unintended consequences of ESG mandates, including the rise of greenwashing, reporting fatigue, or performative compliance.

For executives, ESG officers, and board members, moving forward means going beyond simply embracing ESG – it calls for active integration and strategic commitment. ESG cannot be siloed or outsourced; it must be embedded into the DNA of corporate strategy. That means treating sustainability not as cost, but as capacity. Not as constraint, but as lens. Practically, firms should prioritize ESG literacy across functions – not just at the top but within operations, procurement, legal, and finance. Strategic alignment will depend on cross-functional fluency and the institutionalization of ESG as shared responsibility. Investing in adaptive governance structures, flexible KPIs, and iterative learning mechanisms will enable organizations to navigate complexity rather than avoid it.

In short, the successful future of ESG will depend not on isolated leadership or one-time compliance, but on multi-actor coordination, evolving capabilities, and a willingness to engage with uncertainty. Policy can set the direction. Research can illuminate the path. But practice – the everyday decisions made under pressure – ultimately determine how far the entities will go.

6. CONCLUSIONS

ESG adoption does not unfold along a clean, linear path. It evolves, often unevenly, within a shifting architecture of enablers and constraints. Firms move toward ESG not because the path is clear, but because conditions – regulatory, cultural, financial – begin to suggest that doing so is no longer optional. The decision to act emerges not from certainty, but from pressure, anticipation, and – occasionally – vision. This process is anything but static. The same factor that serves as a barrier today might become an enabler tomorrow, depending on shifts in institutional logic, market sentiment, or organizational learning. Timing matters. So does interpretation.

The variables are many, but they do not operate in isolation. Internal resistance, for example, is rarely just internal. It often mirrors external ambiguity – unclear policy mandates, volatile investor expectations, or rapidly evolving stakeholder norms. Conversely, external enablers – regulation, investor pressure, or reputational incentives – gain traction only when organizations are culturally and strategically positioned to respond. The interplay is recursive. Organizational culture, too, is not merely a background condition – it is an infrastructure of meaning. It informs how firms interpret ESG: as risk or as value, as compliance or as opportunity. Firms with an embedded culture of innovation, responsibility, and long-term orientation tend to frame ESG not as disruption, but as an extension of existing commitments. These are the organizations that find

ESG easier to internalize – not because they have more resources, but because they are structured to absorb complexity.

Still, resistance persists, and not irrationally. ESG initiatives are often resource-intensive, ambiguous in their payback timelines, and difficult to quantify in conventional financial terms. The logic of short-term performance metrics – quarterly earnings, margin targets – does not always sit easily beside climate disclosure or social impact. For many firms, particularly those navigating thin margins or volatile markets, ESG may appear aspirational at best, indulgent at worst. Yet this resistance is not fixed. With the right incentives, it can be softened – reshaped, even. Green bonds, blended finance instruments, sustainability-linked loans: these are not silver bullets, but they alter the calculus. Similarly, government-led interventions – clear standards, tax credits, streamlined compliance processes – can reduce friction and bring ESG within reach for firms that would otherwise delay or avoid adoption altogether.

But even when incentives exist, organizations must still act. Awareness does not guarantee alignment. Leadership commitment is essential – but not sufficient. Strategic alignment is where transformation happens. ESG must be translated into operational reality, budget priorities, KPIs, and governance routines. That is hard work, it is iterative, often slow, and it requires leadership not only at the top, but also in the middle – in those roles where strategic ambition meets logistical constraint. These are the actors who interpret ESG not as a disruption, but as part of the firm’s evolving risk and value narrative.

Technology plays a growing role in this process. Not as a solution in itself, but as an enabler of scale, accuracy, and accountability. Digital tools – from emissions tracking platforms to AI-based ESG risk analysis – reduce the labour of compliance and make abstract commitments more legible. They do not replace governance or leadership, but they help operationalize both. Yet technological access is uneven. The ESG digital divide is real. Without attention to infrastructure equity, the tools that enable transparency in some contexts may deepen opacity in others.

In this complex landscape, ESG adoption cannot be reduced to a checklist. It is a situated, adaptive process – responsive to the organization’s capabilities, context, and interpretation of risk and opportunity. It requires more than compliance. It demands reflexivity, not just about what ESG is, but about what it means – to the firm, to its stakeholders, and to the system it inhabits. This meaning, too, is dynamic.

And so, the task is not simply to remove barriers, or to scale enablers. It is to understand how organizations make sense of both. How they navigate the frictions. How they improvise within ambiguity and how they learn. ESG integration is not inevitable, but with the right combination of leadership, alignment, external pressure, and internal capacity – it becomes possible, and increasingly necessary.

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SESSION III
**CARPE SCIENTIAM: THE EVOLUTION OF SOCIAL AND
HUMAN SCIENCES IN THE KNOWLEDGE ECONOMY**

THE EXPERIENCE OF INSTITUTIONAL AND ECONOMIC INTEGRATION OF CENTRAL AND EASTERN EUROPEAN COUNTRIES INTO THE EUROPEAN UNION

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Abstract: This study examines the institutional and economic integration of Central and Eastern European countries into the European Union and assesses its relevance for Ukraine in the context of its newly acquired candidate status. The research focuses on the mechanisms of institutional adaptation, legal harmonization, and economic modernization implemented during the EU's *Eastern enlargement*, with particular attention to the role of financial instruments (PHARE, SAPARD, ISPA) and the Copenhagen criteria. The analysis highlights both the benefits of integration such as increased investment attractiveness, access to the EU internal market, and institutional modernization and the structural challenges, including socio-economic disparities, fiscal imbalances, and dependence on foreign capital. Methodologically, the study employs a comparative institutional and structural analysis of the reforms undertaken in eleven Central and Eastern European countries from the 1990s to the 2010s. The results demonstrate that while integration facilitated convergence with Western European standards, it also generated significant transitional costs, such as industrial closures, high unemployment, and social inequality. The article argues that for Ukraine, the key lessons of this experience lie in the necessity of strategic evaluation of internal institutional and structural deficits. The findings contribute to the academic discourse by providing a systematic assessment of integration outcomes and outlining a framework for Ukraine's sustainable accession strategy in the post-war period.

Keywords: European integration, institutional transformation, economic convergence, Central and Eastern Europe, Ukraine, EU enlargement

JEL Classification: F15, F36, O52, P27

1 Introduction

The acquisition of candidate status for European Union membership by Ukraine in the contemporary, specific-historical context has created a strong motivation to determine concrete strategic steps toward full membership. In this context, the analysis of the experience of eleven Central and Eastern European countries, which implemented large-scale institutional and economic transformations within the framework of the EU's "Eastern Enlargement," is of particular importance. Specifically, Hungary, Latvia, Lithuania, Poland, Slovakia, Slovenia, the Czech Republic, and Estonia became EU members in May 2004; Bulgaria and Romania joined in 2007, and Croatia in 2013.

This enlargement brought both anticipated benefits, such as increased investment attractiveness, access to the EU internal market, and institutional modernization, and a number

of unforeseen challenges, including the intensification of structural disparities, growth in socio-economic inequalities, and the need to adapt to the EU's strict regulatory requirements. For Ukraine, this experience represents not only a source of practical lessons but also a framework for developing its own integration strategy, capable of taking into account the specificity of the national economic system and the unique challenges of post-war development.

2 Research methods

The methodological basis of this research is the paradigm of light-system analysis. With the help of such a basis, one can interpret the European integration transformations of the countries of Central-Convergent Europe as the process of inclusion of their national economies into the European Union from the hierarchical structure and division of roles attached to it. The use of light-system analysis makes it possible to investigate not just the state, but the mutually related totality of countries that operate between the residential economic and institutional space, and carry out the analysis of the group transformation itself directly. This methodological approach makes it possible to trace the rise of not just one power, but a group of countries of Central-Converging Europe on the path to the EU.

In order to achieve the goals set in the statistics, a systemic-structural and level analysis has also been carried out, allowing us to understand the dynamics of integration processes in a group of countries, to assess the stage of their adaptation to EU standards and reveal major structural imbalances, as well as problems that arose in the integration process. A regular analysis has revealed the success and failure of reforms by officials. The comprehensive use of methodological tools will ensure the ability to formulate guidelines and recommendations for current candidate countries for accession to the EU, including Ukraine and Moldova. The light-system analysis itself makes it possible to integrate individual national characteristics into the broader context of the European integration space, in order to obtain results that are meaningful in both the theoretical and applied worlds.

3 Institutional and Economic Motivation

The primary determinant of the economic motivation of Central and Eastern European states to join the European Union was the strategic aspiration to leverage the institutional and resource advantages of the EU integration space to accelerate the modernization of national economic systems and achieve sustainable economic growth. In the long term, the key objective of this process was viewed as bridging the structural, economic, and socio-civilizational gap between the countries of this region and the highly developed Western European states in terms of population income, labor productivity, production competitiveness, and quality of life (Anusik, Riedel, 2023).

Achieving these objectives required comprehensive institutional adaptation, that is, the transformation of national institutional systems in accordance with European standards of legal, economic, and social regulation, as well as deep economic integration into the EU internal market, which ensured the free movement of goods, capital, services, and labor. An important factor stimulating structural transformations was the financial instruments of European regional policy, particularly access to resources from EU structural and cohesion funds. The funds were used to upgrade infrastructure, develop human resources, introduce new technologies, and improve the efficiency of the institutional component of member states. A reasonable combination of institutional reforms and access to EU financial funds created conditions for increasing the efficiency of structural restructuring of the economy, resulting in increased investment attractiveness and economic rapprochement with countries that are "old" EU members. A study of the experience of individual states (for example, Poland and Hungary) has shown that Europeanization was accompanied by parallel regionalization and changes in the internal architecture of public administration (Hughes, Sasse, & Gordon, 2004).

4 Institutional Reforms and Adaptation

In the period from the 1990s to the early 2000s, the countries of Central and Eastern Europe carried out institutional and structural reforms. Researchers have called these reforms the process of "borrowing market institutions and democracy" from the "old" members of the European Union. In content, this meant copying individual organizational and legal norms or economic regulations, as well as the purposeful formation of a new content of socio-economic relations that corresponded to the internal content of European integration. The essence of the new content of socio-economic relations was to change the economic mechanism based on a healthy competitive environment, the existence of private property, liberalization of prices and trade, as well as the democratic transformation of the political system and the formation of institutions of the rule of law.

In order to maintain the stable integration of the states of Central and Eastern Europe, the European Union developed and implemented a mechanism for their gradual involvement in its own economic, political and institutional system. This mechanism was implemented through the creation of specialized financial systems, the purpose of which was to ensure adaptation and modernization processes in the candidate countries (Shkolnykova, 2025). The decisive role in this context was played by instruments such as:

1) PHARE (Poland and Hungary: Assistance for Restructuring their Economies, later expanded to all countries in the region) – the EU’s main program aimed at institutional development, strengthening administrative capacity, supporting structural reforms, and fostering private sector development. It functioned as a “preparatory tool” for aligning national systems with the EU’s **acquis communautaire**.

2) SAPARD (Special Accession Programme for Agriculture and Rural Development) – a specialized fund to support the agricultural sector and rural areas. Its objectives included enhancing the competitiveness of agricultural production, modernizing rural infrastructure, promoting environmentally sustainable agriculture, and gradually integrating candidate countries’ agricultural policies into the EU’s Common Agricultural Policy (CAP).

3) ISPA (Instrument for Structural Policies for Pre-Accession) – a financial instrument focused on funding large infrastructure projects, primarily in transport and environmental sectors. Its key aim was to align Central and Eastern European transport corridors with the European infrastructure network and to adapt environmental standards to EU requirements.

The coordinated operation of these programs created a comprehensive external support mechanism, enabling countries in the region not only to implement structural modernization of their economies but also to form institutional prerequisites for full participation in the EU internal market. Thus, the interaction between domestic reforms and external financial and organizational incentives became the foundation for accelerating integration processes and reducing the gap in socio-economic development levels between the “new” and “old” EU members. At the European Council meeting in Copenhagen in 1993, a set of political, economic, and legal requirements for candidate countries was institutionalized, known as the **Copenhagen Criteria**. These criteria became the foundational normative reference for the EU enlargement process and defined the framework parameters of integration readiness for Central and Eastern European countries.

Politically, the criteria required the presence of stable democratic institutions capable of ensuring the rule of law, an effective system for protecting human rights and freedoms, and guarantees for respect for the rights of national minorities. Therefore, candidate countries were expected not only to formally declare democratic principles but also to establish a resilient institutional architecture capable of guaranteeing their practical implementation.

Economically, the criteria required the functioning of a viable market economy capable of withstanding competitive pressures and integrating into the EU’s single internal economic

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system. This entailed the liberalization of economic relations, structural restructuring of production capacities, and the creation of conditions for institutional adaptation of market mechanisms to the **acquis communautaire**.

The legal and institutional component of the criteria meant that the candidate country had to be ready to assume all obligations arising from EU membership, including the implementation of EU legislation and adherence to its political, economic, and monetary objectives. Thus, the Copenhagen criteria played the role of an “integration filter”. This filter assessed how candidate countries ensure political stability, the competitiveness of the market mechanism and legal similarity with the institutional system of the European Union (Kusińska, Strzelecki, 2021).

In 1995, the Council of the European Union approved the “White Paper on the preparation of the associated countries of Central and Eastern Europe for integration into the EU internal market” prepared by the European Commission. This normative and methodological document became the basis for the process of legal and institutional adaptation. It included about 820 acts of EU legislation, which were harmonized with the national legal systems of the candidate states (European Commission, 1995).

The annexes to the “White Paper” contained information on the approximation of the legal norms of the candidate countries to the *acquis communautaire* in 23 sectors of economic and social policy. In addition to legal norms, the document provided for the creation of administrative and technical institutions that were necessary to ensure the implementation of EU legislation in practice and to supervise the process of approximation of legal systems.

The White Paper served as a so-called roadmap, with clear time parameters, control mechanisms and consistency in the implementation of reforms. Its implementation was carried out through partnership coordination between the governments of the candidate countries and European Union experts. In the process of integration preparations, the European Union criticized and exerted tough regulatory pressure on the countries of Central and Eastern Europe regarding certain sectors of their economic policy. Particular attention was given to the energy sector: programs based on the operation of Soviet-era nuclear power plants were deemed non-compliant with European safety and environmental standards. As a result, most of these facilities were gradually decommissioned, except for certain energy units in Hungary that remained operational due to strategic and technical considerations.

Industrial and food production also faced substantial restrictions. Production facilities that did not meet EU sanitary, technical, and environmental standards were closed. This was particularly relevant for food industry enterprises that failed to maintain proper hygiene practices, as well as industrial plants with excessive atmospheric emissions into the atmosphere that violated European environmental policy standards.

The European Union also had strict control over the transport and defense sectors. In this area, old vehicles, urban public transport and military equipment were gradually replaced. This modernization was aimed at ensuring that technical equipment and environmental parameters met EU standards.

The European Union also established rules for the privatization process and the participation of foreign capital in entrepreneurial activity. Certain rules were outlined for the purchase and sale of land to foreign private entrepreneurs, the return of national capital and the protection of national economic interests in the context of liberalization of integration relations.

Negotiations on the accession of candidate countries to the European Union were necessarily held on a bilateral basis. The national socio-economic specifics of each state were taken into account. Thus, the negotiation process consisted of two interrelated stages: a comprehensive analysis of the country's compliance with the Copenhagen criteria, as well as

an assessment of the degree of progress and approximation of national legislation with EU norms and standards.

Within the framework of this process, the main conditions for accession were outlined, which included the introduction of temporary exceptions from the general EU rules. In turn, this approach allowed taking into account the national characteristics of the countries and the difficulties that arose during the transition to new norms and rules.

Alongside legal reforms, the accession process of Central and Eastern European countries also involved financial conditions of integration. Key aspects included the contributions of candidate countries to the EU budget and the mechanisms for receiving transfers from the Union's general funds, which had a compensatory and incentivizing effect for modernizing national economies. This financial balance simultaneously ensured a fair distribution of burdens and resource support for structural reforms necessary to align candidate countries' standards with the EU internal market requirements.

Compliance with the economic criteria required all candidate countries to maintain a functioning market economy capable of withstanding fierce competition in the EU internal market and integrating into the European economic system. In Poland and the Czech Republic, for example, the industrial base was reformed, and state-owned enterprises were privatized to ensure effective market competition (Lados, Sowa, 2022)

For implementing the most complex EU norms, transitional periods were established to gradually achieve compliance with standards. In the area of free movement of persons, candidate countries had limited periods during which special quotas for workers from new member states applied. In agriculture, transitional mechanisms allowed for gradual introduction of EU subsidies and standards in the Baltic States and Hungary, ensuring financial and technical readiness of farming enterprises for full integration into the Common Agricultural Policy.

Measuring the overall economic effect of institutional reforms remains methodologically complex due to the multifactorial nature of impacts and time lags in transformation implementation. Nevertheless, it is undeniable that the institutional adaptation carried out by Central and Eastern European countries brought previously underdeveloped democratic, economic, and legal institutions, as well as civil society institutions, into compliance with the high standards of the European Union.

Improvement of institutional components generated a positive multiplier effect at both micro- and macro-levels. This was manifested in increased efficiency of management procedures, strengthening of legal norms and regulatory control, substantial reduction in corruption levels, and increased transparency in the functioning of state and market institutions. Collectively, these factors created conditions for sustainable economic growth, enhanced investment attractiveness, and positively impacted citizens' quality of life, fostering social and economic convergence with Western European countries.

5 Structural Disparities and Economic Challenges in New EU Member States

The experience of Central and Eastern European countries demonstrated that, at the time of integration, optimal institutional frameworks for candidate EU members were absent, and the gap in economic, social, and administrative development between candidate countries and existing EU members remained significant. For example, in Poland, national enterprises experienced economic losses due to prioritization of public contracts for firms from older EU members, limiting access to government contracts and slowing industrial sector modernization. In Hungary, the implementation of European environmental and sanitary standards led to the closure of some food industry enterprises that did not meet EU requirements for product safety and emissions control.

Such structural changes had a complex effect: on one hand, they contributed to gradually aligning national economies with the standards of the EU internal market; on the other hand, they created short-term economic costs and social challenges. This experience underscores the necessity of a sequential adaptation of institutional, legal, and economic infrastructures of candidate countries before full EU membership, as well as the importance of EU support and corrective mechanisms to ensure economic stability during the transition phase of integration.

Analysis of the institutional environment shows that despite systematic work on adapting European legal norms, creating a homogeneous institutional space in Central and Eastern European countries was not fully achieved. Notable differentiation exists in areas such as taxation, contract enforcement, and reducing corporate insolvency. These discrepancies reflect uneven efficiency of national legal and economic institutions and differing speeds of adaptation to EU standards, limiting full integration into the internal market and affecting the competitiveness of new member economies (Sagan, Záhradník, 2023)

6 Causes of Economic Problems in New EU Member States and Lessons for Ukraine

The process of economic alignment within the EU can be viewed as a complex mechanism for overcoming historical structural backwardness through modernization and integration into the common market (Epstein, 2014)

The primary reason for the problems that emerged in the economies of new EU countries is that Central and Eastern European nations adopted the European integration model of economic growth, which was based on a liberal economic paradigm characterized by the removal of all restrictions on the movement of capital, goods, services, and labor. External liberalization, as one of the main imperatives of this model, was accompanied by a substantial increase in foreign direct investment (FDI) in Central and Eastern Europe. However, much of this investment was directed by transnational corporations to establish subsidiaries, which did not contribute to the overall modernization of national economies.

The majority of FDI was concentrated in financial services, trade, and real estate turnover, with only a very limited share entering the real sector. In industry, such investments were mostly allocated to assembly operations, where the national component of production was minimal. In conditions of open competition from foreign producers of goods and services, many domestic manufacturers did not receive state support and were closed. National economies that failed to create innovative sectors and production clusters capable of withstanding foreign competition relied solely on lowering labor costs per unit of low value-added products. Cost-cutting in labor and the focus on maintaining competitiveness of manufactured goods led to growth in net exports but significantly reduced overall domestic demand, which had previously been stimulated by credit expansion. When credit support was halted amid the global financial and European debt crises, economic growth in Central and Eastern European countries was seriously affected. The reduction of corporate taxes as a measure to attract foreign capital led, in nearly all countries of the region, to an increase in government budget deficits. Consequently, this deficit resulted in reductions not only in social spending but also in funding for areas crucial for economic growth, such as education and scientific research.

Central and Eastern European countries demonstrated recovery-driven economic growth after joining the EU, which continued until the onset of 2008. Positive trends in factor productivity were accompanied by clearly negative phenomena, including high unemployment, large-scale migration (especially of young people), and increasing income inequality. Support for new EU member states through transfers from structural and cohesion funds (amounting to approximately 2.6% of their total GDP) helped to balance socio-economic development in these countries. Fund allocations were mainly directed toward environmental projects and infrastructure development. The provision of these funds required national co-

financing, fostering development in areas prioritized by EU leadership. Per capita subsidies were higher in countries with relatively strong development indicators, which led to increased socio-economic disparities among new EU members. For instance, differences between the high economic growth rate in Poland and the lagging development of Bulgaria became comparable to the gap between Germany and Greece.

The implementation of the integration model of economic growth in Central and Eastern Europe demonstrated that it could not provide the macroeconomic development necessary to overcome historically inherited semi-peripheral socio-economic conditions. This experience showed that Central and Eastern European countries increasingly depended on Western Europe for economic growth financing, particularly for long-term investments and sales of manufactured products. Moreover, during relatively dynamic growth years, most Central and Eastern European countries accumulated numerous internal structural problems. Due to this combination, these countries are more sensitive than other regions of the world to instability in the European economy, commodity markets, and capital flows. A slowdown in business activity in Western Europe causes a deceleration of economic growth in Central and Eastern Europe, primarily affecting export dynamics and foreign financial capital in new EU countries. Poland has demonstrated the greatest resilience, having received the largest amount of EU fund assistance compared to other countries and being the least integrated into the EU market, maintaining relatively healthy macroeconomic balances (Bukowski, 2014; Sadowski, 2010). Returning the economies of new EU member states to sustainable growth requires reforming national projections of the integration model, as the existing model has lost effectiveness under new conditions. This necessitates reducing dependence on foreign capital, diversifying exports, developing innovation as a driver of competitiveness, and shifting from technology imports to the creation of domestic innovative products. Successfully addressing these tasks would enable Central and Eastern European countries to achieve long-term economic growth rates sufficient to reduce their economic lag relative to developed EU countries.

For Ukraine, the lessons of this experience are especially important (Emerson, Blockmans, 2024; Börzel & Risse, 2010). Specifically, it is necessary to strategically assess internal institutional and structural deficits to avoid the imbalances experienced by Central and Eastern European countries. This also implies combining regulatory changes with programs supporting domestic producers and infrastructure modernization, introducing transitional periods for the most complex regulations, and establishing effective control and monitoring mechanisms.

7 Conclusion

The integration experiences of Central and Eastern European countries show multiple transformational effects: successful adaptation of EU standards, modernization of administrative and production capacities, and gradual improvement in citizens' quality of life. At the same time, structural disparities, underdeveloped institutional frameworks, and uneven economic capacities constrained full integration. For Ukraine, these lessons are crucial: it must strategically assess institutional and structural deficits, combine regulatory reforms with domestic production support, introduce transitional periods for complex regulations, and establish robust monitoring mechanisms. By doing so, Ukraine can mitigate risks observed in earlier EU enlargement and foster sustainable economic growth, technological advancement, and competitiveness within the EU framework.

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THE REPUBLIC OF MOLDOVA – MID-RUN MACROECONOMIC OPPORTUNITIES AND CHALLENGES

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Abstract: In recent years, the economy of the Republic of Moldova has been confronted with the consequences of the unprecedented global exogenous shocks, the coronavirus pandemic, and the intensification of geopolitical tensions. The volume of GDP grew for the second year in a row in 2024, but at a slowing annual pace of 0.5%, according to the estimates of the International Monetary Fund (2025). Therefore, in 2024, the volume of economic activity was only 1.3% higher than the pre-pandemic level in 2019. This paper applies standard econometric tools (the Hodrick-Prescott filter) and uses the estimates and forecasts of the International Monetary Fund (2025) for the period 1993 - 2025 in order to assess the macroeconomic developments and the medium-run opportunities and challenges for the economy of the Republic of Moldova. According to our results, the economy of the Republic of Moldova would record an annual growth pace below its potential for the fourth year in a row in 2025. On the other hand, the annual potential growth pace changed the trend in 2024, after hitting the lowest level since the beginning of the 2000s. However, this annual potential growth pace would persist at lower levels compared to the pre-pandemic period in the coming years, in a context dominated by several structural challenges, including the decline of the population and the high levels of the twin deficits (the budget deficit and the current account deficit).

Keywords: the economy of the Republic of Moldova, potential output, structural reforms

JEL Classification: C 22, E 17, O 47

1. Introduction

The economy of the Republic of Moldova has recently been significantly impacted by the consequences of global exogenous shocks, including the coronavirus pandemic (the worst health crisis in the world in over 100 years) and the intensification of geopolitical tensions.

One can notice the severe deterioration of the investment climate, as the geopolitical tensions distorted the supply chains and increased the production costs, as emphasized by Augusztin et. al (2023).

The gross fixed capital formation contracted by annual rates of 6.8% in 2022 and 1.3% in 2023, according to the database of the National Bureau of Statistics of the Republic of Moldova (2025). At the same time, the estimates of the International Monetary Fund (2025) indicate the decline of the total investment / GDP ratio to a record low level of 20.1% in 2023.

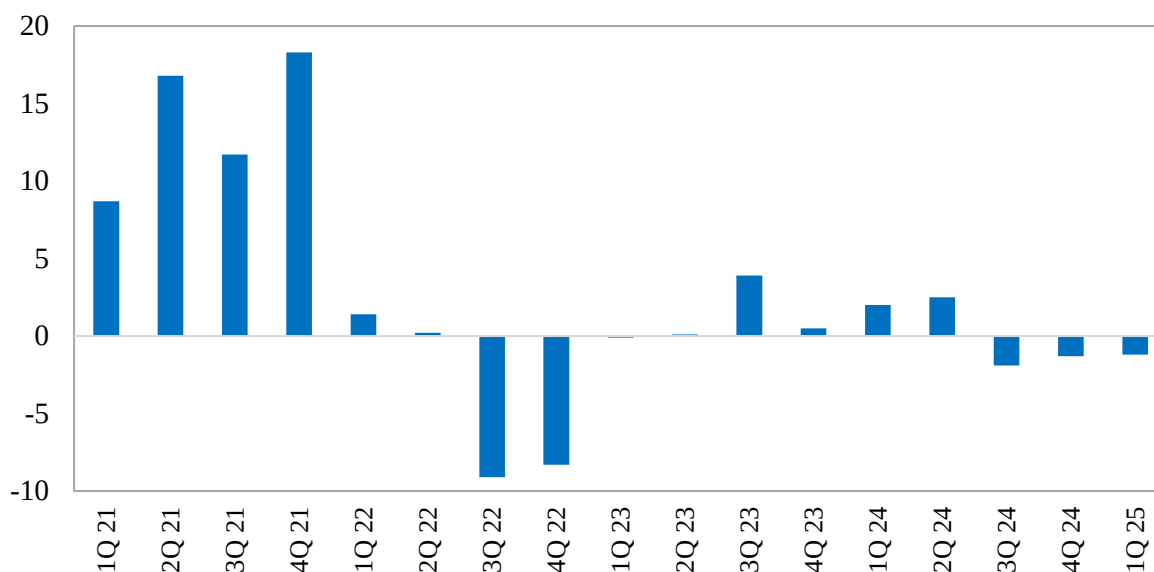
The contraction of the fixed investments determined the deterioration of the labour market climate, the employment rate increasing to 4.6% in 2023, the highest level since 2019, according to the database of the International Monetary Fund (2025).

Furthermore, the unprecedented high level of regional geopolitical tensions also has an impact on the medium-term macroeconomic performance of the Republic of Moldova, according to the World Bank (2024).

At the same time, the intensification of the inflationary pressures (double-digit annual inflation in 2022 and 2023) harmed the real disposable income of the population, as underlined

by the International Monetary Fund (2022). The household consumption contracted by annual rates of 4.0% in 2022 and 0.5% in 2023, according to the estimates of the National Bureau of Statistics of the Republic of Moldova (2025).

More than five years since the outbreak of the coronavirus pandemic and more than three years following the intensification of the geopolitical tensions in Eastern Europe, the economic climate in the Republic of Moldova continues to be difficult. According to the database of the National Bureau of Statistics of the Republic of Moldova, the economic activity contracted for the third quarter in a row in 1Q 2025, by an annual rate of 1.2%, as represented in Figure 1.



Figure

1. The economic activity in the Republic of Moldova (% , annual rate)

Source: representation of the author based on the estimates of the National Bureau of Statistics of the Republic of Moldova (2025)

The macroeconomic climate in the Republic of Moldova is forecasted to maintain tough in the coming quarters, the experts of the International Monetary Fund (2025) forecasting a growth pace of only 0.6% in 2025.

In this paper, standard econometric tools are implemented, and the database of the International Monetary Fund (2025) is used in order to estimate the annual potential growth pace in the Republic of Moldova during the period 1993 – 2025. The purpose is to assess the macroeconomic developments and to identify the main opportunities and challenges for the economy of the Republic of Moldova in the medium run.

The rest of the paper has the following structure: the next chapter presents the methodology; the main results are analysed in the third chapter; the conclusions are drawn in the last chapter.

2. Methodology

In this paper, we apply the Hodrick–Prescott filter in order to estimate the evolution of the annual potential growth pace in the Republic of Moldova during the period 1993 – 2025.

Several methods were developed by experts in order to distinguish between the structural and cyclical components of the macroeconomic indicators, one of the most used being the filter of Hodrick and Prescott (1997).

This method is based on the following formula

$$\text{Min} \sum_{t=1}^T (\ln Y_t - \ln Y_t^*)^2 + \lambda \sum_{t=2}^{T-1} ((\ln Y_{t+1}^* - \ln Y_t^*) - (\ln Y_t^* - \ln Y_{t-1}^*))^2 \quad (1)$$

In this formula, Y_t , Y_t^* and λ are the macroeconomic indicator, its trend component and a smoothness parameter. In our analysis Y_t , Y_t^* represent the GDP and the potential GDP of the Republic of Moldova, expressed as annual rates.

As regards the smoothness parameter, as can be noticed from formula (1), the higher its value, the larger the gap between the GDP and its trend component. Hodrick and Prescott (1997) recommend a value of 100 for implementation while working with annual observations.

Among the main advantages of using this standard econometric tool to distinguish between the structural and cyclical components of the macroeconomic indicators is the transparency, according to Bouthevillain et al. (2001) and de Castro Souza (2005).

On the other hand, we also mention several disadvantages of this methodology, as underlined by de Castro Souza (2005): arbitrariness, imposition of symmetry on the gap (between the macroeconomic indicator and its structural component), and the end-of-sample bias.

In our paper, we used the database of the International Monetary Fund (2025), from the Spring edition of the World Economic Outlook. We took into account the annual rate of GDP of the Republic of Moldova, with estimates for the period 1993 – 2024, while for the year 2025, we considered the forecasts of the experts of the International Monetary Fund (2025).

As we worked with annual data, we considered a value of 100 for the smoothness parameter.

The econometric software E-Views was used to apply the Hodrick-Prescott method in this analysis.

3. Main results

According to the results of the econometric analysis, the annual potential growth pace in the Republic of Moldova has presented a downward trend since 2006, from around 5.3% to less than 2% at present.

Several factors determined this unfavourable dynamic of the annual pace of the potential GDP in the Republic of Moldova over the past two decades in our view, among them we mention:

1. the outbreak of the Great Financial Crisis in 2007 - 2008 (the worst economic and financial crisis in the world since the end of WWII) and its consequences;
2. the intensification of the risk perception in the region from 2014, given the regional geopolitical developments;
3. the outbreak of the coronavirus pandemic and its consequences;
4. the crisis in Ukraine (starting 2022) and its consequences;
5. the supply-side shocks, including the energy crisis.

We point out that the annual growth pace of the potential output in the Republic of Moldova decelerated from around 5.3% before the outbreak of the Great Financial Crisis in 2007-2008 to less than 4.0% in 2013 (3.8%), as represented in the following chart (Figure 2).

However, this downward trend was more pronounced from 2014, when the risk perception intensified in the context of the outbreak of geopolitical tensions in the region. The annual rate of the potential output deteriorated from 3.8% in 2013 to 3.6% in 2014 and 2.3% in 2019, the year before the outbreak of the coronavirus pandemic, as can be noticed from Figure 2.

This downward trend continued until 2023, to only 1.7%, the lowest level since the year 2000, according to our econometric estimates.

In recent years, this indicator stabilised at levels close to the lowest since the beginning of this century, below 2%.

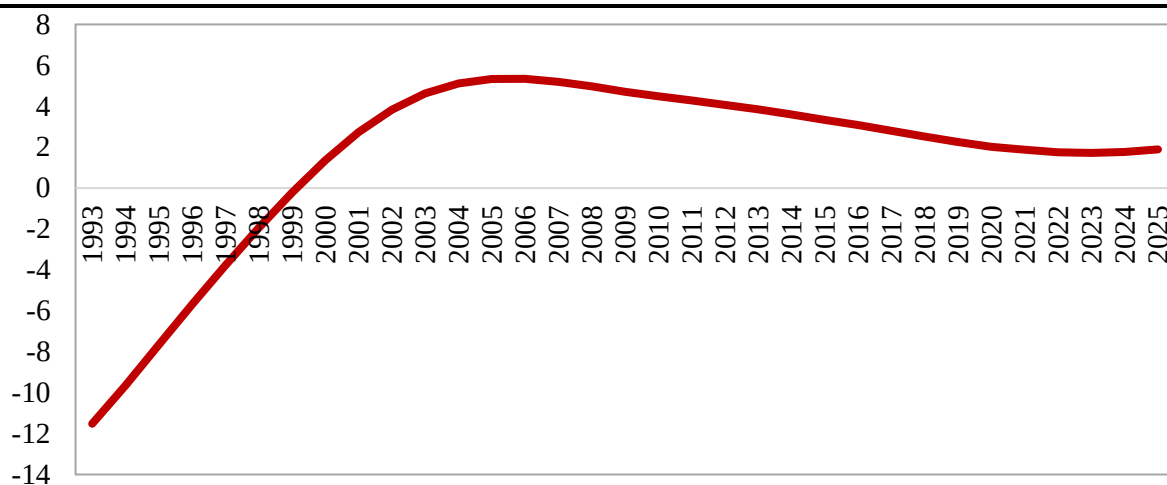


Figure 2. The potential output in the Republic of Moldova (% , annual rate)

Source: representation of the author based on the econometric estimates using IMF data (2025)

Furthermore, the results also show the fact that the annual dynamic of the economic activity in the Republic of Moldova stood below its potential in 2022, 2023, and 2024 and is expected to continue this evolution in 2025, as can be noticed in Figure 3.

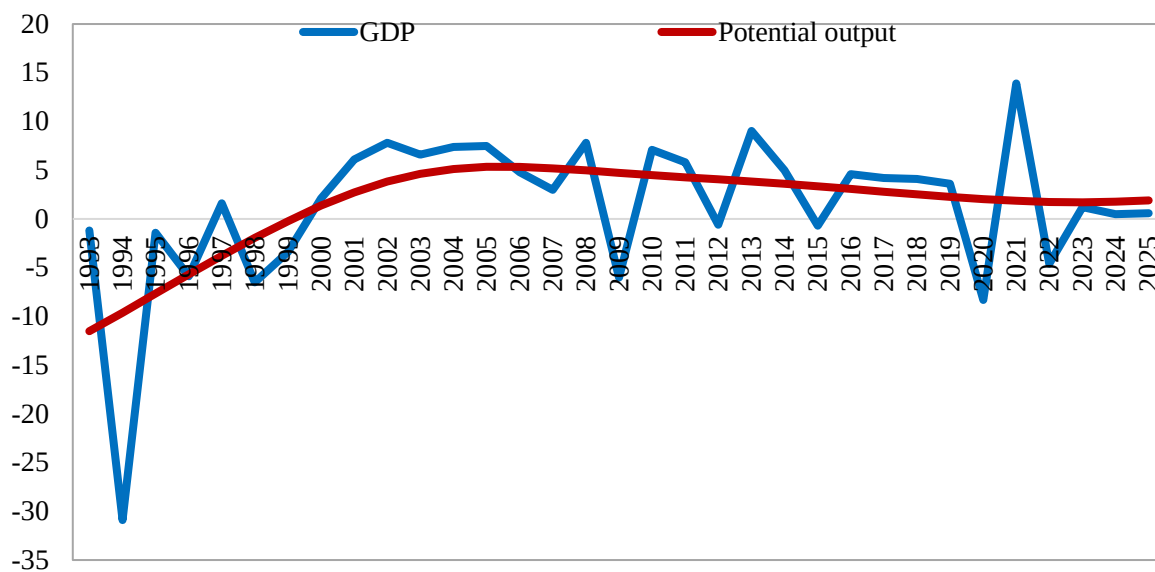


Figure 3. GDP vs. potential output in the Republic of Moldova (% , annual rate)

Source: representation of the author based on the econometric estimates using IMF data (2025)

We point out that the deterioration of the annual potential growth pace and the evolution of the economy by an annual pace below its potential in recent years contributed to the decline of the population of the Republic of Moldova. According to the estimates of the International Monetary Fund (2025), the population of the country diminished from 2.89 million in 2006 to 2.87 million in 2014, 2.64 million in 2020, and 2.36 million in 2025. The experts of this international financial institution forecast the continuity of this downward trend in the coming years, to 2.05 million in 2030.

Conclusions

The results of our analysis confirm the fact that the macroeconomic climate in the Republic of Moldova continues to be affected by the consequences of the recent shocks, especially the regional geopolitical tensions. These contributed to the deterioration of the annual potential growth pace towards the lowest level since the beginning of this century, according to the results of our econometric estimates.

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In this context, structural reforms are needed in order to change the downward trend for the annual potential growth pace in the Republic of Moldova. In this respect, the experts of the World Bank (2025) recommended the reforms needed to increase labour participation, support energy independence, and improve climate resilience.

In our view the structural reforms included in the recently launched Moldova Growth Plan, a three-year programme of EUR 1.9bn, agreed with the European Union (European Commission, 2025), with a focus on developing the infrastructure (including hospitals), improving the energy security, increasing the access to financing of SMEs, and enhancing the access to the EU's Single Market are going to improve the annual potential growth pace and to contribute to the adjustment of the twin deficits in the coming years.

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INTERCULTURAL COMPETENCE AS A CORE SKILL IN THE GLOBAL BUSINESS ENVIRONMENT: INTERNATIONAL AND MOLDOVA CASE STUDIES

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Abstract: In the era of globalization and the Republic of Moldova's efforts to integrate in EU and global environment, intercultural competence has become an essential capability that significantly influences leadership effectiveness, team performance, and organizational success. This paper examines the strategic importance of intercultural competence not just in business and management but also in education, by analyzing its theoretical foundations and practical implications. Furthermore, the paper explores the relationship between intercultural competence (IC) and cultural intelligence (CQ), emphasizing its role in fostering adaptability, trust-building, and innovation. Empirical evidence from international business contexts demonstrates that organizations investing in intercultural competence training achieve greater resilience and competitiveness in global markets. The findings from the international cases and the macro level studies in the Republic of Moldova analyzed suggest that intercultural competence should be recognized as a core component of managerial education and development, contributing both to individual leadership growth and to sustainable organizational performance.

This paper also proposes methodological suggestions for developing company case studies aimed at examining intercultural competence (IC) in organizational and managerial contexts. The proposed framework outlines strategies for selecting companies, gathering data, and assessing the managerial and organizational outcomes of IC initiatives.

Keywords: intercultural competence, international business, diversity, management, Moldova

JEL Classification: F23, M14, M16, Z13

Introduction

In the twenty-first century, globalization has transformed the landscape of business and management, creating unprecedented opportunities and challenges for organizations operating in multiple countries (Friedman, 2005; Bartlett & Ghoshal, 2002). Companies and businesses are no longer confined to domestic markets; they increasingly engage in international trade, form global partnerships, and manage multicultural teams across geographically dispersed locations. This global expansion has made cultural diversity a defining feature of modern organizational life (Shenkar & Luo, 2008).

Cultural diversity in modern management refers not only to differences in nationality, language, and ethnicity but also to variations in values, interaction and communication styles, decision-making preferences, and social norms (Hofstede, Hofstede, & Minkov, 2010). These differences can deeply affect managerial practices, including leadership, negotiation, teamwork, and strategic planning (Trompenaars & Hampden-Turner, 2012). Managers working in cross-cultural environments must navigate, understand and deal with potential misunderstandings, misinterpretations, and conflicts arising from cultural differences. Failure to recognize and adapt to these differences can result in decreased team cohesion, lower employee engagement, and reduced organizational performance (Earley & Ang, 2003).

Conversely, organizations that effectively manage cultural diversity gain a competitive advantage. Diverse teams bring varied perspectives, foster creativity and innovation, and enhance problem-solving by integrating multiple viewpoints (Stahl et al., 2010). As a result, the ability to operate successfully in culturally heterogeneous settings has become a critical managerial

competency. Intercultural competence - the knowledge, skills, and attitudes that enable effective interaction across cultures - is increasingly recognized as a strategic asset, essential for leadership, talent management, and sustainable organizational growth in the global economy (Deardorff, 2006).

Intercultural Competence in Management Research

Despite the clear benefits of cultural diversity, many organizations struggle to fully leverage it due to insufficient intercultural competence among managers and leaders (Ang et al., 2007; Rockstuhl et al., 2011). Intercultural competence encompasses the knowledge, skills, and attitudes required to navigate cultural differences effectively, including awareness of one's own cultural biases, understanding of other cultural norms, and the ability to adapt communication and management strategies accordingly (Deardorff, 2006).

When managers lack these competencies, misunderstandings and conflicts often arise in multicultural teams (Hofstede et al., 2010). For example, differences in communication styles - such as direct versus indirect feedback, or high-context versus low-context messaging - can lead to misinterpretation of intentions and reduced collaboration (Hall, 1976; Gudykunst, 2003). Similarly, variations in decision-making preferences, power distance expectations, and approaches to hierarchy may create tension or slow down organizational processes (Trompenaars & Hampden-Turner, 2012). These challenges negatively impact team performance, employee satisfaction, and overall organizational effectiveness (Stahl et al., 2010).

Moreover, in the era where businesses increasingly operate in global networks, failure to develop intercultural competence can hinder international negotiations, partnerships, and market expansion (Earley & Mosakowski, 2004). Organizations and companies risk losing competitive advantage if leaders are unable to bridge cultural gaps and facilitate productive cross-cultural interactions. Therefore, addressing the lack of intercultural competence is critical not only for mitigating risks but also for maximizing the potential of multicultural teams, fostering innovation, and achieving sustainable organizational success (Ang et al., 2007; Deardorff, 2006).

Intercultural competence (IC) has been increasingly recognized as a critical factor influencing managerial effectiveness and organizational outcomes in diverse work environments. Research indicates that managers with high IC are better equipped to navigate cultural differences, reduce misunderstandings, and foster cohesive and productive teams (Earley & Ang, 2003; Ang et al., 2007). By understanding both their own cultural assumptions and the values and behaviors of others, managers can adapt their leadership style to fit diverse contexts, enhancing employee engagement and motivation (Rockstuhl et al., 2011).

IC has also been linked to improved **team performance**. Culturally diverse teams often face challenges related to communication, decision-making, and conflict resolution due to cultural diversity (Stahl et al., 2010). Managers who use intercultural competence can mediate potential conflicts, facilitate effective collaboration, and leverage diverse perspectives to drive innovation and problem-solving (Deardorff, 2006). Empirical studies demonstrate that culturally competent leaders and managers contribute to higher levels of trust, satisfaction, and cohesion within multinational teams, leading to superior performance outcomes (Ang et al., 2007; Stahl et al., 2010).

Furthermore, IC is considered a **strategic asset** for global organizations. In international business contexts, managers have to engage in negotiations, partnerships, and cross-border projects where cultural misalignment can lead to financial losses or reputational risks (Hofstede et al., 2010; Earley & Mosakowski, 2004). Companies that invest in developing IC through mentoring, training programs, and experiential learning demonstrate increased adaptability, innovation, and overall competitiveness in international markets (Gonzalez, 2013; Deardorff, 2006).

Case Studies on the importance of Intercultural Competence

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The body of management research consistently demonstrates that intercultural competence is not merely a desirable trait but a fundamental requirement for effective leadership, team management, and organizational performance in multicultural and globalized business environments (Ang et al., 2007; Rockstuhl et al., 2011; Stahl et al., 2010).

Empirical and practical evidence highlights the critical role of intercultural competence (IC) in managerial effectiveness and organizational performance.

International cases

The following international case studies illustrate both the benefits of IC and the risks associated with its absence.

During Starbucks' expansion into China, American managers initially faced challenges related to indirect communication and hierarchical decision-making norms common in Chinese business culture. By applying intercultural competence - understanding local consumer preferences, respecting business etiquette, and adapting marketing strategies - Starbucks successfully localized its offerings, including tea-based beverages, and built strong relationships with local partners (Moon, 2004). This case demonstrates how IC enables managers to navigate cultural differences and achieve sustainable growth in foreign markets.

The 1998 **merger between Germany's Daimler-Benz and the U.S.-based Chrysler** highlighted the consequences of insufficient IC. Differences in decision-making styles, hierarchical expectations, and communication norms led to frequent misunderstandings, reduced morale, and operational inefficiencies. Ultimately, cultural misalignment contributed to the failure of the merger (Nahavandi & Malekzadeh, 1993). This example underscores the importance of IC in cross-cultural mergers and international management.

Google operates globally with diverse teams. Managers employ IC to facilitate effective communication, resolve conflicts, and harness diverse perspectives to drive innovation. Google's IC-focused training and inclusive leadership practices have been linked to higher team performance and employee satisfaction (Ghemawat, 2011).

IKEA's entry into India required managers to adapt product designs, store layouts, and marketing campaigns to align with local cultural norms. Intercultural competence enabled managers to negotiate successfully with local suppliers and meet consumer expectations, demonstrating IC's role in market adaptation and organizational success (Bartlett & Beamish, 2018).

The international cases above enumerated, collectively demonstrate that IC is a strategic managerial capability. It mitigates misunderstandings, supports effective leadership, enhances team cohesion, and drives organizational performance in multicultural and global contexts. Organizations investing in IC development are better positioned to succeed in international business environments.

Case/studies in the Republic of Moldova

We searched, but we **couldn't find** any full published company case studies in Moldova that explicitly treat intercultural competence (IC):

A case study of a *single company* in Moldova that explicitly designed, implemented, and evaluated an intercultural competence program (training / leadership development / cross-cultural teaming), showing before - after metrics (employee satisfaction, turnover, performance, international partnership success, etc.).

Detailed qualitative studies from within companies (interviews, observations) about cultural frictions (between ethnic groups, languages, local vs foreign management) and how those are managed or resolved.

Company-level financial performance data linked to IC practices (e.g. comparing companies with more inclusive, culturally aware cultures vs those without).

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What is available are several studies that come close or contain company - level data (especially in banking, surveys, organizational culture) from Moldova. We have summarised, in table 1, the most relevant ones, and note what data is lacking.

Table 1. Cases / Studies in or about Moldova

N r.	Title / Study	What it looks at / Findings	Relevance to IC & things we can draw from it
1.	Industrial Processing Companies in the Moldovan Agri-Food Sector: A Case Study (Ghencea & Stanciu, IBIMA, 2024)	Looks at small and medium enterprises (SMEs) in food processing: competitive situation, revenue growth, etc., using national statistics, etc.	This is more about economic/financial performance and industrial growth, not directly on intercultural competence. But sectors with foreign trading or export could have IC implications. It might serve as indirect evidence.
2	Change management: a case study in the Republic of Moldova through the prism of business efficiency (Şargu, Cobzari, Bivol, Ignat, Coca-Elena, 2021)	A local enterprise, particularly a large commercial bank, is studied for its organizational culture and how it handles change management; assessing effects on administrative/managerial efficiency.	Stronger relevance: banking is often multicultural (clients, staff, possibly foreign investment or partnerships). The study shows how organizational culture and change processes (which include elements of intercultural interaction) can improve efficiency. This can be used as a quasi-case of IC in practice
3.	Intercultural Profile of Managers in the Republic of Moldova (Pirlog, 2021)	Survey of managers in different sectors and students; uses Trompenaars-Hampden-Turner dimensions; identifies Moldova's "national cultural profile" (e.g. particularism, individualism, neutral affect, status via achievement, etc.).	While it's not a case of a single company, it gives good empirical baseline: how managers behave, perceive culture. This helps to understand what IC skills are more or less present in Moldova. Could be used to compare companies that deviate from the national norm.
4.	Intercultural "Diagnosis" of Management in the Republic of Moldova According to Geert Hofstede Model: Comparative Analysis (Pirlog, 2020)	Compares Moldova's scores on Hofstede's dimensions with those of key partner countries.	It provides macro / sectoral context. Useful to see how companies face cross-cultural interactions (imports, exports, foreign partners).
5.	The Dimensions of Corporate and National Culture: The Cross-National Analysis (Covas & Pirlog, 2019)	Compares corporate culture of companies in Moldova & Romania, and national culture dimensions.	Closer to company level. Could be used to extract cases of companies in Moldova whose internal culture practices illustrate IC or lack thereof, especially in comparison to similar companies

Source: Author's compilation

From the examples in table 1, we can deduce some practical management strategies or components of IC that are working or should be working in the Republic of Moldova:

- ✓ **Adopting foreign management practices** - subsidiaries of foreign companies bring formal processes, documentation, standardization; local firms that wish to engage in international business should either learn/adapt those practices or partner in ways that allow cross-cultural learning.

-
- ✓ **Change management and organizational culture development** - companies (especially banks) that actively manage change (in structure, communication, culture) are more likely to be effective. Managing resistance, ensuring leaders understand local culture (communication styles, hierarchy) helps during transitions.
 - ✓ **Surveying internal values / perceptions** - the studies show that mapping what managers believe (their cultural orientation) helps companies design training, communication, and leadership development tailored to what is culturally realistic in a Moldovan context.
 - ✓ **Foreign ownership / international customer base as drivers of IC** - companies like Moldcell or foreign-subidiaries set up in Moldova see the need to handle cross-cultural issues: different languages, customer expectations, parent company norms, etc. Management in these companies has to have cross-cultural awareness and adaptability.

Suggestions for Developing Company Case Studies

In order to strengthen the empirical foundation of intercultural management research in the Republic of Moldova, it is essential to develop well-structured company case studies. Such case studies provide valuable insights into how organizations apply intercultural competence (IC) in real business contexts and how these practices influence managerial effectiveness, teamwork, and overall performance.

Developing company case studies involves identifying firms with international exposure or diverse workforces, collecting both qualitative and quantitative data, and documenting best practices, challenges, and outcomes. By focusing on local enterprises that collaborate with foreign partners, export goods, or employ multicultural teams, researchers can generate practical examples that connect theory with the realities of Moldovan business life:

Banking sector seems promising. The *change management* example suggests there are banks with some degree of managerial sophistication. Reaching out to large banks (Moldindconbank, Victoriabank, etc.) to see if their internal HR/OD departments have reports on cross-cultural issues (e.g. staff diversity, foreign investors, cross-boundary operations) could yield usable cases.

Telecommunications / telecoms (e.g. Moldcell, Orange Moldova) - they often have multinational ownership / partners, customer bases with linguistic diversity (Romanian/Moldovan, Russian, possibly Gagauz or other minorities). They might have case studies or internal reports about dealing with cultural differences in customer expectations, branding, communication.

Export-oriented SMEs in agri-food - the agri-food sector case study may contain subcases of companies dealing with standards, foreign clients, cross-border trade which likely force some intercultural adjustments.

Multinationals or foreign companies operating in Moldova - these are likely to have documented practices regarding IC (e.g. dealing with headquarters abroad, or managing multicultural teams). Checking annual reports, CSR reports, or contacting HR/communications departments could reveal informal or unpublished case material.

Developing medical tourism healthcare organizations (The Medical Tourism Association of Moldova, 2025) providing services to foreign patients, will have to apply to IC training programs enhance employees' skills. professionals trained in IC effectively navigate differences in communication styles, professional hierarchies, and patient expectations, improving team collaboration and patient outcomes (Caligiuri & Tarique, 2012).

Structure of a Company Case Study on IC

To ensure that case studies exploring intercultural competence (IC) are both academically rigorous and practically relevant, a clear methodological framework is required. According to Yin (2018), well-designed case studies allow researchers to investigate complex real-life phenomena in depth and within their specific contexts - in this case, how Moldovan companies develop and apply intercultural competence in management practices.

1. Selection of Companies. The selection of companies should be guided by their exposure to international or multicultural environments. Yin (2018) and Stake (1995) recommend a **purposive sampling strategy**, focusing on organizations that provide rich information about the phenomenon of interest. In the Moldovan context, this might include enterprises engaged in export activities, international partnerships, or multinational subsidiaries (Pirlog, 2021). Including diverse sectors such as IT, hospitality, manufacturing, and education allows for broader applicability and comparative insights (Creswell & Poth, 2018).

2. Data Collection Methods. Qualitative methods are central to case study research. As suggested by Flick (2014), researchers can employ **interviews, surveys, document analysis, and observation** to gain a multi-dimensional understanding of intercultural practices. Interviews with managers and employees help capture perceptions of cultural diversity and management adaptation (Deardorff, 2009), while surveys based on frameworks such as Hofstede’s cultural dimensions or the Intercultural Development Inventory (IDI) provide measurable indicators (Thomas&Inkson,2017). Document analysis - including HR manuals, training materials, and corporate communication - reveals how intercultural values are institutionalized within organizations (Brewster, Wood & Brookes, 2008).

3. Key Indicators for Measuring IC Impact. To assess the effectiveness of IC in organizations, case studies should focus on both **organizational** and **human** indicators. Thomas and Inkson (2017) suggest evaluating managerial adaptability, team coordination, and communication effectiveness. Quantitative metrics such as employee satisfaction, turnover rates, or client satisfaction can be used to demonstrate the business impact of intercultural programs (Brannen & Doz, 2010).

4. Structure of a Case Study Report The structure, as indicated in table 2, follows recommendations by Stake (1995) and Miles, Huberman & Saldaña (2014), who emphasize systematic data presentation and theory linkage to enhance analytical depth.

Table 2. A well-structured case study

Background of the company	Purpose of the study	Research methods and data sources	Findings and analysis	Discussion and implications
Sector, size, ownership, and international exposure	Intercultural challenge addressed	Interviews, surveys, observations	Linking empirical data to intercultural management theories	Organizational strategy and leadership development

Source: Stake (1995) and Miles, Huberman & Saldaña (2014)

5. Ethical Considerations. Case study research must respect confidentiality, informed consent, and cultural sensitivity. Deardorff (2009) warns against cultural stereotyping and promotes reflective, respectful research communication. Maintaining anonymity of participants and companies ensures ethical integrity and builds trust in the research process (Creswell & Poth, 2018).

Discussion and Conclusions

Intercultural competence (IC) has emerged as a critical capability for managers operating in globalized and culturally diverse environments. The evidence from theoretical frameworks and real-world cases demonstrates that IC enables managers to navigate cultural differences, mitigate conflicts, foster effective communication, and enhance team and organizational performance.

The findings from the case studies reinforce the theoretical frameworks of intercultural management and highlight the critical role of intercultural competence (IC) in achieving effective leadership and organizational performance. Starbucks’ success in China illustrates Hall’s (1976) high- and low-context communication theory: understanding implicit communication patterns and

local business etiquette enabled managers to build trust and align marketing strategies with cultural expectations. Similarly, IKEA's adaptation to the Indian market reflects Hofstede et al.'s (2010) cultural dimensions, such as power distance and collectivism, demonstrating the need to tailor organizational practices to cultural norms.

The Daimler-Chrysler merger exemplifies the risks of neglecting Trompenaars' (2012) cultural dimensions, including differences in achievement versus ascription orientation and hierarchical expectations. Misalignment in these dimensions resulted in operational inefficiencies, low morale, and ultimately, organizational failure. Conversely, Google's multicultural teams highlight how integrating IC into management practices promotes collaboration, innovation, and employee satisfaction, aligning with findings from the GLOBE project (House et al., 2004), which emphasizes culturally contingent leadership behaviors.

Organizations that invest in developing IC through training, mentoring, and experiential learning gain a strategic advantage by leveraging diversity for innovation and sustainable growth.

The examples under discussion underscore several practical implications. Managers in multicultural settings must develop self-awareness, cultural knowledge, and adaptive skills to navigate cross-cultural interactions successfully. Organizations should invest in IC training programs, mentoring, and experiential learning to enhance leaders' capabilities. Theoretical implications include the validation of established cultural models (Hofstede, Trompenaars, Hall, GLOBE) in practical contexts, demonstrating their relevance for predicting managerial behavior and organizational outcomes in global environments.

IC is both a theoretical construct and a practical necessity. For global organizations, developing interculturally competent managers is essential for successful leadership, cohesive multicultural teams, and competitive advantage in increasingly interconnected markets. Future research should continue exploring the mechanisms by which IC influences organizational outcomes and the most effective methods for cultivating it in diverse managerial populations.

Our search, has shown that there is academic work (surveys, theses) exploring national culture, cultural dimensions, perceptions among managers in the Republic of Moldova, but hardly any public case study showing an explicit IC program in a for-profit Moldovan company with before/after data on organizational performance, employee satisfaction, turnover, etc.

Therefore, there is a clear need for empirical research and applied initiatives that systematically integrate intercultural competence (IC) development into managerial and organizational practices. Future studies should focus on designing, implementing, and assessing IC training programs in Moldovan enterprises, particularly those engaged in international partnerships or operating in culturally diverse markets. Such programs could serve as a foundation for improving leadership adaptability, communication across cultures, and overall competitiveness in the global economy.

While Moldova's academic community has laid valuable theoretical groundwork, the next step involves transforming this knowledge into actionable strategies that enhance managerial effectiveness and organizational performance through intercultural competence. Strengthening this link between theory and practice will not only benefit individual companies but also contribute to the broader modernization and international integration of Moldova's business environment.

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THE IMPACT OF ARTIFICIAL INTELLIGENCE ON GLOBAL BUSINESS PRACTICES

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Abstract: This article highlights how artificial intelligence (AI) is transforming international business models by altering traditional business practices. With AI's assistance, global businesses can more easily grasp market trends, thereby enhancing operational efficiency and productivity.

AI has revolutionized the efficiency of decision-making processes by reducing time, improving operational efficiency and reducing errors. It has optimized supply chain management by providing new AI-driven insights. Thanks to new technologies such as big data and the Internet of Things (IoT), companies can analyze market trends and improve their global competitiveness. However, AI may present risks in terms of ethical concerns and errors that could impact data security. It has become the responsibility of every employee and manager to improve their digital skills and knowledge about AI in order to remain competitive in their field of work. This research aims to understand the main challenges and opportunities that global businesses are facing due to the expansion of AI in the global economy, and how this is reshaping business models. Strategic adoption of AI can considerably foster innovation and bring huge competitive advantages. Companies and organizations should cooperate with AI researchers to innovate and expand safely. The future belongs to AI, and companies that master it will be more sustainable and resilient in a competitive global market.

Keywords: AI, global business, efficiency, competitiveness, challenges, opportunities.

JEL Classification: O33, M15, F23, M21, L86

Artificial Intelligence (AI) is becoming the shaper and reshaper of international business (IB) strategies, practices, and global environments (Menzies et al., 2024). With operational efficiency, innovation, and decision-making as primary thrusts, AI makes it possible for multinational enterprises (MNEs) to run complex and increasingly digitalized conditions. AI spans a multitude of technologies-including machine learning, natural language processing (NLP), robotics, and neural networks-that can assist organizations in automating tasks to analyze and process huge data volumes to make strategic decisions. In addition to carrying organizational improvements, AI enables firms to foster multinational collaboration through communication, supply chain improvement, and firm product and service adaptation to various cultural, linguistic, and regulatory contexts. Despite that, AI international business faces many challenges, including ethical issues, risks concerning personal data privacy, workforce adaptation problems, and the

imperative for effective governance and compliance structures. In the methodology, the selection and analysis of relevant articles, industry AI reports, and policy papers that address issues in international business—from AI openness and human resource management to digital technologies and B2B marketing—were done in a systematic manner. These sources were then subjected to critical analysis to trace recurring themes, benefits, challenges, and knowledge gaps in the adoption of AI in international business practices.

According to a study of McKinsey Global Institute, (“The State of AI”, 2025) in a survey (The survey question asked, “In which business functions has your organization adopted AI (for example, machine learning, computer vision, natural-language processing)?), 78 percent of respondents say their organizations use AI in at least one business function, up from 72 percent in early 2024 and 55 percent a year earlier. The most frequent use of the technology has been reported in the functions of IT and marketing and sales, followed by service operations. The business function under the scrutiny of the rapid rise in AI use in the past six months is IT, where the share of respondents reporting AI use jumped from 27 percent to 36 percent. There are also more functions in which organizations are reporting AI usage compared to the previous State of AI survey. For the first time, more of the survey respondents are reporting AI use in more than one business function. Overall responses indicate that organizations are using AI in an average of three business functions—up from early 2024 but still a minority of functions.

Organizations that use AI in at least 1 business function, % respondents

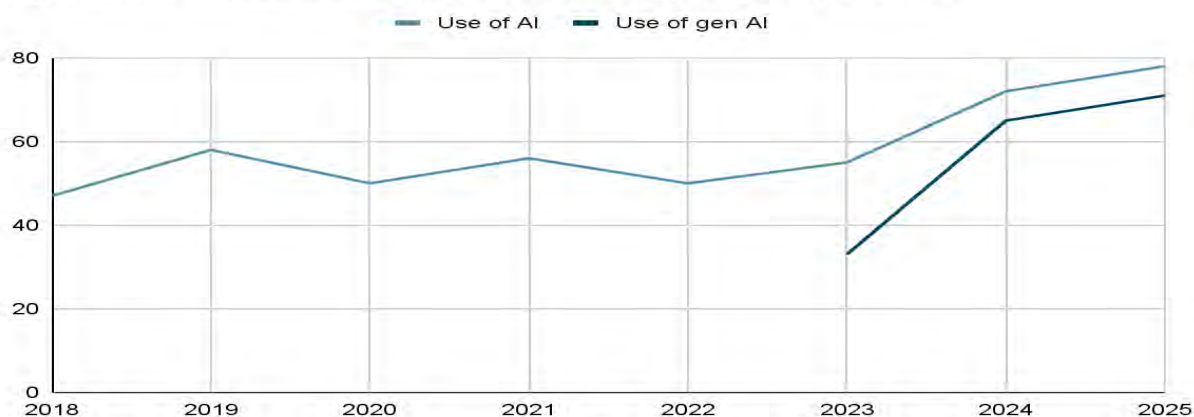


Figure 1. Organisations that use AI in at least 1 business function, in %

Source: Elaborated by authors, based on the report “The state of AI”, 2025

The uses of AI in marketing and sales will be the most common across organizations in all sectors, whereas the deployment in other functions varies greatly by industry. Organizations apply the technology to generate maximum value—for instance, service operations for media and telco companies, software engineering for tech companies, or knowledge management for professional services ones. Gen AI deployment varies also by company size. Responses show that organizations with more than half a billion dollars of annual revenue are using gen AI across a broader scope of their organizations than smaller companies. Gen AI is most widely applied in marketing and sales, product and service development, service operations, and software engineering, as shown by survey responses.

Amazon case study: implementing AI within business operations

It demonstrates that AI adoption in the business operations of such a multinational giant as Amazon has a lot to offer in terms of benefits and challenges. These benefits include the promise of more efficient operation, reduced costs, and improved experiences for customers, such as using technologies like natural language processing (NLP) for the customer service team, machine learning (ML) for supply chain optimization, as well as computer vision for quality control. Integration of AI, however, poses challenges, including but not limited to job displacement, ethical

implications, and data privacy issues, which would need to be addressed through proper planning and strategy.

For many years now, AI has been part of the business model of Amazon, (Etukudo, Emem., 2023) that automates more repetitive jobs within the firm, engages in advanced data analytics for a better decision-making process among stakeholders, and enhances supply chain management processes for customer service and marketing operations. Among considerations for any organization intending to adopt AI are the reasons for adopting AI, the appropriate technology for deployment, measurement standards for benefit realization, identification of scope of impact areas of AI, influence on employees, ethical concerns to be discussed, and practical recommendations for peer companies. With strategic alignment focused on risk management while rolling out AI technologies, companies can replicate the increased competitiveness and innovation that Amazon gained from its adoption of AI across global markets.

Advanced digital technologies in international business

Although among other digital technologies, AI, is implicated in international business, other technologies include blockchain, Internet of Things (IoT), 3D printing, and simulation (Alan A. et al., 2023). The blockchain supports greater transparency and trust through secure and immutable ledgers, reducing monitoring costs and providing reliable transaction support in the international arena. IoT-based data collection and analytics are real-time invisible optimization of supply chains and better responsiveness in meeting market demand. 3D printing encourages local manufacturing, which reduces transportation costs and makes it easy to become established in foreign markets. Untapped simulation technologies have great promise for future applications in scenario analyses and strategic decision-making. However, these technologies in the literature seem to be rather developing and unformed. Thus, this area needs intense interdisciplinary research to understand better such technologies in global value chains, inter-firm and intra-firm relationships, and cybersecurity.

Global AI infrastructure and risk management

Such international deployments depend more on global cloud infrastructure for the international exchange of reliable data sources and AI services than on establishing complete domestic capabilities (OECD, 2025). Countries with developed cloud infrastructures are major venues for AI model hosting and distribution toward international expansion. However, there are apparent risks with international deployment of AI, such as system failure, cybersecurity vulnerability, and regulatory compliance issues. Risk assessment processes help analyze both the possible advantages and possible evils that can result from relating to AI in organizations. It is also equally critical to note that the effects of risk phenomena such as "boiling frog" (Mohsen Soori, et. al., 2023) in organizations, which leads organizations to carry increasing risks as concession benchmarks become lax, make continuous monitoring the apparent gold standard to save organizations from financial losses, reputational damage, and legal complexities.

AI in human resource management

AI applications in human resource management to improve employees' experiences by automating mundane tasks, providing hyper-personalized talent management solutions, and assisting in performance evaluations (Menzies et al., 2024). Employee satisfaction, engagement, and commitment improve, while the organization benefits from increased efficiency and productivity. However, concerns remain: job insecurity, stress, and resistance to this technology. Developing fusion skills (soft skills, judgment, and innovation) (Budhwar et al., 2022) and AI literacy (understanding algorithmic systems) are essential for employees to effectively partner with AI. Sometimes, ethical issues, data privacy, and mitigating bias become equally important, especially in an early AI application that has shown gender and race biases in recruitment and promotion decisions. Compliance with regulations, such as GDPR, becomes a real challenge for multinationals, especially when operating across multiple jurisdictions.

AI in supply chain and B2B Marketing

Supply chain management is optimized by ANNs (Artificial Neuronal Networks) and analytics powered by AI to enhance forecasting accuracies and improve route planning, inventory management, and demand forecasting (Surajit Bag, et. All, 2021). The incorporation of customer e-sentiments from large unstructured datasets enhances the overall intelligence and decision-making. In B2B Marketing, AI aids in knowledge generation from structured and unstructured data (e.g., social media and search engines) and supports rational decision-making under uncertainty, thus stimulating innovation outside traditional marketing models. AI gives foresight and automates processes, thereby enabling companies to react to fast-evolving international markets, adjust strategies to accommodate sustainability and efficiency trends, and improve their overall performance.

AI openness, transparency, governance and economic impact

Open-weight AI models create innovation, competition, and access to advanced technologies for smaller firms and emerging markets. Such cases provide the best localization possible for products and services-with respect to cultural, linguistic, and regulatory contexts (Mohsen Soori, et. all, 2023) . However, openness brings with it risks of intellectual property, cybersecurity, and misuse. All stakeholder organizations and policymakers need to combat the need for protection from transparency by creating governance frameworks that promote responsible deployment of AI while protecting proprietary assets, privacy, and operational safety. Open weight models help businesses to be innovative and competitive, because they lower barriers to entry. Especially is important for startups, because they have access to develop their own models.

By this, companies can adapt, access their own models of AI. According to OECD analysis, (AI Openness: Balancing Innovation, Transparency and Risk in Open-weight Models - OECD.AI, n.d.) USA and China are leaders in developing open-weight models. Among the actors involved in the undertaking are primarily the United States, China, and France, emphasizing what could be termed a global race as well as a national strategy of technological sovereignty and global influence. Besides, the open-weight models are becoming more numerous but also generally better. As per conclusion, it emphasize the proper chance for businesses to grow, expand with the help of AI, which help in the decision-process making and other

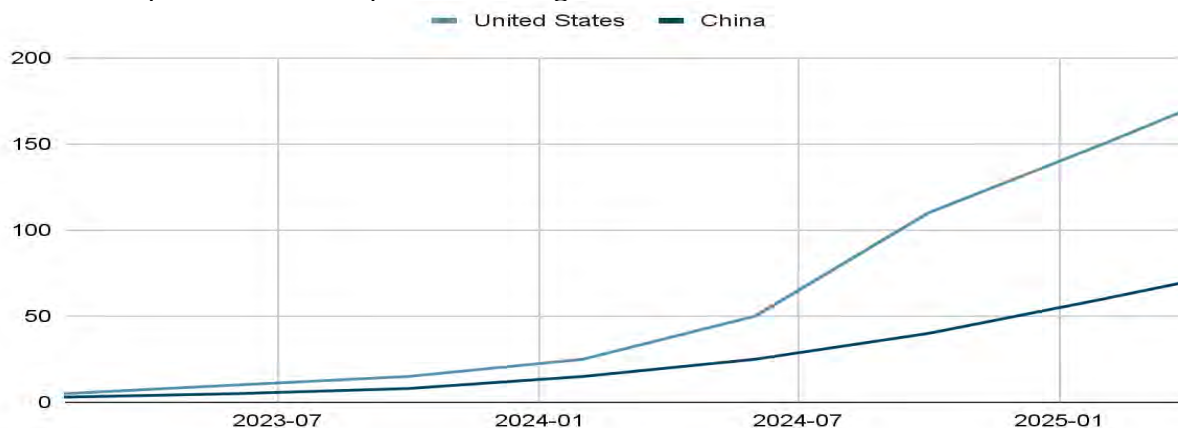


Figure 2. Open-weight models

Source: Elaborated by authors, based on the OECD report

Penetration of AI (Quiroz-Vázquez, C.,et. all, 2025) within all organizational functions-such as marketing, sales, IT, and cybersecurity-brings about tremendous economic and strategic advantages. Institutional capabilities, like sound data governance, hybrid or multicloud infrastructure at scale, and mapping AI efficiencies against the core business objectives, will have to be built up by firms. Ethics and risks management, along with security, will remain very

important, for AI could harbor bias, lack in transparency, and misuse. Responsible acquisition would gain competitive advantage, trust in stakeholders, and a pathway to sustainability.

Conclusion

AI is believed to be a disruptive force for the international business sector affecting strategy, operations, and value creation across supply chain management, marketing, human resources, and customer engagement. An example of how AI has maximized efficiency, minimized cost, and enhanced customer experiences with modern technological inventions like natural.

Yet, these very challenges-moral considerations on data privacy and the adaptations that the workforce will need to embrace, alongside compliance with regulation-raise serious concerns and warrant immediate attention and intervention. The establishment of open-weight AI models is an important tributary in this respect-by truly democratizing access to the most cutting-edge AI technology, thus allowing companies, including startups from developing markets, to customize these systems to meet local needs. These models encourage innovation, transparency, and collaboration cross-border in as much as they also bear the risks of misuse, disregard for intellectual property rights, and open doors for cybercriminals. The AI integration future might push multinational companies to harmonize innovation with responsible governance to enable AI adoption benefits-increased competitiveness, adaptability, and resilience-to culminate in sustainable growth and ethical conduct in international business.

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THE EVOLUTION OF GENDER EQUALITY IN THE EU CANDIDATE COUNTRIES

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Abstract: This article explores the progress of gender equality in selected European Union (EU) candidate countries, focusing on a comparative analysis with the EU member states over the past decade. Key indicators will be evaluated to assess the status of gender equality, highlighting disparities and trends relative to the EU average. Among the Sustainable Development Goals (SDGs), promoting gender equality remains a central priority for governments worldwide, recognised as a fundamental driver of sustainable development and inclusive economic growth. Identifying existing gender gaps and harnessing the full potential of women is essential for achieving meaningful progress and long-term development. The analysis will explore the structure of employment using indirect indicators, including mortality rates, and will assess the overall quality of life for women in EU candidate countries. Particular attention will be given to the evolution of women's participation in the labour force, expressed both as a share of the total labour force and relative to the female population. Additionally, the study will address aspects of vulnerability among women in these countries. Finally, the representation of women in top and middle management positions will be compared across the selected economies, offering further insights into gender-based disparities in leadership and decision-making roles.

Keywords: gender equality, EU candidate countries, women's enhancement, gender gap, female employment **JEL Classification:** J16, J21, O52

Introduction

Ranked fifth under the Sustainable Development Goals, gender equality is a major concern for policymakers around the world. The objective is to promote gender equality and empower all women and girls. This goal has become even more critical in the wake of recent global challenges, particularly the COVID-19 pandemic, the war in Ukraine, the war in Gaza, and the energy crisis. It is now clear that achieving gender equality by 2030 is unlikely. In several domains, gender disparities have not only persisted but have widened. The COVID-19 pandemic, conflicts and wars further exacerbated these inequalities, with women in many countries, particularly those with low income, facing significant barriers to accessing essential health services. Statistics reveal that in many states, an increase in violence against women was registered during the pandemic, conflicts and wars.

As per the United Nations Sustainable Development Goals Report 2022, 26 per cent of women aged 15 and older worldwide have experienced physical and/or sexual violence at least once in their lifetime. While this figure reflects the persistent and pervasive nature of gender-based violence, some progress has been observed in women's political representation. As of January 1, 2022, the global share of women in national parliaments increased to 26.2%, up from 22.4% in 2015. Representation at the local government level is somewhat higher, reaching approximately 33%. In the economic sphere, women's participation in managerial roles saw only marginal improvement, rising to 28.3% in 2020, the same as in 2019, from 27.2% in 2015, indicating stagnation in leadership advancement. In terms of financial commitment to gender equality, the

report highlights significant shortcomings. Between 2018 and 2021, only 26% of countries implemented comprehensive systems to track public budget allocations related to gender equality. An additional 59% had partial systems in place, while 15% lacked even the basic elements required to monitor such expenditures. (United Nations, 2022).

As mentioned by the UN, progress has been fragile and unequal in achieving the SDGs between 2015 and 2025. Millions of individuals continue to endure extreme poverty, food insecurity, inadequate housing, and limited access to essential services. Systemic inequalities persist, disproportionately affecting women, persons with disabilities, and marginalised communities. (United Nations, 2025).

The European Union remains a central actor in advancing gender equality, currently implementing the Gender Equality Strategy 2020–2025, which builds upon the earlier 2016–2019 Strategy on Gender Equality (European Commission, 2022). Among the notable UN–EU collaborative efforts is the Spotlight Initiative, a global, multi-year program dedicated to eliminating all forms of violence against women and girls (United Nations, 2022).

While the EU has made significant progress in promoting gender equality, often outperforming the global average across various indicators, persistent gaps remain, particularly in the labour market. Women continue to be overrepresented in lower-paid sectors and underrepresented in leadership and decision-making roles. The EU Gender Equality Strategy 2020–2025 outlines several key priorities: eradicating gender-based violence, challenging gender stereotypes, closing gender gaps in employment, ensuring equal pay for equal work, promoting equal participation across all sectors of the economy, and strengthening women's representation in politics and management positions. (European Commission, 2022).

The methodology used in this article focuses on temporal and comparative analysis of gender equality indicators, integrating both socio-economic development and gender-specific labour market dynamics.

The objective is to analyse the evolution of gender equality in selected EU candidate countries from 2012 to 2023 (or the latest available), using a set of economic, demographic, and labour-market indicators disaggregated by gender, and the geographic scope covers the following EU candidate countries: Albania, Serbia, Bosnia and Herzegovina, Montenegro, North Macedonia, Türkiye and Georgia (included for comparative purposes due to its previous EU integration aspiration and similarities to Republic of Moldova). Data will be sourced from reliable international databases, to ensure comparability of data, including: World Bank Open Data, ILO (International Labour Organisation), Eurostat, UNDP Human Development Reports etc. Limitations of the current research include data gaps: missing values may limit comparability for certain years or countries, structural changes: labour market definitions (e.g., “vulnerable employment”) may differ by source, and causality: the analysis is descriptive/exploratory; causal inference is not attempted here.

Results

Several key indicators will be analysed to assess the evolution and current state of gender equality in EU candidate countries, with a comparative perspective against the EU average.

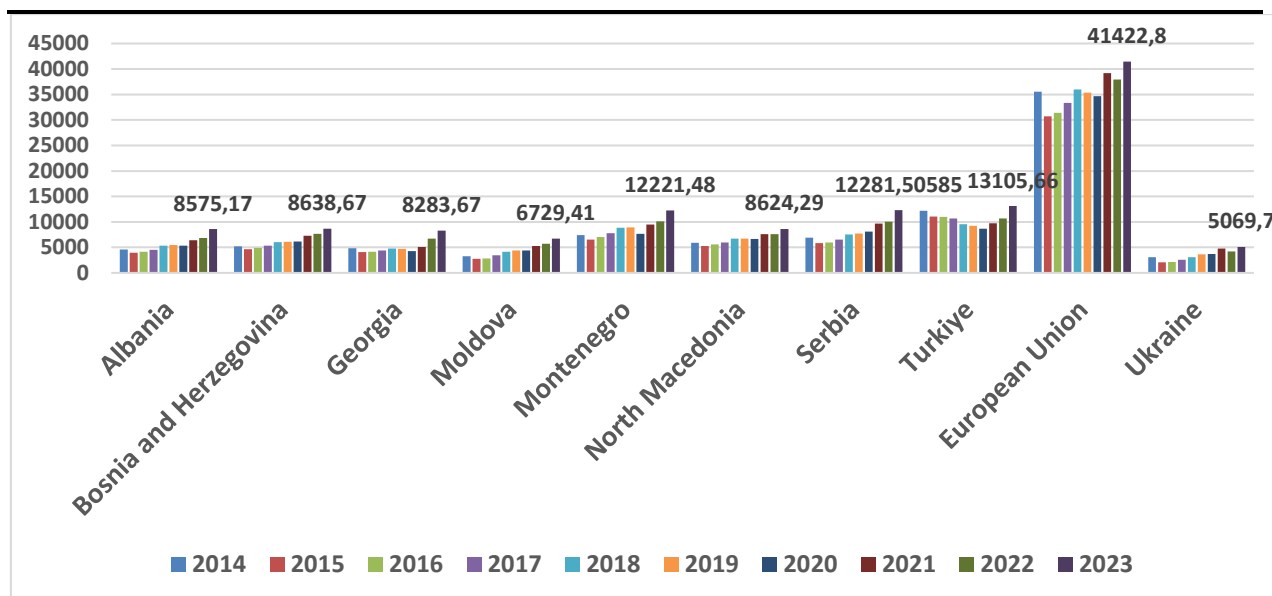


Figure 1. GDP per capita, US\$, current prices

Source: elaborated by the author based on the data from <https://databank.worldbank.org/reports.aspx?source=2&series=SE.ENR.PRSC.FM.ZS&country=#>

The highest per capita income among non-EU countries is in Montenegro (12,221.5 USD in 2023) and Serbia (12,281.5 USD in 2023), which are at the top in the Western Balkans. Türkiye also stands out, reaching 13,105.7 USD in 2023. While the lowest per capita income is registered in Ukraine, with 5,069.7 USD in 2023, heavily affected by war and instability, and Moldova is also at a low level, with 6,729.4 USD in 2023, though showing steady growth.

Considering the income inequality of selected EU candidate countries, it can be noticed from the figure below that most countries show relative stability in their Gini coefficients across the years, with minor fluctuations. Türkiye stands out with the highest Gini coefficient, around 42–44 in recent years, showing persistent and rising inequality. Georgia, Montenegro, and Serbia present mid-range values, registering moderate inequality: Georgia: fluctuating between 34–36, stabilising at 34.2 in 2022, Montenegro: around 34–39, ending at 34.3 in 2022, and Serbia: highest earlier - 40 in 2014–2015, then declining to 33.1 in 2022, showing improvement in income distribution.

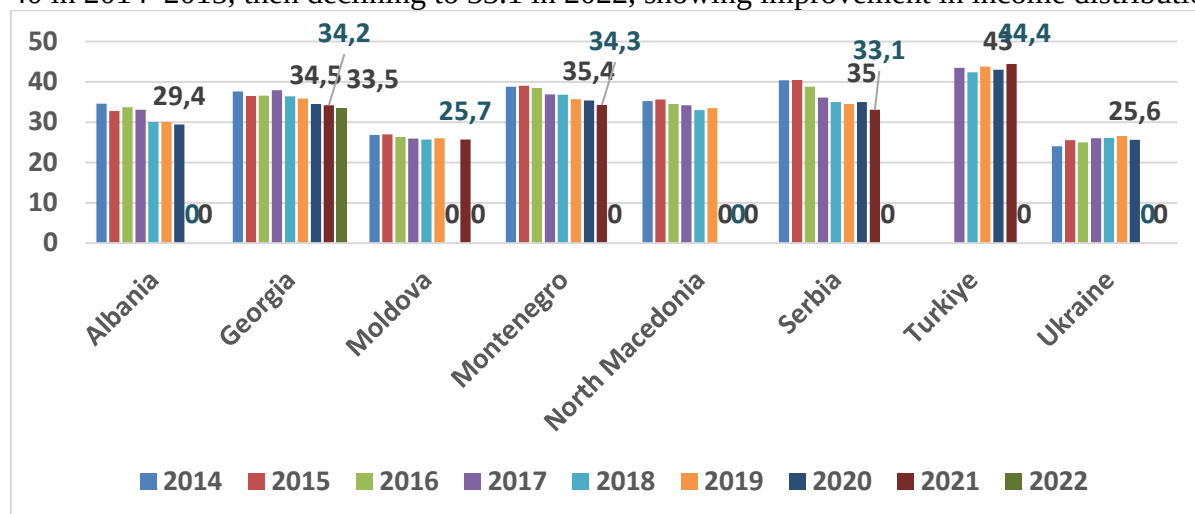


Figure 2. Gini Coefficient

Source: elaborated by the author based on the data from

<https://databank.worldbank.org/reports.aspx?source=2&series=SE.ENR.PRSC.FM.ZS&country=#>

On the other hand, lower inequality is registered in Albania, with a decline from 34–35 in 2014 to 29.4 in 2019, suggesting a more equal income distribution. Moldova consistently has low inequality, around 25–27, among the most equal in the region, and Ukraine also has relatively low inequality (25–26). Moldova and Ukraine appear more equal, but this is partly due to structural factors (lower overall incomes, a high informal sector, and war effects in Ukraine). Türkiye is a clear outlier with rising inequality. The Balkans (Serbia, Montenegro, and Georgia) exhibit moderate inequality, but Serbia has achieved some reduction. Albania shows notable progress, moving toward greater equality.

The figure below shows the Human Capital Index (HCI) for women in EU candidate countries. HCI measures the productivity of the next generation of workers, given current health and education conditions, with values ranging from 0 to 1 (higher values indicate better performance).

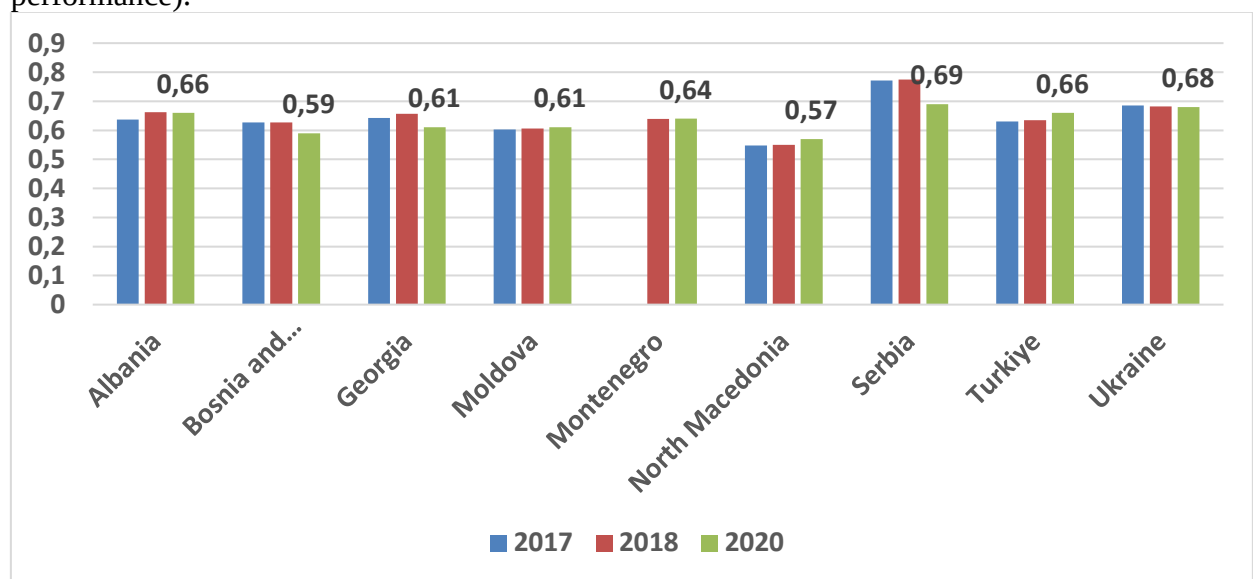


Figure 3. Human Capital Index (HCI) for women

Source: elaborated by the author based on the data from

<https://databank.worldbank.org/reports.aspx?source=2&series=SE.ENR.PRSC.FM.ZS&country=#>

The HCI values range between 0.57 and 0.69, showing moderate human capital outcomes for women in the EU candidate countries. No country from the analysed ones reaches 0.7 or higher, highlighting persistent challenges in education, health, or labour outcomes for women. Overall, progress between 2017 and 2020 is slow, with limited improvements.

Serbia, Albania, Türkiye, and Ukraine show slight improvements between 2017–2020. Bosnia and Herzegovina, Georgia, and Moldova demonstrate stagnation or mild decline, indicating that gains in female human capital have not been consistent. North Macedonia improved marginally from 0.55–0.57, but remains at the bottom of the regional ranking.

South-Eastern Europe and Eastern Partnership countries fall below EU averages (on average 0.75–0.8 for women). This indicates a development gap, particularly in education quality, health outcomes, and labour force participation of women.

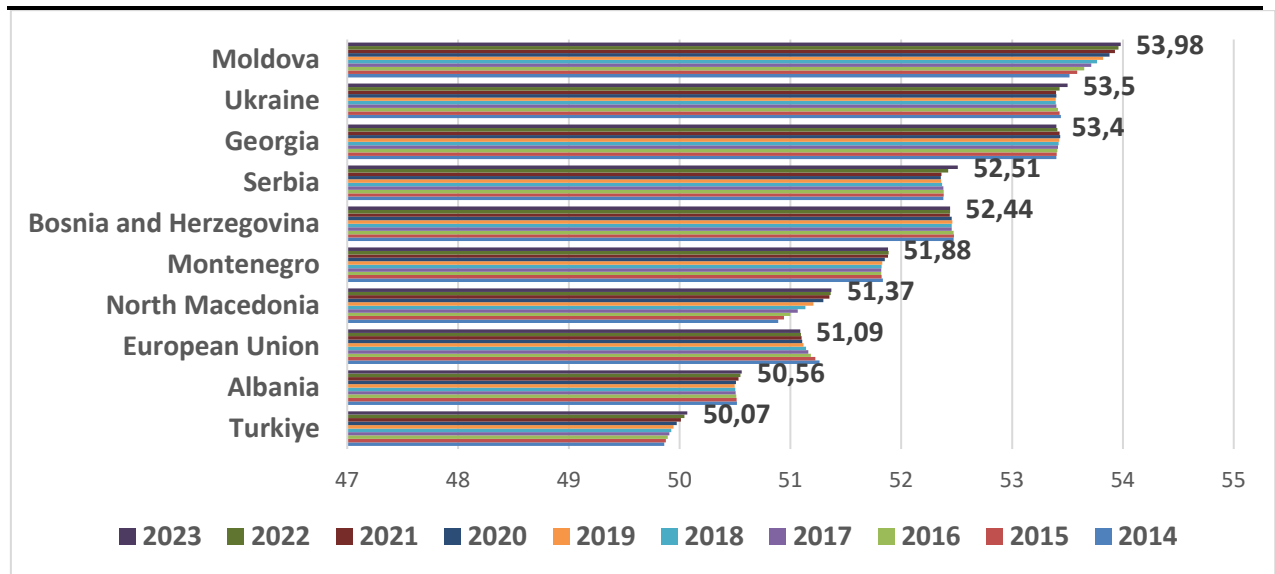


Figure 4. The share of women in the total population, %

Source: elaborated by the author based on the data from

<https://databank.worldbank.org/reports.aspx?source=2&series=SE.ENR.PRSC.FM.ZS&country=#>

Across all considered EU candidate countries, the share of women in the population is above 50%. Moldova (53.98% in 2023) has the highest proportion of women, reflecting demographic factors such as higher female life expectancy and male out-migration. Ukraine (53.5%) and Georgia (53.4%) also stand out, showing a similar demographic pattern, largely influenced by male mortality and migration trends.

European Union (51.1%) is close to balance but still has a female majority. Albania (50.6%) and especially Türkiye (50.1%) are the closest to parity between men and women.

Countries with higher female population shares (Moldova, Ukraine, Georgia) face specific demographic challenges: ageing populations with more elderly women than men, Gender imbalances partly caused by male labour migration, conflict-related mortality (Ukraine), and health gaps. Countries closer to parity (Türkiye, Albania) tend to have younger populations and higher male survival rates, narrowing the gender gap.

The structure of the labour market in both the EU and EU candidate countries will also be analysed below.

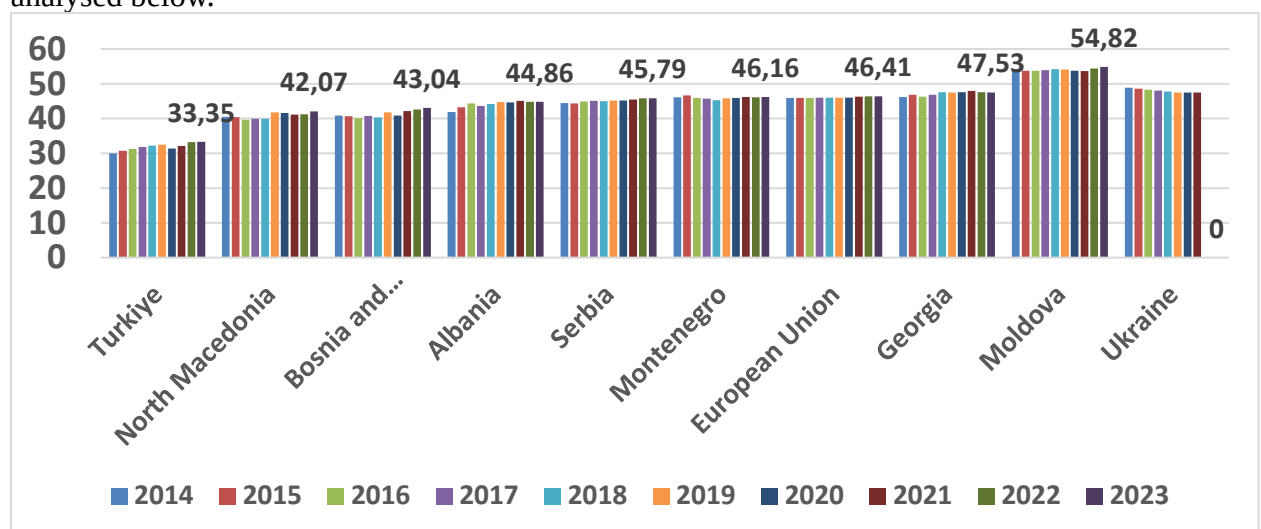


Figure 5. Female share of the total labour force (%)

Source: elaborated by the author based on the data from

<https://databank.worldbank.org/reports.aspx?source=2&series=SE.ENR.PRSC.FM.ZS&country=#>

A wide variation across countries is observed, with the lowest female participation in: Türkiye – only 33.35% in 2023, showing structural barriers for women in the labour market (cultural norms, childcare burdens, labour informality). And the highest female participation is registered in Moldova – 54.82% in 2023, meaning women represent the majority of the labour force, which is exceptional for the region.

Middle-range countries in terms of female share in the total labour force are: the European Union: female share around 47.5%, stable, serving as a regional benchmark, Georgia: close to the EU level (47% in 2023), Montenegro - 46.4%, also slightly below the EU, Serbia - 44.9%, lower than the EU average but relatively stable, Albania (43%) and Bosnia and Herzegovina (42%) are in the mid-range, and North Macedonia: 42% in 2023, close to Bosnia and Albania.

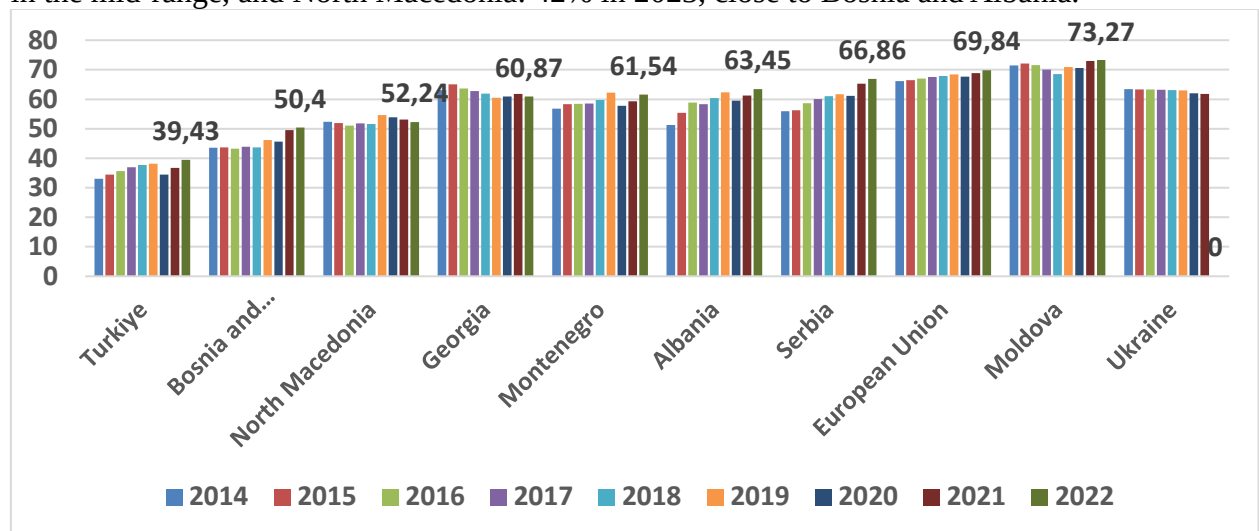


Figure 6. Labour force participation ratio, 15+, female (%), EU and EU candidate countries

Source: elaborated by the author based on the data from <https://databank.worldbank.org/reports.aspx?source=2&series=SE.ENR.PRSC.FM.ZS&country=#>

Türkiye has by far the lowest female participation rate: only 39.4% in 2022, although it shows a slow increase compared to 33% in 2014. This indicates deep-rooted structural, cultural, and institutional barriers for women entering the labour market.

Moldova leads with 73.3% in 2022, showing the highest female participation rate in the region, even above the EU average. This reflects both necessity-driven labour participation and relatively strong engagement of women in the workforce.

European Union - 69.8% in 2022, serving as the benchmark, Ukraine is stable around 62–64% before 2021, though no data is available for 2022 due to war disruptions. Serbia - 66.9%, above the EU average and one of the strongest in the Balkans. Albania - 63.5%, also relatively high. Montenegro (61.5%) and Georgia (60.9%) show strong but slightly below EU participation. North Macedonia (52.2%) and Bosnia and Herzegovina (50.4%) remain low compared to peers, suggesting persistent barriers for women's inclusion.

All countries show gradual improvements from 2014 to 2022, except Ukraine, where the data stops earlier. The gap between Türkiye and Moldova widened significantly: a difference of more than 34 percentage points in 2022.

Thus, above or close to the EU average are: Moldova, Serbia, Albania, moderate but improving: Georgia, Montenegro, and lagging are: North Macedonia, Bosnia and Herzegovina. While Türkiye is significantly below all others, despite small improvements in the female participation rate.

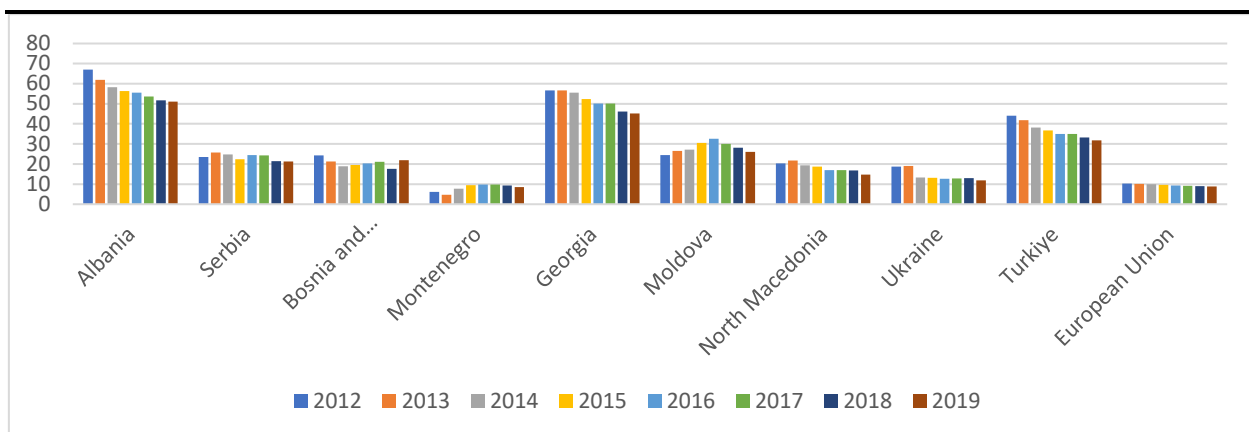


Figure 7. Vulnerable employment, female (% of female employment) in EU and EU candidate countries and Georgia, 2012-2019

Source: elaborated by the author based on the data from <https://databank.worldbank.org/reports.aspx?source=2&series=SE.ENR.PRSC.FM.ZS&country=#>

There is significant variation in the share of vulnerable employment among women across the analysed countries. In 2019, the proportion ranged from as low as 8.57% in Montenegro to as high as 51.05% in Albania. Vulnerable employment, defined as the share of contributing family workers and own-account workers among total female employment, was lowest in Montenegro, where the rate declined from a peak of 9.86% in 2017 to 8.57% in 2019, though it remained above the 2012 level of 6.16%. The lowest rate recorded in Montenegro was 4.67% in 2013. The European Union held the second-lowest share of vulnerable female employment in 2019, at 8.82%, down from 10.23% in 2012. Ukraine followed with 11.8% in 2019, reflecting a substantial decline from 18.7% in 2012. Conversely, the highest rates of vulnerable employment among women were observed in Albania (51.05% in 2019), though this marked a notable decline from 67.04% in 2012. Other countries with elevated vulnerability rates include Georgia (45.2% in 2019, down from 56.7%), Türkiye (31.8% in 2019, down from 44.1%), and Moldova (26% in 2019, down from a peak of 32.5% in 2016).

Among the EU candidate countries, only Montenegro had a lower rate of vulnerable female employment than the EU average. All others reported significantly higher levels. For instance, Albania's share was nearly six times higher than that of both Montenegro and the EU, while Georgia's was over five times higher in 2019.

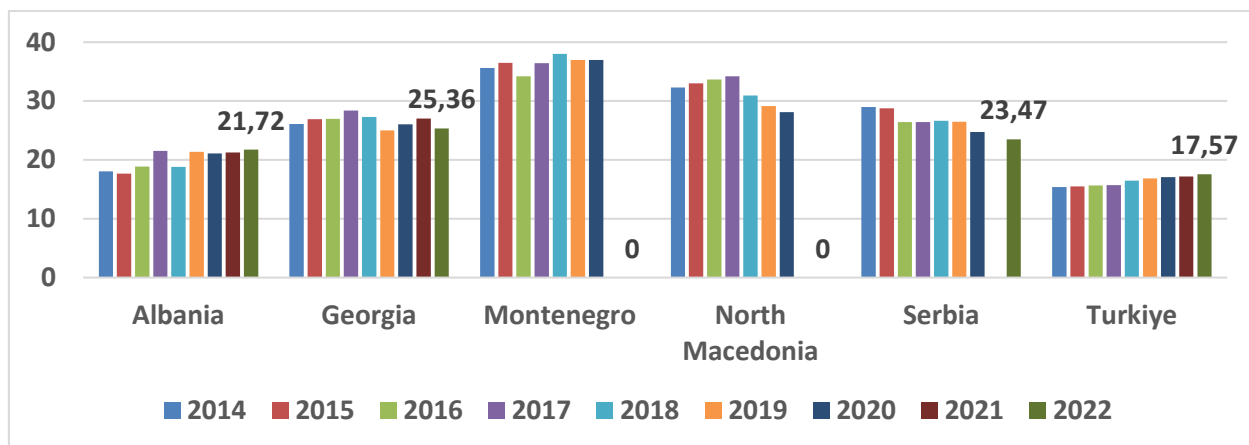


Figure 8. Share of women business owners (% of total business owners)

Source: elaborated by the author based on the data from <https://databank.worldbank.org/reports.aspx?source=2&series=SE.ENR.PRSC.FM.ZS&country=#>

Montenegro has the highest share, with women representing around 35–38% of business owners, consistently leading the region. North Macedonia follows closely, with 32–34%, showing a relatively strong female entrepreneurial presence. Georgia: around 25% (25.4% in 2022), relatively stable but clearly lower than Montenegro and North Macedonia. Serbia - around 23–29%, with some fluctuation (slightly declining to 23.5% in 2022). The lowest female ownership is registered in Albania: between 18–22%, showing small but gradual improvement, reaching 21.7% in 2022, Türkiye: lowest performer, only 15–18%, ending at 17.6% in 2022, pointing to strong structural/cultural barriers for women’s entrepreneurship.

Slight upward trends are visible in Albania, Georgia, and Türkiye, though growth is modest. Montenegro and North Macedonia show consistently higher shares but without strong upward dynamics. Serbia has a more volatile trend, with a small decline in recent years.

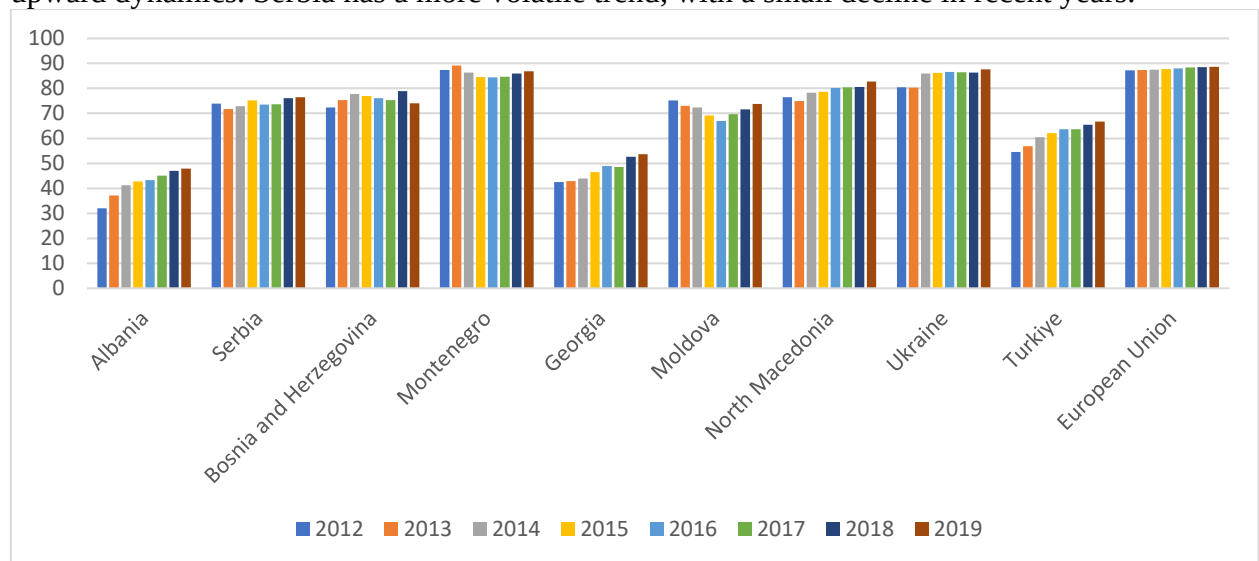


Figure 9. Wage and salaried workers, female (% of female employment), EU and EU candidate countries and Georgia, 2012-2019

Source: elaborated by the author based on the data from <https://databank.worldbank.org/reports.aspx?source=2&series=SE.ENR.PRSC.FM.ZS&country=#>

A similar ranking is observed when examining the share of wage and salaried workers among women. In 2019, the highest share was recorded in EU member states, where 88.7% of employed women were in wage or salaried positions, reflecting a slight increase from 87.2% in 2012. Ukraine followed closely with 87.6% in 2019, up from 80.5% in 2012, while Montenegro reported 86.8%, a marginal decrease from 87.4% in 2012. North Macedonia ranked fourth, with 82.7% of women in wage and salaried employment in 2019, up from 76.5% in 2012. In Serbia, Bosnia and Herzegovina, and Moldova, the corresponding shares in 2019 were 76.5%, 74.02%, and 73.82%, respectively.

The lowest shares of wage and salaried employment among women were recorded in Albania (47.8%), Georgia (53.7%), and Türkiye (66.71%) in 2019. Despite these lower levels, all three countries registered improvements compared to 2012, indicating progress in reducing employment vulnerability among women. Among the countries analysed, only Montenegro and Moldova experienced a decline in the share of wage and salaried female employment between the period 2012 and 2019.

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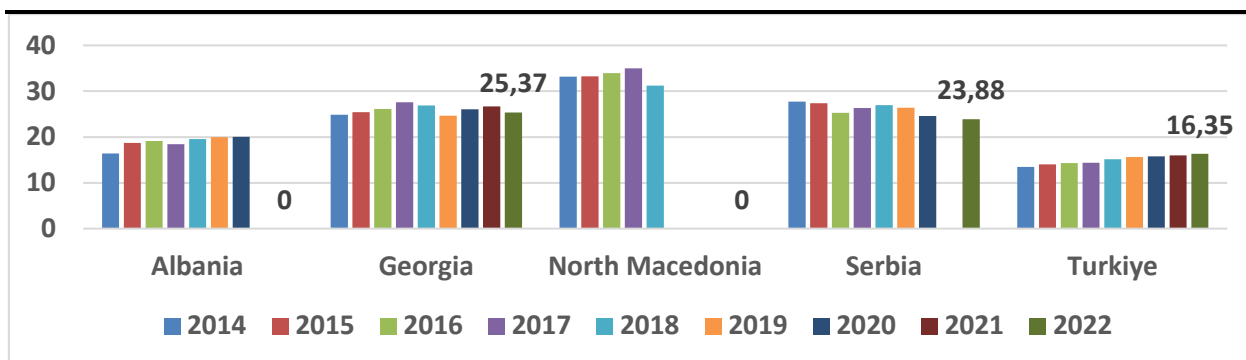


Figure 10. The share of women directors in total, %

Source: elaborated by the author based on the data from <https://databank.worldbank.org/reports.aspx?source=2&series=SE.ENR.PRSC.FM.ZS&country=#>

North Macedonia holds a share of 33–35% of women in director positions across the years, the highest among the countries. This suggests relatively better access for women to top leadership roles compared to regional peers. Georgia - around 25–27%, stable, with a slight upward trend (25.4% in 2022). Serbia - around 24–28%, also stable, with slight fluctuations. Lower representation is identified in Albania: around 16–20%, showing some improvement, but still significantly below regional leaders., Türkiye - lowest performer, with only 13–16% of directors being women, reflecting limited female representation in corporate leadership.

All considered countries show relative stability with minor improvements since 2014. Türkiye has the slowest progress, while North Macedonia consistently maintains the highest share. Serbia and Georgia maintain moderate but stable female representation in leadership.

Table 1. Female share of employment in senior and middle management (%)

Countries	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Albania	14,7	29,3	20,6	19,3	24,0	22,6	31,6	41,3	37,1	30,7	29,1	32,4	..
Bosnia and Herzegovina	23,0	21,4	24,2	24,2	18,8	18,8	26,1	25,4	24,9	20,2	24,1	27,9	..
Georgia	31,0	32,7	33,7	38,8	44,2	31,9	35,7	36,7	33,8	..	..	..	..
Montenegro	23,3	22,7	24,6	17,6	24,9	25,4	23,8	28,2	25,3	28,3	21,8	22,7	..
North Macedonia	23,3	24,7	25,9	23,0	27,3	22,5	28,1	28,2	24,2	24,9	29,8	32,4	31,6
Serbia	29,1	32,7	31,5	30,9	30,9	30,3	29,8	33,6	32,6	36,7	39,9	37,1	33,1
Türkiye	14,3	16,6	15,5	14,5	16,7	17,3	16,3	17,5	19,3	20,7	19,6	20,5	21,5

Source: retrieved from <https://databank.worldbank.org/>

According to the most recent data available in the World Bank database, on the share of women in senior and middle management positions, Georgia remains among the leading countries, with a share of 33.8% in 2020. Although this represents a slight decrease from 36.7% in 2019, it is still higher than the 31.0% registered in 2012. Georgia recorded its highest level in 2016 at 44.2%, underscoring considerable volatility over the years. Montenegro ranks next, with 25.3% in 2020 and a slight rebound to 28.3% in 2021. Despite this increase, it remains below the 2019 figure of 28.2%, though it still reflects improvement over 2012 (23.3%). However, data for 2023 (22.7%) suggests a renewed decline after a temporary peak, indicating persistent fluctuations. North Macedonia has demonstrated a more stable upward trend in recent years. After reaching 28.2% in 2019, the figure dropped to 24.2% in 2020, followed by a recovery to 24.9% in 2021, and then a marked improvement to 29.8% in 2022, 32.4% in 2023, and 31.6% in 2024. This positions North Macedonia as one of the most consistently improving countries in terms of female managerial representation over the last decade. Bosnia and Herzegovina and Türkiye remain at the lower end

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of the spectrum. In 2021, Bosnia and Herzegovina recorded 20.2%, reflecting a general decline compared to earlier years (e.g., 23.0% in 2012 and 24.2% in 2015). Türkiye has shown a gradual but consistent increase, from 14.3% in 2012 to 20.7% in 2021, continuing to rise to 19.6% in 2022, 20.5% in 2023, and 21.5% in 2024, its highest value during the observed period.

Overall, the data shows that female representation in senior and middle management remains limited across most EU candidate countries, although some, particularly North Macedonia and Georgia, have made notable progress in recent years.

According to the most recent data, the share of firms with female top managers remains low across most EU candidate countries, with mixed progress between 2013 and 2024. While some countries have made moderate gains, others have seen declines or stagnation, and the majority still trail behind parity.

In 2019, North Macedonia led among EU candidate countries, with 21.3% of firms reporting a female top manager, an increase from 16.8% in 2013. However, more recent data reveal a decline to 16.4% in 2023, suggesting a reversal in progress.

Moldova followed closely, registering 18.6% in 2019, down from 22.4% in 2013, but then rebounded to 21.6% in 2024, regaining its position among the top performers.

Serbia showed steady improvement, with the share rising from 15.3% in 2013 to 18.2% in 2019, and further to 20.9% in 2024, indicating sustained momentum in promoting female leadership in the private sector.

Georgia displayed the most volatility. While it recorded the highest initial share of 32.7% in 2013, the figure dropped sharply to 16.5% in 2019, followed by a recovery to 21.0% in 2023. Despite the rebound, the 2023 level remains substantially below its 2013 peak.

Albania improved from 12.2% in 2013 to 18.1% in 2019, but more recent data is unavailable to assess continued progress. Similarly, Ukraine declined from 20.9% in 2013 to 17.7% in 2019, with no subsequent data available.

Bosnia and Herzegovina remained relatively stable between 2013 (16.6%) and 2019 (16.6%), but saw a modest decline to 15.3% in 2023, reflecting limited advancement in female executive leadership.

Montenegro has experienced a continuous downward trajectory, with the share falling from 19.2% in 2013 to 15.0% in 2019, and further to 13.5% in 2023, reflecting growing barriers to women's representation in corporate leadership.

Türkiye consistently recorded the lowest values, with 3.9% of firms led by women in 2019, a drop from 5.5% in 2013. No updated data is available, but these figures highlight a persistent structural gender gap.

By comparison, the European Union average stood at 17.7% in 2024, placing it behind Moldova, Serbia, and Georgia (2023), but ahead of several other candidate countries such as Montenegro, Bosnia and Herzegovina, and Türkiye.

These trends underscore the slow and inconsistent progress toward gender parity in corporate leadership. While countries like Serbia, Moldova, and Georgia have shown encouraging signs, the overall landscape continues to reflect systemic barriers that hinder women's access to top executive positions. Addressing these disparities requires not only policy reform and institutional support, but also corporate accountability and cultural change to foster truly inclusive leadership environments. (World Bank, 2024).

Globally, women hold less than one-third of managerial positions. Between 2015 and 2023, their representation rose by only 2.4 percentage points, reaching 30 per cent. At the current rate of progress, achieving gender parity in management could take nearly a century. Thus, in EU candidate countries, the share of women in managerial positions is even below the world average. Overall, women remain markedly underrepresented in top management positions across EU candidate countries.

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As of January 1, 2025, women occupied 27.2 per cent of seats in national parliaments - a 4.9 percentage point increase since 2015, but a modest rise of only 0.3 points from 2024, indicating a deceleration compared to the previous decade's average annual growth of nearly 0.5 points (UN, 2025). While the EU average is about 33%, and from EU candidate countries, North Macedonia is above the EU average, registering 42%, followed by Moldova with 39% and Albania and Serbia with around 35%. The lowest levels of women's representation in Parliament are registered in Ukraine, Türkiye, Bosnia and Herzegovina and Georgia – around 20% below the world average. (UN, 2025)

Conclusion

The analysis reveals significant variation in gender equality outcomes among EU candidate countries and the potential candidate, Georgia. While certain indicators in some countries approach or even exceed the EU average, the majority of observed values remain below the average levels recorded in EU member states.

Between 2012 and 2022, the evolution of the economically active female population aged 15 and older was notably heterogeneous. As of 2022, all EU candidate countries reported lower participation rates compared to the EU average of 47.5%. Among these, Georgia and Albania came closest to the EU benchmark in 2021, whereas Bosnia and Herzegovina reported the lowest rate, 26.5%, which is approximately 21 percentage points below the EU average.

When considering the female labour force as a share of the total labour force, the rankings shift. In this case, Ukraine outperformed the EU average, followed by Georgia and Moldova, with the EU ranking fourth among the countries assessed.

Notably, in 2020, only the EU, Serbia, and Montenegro registered slight increases in the female labour force share. In contrast, other EU candidate countries experienced a decline, reflecting broader labour market disruptions, possibly linked to the COVID-19 pandemic. From the perspective of the share of economically active women aged 15 and older, the European Union ranks highest among the analysed countries. While all EU candidate countries fall below the EU average, Georgia and Albania report rates relatively close to the benchmark, at 50.99% and 50.7%, respectively. At the opposite end of the spectrum, Türkiye records the lowest participation rate, at 19.5%, significantly below the EU average, highlighting major disparities in female economic engagement.

In terms of the share of wage and salaried workers among women, EU member states again lead with 88.7% in 2019, followed by Ukraine (87.6%) and Montenegro (86.8%). Conversely, Albania reports the lowest share at 47.8%, indicating a higher level of employment vulnerability and instability for women in that country.

In terms of women's representation in top management, the disparity is even more pronounced than in other labour market indicators. Türkiye remains at the extreme low end, with just 3.9% of firms reporting a female top manager in 2019, declining from 5.5% in 2013. Meanwhile, North Macedonia recorded the highest share among EU candidate countries in 2019, at 21.3%, although more recent data from 2023 reveal a decline to 16.4%, reflecting setbacks in leadership representation. Moldova shows a more positive trend, with its share increasing to 21.6% in 2024, rebounding from a dip in 2019. Serbia also improved steadily from 15.3% in 2013 to 20.9% in 2024.

Although some countries have demonstrated incremental progress over the past decade, particularly in areas such as female labour force share or regulatory environments (e.g., business start-up conditions), the majority of gender equality indicators remain below the EU average. In several cases, the gaps are wide and persistent, especially in leadership and decision-making roles. The most critical shortfall is in female representation at the top management level, where even the best-performing countries out of the analysed ones, such as Moldova and North Macedonia, remain below parity, and others like Türkiye lag far behind. This underrepresentation reflects

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systemic barriers in access to leadership opportunities for women, including structural discrimination, weak institutional frameworks, and limited enforcement of gender equality policies.

Overall, the findings highlight that while progress has been made, it is uneven and insufficient. Substantial efforts are still required at the policy, institutional, and implementation levels, supported by dedicated budgets and political commitment. In many EU candidate countries, the lack of political will remains a critical obstacle to advancing gender equality and women's empowerment. Without sustained reform, these disparities risk undermining the broader goals of inclusive and sustainable development across the region.

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LANGUAGE DIVERSITY AND MULTICULTURALISM IN MOLDOVA: A DOUBLE-EDGED SWORD

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Abstract: This article explores the linguistic aspects of diversity and multiculturalism in the Republic of Moldova, a country where multiple languages coexist and interact in complex ways. As the official state language recognized by the constitution, Romanian is vital to public life and civic engagement. Russian is still widely used, nonetheless, particularly in urban settings, trade, and interethnic contact. Together with these two prominent languages, smaller communities also conserve Gagauz, Ukrainian, Bulgarian, and Romani, all important components of Moldova's cultural diversity. The complexities of language are heightened by migration dynamics, encompassing both immigration and emigration: Moldovans abroad adopt new vocabulary, while returning migrants and their children face challenges with reintegration. Additionally, English has emerged as a key language for economic prospects, advanced education, and global mobility, illustrating Moldova's increasing participation in processes of European integration and international networks. According to this article, Moldova's multilingualism represents a double-edged sword. While linguistic diversity provides communities with a sense of continuity and belonging, it also enhances cultural rights, identity, and social cohesion. However, varying levels of proficiency in the official language frequently result in differences in education, obstacles in the job market, and restricted access to public services. Without intentional policy support, minority and endangered languages—like Romani—are also at risk of losing their domains and experiencing generational decline. The study focuses on how community-driven projects, educational frameworks, and official laws interact to shape Moldova's linguistic environment.

This article places Moldova in the context of larger discussions on multilingualism and integration by referencing sociolinguistic ideas like code-switching, diglossia, and intergenerational transmission. Protecting minority languages, guaranteeing widespread participation through Romanian proficiency, and developing bridging mechanisms to facilitate integration and reintegration are the three pillars of the Protect–Participate–Bridge framework that it suggests. By doing this, it highlights how crucial it is to implement balanced linguistic policies that protect Moldova's multilingual legacy while guaranteeing fair access to civic life, work, and education.

Keywords: multiculturalism, linguistic diversity, international mobility, bridging mechanisms, educational frameworks, reintegration, minority

JEL Classification: J240, Z130

INTRODUCTION

Globally, societies are becoming more multicultural as a result of the quick rise in international migration, technology communication, and cultural interchange. Language is an important cultural and identity marker in many societies, reflecting both their diversity and challenges. Globalization, migration, and digital communication rapidly transform societies into multicultural and multilingual environments. In such contexts, language functions not only as a communication tool but also as a symbolic resource tied to identity, group belonging, and political power (Bialystok, 2012; Hermanto et al., 2012). Multiculturalism, which promotes the coexistence of diverse cultural identities under a single national framework, frequently interacts with linguistic variety. While

some argue that linguistic diversity can strengthen mixed cultures, others assert that it may present serious challenges to social cohesion and national unity.

Moldova—positioned between Romania and Ukraine—is a highly relevant case for studying these tensions. With Romanian as the official state language, Russian as a widely used interethnic language, and minority languages such as Gagauz, Ukrainian, Bulgarian, and Romani, Moldova represents a complex linguistic ecosystem (Guțu, 2021; Council of Europe, 2019). While linguistic diversity enriches cultural identity, it also poses challenges for social cohesion, educational equality, and political stability.

The dilemma of whether language diversity acts as a unifying factor that prevents national unity or as a bridge for integration and cultural expression is complicated by its role in forming multicultural communities. The discussion highlights the ways in which language policies impact multicultural identities and explores the advantages and difficulties of multilingualism in fostering social peace and political stability through case studies from nations like Canada, Belgium, India, Switzerland, and South Africa.

LANGUAGE DIVERSITY IN MULTICULTURAL SOCIETY

The use and existence of multiple languages within a community is known as "language diversity." One distinctive feature of multilingual cultures is the diverse linguistic heritage of numerous cultural or ethnic groupings. Through bilingual or multilingual policies that acknowledge and meet the linguistic demands of diverse people, language diversity is institutionalized in several countries. This kind of diversity can include unofficial languages spoken by immigrant or minority groups as well as official languages, including those acknowledged by the government. In Moldova, Romanian serves as the state language and primary medium of administration, while Russian offers interethnic communication and access to cultural networks. Minority languages preserve local identities but have limited institutional domains (Ciobotaru, 2023). These hierarchies influence educational outcomes, media consumption, and political alignment.

In diverse, multicultural societies, language is much more than just a way to talk—it's a deep part of who people are and where they come from. It connects generations, carries traditions, and reflects cultural roots. In cities shaped by globalization, speaking multiple languages is often seen as a strength, opening doors to richer cultural experiences and broader thinking. But this diversity also comes with challenges. When one language—often that of the dominant group—becomes linked with power or what it means to be "truly" part of a nation, it can create tension and raise tough questions about fairness and inclusion.

In the realm of language, multiculturalism supports the idea that the variety of languages spoken within a country is a vital part of its cultural identity and heritage. It encourages the recognition and protection of minority languages, seeing them not just as means of communication but as essential threads in the nation's cultural tapestry. Multicultural policies often strive to strike a balance: supporting minority language preservation while also promoting the full participation of diverse communities in the country's social, economic, and political life. In this context, multilingualism is celebrated as a valuable resource—it helps maintain cultural traditions, fosters social inclusion, and encourages greater empathy and understanding among different cultural groups.

The interplay between multiculturalism and language presents considerable complexities. While embracing linguistic diversity is a crucial step towards equity and respect, it can also introduce challenges when it comes to building a unified national identity. Officially recognizing multiple languages may, in some cases, unintentionally deepen divisions between groups, especially if communities become socially or linguistically isolated. Rather than bridging cultural differences, such separation can reinforce ethnic boundaries, making it harder to create a shared sense of belonging across the whole society. This tension raises important questions for

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policymakers about how to celebrate and protect diversity, while also encouraging integration and common identity that bring people together.

Multiculturalism in language policy goes beyond simply recognizing differences—it’s about striking a balance that celebrates diversity while keeping society connected. It means making sure everyone’s voice is respected and included, while also fostering a shared sense of belonging and unity. In Moldova, language plays a crucial role in the country’s multicultural identity, and as Business English teachers, it is eye-witnessed how this complexity impacts communication and professional integration. Moldova is home to multiple linguistic communities, including Romanian, Russian, Gagauz, and others. Multiculturalism in Moldova promotes acknowledging these various languages as integral elements of the country’s cultural identity. Policies often aim to preserve minority languages while encouraging individuals to engage with the broader Moldovan society, especially in business and professional settings.

From a business perspective, multilingualism can be a significant advantage. It opens up opportunities for cross-cultural collaboration, expands markets, and enhances networking both within Moldova and internationally. Teaching Business English in this environment means more than language instruction—it involves helping students navigate cultural nuances, bridge communication gaps, and foster mutual understanding between different linguistic groups.

However, Moldova’s language dynamics also present challenges. The ongoing tension between the use of Romanian and Russian can affect social cohesion and professional integration. While official recognition of multiple languages reflects multicultural values, it sometimes risks creating linguistic silos where communities remain divided rather than unified. This can make it harder for businesses to operate seamlessly across different regions and groups, and for individuals to fully participate in the national economy.

As Business English teachers, it is our responsibility to assist students in gaining cultural competency in addition to language proficiency, fostering an appreciation for linguistic variety and collaboration. By doing this, we can encourage a more diverse work environment that leads to cooperation among all members of Moldova's multicultural community.

LANGUAGE AS A KEY TO MULTICULTURAL INTEGRATION: THE EDUCATIONAL PERSPECTIVE

In societies characterized by multiculturalism, language policies significantly influence the educational experiences and achievements of students from various backgrounds. Multilingual education systems offer much more than mere language proficiency; they lay an essential groundwork for social inclusion and equitable opportunities. By adopting multiple languages, schools foster learning environments that make all students feel appreciated and acknowledged, independent of their native language. Research from Moldova’s multilingual schools (CREDO, n.d.) shows that students educated primarily in Russian face challenges in higher education, where Romanian-language proficiency is required. Conversely, minority-language schools (Gagauz, Bulgarian, Ukrainian) often struggle with resource shortages, limited teacher training, and outdated curricula.

Bilingual or multilingual education enables students to preserve ties to their cultural roots while acquiring skills in the dominant or official language. This combined approach promotes academic achievement by connecting the home and school experiences, facilitating greater student engagement with the curriculum and full participation in school activities. It also empowers individuals by affirming their linguistic identities, which enhances their confidence and motivation.

Moreover, students who are learning multiple languages and cultures also develop their critical thinking and cognitive flexibility. These abilities are becoming more and more significant in today's globalized society, where intercultural communication plays a vital role. By fostering

respect for linguistic diversity within the classroom, schools contribute to building a more inclusive society that values cultural differences as assets rather than obstacles.

In this way, language education is not only about teaching communication skills but also about nurturing social cohesion and preparing students to thrive in a multicultural world. Thoughtful language policies in education can therefore be a powerful tool to promote integration, reduce inequalities, and cultivate mutual understanding among future generations.

LANGUAGE DIVERSITY AS A DOUBLE-EDGED SWORD: POTENTIAL BENEFITS

Cultural Enrichment

Multilingualism fosters shared cultural spaces and supports linguistic creativity through code-mixing and hybrid cultural practices. In countries that officially recognize several languages, the diversity often fuels a flourishing cultural scene. Multiple languages open doors to a wider range of stories, histories, and modes of expression, allowing communities to maintain their distinct identities while contributing to the collective cultural mosaic. This richness can be seen in festivals, theater, media, and even everyday conversations that reflect the blending and coexistence of different cultural narratives.

Beyond preserving traditions, cultural enrichment through language diversity also encourages innovation and creativity. Exposure to multiple linguistic frameworks can inspire new ideas and foster a more open-minded society, where people are more willing to learn from one another and embrace differences.

Preserving Minority and Indigenous Languages

Another critical benefit of linguistic diversity is its role in safeguarding minority and indigenous languages—many of which face extinction due to the dominance of global languages like English, Spanish, or Mandarin. Preserving these languages is essential not only for maintaining cultural heritage but also for protecting unique worldviews and knowledge systems embedded in these tongues.

By valuing and supporting minority languages through policies and programs, multicultural societies help prevent cultural erasure and empower marginalized communities. These efforts can take many forms, including bilingual education, media broadcasting in minority languages, cultural festivals, and official recognition of languages in government and public services.

When minority and indigenous languages are preserved, communities gain a stronger sense of identity and pride, which can improve social well-being and cohesion. It also ensures that younger generations inherit a full sense of their heritage, enabling them to pass down language, customs, and traditions that might otherwise vanish.

Linguistic preservation enriches the world’s cultural diversity and maintains the richness of human expression, which is invaluable not just for the communities involved but for global humanity as a whole. Policies protecting Gagauz, Romani, and Ukrainian support social inclusion. Without explicit support, endangered languages risk rapid intergenerational discontinuity (Council of Europe, 2013).

Promoting Social and Political Cohesion

When managed with care and inclusivity, language diversity can be a powerful force for social unity and political stability. Official recognition and support for multiple languages ensure that all linguistic communities feel acknowledged and respected within the nation’s institutions. This fosters a sense of belonging and participation, reducing feelings of exclusion or marginalization.

In multilingual societies, providing public services, education, and legal proceedings in several languages ensures equitable access and fair treatment. It builds trust between citizens and the state, reinforcing democratic values and encouraging active civic engagement from all groups.

Politically, embracing linguistic diversity often requires decentralization or power-sharing arrangements, which can help manage ethnic and cultural differences peacefully. When linguistic minorities have a say in local governance and cultural affairs, they are more likely to feel invested in the country's future, thus promoting harmony and reducing tensions.

Moreover, recognizing and promoting multiple languages encourages dialogue and cooperation across communities. Language becomes a bridge rather than a barrier, helping to negotiate differences and build consensus. This can lead to stronger social networks, economic collaboration, and collective problem-solving.

In essence, language diversity—when integrated thoughtfully into policy—can transform multicultural societies from fragmented groups into cohesive, resilient nations that celebrate both their unity and their differences. States that institutionalize multilingualism (Switzerland, Canada) show that well-managed linguistic rights increase trust in institutions and reduce ethnic conflict (Mady, 2012).

LANGUAGE DIVERSITY AS A DOUBLE-EDGED SWORD: POTENTIAL CHALLENGES

Community Division

Although language diversity can enrich societies, it also has the potential to create social fragmentation if not managed carefully. When communities primarily associate with their own linguistic group and have limited interaction with others, it can weaken the sense of belonging to a larger national community. Language, in such cases, becomes more than just a communication tool—it turns into a symbol of separation, marking clear boundaries between groups. Residential and school segregation in Moldova reflects linguistic divisions, especially in urban Russian-speaking districts and rural Romanian-speaking regions. Limited cross-linguistic interaction weakens shared identity.

This division can lead to the emergence of parallel societies, where people live side by side but rarely engage with one another socially or culturally. Such segregation reduces opportunities for mutual understanding, collaboration, and trust-building across linguistic lines.

Belgium's experience vividly illustrates this dynamic. The country's linguistic split between Dutch-speaking Flanders and French-speaking Wallonia has not only fueled political friction but also complicated governance. Debates over language rights and regional autonomy have at times stalled decision-making and contributed to feelings of alienation within different communities. This situation shows how language-based divisions can undermine national unity and political stability.

Economic and Educational Barriers

Language diversity can also create significant impediments in access to essential services, education, and economic participation. Linguistic minorities who lack proficiency in the dominant language often face systemic disadvantages. In education, students who do not speak the language of instruction fluently may struggle to keep up academically, limiting their future opportunities. Without targeted support, these students risk falling behind, which can have long-lasting effects on their career prospects and social mobility.

On an economic level, language barriers can restrict job opportunities, particularly in sectors where communication skills are essential. For those from minority language backgrounds, insufficient language skills can lead to underemployment or unemployment, perpetuating cycles of poverty and exclusion. Additionally, limited language access to healthcare, legal services, and social programs can further marginalize these groups.

India provides a complex example, with over 20 officially recognized languages. While this reflects the country's rich linguistic landscape, it also means that speakers of less widely used languages might face challenges in navigating government systems or participating fully in the political process. Similarly, immigrant communities across Europe and North America often

encounter language obstacles that slow their social and economic integration. Without adequate language learning programs and support services, these barriers can reinforce inequality and hinder broader societal cohesion.

Language as a Political Tool

Language is not only a means of communication but can also become a powerful symbol of identity—and sometimes a tool for political agendas. In multilingual societies, language nationalism can emerge, where language is strongly linked to group identity and political claims. This often leads to heightened tensions as different communities struggle for recognition, rights, and power based on their language.

For example, in Quebec, the promotion and protection of French language rights have been central to debates about the province’s relationship with the rest of Canada. Language policy has played a role in fueling movements for greater autonomy and even independence, reflecting deep-rooted concerns about cultural preservation and political representation. Similarly, Catalonia’s push for recognition of Catalan language and culture is intertwined with broader aspirations for political self-determination, which has sparked significant political conflict within Spain.

In such contexts, language issues become more than cultural matters—they evolve into political flashpoints. Language policies designed to protect linguistic diversity can sometimes unintentionally exacerbate divisions if they are perceived as favoring one group over another or if they fuel identity-based grievances. This politicization of language complicates efforts to promote social integration and can destabilize political systems.

Overall, while language diversity enriches societies in many ways, it also presents complex challenges. Managing these requires careful, inclusive policies that promote interaction and understanding across linguistic groups, ensure equitable access to education and services, and prevent language from being exploited for political division. Language debates in Moldova often reflect geopolitical orientations (EU vs. post-Soviet). As shown in Gagauzia (Bodean Vozian & Soltan, 2023), linguistic issues can morph into autonomy disputes.

CASE STUDIES: LANGUAGE DIVERSITY AND MULTICULTURALISM IN PRACTICE

Canada

Canada’s official policy of bilingualism stands as a prominent example of how embracing language diversity can support multiculturalism while strengthening national unity. By recognizing both English and French as official languages, Canada ensures that citizens from both linguistic communities have equal access to government services, education, and the legal system. This approach has fostered a cultural mosaic in which various ethnic and linguistic groups coexist, each maintaining its unique cultural heritage within the broader Canadian identity.

That said, bilingualism is not without its challenges. In Quebec, for instance, there is an ongoing debate about the dominance and protection of the French language. Quebec nationalism, fueled in part by the desire to safeguard French culture, has occasionally caused tensions with English-speaking Canadians and complicated the country’s efforts to maintain a unified national identity.

Switzerland

Switzerland offers another notable example of managing language diversity within a multicultural framework. The country officially recognizes four languages—German, French, Italian, and Romansh—and has developed a federal system that grants significant autonomy to linguistic minorities. This decentralized governance allows communities to preserve their cultural identities while contributing to the overall political stability and unity of the nation.

However, linguistic diversity in Switzerland also brings challenges, especially in urban centers where different language groups live close to each other but may have limited social

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interaction. The ongoing task is to ensure that multilingualism acts as a bridge fostering cooperation and integration, rather than creating further divisions between communities.

India

India is one of the world's most linguistically diverse countries, with more than 1,600 languages spoken across its vast territory. Its constitution recognizes 22 official languages, reflecting this rich linguistic landscape. Yet, this diversity has sometimes led to tensions, especially regarding the promotion of Hindi as the national language. Periodic language riots and political movements advocating for the recognition of regional languages have posed challenges to national unity.

Despite these difficulties, India's linguistic variety has enriched its cultural and political life, allowing for vibrant regional identities and expressions. The central challenge lies in striking a balance between promoting a common national language and preserving the country's many regional languages.

South Africa

South Africa's post-apartheid constitution recognizes 11 official languages, making it one of Africa's most linguistically diverse countries. Multilingualism has been a cornerstone of the country's efforts to build an inclusive and equitable society following decades of racial segregation. The official recognition of multiple languages has empowered historically marginalized communities to reclaim and celebrate their cultural identities.

However, South Africa still faces practical challenges, such as allocating resources fairly and ensuring equal access to education and public services for all linguistic groups. Balancing these needs remains an ongoing process, particularly for languages spoken by smaller populations.

These cases offer benchmarks for Moldova: decentralization, strong minority-language institutions, and balanced bilingualism are effective strategies.

MOLDOVA: NAVIGATING LANGUAGE DIVERSITY AND MULTICULTURALISM

Moldova presents a complex case where language diversity intersects with multiculturalism amid political and social tensions. The country's linguistic landscape is characterized primarily by Romanian and Russian speakers, along with smaller communities speaking Gagauz, Ukrainian, Bulgarian, and other minority languages. Language plays a critical role in Moldova's national identity and political discourse. Romanian is the official state language, symbolizing the country's cultural heritage and European aspirations. However, Russian remains widely used, especially in urban areas and among minority groups, reflecting ongoing geopolitical influences. This duality creates both opportunities and challenges for social cohesion.

On the one hand, Moldova's linguistic diversity enriches its cultural life, allowing different communities to maintain their distinct traditions and languages. Educational policies have aimed to promote bilingualism, offering instruction in Romanian and Russian to accommodate the country's diverse population. This approach has the potential to foster mutual understanding and inclusion if implemented effectively.

On the other hand, language issues have at times deepened divisions. The status of the Russian language and its role in public life is a sensitive topic, often linked to political and ethnic identities. In the autonomous region of Gagauzia, for example, language and cultural rights are central to local identity and political autonomy, illustrating how language policy is deeply intertwined with governance and minority rights.

Furthermore, Moldova faces challenges in balancing language education and ensuring access to quality instruction across linguistic communities. Disparities in language proficiency can impact economic opportunities and social mobility, particularly in rural areas and among minority groups.

Overall, Moldova's experience highlights the delicate balance required in managing language diversity within a multicultural society. Effective language policies that promote respect,

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inclusion, and equitable access to education and public services are essential for building national unity and fostering peaceful coexistence among its diverse linguistic communities.

Moldova's linguistic dynamics involve:

- Romanian as the official language and symbol of European integration.
- Russian as a functional lingua franca in trade, urban life, and media.
- Minority languages (Gagauz, Bulgarian, Ukrainian, Romani) with limited domains and varying degrees of institutional support.

Empirical issues identified in policy reports include:

- ✓ inconsistent Romanian proficiency among minority communities (CoE, 2019);
- ✓ disparities in educational materials in minority languages (CREDO);
- ✓ lack of early childhood bilingual support programs;
- ✓ political polarization tied to language amendments (ConstitutionNet, 2021).

Thus, Moldova's system reflects both linguistic richness and structural inequalities.

RECOMMENDATIONS FOR IMPROVING MULTICULTURAL INTEGRATION IN MOLDOVA

Promote Inclusive Language Education Policies

One of the most effective ways to foster multicultural integration in Moldova is through inclusive and balanced language education. Schools should provide high-quality instruction in both Romanian (the official state language) and Russian, alongside support for minority languages such as Gagauz and Ukrainian where appropriate. This bilingual or even multilingual education approach can help bridge linguistic divides and equip students with the skills needed to engage fully in all aspects of Moldovan society.

Investing in teacher training, developing culturally sensitive curricula, and ensuring equal access to educational resources across regions—urban and rural alike—will be critical. Encouraging early childhood bilingual education can build a foundation for mutual understanding and respect among Moldova's diverse communities.

Strengthen Intercultural Dialogue and Community Engagement

Creating platforms for intercultural dialogue is essential to break down stereotypes and foster social cohesion. Government agencies, NGOs, and local communities should collaborate to organize cultural events, workshops, and public forums where people from different linguistic and ethnic backgrounds can share their traditions, languages, and experiences.

These initiatives can promote empathy, reduce mistrust, and encourage active participation in civic life. Supporting local media and cultural institutions that highlight multicultural stories can further contribute to a shared sense of belonging and appreciation for Moldova's diversity.

Ensure Equal Access to Public Services in Multiple Languages

To build trust and inclusivity, public services—such as healthcare, legal aid, and administrative support—should be accessible in both Romanian and Russian, with accommodations for minority languages where possible. Clear communication in citizens' preferred languages ensures that no group feels excluded or marginalized.

Training public service workers in multilingual communication and cultural sensitivity will improve the quality of interactions and service delivery. This inclusive approach also helps prevent social and economic exclusion that can arise from language barriers.

Promote Language Rights within a Framework of National Unity

Moldova's language policies should balance the recognition of linguistic diversity with the promotion of a unified national identity. This means respecting minority language rights while emphasizing common values and shared citizenship.

Legislators can support inclusive narratives that emphasize the nation's multicultural background as a strength rather than a cause of conflict. Minority populations can be reassured

that their identities are respected inside the Moldovan state via official acknowledgment of minority languages and effective steps to encourage their preservation.

Invest in Multilingual Media and Communication Platforms

A significant influence on how the general public views multiculturalism is the media. Supporting multilingual media outlets—radio, television, internet platforms—that provide news and cultural content in Romanian, Russian, and minority languages helps create greater understanding and information sharing. By combating false information and racial stereotypes, balanced media representation fosters a more informed and unified society.

Encourage Political Inclusion and Representation of Linguistic Minorities

Sustainable multicultural integration requires that minority linguistic groups be meaningfully represented in political and decision-making processes. Political organizations ought to set up procedures that allow minority opinions to be heard and taken into account when it comes to issues of language, education, and culture. This collaborative strategy lowers the possibility that linguistic issues may escalate into more significant political disputes and fosters confidence in state institutions. Implementing these suggestions will enable Moldova to use its language diversity as a means of fostering greater social inclusion and national cohesion. The peaceful and productive development of Moldova's multicultural society will be facilitated by well-considered, inclusive language policies, community involvement, and fair access to services.

CONCLUSION

Language diversity presents both opportunities and difficulties for multicultural societies. It contributes to cultural richness, helps sustain minority languages, and fosters inclusion, yet it can also lead to social fragmentation, reinforce inequality, and hinder the development of a unified national identity. To navigate these complexities, policymakers must implement inclusive language strategies that promote unity, support minority language communities, and acknowledge cultural and linguistic variety.

As global demographic shifts accelerate, the link between language diversity and multiculturalism will grow increasingly significant. The central challenge will be to leverage the benefits of linguistic diversity to enhance multicultural cohesion while minimizing its potential to divide.

Language diversity in Moldova is both an asset and a challenge. The analysis demonstrates that multilingualism enriches cultural heritage, supports minority identities, and enhances societal resilience. Yet structural inequalities in education, employment, and political representation persist, particularly for speakers of Russian and minority languages. Balanced, evidence-based language policies are essential to ensure that Moldova's multilingualism strengthens rather than fragments its social fabric.

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HUMAN CAPITAL DEVELOPMENT AS A STRATEGIC OBJECTIVE IN GLOBAL DEVELOPMENT GOALS

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Abstract: The global economy is currently developing in the alignment with the UN' 17 Sustainable Development Goals (SDGs), as an essential plan for strengthening economic growth in all the countries around the world. It is essential to note that these goals are largely focused on supporting and promoting human capital, which is indispensable for national economies. The link between these two major topics is very clear, in the context that in recent years major investments in human capital development are needed, and the SDGs can successfully support this aspect. On the other way, without developed, smart, and professionally skilled human capital, cannot be registered economic progress, advanced industries, quality education, or efficient healthcare, which are all part of the 17 SDGs. The study explores the interrelated and interdependent relationship between human capital and SDGs, which would help identify solutions for economic growth and prosperity in countries around the world. The focus will be on the main SDGs such as: Economic Growth and Poverty Reduction (SDGs 1, 8, 9), referring to a skilled and healthy workforce that can increase productivity, innovation and income, which are essential for economic growth and reducing poverty; Health and Well-being (SDG 3), where investments in education and health improve health outcomes and life expectancy; Quality Education (SDG 4), which emphasizes quality education and lifelong learning as fundamental building blocks for national development; Reduced Inequality (SDG 5, 10), which involves developing human capital, particularly through education and

employment opportunities, which helps reduce gender and economic inequalities. The findings indicate that the synergy between all SDGs allows for better alignment between global goals, priorities, and local needs. This ensures that actions taken at the national or local level contribute effectively to the global sustainable development agenda, stimulating effective global cooperation that helps maintain world peace and prosperity.

Keywords: Human capital, Sustainable Development Goals, education, skills.

JEL Classification: J24, I20, O30

INTRODUCTION

In 2015, the United Nations established 17 global development goals along with their 169 targets to support the development of countries around the world by 2030, included in the Agenda 2030. (UN, 2025) It is a strategy used by the United Nations (UN) once every 15 years. The Global Goals set by the UN, also known as the Sustainable Development Goals (SDGs), play a key role in supporting global economic processes by promoting inclusive and sustainable economic growth, as well as ensuring full productive employment and decent work for all. This highlights the importance of the human factor for the prosperity of the global economy. The goals perfectly connect economic, environmental, social, and governance aspects, and are thus classified into four basic categories. Their goal is to successfully integrate innovation and productivity into the economy in order to contribute to economic growth in countries, by unconditionally supporting the human factor as a reliable force in this process. The human factor is crucial, because the achievement of these objectives depends directly on the quality and involvement of the workforce, on the skills and competences of human resources. Each of the 17 existing goals requires skilled and efficient human capital to achieve them, which leads to economic growth. The success of economic transformations requires placing the human factor at the center of strategic processes, and people's hard and soft skills allow prosperity to be stimulated.

Thus, the role of sustainable development goals in the global economy is integrative and transformative, involving a balance between economic growth and human capital development, which is essential for the long-term sustainability and prosperity of economies around the world. In this context, the authors aim to identify the connection between the human factor and sustainable development goals in order to establish the impact of these two essential aspects in supporting human development.

Methods and data. This study employs a mixed-methods approach to comprehensively analyze the role of human capital in achieving Sustainable Development Goals (SDGs). The methods used are monographic analysis, documentary analysis, comparative analysis, historical method and synthesis. This design allows for a holistic understanding of the interconnections between human capital and SDGs.

1. THE ROLE OF THE HUMAN FACTOR IN ACHIEVING SUSTAINABLE DEVELOPMENT GOALS (SDGs)

The human factor is a broad concept that defines the role of people and society in promoting and supporting processes in a country, region, or community. Globally, the human factor is considered a basic resource that involves the physical and intellectual capacities of individuals who develop an organization, community, or country. Over time, economists around the world have highlighted the role and importance of the human factor in a country's economic growth. Theodore W. Schultz is considered an important promoter of human capital theory, introducing the concept of the human factor as an important driver of economic growth, emphasizing the need for investment in education and workforce development, while Gary S. Becker expanded on human capital theory, analyzing investment in education, health, and vocational training as essential factors in economic growth. (Schultz, 1961) At the same time, Alfred Marshall was among the first economists to recognize the role of the human factor in economic growth, pointing out the importance of knowledge and skills, while Elton Mayo, through his studies in the 1930s,

developed a model based on social premises and human factors within organizations, highlighting worker relationships and motivation. (Nishizawa, 2002).

There is a series of definitions and concepts proposed to identify the notion of human factor:

- According to the OECD (Organization for Economic Cooperation and Development), the human factor is perceived as the knowledge, skills, competencies, and attributes that empower people to contribute to their personal and social well-being, as well as that of their countries; (OCDE, 2007)
- The human factor refers to the human and individual characteristics of people that influence their behavior at work or in society; (UNM, 2025)
- Human factors is an applied field of study that examines human abilities, limitations, behaviors, and processes to inform human-centered designs; (MIT, 2023)
- Human factors is the science that deals with people. It focuses primarily on understanding human capabilities and then applying this knowledge to the design of equipment, tools, systems, and work processes. Human factors is the driving force behind the management of processes and technologies that lead to economic growth; (AUG,2025)
- The human factor is a multidisciplinary field that deals with the study of human behavior and interactions within various systems. Its main objective is to optimize performance, well-being, and safety by integrating knowledge from engineering, design, management, occupational health, psychology, and sociology. (Capotescu, 2025)

Thus, by summarizing all the concepts presented above, we can conclude that there are two main notions: the human factor and human capital. The human factor is a more complex concept, referring to people and their influence in all economic, social, or institutional management processes, while human capital refers to the knowledge and skills of individuals in managing these processes. For this reason, it is essential to identify how the human factor can enhance and streamline the global processes and phenomena set out in the 2030 Agenda.

2. SUSTAINABLE DEVELOPMENT GOALS AS STRATEGIC POINTS IN THE DEVELOPMENT OF THE GLOBAL ECONOMY UNTIL 2030

As mentioned already, the global economy is aiming to hit a bunch of development goals by 2030, which are in the UN's proposed document, Agenda 2030. This agenda is an action plan with people and for people, the planet, and prosperity. It also aims to strengthen universal peace in greater freedom. This major goal will be pursued in all countries of the world, with the aim of achieving global prosperity through a series of actions that will eradicate poverty, create jobs, and bring peace and well-being to the countries of the world. The 17 sustainable development goals are integrated into three basic dimensions: economic, social, and environmental, covering five major areas: People, Planet, Prosperity, Peace, and Partnership. The proposed goals are quite ambitious, but necessary. It is important to note that poverty eradication and hunger elimination can be achieved through job creation, access to various social services, access to quality education and training throughout life, in a healthy, environmentally friendly and clean environment. The proper integration of all dimensions enables global economic progress. (Fig.1)

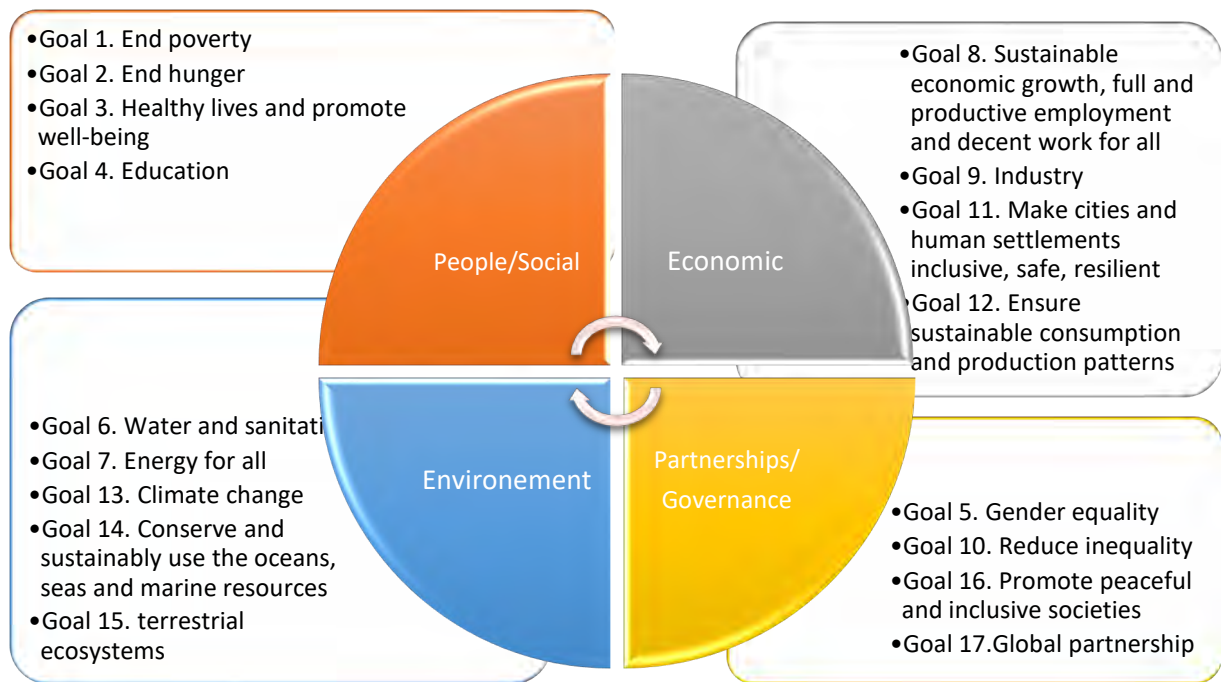


Figure 1. Sustainable development goals by area of action

Source: authors own study

In 2025, a decade after the goals were set, it is necessary to highlight both the progress and challenges that countries and international organizations have encountered. Although conflicts, climate change, economic instability, and growing geopolitical tensions have challenged the achievement of the goals, there is still time until 2030 to turn things around. Impressively, since 2015 there have been some successes in terms of the SDGs, with improvements in key areas including poverty reduction, infant mortality, access to electricity, and the fight against certain diseases. Currently, more than four billion people benefit from some form of social protection, 10% more than ten years ago. Great results have been achieved in reducing infant mortality in underdeveloped countries. Women now hold 27% of seats in parliaments worldwide, up from 22% in the past. Access to electricity has reached 92% of the global population, while internet usage has increased from 40% in 2015 to 68% in 2024. New HIV infections have fallen by 39% since 2010. Malaria prevention efforts have saved 12.7 million lives. More than 110 million additional children are enrolled in school, and the gender gap in education continues to narrow, with more girls completing school. Despite these results, it is estimated that only 35% of the SDGs are on track to be achieved or are making modest progress. Nearly half are progressing too slowly, and 18% are actually regressing. Over 800 million people still live in extreme poverty and hunger. Billions of people live without safe drinking water and sanitation. Women continue to bear 2.5 times more unpaid care work than men. People with disabilities remain disadvantaged in all sectors. Climate records are being broken, with 2024 being the warmest year in history. CO₂ levels are the highest in over two million years. Over 120 million people are displaced, more than double the number in 2015. (SDG, 2025)

It is worth mentioning that continued efforts are crucial, and active human participation remains indispensable.

3. THE CONNECTION BETWEEN THE HUMAN FACTOR AND SUSTAINABLE DEVELOPMENT GOALS

From the previous analysis, it can be seen that sustainable development goals cover a wide range of areas. Firstly, it is people who contribute directly to the implementation of these goals

through individual and collective actions, from adopting sustainable behaviors to getting involved in social, economic, and environmental initiatives. Every person, community, organization, and government has a role to play in achieving the SDGs, thus supporting sustainable development at all levels. The human factor is also seen as the main driver of change, as sustainable development is based on human capital, i.e., skills, education, health, and social equality, which enables inclusive economic growth. Quality education, gender equality, decent work, and safe working conditions are essential to ensuring an active and motivated population capable of innovating and contributing to sustainable prosperity. In addition, the UN agenda emphasizes that human rights, social inclusion, and combating inequalities are fundamental to achieving these goals. The active participation of people in decision-making and policy implementation develops a collective responsibility for environmental protection and social well-being, thus generating a sustainable impact. Therefore, the human factor is the core that gives life and sustainability to the UN goals, through its active involvement, education, respect for rights, and the creation of fair conditions for all individuals. The relationship between the human factor and sustainable development goals is interconnected. On the one hand, the human factor is the most important resource in achieving SDGs, through the optimization and efficient use of its possibilities, and on the other hand, there is a need to improve the components of human capital through access to education, decent work, and health. Eradicating poverty, reducing inequalities, protecting the environment, and collaborating between nations are goals that can only be achieved by involving all aspects related to people, their behavior and capabilities, as well as adapting systems and the environment to optimize their performance (Fig.2).

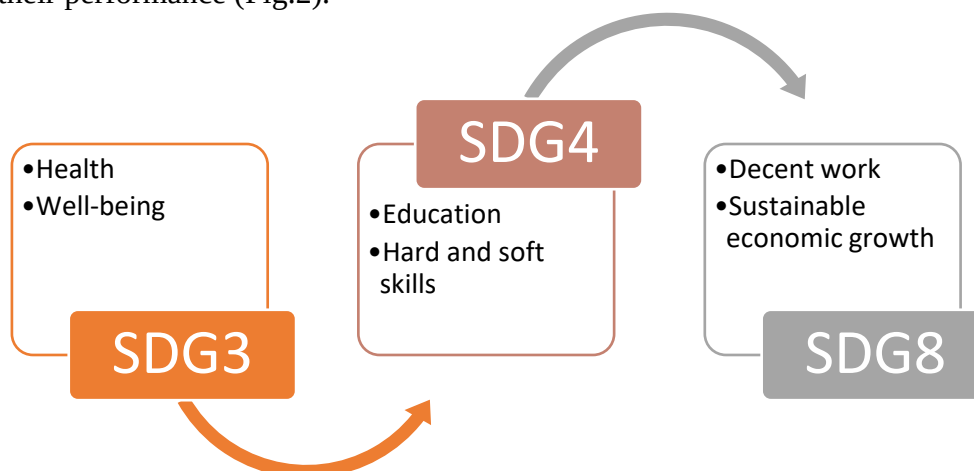


Figure 2. The connection between the human factor and Sustainable Development Goals

Source: authors own study

When analyzing the interconnection between them, it is essential to realize that SDG 3, which refers to health and well-being, and SDG 4, which refers to access to education, improving soft and hard skills, and lifelong learning, determine access to decent work and economic growth (SDG 8). The effective achievement of sustainable development goals depends on the quality of the human factor.

On the other hand, the consequences or benefits of sustainable development are closely linked to increasing human capacity, ensuring social inclusion, protecting human rights, and promoting adequate education and training for the population. Thus, the human factor is both a driver and a beneficiary of the achievement of the SDGs, highlighting the importance of investing in people for sustainable and equitable development.

CONCLUSIONS

Approaching of the interdependencies between the human factor and the Sustainable Development Goals is essential, as it is a complex system made up of many interconnected

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elements. Achieving particular goals is conditional to achieving others. If we refer to SDG 4 - quality education, which aims to ensure that all students acquire the knowledge and skills necessary to promote sustainable development, including through education, then SDG 5 - gender equality, which aims to achieve gender equality and empower all women and girls, is also essential. If we refer to SDG 4 - quality education, which aims to ensure that all students acquire the knowledge and skills necessary to promote sustainable development, including, among other things, through education for sustainable development and sustainable lifestyles, human rights, gender equality, the promotion of a culture of peace and non-violence, global citizenship, and appreciation of cultural diversity and the contribution of culture to sustainable development. Thanks to increased access to education and the acquisition of various skills, people can have secure jobs, which contributes to economic growth and prosperity, thus achieving SDG 8. The collaboration between SDG 4 and SDG 8 reduces the number of people with low incomes, eradicating poverty and gender discrimination, or the income gap. In this case, we achieve SDG 1, SDG 2, SDG 3, and SDG 5. On the other hand, the synergy between all SDGs allows for better alignment between global goals, priorities, and local needs. This ensures that actions taken at the national or local level contribute effectively to the global sustainable development agenda, stimulating effective global cooperation that helps maintain world peace and prosperity.

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CHRONIC MACROECONOMIC VULNERABILITY IN TRANSITION ECONOMIES: EVIDENCE FROM REPUBLIC OF MOLDOVA'S INFLATION REGIME CHANGES

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Abstract: This study analyzes Republic of Moldova's Consumer Price Index (1991-2025) to examine structural vulnerabilities and external shock impacts on transition economies. Using Chow Test for structural breaks and Facebook's Prophet for counterfactual forecasting, we investigate persistent inflationary pressures and regime changes in Republic of Moldova's price formation mechanisms. The analysis reveals severe macroeconomic instability, including hyperinflation during early transition 1991-1995. Statistical evidence, using the Chow Test, confirms a significant structural break in February 2022. Counterfactual analysis demonstrates that absent this structural break, Republic of Moldova's Consumer Price Index would have been 35.9% lower by May 2025, indicating permanent economic repricing rather than temporary adjustment. Using Log-Linear autoregressive modeling, we model the Consumer Price Index gap to estimate the half-life of the structural break's impact. We find that the break has an effectively infinite half-life, indicating no natural decay in the gap between actual and counterfactual paths. This represents a fundamental transformation in price dynamics, with inflation volatility increasing 35.4-fold and welfare losses of 15.1%. These findings highlight critical vulnerabilities including extreme import dependence, institutional weaknesses, and inadequate shock absorption mechanisms. The research challenges conventional small open economy theories and provides empirical evidence for comprehensive structural reforms in energy security, monetary policy frameworks, fiscal stabilization, and regional cooperation to enhance macroeconomic resilience.

Keywords: Consumer Price Index, structural breaks, economic vulnerability, inflation forecasting, Prophet model.

JEL Classification: C22, E31, E58, F41, P20.

1. Introduction

The study of inflation dynamics in transition economies has garnered significant attention in macroeconomic literature, particularly as these economies navigate the complex interplay between structural transformation, external vulnerabilities, and monetary policy frameworks. Republic of Moldova, as a small open economy in Eastern Europe, presents a compelling case study for understanding how external shocks can fundamentally alter inflation trajectories in economies characterized by limited diversification and institutional capacity constraints.

Since its independence in 1991, Republic of Moldova has experienced pronounced macroeconomic instability, including episodes of hyperinflation that peaked at 2,705.71% in 1993. While the country achieved relative price stability in the 2000s through monetary and fiscal reforms, recent geopolitical developments have exposed persistent structural vulnerabilities. The Russian invasion of Ukraine in February 2022 marked a critical juncture, triggering unprecedented energy price shocks and supply chain disruptions that reverberated throughout Republic of Moldova's economy.

This paper contributes to the literature on structural breaks in inflation dynamics by providing a comprehensive empirical analysis of Republic of Moldova's Consumer Price Index (CPI) from 1991 to 2025. Using Chow tests for structural break detection and Facebook's Prophet algorithm for counterfactual analysis, we identify and quantify the macroeconomic impact of the

February 2022 shock. Our methodology allows for precise identification of structural breaks while generating robust counterfactual scenarios to assess the magnitude of external shock transmission.

The analysis reveals several key findings that advance our understanding of inflation dynamics in vulnerable transition economies. First, we document a statistically significant structural break in February 2022, representing a fundamental shift in Republic of Moldova's inflation regime. Second, through counterfactual analysis, we estimate that without this external shock, Republic of Moldova's CPI would have been 35.9% lower by May 2025, suggesting permanent repricing effects with an infinite adjustment half-life. Third, we quantify a 35.4-fold increase in inflation volatility post-shock, accompanied by an estimated 15.1% welfare loss, highlighting the severe economic costs of external vulnerability.

These findings have important implications for monetary policy frameworks in small open economies and contribute to the broader literature on external shock transmission mechanisms. Our results suggest that traditional inflation targeting approaches may be insufficient in economies with high external vulnerability, necessitating comprehensive structural reforms including economic diversification, enhanced monetary policy credibility, and stronger automatic stabilizers.

2. Methodological Review

2.1 Data Processing and Descriptive Analysis

The CPI data for Republic of Moldova spanning 1991-2025 underwent comprehensive preprocessing and descriptive analysis. Monthly inflation rates were calculated using both month-over-month and year-over-year percentage changes, with rolling 12-month volatility measures computed using standard deviation of monthly inflation rates. The analysis identified hyperinflation periods defined as annual inflation exceeding 50%, and categorized the time series into four distinct economic periods: Early Transition (1991-1995), Stabilization (1996-2007), Global Crisis (2008-2013), and Recent Period (2014-2025). Descriptive statistics including average inflation rates, volatility measures, and maximum inflation levels were calculated for each period to characterize macroeconomic dynamics.

2.2 Structural Break Testing

Structural break analysis employed Chow tests implemented through the *strucchange* package in R to detect regime changes in Republic of Moldova's inflation dynamics. The analysis focused on February 2022 as the hypothesized breakpoint, corresponding to the onset of the Russia-Ukraine conflict. Chow tests were applied to log-transformed CPI data using both intercept-only and linear trend specifications to test the null hypothesis of parameter stability against the alternative of a structural break. F-statistics were computed across the sample period to visualize the temporal evolution of structural instability, with critical values determining statistical significance at conventional levels.

2.3 Counterfactual Forecasting Framework and Welfare Analysis

A counterfactual analysis was conducted using Facebook's Prophet algorithm developed by Taylor and Letham (2018) to estimate what Republic of Moldova's CPI trajectory would have been absent the February 2022 structural break. The model was trained on log-transformed CPI data from January 1996 through February 2022, incorporating yearly seasonality while suppressing weekly and daily components inappropriate for monthly data. The Prophet model specification included additive seasonality with a changepoint prior scale of 0.05 to control trend flexibility. Out-of-sample forecasts were generated through May 2025, with Jensen's inequality correction applied to transform log-scale predictions back to CPI levels, accounting for the bias introduced by the log-normal transformation using estimated residual variance from the training period. The structural break's economic impact was quantified through multiple approaches comparing actual versus counterfactual CPI paths. Absolute and percentage gaps were computed monthly, with cumulative effects tracked over time to measure persistent inflationary pressures. Welfare loss

approximations employed consumer surplus theory, estimating deadweight losses as half the percentage price increase under unit elastic demand assumptions.

2.4 Impact Assessment

Inflation volatility comparisons assessed whether the structural break increased macroeconomic uncertainty by comparing standard deviations of year-over-year inflation rates between actual and counterfactual scenarios. Shock persistence was analyzed through Log-Linear autoregressive modeling of the CPI gap to estimate the half-life of the structural break's impact, providing insights into the duration of inflationary pressures attributable to the geopolitical shock.

3. Analysis and Prophet Forecast

3.1 Descriptive Statistics Analysis

The multi-panel analysis examines Moldova's CPI across four dimensions. Panel 1 presents raw CPI values over time, with shaded regions highlighting crisis periods (Transition Crisis: 1991–1996; Global Crisis: 2008–2014) to identify potential regime changes. Panel 2 converts CPI data into annualized inflation rates using 12-month percentage changes, which remove seasonal effects; a 50% threshold line marks periods of hyperinflation. Panel 3 measures inflation volatility through a two-step process: first calculating month-over-month inflation, then applying a 12-month rolling standard deviation to capture temporal uncertainty. Panel 4 divides the timeline into four economic periods (Early Transition: 1991–1995; Stabilization: 1996–2007; Global Crisis: 2008–2013; Recent: 2014–2025), computing average inflation and volatility to enable cross-period comparisons of macroeconomic stability.

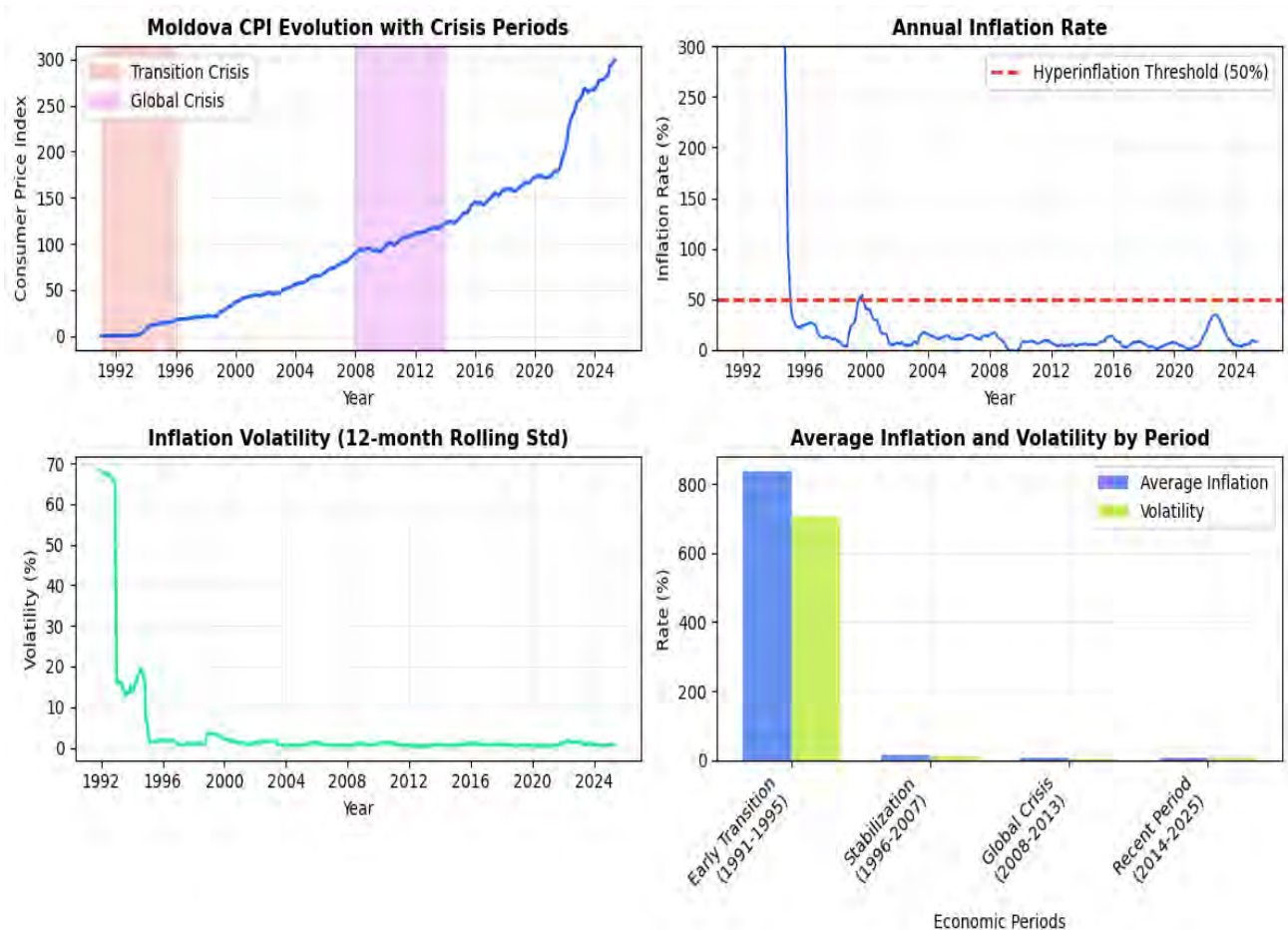


Figure 1. Analysis of Republic of Republic of Moldova's CPI

Source: elaborated by author based on IMF data

A defining feature of the Republic of Moldova's Consumer Price Index (CPI) evolution is the pronounced hyperinflationary event that transpired during the initial post-Soviet transformation phase (1991–1995). This era experienced an average yearly inflation rate of 836.60%, reaching a high point of 2,705.71% in December 1993 (year-over-year), thus positioning it among the most severe hyperinflationary episodes among economies transitioning from the former Soviet Union. These occurrences emphasize notable institutional vulnerabilities, as manifested in the considerable inflation instability—with a standard deviation of 705.68%—revealing deficiencies in sound monetary policy instruments and institutional framework for securing price equilibrium. The severity of this predicament emphasizes the Republic of Moldova's increased vulnerability to external shocks, possibly exacerbated by the breakdown of established trade connections with other former Soviet states, while the prolonged hyperinflation over multiple years indicates fundamental structural imbalances within the economy.

The subsequent stabilization period (1996–2007) exemplifies the Republic of Moldova's aptitude for macroeconomic adjustment, demonstrated by a considerable decrease in average inflation to 15.92% and a significant drop in instability to 10.92%. Nevertheless, inflation rates during this period remained considerably high compared to those seen in developed nations, suggesting persistent structural deficiencies and restricted monetary policy effectiveness. The continuation of relatively high inflation instability additionally implies incomplete institutional development and ongoing obstacles to achieving price stability comparable to more established market-based systems.

The global financial crisis period (2008–2013) unexpectedly reveals the lowest average inflation (6.20%) and instability (4.36%), possibly indicating deflationary forces from external demand shocks instead of enhanced domestic policy efficiency. The contemporary period (2014–2025) displays renewed inflationary stresses with average inflation of 8.36% and increased instability of 7.81%, reaching a peak of 34.62%, implying that the Republic of Moldova's economy is still vulnerable to both domestic policy inconsistencies and external economic turbulences.

The analysis reveals several fundamental structural vulnerabilities that continue to characterize Republic of Moldova's economy. The persistent high inflation volatility across all periods suggests limited central bank credibility and effectiveness in maintaining price stability, a fundamental prerequisite for sustained economic development. The extreme sensitivity to external shocks, evidenced by the hyperinflationary crisis and subsequent volatility patterns, indicates high dependence on external factors including commodity prices, remittances, and foreign capital flows. Furthermore, the prolonged nature of the hyperinflationary episode and subsequent periods of elevated inflation suggest weak institutional frameworks for economic management and policy implementation.

Notwithstanding the considerable advancements achieved since the transitional crisis era, contemporary impediments endure. The persistently high coefficient of variation underscores Republic of Moldova's ongoing difficulties in attaining macroeconomic stability akin to that of advanced economies. These sustained vulnerabilities engender substantial obstacles to the investment environment, insofar as elevated inflation uncertainty fosters adverse conditions for long-term capital allocation and strategic economic forecasting. Furthermore, the pronounced price volatility is apt to exert asymmetric impacts on disadvantaged demographic segments, thereby potentially intensifying income disparities and societal frictions. Moreover, such inflationary patterns could curtail Republic of Moldova's potential for enhanced economic amalgamation with more resilient economies, thereby restricting prospects for regional collaboration and developmental progress.

3.2 Chow Breakpoint Test for February 2022

Table 1. Chow breakpoint test for log(CPI)

Model	Breakpoint Date	supF	p-value
log(CPI) ~ 1	2022-02	693.673145220655	0
log(CPI) ~ t	2022-02	6857.46745526997	0

Source: elaborated by author based on IMF data

The Chow breakpoint test in Table 1 confirms a structural break in the CPI series in February 2022. Testing both intercept-only and trend-augmented models, the test rejects parameter stability with p-values near zero and elevated F-statistics, indicating a significant deviation in price dynamics.

The results are robust across model specifications. Even with a deterministic trend, the significant break suggests a level shift in log(CPI) rather than just a slope change, indicating a fundamental reconfiguration of the price-determination process beyond simple trend modifications.

The break's timing aligns with 2022's macroeconomic disruptions, particularly energy and food price shocks from geopolitical tensions. This suggests the detected break represents persistent price re-leveling rather than temporary deviation. For monetary policy, these findings highlight the need for adequate shock absorption mechanisms and clear communication to re-anchor inflation expectations after external disturbances that fundamentally alter price formation.

3.3 Prophet Forecast

In this analysis, we employ the **Prophet** time series model to forecast the CPI, with the aim of estimating what the trajectory of CPI might have looked like in the absence of a structural break identified in **February 2022**. To ensure the model is trained on a stable inflation regime, we restrict the training period to data from **1996 to December 2021**, excluding the years **1990–1995**, which were marked by hyperinflation.

To stabilize variance and improve model performance, we apply a **log transformation** to the CPI series prior to modeling. Forecasts are generated through **May 2025**, after which we **back-transform the log forecasts to level terms**, applying the **Jensen's inequality correction** to obtain an **unbiased mean estimate**.

Model performance is evaluated using standard accuracy metrics—**RMSE, MAE, MAPE**, and others—calculated in **level units**. While achieving perfect forecast accuracy is not the primary goal, this counterfactual exercise aims to illustrate what the CPI path **would have been** had the structural break in late 2021 not occurred, as identified by the **Chow breakpoint test**.

Table 2. Forecast Accuracy Metrics and Dataset Summary for CPI Counterfactual Analysis (1996–2025)

Metric	Value
Root Mean Square Error (RMSE)	63.837
Mean Absolute Error (MAE)	62.803
Mean Absolute Percentage Error (MAPE)	23.42%
Mean Error (Bias)	62.803
Mean Absolute Scaled Error (MASE)	9.311
Correlation Coefficient	0.9418
Mean Actual CPI	265.95
Mean Forecast CPI	203.14
Standard Deviation of Errors	11.59
Training Period	1996-01 to 2022-02
Forecast Period	2022-03 to 2025-05
Training Observations	314
Forecast Observations	39

Source: elaborated by author based on IMF data

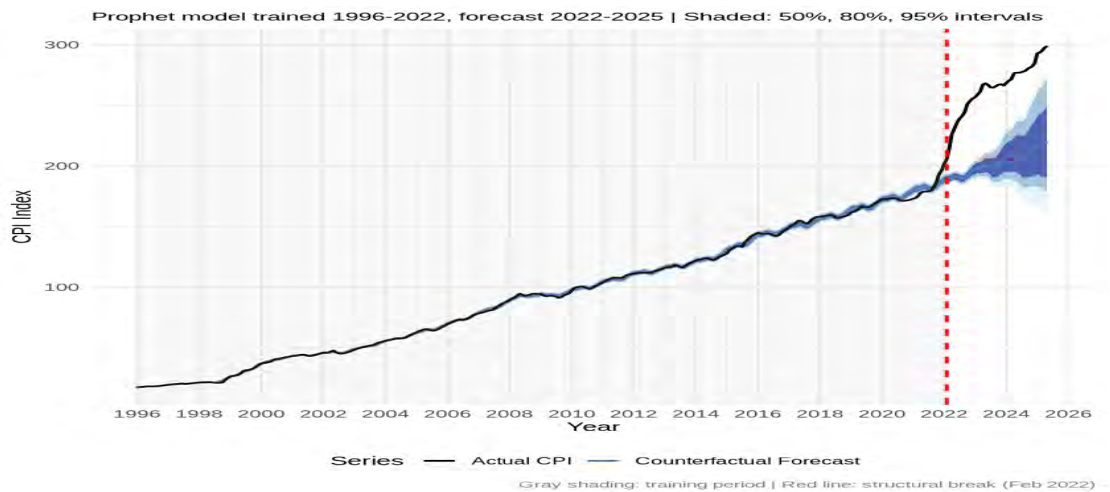


Figure 2. Prophet CPI forecast analysis

Source: elaborated by author based on IMF data

The Prophet counterfactual forecast evaluation reveals significant analytical insights through systematic performance assessment. Key accuracy metrics from Table 2 demonstrate substantial forecast deviations: RMSE of 63.84, MAE of 62.80, and MAPE of 23.42%, indicating proportional deviations between observed and counterfactual trajectories. The systematic bias of 62.80 index points toward underforecasting confirms the structural upward shift following February 2022. The Mean Absolute Scaled Error (MASE) of 9.31 indicates forecast errors exceed seasonal naive benchmarks by factor 9.3, highlighting the unprecedented nature of post-2022 economic dynamics. Despite substantial errors, the correlation coefficient of 0.9418 demonstrates robust linear relationships between actual and predicted values, suggesting intact underlying structural dynamics despite significant level shifts.

Fan chart visualization from Figure 2 provides critical insights into model performance and structural break characteristics. During the 1996-2022 training period, the model effectively captured historical CPI dynamics across confidence intervals. The February 2022 structural break marked sharp divergence from projected trajectories, with actual CPI consistently exceeding 95% confidence bands throughout the post-break period, confirming permanent regime change. Narrow confidence bands surrounding counterfactual forecasts indicate high model certainty regarding alternative trajectories absent structural disruption.

The counterfactual analysis reveals Republic of Moldova's CPI would have reached approximately 220 points by May 2025 without the February 2022 break, contrasting sharply with the observed 299 points—a 35.9% divergence. This represents fundamental economic repricing rather than temporary shock, exposing structural vulnerabilities previously masked during global stability periods. The gap escalated from 23.4% in 2022 to 35.5% by 2025, defying conventional mean-reverting dynamics and suggesting self-reinforcing mechanisms including wage-price spirals and unanchored inflation expectations.

Welfare implications prove severe, with consumption losses reaching 15.1% (welfare loss $\approx 0.5 \times \text{price increase}$) amid 30.2% average price increases across 40 months. Lower-income households experienced disproportionate hardship, amplifying aggregate social costs. The volatility analysis reveals the most striking transformation: actual inflation volatility increased 35.4-fold (was calculated by dividing the standard deviation of actual YoY inflation (5.728) by that of the counterfactual series (0.1618)) relative to counterfactual baselines, indicating fundamental breakdown in price stability mechanisms. The negative correlation (-0.094) between

actual and counterfactual inflation rates demonstrates complete severance from historical determinants.

3.4 Semi-Log (Log-Linear) Exponential Decay Model

Table 3. Result of Log-Linear model (2022m06 2025m05)

Table 3: Results of Log-linear model (columns 2 columns)						
term	estimate	std.error		t-Statistic	p.value	
(Intercept)	3.32534157818699	0.0242945158411551		137.047569 1525546	3.1994189825336e -48	
months_since_br eak	0.00623518521003879	0.00101279219877896		6.21766805 80376	4.4993289521686 8e-07	
Model Fit Statistics						
r.squared	adj.r.squared	sigma	statistic	p.value	df	logLik
0.5321	0.5183	0.0634	38.6594	4.4993e-7	1	49.2227

Source: elaborated by author based on IMF data

Shock persistence analysis yields from Table 3 concerning results with estimated monthly decay rate of - 0.6325% per month (the model estimates **how quickly the inflation gap closes** after a shock by modeling the **exponential decay** of the gap over time and translating it into an interpretable **half-life**), so the gap is increasing slightly over time rather than decaying, implying effectively infinite half-life for actual-counterfactual divergence. This suggests that the shock to CPI in February 2022 created a **persistent divergence** rather than a temporary deviation. The actual CPI continues to diverge from what would have been expected based on the pre-break trend, indicating a permanent structural change rather than a temporary shock that dissipates over time. The exponential growth pattern implies that without policy intervention or other structural changes, the gap between actual and counterfactual CPI will continue to widen over time.

This contradicts standard models expecting shock dissipation through market adjustments, suggesting fundamental deficiencies in Republic of Moldova's adjustment mechanisms reflecting structural rigidities, extreme import dependence, and insufficient financial buffers.

These findings challenge theoretical propositions regarding small open economies. The insulation hypothesis proves inadequate for import-dependent economies where currency depreciation amplifies external pressures. Pre-2022 stability likely reflected borrowed credibility from favorable global conditions rather than robust domestic frameworks. The analysis exposes multiple vulnerability layers: cascading price effects from intermediate input dependence, absence of automatic stabilizers, and fragile expectation formation mechanisms.

The evidence suggests conventional stabilization measures cannot restore pre-shock equilibrium, necessitating comprehensive structural transformation. Policy priorities must focus on vulnerability reduction through energy independence, import substitution, and institutional reform to build credible monetary frameworks. The February 2022 break serves as both catastrophe and revelation, quantifying the ongoing cost of structural vulnerabilities that compound continuously while fundamental weaknesses persist unaddressed.

4. Conclusion and recommendations

This in-depth analysis of the Republic of Moldova's inflationary trends from 1991 to 2025 offers significant understandings of the underlying vulnerabilities and macroeconomic obstacles facing small economies in transition within an increasingly volatile global environment. The research clarifies that the Republic of Moldova's economic trajectory has been deeply shaped by two related but distinct occurrences: the disastrous hyperinflationary period during the early post-Soviet transition and the significant structural shift identified in February 2022. By utilizing rigorous methods for identifying structural breaks and counterfactual forecasting, this study measures the lasting spread of external shocks and reveals the inadequacy of conventional stabilization tools in lessening systemic economic weaknesses.

The empirical evidence strongly supports the concept of a permanent structural transformation in the Republic of Moldova's price-setting models after February 2022. Chow breakpoint analyses provide clear statistical confirmation of regime change, while the Prophet-based counterfactual assessment indicates a 35.9% difference between observed and predicted CPI paths by May 2025. This difference is more than a temporary adjustment to external pressures; it signifies a fundamental repricing of the economy marked by self-sustaining dynamics that go against typical mean-reversion models. The predicted infinite half-life of the structural break's effects highlights the severity of the Republic of Moldova's adaptation limitations and emphasizes the need for proactive policy actions to restore macroeconomic stability.

The welfare consequences of this investigation are particularly alarming, with projected consumption declines of 15.1% affecting marginalized groups disproportionately and worsening existing socioeconomic inequalities. The 35.4-fold increase in inflation volatility compared to counterfactual benchmarks indicates a widespread breakdown of price stability mechanisms, creating an environment inherently unfavorable to sustained economic progress. These findings challenge optimistic assessments of the resilience of small open economies and demonstrate that dependence on imports, when combined with institutional shortcomings, can amplify rather than reduce external disturbances. The prolonged nature of the inflationary pressures suggests that the Republic of Moldova's pre-2022 relative stability stemmed from favorable global conditions rather than from robust domestic policy frameworks.

Recommendations.

Based on this analysis, several critical policy interventions are essential for addressing Republic of Moldova's structural vulnerabilities and restoring macroeconomic stability.

Energy Security: Immediate priority should focus on diversifying energy sources, investing in renewable infrastructure, and establishing strategic reserves to reduce dependence on volatile external suppliers—addressing the primary transmission channel of the February 2022 shock.

Monetary Policy Reform: The framework requires restructuring through explicit inflation targeting with clear communication, strengthened central bank independence, and sophisticated macroprudential tools. Conventional instruments have proven inadequate for managing import-dependent economies facing external shocks.

Fiscal Policy Enhancement: Comprehensive reforms should establish automatic stabilizers including sovereign wealth funds, countercyclical fiscal rules, and robust social protection systems to mitigate welfare costs during crises.

Economic Transformation: Long-term structural reforms through strategic import substitution and export diversification are imperative. Priority sectors include food security, essential medical supplies, and critical manufacturing inputs, supported by human capital and technological development.

Regional Cooperation: Strengthening initiatives for collective shock management through deeper EU integration, and collaborative frameworks for energy security and food price volatility can reduce individual country vulnerability.

These interconnected reforms address the fundamental vulnerabilities revealed by the February 2022 structural break and provide a comprehensive framework for building resilience against future external shocks.

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SYNERGIES BETWEEN THE CIRCULAR AND COLLABORATIVE ECONOMIES: INTEGRATED APPROACHES IN THE EUROPEAN UNION

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Abstract: This article explores the synergies between the circular and collaborative economies within the European Union, highlighting how these models can complement each other to promote resource efficiency, social innovation and inclusive growth. The circular economy emphasizes waste reduction, material reuse and sustainable production cycles, while the collaborative economy focuses on shared access to goods and services, promoting community engagement and new business models. By analysing policy frameworks and institutional initiatives, the authors identify the mechanisms through which circular and collaborative approaches converge. The research examines regulatory challenges and institutional barriers that may hinder the simultaneous development of both economic models. The paper argues that integrated strategies – combining circular resource management with collaborative consumption practices – can enhance the EU’s transition towards sustainable and inclusive economic systems. By providing a conceptual framework and empirical illustrations, the article contributes to a more comprehensive understanding of how the European Union can harness circular and collaborative economies together, rather than in isolation, to address sustainability and social cohesion objectives. The authors conclude that promoting interactions between circular and collaborative economic models is becoming a strategic imperative for the EU.

Keywords: circular economy, collaborative economy, collaborative consumption, resource efficiency, social innovation, sustainable production, integrated approaches

JEL Classification: Q01, Q56, D16

1. Introduction

The increasing complexity of global environmental issues, for instance, resource depletion, climate change, and by-product waste accumulation, demands a gradual yet profound shift toward more sustainable socio-economic systems. Traditional linear models of production and consumption, commonly known as “take-make-dispose” no longer fit within ecological limits or ensure long-term stability. Instead, sustainable models such as the circular and collaborative economies offer more efficient and, in certain respects, resilient alternatives.

Examining the relationship between the circular and collaborative economies is at the forefront of sustainability in practical terms. Both models promote resource efficiency and systemic resilience. The circular economy aims to reduce waste and extend material lifecycles,

mainly by means of regenerative loops, while the collaborative economy encourages shared access over individual ownership. Bringing the aforementioned models within sectoral realm can lead to practical ways in approaching sustainable economy and social innovation. In practical terms, this approach has the distinct force function to improve resource efficiency, in tandem with promoting sustainable production and consumption, and an ultimate goal of expanding access to goods and services.

Primarily, the convergence of the circular and collaborative economies is bottomed on the factors of technological and scientific advances as well as the climate issues, which we set as cofactors. These factors level up new forms of access-based consumption and reinforce circular production lines across various economic sectors.

Digital platforms act as key go-betweens for sharing goods and services grounded on the triangle principle: reuse-repair-recycle. The circular and collaborative economies gain from this technological mediation as both are connected and use open public platforms.

Although both models pursue worthwhile goals in climate action and economic development, they have not been sufficiently studied, neither at the level of public policy nor with respect to their potential synergy. This latter aspect represents a huge gap and neglected area in development policy. Our study attempts to advance this understanding through the lens of relevant EU policies. Simultaneously, this paper discusses the integrated concept of the circular and collaborative economies.

2. Methodology

As we integrated the main policy-related documents in the analytical loop, the research aims to provide an in-depth assessment of the European Union's policy architecture in connection to circular and collaborative economies. On the other end of the spectrum, we tend to provide multi-layered research to understand how policy instruments, socio-technical innovation, and behavioural change interact within the European Union's sustainability agenda.

As we research this topic, it becomes clear that policy analysis needs to evolve beyond sectoral divisions towards cross-cutting approaches. Our methodology addresses the diverse aspects of the topic by integrating interdisciplinary, analytical, and descriptive methods, as well as both qualitative and quantitative dimensions.

Perspectives from economics, sociology, technological sciences, and environmental studies tend to cover the multidisciplinary basis, which is essential for tracing the roots of what we call synergy in this paper.

The methodological strategy presents theoretical and empirical frameworks, allowing for the assessment of the extent to which policies drive measurable outcomes. By bringing together policy analysis from various fields, it aims to examine the current trends, assess policy design, and elucidate the integrated concept of circular and collaborative economies. Ultimately, this combined approach helps to better understand how the European Union is moving toward a more resource-efficient and socially resilient economy.

3. Main Findings

3.1. Conceptual and applicative dimensions of the convergence between the circular and collaborative economies

Circular and collaborative economic models jointly yield shared resources as a core element of their convergence. Digital platforms enable both individuals and organizations to access commonly used goods. For instance, peer-to-peer rental platforms for equipment allow users to borrow used products rather than purchase new ones, which reduces demand for new production, and consequently lowers material use, and minimizes waste (Heinrichs, 2016).

Another important dimension is the extension of product lifecycles. Collaborative economy practices, such as sharing, leasing, and reusing, naturally prolong the functional lifespan of goods. For instance, clothing rental services facilitate garment reuse and align with circular-economy

principles by reducing textile waste and encouraging more sustainable consumption practices. Such examples reinforce circular strategies and show the way to access-based systems, where the focus shifts from ownership and disposal toward longevity, efficiency, and cultural adaptation in consumption behavior.

Community involvement is another synergistic dimension, wherein social engagement plays a role as a catalyst for the development of interpersonal networks that, in turn, increase trust and cooperative behavior. Accordingly, this social dimension enhances the effectiveness of circular practices, as communities can jointly create sustainable systems and exchange knowledge on resource management.

With this background, social entrepreneurship is evolving as an emerging paradigm with the purpose to line up neatly the principles of circular and collaborative economies. In such a manner, organizational success can be redefined through the lens of community well-being. In this social model, financial profit is redefined and subordinated to the social mission, not representing an ultimate goal. Moreover, within social entrepreneurship, collective action is meant to empower beneficiaries to become active contributors to value creation. In this sense, social initiatives, participatory actions, could encourage the initiation of new forms of collaboration, innovation and shared responsibility.

It is worth noting that the collaborative economy is increasingly serving as a platform for policy coordination within the European Commission, bridging tense institutional areas such as environmental and economic policy. In this sense, the collaborative economy contributes to policy connectivity and intersectoral integration.

In recent times, new partnerships have emerged between circular and collaborative economy models, emphasizing that circularity is intrinsically linked to community development and, implicitly, to a more equitable society. The collaborative economy, based on a culture of repair and maintenance, requires a transformation in consumer behaviour. Starting from the fact that products can be repaired, reused and shared, thus extending the functional life of goods, these approaches erode the practice of continuous purchases. At the same time, these practices lead to the obsolescence of the material accumulation concepts as a prosperity standard. Simplicity and voluntary sufficiency step in and gradually take up their positions.

As a result, local collaborative initiatives have proliferated across EU. Amsterdam, in particular, distinguishes itself as a leader in “sharing cities” initiatives that implement circular economy principles and collaborative methodologies. The Amsterdam Circular Strategy focuses on material reuse and closed-loop production by fostering policies and partnerships among private companies, public authorities, and community groups (Calisto F. et al., 2023).

International stakeholders play a key role in advancing the principles of circular and collaborative economies through various tangible projects and programs. The United Nations Environment Programme (UNEP) promotes circular economy principles globally, notably through initiatives such as the International Resource Panel. UNEP aims to reduce resource inefficiency and pollution, as well as to facilitate multi-stakeholder partnerships by putting together key stakeholders from governmental institutions, the private sector, and civil society organizations (UN Environment Programme, 2018).

As for the EU side, the European Commission implements targeted policy initiatives and invests in research and innovation. The Horizon 2020 and Horizon Europe programs have funded projects that integrate circular-economy principles with collaborative consumption models across sectors such as digital services, textiles, electronics, and construction (European Commission, 2024). Figure 1 shows the conceptual framework that delineates the reciprocal linkages between the circular and collaborative economies in the EU.

As for the civil society sector, one can mention the profiled Ellen MacArthur Foundation, which provides wholehearted support for circular-economy models. Its Circular Cities Initiative

demonstrates how collaborative platforms enable cities to function as genuine hubs of multilevel circularity, including shared mobility, resource exchanges, and peer-to-peer networks (Ellen MacArthur Foundation, 2019). This integrated urban approach put forth a city’s capacity to act as a catalysts for the transition toward more sustainable economic models, where resources are efficiently utilized and recirculated through collaborative networks and digital sharing infrastructures.

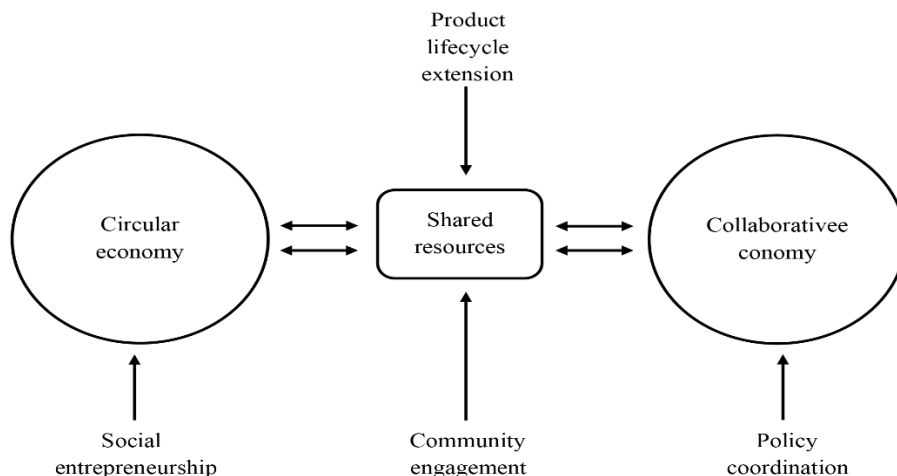


Figure 1. Conceptual framework of the synergies between the circular and collaborative economies within the European Union

Source: designed by the authors based on European Commission (2018) and European Commission (2023).

Drawing on recent institutional and urban developments, the integrated concept posits that the collaborative business models and platforms can facilitate the advancement of the circular economy. On the one hand, the collaborative economy, based on sharing resources and access rather than conventional ownership, is expected to expand sectorally. On the other hand, the circular economy will use collaborative models as an effective vehicle for scaling regenerative practices and waste minimization strategies.

Implementing the integrated concept of the circular and collaborative economies would require promoting coordinated initiatives to support both the collaborative and circular economy altogether. This would involve developing digital platforms to facilitate resource sharing and reuse, adopting public policies that integrate circular-economy practices into strategic economic sectors, and attracting foreign direct investment (FDI). In addition, effective collaboration between governmental institutions and the private sector could support the implementation of pilot projects and the creation of sustainable innovation hubs.

3.2. Integrated approaches to the circular and collaborative economies within EU policy architecture

In 2015, the European Union adopted its first comprehensive policy-wrapping initiatives for the circular economy, the Circular Economy Package (European Commission, 2015a). This Package pursued two overarching objectives: (1) reconciling environmental and economic goals, and (2) supporting economic recovery in the aftermath of the 2009 financial crisis and its ensuing recession. This framework was based on comprehensive economic and methodological assessments of the implementation of circular economy principles in European Union economic sectors. These assessments incorporated strategic directions discussed in policy forums and insights from academic conferences. The initial Circular Economy Package aimed to increase competitiveness, create employment opportunities, and promote sustainable economic development.

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The Circular Economy Action Plan, adopted in 2020 (European Commission, 2020), as a key component of the European Green Deal, introduced a series of measures focused on the entire product life cycle. This Action Plan emphasized sustainable consumption, waste prevention, and the retention of resources within the European Union economy for as long as possible (European Commission, 2020).

In implementing consumption-related policies, the European Union has increasingly addressed the need for more sustainable and circular consumption patterns. According to the EU Circular Economy Action Plan released in 2020, circularity in consumption entails maximizing the value of resources, materials, and products through their repeated and diversified reuse (European Commission, 2020). Despite the multiple benefits outlined in the Plan, there are gaps in regard to the implementation instruments, particularly across product categories, industrial sectors, and mechanisms for reducing consumption by product type. To address these issues, in 2022 the EU adopted its Strategy for Sustainable and Circular Textiles (European Commission, 2022) and in 2024 enforced the Regulation on Eco-design for Sustainable Products (European Union, EUR-Lex, 2024).

The European Union Directive 2018/851, part of the Circular Economy Package, amends the Waste Framework Directive and sets specific targets. These targets include recycling 55% of municipal waste by 2025 (European Union EUR-Lex, 2018), reducing total waste generation to 10% by 2030 (European Commission, 2023) and promoting the waste hierarchy through economic measures. However, the directive does not cover the recycling of all categories of waste. For example, it does not cover industrial waste traded across borders, which represents almost 90% of all waste (Kovacic, 2020).

A comprehensive and integrated framework for waste management is missing, one that would set clear targets for the recycling and reuse of industrial waste. It should implement robust mechanisms to monitor transboundary waste movements and promote economic strategies that facilitate the transition to sustainable industrial practices. In addition, the framework should stimulate technological progress and encourage collaboration between EU Member States to ensure the full management of industrial waste in the circular economy.

Analysis of the EU's main policies along the circular economy reveals a weak valorisation of the collaborative economy. As shown in Table 1, the EU's policy has gradually shifted from waste management priorities to system-level sustainability objectives. Thus, EU circular economy policies primarily focus on two core components: (1) sustainable or circular consumption, and (2) waste recycling and/or reuse. Consequently, EU initiatives tend to address in a pragmatic manner the determinants of consumption (personal, psychological, social, and cultural), the prevailing consumption models (linear, circular, collaborative, sustainable), as well as the implementation instruments, including eco-design, product durability, and standardization.

Table 1. Selected EU regulations and communications on the circular economy, years 2014–2023

Year	Regulations and communication
2014	- Communication of the Commission addressed to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions - “Towards a Circular Economy: A Zero Waste Programme for Europe” (COM(2014) 398 final).
2015	- Communication of the Commission addressed to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions - “Closing the Loop: An EU Action Plan for the Circular Economy” (COM(2015) 614 final). This Communication includes proposals to amend the following directives: • Directive 2000/53/EC on end-of-life vehicles.

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	• Directive 2006/66/EC on batteries and accumulators and waste batteries and accumulators. • Directive 2012/19/EU on waste electrical and electronic equipment (WEEE); • Directive 1999/31/EC on the landfill of waste. • Directive 94/62/EC on packaging and packaging waste. • Directive 2008/98/EC on waste, including a legislative proposal to extend the minimum legal guarantee for goods sold online to two years.
2016	- Proposal for a Regulation of the European Parliament and of the Council establishing rules for the market availability of CE-marked fertilizing products and amending Regulations (EC) No 1069/2009 and (EC) No 1107/2009. - Launch of the “Innovation Deals for a Circular Economy” Initiative, open between 26 May and 15 September 2016, aimed at identifying perceived regulatory barriers to innovation within the circular economy framework. - Adoption, on 30 November 2016, of the Ecodesign Working Plan 2016–2019, as part of the “Clean Energy for All Europeans” package. - Launch of the EU Platform on Food Losses and Food Waste, including the development of a common EU methodology for measuring food waste and the preparation of EU guidelines to facilitate food donation and the use of unsold food products as feed for animals.
2017	- Proposal for a Directive of the European Parliament and of the Council amending Directive 2011/65/EU on the restriction of the use of certain hazardous substances in electrical and electronic equipment. - Communication on the role of waste-to-energy processes in the circular economy (European Commission, 2017b). - Launch of the Circular Economy Finance Support Platform.
2018	- Circular Economy Monitoring Framework. - Amendment to Directive (EU) 2018/851 on waste. - European Union Strategy for Plastics.
2020	- Circular Economy Action Plan. - European Industrial Strategy.
2022	- Circular Economy Measures Package. - New policy framework on biodegradable and compostable plastics.
2023	- Revision of circularity indicators.

Source: elaborated by the authors based on data and insights from Kovacic, Z., Strand, R. (2020); Iordachi, V., Popa V., Popa N. (2022); European Commission (2023), European Union, EUR-Lex (2022, 2024).

As for the collaborative economy, EU policies separately address the regulatory frameworks for digital platforms, innovation and entrepreneurship, labor-market and social-protection regulations. These policies are complemented by specific initiatives on cybersecurity, data protection standards, and the development of digital infrastructure necessary for the effective functioning of collaborative models (Dijmărescu, 2023). EU policies also aim to maintain a balance between promoting technological innovation and ensuring quality and safety standards for users, including effective mechanisms for monitoring and evaluating the impact of these policies.

Adopted by the European Commission in 2015, the Digital Single Market Strategy was the first comprehensive EU-level policy to address challenges from new economic models and globalization (European Commission, 2015a). Specifically, the Strategy aims to expand consumer access to digital goods and services across the EU by dismantling cross-border barriers to online trade. Moreover, it creates an enabling environment and ensures a level playing field for digital innovation. The Strategy also highlights the need to harness the EU’s digital growth potential by substantial investments in communication infrastructure and advanced technologies, such as cloud computing and Big Data systems.

Between 2016 and 2017, the EU introduced a series of transformative measures that redefined the digital landscape across Europe. Among the most significant achievements were the

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abolition of roaming charges to improve cross-border connectivity and updating data protection standards to align with updated digital security and privacy standards. The introduction of cross-border content portability and the ban on unjustified geo-blocking also advanced e-commerce and supported the ongoing integration of the Digital Single Market.

The transport sector shows how ridesharing and car sharing platforms are transforming urban mobility. In the accommodation sector, platforms such as Airbnb have disrupted the short-term rental market, altering both tourism supply and urban housing policies. In finance, fintech firms and crowdfunding platforms have expanded access to capital and fuelled innovation, while also raising new regulatory and consumer protection issues.

The European Commission’s Communication, “A European Agenda for the Collaborative Economy” (European Commission, 2016) and the European Parliament’s Resolution of 15 June 2017 constitute primary policy frameworks for regulating and advancing the collaborative economy across the European Union (European Parliament, 2017). These policy documents provide explicit guidance on consumer protection, specify regulatory requirements for businesses, and assist public authorities in formulating and implementing policies. The Agenda for the Collaborative Economy is grounded in Digital Single Market principles and is consistent with major legislative instruments, including the Services Directive, the E-Commerce Directive, and the Unfair Commercial Practices Directive. This policy document seeks to foster innovation and maintain robust regulatory standards capable of safeguarding all stakeholders. The Figure 2 presents a matrix of European Union policy frameworks in the environmental/circular and digital/collaborative sectors, aiming to show the main distinctions and interactions between legislative instruments and market-based solutions.

Figure 2. EU policy interaction matrix of the circular and collaborative economies

Strategic and regulatory frameworks for circularity • Circular Economy Package (2015) • Circular Economy Action Plan (2020)	Regulatory/legislative level	Regulatory frameworks for the collaborative economy • Digital Single Market Strategy (2015) • European Agenda for the collaborative economy (2017)
Environmental policy orientation	Strategic convergence • Consumer protection • Impact monitoring • Eco-design and sustainability standards • Data protection and transparency	Digital policy orientation
Sectoral and operational applications of circularity • Textiles Strategy (2022) • Eco-design for Sustainable Products Regulation (2024) • Waste reduction, repair and reuse	Operational/market practice level	Market-driven collaborative platforms • Uber • Airbnb • Kickstarter • Fintech

Source: elaborated by the authors based on Kovacic, Z., Strand, R. (2020); Heinrichs, H. (2013); Schor, J. B. (2021).

Reportedly, European collaborative platforms face significant limitations in both revenue and geographic expansion. Most operate in only a few EU Member States and report modest financial outcomes compared to global leaders. In contrast, international companies such as Uber, Airbnb, Uber Eats, and Kickstarter generated about 45 billion euros in 2023 (Business of Apps, 2025; Yahoo Finance, 2023), representing nearly 40% of the collaborative economy’s total revenue across all EU Member States (Eurostat, 2024).

It is important to acknowledge that Uber and Airbnb are early examples of the collaborative economy model. Both have faced substantial criticism due to their disruptive socio-economic impacts (Schor and Vallas, 2021). For Uber, the widespread availability of low-cost ride-hailing services can encourage people to use taxis more and rely less on public transportation. This shift may worsen urban congestion. In case of Airbnb, the platform has been linked to real estate speculation and higher rental prices, as converting private residences into commercial assets can increase housing demand and reduce affordability.

4. Conclusions

The analysis of the European Union legislative framework reveals interconnections between the circular and collaborative economies. However, these interconnections rarely align in practice, in particular due to the fragmented nature of the European Union policy on the circular and collaborative economies. Furthermore, the transformation of the European Union economy into a full circular model still remains uncertain. Currently, the concept of circularity is limited to a number of economic sectors that may in future generate a multiplier impact in other areas of economic activity.

Waste reduction and environmental objectives are essential for the EU's circular economy policy. In parallel, it is necessary to encourage innovation in production processes and business models. The ecological or green dimension should not overshadow innovation and technological development but allow for synergies between the circular and collaborative economies. Aligning the circular economy with the collaborative economy integrates collective engagement and promotes responsible consumption as a societal ethic, not just a political objective.

The collaborative economy, for its part, has a substantial impact across key sectors of the EU economy, especially through vertical business models in transport, accommodation, and financial services. The rapid technological progress of recent decades has brought profound changes to the Single Market of the EU.

Under these conditions, a thorough understanding of the dynamics of circular and collaborative economies is essential for promoting effective public policies that would allow for synergies between these two economic models.

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CULTURAL INTELLIGENCE: STRATEGIC COMPETENCE FOR PROFESSIONAL SUCCESS IN INTERNATIONAL BUSINESS

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Abstract: The article investigates cultural intelligence (CQ – Cultural Intelligence) as an essential strategic competence in the context of globalization and increasing cultural diversity. The research analyzes how this skill contributes to career performance growth, facilitates effective adaptation in multicultural environments, and enhances chances of professional insertion. The aim of the study is to highlight the impact of CQ on professional performance, intercultural adaptability, and employability in the international labor market. A high level of CQ represents a competitive advantage for both professionals active in international companies and students preparing for a career in a multicultural environment. To achieve this objective, the methodology used is a mixed one: the theoretical analysis of specialized literature is complemented by case studies from the international business environment, as well as with qualitative information obtained from the experiences of students involved in academic mobility and intercultural activities. The article is structured into three major directions. The first part theoretically grounds the concept of cultural intelligence, explaining the four interdependent dimensions: metacognitive, cognitive, motivational, and behavioral. It also makes a clear distinction between CQ and other forms of intelligence (emotional, social, cognitive, academic), given its specific nature of adapting to cultural differences in professional contexts. The second part of the study analyzes the impact of CQ on career, providing examples that demonstrate that employees with high levels of CQ adapt more quickly in multicultural environments, communicate more effectively, and achieve better results in international negotiations. Finally, it argues for the necessity of developing CQ in higher education and in continuing professional training. Some recommendations are formulated for universities, especially for the integration and development of CQ, the continuous training of teaching staff in the field of intercultural education, as well as for employers, who can leverage CQ in the processes of recruiting, selecting, and promoting staff. This multidimensional approach supports the idea that cultural intelligence is not just an advantage, but a strategic competence for professional success in international business.

Keywords: cultural intelligence, intercultural skills, professional adaptability, professional integration, university education, international business.

JEL Classification: M14, F23, J24

1 Introduction

In recent decades, accelerated globalization and the cultural diversification of the labour market have significantly transformed the professional environment, necessitating a rethinking of the skills required for success in international business. In this context, cultural intelligence (CQ) has emerged as an essential strategic competency for perceiving cultural complexity and collaborating productively in multicultural environments. Thus, the ability to understand, interpret,

and adapt behaviours according to cultural context becomes indispensable for both individuals and organizations operating globally. Currently, intercultural interactions are increasingly frequent within international teams, in negotiation processes, and in cross-border business relations. In this regard, CQ facilitates the building of strong professional relationships, effective communication, and the reduction of intercultural conflicts, becoming a competitive advantage for professionals. Additionally, a high level of cultural intelligence is associated with better organizational adaptation, new performances, and a significant increase in employability.

The main purpose of the study is to analyse how cultural intelligence influences professional performance and employability, as well as the mechanisms by which it can be developed in educational and organizational contexts. The research combines theoretical foundations with an applied component, based on case studies from the international business environment, which allows for an understanding not only conceptual but also practical of the strategic value of CQ.

The article is structured into three chapters: the first explores the theoretical foundations of cultural intelligence; the second chapter analyses the impact of CQ on professional and academic performance in a globalized context; and the third highlights the role of education in developing intercultural competencies, with a focus on the training of students and teachers. Finally, conclusions and recommendations are made regarding the integration of CQ into educational and human resources policies, strengthening the training of human capital to adapt to an increasingly globalized professional world.

2 Cultural Intelligence: Theoretical Foundations, Dimensions and Explanatory Models

Cultural Intelligence (CQ) is an essential concept for professional success in international and multicultural environments, having significant importance in facilitating effective communication, negotiation, and adaptation in a globalized context. This chapter aims to provide a theoretical basis for cultural intelligence, explore its fundamental dimensions, and differentiate it from other forms of intelligence, highlighting relevant theoretical models that have contributed to the development of this concept. In general, cultural intelligence is defined as the ability to interact effectively with people from different cultures. This involves not only knowledge of cultural differences but also the ability to adapt behaviours and strategies to successfully navigate various intercultural contexts. The first researchers to introduce this concept were Earley P. C. and Ang S., who defined CQ as "the ability to function effectively in a diverse cultural context where people from different cultures work, live, or interact" (Earley et al., 2003). At the same time, cultural intelligence is not limited to simply knowing a set of cultural norms and values, but involves a complex approach that integrates cultural awareness, cognitive, motivational, and behavioural skills.

To understand this concept better, it is important to address the four fundamental dimensions of CQ, proposed by Earley P. C. and Ang S. (Earley et al., 2003). These dimensions reflect various aspects of human behaviour that influence intercultural interactions, being essential for success in a globalized environment. The CQ dimensions are:

The cognitive dimension refers to the theoretical and intellectual knowledge about various cultures and how these influence human behaviours and values. It involves understanding cultural structures and norms, as well as how they affect social and professional interactions. For example, a person who knows that in Japanese culture there is a special emphasis on respect for authority will avoid being too direct in their interactions with Japanese colleagues.

The motivational dimension refers to a person's desire and openness to learn about different cultures and engage in intercultural interactions. In this sense, it is essential for individuals to be motivated to overcome cultural barriers and build relationships with people from other cultures. For example, a manager motivated to understand and integrate cultural diversity will actively seek to participate in international events or intercultural training sessions.

The behavioural dimension refers to an individual's abilities to adapt behaviourally according to the cultural context in which they are situated. This involves using appropriate strategies and behaviours in intercultural interactions. For example, a person from an individualistic culture, such as the American one, may adopt a different approach to negotiation compared to a person from a collectivist culture, such as the Chinese one, where group relationships are emphasized.

The metacognitive dimension refers to the ability to reflect on one's own cultural knowledge and skills, to adjust interaction strategies according to intercultural situations. This entails a critical awareness of one's understanding of cultures, a capacity to evaluate and adapt behaviours and approaches during intercultural interactions. For example, a team leader working in a multicultural context will constantly reflect on the communication styles of team members, adjusting leadership methods according to their cultural needs and expectations. Through its specific character of adapting to cultural diversity, cultural intelligence differs from other forms of intelligence, such as emotional, social, cognitive, and academic intelligence.

Cultural intelligence vs. emotional intelligence. While emotional intelligence (EQ) focuses on recognizing and managing one's own emotions and those of others, CQ involves understanding and adapting to the specific emotions and behaviours of other cultures.

Cultural intelligence vs. social intelligence. Social intelligence involves the ability to interact effectively in various social situations, but it does not guarantee adaptability to cultural differences. CQ is a higher level of social intelligence, encompassing not only effective interaction but also intercultural flexibility.

Cultural intelligence vs. cognitive intelligence (IQ) – Cognitive intelligence measures general intellectual abilities, the capacity to solve abstract problems, and is not directly correlated with intercultural skills.

Cultural intelligence vs. academic intelligence. Academic intelligence reflects analytical and cognitive skills applied in solving theoretical problems, but does not necessarily involve interpersonal skills or cultural adaptability. Therefore, cultural intelligence is a multidimensional concept that integrates cognitive, emotional, and social elements, being essential in international professional environments.

The Sternberg model (1985) on practical intelligence. Although it does not directly refer to CQ, this model suggests that success in intercultural interactions depends on practical adaptation skills, which is reflected in the principles of cultural intelligence (Sternberg, 1985).

The Schwartz model (1992) on cultural values. This model provides a perspective on how fundamental values influence intercultural interactions and the need for a flexible approach based on CQ (Schwartz, 1992).

The Earley & Ang model (2003). This model is based on the four dimensions of CQ and highlights the importance of integrating them for effective adaptation in diverse cultural environments (Earley et al., 2003).

Thomas's model (2006). It is another relevant model that emphasizes the role of motivation and intercultural awareness. Thomas argues that CQ is a learned skill that can be acquired and developed through experience and intercultural training. His model emphasizes that, in addition to cognitive knowledge, the motivation to understand and interact effectively in an intercultural context plays an essential role (Thomas, 2006).

The Gelfand et al. model (2008) concerning culture and behavioural flexibility. This theoretical framework emphasizes the role of cultural intelligence in developing behavioral adaptation mechanisms and resilience in multicultural contexts (Gelfand et al., 2008).

In summary, we state that these models contribute to understanding the complexity of cultural intelligence and its application in various fields such as international business, education, and diplomatic relations. Therefore, cultural intelligence represents an essential element for

professional success in the international arena, facilitating effective interactions between individuals from different cultures.

3 The impact of cultural intelligence (CQ) on professional and academic success in a globalized context

Cultural intelligence (CQ) becomes a determining factor in the employability of professionals, facilitating collaboration in international teams, optimizing negotiations, and building sustainable business relationships. In what follows, we will analyse the impact of CQ on professional success, on one hand, and address cultural competencies, adaptability, influence in negotiations, and relevant case studies, on the other hand. Currently, multinational companies and international organizations favour the recruitment of individuals who, in addition to technical skills, also possess the ability to navigate diverse cultural environments, collaborate effectively with global teams, and demonstrate flexibility in work relationships. Therefore, cultural competencies include:

awareness of cultural diversity - understanding the norms, values, and specific practices of different cultures;

behavioural flexibility - adapting communication and interaction styles according to the cultural context;

intercultural tolerance and empathy - the ability to accept, respect, and understand cultural diversity without prejudice or mental barriers, promoting constructive collaboration;

communication, negotiation, and networking skills - using intercultural strategies to establish effective professional relationships.

There are studies that highlight the importance of diversity and cultural intelligence (CQ) in the recruitment process. For example, a study conducted by McKinsey & Company found that organizations with diverse executive teams outperformed their industry peers by 21% in terms of profitability. Additionally, the Boston Consulting Group discovered that companies with diverse management teams have revenues that are 19% higher. These data suggest that professionals with a high level of CQ are preferred in recruitment, as they contribute to organizational success through adaptability and effective management of multicultural relationships <https://bia.ro/diversitatea-in-recrutare/>.

In international business environments, where daily interactions involve significant differences in work styles, behaviours, and social norms, intercultural adaptability is essential. Organizations operating in the global space often face challenges related to:

communication between multicultural teams - for example, communication styles differ substantially between Western and Asian cultures;

managing conflicts and cultural divergences - differences in decision-making approaches can create tensions in heterogeneous teams;

integrating professionals relocated to other countries - they need to quickly adapt to new cultural environments.

Individuals with developed cultural intelligence demonstrate an increased ability to accurately interpret the behaviours and cultural norms of their interlocutors, avoiding communication barriers and effectively managing cultural divergences. This ability helps reduce conflicts and foster collaboration, providing a suitable atmosphere for professional efficiency. A concrete example is the IT and technology sector, where teams are made up of specialists from various corners of the world, collaborating on complex projects. Companies like Microsoft, Google, and IBM actively invest in CQ development programs, recognizing the significant benefits of intercultural adaptability: more effective collaboration and increased productivity. IBM and Microsoft are collaborating to accelerate digital transformations through hybrid cloud and AI strategies, which also involves developing intercultural competencies for global teams <https://www.ibm.com/microsoft>.

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Google invests in diversity and inclusion programs, promoting an organizational culture that values intercultural adaptability (<https://patentpc.com/blog/big-techs-quantum-computing-investments-google-ibm-and-microsoft-by-the-numbers>).

Without an adequate understanding of cultural norms, negotiations can be compromised, and business relationships may suffer. Several studies in the field reveal that professionals with high CQ succeed in adapting negotiation strategies according to cultural norms, avoiding tensions and establishing strong business relationships. According to several authors who have studied the influence of culture on negotiations (Hofstede, 2010; Meyer, 2014; Trompenaars & Hampden-Turner, 1997), the main relevant cultural differences that influence this complex process include:

Relationship orientation vs. result orientation. In Asian cultures (e.g., Japan, China), negotiations emphasize trust and long-term relationships, unlike American culture, which favours a direct approach and pragmatism.

Communication style. Some cultures (e.g., Germany, the Netherlands) prefer explicit and direct communication, while others (e.g., India, Brazil) favor diplomacy and indirect communication.

Perception of time. Negotiations in Western culture are fast and decision-oriented, while in Arab or Asian culture, the process is slower and based on protocol.

It is worth mentioning that in American culture, negotiations are results-oriented, with a direct and pragmatic approach, which requires clear and efficient communication. In Arab culture, respect and protocol are essential, and professionals who understand these nuances will have a better chance of achieving favourable agreements. Therefore, cultural intelligence allows professionals in international business to adjust their behaviours, negotiation styles, and optimize their negotiation strategies. Several multinational companies have implemented cultural intelligence training programs, recognizing the positive impact of CQ on employee performance and operational efficiency. In this regard, relevant examples of companies can serve the following:

Google. The company successfully integrates CQ courses for employees, facilitating effective collaboration in international teams and optimizing international projects. Furthermore, Google invests significantly in diversity and inclusion programs, including by providing training courses in cultural intelligence (<https://patentpc.com/blog/big-techs-quantum-computing-investments-google-ibm-and-microsoft-by-the-numbers>).

Airbnb. The company uses cultural intelligence strategies to adapt services according to the local culture and market, maximizing customer satisfaction and strengthening international partnerships.

IKEA. The company adjusts its global strategy according to the specifics of each region, applying CQ principles in expanding into diverse markets. IKEA maintains common core values across all markets, while adjusting elements such as products, services, and marketing to meet the needs and cultural preferences specific to each region. (https://www.researchgate.net/publication/306323896_IKEA_Group_on_the_International_Stage).

The case studies presented: Google, Airbnb, IKEA, demonstrate that CQ is a strategic advantage for large corporations, and success in a competitive global environment increasingly depends on the ability to effectively manage cultural diversity. Currently, cultural intelligence (CQ) is recognized as an essential strategic competency, both in the corporate environment and in higher education institutions, having a significant impact on the professional success of graduates. The Academy of Economic Studies of Moldova (ASEM) serves as a relevant example, being internationally recognized for the quality of its programs and included in the prestigious Eduniversal ranking (<https://ase.md/asem-in-clasamentul-international-eduniversal/>). In the World Economy and International Economic Relations study program, students are prepared to manage external economic activities and coordinate the internationalization processes of companies. The extensive professional training opportunities significantly contribute to their integration into the

global labour market. According to information available on the official ASEM website, the EMREI program aims to train specialists in the field of world economy and international economic relations, capable of adapting to the demands and dynamic changes of the national and international economic environment. Graduates acquire skills in organizing and managing the external economic activities of companies, departmental or ministerial structures, as well as in coordinating the internationalization activities of domestic companies. They are trained in managing human, material, and financial resources within enterprises and institutions engaged in foreign activities, and in negotiating agreements and contracts with foreign partners (<https://smeeb.ase.md/studii-universitare-de-licenta-ciclu-i/>).

Moreover, academic mobility programs play a fundamental role in the development of cultural intelligence, providing students with the opportunity to interact with various educational and cultural environments. Among the initiatives contributing to this process are Erasmus+, the SUR-PLACE scholarship offered by the Konrad Adenauer Foundation, and other academic exchange projects. Participation in the **Erasmus+ program at the University of Liechtenstein** facilitates the development of intercultural and academic skills. The focus is on individual learning, autonomy in the educational process, and collaboration in international teams. The academic environment provides resources and constant support, fostering the deepening of knowledge and its applicability in various professional contexts. Mobility programs allow for interaction with different teaching methods, encourage the development of social skills, and provide access to diverse academic perspectives. Furthermore, practical activities contribute to reinforcing a balanced approach between theory and the applicability of economic concepts.

The Konrad Adenauer Foundation's Sur-Place program supports academic training and civic engagement through participation in seminars, conferences, and workshops focused on democracy, European integration, and the functioning of international institutions. These experiences enrich economic and political knowledge, facilitating the development of a broad vision of global dynamics. Additionally, within the program, civic projects are carried out, such as “I am young and I care,” which aim for direct interaction with young people and the promotion of civic values. Involvement in such initiatives contributes to the development of competencies in project management, teamwork, and public speaking, which are necessary for professional success. Therefore, the experiences gained from academic mobility programs and civic projects represent valuable opportunities for developing a global perspective and strengthening cultural intelligence, essential elements in the context of an international career.

In summary, it can be said that in the current context of globalization, cultural intelligence represents an essential criterion for integration into international teams, negotiating contracts, and strengthening sustainable professional relationships. Educational experiences and mobility programs, such as Erasmus+ or the Sur-Place scholarship, significantly contribute to the development of intercultural competencies, fostering openness, tolerance, and the acquisition of practical skills relevant to the global labour market. Case studies of companies such as Google, Airbnb, or IKEA demonstrate that effective management of cultural diversity constitutes a major competitive advantage, promoting innovation and success in an interconnected professional environment.

4 University Education and the Development of Cultural Intelligence (CQ) for International Business

In an international context characterized by cultural diversity and global interdependence, education plays an essential role in developing cultural intelligence, providing future specialists with the necessary tools to understand and successfully navigate cultural diversity. Next, we will analyse the integration of CQ in student training, the impact of educational modules, the development of teaching staff, as well as some perspectives for research in the field of cultural intelligence. Studies show that early exposure of students to multicultural contexts, through

international mobility, intercultural projects, as well as simulations and case studies, significantly contributes to increasing CQ (Ng, Van Dyne & Ang, 2009). In the academic environment, the development of cultural intelligence can be achieved through:

- courses on intercultural communication, diversity, and global intercultural leadership;
- extracurricular activities (international clubs, partnerships with NGOs, multicultural events);
- international mobility programs (Erasmus+ or academic exchanges);
- experiential learning methods, such as role-playing, international business simulations, intercultural case studies.

The introduction of CQ in student training should be an integral part of a transdisciplinary curriculum that leverages cultural diversity as an educational and professional resource. It is important to mention that, for the integration of CQ into higher education, adequate training of teaching staff is necessary, as they play a fundamental role in shaping students' attitudes and values. Therefore, university professors must become facilitators of intercultural learning and promoters of diversity. The training of teaching staff in the field of cultural intelligence may include:

- continuing professional development programs** in intercultural education, designed to prepare them for teaching CQ in a practical and labour market-relevant way;

- innovative pedagogical methods**, such as project-based learning, interaction with international guests, and business simulations;

- thematic workshops** on integrating cultural diversity into the teaching process;

- international academic mobility**, which allows exposure to other educational systems and cultural models;

- exchanges of best practices** between universities and international institutions;

- the creation of educational modules** on intercultural leadership, international negotiation, and global team dynamics, which represent a concrete step toward systematizing intercultural training. These can be mandatory, optional, or part of training programs in management, communication, international relations, social sciences, or education. Cultural intelligence will continue to be an essential subject of study in globalized education, with direct implications for the preparation of future leaders and specialists. Therefore, research directions in education would target the following areas:

- CQ and academic success in international contexts** – analysing how students with high CQ achieve better results in intercultural collaboration and international projects;

- digitalization and intercultural learning** – developing CQ through online platforms, cross-border collaborative learning, and intercultural virtual classrooms within distance education.

In light of the above, it can be stated that cultural intelligence becomes an essential competence for professional success in international business, a strategic investment in preparing leaders capable of performing in an increasingly diverse and interconnected professional environment. University education plays a key role in shaping this.

5 Conclusions and Recommendations

In a professional environment deeply influenced by globalization and economic interdependence, cultural intelligence (CQ) emerges as an essential strategic competence for success in international business. Unlike other forms of intelligence, CQ focuses on the ability to understand, interpret, and act effectively in different cultural contexts, facilitating collaboration, negotiation, and decision-making in multicultural teams. The development of CQ should begin as early as the university education stage, through an adapted curriculum, experiential learning methods, international mobility, and teacher training. Universities thus become key actors in preparing professionals for the global labour market. At the same time, organizations play a crucial role in supporting the continuous development of CQ through intercultural training programs, inclusion policies, and the assessment of intercultural competencies as part of professional performance. It is recommended that higher education institutions include CQ development in the

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mandatory curriculum structure, not just as an elective, either as part of foundational training in fields such as business, management, social sciences, education, or international relations. Universities should actively promote international mobility, intercultural projects, and applied learning experiences, which contribute to fostering a global mindset among students.

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THE DEVELOPMENT OF MEDICAL TOURISM IN SOUTH KOREA AND TURKEY: THE COMPARISON OF ECONOMIC MODELS

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Abstract: The development of medical tourism has become a significant economic and social phenomenon in the last two decades, and the Republic of Korea and Turkey represent two distinct models of success in this field. The purpose of the study is to compare those two economies, focusing on the institutional strategies and economic mechanisms that have contributed to strengthening their position in the global medical tourism market. The research is based on a comparative approach, using documentary analysis, official statistical data and international reports on patient flows, investments and impact on gross domestic product. The results highlight that, while the Republic of Korea relies on technological innovation, high-quality medical services and digitalization, Turkey has developed a competitive model based on low costs, extensive infrastructure and regional accessibility. Both countries have managed to attract international patients through favorable government policies and massive investments in the medical sector, but the differences in strategy highlight the multidimensional nature of medical tourism. The research conclusions emphasize that the experience of South Korea and Turkey provides valuable examples of good practices in the development of medical tourism, using different but effective economic models. For the Republic of Moldova and Romania, these results can serve as a benchmark in the development of national policies aimed at diversifying medical services, improving infrastructure and promoting regional competitiveness. Integrating the positive elements of the South Korean and Turkish models could contribute to capitalizing on the existing potential and positioning these countries on the international medical tourism map.

Keywords: medical tourism, Republic of Korea, Turkey, economic models, competitiveness, development.

JEL Classification: I15, I18, F2, L83, O5, P52

INTRODUCTION

Medical tourism has emerged over the last two decades as a complex phenomenon, at the intersection of health, economy and international mobility. Beyond its social dimension, this form of tourism represents an important segment of international trade in services, generating substantial investments and significant contributions to the gross domestic product of some countries. The Republic of Korea and Turkey represent two distinct models of success, illustrating different ways of responding to the growing demand for international medical services. The current context of globalization, characterized by increased patient mobility, diversified demand for high-quality treatments and cost differences between medical systems, favors the development of distinct economic models. In this context, the experiences of South Korea and Turkey illustrate two complementary directions of development.

The role of public policies and massive investments in the medical sector is essential for both states. Visa facilitation programs, international accreditations and promotional campaigns have contributed decisively to the positioning of the two countries in the global medical tourism market (Pirzada, 2022; Korea.net, 2025). At the same time, strategic differences emphasize the multidimensional nature of medical tourism and the relevance of adapting economic models to the national context.

The relevance of this research goes beyond the strict framework of the two analyzed states, while also providing benchmarks for other developing countries. For the Republic of Moldova and Romania, adapting the successful elements of the South Korean and Turkish models could constitute a solid basis for diversifying medical services, improving infrastructure and strengthening regional competitiveness in the field of medical tourism.

The purpose of this paper is to highlight and formulate the conceptual economic models of the Republic of Korea and Turkey for medical tourism and to carry out a comparative analysis of them, highlighting the common elements and structural differences that have allowed these states to assert themselves on the international medical services market. Through this comparison, the specific and essential features of each state are highlighted, which have determined the competitive advantages of each in the global medical tourism market. In addition, the analysis examines the role of public policies and government investments, which have functioned as accelerators of the development of medical tourism in both countries. The purpose of the paper is not limited to identifying the targeted conceptual economic models, but extends to developing recommendations on the adaptation and transfer of good practices for the Republic of Moldova and Romania, in order to diversify medical services, capitalize on existing potential and increase regional competitiveness. In the future, these measures could contribute to the integration of the Republic of Moldova and Romania on the international map of medical tourism and to the transformation of this sector into a pillar of economic and social development.

METHODOLOGY AND CONCEPTUALIZATION

To achieve the proposed goal, the research is based on a complex methodology. First of all, it involves the application of *conceptual modeling* that works in two methodological directions:

✓ *inductive conceptual modeling* that implies the generalization of the studied specialized literature, statistical data, facts etc, and revealing the essential features, which constitute the pillars for the country's conceptual model, reflecting the competitive advantages of the investigated countries in the global economy;

✓ *deductive conceptual modeling* that moves from the formulated conceptual economic models of the Republic of Korea and Turkey towards the recommendations for the Republic of Moldova and Romania.

As an outcome, the conceptual economic model is conceptualized as follows:

Conceptual Economic Model refers to the foundations that constitute the pillars of a country's competitive advantage in a certain industry.

Those foundations are determined by the specific combination of essential factors, among which, if applied to the medical tourism, are:

- The favorable governmental strategy
- The investment in medical and touristic infrastructure
- The degree of digitalization and implementation of innovations
- The service-accessibility and cost-competitiveness

Secondly, comparative and interdisciplinary methodology is used, combining economic analysis with that of public health policies. The study is structured in several steps within those two aforementioned methodological directions:

1. *Documentary analysis* – academic sources, international reports (e.g. WHO, OECD, UNWTO), specialized studies regarding medical tourism in the Republic of Korea and Turkey were consulted. This step allowed for the theoretical and contextual substantiation of the research.

2. *Statistical analysis* – official data from national sources (e.g. Turkish Statistical Institute, KOSIS – Korea Statistical Information Service) were used, as well as international databases (e.g. UN Comtrade, Intracen, OECD). Those data focused on patient flows, investments in medical infrastructure and the impact of medical tourism on gross domestic product.

3. *Qualitative analysis* – aimed at identifying institutional strategies and government policies that supported the development of medical tourism in the two countries, with an emphasis on the role of innovation, digitalization and fiscal or legislative facilities.

4. *Comparative analysis* – by comparing economic indicators and strategies, the similarities and differences between two conceptual economic models were highlighted.

5. *Interpretation of results* – the data and observations collected were synthesized to provide a clear picture of how the Republic of Korea and Turkey managed to establish themselves as competitive medical tourism destinations, as well as on the lessons applicable in other national contexts, especially in the Republic of Moldova and Romania.

The *hypothesis* underlying this paper is that the development of medical tourism depends on the well-thought conceptual economic model that is based on the combination of essential factors such as favorable public policies, investments in medical and tourism infrastructure, the level of digitalization and innovation, as well as accessibility and cost competitiveness. It is assumed that success on the international market is not determined by a single element, but by a set of economic and institutional measures that, applied coherently, can generate sustainable growth and attractiveness for international patients.

RESEARCH FINDINGS

As it has been mentioned above, the hypothesis of this research starts from the premise that the development of medical tourism is determined by economic, institutional and social factors, integrated within coherent national policies. To test it, the conceptual modeling and comparison of the current situation in the Republic of Korea and Turkey related to medical tourism have been undertaken based on the analysis of concrete measures implemented by the two states.

South Korea has managed to become a pole of attraction for international patients by focusing on quality and innovation. The state has massively supported the digitalization of the medical system by developing electronic medical records and telemedicine platforms, which has facilitated foreign patients' access to remote medical consultations and services (Kim, 2023). In addition, the Korean government has launched dedicated programs for international patients, including multilingual information centers and helplines, thus strengthening their trust in the South Korean healthcare system. Another concrete step was the investment in international accreditations. Currently, the Republic of Korea has dozens of JCI (Joint Commission International) accredited hospitals, confirming compliance with the highest global quality standards (Kim, 2019). These institutions offer cutting-edge treatments in oncology, cardiology, plastic surgery, using robotics, and thus helping to attract a segment of high-income patients interested in premium services. As a result, in 2024, South Korea attracted approximately 1.17 million foreign patients from 202 countries, a record number supported by both the Ministry of Health's promotional campaigns and the country's high-level medical infrastructure (mohw.go.kr, 2025). Approximately 85% of patients received treatment at medical centers in Seoul (see figure 1).

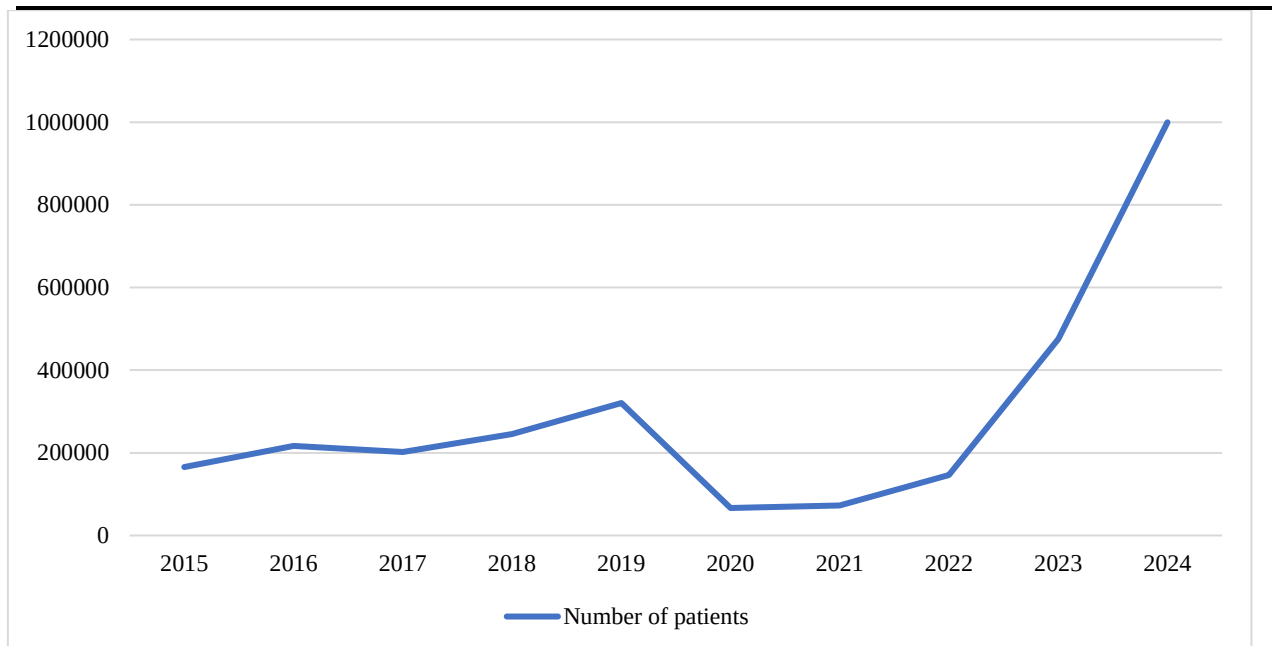


Figure 1. Evolution of foreign medical tourists in Seoul (2015-2024)

Source: compiled by the authors, english.seoul.go.kr (2025)

The data presented in the figure 1 highlights the evolution of the number of international medical tourists in Seoul during the period 2015–2024. A steady upward trend is observed between 2015 and 2019, with a significant increase from 165,689 patients in 2015 to 320,284 patients in 2019. The trend was conditioned by the accent of the country put on quality of medical services.

The period 2020–2021 saw a dramatic decline, caused by the restrictions imposed due to the COVID-19 pandemic, when the number of patients decreased to 66,507 in 2020 and 72,525 in 2021. However, starting with 2022, Seoul's medical tourism market experienced a rapid recovery, reaching 146,310 patients in 2022 and 473,340 patients in 2023. The recovery and growth were determined by the aforementioned digitalization of the medical system, on the one hand, and the specialized government programs and international accreditation, on the other hand.

The most spectacular increase occurred in 2024, when the number of international medical tourists reached almost 1 million (999,642), representing an absolute record for the capital of South Korea. The income generated by international patients in Seoul was approximately ₩1.2 trillion (around US\$923 million). At the country level, the total medical expenses by international patients was approximately ₩1.4 trillion (about US\$1.08 billion). This evolution confirms the effectiveness of South Korean public policies, investments in medical infrastructure and international promotion strategies, strengthening Seoul's position as a competitive destination in the global medical tourism market.

In Table 1, there is an evolution of the inbound flows of medical tourism in Seoul, by country of origin. For the period 2020–2024, the data attests a spectacular increase in the number of international patients for all 10 countries of the top of the list, which constituted 90,4 % from total inbound flows in Seoul. Japan and China are the main suppliers of international patients to South Korea, in general, and in Seoul, in particular. In 2024, Japan registered 421,541 patients and China 220,260 patients, together representing over 60% of the total. The same East Asia region Taiwan and Mongolia belong to, having together the flux of 92 892 patients, and adding 9,3 % to the regional flux. This reflects the geographical proximity, economic and cultural ties, but also the direct air connectivity between these countries and South Korea.

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Table 1. The Evolution of International Medical Tourists in Seoul (2020–2024), by country of origin

No.	Country	2020	2021	2022	2023	2024
Total patients		66507	72575	146310	473340	999642
1	Japan	13138	2446	19440	182166	421541
2	China	18926	15050	24196	82510	220260
3	USA	7323	14742	25123	51777	75531
4	Taiwan	395	378	1132	12157	74292
5	Tailand	3886	3918	15842	24714	31223
6	Singapore	321	423	3319	13074	25977
7	Mongolia	3562	5957	9780	15727	18600
8	Canada	850	1788	3861	8167	13451
9	Australia	442	500	1965	6025	13073
10	Indonesia	346	611	1870	5464	9261
11	Other	17318	26762	39782	71569	96433

Source: compiled by the authors, english.seoul.go.kr (2025)

Another significant group of patients comes from the United States (75,531 patients), and the constant rapid growth is observed in Canada, reaching 13,451 patients in 2024. It means the expansion of South Korea's base of attraction beyond East Asia, including American markets, where the costs of medical procedures are much higher, and demonstrating the interest of patients from developed countries in high-quality Korean services.

It is observed even more regional variety of the countries of origin: Southeast Asia and Oceania, which include Thailand (31,223 patients), Singapore (25,977), Australia (13,073), and Indonesia (9261). They also contributed to the diversification of medical tourism, confirming South Korea's regional attractiveness,

The “Other” category included patients from multiple countries and reached 96,433 patients in 2024 (9,7 % of the total). It proves the expansion of South Korean medical tourism to various markets in Europe, the Middle East and Africa, but also demonstrates the regional potential as it has been rapidly growing.

The main treatment areas in South Korea are: dermatology, plastic surgery, general surgery, ophthalmology, dentistry, internal medicine (integrated), traditional medicine, etc.

In the Republic of Korea, medical tourism is coordinated by the MOHW (Ministry of Health and Welfare) and KHIDI (Korea Health Industry Development Institute), a government agency responsible for the promotion and development of the health industry. Under the auspices of the Medical Korea project, programs to promote medical services, information centers for foreign patients, emergency assistance services, as well as complaint resolution mechanisms have been launched. At the same time, KHIDI runs international training programs and know-how exchange, strengthening Korea's reputation as a regional and global medical hub (Kim, 2023).

The results are visible. As it has been mentioned above, South Korea reported 1.17 million international patients in 2024, a historic record (Korea.net, 2024). This success is supported by complementary policies, such as visa simplification, continued investments in digitalization and the development of telemedicine, as well as international partnerships, such as the KHIDI–HIMSS (Healthcare Information and Management System Society) agreement to assess the digital maturity of Korean hospitals. All of this confirms the *South Korean model based on quality, technology and innovation*.

Turkey has developed a different *model, based on accessibility, competitive costs and extensive infrastructure*. Through massive investments in public and private hospitals, as well as the development of city hospitals, Turkey has managed to significantly increase its capacity to treat international patients (Yılmaz & Aktaş, 2021). A concrete example is the implementation of

medical air corridors, starting in 2012, which provided direct connections for patients from Europe, the Middle East and North Africa. This measure has reduced travel time and costs, transforming Turkey into an accessible destination for medical treatments. In parallel, the government has introduced standardized medical service packages, which include intervention, accommodation and transportation, strengthening the transparency and attractiveness of the offer (Kılavuz, 2018).

The central element of Turkish policies is the “City Hospitals” program, implemented through public–private partnerships (PPP) since the 2010s. These integrated hospital campuses are built and operated by private consortia, with the state providing long-term financing and guarantees. The goal is to increase treatment capacity, modernize infrastructure, and standardize the quality of medical services. The bright examples are the Adana Integrated Health Campus with 1,550 beds in 6 specialized hospitals, the Bilkent Health Campus in Ankara with over 3,600 beds, and the Etlik Health Campus, all of which were built with state investment (Yılmaz and Aktaş, 2021). The “City Hospitals” program was complemented by solid budgetary measures: in 2024, the Ministry of Health allocated about TRY 83.7 billion (USD 2.02 billion) just for those hospitals, while capital expenditures accounted for almost 20% of the ministry’s budget (OECD, 2024). These investments confirm Turkey's strategy to develop a medical model oriented towards accessibility, volume and relatively low costs, attractive to regional and international patients.

Turkey has become a regional leader in medical tourism, attracting 1.4 million international patients in 2023, and 2 million patients in 2024, especially for general surgery, plastic surgery, ophthalmology, dentistry and transplant services (fineupclinic.com, 2025). The Turkish state has launched global promotional campaigns and offered tax incentives to private investors in the healthcare sector, confirming the decisive role of public policies and competitive costs in supporting medical tourism (Pirzada, 2022).

The most important source markets are represented by the countries of the Middle East and Europe, but also by more distant countries, where the high costs of medical services stimulate the migration of patients to Turkey.

The inbound flows by country include:

- Germany – a large community of patients from the Turkish diaspora, as well as European patients attracted by lower costs and the quality of medical services.
- Iraq and Libya – two very important markets for Turkish medical tourism, generated by geographical proximity and the limitations of local medical systems.
- Azerbaijan and other Caucasus countries – benefiting from cultural and economic ties with Turkey, these countries send thousands of patients annually for surgical interventions and specialized treatments.
- Russia and the CIS countries – patients attracted by oncological treatments, in vitro fertilization services and cosmetic surgery, where Turkey offers more affordable alternatives than Western Europe.
- The United Kingdom and other Western European countries – where waiting lists and high costs are causing more and more patients to choose Turkey for dental procedures, hair transplants and cosmetic interventions.
- States of the Arabian Peninsula (Saudi Arabia, United Arab Emirates, Kuwait, Qatar) – high-income patients, who are attracted by integrated packages (treatment + tourist services), but also by the modern infrastructure of Turkish hospitals.

This diversity of source countries confirms that Turkey combines geographical and cultural advantage with effective marketing strategies and supportive government policies, becoming a regional and international medical hub (tuik.gov.tr, 2025).

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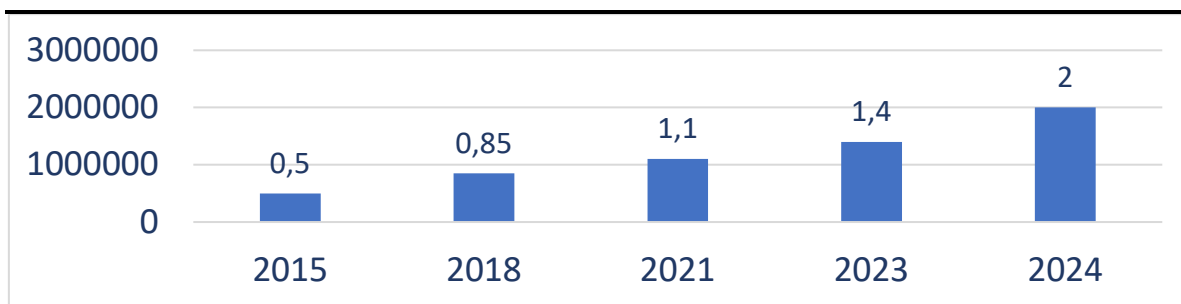


Figure 2. Number of international patients in Turkey, 2015-2024, mln

Source: Created by authors based on OECD and Turkstat, 2025

Figure 2 illustrates the significant increase in the number of international patients choosing Turkey as a destination for medical treatment over a nine-year period. In 2015, Turkey registered approximately 500,000 international patients, marking the beginning of an accelerated development phase of medical tourism. Thanks to the state's massive investments in hospital infrastructure, especially through the *City Hospitals* program, and international promotional campaigns, the number of patients has steadily increased: in 2018 it reached 850,000, and in 2021 it reached 1.1 million people. After the pandemic period, Turkey managed a rapid recovery, reaching 1.4 million international patients in 2023. The sharp increase in 2024, when a record of 2 million patients was registered, confirms the consolidation of Turkey's position in the field of medical tourism.

This positive development is the result of a combination of several factors:

- implementation of a favorable government strategy, with support for investments in modern hospitals and integrated medical service packages;
- advantageous fiscal policies and public-private partnerships to attract patients from Europe, the Middle East and Central Asia;
- intensive international promotion of the “Health Türkiye” brand and development of complementary tourism infrastructure;
- competitive cost-quality ratio, which allows patients to access advanced medical services at reduced prices compared to Western countries.

At the same time, data provided by the OECD on medical infrastructure expenditures, measured as a percentage of GDP, show significant differences between the Republic of Korea and Turkey over the period 2015–2024 (see Table 2).

Table 2. Government Investment in Healthcare Infrastructure (% of GDP)

Period	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Government Investment in Healthcare Infrastructure: Total										
Republic of Korea	3,6	3,7	3,9	4,1	4,5	4,8	5,2	5,6	5,1	5,0
Turkey	3,2	3,4	3,2	3,2	3,4	3,6	3,6	2,8	3,2	3,7
Government Investment in Healthcare Infrastructure: Hospitals										
Republic of Korea	1,7	1,8	1,9	2,0	2,2	2,3	2,4	2,5	2,2	2,8
Turkey	1,8	1,9	1,8	1,7	1,8	2,0	2,0	1,6	2,0	-

Source: done by the authors based on OECD (2025)

In the case of South Korea, public spending on health infrastructure (all healthcare facilities) has increased steadily, from 3.6% of GDP in 2015 to a peak of 5.6% in 2022, remaining at the level of 5% in 2024. The trend confirms the government's focus on continuous investment in quality, digitalization and modernization, reinforcing the South Korean model based on innovation and highly complex healthcare services. At the hospital level, spending rose from 1.7% in 2015 to

2.5% in 2022, and reaching peak of 2,8 % in 2024. This pace shows that hospitals represent a strategic core of investment policy.

For Turkey, the values are lower, but show an interesting dynamic. Total healthcare spending has ranged between 3.2% and 3.7% of GDP, with a slight increase in recent years (2020–2024). At the hospital level, the share has been relatively constant, oscillating between 1.6% and 2.0%, reflecting the emphasis on the development of city hospitals through public–private partnerships (PPP), but also maintaining a competitive price–quality ratio.

The development of medical tourism in Turkey and the Republic of Korea is explained not only by market dynamics, but also by the strategic intervention of the state, which has implemented institutional programs and major investments in health infrastructure.

South Korea has consolidated its position by investing in technological innovation, digitalization and high-quality medical services, which has led to an increase in average income per patient and the attraction of a segment interested in complex procedures (Kim, 2019; Kim, 2023). In contrast, Turkey has developed a competitive model based on low costs, extensive infrastructure and regional accessibility, managing to attract a significant volume of patients from the Eastern Europe, Middle East and North Africa region (Yılmaz & Aktaş, 2021; Kılavuz, 2018).

Both countries have developed complementary strategies, finding their niche at the global market of medical tourism. Turkey continues to expand PPPs and develop centers of excellence (including in advanced therapies, such as cellular and genetic), with a direct impact on international attractiveness (Pirzada, 2022). The Republic of Korea is constantly investing in biomedical R&D, digital infrastructure, and international promotional campaigns under the "Medical Korea" brand to attract patients seeking highly complex medical services.

Conclusions

The research confirms the hypothesis from which it started: the development of medical tourism is the result of the elaboration and implementation of a well-thought conceptual economic model that leans on the interaction between public policies, strategic investments and economic mechanisms adapted to the national context. The comparative analysis of the conceptual economic models for the development of medical tourism in the Republic of Korea and Turkey confirms that success in this area can be achieved through different, but complementary strategies.

In the case of the *Republic of Korea*, the fundamental ideas of its conceptual economic model are:

- orientation towards innovation and digitalization in the medical sector;
- continuous investments in medical infrastructure as well as the field research and development;
- promotion of quality through international accreditations (JCI);
- attracting patients through medical services of high complexity and added value.

In the case of *Turkey*, its conceptual economic model is based on:

- low costs and favorable price-quality ratio;
- development of an extensive medical and tourist infrastructure;
- emphasis on regional accessibility and the creation of medical air corridors, and integration of treatments with complementary services (accommodation, transport, tourism).

The research results also demonstrate that both models respond to global demand: the Republic of Korea covers the need of patients seeking highly complex and safe treatments, while Turkey offers affordable solutions for price-sensitive patients who are looking for quality services comparable to Western standards. Respectively, medical tourism can be viewed as a *multidimensional phenomenon*, capable of adopting different but equally effective models, and reaching success through variety of approaches, adapted to the resources and priorities of each state.

The comparative analysis of the South Korean and Turkish conceptual economic models also allow to develop the idea in such a way that both the *Republic of Moldova and Romania* can capitalize on the lessons learned from these experiences, and develop a competitive medical tourism sector. In both cases, adapting good practices to the national context could transform the medical system into a pillar of economic growth, service diversification and regional integration.

For the Republic of Moldova, it can be recommended to put emphasis on investments in quality and digitalization, inspired by the South Korean model. The creation of centers of excellence in rehabilitation, cardiology or minimally invasive surgery, the introduction of electronic medical records and supporting hospitals in the international accreditation process would strengthen the confidence of international patients. In parallel, the elements of the Turkish model – integrated medical packages and competitive costs – could be leveraged to attract patients from neighboring countries, especially Romania, Ukraine and the Caucasus.

Romania, with a more developed medical infrastructure than the Republic of Moldova, can follow a path of consolidation by modernizing and diversifying services. The development of regional medical hubs, the integration of treatments with spa and wellness tourism, as well as active promotion on foreign markets could place Romania in a position of regional leadership. Public support policies and promotional campaigns should emphasize both the quality of human resources and the comparative advantages related to costs and geographical proximity.

Both the Republic of Moldova and Romania can benefit from the involvement of the diaspora in promoting medical services in Europe and from public-private partnerships to attract investment. Diversifying services, from complex treatments to check-ups and prophylactic procedures, would contribute to strengthening their position on the international map of medical tourism.

Therefore, combining the elements of innovation and digitalization from the South Korean model with those of accessibility and extensive infrastructure from the Turkish model, will help build *hybrid conceptual economic models*, adapted to the realities of the Republic of Moldova and Romania. These could transform medical tourism into a strategic sector, with a significant impact on the economic development and international image of these two states.

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AMERICAN VS. BRITISH PHRASAL VERBS: LINGUISTIC VARIATION AND MULTICULTURAL IMPLICATIONS

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Abstract: Phrasal verbs - verbs combined with particles (e.g., *carry out*, *fill in*, *knock up*) are highly frequent and polysemous in English, but their use varies between American and British English. This paper examines corpus-based studies of phrasal-verb frequency, register, and meaning in the two varieties, with a focus on business and academic contexts. We draw on large corpora like the Corpus of Contemporary American English (COCA), the British National Corpus (BNC), American National Corpus and recent research (Gardener and Davies, 2007; Liu, 2011; Oros, 2006) to compare usage patterns. Key findings show that a small set of high-frequency phrasal verbs accounts for a large share of usage in both dialects, and that spoken informal registers employ much more phrasal verbs than academic writing. Some verbs (e.g., *fill out* vs *fill in a form*) or idioms (e.g., *knock someone up*) differ markedly in British vs. American English. The paper provides numerous authentic example sentences (particularly from business and academic sources) and discusses how mismatches can cause confusion in international or multilingual settings. For instance, at the Academy of Economic Studies of Moldova (ASEM), faculty note that ‘*to carry out market research*’ (neutral in business English) is common usage, whereas informal variants might be avoided in formal writing. Misuse of phrasal verbs or unawareness of dialectal preferences can lead to misunderstandings. For example, an American use of *knock up* (*impregnate*, *make a woman pregnant*) can embarrass a British listener used to it meaning *wake up*. This article, thus, explores the linguistic variation of phrasal verbs and emphasizes pedagogical and pragmatic implications for global communication.

Key words: phrasal verbs, corpus, register, multicultural communication, AmE vs BrE, polysemous

JEL Classification: A23

Introduction

Why do phrasal verbs matter so much and why do they confuse even advanced learners? Phrasal verbs (PVs) meaning a verb plus one or two particles (often prepositions or adverbs) are widely used in English. They are surprisingly frequent: roughly 0.2% of running text, or about 2,000 tokens per million words (Biber *et al.*, 1999). That might not sound like a lot at first, but because many PVs are highly idiomatic, they surprise us in many contexts. Learners who avoid or mistranslate these constructions often come across as non-idiomatic or awkward in speech and writing (Gardner and Davies, 2007). In short, get PVs right, and you sound fluent; get them wrong, and the meaning or tone can slip away.

PVs are also highly polysemous. Take *look up*: it can mean ‘*search for information*’, ‘*improve*’ (‘*things are looking up*’), or ‘*visit someone*’ (‘*look me up sometime*’). Many frequent PVs carry several related senses, on average multiple senses per item, so a single PV cannot always be replaced by one close synonym. Corpus work shows another useful fact for teachers and learners - usage is concentrated in a surprisingly small set of items. Gardner and Davies (2007) report that just a few dozen PVs account for a large part of all occurrences in the British National Corpus. Practically speaking, that means targeting high-frequency PVs (*get up*, *set up*, *carry out*, *make up*, etc.) provides learners with substantial communicative competence in a short period of time.

However, PVs are not the same everywhere. In our globalized classrooms and particularly in Business English contexts students meet both American and British varieties, and small particle or idiomatic differences can matter. Americans say *fill out a form*; Britons usually say *fill in a form* (Liu, 2011). Some contrasts are harmless, whilst others can be embarrassing or even problematic (the infamous *knock up* example is a favorite anecdote). Therefore, this paper takes a corpus-driven look at AmE vs BrE PVs, drawing on COCA, the BNC, and comparative studies (e.g., Liu, 2011; Oros, 2006). I shall also refer to classroom examples and short case notes from Business English seminars at the Academy of Economic Studies (ASEM), so the findings stay grounded in my daily practice of teaching English.

In this paper, after defining key terms, we first present broad frequency and register differences between American and British use. Next, we examine idiomatic and particle-level contrasts with real-sentence examples used with university students. Finally, we consider multicultural-pragmatic implications: how subtle PV choices can affect clarity, formality and cross-cultural rapport in professional settings. Along the way I will highlight practical teaching points for ASEM-style courses, so instructors and learners can avoid the common traps.

To make it clear from the very start we first look into some definitions and general patterns. Phrasal verbs (PVs) are multiword expressions made from a base verb plus an adverbial or prepositional particle or sometimes both. What sets them apart from fixed idioms is that PVs often keep a semantic link to the verb: *carry out* = *execute*, whereas an idiom like *kick the bucket* has no transparent connection to its literal parts. Crucially, many PVs are polysemous: the same verb + particle can cover several related senses. Research gives an instructive example: frequent PVs average multiple meaning senses each (about 5.6 senses per frequent item). For example, *look up* can mean *search for information*, *improve (things are looking up)*, or *visit someone (Look me up when you're in town)*. Because one PV may fit onto several uses, you cannot always replace it with a single neat synonym and that is why PV knowledge matters for nuance. (Nottingham Repository; Gardner and Davies, 2007).

Corpus counts make the practical importance of PVs even clearer. PVs occur far more often in running text than many learners expect: around 2,000 tokens per million words, roughly one PV every 500 words. In the British National Corpus, Gardner and Davies (2007) show that usage is heavily concentrated: a surprisingly small subset of PVs accounts for a very large share of all occurrences - 20 lexical verbs combining with eight particles (160 combinations) account for more than half of the corpus's PV tokens, and only 25 PV forms make up roughly one-third of all occurrences. In classroom terms, that is good news: if learners master the high-frequency items (*get up*, *set up*, *carry out*, *make up*, etc.), they quickly cover a large portion of everyday, business, and academic language.

Which PVs dominate depends on register, of course, but some items are consistently high-frequency across genres. Neutral PVs such as *point out*, *carry out*, *go on*, *make up*, and *set up* regularly appear even in formal academic writing which is a fact confirmed by recent corpus checks (Writefull, 2020). Other PVs, the more colloquial ones, are concentrated in speech and informal writing. The final outcome for teachers and course designers, for example in ASEM's Business English classes, is straightforward: we prioritize neutral, high-utility PVs first, then introduce more register-specific or idiomatic items with contextualized practice.

Finally, we should remember the learning implication of polysemy and concentration together: learners need both breadth (to know which PVs are common) and depth (to recognize the different senses and registers in which those PVs appear). A short classroom activity that I have found useful is to give students multiple short sentences with the same PV and ask them to infer the different senses from context. This helps link the form, meaning, and usage in a way that single-synonym exercises rarely do.

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Table 1. Classroom Activity for Teaching Phrasal Verb Polysemy

Verb	Activity description	Example sentences	Task for students	Learning focus
PUT	Provide short sentences using <i>put up</i> in different contexts.	1. <i>They put up a tent in the garden.</i> 2. <i>The prices were put up again.</i> 3. <i>She’s putting me up for the night.</i>	Infer the different meanings of 'put up' and group them (literal / figurative).	Recognizing meaning shifts through context.
TAKE	Use <i>take off</i> in various sentences to highlight its multiple senses.	1. <i>The plane took off on time.</i> 2. <i>His career took off after the show.</i> 3. <i>Please take off your shoes.</i>	Explain each meaning and identify which is literal vs. idiomatic.	Linking meaning and metaphorical extension.
GET	Show contextual variation in <i>get over</i> .	1. <i>It took her months to get over the flu.</i> 2. <i>He can’t get over how tall you’ve grown.</i> 3. <i>We finally got over the fence.</i>	Discuss semantic differences and propose a general “core meaning.”	Developing awareness of phrasal verb networks.

Source: Own work based on research

Shortly, PVs are frequent, polysemous, and unevenly distributed across items and registers. That combination makes them indispensable for fluent, native-like English and a high-value target for focused instruction.

Further the paper compares how these patterns behave in American vs British corpora. When we look at massive text collections (corpora) from the U.S. and U.K., we see that Americans and Brits actually draw on almost the same pool of phrasal verbs. In fact, Liu’s 2011 study used both the Corpus of Contemporary American English (COCA) and the British National Corpus (BNC) to list the top phrasal verbs in each variety. He found that the core inventory of high-frequency phrasal verbs overlaps heavily. In plain English, that means the big, common idioms like *carry out*, *give up*, *turn down* are popular on both sides of the Atlantic.

However, the **frequency** with which each group uses those shared verbs may differ a lot. For example, let us take *filling out a form*. In the U.S., they often say *fill out a form*, whereas in the U.K. people say *fill in a form*. Corpus data confirm this: COCA (American) shows dozens of examples of *fill out a form* but almost none of *fill in a form*, while the BNC (British) shows the opposite pattern. In Liu’s own words, ‘while Americans tend to fill out a form, the British typically fill in a form’. In other words, both sides know the expression, but American speakers use *fill out* far more often and British speakers use *fill in* more.

This kind of dialectal tendency happens with several verb-particle pairs. For instance, researchers have noted that Americans will often say *take over* when one company buys another, whereas British English speakers might say *take on* in a similar context. Likewise, Americans commonly use the verb *reschedule* to push a meeting to a new time, while in the UK you might more often hear *put off* or *call off* for postponing an event. These examples are not as systematically documented as the *fill out* case, but they fit the same pattern, the same basic idea is expressed with different preferred phrasal verbs in each dialect. Here are some more examples:

fill out vs. *fill in* forms: Americans overwhelmingly say *fill out a form*, Brits say *fill in a form*. As the corpus numbers show, COCA had about 92 hits for *fill out a form* and only 2 for *fill*

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in a form, while the BNC had 26 *fill in* vs. 6 *fill out* (Liu, 2011). Thus, we can notice a clear flip in preference.

stand in for vs. *fill in for* substitution: Both varieties know *stand in for* someone (to temporarily replace a person), but *stand in for* turns up far more often in each corpus. One analysis found roughly three times as many instances of *stand in for* in British sources than *fill in for*, and a similar American pattern, though Americans use *fill in for* a bit more frequently than the Brits do. Again, the meaning is shared, but *stand in for* dominates both, with *fill in for* being wider used in American English.

Other verb-particle pairs: Even when the same verbs exist on both sides, one form usually wins out. For example, *carry out* is far more common than *carry through* in both U.S. and U.K. data. And for making phone calls, Americans say *call up* someone, while Brits often say *ring up* someone. Table 3 below provides more examples of divergent usage and neutral examples.

Table 2: British vs. American phrasal verb usage

Meaning	British usage	American usage	Example sentence
Postpone discussion	<i>table the motion (begin debate)</i>	<i>table the motion (delay)</i>	<i>The chair moved to table the proposal (UK = begin debate; US = postpone discussion).</i>
Request help	<i>call for assistance</i>	<i>reach out for help</i>	<i>The student called for assistance (UK) vs The student reached out for help (US).</i>
Visit briefly	<i>pop round</i>	<i>drop by</i>	<i>We popped round to see our neighbors (UK) vs We dropped by to see our neighbors (US).</i>
Refuse participation	<i>opt out of</i>	<i>back out of</i>	<i>Several members opted out of the survey (UK) vs Several members backed out of the deal (US).</i>
Investigate	<i>look into</i>	<i>check out</i>	<i>The committee will look into the matter (UK) vs The manager will check out the issue (US).</i>
Meet unexpectedly	<i>bump into</i>	<i>run into</i>	<i>I bumped into my professor at the station (UK) vs I ran into my professor downtown (US).</i>
Resolve a problem	<i>sort out</i>	<i>figure out</i>	<i>The manager sorted out the issue (UK) vs The engineer figured out the problem (US).</i>

Sources: corpora and usage guides

In summary, the research shows that Americans and British use largely the same phrasal verbs, but how often they use each one can differ. They tend to share a ‘core’ vocabulary of idioms, yet subtle preferences emerge. These dialectal biases are visible in corpus counts which show that an expression might be common everywhere, but one side of the Atlantic just uses it a bit more. This helps explain why a phrase that sounds natural to you might strike someone from the other side as a bit odd, although they are all part of the shared inventory, just in slightly different proportions.

The findings of the study that has been carried out show that phrasal verbs are strongly influenced by register. Certain studies (Biber 1988) have shown that they occur far more frequently in spoken and informal communication than in formal written texts. In fact, Biber (1988) identified phrasal verbs as one of the clearest markers of an informal and concrete style. Therefore, phrasal verbs would appear more often in spoken text than in written text and their corpus analysis confirmed this expectation. When comparing spoken data from the London-Lund Corpus with

written material from the LOB Corpus, they found that phrasal verbs appeared almost twice as often in spoken registers. (Dempsey B., *et al*)

Everyday conversations, meetings, and TV dialogues are therefore rich in expressions like *come up with* or *find out*, while formal genres such as newspaper editorials or academic papers tend to favor more single-word verbs, for instance *discover* or *establish*. This register-based difference is true across both American and British English. Data from the COCA corpus reveal that phrasal verbs are up to ten or eleven times more frequent in TV and movie subtitles and in web texts than in academic texts. A Writefull’s analysis of COCA further confirms that phrasal verbs are ‘considerably more frequent in other genres than academic writing: up to 11 times more frequent in TV and movies subtitles, and close to 10 times more frequent in blogs, webpages and fiction’.

In business communication, which often balances between formal and informal tones, for instance, reports versus internal emails, the use of phrasal verbs is moderate. Neutral and widely accepted forms like *carry out*, *set up*, *come up with*, or *turn down* often appear in financial reports or news articles, while highly colloquial ones such as *shoot the breeze* or *pig out* are naturally absent. Within professional and academic contexts, certain phrasal verbs are not only acceptable but sometimes preferred. Garnier (2020) observes that in research writing, *carry out* is used much more frequently than its single-word equivalents like *do* or *perform*, as in ‘*Researchers carried out the experiment*’ rather than ‘*did the experiment*’.

Table 2 below lists some of the most frequent and stylistically appropriate phrasal verbs used in business and academic English, together with example usages.

Table 3. Frequent phrasal verbs used in business and academic English.

- *point out* - e.g. The speaker **pointed out** several market risks.
- *carry out* - e.g. The auditor **carried out** a review of accounts.
- *set up* - e.g. The firm **set up** a joint venture in Asia.
 - *turn out* - e.g. It **turned out** that sales had increased.
 - *bring about* - e.g. New regulations **bring about** closer oversight.
 - *give up* - e.g. The nation **gave up** certain export controls.

Source: Own work based on research

These examples from academic corpora illustrate that many PVs are neutral and fit formal writing if chosen appropriately. Nonetheless, learners often find it safer and easier to use single-word equivalents (e.g., *propose* instead of *put forward*, *construct* vs. *build up*) in formal contexts, to avoid what may be interpreted as colloquialisms. Thus, corpus evidence presents a clear picture of how phrasal verbs behave across English varieties and registers:

1. Vocabulary overlap: The core set of high-frequency phrasal verbs is largely shared by both American and British English. Common verbs such as *get up*, *turn on*, *set up*, and *come out* occur frequently in both varieties, forming a shared lexical foundation.

2. Frequency differences: When it comes to individual phrasal verbs or synonymous pairs, one variety often favors a particular form. For instance, *fill out* is more typical of American English, while *fill in* tends to appear in British English. Similarly, *stand in for* is used in both varieties but is somewhat more common in British English, whereas Americans more often say *fill in for*. Weather-related expressions show the same pattern: Americans talk about games being *rained out*, while the British say they were *rained off*.

3. Register: In all studies, phrasal verbs emerge as a characteristic of informal, spoken, and popular registers, while formal or academic texts make much more limited use of them.

These findings have direct classroom relevance. For teachers, especially in contexts such as ASEM’s Business English programs, it is important to help learners understand not only what

phrasal verbs mean, but also where and how often they are used. Using the non-standard variant in the other country may sound slightly odd, even though it remains understandable. Although most phrasal verbs are mutually understandable across the Atlantic, their frequency and stylistic suitability can vary considerably.

The next section examines some of these idiomatic and particle-based differences that students commonly encounter which highlight some of the most illustrative contrasts between American and British English. Besides *fill in* vs. *fill out* forms there are plenty of other examples of a certain preferred form.

Fork out vs. *fork over* pay. In the UK, people often *fork out* money usually implying they do so reluctantly. Americans express the same idea with *fork over*, or simply *fork*. For example, *Britons may have to fork out a high fee to enter*, but Americans might say *fork it over*. Both forms are recognized on either side of the Atlantic, but each has its preferred home.

Rained off vs. *rained out*. When an outdoor event is canceled because of bad weather, a Brit would say *it was rained off*, while an American would call *it rained out*. For example: *‘Our golf match was rained off,’ said the Brit. ‘You mean rained out,’ replied the American.* Such subtle lexical choices often reflect deeper cultural conventions and idiomatic patterns.

Beat up vs. *beat up on*. Both varieties use *beat (someone) up* to mean ‘attack physically’. However, in American speech, *beat up on* also occurs, often in informal or slang contexts (e.g., *Don’t beat up on yourself*). British speakers generally stick to *beat up*.

Knock up (wake vs. impregnate). This is one of the most famous cross-cultural pitfalls. In British English, *knock someone up* means ‘wake them up’, while in American English, it means ‘impregnate someone’. For example, a Brit might say, *‘I’ll knock you up at 7 AM,’* meaning ‘I’ll wake you.’ To an American listener, however, that same phrase can sound shocking. Conversely, when an American says, *‘He knocked her up,’* the meaning is different and likely to cause laughter or confusion in the UK. Such differences have inspired countless humorous moments in films and intercultural encounters.

A useful way to make these contrasts understandable, especially in teaching contexts like ASEM’s Business English classes, is through short comparative dialogues. For instance, a U.S. manager might say, *‘We need to wrap up this deal by Friday.’* A British colleague understands *wrap up* to mean ‘finish,’ though in very formal writing they might prefer *finalize*. Likewise, a British speaker might suggest, *‘We should put off the meeting due to delays,’* while an American might say *‘postpone it’* or even *‘table it’* (with *table* itself having opposite meanings in AmE and BrE).

Recognizing and practicing such equivalents helps teachers and learners navigate real-world communication with greater confidence and cultural awareness. So, what are the pragmatic and cross-cultural implications?

In international business and academia, choosing the right phrasal verb is more than a style decision, it shapes clarity, tone, and how professional you sound.

Register and formality. British English often treats phrasal verbs as more colloquial alternatives to Latin verbs, whereas American English tolerates or even prefers many phrasal forms in business contexts. For example, an American report may say *‘carry out an analysis,’* while a British writer might prefer *‘undertake an analysis.’* (Garnier, 2020). At ASEM we teach students that such items like *carry out* and *set up* are perfectly acceptable in academic writing (indeed, *carry out* is far more common than its single-word alternatives). Very informal phrasal verbs like *cowboy up*, *shut up shop* remain inappropriate in formal communications.

Miscommunication. Using the ‘wrong’ phrasal verb can confuse or even offend. The *knock up* example is extreme but instructive: what sounds harmless in the UK can be embarrassing in the US. Smaller cases are subtler but still real, telling someone *to give up the search* may be interpreted differently as a literal or figurative urge, depending on the audience or context. A sentence like

‘I’ll call you back’ could first puzzle a non-native listener who might perceive *back* as an adjective. These mismatches are usually resolved by context, but awareness can prevent awkward moments.

Business settings. In multinational meetings, phrasal-verb choice signals formality. A British executive might prefer *‘finalize the contract’* over *‘wrap up the contract,’* while an American counterpart may find *‘wrap up’* brisk and positive. AmE press releases commonly use idiomatic PVs such as *roll out*, *ramp up*, or *hammer out*. These have become international business jargon, but localizing language for the target audience still helps avoid sounding too formal or too colloquial.

Interpersonal contexts. In networking or small-talk, pragmatic approaches matter. If an American says, *‘We need to sort it out,’* a Brit will likely understand *‘address the problem.’* But an American hearing *‘sort out’* as *‘tidy up’* might pause. Listeners regularly use context to decode the intention, but teaching these pragmatic twists reduces confusion in everyday exchanges. The better-known traps (e.g., *table*, *knock up*, *fill in/out*) deserve special classroom attention.

Thus, we can state that phrasal verbs carry cultural weight: an unexpected variant can sound refreshingly new or absolutely wrong. Consequences range from a momentary smile to genuine misunderstanding or a professional faux pas, for instance, a Moldovan student telling an international chat, *‘Let’s table this topic for later,’* may confuse both British and American peers who interpret *table* differently. In British English, *to table* usually means *to bring something forward for discussion* or to put it on the agenda, i.e., *to present or raise an item*. While in American English, *to table* commonly means *to postpone or suspend discussion* (i.e., *put it aside*). Therefore *‘Let’s table this topic for later’* can be read two opposite ways and the speaker must use less ambiguous words or be more explicit. For this reason, intercultural communication training often includes focused practice on phrasal-verb differences as pragmatic, not merely lexical points.

Conclusion

Phrasal verbs are a dynamic, high-frequency layer of English that speakers of both AmE and BrE largely share, but they differ in which verbs they prefer and in which registers those verbs appear (Liu, 2011). These distributional differences mean PV choice affects clarity, tone and perceived professionalism: some PVs (e.g., *carry out*, *set up*) are neutral in business and academic contexts, while others are strongly colloquial and risky in formal settings.

Because misuse can cause misunderstanding, from mild confusion (*fill out* vs *fill in*) to serious embarrassment (*knock up*), teachers and language learners should treat PVs as pragmatic choices, not just vocabulary. Practical strategies include teaching contrastive examples, preferring one-word synonyms when precision matters (e.g., *cancel* vs *call off*), and signaling intent explicitly in international exchanges (Oros, 2006; Liu, 2011).

Finally, integrating corpus evidence and local case studies into Business English curricula gives learners concrete tools to navigate register and variety: showing the same message in US vs UK sources makes differences visible and manageable.

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SUPPORT FOR EXPORTERS UNDER CURRENT CONDITIONS: FROM INTERNATIONAL PRACTICE

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Abstract: A country's export is the engine of its economic development, contributes to attracting investments, creating new jobs, increasing the income level of the population. Export deliveries stimulate the development of industry, promote the expansion of product sales, increase the competitiveness of enterprises, strengthen their positions on the world market. In addition, export is a source of foreign exchange earnings, thus contributing to the import of modern equipment and technologies, the development of infrastructure, which, in turn, makes it possible to achieve structural transformations of the national economy, which is also a necessity for the Republic of Moldova.

In world and European practice, various methods of supporting exporters are used. At the state level, export strategies and programs are developed, a wide range of economic and financial measures are implemented to support exporters by the state. Most countries have created organizations to support foreign economic activity, which are part of the national export support systems.

Exporter support mechanisms have been formed over a long period of time. The article examines the forms of support for export operations currently used internationally, in particular, in several European countries. It is noted that in recent decades, export support in Europe has undergone significant changes, adapting to changing economic conditions and political priorities. In general, the following trends can be identified: a shift from direct subsidies to indirect forms of support, correlated with innovation, sustainability, market diversification.

The historical and systemic approach was used, as well as the general scientific methods of logical and comparative analysis.

Keywords: export, financing, subsidies, export agency, economic diplomacy

JEL Classification: F10, F14

1 Introduction

Foreign trade is one of the ways for economic agents of a country to participate in world economic flows. Moreover, by virtue of international trends, the basis of development in many countries of the world is precisely trade relations with the outside world. They allow national producers to actively participate in competition on the world market, contributing to the development and stimulation of national production. Such processes favorably influence the economic growth of countries. Export orientation has been almost universally accepted as the direction of industrial development since the early 1970s. This is the path chosen by Japan and the newly industrialized countries of Asia (South Korea, Hong Kong, Singapore, Taiwan), which have achieved remarkable successes, in 2023 the first two of the listed countries are in the top 10 of world exporters. (Banque Mondiale, 2025)

Currently, supporting national exporters is an integral part of the economic and trade policy of all countries in the world. We believe that the problem is particularly relevant for the Republic of Moldova, as statistical data indicate that the negative trade balance of the Republic of Moldova over the past five years has been increasing. In 2024, the considerable gap between exports and imports of goods determined the accumulation of a trade balance deficit of \$5510.1 million or \$883.2 million (+19.1%) more than that recorded in 2023. (BNS, 2025) In this context, it is necessary to adopt measures to more actively support exporters, and international and European

practice confirms that in all countries there are support systems for local producers/exporters, based on short-term and strategic priority objectives, market conditions, signed agreements, etc.

2 General characteristics of export support

In international practice, various methods of supporting exporters are used. However, the combination of different elements is quite flexible, which gives flexibility to the entire system, which reacts and changes depending on the economic situation, the role of the state, the situation on world markets, etc. Of course, the dynamism and nature of supporting export activity in different countries differ depending on the structure of the economy, participation in international organizations and other factors. The state is the one that organizes the formation of the export strategy, contributes to the promotion and implementation of its basic provisions through economic policy instruments, and in particular, means of supporting national exporters. At the same time, supporting national exporters in developed countries can be characterized by a number of common features:

Export support has become a major direction of the state's economic activity, often resulting in direct trade expansion. Significant financial resources are allocated to this purpose, the activities and competencies of state structures and special organizations involved in foreign economic activity are subordinated to it;

The activity of governments aimed at stimulating exports is carried out continuously, including during favorable economic conditions. Increased attention in this regard is paid to the prospects for expanding exports, in particular, the development of special support programs;

Along with the intensification of the stimulation of export transactions, measures are taken to form or expand demand for national products abroad, by organizing special distribution and sales networks and creating international associations with numerous subsidiaries and divisions of companies in the markets of partner countries in transactions.

In connection with the use of various methods of financial support for exporting industries and, as a result, mutual accusations of unfair competition, countries tend to coordinate control functions. The Consensus on Export Credits and the concept of the need for a transition from free trade to organized free trade, which emerged as early as the 1980s, can serve as evidence and which involves the development of a complex system of intergovernmental agreements, combined with intergovernmental regulation of the conditions for granting export credits, guarantees and subsidies. (OECD, 2024)

This integration of efforts and means in the competition for export markets is based on objective foundations. On the one hand, globalization has expanded access to new markets, determined the evolution of institutions that ensure and determine the development of international trade in goods and services. In the world circuit, production with a high technical and capital intensity is increasingly attracted, manufactured by cooperating companies or production units from different countries. In parallel, the world market for technologies that involve long-term partnership relationships has expanded. In this context, the promotion of goods on foreign markets currently requires exporters to mobilize quite significant resources, and to direct them towards the importer in order to provide technical services, maintenance, etc. On the other hand, such an integration of possibilities is subordinated to the contemporary framework for the development of trade, which develops in conditions of economic instability in certain regions or sectors of activity, of toughening competition, the existence of geopolitical, commercial, financial risks, etc. (WTO, 2025) Modern protectionism differs significantly from the protectionism of previous decades, as it largely involves a combination of traditional means of protection with disguised protectionist measures and the promotion of the interests of domestic producers.

3 Support measures for exporters

The mechanism for supporting exporters was formed over a long period of time. In this process, we can highlight several stages depending on the actuality of the state's economic tasks.

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Thus, in the 50s of the 20th century, there was a tendency to regulate the level of selling prices by various methods, in the 60s - to create a long-term interest in the export of goods and penetration into new sales markets, in the 70s-80s the main task was the formation of a competitive export base, in particular, in the machine-building industry. In the first decades of the 21st century, we note the tendency to support market diversification, orientation towards consolidating positions in emerging markets, promotion of intelligent products and services with high added value. In the arsenal of export support measures, we mention:

Subsidies (export premiums) - financial support provided by the government or private institutions to manufacturing firms for the export of certain goods. Many countries have gradually reduced or revised direct subsidies to exporters, following World Trade Organization rules. They often arise as a reason for disputes and accusations of unfair competition, for example, case Boeing vs Airbus. (Reuters, 2021)

Export credits. They apply mainly to finished goods, include both long-term and short-term credits. Lending is carried out through payments from special funds, as well as refinancing, subsidizing or insurance and is implemented through banks and intergovernmental banking organizations.

Export insurance. This is achieved by providing state guarantees to banks that provide export credits. Insurance covers not only traditional commercial risks, but also political risks and applies to a wide range of goods and countries.

Devaluation of the national currency. Many countries that have successfully developed their exports (China, South Korea, Indonesia, Chile, Colombia, Mexico, Taiwan) have resorted to maintaining an artificially low exchange rate of the currency. Devaluation has its positive and negative effects. On the one hand, it is an effective means of forming exports, since the exporter gets the opportunity over a period of time to take advantage of advantages on the foreign market. As the owner of foreign currency, by exchanging it, he comes into possession of a higher equivalent in the national currency, in accordance with the variation in the exchange rate. However, after a certain period, production costs, related to the increase in the price of imports, could exceed all the advantages of devaluation, including for exporters.

All of the above export support measures are used to some extent. But the significance of each of them in certain periods of time for different countries was different. Moreover, it can be said that some export stimulation measures, previously widely used, are gradually beginning to disappear under the influence of fiscal pressure, anti-dumping and anti-subsidy measures. The WTO and a number of other international organizations are acting in the same direction. This does not mean that such measures have been completely abandoned, but the possibilities for their use have narrowed.

Under current conditions, the most common methods of stimulating exports are export credit and export credit insurance. As a rule, state support for export operations is carried out through export credit agencies (ECAs). By providing insurance services, ECAs act mainly to support export projects, in terms of commercial and political risks that are not covered by commercial insurance companies. It is important that the activities of ECAs do not violate the principles of the commercial insurance market. Among other support measures for exporters in the current period, we mention:

Training and consultations: organizations can organize seminars, trainings and consultations on export activities, helping companies develop the necessary skills and knowledge;

Support at international exhibitions: many countries support exporters at international exhibitions and fairs, providing exhibition space, consultations on participation, etc.;

Informational support: providing information on potential markets, product requirements, customs procedures and other aspects of international trade.

All these measures, used in international practice, are intended to contribute to the expansion of exports in both the short and long term. Simultaneously with operational regulation, states carry out strategic tasks of trade policy aimed at long-term goals and strengthening the national economy. An example is the increase in state allocations for scientific and research work, which increase the competitiveness of the national economy, which is the foundation of export competitiveness. In this context, we mention the leading countries in terms of the share of research and development expenditures in GDP in 2024: Israel – 5.56%, South Korea – 4.93%, USA – 3.46%, Belgium – 3.43%, Sweden – 3.42%, Switzerland – 3.36%. (UIS UNESCO, 2024)

We note the increasing role of economic diplomacy which contributes to solving important political tasks of the state and involves activities to protect the country's economic interests at the international level: increasing exports, attracting foreign investments, participating in the activities of international economic and financial organizations; promoting national interests in the sphere of interstate cooperation in the economic field, etc.

A means of promoting goods on foreign markets is counterparty, which is currently used in various forms by most countries of the world. The role of the state here is reduced to the legal support of counterparty transactions, to the creation of structures, designed to contribute to the development of these types of transactions. Although there are reticent attitudes towards counterparty transactions on the part of large companies, due to additional obligations, complicating their commercial activity, the governments of Western countries, proceeding from commercial interests, support the participation of national companies in such transactions. By its characteristics, counterparty transactions occupy an intermediate place between the means of stimulation of a financial and administrative nature. (NATIONS UNIES, 1993)

4 From the experience of some European countries

France is undergoing a profound transformation of the system of state support and foreign economic activity. In 2015, after the merger of two specialized organizations, a new national institute for supporting exports and attracting investments was created - Business France. Government guarantees were transferred from the private insurance company COFACE to the state bank Bpifrance, which was allowed to issue state guarantees directly. Bpifrance plays a central role in financing French exports through several key measures, such as prospecting insurance, international growth loans, export credit insurance.

Launched in 2018, Team France Export brings together all stakeholders in the field of public export support (Business France, Chamber of Commerce and Industry, Bpifrance) to offer a unified service, a “one-stop shop” with a dedicated international advisor who can leverage all available solutions according to the exporter’s needs. Team France Export offers: • Export diagnostics; • Personalized assistance programs; • Business prospecting missions abroad; • French pavilions at major international fairs.

The missions of the Chambers of Commerce and Industry include providing support and advice for the international development of businesses and the export of their products. Specifically, this mission can take various forms (putting partners in contact, providing information, providing free or paid advice, etc).

The French Chambers of Commerce Abroad are private organizations governed by local law, which bring together French and foreign companies. Federated within a network led by CCI France International, they aim to facilitate business relations and contacts abroad. In addition to their general mission of supporting French companies wishing to establish or expand in a foreign country, some French Chambers of Commerce Abroad have won a tender to designate a public service concessionaire on behalf of Business France. (COMMISSION DES AFFAIRES ÉCONOMIQUES, 2023)

In the **Netherlands**, support for exporters is provided as part of a general economic policy aimed at strengthening the country’s competitiveness. Exporters can benefit from various grants

and subsidies. For example, the government can repay part of the exporter's loan if the exporter cannot repay this part himself. The subsidy programme 'Support for International Business' (SIB) provides professional advice on export plans, especially for SMEs that plan to expand into new markets. (Ondernemersplein, 2025a) The SIB Alternatieve markten subsidy is offered to small and medium-sized enterprises in the Netherlands affected by the war in Ukraine or trade sanctions against Russia. The subsidy covers 80% of the costs, up to 2500 euros. (Netherlands Enterprise Agency, 2025a)

The Netherlands Enterprise Agency helps to conduct business abroad, provides tailored country information, using its own experience and databases, as well as collaborating with the international network of embassies, consulates and national statistical offices. Advice is provided on current market trends, possible distribution channels for the product or service, export rules and product requirements, business culture, subsidy and financing options. The services are provided free of charge and always take into account specific needs. Individual support is also provided regarding business partners, which meet specific needs and requirements. The consultants collaborate with the international network in the chosen country, including, for example, the embassy. The best way to establish contact with potential business partners is recommended. An individual approach is essential in finding the best ways to establish contact with international business partners and helps to quickly consolidate positions in a new market. (Rijksdienst voor Ondernemend Nederland, 2025a)

In the Netherlands there is a government program for export credit insurance (EKV), which is applied when private companies are reluctant to insure against non-payment on exports, for example in case of very large amounts, long delivery times or unstable political situations in the country. In addition to export credit insurance, there are other state products to increase protection against export risks, such as 1. investment insurance against political risks such as civil war, 2. export credit guarantee, which allows banks to expand the range of export financing for Dutch exporters. (Rijksdienst voor Ondernemend Nederland, 2025b)

The Eurostars grant is designed to support small and medium-sized enterprises in high-tech research and development, in collaboration with partners from other countries (at least two). Eligibility requirements: at least 10% of turnover is spent on research and development or at least 10% of staff is engaged in research and development. The project must be completed within 36 months and aims to develop a marketable product or process within 1 year of completion. (Netherlands Enterprise Agency, 2025b.)

The Dutch Good Growth Fund (DGGF) provides financing for Dutch and local companies in emerging markets and developing countries. It is a program created at the request of the Ministry of Foreign Affairs of the Netherlands. The DGGF offers several opportunities for Dutch SMEs: Investment in an emerging market or developing country; Import of goods from an emerging market or developing country; Export to an emerging market or developing country; (Netherlands Enterprise Agency, 2025c) The DGGF is accessible to a number of countries in Asia, Africa, Central America, South America and Europe, including the Republic of Moldova. (Invest International, 2025)

Openness to business, ideas and people is essential for **Ireland's** success. The country's economic climate is currently considered one of the most favourable in the EU. Export-oriented companies can use the Market Discovery Fund to explore new markets, with support of up to €150,000. The Get Exporting programme covers both financial support and consultancy for entering international markets. The state actively supports companies focused on international markets and innovation. The Key Manager Support programme offers funding of up to €150,000 for the employment of highly qualified managerial staff capable of developing export activities.

European programmes such as Eureka Eurostars and Innowwide fund research and training for small and medium-sized enterprises to enter international markets. The Digital Marketing

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Capability Grant helps develop digital marketing, improving companies' international presence. To participate in such programmes, it is necessary to prepare a strategic plan, analyse target markets and interact with relevant agencies. (Irish Exporters Association, 2025)

Embassies and consulates play an important role in trade activities, which vary by market and include:

Influence and Networking – embassies and consulates build long-term networks of influence in the political, economic, cultural and academic spheres, which can be used to support Irish economic and business objectives.

Providing local market information and advice to Irish government bodies and companies, as well as briefings and practical advice on business culture, legislation and regulations. As part of economic diplomacy, the embassy also disseminates important economic information about Ireland to key local stakeholders and reports to headquarters on local economic developments.

Commercial and other support to Irish agencies and companies operating in the market, as required. This includes addressing market access issues, facilitating local contacts, providing certifications and other consular services, and highlighting opportunities and challenges associated with new or existing EU free trade agreements with third countries. (Department of Foreign Affairs and Trade, 2025)

There are various government support programmes available to Irish businesses. (Enterprise Ireland, 2025a) <https://www.enterprise-ireland.com/en/enterprise-hub>. The government's Market Diversification Action Plan, launched in August 2025 following the introduction of US tariffs on EU products, is a comprehensive government approach to supporting Irish businesses in securing new and diversified markets for their innovative and high-quality products. (Enterprise Ireland, 2025b)

Team **Estonia** is a cooperation model created to promote the economic development and international competitiveness of Estonia, led by the Ministry of Economic Affairs and Communications, the Ministry of Foreign Affairs and the Enterprise Estonia Foundation (EIS). The aim is to coordinate the state's efforts to bring companies to the international stage, attract investment and promote Estonia as an attractive environment for investment and business. The cooperation also aims to attract foreign talent and knowledge.

The Ministry of Economic Affairs and Communications sets the strategic direction, the Ministry of Foreign Affairs provides diplomatic support and representation opportunities, while the EIS focuses mainly on providing relevant and effective services to help attract new foreign investment and enable Estonian companies to successfully enter new target markets or expand their growth opportunities in existing export markets. Diplomatic missions and export advisors provide support to companies entering foreign markets and collect market intelligence. As of 2024, Estonia has 36 diplomatic missions that provide local support to companies in foreign countries, help establish business contacts and promote Estonia's interests internationally. In addition, Estonia has 195 honorary consuls who are ready to support Estonian companies in over 90 countries, significantly expanding the availability of assistance and the network of local contacts. Furthermore, EIS has advisors in 14 countries who share detailed market intelligence and provide strategic advice and local expertise to increase the competitiveness of Estonian companies in global markets. (Ekspordi strateegia 2025–2028)

For Estonia, a current objective is to create an export support measure for trade associations. The aim of the measure is to support the capacity of trade associations to develop export activities in their sector and to direct resources towards promoting smart and value-added products and services to foreign markets. The support measure will amount to two million euros and will be financed from the European Union's structural funds. Support activities include participation in trade fairs, hiring export advisors or conducting market research. The support is mainly targeted

at smart and value-added industries, including digital solutions, medical technology, sustainable energy solutions and the valorisation of local resources. (Government Republic of Estonia, 2024)

5 Conclusions

Export support is an integral part of the foreign economic policy of states. In order to promote export products, countries create a favorable climate for exporters, use incentive support measures, both financial and non-financial methods. Countries have created special organizations and devices to support foreign economic activity, which are part of the national export support systems. In the current conditions, marked by uncertainty, geopolitical conflicts, trade disputes, protectionist tendencies, we note that:

Measures to support national exporters are a significant part of export promotion strategies;

There are different methods of supporting exporters, aiming to ensure certain priorities and advantages, both short-term and strategic;

Measures to diversify markets are current to maintain profitability and jobs in the context of tariff pressures;

Grants provide exporters with the necessary financing to help them diversify their markets and improve the sustainability of their business models.

Financial and credit means of stimulating exports currently remain effective instruments of trade expansion for most states. State support for export operations is carried out, in particular, through export credit agencies. Participation in international organizations, mainly the WTO, and the search for a balance between market opening and protecting and promoting the interests of national producers require extensive and complex work, constant study and forecasting of development trends and flexible adaptation of the national economic strategy to current challenges. An important role in the set of measures is played by economic diplomacy.

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MOLDOVA'S EXPORTS: BETWEEN REGIONAL INSTABILITY AND THE CHALLENGES OF THE GLOBAL ECONOMY

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Abstract: The article analyzes how Moldova's exports have been affected by the regional instability caused by the conflict in Ukraine. As well as the macroeconomic challenges of the global economy, the volatility of international prices, the fragmentation of supply chains and inflationary pressures, (focus on the year 2020-2024). This study pursued three directions: the analysis of the value and structural development of exports, changes in the geographical structure and the assessment of the economy's ability to adapt to external impacts.

The research comprises both quantitative and qualitative evaluation indicators, such as the Export Diversification Index – to determine structural change in exports, the Herfindahl-Hirschman Index (HHI) – to measure export market concentration and systemic vulnerability external shocks (logistical bottlenecks, fluctuations in global demand). Data sources such as the National Bureau of Statistics, UNCTADstat, the World Bank and Trade Map were used.

The result shows a dependence on traditional markets and low value-added products. The situation increases the vulnerability of exports to external shocks. However, some progress has been seen in recent years – notably in diversifying the processed agri-food sector and expanding trade. Even so, the low level of the diversification index and the high values of HHI show that structural imbalances remain strong. That is why we need trade policies that are resilient and much more flexible. In the new global context, Moldova has only to gain if it rethinks its export promotion model. A focus on smarter integration into international value chains, better resilience to disruption and diversification could turn exports into an engine of sustainable growth.

Keywords: International Trade, International Diversification, Economic Vulnerability, Export Diversification, Regional Integration

JEL Classification: F10, F15, F43

Introduction

In recent years, due to major external events and global macroeconomic challenges, Moldova has been facing a number of difficulties. Geopolitical instability in the region, particularly due to the Ukrainian war, has had direct effects on trade. Added to all this was a world economy weakened by inflationary pressures, fragmentation in supply chains and unstable international prices.

The present research starts from the analysis of these factors and their impact on foreign trade in the period 2020-2024. We focused on how Moldova's exports managed to adapt in a time of crisis and uncertainty. By assessing key indicators such as the structure of exported products, the degree of diversification and the concentration of markets – we can better perceive economic developments in the short and medium term. This picture helps us identify vulnerabilities and outline steps that can increase economic resilience in the face of global challenges in the coming years.

Objective of the research

The research aims to analyze how the structure and competitiveness of Moldova's exports have evolved in the last five years. To this end, we analyzed economic indicators such as the Herfindahl-Hirschman index (to measure the concentration of export markets), the diversification index (determined by structural change in exports) and the number of exported products (EQuIP, 2015). We have also taken into account the impact of external factors - from geopolitical tensions

and logistical bottlenecks, to inflationary pressures. Based on the results, certain policy recommendations are proposed to support trade resilience and stimulate sustainable diversification, both of markets and of exported products.

Methodology and data sources

In order to better understand the evolution of Moldova's exports, we have combined quantitative methods with qualitative analyses. Several relevant indicators were taken into account in the research: the export diversification index, which reflects structural changes; the Herfindahl-Hirschman index, used to measure the degree of concentration on export markets; as well as indicators of systemic vulnerability, linked to logistical constraints and geopolitical tensions.

The data used come from official and reliable sources, such as the National Bureau of Statistics of Moldova (NBS), UNCTADstat, the World Bank and Trade Map, which allowed a rigorous analysis. The analyzed period, 2020–2024, was chosen to capture more clearly the effects of the global and regional context on Moldovan exports.

Results and discussions

1. Value and structural evolution of exports, 2020-2024

Moldova's exports have gone through a period full of challenges in recent years, influenced by both global dynamics and domestic factors. The beginning of the pandemic in 2020, strongly influenced economic activity and led to a temporary decrease in international trade. After this period, the following year, due to a good agricultural harvest and high demand in traditional markets, exports increased significantly.

The situation became complicated again in 2023 and 2024. Moldova's exports have been increasingly influenced by geopolitical instability, due to the Ukrainian conflict. Traditional supply chains have been disrupted, and the country has gradually lost its role of functioning as a regional hub.

As a result, total exports fell to about USD 3.56 billion for 2024, which shows a decrease of 12% compared to the previous year (figure 1). Part of the decrease observed comes from the reduction in re-exports, which fell by more than 28% (National Bureau of Statistics, 2025). At the same time, deliveries to several important markets have also decreased. Due to the instability, trade with regions such as Ukraine, Romania and Germany, but also with CIS states, visible losses have been observed. A clear example is Russia, where Moldova's share of exports decreased from 9% in 2020 to only 3.3% in 2024 (Trading Economics, 2024).

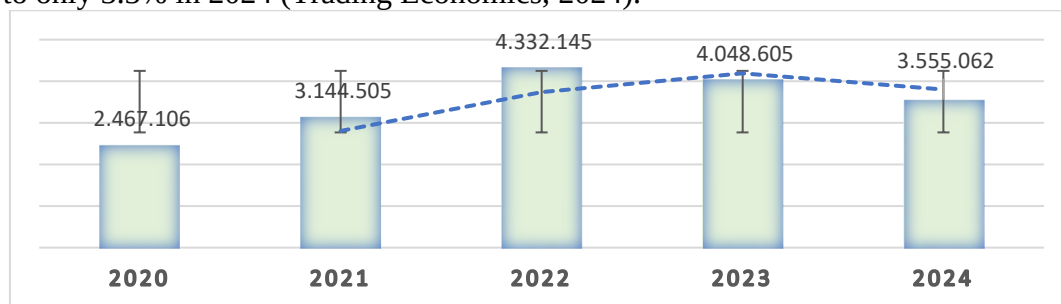


Figure 1. Dynamics of Moldova's Foreign Trade (US\$, thousands), 2020-2024

Source: Elaborated by the Author based on data from the National Bureau of Statistics (NBS, 2025)

Moldova's exports are largely based on agricultural products, and for this reason the agri-food sector has been the most driven to change by the recent external disturbances. The dependency relationship shows how fragile the economy is in the face of this kind of challenges. In addition, the export structure remains dominated by low value-added products such as wheat, maize, oilseeds and unprocessed fruits (Figure 2). However, we also have reason to be optimistic, because in recent years some sectors with higher added value, such as the production of electrical equipment and the processed agri-food industry, have also started to stand out (Trading Economics, 2024).

In 2024, machinery and electrical appliances became the most valuable segment of foreign trade, with a share of almost 16% of total exports. At the same time, grain exports fell to just 9.1%, a drop that raises questions. In contrast, oilseeds and oleaginous fruits had a positive evolution, reaching around 10.2% of the total export (Figure 2).

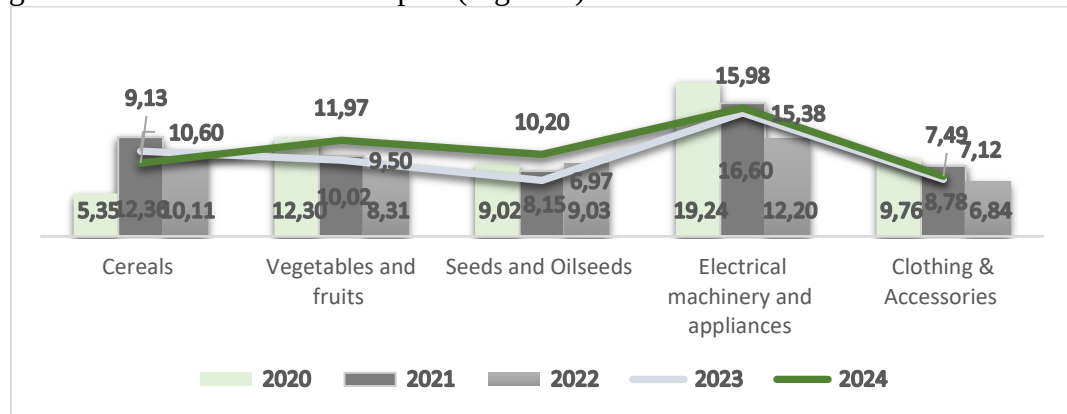


Figure 2. Share of Major Product Groups in Export Value %, 2020-2024

Source: Elaborated by the Author based on data from the National Bureau of Statistics (NBS, 2025)

The situation confirms that Moldova's economy is still heavily dependent on the export of raw materials and semi-processed products, which remain vulnerable to price fluctuations on international markets. However, the growth of exports of processed agri-food products and those in the electrical equipment industry shows a promising direction, more added value and a stronger export base.

One conclusion is that the decrease in Moldova's exports was driven by several factors. Firstly, external demand has decreased, and export potential has become more limited. To this were added lower prices on global markets and a decrease in re-exports. Logistical problems with supply chain disruptions and increased transport costs also played an important role. All these difficulties have strongly impacted trade performance, reducing both the volume and the value of exports. In the end, Moldova lost competitiveness on international markets and received lower revenues from exports.

2. Changes in the geographical architecture of exports

Geographically, Moldova remains strongly oriented especially towards the European market, which in 2024 absorbed over 67.3% of total exports (Trade Map, 2024). At the top is Romania, the country's main trading partner, due to its geographical proximity, close economic relations and the country's integration process into the EU. It alone concentrated for nearly a third of Moldovan exports – 32.6%, the equivalent of 1.16 billion US dollars (Trade Map, 2024).

Other important markets for Moldova are Ukraine, with a share of 9.3% and exports of 329.1 million US dollars, Italy with 6.7% and the Czech Republic with 6.1%. At the same time, Turkey (6.0%), Germany (4.8%) and Poland (4.3%) remain significant markets (Trade Map, 2024).

In the period 2020-2024, Moldova's exports to Ukraine increased by about 64% (Trade Map, 2024). A sign that trade relations between the two countries have expanded rapidly following recent geopolitical and economic changes. The evolution was mainly driven by exports of agricultural products and raw materials. In the context in which Ukraine needs resources for reconstruction and securing supplies. In the same period, exports to Romania rose by 16%. Although a slight decrease was observed in 2024 compared to the previous year, the overall trend remains positive and confirms the strengthening of bilateral ties, but also Moldova's integration into European value chains.

Also, notable developments were recorded: the Czech Republic with +31%, Bulgaria with +15% and Poland with +9%. Surprisingly, the United States has become a more visible partner,

with a 37% increase, mainly due to exports of food and alcoholic beverages (Trade Map, 2024). This shows not only a diversification of export destinations, but also an important proximity to a global economy.

In contrast, exports to Germany and Turkey fell by around 6% and 4% respectively. Those to Russia saw a sharper decline of 17% (Trade Map, 2024). Confirming the loss of interest in that market, as a result of geopolitical tensions and international sanctions.

Overall, Moldova's exports show a two-way trend. On the one hand, trade ties with existing partners, especially Romania, are strengthened. On the other hand, there are openings to new markets, such as Ukraine, the Czech Republic or Poland. However, these changes are still in their infancy, and the impact of diversification remains modest.

In order for Moldova's economy to become more sustainable and resilient, it is essential to focus on diversifying trading partners and reducing dependence on a single market. This can be achieved by opening up to new markets, such as Asia, the Middle East, or North America. In parallel, making more effective use of existing agreements with the European Union can create a solid basis for diversification. On this basis, strengthening existing partnerships and investing in higher value-added products could accelerate Moldova's integration into global value chains.

3. Assessment of the economy's adaptive capacity

The capacity of Moldova's exports to withstand external shocks can be seen through several indicators: the diversification index, the Herfindahl-Hirschman index and the total number of exported products. These indicators, taken together, show how varied the structure of exports is and how vulnerable the economy becomes when it depends too much on certain markets or products (EQuIP, 2015).

The Concentration Index (HHI) ranged between 0.174 and 0.195 between 2020–2024, indicating a moderate dependence on certain key markets and products (Figure 3). In 2021, its value decreased by almost 11% compared to the previous year, a positive sign, which shows a slight diversification. The trend was supported by both a good agricultural harvest and modest attempts to access new markets.

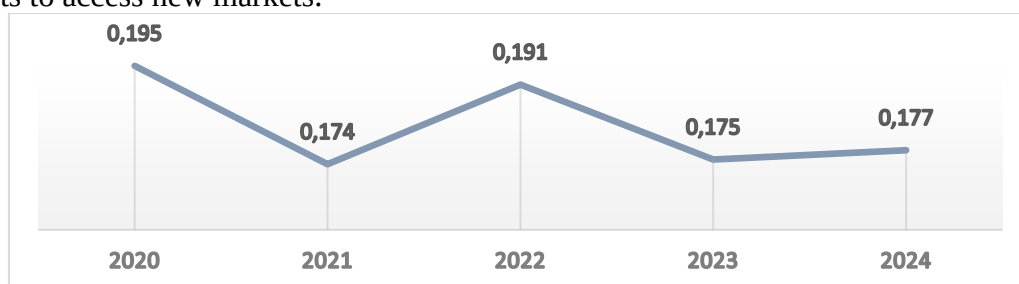


Figure 3. Dynamic Index of HHI, 2020-2024

Source: Prepared by the Author based on data from UNCTAD, n.d.

In the following years, especially in 2022, the index recorded an upward trend, a sign that exports were once again concentrated in a certain number of markets. In 2023-2024, it decreased slightly, registering 0.175-0.177 (figure 3). The oscillations show that Moldova have made some efforts to diversify, but for the most part, exports have remained dependent on traditional markets and products.

This is not surprising, if we think about the situation in the region (the Ukrainian war, large price fluctuations on international markets and problems in global supply chains). All this has led many companies to stay in previously identified markets - such as Romania, Ukraine, Italy or the Czech Republic, instead of venturing into new markets (The Observatory of Economic Complexity, 2025).

Although, there were increases in some new categories, such as machinery and electrical appliances, live animals or food products and preparations, they were unable to compensate for

decreases in other areas. In addition, increase in manufacturing costs and volatile of raw material prices have led exporters to take a more cautious approach, limiting openness to emerging markets.

In other words, the economy tries to remain competitive with changes in the global market, but relies too much on classic relationships and products. To ensure solid growth in the long term, it is clear that we need to continue and even accelerate diversification efforts in order to reduce dependence on a few products and markets.

As for **the Diversification Index**, the analyzed period marked a slight decrease, from 0.697 in 2020 to 0.669 in 2024 (figure 4). The difference of 3.9% indicates the same strong orientation towards traditional products with low added value.

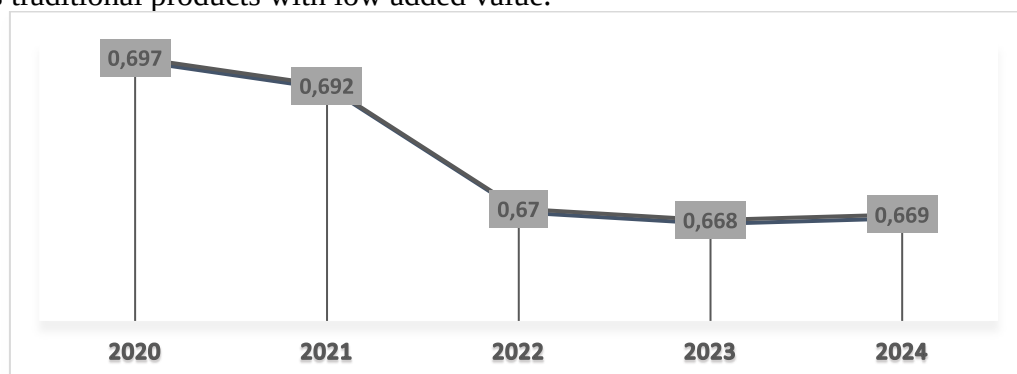


Figure 4. Dynamics of the Diversification Index, 2020-2024

Source: Prepared by the Author based on data from UNCTAD, n.d.

The decrease in diversification can affect the country's ability to capitalize on new opportunities in more competitive markets and to protect itself from external impacts. Data for 2024 shows that exports were largely based on a narrow group of products. Machinery and electrical appliances accounted for 16% of the total, vegetables and fruits 12%, oilseeds 10%, cereals 9%, clothing 7.5% - accumulating a significant part in the total exports, about 55% (Figure 2).

On the other hand, positive signals have also appeared in 2024. The diversification index showed a small rebound, fueled by increases in sectors such as machinery, industrial products, pharmaceuticals, minerals and alcoholic beverages (National Bureau of Statistics, 2025). These developments show that there is real potential for the expansion of the export basket in the coming years.

If we look at these trends in parallel with the Herfindahl-Hirschman Index, we can clearly see a connection: when diversification decreases, the concentration of exports increases. Basically, this confirms once again how difficult it is for Moldova to maintain a sufficiently varied and balanced export portfolio.

These results show the importance of adopting well-thought-out and consistent economic policies that support export diversification. This means opening up to new markets, stimulating sectors with growth potential, investing in innovation and technology and, last but not least, concrete support for small and medium-sized exporters. Such measures can ensure stable economic growth and make it more resilient to external challenges.

In this context of the analysis, we cannot to take into account the **number of exported products** (at the three-digit SITC level), which has undergone interesting variations between 2020 and 2024. Probably as a consequence of economic dynamics and the international environment. In 2020, 172 distinct products were registered, and in 2022 this number increased significantly to 198 (Figure 5). This growth denotes an effort to diversify the offer, trying to penetrate new market segments and expand the portfolio of exported products.

In the following years, 2023 and 2024, the number of exported products decreased slightly, reaching 191 and 187 respectively (Figure 5). This decrease shows that exports have been more focused on already traditional products and markets, likely influenced by regional and global instabilities.

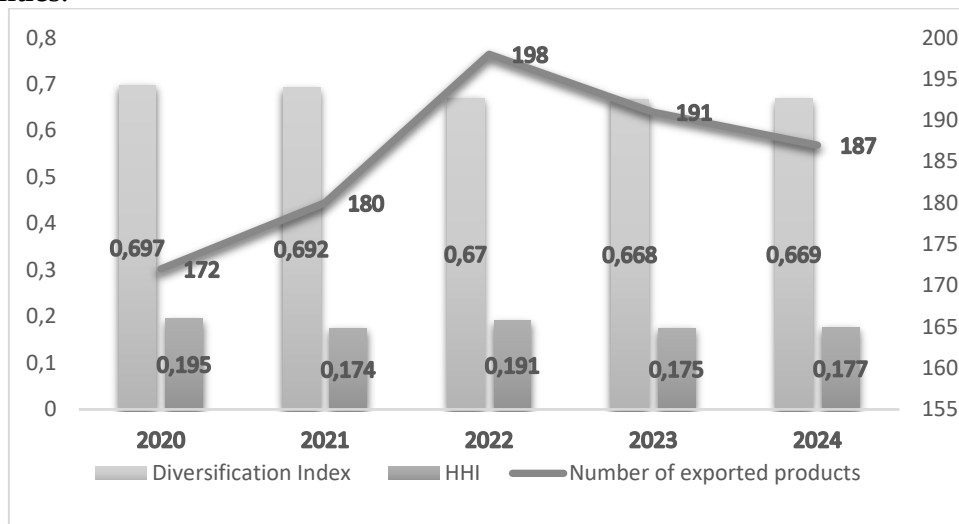


Figure 5. Dynamics of the Diversification Index, HHI and number of products, 2020-2024

Source: Prepared by the Author based on data from UNCTAD, n.d.

The trajectory is clearly reflected in the data on the Diversification Index and HHI. The HHI index shows a moderate to high level of concentration, with a maximum in 2020 and 2022, while the diversification index decreases slightly, from 0.697 in 2020 to 0.669 in 2024 (figure 5). Basically, although in 2022 there was a temporary diversification of Moldova's export portfolio, they remained focused on a few main products and markets. Consequently, even if new products appeared, they were not enough to diminish the existing dependence.

The situation highlights a structural vulnerability of economy. We tend to rely on products with tradition and previously identified markets, so it makes us more exposed to external changes. To increase resilience, it is essential to continue and intensify diversification policies, both geographically and productively.

Efforts to increase the number of products must be supported by investments in innovation and competitiveness. Direct support for small and medium-sized companies is crucial, as they can introduce the latest merchandise into the export portfolio.

Systemic Challenges in Moldova's Economy

In recent years, the world economy has entered a phase of visible slowdown. Estimates show that the global growth rate, which was 3.3% in 2024, will fall to just 2.9% in 2025 and 2026 (OECD, 2025). The reduction reflects the effects of growing uncertainty, trade barriers and geopolitical instability. The impact was felt especially in small and open economies, such as the Republic of Moldova. Between 2020 and 2024, the country faced serious systemic vulnerabilities, which limited its ability to face with external and internal unexpected events.

One of the main factors was **the logistical bottleneck**, which severely affected the country's ability to maintain its trade flows, especially in the agri-food sector. The situation was most clearly seen in the case of sunflower oil. In 2024–2025, exports collapsed by more than 90%, due to a poor harvest and logistical problems (AgroExpert, 2025). In just one year, Moldova went from exporter to importer status and came to depend largely on Ukraine.

Globally, **the pandemic and geopolitical tensions** have accentuated demand fluctuations and destabilized traditional export markets. The conflict in Ukraine has further amplified economic uncertainty for local companies (World Bank, 2024). The blockade of Black Sea ports disrupted the

usual trade routes, which made it necessary to extend the road transport agreement between Moldova and Europe in 2024. The adopted measure led to a 57% increase in the volume of road exports to the EU in the quarter. III and contributed to the maintenance of trade flows. At the same time, supporting the solidarity corridors for Ukraine in the context of the conflict (Trans.info, 2024).

Another significant vulnerability is the **concentration of exports** on a small number of products. In particular oilseeds and cereals and in several major markets, such as the EU and Ukraine (National Bureau of Statistics, 2025). The existing dependency raises the risk of systemic shock. Any disruption in these segments can have a rapid and powerful impact on the entire economy.

Moldova's constant trade deficit and dependence on imports of energy and raw materials make it more vulnerable to external disruptions (Expert-Grup, 2025). Any increase in resource prices or bottlenecks in the supply chain directly hits the economy and reduces our country's ability to maintain stability. In parallel, rising costs have impacted export competitiveness and led to a decrease in export volumes (Ministry of Economic Development and Digitalization, 2025).

These systemic challenges clearly highlight the need for deep reforms and more coherent policies. An integrated strategy should combine economic modernization, diversification and infrastructure development. The focus must be on innovation, competitiveness and institutions that are better prepared to manage risks. In such a way that current vulnerabilities are transformed into future opportunities.

Conclusions

The analysis highlighted the underlying vulnerabilities of Moldova's economy, strongly marked by structural imbalances and excessive dependencies. Exports are concentrated in certain traditional products and markets, and to these are added the trade deficit and logistical bottlenecks, which have limited the prospects for sustainable economic growth. Fluctuations in global demand and geopolitical tensions in the region, especially the war in Ukraine, have amplified instability and revealed the limits of the current export model.

Although small steps have been taken towards diversification, Moldova's exports are mainly based on low value-added products. Existing dependence on traditional markets remains a major obstacle to sustainable development. The analyzed indicators show a fragile balance. The maintenance of traditional positions has provided a certain degree of stability, but the lack of consistent diversification has reduced the ability to adapt to rapid changes in the external environment.

Under these conditions, Moldova needs a strategic repositioning of its export model. The solution depends on deeper integration into the global economy and more flexible trade policies geared towards resilience and sustainability. In the coming years, the way these vulnerabilities will be managed will matter decisively for the country's economic trajectory.

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GENDER-BASED VIOLENCE IN THE CONTEXT OF MULTICULTURALITY AND INTERNATIONAL ECONOMIC RELATIONS: COMPARATIVE PERSPECTIVES FROM ROMANIA AND MOLDOVA IN AN EU FRAME

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Abstract: This article examines gender-based violence (GBV) through the lens of multiculturalism and international economic relations, emphasizing its dual role as a human rights issue and a determinant of sustainable development. It draws on key international instruments such as the Universal Declaration of Human Rights, CEDAW, and the Istanbul Convention to analyze how GBV restricts women's empowerment, limits labor market participation, perpetuates structural inequalities, and undermines social cohesion. The study applies a comparative approach, focusing on Moldova's recent legal reforms and Romania's more mature institutional framework. Moldova's ratification of the Istanbul Convention and pioneering measures against digital violence illustrate its commitment to aligning with European standards. Romania contributes valuable good practices, including legal innovations, integrated services, and multicultural strategies. The findings highlight that multicultural contexts carry both risks, through entrenched patriarchal norms and opportunities, by fostering intercultural dialogue and policy learning. Addressing GBV requires mainstreaming gender equality across policy sectors, strengthening institutions, and leveraging international cooperation. Comparative and global insights show that reducing GBV is not only an ethical imperative but also a driver of inclusive growth and competitiveness.

Keywords: gender-based violence, multiculturalism, economic relations, public security, sustainable development
JEL Classification: F22, J16, K37

1. Introduction

Gender-based violence (GBV) is one of the most persistent and complex human rights violations worldwide. It transcends cultural, geographic, and economic boundaries, undermining individual security, public health, and social cohesion. In contemporary societies characterized by cultural diversity and transnational economic flows, GBV takes on additional layers of complexity. Multicultural contexts shaped by migration, minority communities, and intercultural interaction can both exacerbate gender inequalities through entrenched patriarchal norms and offer opportunities for innovation through intercultural dialogue and policy exchange.

From a global governance perspective, GBV is simultaneously a human rights concern and a determinant of sustainable development. International legal instruments, including the *Universal Declaration of Human Rights* (United Nations, 1948), *Convention on the Elimination of All Forms of Discrimination against Women* (United Nations, 1979), and the *Council of Europe Convention on Preventing and Combating Violence against Women and Domestic Violence* (Council of Europe, 2011), establish clear state obligations to prevent and combat violence against women and

girls. Yet, despite the growing normative framework, implementation remains uneven, especially in societies undergoing political and economic transformation.

This article explores GBV within the framework of multiculturalism and international economic relations, adopting a comparative perspective focused on Moldova and Romania. Moldova exemplifies a post-Soviet society in the process of European integration, while Romania offers the experience of an EU member state with more consolidated institutions. This comparison highlights both common structural challenges and divergent policy trajectories.

The article applies a multidisciplinary methodology that combines comparative legal and policy analysis, case studies, and insights from feminist theory and international political economy. By situating national developments within European and global frameworks, it seeks to illuminate how GBV functions as both a barrier and a catalyst in multicultural and economic relations. The ultimate aim is to identify strategies that can strengthen prevention, protection, and cooperation mechanisms across contexts.

2. Theoretical and Legal Framework

Gender-based violence (GBV) is best understood as a structural phenomenon that emerges at the intersection of social norms, power relations, and institutional arrangements. Feminist theory has long emphasized that GBV is not merely a series of isolated acts, but rather a manifestation of systemic gender inequality that operates through both formal institutions and informal cultural practices (MacKinnon, 1989). It reflects historically entrenched patriarchal structures, wherein power is unequally distributed between men and women, often reinforced by legal frameworks and social expectations.

2.1. Intersectionality and Multicultural Contexts

The concept of intersectionality, developed by Kimberlé Crenshaw, provides a critical analytical tool for understanding GBV in multicultural societies (Crenshaw, 1989). Intersectionality highlights how gender interacts with other social categories, such as ethnicity, class, migration status, or religion, to produce differentiated experiences of violence and access to protection. For example, a migrant woman from a minority community may face multiple layers of discrimination simultaneously: as a woman, as a migrant, and as a member of an ethnic group. In European multicultural contexts, these intersections often determine both the forms of violence experienced and the effectiveness of institutional responses.

Intersectional approaches also challenge the universality of legal frameworks, emphasizing that policies designed for majority populations may not fully address the specific vulnerabilities of minority groups (Beijing Declaration, 1995; United Nations, 1979). This is particularly relevant in contexts like Moldova and Romania, where Roma communities and migrant populations face overlapping forms of marginalization (Council of Europe, 2011; EIGE, 2021).

2.2. Legal Frameworks: From Human Rights to Implementation

International law provides a robust normative foundation for combating GBV. The *Universal Declaration of Human Rights* affirms the right to security and dignity (United Nations, 1948), while the *Convention on the Elimination of All Forms of Discrimination against Women* recognizes violence against women as a form of discrimination, obliging states to take proactive measures in legislation, education, and policy (United Nations, 1979). The *Beijing Declaration and Platform for Action* further integrates GBV into global gender equality objectives, framing it as both a human rights and development issue (Beijing Declaration, 1995).

In Europe, the *Council of Europe Convention on Preventing and Combating Violence against Women and Domestic Violence* represents the most comprehensive legal instrument to date (Council of Europe, 2011). It requires states to implement a four-pillar approach: prevention, protection, prosecution, and integrated policies. The Convention is significant because it explicitly addresses the cultural and structural dimensions of GBV, urging states to promote gender equality

and challenge cultural norms that perpetuate violence. It also recognizes the role of civil society, education, and media in transforming societal attitudes.

However, ratification alone does not guarantee effective implementation. Legal harmonization must be accompanied by institutional capacity-building, budget allocation, and cultural change. This gap between legal commitments and actual practice remains one of the central challenges in both Moldova and Romania (Moldova, 2021; Romania, 2016).

2.3. Feminist Economics and GBV

Feminist economics has added a crucial dimension to the understanding of GBV by linking it to economic structures and labor market dynamics (OECD, UN Women, and World Bank, various years). Economic dependency, wage gaps, and unequal access to property and credit often constrain women's ability to leave violent relationships or seek institutional support. At the macro level, widespread violence has measurable effects on national productivity and economic growth (World Bank, 2018).

In multicultural contexts, these economic factors intersect with migration dynamics and labor market segmentation. For instance, migrant women employed in informal or precarious sectors may experience both workplace exploitation and intimate partner violence, with limited access to legal recourse. Feminist economics thus underscores that addressing GBV requires not only legal reform but also economic empowerment policies that target structural inequalities (EIGE, 2021).

3. Gender-Based Violence and Economic Development

Gender-based violence (GBV) generates profound and measurable economic costs at individual, household, and national levels. It limits women's economic participation, reinforces structural inequalities, and hinders inclusive growth (World Bank, 2018). Contemporary development frameworks increasingly recognize that gender equality is not only a moral and legal imperative but also an economic necessity (United Nations, 2015; OECD, UN Women, and World Bank, various years).

3.1. Micro-Level Impacts

At the individual and household levels, GBV affects women's physical and psychological health, which in turn reduces their capacity to engage in paid work or education (EIGE, 2021). Survivors may face absenteeism, reduced productivity, and limited mobility due to injuries, trauma, or fear of retaliation. Economic dependency on perpetrators, common in contexts with persistent gender wage gaps, can trap women in abusive relationships. Feminist economists highlight the “vicious cycle” in which violence undermines women's economic independence, while economic dependency increases vulnerability to violence (World Bank, 2018).

Furthermore, violence has intergenerational consequences. Children who witness domestic violence are at higher risk of experiencing or perpetrating violence later in life, and their educational outcomes are often negatively affected (Beijing Declaration, 1995). This perpetuates a cycle of economic marginalization and gender inequality across generations.

3.2. Macroeconomic Implications

At the macroeconomic level, the economic burden of GBV is substantial. A landmark *World Bank* study estimates that intimate partner violence alone costs between 1.2% and 3.7% of GDP annually, depending on the country (World Bank, 2018). These costs include direct expenditures such as health care, legal services, and shelters, as well as indirect costs like lost productivity, decreased tax revenues, and long-term social welfare expenses. In the European Union, the *European Institute for Gender Equality* (EIGE) estimated the annual cost of GBV at €366 billion, with €45 billion attributed to lost economic output (EIGE, 2021).

These figures demonstrate that violence is not merely a “social problem” but a macroeconomic challenge that affects national competitiveness, labor markets, and fiscal systems. Economies with high levels of gender inequality and weak protection mechanisms experience

lower female labor force participation and slower productivity growth. Conversely, reducing GBV contributes directly to sustainable development by increasing economic resilience and fostering inclusive growth (OECD, UN Women, and World Bank, various years).

3.3. Migration, Multiculturality, and Economic Structures

Migration and multicultural dynamics add further complexity to this economic picture. Migrant women often occupy precarious and informal labor market niches, such as domestic work, agriculture, or caregiving (EIGE, 2021). These sectors are typically underregulated, leaving workers more vulnerable to exploitation and abuse. Moreover, legal insecurity, such as irregular migration status, can discourage victims from reporting violence, perpetuating cycles of economic and physical vulnerability.

Multicultural settings can either exacerbate vulnerabilities or provide spaces for innovation. In some cases, cultural norms that subordinate women's roles may persist within migrant or minority communities, leading to higher risks of GBV and economic exclusion. However, multicultural contexts also foster policy diffusion and intercultural dialogue, enabling governments and civil society actors to adopt innovative approaches (Council of Europe, 2011). For example, EU-funded programs have facilitated cross-border cooperation on victim protection and the exchange of good practices between Romania, Moldova, and other EU neighbors (European Union, 2020).

3.4. GBV, Sustainable Development, and Global Agendas

Addressing GBV is central to achieving the *United Nations Sustainable Development Goals* (SDGs), particularly SDG 5 on Gender Equality and SDG 8 on Decent Work and Economic Growth (United Nations, 2015). The OECD, UN Women, and the World Bank emphasize that combating GBV enhances human capital, boosts labor market participation, and improves institutional trust—all crucial for sustainable development (OECD, UN Women, and World Bank, various years).

In this sense, GBV reduction should be understood as both a development strategy and a requirement for equitable globalization. Countries that successfully reduce GBV create environments that are more attractive to foreign investment, foster stable labor markets, and build stronger social cohesion (World Bank, 2018). Moldova and Romania, through different trajectories, provide instructive examples of how addressing GBV intersects with broader economic and integration processes (EIGE, 2021).

4. European Union Policies and Multicultural Contexts

The European Union (EU) has developed one of the most comprehensive normative frameworks for gender equality and combating gender-based violence (GBV) in the world. This framework integrates human rights protection, gender mainstreaming, and multicultural policy instruments, reflecting the EU's dual commitment to equality and diversity (European Union, 2020).

4.1. Normative and Legal Framework

At the legal level, the *Charter of Fundamental Rights of the European Union* affirms the right to dignity, integrity, and equality between women and men (European Union, 2000). A series of directives and regulations establishes minimum standards for the protection of victims of crimes and promotes gender-sensitive governance. Among the most significant are:

Directive 2012/29/EU on the rights, support, and protection of victims of crime, which sets out procedural guarantees and specialized services for victims, including GBV survivors (European Union, 2012).

Directive 2011/36/EU on trafficking in human beings, which recognizes the gender-specific nature of trafficking and calls for prevention and victim protection measures (European Union, 2011).

The *EU Gender Equality Strategy 2020–2025*, which aims to create a “Union of Equality,” prioritizing GBV prevention, digital violence, and closing gender gaps in the economy (European Union, 2020).

The *Digital Services Act*, which addresses emerging forms of online and digital violence, mandating stronger accountability for platforms and member states (European Union, 2022).

These legal instruments are complemented by soft law measures, funding programs, and strategic frameworks that encourage member states and partner countries to align with EU standards.

4.2. Migration and Multicultural Policy Dynamics

The EU’s multicultural landscape has been profoundly shaped by migration flows, both from within and outside Europe. Between 2010 and 2020, over 20 million people migrated to the EU, many from regions with patriarchal social structures and weaker gender equality protections (EIGE, 2021). While migration enriches cultural diversity, it also creates new challenges for GBV prevention and response, as legal and institutional systems must adapt to culturally diverse populations.

Migrant women are disproportionately affected by GBV due to intersecting factors such as legal status, language barriers, economic dependency, and cultural isolation (Crenshaw, 1989; Council of Europe, 2011). EU policy frameworks acknowledge these vulnerabilities, encouraging member states to integrate intersectional and culturally sensitive approaches into their GBV strategies. This includes training for police, judicial personnel, and social workers on intercultural communication, as well as funding for NGOs that work with minority and migrant communities (European Union, 2020).

At the same time, multicultural settings provide unique opportunities for innovation. Many EU countries have developed community-based programs that leverage intercultural dialogue to prevent GBV, foster trust, and promote reporting. For example, intercultural mediators—often recruited from minority communities—play a crucial role in bridging cultural gaps between institutions and vulnerable populations (EIGE, 2021). These programs are especially relevant for countries like Romania and Moldova, where Roma and migrant communities experience overlapping vulnerabilities.

4.3. EU Enlargement, Neighborhood Policy, and Conditionality

The EU’s approach to GBV is not limited to its member states; it extends to candidate and neighboring countries through the *European Neighborhood Policy (ENP)* and enlargement conditionality (European Union, 2020). Countries aspiring to closer integration with the EU are encouraged or required to harmonize their legal frameworks with EU standards, including ratification and implementation of the *Istanbul Convention* (Council of Europe, 2011).

Moldova’s ratification of the Convention in 2021 was influenced by both domestic advocacy and EU integration incentives (Moldova, 2021). Through instruments such as *Twinning projects*, *TACIS*, and *CERV* funding, the EU supports legislative reforms, capacity building, and cross-border cooperation on GBV issues in neighboring countries.

This conditionality mechanism has proven particularly effective in accelerating legal and institutional change. Romania’s accession process (2000–2007) stimulated major reforms in gender equality legislation, institutional development, and cooperation with civil society (Romania, 2016). Similarly, Moldova’s gradual alignment with EU standards has led to measurable progress in victim protection services and legal frameworks, although implementation gaps remain (Moldova, 2023).

4.4. Digital Transformation and Emerging Challenges

A particularly dynamic area of EU policy development concerns digital transformation and online violence. The increasing prevalence of cyberviolence—including online harassment, non-

consensual sharing of images, and cyberstalking—has prompted the EU to update its legal frameworks (European Union, 2022).

The *Digital Services Act (DSA)* represents a major innovation by regulating platforms and imposing responsibilities on service providers to address harmful content (European Union, 2022). This is especially important for young women and girls, who are disproportionately targeted online. Moldova’s adoption of digital violence legislation in 2023 demonstrates the influence of EU standards in neighboring countries (Moldova, 2023).

As GBV increasingly takes digital forms, EU policies must adapt to new technologies, cross-border jurisdictional challenges, and the role of private companies in shaping online spaces. This evolution illustrates the EU’s broader approach—combining legal harmonization, cultural sensitivity, and technological governance (EIGE, 2021).

5. Case Study: Republic of Moldova

The Republic of Moldova provides a particularly instructive example of how a post-Soviet, multicultural society engages with the challenge of gender-based violence (GBV) while navigating processes of European integration and internal transformation. Moldova’s GBV policies reflect both international pressures—mainly from the Council of Europe and the European Union—and domestic dynamics, including civil society activism and cultural diversity (Council of Europe, 2011; European Union, 2022).

5.1. Legal and Institutional Reforms

Moldova’s legal framework on GBV has undergone a significant transformation since the early 2000s. The adoption of the *Law on Preventing and Combating Domestic Violence* established a legal basis for protective measures, victim services, and sanctions against perpetrators (Moldova, 2008). However, implementation remained weak for over a decade, with insufficient institutional coordination and limited resources.

A major turning point came in 2021, when Moldova ratified the *Istanbul Convention*, signaling a strong political commitment to align its legislation with European standards (Moldova, 2021; Council of Europe, 2011). This led to a series of legal amendments, including the introduction of emergency protection orders, the criminalization of various forms of psychological and economic violence, and the formal recognition of digital violence as a punishable offense.

In 2023, Moldova became one of the first Eastern European countries to adopt a comprehensive legal framework against cyberviolence, influenced by the EU’s *Digital Services Act* and supported by civil society advocacy (Moldova, 2023; European Union, 2022). Institutionally, Moldova established specialized units within police departments and created inter-institutional coordination councils to oversee GBV policy implementation. However, institutional capacity remains uneven, particularly in rural and multicultural areas. Many local authorities lack trained personnel, and inter-agency cooperation is often ad hoc rather than systematic (Moldova, 2023).

5.2. Multicultural Realities and Vulnerabilities

Moldova’s population is ethnically diverse, including significant Ukrainian, Russian, Gagauz, Roma, and other minority communities (EIGE, 2021). This multicultural context creates both opportunities and vulnerabilities in addressing GBV. Some communities retain patriarchal social norms that discourage reporting violence or seeking institutional support. For example, early marriages and extended family hierarchies can limit women’s autonomy, particularly in rural Roma communities.

Language barriers and mistrust of state institutions also pose obstacles. Minority women may have limited access to information about their rights or available services, especially if they live in isolated regions. These factors contribute to underreporting, which remains one of the central challenges for Moldovan authorities (La Strada Moldova, various years).

At the same time, multiculturalism has spurred innovative community-based approaches. For instance, some local NGOs and municipalities have introduced intercultural mediators—often recruited from minority communities—who act as cultural brokers between victims and institutions. This strategy has shown promising results in Roma communities and in areas with significant migrant populations, improving trust and increasing referrals to support services (La Strada Moldova, various years; Moldova, 2023).

5.3. Role of Civil Society and International Actors

Civil society organizations have been instrumental in advancing Moldova’s GBV agenda. The NGO *La Strada Moldova*, for example, has played a central role in promoting digital violence legislation, providing victim assistance, and conducting awareness campaigns (La Strada Moldova, various years). The *Women’s Law Center* and other local NGOs offer legal aid, shelters, and training for professionals.

These NGOs often function as bridges between international norms and local realities, translating EU and Council of Europe standards into practical tools and advocating for institutional change (Council of Europe, 2011). Their efforts have been supported by international donors such as *UN Women*, *OSCE*, and the *EU Delegation*, which have funded projects on capacity building, victim protection, and data collection (UN Women, various years).

Moldova’s alignment with EU standards has also been encouraged through *European Neighborhood Policy (ENP)* instruments and cross-border cooperation programs (European Union, 2020). These have facilitated knowledge transfer and joint training initiatives with Romania and other EU member states, particularly in areas such as protection orders, data harmonization, and digital violence response (Romania, 2016; Moldova, 2023).

5.4. Remaining Challenges

Despite notable progress, Moldova continues to face significant implementation challenges. Underreporting remains pervasive, driven by social stigma, patriarchal norms, and distrust in law enforcement (EIGE, 2021). Institutional capacity gaps persist, especially at the local level, where services are unevenly distributed and often dependent on donor funding rather than sustainable state budgets (Moldova, 2023).

Additionally, cultural resistance to gender equality reforms remains strong in certain regions, particularly the autonomous territory of Gagauzia, where conservative attitudes limit the uptake of GBV policies (La Strada Moldova, various years). Digital violence legislation, while progressive, is still in its infancy in terms of enforcement and public awareness (Moldova, 2023; European Union, 2022).

Overall, Moldova’s experience demonstrates the potential of legal harmonization and international cooperation, but also the limits of top-down reforms in the absence of sustained institutional development and cultural change (Council of Europe, 2011; Moldova, 2023).

6. Comparative Perspective: Romania – Good Practices and Case Studies

Romania represents a more consolidated legal and institutional framework for addressing gender-based violence (GBV) compared to Moldova. Its trajectory reflects both internal legal developments and the transformative impact of European Union accession between 2000 and 2007 (European Union, 2020). Romania’s experience is particularly valuable because it demonstrates how sustained legal reform, civil society engagement, and multicultural strategies can reinforce each other to produce more effective GBV responses.

6.1. Legal Evolution and Institutional Consolidation

Romania began developing its legal framework on domestic violence in the early 2000s. The first *Law No. 217/2003 on Preventing and Combating Domestic Violence* marked a starting point, but implementation remained weak due to limited funding and institutional fragmentation (Romania, 2003). Over the next decade, pressure from civil society and the EU accession process drove significant legislative improvements.

Key milestones included:

The introduction of emergency protection orders in 2012, which enabled police to remove aggressors from households within 72 hours without requiring the victim to file a formal complaint (Romania, 2012).

Ratification of the *Istanbul Convention* in 2016, which strengthened Romania’s obligations to adopt comprehensive GBV policies (Romania, 2016; Council of Europe, 2011).

The *National Strategy for Preventing and Combating Domestic Violence 2021–2027*, focusing on prevention, digital violence, and interinstitutional coordination (Romania, 2021–2027).

The launch of electronic monitoring systems for aggressors in 2022, designed to ensure enforcement of protection orders (Romania, 2021–2027).

Romania has also progressively expanded its network of specialized services, including shelters, counseling centers, and legal aid. By 2023, the country had over 100 shelters and a national helpline accessible 24/7. These developments reflect a steady institutionalization of GBV responses, supported by EU structural funds and increased national budget allocations (European Union, 2020).

6.2. Civil Society’s Catalytic Role

Civil society organizations have played a pivotal role in driving legislative reform, providing services, and shaping public discourse. NGOs such as *Centrul FILIA*, *Asociația ANAIS*, and *A.L.E.G.* have consistently advocated for survivor-centered policies, strategic litigation, and public awareness campaigns.

Centrul FILIA has been at the forefront of pushing for better protection for Roma women and survivors in rural communities, while *ANAIS* has provided legal aid and strategic litigation to challenge gaps in the justice system. *A.L.E.G.* pioneered educational programs on gender equality and early prevention, targeting schools and universities.

These organizations have also fostered cross-border cooperation with NGOs in Moldova and other EU countries, sharing best practices on protection mechanisms and advocacy strategies. Civil society’s involvement has been critical in monitoring government commitments, especially regarding *Istanbul Convention* implementation and the use of EU funds (Council of Europe, 2011; European Union, 2020).

6.3. Multicultural Strategies and Roma Communities

Romania’s multicultural landscape includes Hungarian, Roma, Ukrainian, and other minority groups (EIGE, 2021). Roma women, in particular, face intersectional vulnerabilities related to poverty, discrimination, and patriarchal traditions (Crenshaw, 1989). Historically, state institutions have struggled to reach Roma communities effectively. However, over the past decade, Romania has developed several innovative strategies:

Deployment of intercultural mediators in Roma communities to facilitate communication between survivors and institutions.

Targeted awareness campaigns in minority languages, often in partnership with local NGOs.

Inclusion of Roma women’s organizations in national GBV policy consultations (Romania, 2021–2027).

These strategies have helped increase reporting rates and improve access to services, although significant gaps remain, particularly in rural areas. Importantly, Romania’s experience demonstrates that multicultural contexts can generate adaptive, community-centered solutions when policy frameworks are inclusive and participatory (EIGE, 2021).

6.4. Digital Violence and Policy Innovation

Romania has also taken steps to address emerging forms of GBV in the digital sphere. Following public debates and NGO advocacy, the *Criminal Code* was amended in 2021 to include provisions on digital harassment, cyberstalking, and non-consensual sharing of intimate images

(Romania, 2021). The government, in collaboration with *Vodafone Romania Foundation*, launched the *Bright Sky App*, a mobile application offering legal information, emergency contacts, and risk assessment tools for survivors (Bright Sky Romania App, 2025).

While enforcement is still evolving, Romania's early attention to digital violence aligns with broader EU trends and provides a valuable model for neighboring countries like Moldova, which is in the early stages of implementing similar legislation (European Union, 2022).

6.5. Lessons from Romania's EU Accession

Romania's EU accession process was a key catalyst for reform. Conditionality mechanisms required the adoption of gender equality legislation, the strengthening of institutional frameworks, and the establishment of monitoring mechanisms (European Union, 2020). EU structural funds enabled the expansion of service infrastructure, including shelters and training programs for professionals.

Moreover, EU integration provided access to transnational networks, facilitating policy learning and the exchange of best practices. Romania's progress illustrates how EU membership can function as both a normative and material accelerator for GBV policy advancement, provided that domestic actors are willing to engage constructively (Council of Europe, 2011; European Union, 2020).

7. New Comparative Insights and Global Lessons

The comparative analysis between Moldova and Romania offers valuable insights that transcend national contexts and can inform broader global strategies for combating gender-based violence (GBV) in multicultural societies. These insights highlight both transferable good practices and the structural challenges that persist across different political, economic, and cultural settings (EIGE, 2021; OECD, UN Women, and World Bank, various years).

7.1. Gradual Legal Harmonization vs. Accelerated Institutional Reform

Romania's EU accession process created a gradual, structured pathway for legal and institutional reforms over nearly a decade (2000–2007). This incremental process allowed for the steady consolidation of specialized services, legal frameworks, and administrative capacities (Romania, 2016). Moldova, by contrast, is undergoing a compressed reform timeline, particularly after its ratification of the *Istanbul Convention* in 2021 (Moldova, 2021; Council of Europe, 2011).

While accelerated reforms can generate quick legal alignment, they often outpace institutional capacity and cultural adaptation. This is evident in Moldova's uneven implementation of digital violence legislation and rural service provision (Moldova, 2023). The lesson for other transitional societies is that legal change must be synchronized with resource allocation, training, and cultural engagement to ensure sustainability (OECD, UN Women, and World Bank, various years).

7.2. EU Integration as a Catalyst for Gender Equality

Romania's experience demonstrates the powerful role of EU conditionality as both a normative and material catalyst for reform (European Union, 2020). Accession negotiations required the adoption of gender equality legislation, institutional strengthening, and cooperation with civil society. Moreover, access to EU structural funds enabled Romania to expand service infrastructure and professional training.

Moldova's status as an EU candidate and *European Neighborhood Policy (ENP)* partner offers similar opportunities, but without the same binding conditionality mechanisms (Moldova, 2023). The lesson here is that regional organizations can play a transformative role if legal harmonization is accompanied by funding, monitoring, and political commitment. This insight is relevant beyond Europe, for example, in Latin America, where regional treaties exist but implementation often falters without sustained incentives (OECD, UN Women, and World Bank, various years).

7.3. Multicultural Mediation and Intercultural Strategies

Both countries show that multicultural contexts do not inherently hinder GBV prevention but require tailored, intercultural strategies (EIGE, 2021). In Moldova, intercultural mediators in Roma and minority communities have improved trust and access to services (La Strada Moldova, various years). Romania institutionalized similar programs more systematically, integrating them into public health and education systems (Romania, 2021–2027).

The global lesson is that multicultural mediation should not be treated as an “add-on” but as a core component of GBV policy. In societies with significant migration or minority populations, such as Canada, South Africa, or EU member states, intercultural strategies can bridge legal frameworks and community realities effectively (Council of Europe, 2011; European Union, 2020).

7.4. Digital Violence as a Policy Frontier

The rapid evolution of digital violence presents a shared challenge for both Moldova and Romania. Romania’s earlier legal amendments and initiatives such as *Bright Sky App* demonstrate the value of early policy innovation (Bright Sky Romania App, 2025). Moldova’s quick legislative adoption shows strong alignment with EU standards but underscores the gap between legislation and implementation capacity (Moldova, 2023; European Union, 2022).

Globally, digital violence has become a transnational phenomenon, often exceeding the jurisdictional reach of national authorities. The lesson is that regional and international cooperation through legal harmonization, joint investigations, and platform regulation is essential (European Union, 2022). The EU’s *Digital Services Act* provides a model that could be adapted in other regions (Council of Europe, 2011; European Union, 2022).

7.5. Civil Society as a Structural Actor, Not a Substitute

Finally, the comparative analysis underscores the critical role of civil society in both countries. In Romania, NGOs have acted as long-term policy drivers, strategic litigators, and service providers (Romania, 2016). In Moldova, civil society has filled gaps left by weak institutions, especially in rural and multicultural contexts (La Strada Moldova, various years).

The global lesson is that civil society must be recognized as a structural partner in GBV governance, not merely a substitute for state services. Sustainable progress depends on institutionalized partnerships, legal recognition, and stable funding mechanisms (OECD, UN Women, and World Bank, various years). This principle is relevant across contexts, from Eastern Europe to Southeast Asia and Sub-Saharan Africa (Council of Europe, 2011; European Union, 2020).

8. Policy Recommendations and Conclusion

The comparative analysis of gender-based violence (GBV) in multicultural and international economic contexts reveals the centrality of gender equality not only as a human rights imperative but also as a driver of sustainable development, social cohesion, and European integration (OECD, UN Women, and World Bank, various years). Both Moldova and Romania offer instructive examples: Moldova illustrates the challenges of legal harmonization and institutional development in a transitional, multicultural society, while Romania demonstrates the transformative potential of EU accession, sustained civil society engagement, and gradual institutional consolidation (Moldova, 2021; Romania, 2016; European Union, 2020).

Based on the findings presented in this study, the following **policy recommendations** are proposed at the **international, national, and community levels**.

8.1. International and European Level

Strengthen implementation mechanisms of international conventions. Instruments such as the *Istanbul Convention* should be accompanied by enhanced monitoring and support mechanisms to ensure that legal commitments translate into tangible institutional and cultural changes (Council of Europe, 2011). EU institutions and the Council of Europe should increase

technical assistance and targeted funding for countries with implementation gaps, particularly in Eastern Europe (European Union, 2020).

Integrate GBV more explicitly into economic policy frameworks. International organizations such as the *OECD*, *World Bank*, and *European Commission* should further develop tools that link GBV reduction with economic competitiveness, labor market participation, and sustainable growth (OECD, UN Women, and World Bank, various years). This approach reinforces the economic rationale for allocating development funding to gender-sensitive policies (EIGE, 2021).

Promote cross-border and regional cooperation. Given the multicultural and migratory dynamics of GBV, the EU should support regional protection networks, cross-border data sharing, and joint training programs between member states and neighboring countries (European Union, 2020). Programs such as *CERV* and the *European Neighborhood Policy (ENP)* could be expanded to foster Moldova–Romania partnerships, particularly on digital violence and minority protection (Moldova, 2023; Romania, 2021–2027).

8.2. National Policy Level

Ensure sustainable funding and institutional capacity. Both Moldova and Romania face challenges in ensuring stable, long-term funding for shelters, legal aid, and prevention programs (Moldova, 2023; Romania, 2021–2027). Reliance on short-term donor projects undermines institutional continuity. National budgets should allocate predictable resources, and multi-annual funding schemes should be institutionalized (OECD, UN Women, and World Bank, various years).

Enhance rural and multicultural outreach. In both countries, rural communities and minority groups remain underserved (EIGE, 2021). Culturally sensitive strategies such as intercultural mediators, minority language campaigns, and partnerships with local NGOs should be scaled up nationally. Roma women and migrant communities require targeted legal awareness and access to services (La Strada Moldova, various years; Romania, 2021–2027).

Invest in training and professionalization. Effective GBV response depends on well-trained professionals across the police, judiciary, health, and education sectors (Romania, 2016; Moldova, 2023). Regular training modules, gender-sensitivity curricula, and interdisciplinary cooperation protocols should become mandatory within national strategies.

Develop digital governance and cyberviolence frameworks. As digital violence evolves, states must adapt legal frameworks, law enforcement practices, and public awareness campaigns (European Union, 2022). Romania’s experience with *Bright Sky App* and Criminal Code amendments can serve as a model for Moldova and other Eastern European countries (Bright Sky Romania App, 2025; Moldova, 2023).

8.3. Community and Civil Society Level

Support grassroots NGOs as key intermediaries. Civil society organizations often act as bridges between international norms and local realities, translating abstract policies into community-based interventions (La Strada Moldova, various years; Council of Europe, 2011). Funding mechanisms should support both large national NGOs and smaller community-based initiatives, particularly in multicultural areas.

Promote gender-transformative education and cultural dialogue. Long-term reduction of GBV requires challenging patriarchal norms through education, public debate, and cultural dialogue (OECD, UN Women, and World Bank, various years). Intercultural programs in schools, community centers, and media campaigns can foster new models of gender relations, especially in multicultural contexts (EIGE, 2021).

Encourage survivor participation in policy development. Survivors should not be passive recipients of policy but active contributors. Involving survivors in designing services, legal frameworks, and awareness strategies increases effectiveness and legitimacy (Romania, 2016;

Moldova, 2023). Romania’s emerging survivor networks provide models for participatory policymaking and empowerment.

8.4. Concluding Reflections

Gender-based violence remains one of the most persistent barriers to gender equality, sustainable development, and multicultural integration (Council of Europe, 2011; OECD, UN Women, and World Bank, various years). In the context of globalization and increasing population mobility, addressing GBV requires multilevel governance that combines legal harmonization, institutional investment, and cultural transformation (European Union, 2020; 2022).

Moldova’s progress in ratifying the *Istanbul Convention*, adopting digital violence legislation, and engaging multicultural mediators represents a significant step forward, though challenges remain in enforcement and cultural change (Moldova, 2021; 2023). Romania’s experience demonstrates the long-term benefits of sustained legal reform and EU integration, particularly in building institutional capacity and civil society networks (Romania, 2016; European Union, 2020).

Ultimately, combating GBV in multicultural contexts is not only about legal compliance but about transforming power relations and building inclusive societies where diversity and gender equality reinforce one another (EIGE, 2021; OECD, UN Women, and World Bank, various years).

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THE 2025 TRUMP-PUTIN SUMMIT: ROAD TO PEACE AND EUROPEAN INTEGRATION

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Abstract: This study investigates the 2025 Alaska summit between Presidents Donald Trump and Vladimir Putin as a diplomatic effort to address the ongoing armed conflict between Ukraine and the Russia. The primary objective is to analyze the prospects for peace in Ukraine, considering the complex interplay of sovereignty, European integration, security guarantees, reconstruction, and strategic resource management. Specifically, the study aims to identify the constraints and opportunities for Ukraine’s future within the European and global political context.

A qualitative research methodology is employed, relying on data sources including speeches, statements, conferences, and organization reports. Key leader’s declarations from the United States, Russia, Ukraine, and European Union countries are interpreted to assess diplomatic intentions and negotiation dynamics. Supplementary data on humanitarian impacts, infrastructure damage, refugee flows, and financial aid are drawn from UNHCR, World Bank Rapid Damage and Needs Assessments (RDNA), and economic reports, enabling an understanding of both material consequences and interests.

The results reveal that peace prospects hinge on three interlinked areas: (i) balancing Ukraine’s potential non-membership in the EU and NATO with robust security guarantees; (ii) addressing sovereignty concerns alongside European Union integration; and (iii) coordinating post war reconstruction with resource management to avoid dependency. European Union member states exhibit diverging positions, reflecting economic, security, and geopolitical considerations. The study concludes that the most sustainable path to peace is a hybrid strategy in which the Ukraine abandons the desire of EU membership, obtains security guarantees from non-NATO partners, forms economic cooperation agreements, and keeps full control over its mineral resources.

Keywords: peace negotiations, Trump-Putin summit, European Union integration, explosive remnants of war, reconstruction, rare earth minerals.

JEL Classification: F51, F52, H56.

1 Introduction

The 2025 summit in Alaska between President Donald Trump and President Vladimir Putin has been presented as a pivotal moment in the attempts to address and end the ongoing armed conflict between the Russian Federation and Ukraine. Ukraine wanted a ceasefire, but both the leader of the Russian Federation and the United States pushed the talks towards a peace agreement, which led the path to permanent peace in Ukraine (Kottasová, 2025). This summit signifies not just a potential route to peace. But also, an opportunity to reconsider the broader question of European integration. For over three and a half years, the war has inflicted significant costs on Ukraine, the Russian Federation, the European Union, and the global community at large.

The conflict dates back to February 2022 when the Russian Federation started a special military operation in Ukraine. This ongoing armed conflict is one of the largest wars in the European Union since World War II. The armed conflict quickly escalated into a prolonged confrontation. Because of the war, Ukrainians are facing severe territorial, economic, and humanitarian consequences. Ukraine continues to face rising destruction across infrastructure, housing, and industry. The human and territorial costs of the war have mounted steadily.

On August 16, 2025, Italian Prime Minister Giorgia Meloni said that Only Ukraine can negotiate on the terms and its own territories (**Official website of Italian Government**, 2025).

Ukraine has already lost 20 percent of its territory. If the President of Ukraine Volodymyr Zelenskyy follows the path to restore Ukraine's sovereignty within its 1991 borders, the present battlefield situation and economic crisis do not favour him. On September 21, 2025, President Recep Tayyip Erdoğan of Türkiye stated that Ukraine cannot compete economically with Russia. In his opinion, Europe will not sustain its aid to Ukraine forever (Balachuk, 2025). In addition, the Russian Federation annexed the autonomous Republic of Crimea, the Donetsk, Luhansk, Zaporizhzhia, and Kherson oblasts as a result of independence referendums (Moeckli & Reimann, 2022). The scale of destruction suggests that if the war continues, both territorial losses and infrastructure damage will worsen over time in Ukraine. These factors highlight the urgency of pursuing meaningful peace negotiations.

The 2025 Alaska summit gained international attention because of the role played by President Donald Trump and President Vladimir Putin. The Ukraine war was started during the period of the former President of the United States, Joe Biden. Trump has presented himself as a mediator between the Russian Federation and Ukraine. His engagement opens a new dimension in peace diplomacy. At the same time, President Vladimir Putin has reiterated that Ukraine remains deeply tied to the Russian Federation historically and culturally. He framed the conflict as a tragedy that requires eliminating the root causes of the armed conflict (Official website of President of Russia, 2025).

European Union institutions and leaders face significant dilemmas. The war has placed intense pressure on European countries economies and energy markets. Millions of Ukrainian war refugees have relocated and resettled in European Union member states and European Union candidate states like Moldova (Khan, 2025). This created long term social and financial burdens on the economies of European countries. Moreover, the prospect of further NATO expansion has deepened divisions between the Russian Federation and the West. China also does not welcome NATO expansion eastwards. The 2025 Alaska Summit presents an opportunity to review security agreements concerning both the Russian Federation and Ukraine. One potential solution under consideration is that Ukraine would refrain from joining NATO and European Union membership.

2. Literature Review and Theoretical Framework

The study of peace negotiations and conflict resolution has evolved significantly over the last few decades. Zartman (2001) highlights the importance of “hurting stalemates” and “ripe moments” in conflict resolution, arguing that peace initiatives are most effective when both parties recognize a mutual cost in continued conflict. This approach is particularly relevant to the ongoing Russian Federation–Ukraine war, where prolonged hostilities have produced substantial humanitarian and economic costs, making the timing of negotiations crucial for both sides. Wallensteen (2018) further emphasizes that conflict resolution is not a one dimensional process but involves political, economic, and social considerations that shape the effectiveness of peace efforts.

Peacekeeping and international interventions have been shown to influence the durability of post-conflict peace. Fortna (2004) demonstrates that the presence of peacekeeping forces can prolong stability after civil wars, though success depends on the alignment of security guarantees with local political realities. In the Ukrainian context, NATO and its allied states military assistance to Ukraine illustrates a complex balance between deterrence and peace facilitation. Russian Federation's insistence that foreign troops in Ukraine constitute a threat (Official website of President of Russia, 2025) underscores the delicate interplay between intervention and negotiation, suggesting that peacekeeping efforts must be carefully calibrated to avoid exacerbating the conflict.

The theoretical underpinnings of war also shed light on the roots of the Ukrainian conflict. Fearon (1995) argues that rationalist explanations, including information asymmetries and commitment problems, often drive states to war despite the costs of conflict. This perspective can

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explain the Russian Federation's strategic concerns about NATO expansion and Ukraine's European Union integration, as both are perceived as shifts in the regional balance of power. Mearsheimer (2014) similarly critiques the West's liberal assumptions, suggesting that NATO enlargement and European Union integration efforts contributed to Russian Federation insecurity and the escalation of the conflict. These analyses underscore that understanding the motivations and perceptions of all parties is essential in designing negotiation strategies.

The role of natural resources in conflict dynamics has been extensively studied. Ross (2012) identifies the “natural resource curse,” wherein resource wealth can both finance conflict and generate economic dependence. Collier and Hoeffler (2004) distinguish between “greed and “grievance” motives in wars, noting that resource wealth often incentivizes continued fighting. Ukraine's mineral reserves, including rare earth elements, have heightened its strategic value to both the United States and the European Union (Abdurasulov & Plummer, 2025). Agreements such as the Ukraine United States Mineral Resources Agreement (2025) and the European Union Ukraine raw materials partnership (2021) reflect this reality, tying reconstruction aid to strategic resource access. While these agreements can provide Ukraine with essential financing, they also create potential long term dependencies, highlighting the tension between sovereignty and economic support.

The path of potential European Union integration presents both opportunities and constraints for Ukraine. European Union membership entails the transfer of legislative, judicial, and economic sovereignty to European Union institutions, as experienced by Norway, Switzerland, and Iceland, who opted out of European Union membership to maintain independence. For Ukraine, these sovereignty considerations intersect with security concerns, as European Union membership is often coupled with alignment to NATO frameworks. The literature on European Union integration highlights this tension: member states balance the benefits of collective security and economic cooperation with the potential costs to national decision making autonomy (Moeckli & Reimann, 2022). The debate within the European Union regarding Ukraine's accession illustrates these trade-offs, with some countries advocating for an impartial or non- European Union member model to facilitate peace while preserving Ukraine's sovereignty.

Post-conflict reconstruction theory provides insights into the challenges of rebuilding war torn societies. Wallensteen (2018) emphasizes that reconstruction requires not only financial resources but also institutional stability, social cohesion, and strategic planning. The projected cost of rebuilding Ukraine, estimated at over US\$524 billion (RDNA4, 2024), exemplifies the scale of the task. International assistance is critical, yet tied to both strategic interests and governance concerns. Fortna's (2004) findings suggest that reconstruction success is enhanced when aid is coordinated, predictable, and accompanied by mechanisms to ensure local agency. This is an important consideration given Ukraine's dual relationships with the United States and European Union.

NATO expansion and European security dynamics are central to the conflict's resolution. Mearsheimer (2014) and Sakwa (2015) argue that NATO enlargement toward Russian Federation's borders is perceived as a strategic threat, prompting defensive measures by the Russian Federation. The Alaska Summit of 2025 reflects an attempt to reconcile these security tensions, with proposals for Ukraine to forego NATO membership in exchange for robust security guarantees. The literature suggests that such security arrangements must be credible, enforceable, and mutually acceptable to all stakeholders to prevent renewed hostilities (Charap & Colton, 2017; Kofman et al., 2017).

The intersection of natural resources, international integration, and security guarantees creates a multidimensional negotiation environment. As Fearon (1995) notes, conflicts are rarely reducible to single issues; rather, they involve overlapping economic, political, and strategic dimensions. Ukraine's rare earth and energy resources make it a target of geopolitical interest,

while European Union integration ambitions complicate sovereignty considerations (Ross, 2012; Abdurasulov & Plummer, 2025). Post-conflict reconstruction demands extensive international aid, which is inevitably linked to these strategic interests, creating potential friction between donor objectives and national priorities.

The theoretical frameworks on conflict resolution, natural resources, and European integration converge in their implications for Ukraine’s peace prospects. Zartman’s (2001) concept of “ripe moments” is particularly relevant: the combination of battlefield stalemates, economic pressures on the European Union, and extensive humanitarian costs suggests a critical juncture for negotiation. Wallensteen (2018) and Fortna (2004) reinforce that the durability of peace will depend on careful alignment of security guarantees, economic reconstruction, and respect for sovereignty. The literature on NATO and European Union integration (Mearsheimer, 2014; Sakwa, 2015; Charap & Colton, 2017) highlights the importance of addressing perceived threats and balancing competing interests among regional and global powers.

In conclusion, the specialized literature indicates that resolving the Ukraine conflict requires a multi-pronged approach. Peace negotiations must be timely, sensitive to perceptions of security and sovereignty, and cognizant of the economic and strategic implications of Ukraine’s resource wealth. The European Union’s integration policies, NATO expansion considerations, and international reconstruction efforts form an interconnected set of variables that will shape the feasibility and sustainability of any peace settlement. Drawing on these theoretical frameworks provides a robust foundation for analyzing the 2025 Alaska Summit, Ukraine’s negotiation options, and the broader European security context.

3. Methodology

This study employs a qualitative research design to examine the dynamics of the 2025 Alaska Summit and its implications for the ongoing conflict between Ukraine and the Russian Federation. The methodology combines political discourse analysis, comparative document analysis, and scenario construction to systematically interpret public statements, official documents, and relevant secondary sources. The aim is to understand the strategic positions of key actors, the negotiation environment, and the prospects for sustainable peace in Ukraine.

3.1 Research Design

Given the complexity and multidimensional nature of the Ukraine Russia conflict, a qualitative approach is most appropriate. The study relies on interpretive methods to explore how political leaders frame the conflict, outline conditions for peace, and respond to competing strategic pressures. This approach allows for in depth understanding of discourse, power relations, and strategic considerations without relying on purely quantitative metrics.

3.2 Data Sources

The analysis is grounded in both primary and secondary data sources:

(i) Primary sources: Official statements, press conferences, and interviews delivered by leaders involved in the conflict. For example, President Volodymyr Zelenskyy, President Vladimir Putin, President Donald Trump, Chancellor Friedrich Merz, President Emmanuel Macron, Prime Minister Viktor Orbán, United Kingdom Prime Minister Kier Starmer, Italian Prime Minister Giorgia Meloni, Slovak Prime Minister Robert Fico, President of the European Commission, Heads of State of European Union Member Countries, President Recep Tayyip Erdoğan, Russian Foreign Minister Sergey Lavrov. And official government documents from Ukraine, the Russian Federation, and European Union institutions. Examples include joint statements issued by European leaders, transcripts of press conferences from the 2025 Alaska Summit, and declarations by foreign ministers.

(ii) Secondary sources: Academic literature on conflict resolution, peace negotiations, and post conflict reconstruction; media reports; expert analyses; and statistical reports (e.g., Rapid Damage and Needs Assessment reports, Eurostat statistics, and strategic resources assessments).

These data sources provide a triangulated view of political positions, negotiation conditions, and strategic interests.

3.3 Analytical Techniques

The study employs three complementary qualitative techniques:

(i) Political Discourse Analysis:

Public statements of leaders are analyzed to uncover the framing of the conflict, underlying priorities, and implied conditions for negotiations. Political Discourse Analysis focuses on language choices, recurrent themes, and narrative strategies to identify political intent, rhetorical positioning, and potential negotiation leverage. For example, Putin’s emphasis on shared cultural roots and Trump’s portrayal of himself as a mediator are examined to assess how these frames influence the negotiation process.

(ii) Comparative Document Analysis:

Official documents, agreements, and policy statements are systematically compared to understand convergences and divergences among actors. This includes evaluating security guarantees, economic cooperation frameworks, and post-war reconstruction commitments. Comparative document analysis allows for identifying alignment or conflict between legal agreements, strategic declarations, and policy proposals.

(iii)

Scenario

Construction:

Based on discourse and document analysis, potential negotiation outcomes are constructed to evaluate plausible pathways to peace. Scenarios consider three primary dimensions:

- Security guarantees versus not joining of European Union/NATO membership,
 - Sovereignty versus European Union integration, and
 - Reconstruction requirements versus control over natural resources.
- Scenarios are developed through a structured approach, informed by theoretical frameworks such as Zartman’s Ripeness theory, which assesses the timing and conditions under which conflicting parties are most likely to negotiate successfully. Each scenario is evaluated for feasibility, political acceptability, and potential risks.

3.4 Theoretical Framework

The analysis applies Zartman’s Ripeness theory to assess whether the conditions for meaningful negotiation are present. This involves evaluating “mutually hurting stalemates,” where the costs of continuing conflict outweigh the benefits, and identifying potential “focal points” for agreement, such as security guarantees or economic cooperation arrangements. By mapping leader statements and policy positions against this framework, the study assesses the likelihood of progress toward sustainable peace.

3.5 Criteria for Analysis

- **Leader statements:** Examined for tone, frequency of key concepts (e.g., sovereignty, security, European integration), and framing of compromise.
- **Official documents:** Evaluated for explicit commitments, conditionalities, and legal or strategic implications.
- **Negotiation scenarios:** Constructed based on consistency between political discourse, legal frameworks, and resource dependencies. Plausibility is judged by alignment with the geopolitical context, past negotiation outcomes, and stakeholder incentives.

3.6 Methodological Limitations

- **Reliance on public statements:** The study is limited to officially released statements and media reports; private negotiations and undisclosed positions remain inaccessible.
- **Speculative nature of scenarios:** Constructed negotiation pathways are hypothetical and contingent upon evolving political developments. They are indicative rather than predictive.

- **Rapidly changing context:** The conflict dynamics, international alliances, and economic conditions can shift quickly, affecting the relevance of conclusions over time.
- **Potential bias in sources:** Media reports and secondary sources may reflect political or editorial biases, which are mitigated by cross referencing multiple sources.

By employing this methodology, the study provides a systematic and theoretically informed analysis of the 2025 Alaska Summit and its implications for Ukraine’s peace prospects, sovereignty, and strategic alignment with European and global powers.

4. Results

4.1 Diplomatic Efforts and Political Negotiations

The 2025 Alaska summit has been widely labelled as an attempt to end the war. President Donald Trump presented himself as a moderator between the Russian Federation and Ukraine during the summit. His active engagement gave the peace negotiations global visibility. And raised anticipations that the ongoing armed conflict could shift from battlefield confrontation to diplomatic engagement.

A joint press conference was held between President Vladimir Putin and President Donald Trump in Anchorage, Alaska, on 16 August 2025 (President of Russia, 2025). President Vladimir Putin said that President Donald Trump showed a strong interest in resolving the conflict and in understanding its root causes. He said that the Russian Federation and Ukraine share common roots. He called the war a tragedy and expressed the Russian Federation’s sincere interest in ending it. However, Putin insisted that for any peace settlement to be sustainable. The root causes of the war must be eliminated. President Donald Trump stated that thousands of people were dying weekly and stressed that both he and President Vladimir Putin wanted to end the conflict.

The Ukrainian stance has also shifted toward openness. On 19 August 2025, President Volodymyr Zelenskyy stated that Ukraine was ready to consider any negotiation format. It may be a bilateral meeting with the Russian Federation at the level of leaders or trilateral meeting. This marked a cautious but significant acknowledgment of the possibility of direct dialogue. Russian Foreign Minister Sergei Lavrov said Putin was ready to meet Ukraine’s leader when the agenda is ready for a summit, and this agenda is not ready at all (Ministry of Foreign Affairs of the Russian Federation, 2025). In addition, President Volodymyr Zelenskyy is not willing to go Moscow but he can join the peace talks some other place (Sky News, 2025).

The Russian Federation government has emphasized that security issues cannot be discussed in Ukraine’s absence but equally cannot be resolved without the Russian Federation’s participation. Russian Federation Foreign Minister Sergey Lavrov underlined that discussing Ukraine’s security guarantees without the Russian Federation would be a road to nowhere (Ministry of Foreign Affairs of the Russian Federation, 2025). He recalled that Putin had repeatedly affirmed the Russian Federation’s readiness to engage in any negotiation format regarding Ukraine.

Taken together, these statements show that both Ukraine and the Russian Federation are interested in exploring negotiated peace solutions. Trump’s involvement as a facilitator adds a new dimension by linking the United States influence to the possibility of de-escalation.

4.2 Perspectives of European Union Leaders

There is a division among European Union leaders on how to address peace in Ukraine. Hungarian Prime Minister Viktor Orbán said on September 8, 2025 that the European Union is financing the conflict. The Russian Federation is also funding its own war effort. He labelled this as a “funding race” in which the Russian Federation currently has the lead. Hungarian Prime Minister Viktor Orbán said that Ukraine was a buffer state before the war. And both the Russian Federation and European nations have 50 percent influence in the territory of Ukraine. He also pointed out that the European Union lacks sufficient funds even to restore its own competitiveness. The European Union does not have the money for Ukraine to continue the war. In his view, this

approach risks ruining the European Union economically. He recommended that, instead of relying on Washington, European Union leaders should negotiate directly with Moscow for a comprehensive European Union–Russian Federation security agreement. It should include Ukraine’s decision not to join NATO and the European Union. Hungarian Prime Minister Viktor Orbán said that prolonging the war represents a losing strategy for the European Union (Velhan, 2025).

In Germany, economic concerns and immigration problems have led to calls for diplomacy. There are 1,164,200 Ukrainian war refugees in Germany. In August 2025, Chancellor Friedrich Merz stated that Germany had entered its third year of recession. He emphasized that diplomacy was essential to restore peace in Ukraine. Merz also described the Russian Federation as a European country (Times of India, 2025). He acknowledged that achieving peace might take weeks or months. But he argued that the shared interest in peace made the effort necessary.

France has also expressed interest in peace in Ukraine. On August 20, 2025, President Emmanuel Macron gave an interview to journalist Kristen Welker that the negotiation process could take the following format (Pangambam, 2025). A bilateral meeting between Presidents Volodymyr Zelenskyy and President Vladimir Putin. Then followed by a trilateral session with United States President Donald Trump. And later expanded into a multilateral format involving European Union countries and possibly the participation of Turkey.

A group of countries within the European Union continues to support Ukraine’s integration into the European Union-Atlantic structures. This includes the United Kingdom, France, Germany, Italy, etc. On 16 August 2025, the following European leaders issued a joint statement.

(i) President Macron (ii) Prime Minister Giorgia Meloni (iii) Chancellor Merz (iv) Prime Minister Keir Starmer (v) President Alexander Stubb (vi) Prime Minister Donald Tusk (vii) President António Costa (viii) and European Union Commissioner Ursula von der Leyen. They said that the Russian Federation could not have a veto over Ukraine’s pathway to the European Union and NATO (**Official website of the European Council**, 2025). Similar joint statement is given by the Nordic-Baltic leaders (Denmark, Estonia, Finland, Iceland, Latvia, Lithuania, Norway, Sweden) and Ukraine on September 3, 2025 (Government of Sweden, 2025).

Italy has also pushed for a stronger security framework for Ukraine. Prime Minister Giorgia Meloni floated the proposal of a NATO Article 5 style security guarantee (**Official website of Italian Government**, 2025). It will guarantee collective defense commitments for Ukraine.

The different stances show the lack of consensus within the member states of the European Union. It complicates the development of a unified European Union approach to achieve peace in Ukraine.

4.3 Military and Security Dimensions

The security dimension of the war remains highly sensitive. NATO members and allied states have debated whether to expand military assistance or to shift focus toward peace negotiations.

A coalition of the willing has emerged which consists of 35 countries. The Coalition of the Willing is committed to supporting Ukraine through security guarantees. Most of the members in the coalition are European Union member states. But it also includes Australia, New Zealand, Japan, the United Kingdom, and Canada. Of these 35, a total of 26 countries are prepared either to send military contingents to provide other forms of support. This framework demonstrates the degree of global involvement in Ukraine’s defense. Although it raises the risk of direct confrontation with the Russian Federation.

From the Russian Federation’s perspective, the presence of foreign troops is unacceptable in Ukraine. On 5 September 2025, at the Plenary Session of the 10th Eastern Economic Forum, President Vladimir Putin stated that foreign military contingents in Ukraine would be regarded as legitimate targets for destruction (**Official website of President of Russia**, 2025). He explained

that this was one of the reasons Ukraine had been drawn toward NATO membership. President Vladimir Putin also said that if any peace agreements were achieved. Then such deployments would no longer be necessary. He insisted that the Russian Federation would fully comply with any negotiated security guarantees, provided that they addressed both the Russian Federation's and Ukraine's concerns.

President Vladimir Putin emphasized that the deployment of foreign troops would not contribute to lasting peace in Ukraine. He reiterated his position that Ukraine's deepening military ties with the West were among the root causes of the February 2022 conflict.

On 17 September 2025, Foreign Minister Sergey Lavrov's said that the security guarantees must fully comply with the West's obligations, enshrined in the United Nations Charter and in the OSCE (Organization for Security and Co-operation in Europe) consensus documents adopted in Istanbul in 1999 and Astana in 2010 and Minsk agreements (Ministry of Foreign Affairs of the Russian Federation, 2025).

The difference between Western security initiatives and the Russian Federation perspective highlights the fragility of the situation. The coalition of states supporting Ukraine seeks to build deterrence. The Russian Federation insists that external troop deployments would only prolong the conflict and undermine prospects for peace.

4.4 Humanitarian and Economic Costs

The humanitarian consequences of the Ukraine war are huge. Millions of Ukrainians have been displaced within the country and across the European countries and the Russian Federation. Host countries in Europe continue to face significant challenges in multiple areas. For example, housing, healthcare, and social integration etc. The financial burden on European Union member states and other European countries has grown steadily since 2022.

According to the Rapid Damage and Needs Assessment (RDNA4) prepared between February 2022 and December 2024. Ukraine recorded US\$176 billion in direct damage. Over the next decade, total recovery requirements are expected to reach US\$524 billion. The armed conflict displaced 6.8 million Ukrainian people abroad. 4.6 million people are internally displaced. About 13 percent of Ukraine's housing stock was either damaged or destroyed. It affected more than 2.5 million households. A total of 1,603 healthcare facilities were damaged or destroyed 5,483 cultural and tourism assets were affected. District heating systems suffered damage worth more than US\$2.5 billion. Explosive ordnance contamination covered 138,503 km² of land and 14,000 km² of water. Humanitarian mine action was estimated to cost US\$29.8 billion. Ukraine is one of the most heavily contaminated regions by explosive remnants of war since the Second World War.

These figures illustrate the scale of the crisis. They also show why reconstruction will require unprecedented levels of international support. Beyond Ukraine, the refugee flows have imposed long term pressures on European countries economies, particularly in housing and labor markets.

The European Union's own financial capacity is under a continuously increasing burden. Prime Minister of Hungary Viktor Orbán said that the European Union does not even have sufficient resources to restore its own competitiveness. But the European Union is allocating money to Ukraine. He said that this approach risks pushing member states of the European Union into deeper economic problems. And undermine the European Union's long term stability.

There is an urgency to sign the peace agreement because of the humanitarian and economic dimensions. Reconstruction cannot begin without peace. Both Ukraine and its European Union partners will face worsening social and financial burdens if war continues.

4.5 Financial Contributions

Both military and financial aid have been critical to sustaining the defense of Ukraine and its government functions. The scale of this aid reflects the geopolitical significance of the conflict for the United States, the European Union, and their allies.

Ukraine has received at least €309 billion (US\$360 billion) in aid from 41 countries since February 2022 (Duggal, 2025). The United States is the largest aid contributor. The United States gave €114.64 billion (US\$134 billion) between January 2022 and June 2025. The breakdown of the United States aid is given. (i) military aid - €64.6 billion (US\$75 billion) (ii) financial aid - €46.6 billion (US\$54 billion) (iii) humanitarian assistance - €3.4 billion (US\$4 billion). The European Union Commission and European Council rank second in terms of aid to Ukraine. It delivered €63.19 billion (US\$74 billion). Germany gave €21.29 billion (US\$25 billion). The United Kingdom gave €18.6 billion (US\$21 billion). And Japan gave €13.57 billion (US\$15 billion).

These contributions show the international commitment to support Ukraine in the war. It also underlines the scale of resources diverted from domestic priorities in donor countries. In particular, debates within the European Union have intensified about whether these sums can be sustained indefinitely.

4.6 Mineral Resources and Strategic Interests

Ukraine's huge natural resources have added a further layer of complexity to the armed conflict. Rare earth minerals, oil, and gas reserves make the Ukraine an attractive partner for both the United States and the European Union. These mineral resources raise questions of economic sovereignty and long term dependency of Ukraine.

The Ukraine United States. Mineral Resources Agreement signed on 30 April 2025 by U.S. Treasury Secretary Scott Bessent and Ukrainian First Deputy Prime Minister Yulia Svyrydenko, sets terms for joint investment in Ukraine's mineral wealth and reconstruction projects. Ukraine will allocate 50% of future revenues from new mineral licences to a joint fund shared with the United States reducing the Ukraine's direct control over these revenues.

The United States cannot fully implement the agreement unless the war ends. Around 70–80 percent of the United States rare earth imports come from China at present. This gives the strategic importance of Ukraine as an alternative supplier.

The European Union had already signed a strategic partnership agreement with Ukraine on raw materials in July 2021. Historically, Ukraine's economy has relied on exporting raw or lightly processed materials rather than value-added goods, risking a “commodity-exporting” role that limits profits from manufacturing higher value products like battery components or high-tech alloys. The challenge for Ukraine is balancing relationships with both the European Union and the United States in the field of natural resources.

Ukraine has 5% of the world's critical raw materials. The natural resources worth map of Ukraine is given in figure 1 (Abdurasulov and Plummer, 2025).



Figure 1. Rare earth minerals and other minerals map in terms of money

Source: Abdurasulov and Plummer, 2025

Beyond legal agreements, the geopolitical stakes are clear. Both the United States and European Union member states have strong economic interests in Ukraine's rare earth resources. These interests are tied not only to reconstruction but also to long term industrial competitiveness.

China remains the dominant player in the extraction and processing of rare earth minerals in the world. China controlled around 90 percent of global processing capacity (McNeal, 2025). According to European Union stat, in 2024, the European Union sourced 46.3% of its rare earth element imports from China and 28.4% from Russian Federation. Supporting Ukraine, therefore, offers European Union an opportunity to secure alternative supplies and reduce reliance on its traditional suppliers.

Ukraine's future will depend not only on peace negotiations but also on how it manages its mineral wealth and its foreign policy alignments.

5. Discussion

The results shows that the armed conflict in Ukraine is no longer framed solely as a territorial dispute but it is a multidimensional struggle. It involves sovereignty, security guarantees, economic survival, and global resource competition. The analysis highlights three interlinked areas. (i) Ukraine's Non-EU membership in the European Union versus Integration into European Union-Atlantic Structures (ii) the issue of sovereignty within the European Union framework (iii) and the role of reconstruction tied to mineral resources.

5.1 Non-EU Membership versus Integration in the European Union

President Donald Trump recommended to the Ukrainian President that drops the path to follow the membership in NATO (TOI World Desk, 2025). Viktor Orbán and Friedrich Merz have emphasized that continuing the war is economically unsustainable for the European Union. They push for peace solutions. Ukraine might take Switzerland's approach into account, preserving national independence without joining the European Union. It could resolve the Russian Federation's security concerns. And it will preserve Ukraine's independence.

A joint declaration by Macron, Meloni, Merz, Starmer, Stubb, Tusk, Costa, and von der Leyen explicitly rejected the Russian Federation's veto over Ukraine's NATO and European Union membership. This emphasises the persistence of a strong pro-integration camp within the European Union. They emphasize that security guarantees and institutional integration remain essential for Ukraine's survival. Ukraine's non-EU membership in the European Union lies at the heart of the peace process debate.

Approximately 4.5 million Ukrainians live and work in the Russian Federation. Ukrainian is the third largest ethnic group in the Russian Federation. At the 2025 Alaska summit, President Vladimir Putin emphasized that Russian Federation and Ukrainians share common roots. This cultural closeness can make peace talks easier. And negotiate the peace deal without English language barriers. Emulating the Swiss model has been suggested as a potential way forward for Ukraine. Similar examples include Norway and Iceland. European Union membership raises sovereignty concerns. European States that join the European Union must share elements of legislative, economic, judicial, and immigration sovereignty. United Kingdom ended its 47 years European Union membership in January 31, 2020. Winston Churchill of the United Kingdom is considered one of the founding fathers of the European Union. Countries like Norway, Iceland, and Switzerland had resisted joining the European Union.

European Union membership demands the transfer of the following forms of sovereignty to Brussels. Legislative sovereignty, judicial sovereignty, and economic sovereignty. This has historically been refused by European countries such as Norway, Switzerland, and Iceland, which value independence in these domains. For Ukraine, such a transfer raises additional complications, as joining the European Union while maintaining an impartial position toward European Union political and military affairs may appear contradictory.

Thus, even if an impartial position toward the European Union were maintained in security matters, Ukraine would still face challenges in reconciling its aspirations for EU membership with the sovereignty concessions that accession requires.

On September 2, 2025, President of the Russian Federation Vladimir Putin met with Slovak Prime Minister Robert Fico in Beijing, China. Putin said that Russian Federation never objected if Ukraine joins European Union (Reuters, 2025).

5.2 Reconstruction, Resources, and Strategic Dependency

Post war reconstruction is projected to cost at least US\$524 billion. The United States and the European Union have positioned themselves as central actors in financing and managing this process. The Ukraine–United States Mineral Resources Agreement was signed in April 2025. And the earlier European Union–Ukraine raw materials partnership of 2021. It shows that both sides view Ukraine’s rare earth resources as a strategic asset.

These agreements place Ukraine in a position of economic dependency, potentially amounting to neocolonial influence. (Madali, 2025). 70–80 percent of United States rare earth imports currently come from China, Ukraine will be a potential alternative supplier. Similarly, the European Union, which imports 46.3% from China and 28.4% from the Russian Federation rare earth needs (Eurostat, 2025). The European Union sees Ukraine as a solution to its strategic vulnerabilities.

Thus, Ukraine’s mineral wealth may secure its relevance to Western partners, but at the same time risks limiting its sovereignty over its own natural resources.

5.3 Prospects for Peace in Ukraine

The evidence suggests that peace depends on resolving three overlapping areas:

- **Security Guarantees vs. Non- European Union membership: Hungary is not in favour of Ukraine joining the European Union, but other European Union countries want Ukraine to join them.** The security guarantees must fully comply with the Minsk agreements, United Nations Charter and in the OSCE (Organization for Security and Co-operation in Europe) consensus documents adopted in Istanbul in 1999 and Astana in 2010.
- **Sovereignty vs. European Union Membership: Ukraine wants to join the European Union, but that means sharing some of its sovereignty.**
- **Reconstruction vs. Resource Control: Western countries help with money and technology, often comes with conditions, like access to Ukraine’s minerals, which could make Ukraine dependent.**

Unless these areas are addressed simultaneously, any peace settlement risks being temporary. The path forward may require a hybrid solution. (i) Ukraine should abandon its pursuit of European Union membership (ii) secures robust but non-NATO security guarantees (iii) economic cooperation agreements with the European Union without full membership (iv) retains negotiated control over its natural resources.

6. Conclusion

(i) This study has examined the evolving dynamics of Ukraine’s war and peace prospects. It is drawn on recent political statements, economic data, and strategic agreements. The findings indicate that Ukraine’s future is shaped by three interdependent issues. (a) Non-EU membership in the European Union and NATO versus European integration, (b) sovereignty versus European Union membership, and (c) reconstruction versus resource dependency.

(ii) Hungarian Prime Minister Viktor Orbán, have expressed opposition to Ukraine’s accession to the European Union. He emphasized the huge economic burden of war for the European Union and the need for a negotiated peace settlement with the Russian Federation. A strong bloc within the European Union and NATO insists that Ukraine must be integrated into Western institutions and granted long term security guarantees. This divide shows the lack of consensus in the European Union and complicates collective policymaking.

(iii) European Union membership is attractive for Ukraine, but it could further strain its relations with the Russian Federation and place an economic burden on EU member states, including Hungary and Italy.

Reconstruction and resources add another dimension. With damages exceeding US\$176 billion and recovery needs surpassing US\$524 billion, Ukraine cannot rebuild without massive external assistance. The United States and the European Union have already positioned themselves as central players, linking aid to strategic access to rare earth resources and other mineral resources. While this provides Ukraine with opportunities, it also risks creating long term economic dependency.

(iv) The evidence suggests that a sustainable peace will depend on reconciling these competing demands. A hybrid approach might be necessary, in which Ukraine: (a) Formally declares its decision not to join the European Union, (b) negotiates strong yet non-NATO security guarantees, (c) economic cooperation agreements with the European Union without membership, and (d) maintains control over its natural resources while permitting carefully supervised foreign investments.

(v) Ukraine's choice to pursue European Union membership, integration, or a compromise model will shape its sovereignty and have significant implications for the stability of Europe, including Russian Federation.

(vi) The process of European integration is contingent upon the removal of sanctions imposed by the Russian Federation on Ukraine, the European Union, and other European states, as well as those reciprocally imposed on Russia. These measures also significantly affect countries that maintain an impartial stance regarding Russia's Special Military Operation in Ukraine.

(vii) President Donald Trump needs to actively work with President Vladimir Putin to end the war in Ukraine. Signing of the peace agreement will take some time because there are many countries that are supporting the Ukraine war. Therefore, the President of the United States needs to have great patience as a mediator.

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SESSION IV
**CARPE SCIENTIAM: THE EVOLUTION OF SOCIAL AND
HUMAN SCIENCES IN THE KNOWLEDGE ECONOMY**

SUBTLE MANIFESTATIONS OF PSYCHOLOGICAL ABUSE IN THE ORGANIZATIONAL ENVIRONMENT: FROM GASLIGHTING TO EXCLUSION AND OTHER FORMS OF PSYCHOSOCIAL MANIPULATION

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Abstract: This paper explores the subtle manifestations of psychological abuse in organizational environments, focusing on mechanisms such as gaslighting, social exclusion, and broader forms of psychosocial manipulation. Unlike overtly aggressive behaviors, these practices are often covert, ambiguous, and therefore challenging to detect, report, or sanction. However, their cumulative impact is substantial, leading to adverse outcomes at both the individual and collective level. Employees exposed to such dynamics may experience heightened stress, anxiety, and diminished psychological well-being, while organizations face erosion of interpersonal trust, weakening of social capital, and deterioration of the organizational climate.

The analysis emphasizes that these practices are not limited to individual interactions between colleagues or leaders and subordinates, but may also be embedded within organizational structures, cultures, and power relations. Gaslighting, for instance, undermines employees' confidence in their own perceptions and judgments, while social exclusion marginalizes individuals, depriving them of meaningful participation in group processes. Such mechanisms perpetuate asymmetric power dynamics and silence dissenting voices, ultimately undermining organizational integrity and performance.

In response, the paper advocates for the development of comprehensive institutional strategies that address psychological abuse beyond its overt manifestations. Preventive measures, recognition protocols, and intervention policies grounded in ethical principles are identified as essential for fostering organizational resilience and sustainability. By cultivating a respectful and inclusive environment, organizations can not only mitigate the risks associated with psychosocial manipulation but also enhance employee well-being, strengthen collective trust, and improve overall effectiveness.

Keywords: organizational psychological abuse, gaslighting, social exclusion, psychosocial manipulation, organizational climate, prevention and intervention policies.

JEL Classification: M12, M14, J28, I12

1 Introduction

In recent decades, interest in psychological health and organizational climate has grown significantly, amid the recognition that the performance and sustainability of an organization directly depend on the well-being of its employees. Beyond the obvious forms of verbal or physical aggression, more and more studies highlight the existence of subtle forms of psychological abuse, difficult to identify and sanction, but with profound effects on the emotional and professional balance of individuals.

These behaviors, often manifested under the appearance of normal work relationships, include gaslighting, social marginalization, professional isolation, constant invalidation or subtle undermining of competence. They contribute to the erosion of self-esteem, increased occupational stress and diminished team cohesion. Unlike direct forms of mobbing or harassment, subtle psychological abuse is characterized by intentional ambiguity and a relational dynamic that is difficult to demonstrate, which makes it all the more dangerous.

In the contemporary organizational context, marked by performance pressures, internal competition and rapid transformations, these manifestations can be normalized or even institutionalized by the organizational culture itself. Therefore, a careful analysis of these forms of abuse — from the psychosocial mechanisms involved to the effects on the individual and the organization — becomes essential for understanding and preventing relational dysfunctions and the degradation of the work climate. The purpose of this article is to explore the subtle manifestations of psychological abuse in the organizational environment, focusing on concepts such as gaslighting, social exclusion and other forms of psychosocial manipulation. It also aims to identify the psychological and contextual mechanisms that facilitate the emergence of these behaviors, as well as their implications for mental health and professional performance.

2 Organizational psychological abuse

Organizational psychological abuse refers to repetitive behaviors, attitudes, or practices within an organization that negatively affect the psychological, emotional, or professional well-being of employees.

This can include harassment, intimidation, undermining self-confidence, social isolation, overwork/excessive workload, or creating a hostile work environment, which is not limited to isolated acts, but rather a systematic pattern.

Organizational psychological abuse represents a set of deliberate or repetitive actions or behaviors within an organization that aim to undermine the self-esteem, mental health, or professional performance of employees, creating a hostile and harmful work environment (Einarsen, S., Hoel, H., Zapf, D., & Cooper, C. L., 2011). These behaviors are distinct from ordinary conflicts due to their persistent, systematic nature and the imbalance between the power exercised and the employee's vulnerability.

Psychological abuse in the organizational environment (also called mobbing or organizational bullying) is not always evident. It sometimes manifests through small behaviors, a series of subtle, constant manifestations that are difficult to notice at first glance, but which consistently undermine a person's confidence and autonomy, and are extremely damaging to both the employee and the organizational climate. Psychological abuse in the workplace, often called mobbing or psychological harassment, is often manifested through subtle and insidious behaviors that are repeated over time and are difficult to identify in the early stages (Leymann, H., 1996). These manifestations create a toxic work environment and aim to undermine, isolate and demoralize the employee.

Here are some of the most subtle manifestations of psychological abuse in the organizational environment:

- Gaslighting
- Passive-aggressive communication: Mixed messages: “You did well, but... you know there’s always room for improvement.” Compliments with an ironic tone.
- Social isolation: Exclusion from meetings or informal activities. Ignoring a person’s contributions or presence.
- Undermining competence: Constant criticism, even for minor things. Intentionally impossible tasks or lack of resources. Minimizing achievements.
- Excessive control and micro-management: Obsessive checking, lack of autonomy. Imposing unrealistic deadlines.
- Intentional ambiguity: Unclear instructions, changing rules without warning. “Moving targets”: standards change at the whim of the superior.
- Emotional manipulation: Inducing feelings of guilt: “If you don’t do this, the team suffers because of you.” Veiled threats: “I don’t want you to cause trouble... but you better do as I say.”

Early Signs of Subtle Psychological Abuse in Organizations. Subtle psychological abuse is insidious precisely because its early signs are easy to ignore or attribute to other causes (such as

"the stress of the moment" or "a bad day"). Recognizing these early signs is crucial to stopping the escalation of abusive behavior.

Early signs of subtle psychological abuse include:

1. *Passive-aggressive communication*: • Ironic comments or jokes with negative connotations. • Frequent criticism, but disguised as “advice” or “constructive remarks”. • Messages or emails that convey tension or subtle reproaches.

2. *Isolation and exclusion*: • Excluding employees from meetings, decisions, or team activities without clear reasons. • Avoiding eye contact or direct interactions. • Lack of access to information essential to completing tasks.

3. *Emotional manipulation*: • Creating feelings of guilt or shame for minor mistakes. • Unrealistic promises or constantly changing expectations. • Subtle pressure to do things “outside of official responsibilities”.

4. *Constant criticism and lack of recognition*: • Ignoring employees’ achievements or minimizing their contributions. • Excessive emphasis on small mistakes, ignoring progress or effort. • Constant comparison with colleagues to induce feelings of inferiority.

5. *Digital signals*: • Ambiguous or demeaning messages on internal platforms. • Repeatedly unclear or contradictory feedback.

6. *Behavioral signs in victims*: • Decreased motivation and involvement in activities. • Social withdrawal or avoidance of interactions with certain people. • Increased absenteeism or time spent “outside the office”. • Visible stress, irritability or unexplained mood swings. • Blocking or ignoring important professional communications.

7. *Tense organizational climate*: • Frequent conflicts between teams or individuals. • Lack of collaboration and trust between employees. • Repeated gossip or gossip that affects morale.

3 Communication styles and psychological abuse

The manifestations of psychological abuse in the organizational environment are closely related to the way the aggressor uses and distorts different communication styles to manipulate, undermine and control the victim. Here is an analysis of how the main communication styles can be used to exercise subtle psychological abuse:

Aggressive style (attacking attitude) - the tendency to always be in front, to have the last word, to impose oneself at any cost, even at the cost of hurting and upsetting other people. In order to dominate, any means seem to be usable - intimidation, contradiction, humiliation, compromising others, shocking attitudes and behaviors, revenge, assuming excessive risks. This attitude stimulates aggression and antipathy from partners and has the effect for the person in question of feeling not loved, respected and appreciated, facts that make him even more aggressive - a true vicious circle of aggression is created.

The connection between the aggressive communication style and the subtle manifestations of psychological abuse in the organizational environment is a very close one, because both describe ways in which work relationships can become toxic, even if there is not always direct and obvious violence.

Subtle manifestations of organizational psychological abuse may be disguised as “constructive feedback” or “firm management style,” but in reality include:

Verbal microaggressions: ironic remarks, derogatory jokes, passive-aggressive comments.

Isolation: ignoring someone’s ideas, excluding them from discussions or meetings.

Disproportionate delegation: intentionally assigning impossible or unnecessary tasks.

Devaluation: constant negative feedback, comparing yourself to others to induce guilt or inferiority.

Excessive control: frequent checking, lack of autonomy, insinuation that the employee is not capable.

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Aggressive communication style is one of the main forms through which psychological abuse manifests itself in organizations (Table 1).

Table 2. The link between aggressive communication style and subtle manifestations of psychological abuse in the organizational environment

Appearance	Aggressive communication style	Subtle manifestations of organizational psychological abuse	The connection between them
Way of expression	Raised tone, interruptions, direct criticism, harsh language.	Irony, sarcasm, derogatory remarks disguised as "jokes".	Aggression can be expressed directly or subtly, but the effect is similar: reducing the dignity of the interlocutor.
Attitude towards the other	Dominance, disrespect, imposing your own opinion.	Ignoring, minimizing, excluding from discussions.	Direct or passive aggression sends the same message: "you don't matter."
Feedback	Harsh criticism, negative generalizations ("you never do well").	Constant negative feedback, humiliating comparisons, lack of recognition.	Aggressive communication is often "camouflaged" as feedback, becoming a form of subtle abuse.
Impact on relationships	It creates visible tensions and open conflicts.	It creates latent tensions, distrust, alienation.	Both undermine collaboration and organizational climate.
Emotional consequences	Fear, shame, anger, defensiveness.	Insecurity, anxiety, low self-esteem, burnout.	The psychological effects are cumulative and can become traumatic.
Durability	It's easy to notice and punish if it's constant.	Hard to identify because it's masked in "normal" behaviors.	Repeated and subtle aggression turns into systematic psychological abuse.

Source: Developed by the author

Psychological abuse often uses verbal or nonverbal aggression (tone, gestures, threatening looks) to control, intimidate or reduce the self-esteem of employees. Even when it is not explicit, aggressive communication can take the form of subtle manifestations, such as repeated irony, ridicule in meetings or undermining credibility. Ultimately, this combination generates toxic organizational climate, increased stress, burnout and decreased performance.

Aggressive communication style is the vehicle through which many of the subtle manifestations of psychological abuse in organizations are expressed. Aggressive communication style is one of the visible forms of psychological abuse, and when it is subtle, it becomes more difficult to sanction and more dangerous for the organizational climate.

Manipulatory style (manipulation attitude) - preference for a backstage role, tendency to wait for the right moment to come to light and put oneself in value, tendency to look for hidden intentions behind any statements of others. The person avoids saying openly what he thinks, changes his opinions according to those of the interlocutor, likes to be around the big and powerful (as a compensation for his own weaknesses) hoping to obtain benefits from his proximity to them. It is a way of interaction in which the person seeks to achieve his personal goals by indirectly influencing others, often through hidden or unbalanced power strategies.

People in this category seek for others to do what they would like, but this does not involve open confrontations; it is rather a matter of waiting for the situation to turn in their favor. Often these people "play roles" in various ways, as a sign of insufficient social maturity, this also appears in connection with a weak, precarious, unsatisfactory social status. The problem of manipulative individuals is to hide their weakness, not to be discovered because they too fear the judgment of others and not to be marginalized.

The connection between the manipulative style and subtle psychological abuse:

Manipulative style - the basis of subtle abuse: Manipulation is a tool of control: the person communicates indirectly, induces guilt or fear and achieves their goals without being transparent.

Subtle abuse = manipulation applied repetitively and contextually: In the organizational environment, manipulation is not only between two people, but can be systematic: bosses → subordinates, colleagues → colleagues, group → individual. It becomes subtle abuse when these techniques lead to the devaluation and psychological control of the victim.

Common element: hidden intention: Both forms avoid direct confrontation. The apparently neutral or "funny" message hides a strategy of control and undermining.

Difference in intensity: Manipulation can also occur in occasional interactions, without lasting effects. Subtle abuse occurs when manipulation becomes a constant pattern, generating stress, marginalization and a toxic climate.

Simplified image: Manipulation = tool (communication strategy with hidden intention). Subtle abuse = repeated use of this tool to maintain power and weaken the psychological resistance of another.

4 Manifestations of psychological abuse in the organizational environment

4.1 Gaslighting

The 1938 play *Gas Light*, along with its 1944 film adaptation, is the origin of the term due to the systematic psychological manipulation of the main character on a victim. In the film, a husband tries to convince his wife that she is mentally unstable by manipulating minor elements of her environment, constantly insisting that she is wrong, that she does not remember things correctly when she mentions them.

Essentially, gaslighting is a situation of interaction between a "manipulator" and his "victim", in which the gaslighter asserts that the victim is incapable of correctly understanding reality, that is, is epistemically incompetent (Speer, J. (2021). The gaslighter accomplishes this through various tactics: most often through direct accusations of epistemic incompetence, such as declaring the victim "crazy", or claiming that the victim is imagining things that are not actually happening, other forms, such as when the gaslighter asserts that the victim's identity, whether related to race, gender, or professional experience, prevents them from taking their perspective on certain realities or current events seriously. This form of gaslighting is most often observed in organizational environments and is characteristic of an authoritarian management style.

Gaslighting and cognitive dissonance (Festinger, 1957)

Cognitive dissonance (Leon Festinger, 1957) is the theory that people tend to seek coherence between beliefs, attitudes, and behaviors. When a discrepancy (cognitive dissonance) occurs, the individual experiences psychological discomfort.

Festinger described the universal mechanism of cognitive dissonance and its reduction. To reduce this discomfort, the person: changes beliefs, or changes behaviors, or justifies the situation through rationalizations.

Gaslighting and the connection with cognitive dissonance:

Gaslighting is a form of psychological manipulation through which the aggressor makes the victim question their perceptions, memories, or judgment. This technique exploits the mechanisms of cognitive dissonance reduction. How it works:

- The victim perceives reality in a certain way - but the aggressor insists that it is wrong.

- Cognitive dissonance appears between what the victim knows (“I saw/heard this”) and what they are constantly told (“It seems to you, you are making it up, you are exaggerating”).

- To reduce the tension, the victim begins to modify their beliefs (“Maybe I really was wrong, maybe I am imagining it”).

- Over time, this process undermines the victim’s self-confidence and makes them increasingly dependent on the aggressor to define “the correct reality”.

Gaslighting uses this mechanism abusively: the aggressor intentionally creates dissonance and then steers the victim towards a solution that serves his or her interests (acceptance of the imposed version of reality).

A central feature of gaslighting is the aggressor’s attempt to convince the victim that he or she is epistemically incompetent. This means that the victim is unable to understand some (or all) aspects of reality (including potentially some aspects of themselves).

A second key feature of gaslighting is that the victim herself believes that the gaslighter is epistemically trustworthy, allowing the gaslighter to gain the epistemic leverage necessary to further manipulate the target. Epistemic leverage can be influenced by a number of factors, including (1) differential power relations within the relationship, financial, structural, and/or emotional dependency, (2) the intensity of the emotional connection, and/or (3) the victim’s internalization of socially established stereotypes.

This leverage is used by the abuser to induce doubt in the victim’s ability to accurately understand reality.

Essentially, the victim believes that the gaslighter is a more accurate interpreter of reality, allowing them to accept and internalize the gaslighter’s view of themselves as epistemically incompetent. Once this perspective is internalized, the gaslighter can easily control them.

The final key characteristic of gaslighting is that manipulating the victim’s behavior benefits the gaslighter. This may be due to material gain (appropriating the victim’s possessions) or non-material gain, such as the desire to dominate the person affected by gaslighting or to avoid responsibility for their actions.

4.2 Social exclusion

Social exclusion in organizations is a phenomenon that occurs when an individual or a group of people is marginalized, ignored, or isolated from the rest of the collective, intentionally or unintentionally. (Williams, K. D., 2007)

Exclusion and social identity theory (Tajfel & Turner, 1979)

Social identity theory (Tajfel & Turner, 1979) shows that belonging to a group confers prestige and psychological resources. When someone is excluded, they not only lose access to information, but also part of their professional identity.

Forms of social exclusion in organizations:

Interpersonal isolation - colleagues avoid interactions with a person, do not include them in conversations or activities. Professional ostracism - the person is excluded from relevant projects, meetings, or decision-making processes.

Labeling and stigmatization - an individual is treated differently because of some characteristics (gender, age, ethnicity, religion, social status, sexual orientation, etc.).

Neglect of contributions - a person’s ideas and work are not recognized or are ignored.

Informal exclusion – lack of inclusion in support networks and social relationships in the organization (breaks, social events, informal groups).

Consequences at the individual level: stress, anxiety, decreased job satisfaction, decreased motivation, burnout, intention to leave the organization. Consequences at the organizational level: decreased team cohesion, increased conflicts, reduced innovation and productivity, damaged organizational image.

4.3 Manipulation through social norms

Another subtle form of abuse is psychosocial manipulation through the appeal to social norms and influence. Robert Cialdini (Robert Cialdini, 2001) identified six fundamental principles of persuasion: reciprocity, consistency, social proof, authority, likeability, and scarcity. In organizations, these principles can be misused. For example: "If you refuse to participate in this unpaid project, your colleagues will think you are not loyal to the team." Here we have the normative pressure of the group and manipulation through social proof.

4.4 Subtle Humiliation and Social Drama

Erving Goffman (Goffman, 1959) described social interactions as a play, in which everyone plays their part. In organizations, controlling public image can become a tool of manipulation. For example: a coordinator publicly praises the team, but completely ignores the contribution of a member. This is not direct criticism, but it is humiliation by omission, an “act on stage” that conveys to the group who is and who is not valued.

4.5 Competence undermining

Competence undermining is a form of subtle abuse in organizations in which someone (colleague, manager, client) repeatedly diminishes, relaxes, or questions the professional capabilities of another person — without overt or violent attacks. It is behavior that erodes the reputation, authority, and trust of the victim in an often ambiguous way, difficult to prove and directly confront. Competence undermining is often indirect, often social (exclusion, diminution), and aims to weaken a person’s professional position.

5 Behavioral strategies

What you can do as an individual (practical strategies)

- Document: date, what was said/done, witnesses, evidence (emails, minutes).
- Use assertive responses (short, neutral).
- Ask for concrete feedback: “What exactly do you think should be improved in this deliverable?” (you get objective criteria)
- Alliances: seek support from colleagues, mentors or internal sponsors.
- Planned escalation: talk to your direct manager (without attacks), then with HR if it doesn’t get fixed.
- Protect your reputation publicly: document contributions in reports, emails, and project updates.

What the organization can do:

- Clear anti-harassment policies that include subtle behaviors and safe reporting mechanisms.
- Training for leaders on recognizing microaggressions and how to manage conflicts.
- 360° feedback process and assessments that penalize undermining behaviors.
- Modeling through leaders: transparency in attributing merit, promoting a culture of credit-sharing (sharing recognition for success among all those involved, not just to leaders or visible people.).
- Remedial mechanisms: mediation, coaching, proportional disciplinary sanctions.
- Continuous measurement: annual climate surveys, retention indicators and wellbeing (general health, balance, and satisfaction of employees – both physically, mentally, emotionally, and socially).
- Creating confidential reporting mechanisms so that victims do not fear retaliation.
- Cultivating an inclusive organizational culture, in which validation and recognition are central principles.

6 Conclusion

Early detection of subtle forms of psychological abuse in organizations is not only an ethical but also a strategic issue, essential for maintaining a healthy and productive work environment.

Social psychology provides us with essential concepts to understand subtle abuse: from cognitive dissonance and social identity, to normative influence and the dramaturgy of interactions. Only by recognizing these dynamics can we build healthy organizations, in which each member is valued not only formally, but also psychosocially.

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THE IMPACT OF MIGRATION ON DEVELOPMENT AT THE COMMUNITY LEVEL: THE CASE OF THE REPUBLIC OF MOLDOVA

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Abstract: This paper analyzes the impact that migration has on local communities in the Republic of Moldova. Although it represents a natural process of development of human societies, migration continues to be one of the greatest challenges facing modern societies. The cumulative impact of migration effects on societies in general and their economies has the role of either balancing or unbalancing them. The negative effects of migration are most often attributed to countries of origin and refer to: depopulation of communities from which people emigrated, the exodus of the qualitative workforce, population aging, etc. These effects set up a study subject for multiple scientific researches.

On the other hand, the positive effects are attributed to the host countries and consider reducing the labor shortage, reducing vacancies for unskilled jobs, increasing the economic level, attracting the young population, increasing technical and scientific progress and innovation, etc.

Migration, especially labor migration, represents an important factor generating growth and development, including for the country of origin of the labor force. Moreover, the cumulative effects and development impact of migration tend to be more evident for the country of origin than for the country of destination. Labor migration significantly contributes to raising the standard of living and improving the quality of life in communities of origin, the impact being not only economic and social, but also cultural, political, and demographic.

The study used scientific research methods such as the analytical method, logical and dialectical modeling, comparative and synthesis methods, etc.

In closing, we note that the development impact of migration in the Republic of Moldova has occurred on the entire national economy. The GDP growth in the last two decades has been largely due to remittances, the standard of living of citizens has increased considerably. However, the greatest impact was achieved at the local community level, the benefits being multiple.

Keywords: migration, development, impact, community.

JEL Classification: J61; O0; R1.

Introduction.

Migration from the Republic of Moldova had, in particular, two basic destinations: the European Union and Russia. Towards the end of the 1990s, the main destination of Moldovan migrants was Russia. The main reasons for choosing this destination were that people could move

around freely, it was cheap to move there, and many people spoke the language. More and more people are interested in moving to the European Union. People were interested in the European Union because the countries there had a much higher standard of living, safety and social guarantees. Migration had serious consequences for our society, but it has also had a series of beneficial effects and has substantially influenced the lives of Moldovans.

Migration is a very complicated thing. It affects many areas of society. This has affected most countries in the world. The process of globalization in the 21st century has led to a significant increase in this phenomenon, resulting in new types of migration such as migration for studies, migration for business, security migration due to serious conflicts, etc. But the most common type of migration is still labor migration. The Republic of Moldova is no exception here. According to the National Bureau of Statistics, in 2024, over 908 thousand Moldovans aged 15-64 were living abroad. This group made up almost 40 percent of the working-age population. The number of people leaving Moldova has been increasing steadily, but since 2000, there has been a big rise in the number of people moving abroad. At the moment, it is thought that there are over 1 million people living outside the Republic of Moldova (National bureau of statistics of RM, 2023). Economic constraints and opportunities were the main reason for the spread and structuring of this phenomenon, the intention of migrants, for the most part, being the accumulation of capital. Consequently, in the last ten years the working-age population has decreased by about 5.5%, from 70.5% of the total population in 2015 to 65% in 2025. Obviously, the state in question seriously affects all social and economic processes in the country. As a consequence, there is a decrease in the pace of economic growth or even a decline in economic activity. Among the most worrying are the considerable decrease in the population of Moldova, depopulation, especially in rural communities and the accelerated aging of the population, the exodus of qualified specialists. Some areas of activity of the economy of the Republic of Moldova have been particularly affected, among these being the fields of education, health, but also public administration.

Literature review

The negative influences of migration have been the subject of study for multiple research conducted by scientists. Beyond the negative effects, the phenomenon in question also has a series of beneficial effects. It is clear that most of the benefits came from the countries that received the workers: they were able to fill the jobs that were needed, and the economy grew. But moving people, and moving workers especially, is an important part of why countries grow and develop. It helps the country the workers are from too. The well-known neoclassical theory shows this connection. The theory says that differences in how much people develop in one place compared to another leads to migration. This migration then helps to balance the pace of development between the countries the migrants are leaving and the countries they are going to.

This means that the impact of migration on a country is usually more obvious for the country it leaves than the country it goes to. Migration is a key factor in improving living standards and quality of life in people's home communities. The impact of labor migration is reflected in the economy, society, demographics, culture and politics.

The economic impact of people moving for work is the main factor. It is very important for helping the economy to grow. Migration can help the economy grow, reduce unemployment, and increase the transfer of financial assets such as wages, savings, remittances, investments, etc., which are some of the most important benefits. For the Republic of Moldova, money sent home by Moldovan citizens living abroad has been very important for the national economy. In fact, the country's economic growth over the last twenty years has been largely due to these remittances. For people who live in the countryside, they often depend on money sent to them by family members working in other countries. This money is often very important for their daily lives, and can help them have a better life. In this way, we can say that migration provides resources for economic and social progress, brings economic well-being, by increasing government revenues,

but also by increasing the consumption that immigrants generate and reduces the degree of poverty in communities.

Calculations provided by the International Organization for Migration show that approximately 25 percent of Moldovan families benefit from financial support from relatives working abroad, and about half of them depend entirely on remittances, being deprived of other income. (International Organization for Migration, 2020) Over time, migrants have sent considerable amounts of money to their families and relatives back home. Unfortunately, however, starting in 2022, money transfers to residents of the Republic of Moldova are showing a downward trend. According to data provided by the World Bank, in 2008 remittances from Moldovan migrant workers constituted 33% of the GDP of the Republic of Moldova, in 2023 they decreased to 11.8%, and in 2024 - to 10.5% of GDP, which considerably affects the country's economy and the level of well-being of the population and may lead to an increase in poverty, especially in rural communities. (World Bank Group, 2024) However, the Republic of Moldova remains in the top ten countries in Europe and Central Asia that benefit from remittances, holding sixth place in this ranking, according to the World Bank Report for 2024 “Remittances Slowed in 2023, Expected to Grow Faster in 2024”. (World Bank Group, 2024)

The calculations of the National Bank of Moldova reflect that in 2024, transfers exceeded just over 1.6 billion US dollars, in 2023 the amount transferred was approximately 1.63 billion dollars, and in 2022, it amounted to 1.74 billion dollars (an increase of 133.91 billion dollars compared to 2021). (NBSRM, 2024) Despite the fact that remittances have decreased considerably in the last three years, Moldovans continue to financially support their families and relatives back home.

However, the migration phenomenon should not be analyzed only through the quantitative approach (number of emigrants, amount of remittances transferred to the country). Migration as a mass phenomenon must be studied from the perspective of its impact on “changing consciousness and developing individual and collective human potential”, which in turn substantially influences people's livelihoods, especially in rural areas. Therefore, migration contributes to the development of communities in various ways. A special role belongs to innovative social behavior, which allows migrants to create significant changes in their communities of origin, combining their unique talents, knowledge and resources to address complex problems in innovative ways. In contact with the outside world, our countrymen bring with them a new civilization, a new approach to living together in their community of origin. The import of a new attitude towards everything that means living together is manifested in various forms: from the desire to get involved in solving collective problems and participating in the decision-making process, the protection of public goods (parks, monuments, holy places, etc.), the attitude towards the accuracy and planning of the community's territory (there are fewer and fewer communities where garbage is thrown into open spaces, the population showing increased interest in the development of services), to the preservation and promotion of local values, traditions and customs, etc. Our fellow citizens understood that progress must start from within, from changing their mentality and attitude towards what belongs to them. The transfer of know-how and knowledge, the emergence and spread of new skills have significantly influenced the increase in the standard of living of the population, especially in rural communities. This “knowledge capital” circulates between migrants' destination and origin countries, including through social networks.

The impact of migration on community development also occurs through the contribution of migrants to the modernization of local communities, with the change in the appearance of communities becoming increasingly visible over time. Moldovan communities have essentially changed their appearance by building new houses, reforming traditional houses, renovating households, fences, cultural institutions, etc. There is a direct relationship between labor migration and building a house in the community of origin. Most of the time, the home built by migrants in

the community of origin becomes a materialization of the family's cumulative financial efforts, an expression of social success, which acquires a special significance, despite the short period in which it is inhabited.

Moreover, on the occasion of the temporary or permanent returns of migrants to the country, as a result of the somewhat ostentatious display of the wealth accumulated abroad, as well as the homes they have built, a true culture of migration spread among the community of origin, which over the years has incited more and more locals to emigrate, in order to reduce the relative deprivation in relation to the migrant group. The house built in the community by the migrant becomes an expression of family and individual success, being one of the visible effects of migration abroad, because “it is not enough to earn, this money must become visible in the eyes of others”. In this regard, an eloquent example is the village of Corjeuți, Briceni, whose fame spread throughout the country after the press called it “Little Paris”. In the Corjeuți community, the house is linked to the family's honor, which has led young people to make great efforts to build a home. For many people, the built house has more of a symbolic value than a utilitarian one, being a sign of the new status accessed through migration. This phenomenon is all the more visible in communities around large cities, where, thanks to labor migration, the local real estate sector has experienced unprecedented development. Even in the case of countrymen who have chosen to settle abroad, the phenomenon is not improper. Many of them invested in their parents' homes to provide them with a decent living and conditions that they would not have had if the children had not worked abroad. Obviously, for this category of population the utilitarian value is much higher, and pride in the success of their children represents a feeling of special value.

Thanks to migrants, preferences for living comfort and municipal utilities have increased considerably. Although living conditions have improved significantly over time, people's general life aspirations have not stopped growing. Labor migration has had a significant impact on increasing the quality and comfort of life, also developing the locality's infrastructure. At the same time, it has been found that migrants act for the benefit of others and get involved in various projects to develop things like social infrastructure or public services. Modern practices have inspired migrants to be more critical and to come back with higher hopes. These hopes include social criticism and pressure on local governments to create better conditions for people to live in. The process of modernizing infrastructure and utilities is becoming a key part of people's lives. Governments understand that if they don't create good living conditions and provide access to public services, they won't be successful in today's world.

Another impact of migration is that migrants are more interested in community life and help to strengthen the bonds within rural communities. People in the Republic of Moldova are becoming more united and involved in society, politics and their local community. Politically speaking, the diaspora has protected fragile democracy on several occasions, but its most significant contribution has been in ensuring our country maintains its European path. The government could not have achieved its goal of recognizing the European identity of the people of Moldova and confirming our country's European path through the Constitution without the help of the diaspora.

The different ways people get involved show that we need to find ways to encourage migrants to play a part in local development plans. This means we should encourage migrants to get involved in their home communities and be part of the decision-making process. In this regard, national public authorities, as well as local ones, with the support of international organizations and the European Union, have piloted various initiatives to attract migrants to local development processes, but also to encourage return migration to the country. The creation of Native Associations, which were intended to contribute to the development of localities, by implementing joint projects, together with local authorities and community members, was a very important step in the context of these initiatives. It is nothing more than a way to implement a new approach to

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the development of Moldovan communities, by involving and mobilizing natives who have left their localities of origin. Local public authorities tend to capitalize on migration and transform this phenomenon from a challenge into an opportunity for the development of localities.

At the national level, the efforts of public authorities have focused on creating the necessary regulatory and institutional framework: developing public policies, adopting regulatory acts, identifying institutions responsible for communicating with migrants, etc. The establishment, in 2012, of the Office of Diaspora Relations represented an important step in achieving this objective. The National Strategies: “Moldova 2020”, “in the field of migration and asylum” (2011-2020; 2021-2030); “Diaspora-2025”, as well as the Action Plans regarding the implementation of these Strategies constituted the first normative acts aimed at involving migrants in the processes of development and modernization of our country. A series of Government decisions, such as: Decision No. 200/2016 on the approval of the National Strategy “Diaspora-2025”, Decision No. 735/2016 on the organization of Diaspora Days, Decision No. 725/2017 on the Mechanism for coordinating state policy in the field of diaspora, migration and development, Decision No. 801/2018 on the approval and implementation of the Diaspora Home Succeeds “DAR 1+3”, Decision No. 107/2022 on the approval of the Program, Government Activity Program for 2021-2025 “Moldova of Good Times”, Decision No. 674/2023 on the approval of the National Program for stimulating returns and facilitating the (re)integration of citizens of the Republic of Moldova involved in the migration process for the years 2023-2027, Decision No. 1032/2023 on the approval of the National Program “Diaspora” for the years 2024-2028, aimed to complete and implement the measures in question. At the same time, an important objective of these programs was to facilitate the process of effective and sustainable return and (re)integration of migrants by shifting from an “individual reintegration” approach to a cross-cutting, integrated approach adapted to gender issues.

The Moldovan diaspora, according to the National Strategy “Diaspora-2025”, is structured in about 250 associations in over 30 countries, including various initiative and professional excellence groups. (Government of RM, 2016) The most numerous associations are registered in Italy, Romania, Ukraine, Portugal, France, the USA, Canada and the Russian Federation. The typology of diaspora associations is complex and diverse, depending on the legal status, the model of management of activities and the field of activity. Their main task is to maintain cultural ties with their homeland, participate in the decision-making process, and support the state’s efforts in the process of democratizing society. Migrants and their associations, local authorities, civil society, non-governmental organizations, the private sector, the academic environment, etc. become key actors in development cooperation.

Migration also has a direct impact on the skills market, also bringing about structural changes in the national labor market. The realities of national experience attest that as early as the late 1990s, the most visible changes in the qualifications market occurred in the construction field. Most Moldovans who have left the country have invested in housing. This has included building new houses and renovating old ones in rural areas, as well as buying a lot of property in big cities, especially in the capital, Chisinau. Because of this, there is now a lot more demand for people with qualifications in construction. There is now a lot more demand for these qualifications, and this has led to more people wanting to study for these professions. A growing number of young people are choosing to study construction. This has also meant that people working in construction now earn more. They are among the highest-paid people in the country. In this situation, there is a high demand for people with building and construction qualifications in local communities. These qualifications will make sure you have a secure life.

The transportation market is another area where communities are exploring new opportunities and making economic progress. The transport of construction materials, migrant passengers and parcels has seen a big increase in business. This field has become more and more

varied, with lots of different activities and jobs. This is good for citizens, businesses and the public budget.

There has also been a noticeable increase in the number of qualifications related to local customs and traditions. When people move from one country to another, they often take with them the customs and traditions of their home country. These traditions can also be based on experiences from other countries. When migrants return home, they often encourage other people to take up popular activities again. These activities can include handicrafts, carpet weaving, woodworking, pottery and artistic trades. Sometimes, migrants even start small businesses based on these activities.

The impact of migration at the community level was also produced through the considerable expansion and development of the entrepreneurial spirit. The new entrepreneurial knowledge and skills acquired through migration by our conational are increasingly being applied in local communities. Returning home, migrants initiated and developed numerous businesses in various fields. Among those that have given new life to local communities are businesses in the fields of agriculture, beekeeping, animal husbandry, rural tourism, traditional cuisine, etc. In this context, migrants have invested not only their own savings, but also resources obtained from government and European projects supporting businesses started by returning migrants. Applications for funding for these businesses have been increasing, especially in the last ten years. Additional funding, modern practices learned abroad, and accumulated experience have enabled migrants to develop businesses based on a new culture and a newly discovered philosophy. Against the backdrop of numerous new businesses, those in the agricultural field recorded the highest performances. The new models that returned migrants developed were radically different from those previously used in our country, the technology, digitalization, and sustainable solutions being the key factors in the development of a modern agricultural business. Currently, an increasing number of farmers are adopting these practices, thereby contributing to the modernization of Moldovan agriculture. Several other benefits result from these practices: increased competitiveness, exports to the European market, increased turnover, and improved living standards in the community.

Favorable changes have also occurred in the zootechnical sector, with the emphasis on quality, new technological processes, digitalization, high-performance equipment, etc. This sector has benefited from increased attention from the state, the farmers benefiting from consistent financial support for the development and modernization of the livestock sector for milk and meat production. A relevant case is the business started by a young family who returned to the country fifteen years ago. The Dutchman and the Moldovan woman established a cattle farm in the Goleni community, Edineț, based on the Dutch model, using state-of-the-art technology and digitizing the entire technological process, which enabled them to achieve the best performance in this field, with the highest milk production. The investment behavior of the owners has also influenced, to a certain extent, the behavior of the community's population. Moreover, the business has attracted considerable interest from local producers eager to learn about new practices for modernizing and digitizing their farms. As a result, the couple is launching a new project – providing training and capacity-building services on farm modernization and digitization for local entrepreneurs. In this way, migrants' experience of working abroad also contributes to the formation and shaping of a new work ethic and business management, awareness of the need to identify alternative solutions the activities carried out, and a better understanding of the value of free time and discipline.

Another impact of migration on community development is achieved through the contribution that migrants make to promoting and developing tourism in local communities. Thanks to migrants, the country's visibility is increasing, with the number of tourists interested in visiting our country continuously increasing. Tourism plays a major role in community development, providing opportunities for social interaction among locals who sometimes lead

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isolated lives in rural communities. Tourism contributes to promoting a new image of rural communities, their values, and cultural events, while also constituting an important source of income. At the same time, tourism contributes to the development of new related businesses, stemming, including from local traditions and customs. Migrants have also played a decisive role in creating tourist complexes based on the crafts of our ancestors, passed down from generation to generation. Activities like pottery, woodworking and weaving are a big part of the country's cultural heritage and are a key part of life in rural communities. Visitors can learn about the complex process of crafts and try traditional food.

Migration has also had a positive impact on the development of local communities. This has been achieved through the creation, development and maintenance of social projects. Examples of these projects include social canteens, supporting the elderly in their communities of origin and supporting vulnerable families. Migration has allowed migrants to share their skills and knowledge with charities. This has helped them start new projects in their home towns and cities. Some projects were done with local public authorities, while others were only done by people who had left the country.

The projects promoted the idea of helping vulnerable people and elderly people who don't have anyone to look after them, especially in rural communities. One example is a project called “Adopt an Elderly Person” that was started by a woman from Moldova who lives in Germany. The project received real support from people living in Moldova outside of the country, and it quickly became part of a larger project – the Mcharity charitable foundation. Thanks to crowdfunding platforms, the project will take more than eight years.

Conclusions

The movement of people from one country to another has increased a lot in the last twenty years and has affected almost all countries in the world. Migration has a big effect on the economy, society, population, culture and politics.

Migration as a mass phenomenon produces both negative and positive effects. It is equally important that studies carried out on this phenomenon focus not only on the negative impact that migration produces, but also on its positive effects.

The impact of migration on the level of development of communities in the Republic of Moldova is undeniable, with visible effects in all areas of social life. Economically, migration has provided resources for economic progress, achieving multiples of the transfer of financial assets.

As a result, in recent years, our country has been among the top 10 countries receiving remittances, according to their share in GDP. Moldovan migrants, especially those who return to the country, invest part of the savings accumulated abroad in the development of their own businesses, contributing to increasing economic performance. In the social field, the benefits of migration have been manifested in many areas of social life, contributing essentially to increasing the standard of living of the population in local communities. Moldovan migrants have brought with them a new approach to common living, contributing to increasing social cohesion, to the modernization of communities, and increasing preference for comfortable living. Of particular value are the social programs that migrants have encouraged or initiated. They have been developed in areas of major importance for society that the authorities fail to fully encompass, are costly, require constant attention, and call for a new approach based on modern practices. Culturally, migration has contributed to increasing Moldova's visibility abroad, promoting and developing tourism in local communities. Politically, migration has favored the acquisition of the European identity of the people of the Republic of Moldova and the irreversibility of the European path of the Republic of Moldova.

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EFFECTIVE ONBOARDING AS AN EMPLOYEE RETENTION AND MOTIVATION STRATEGY

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Abstract: The integration of new employees is a critical stage in the human resources management cycle, with direct effects on retention, motivation and organizational performance. A well-structured onboarding process goes beyond the simple transmission of administrative information, transforming into a strategic mechanism for strengthening organizational culture and developing a sense of belonging. Through personalized programs, which include career guidance, mentoring, managerial support and open communication, employees manage to clarify their roles and responsibilities more quickly, develop their confidence and integrate into the team.

The article highlights the importance of effective onboarding in reducing staff turnover and preventing the costs associated with repeated recruitment, showing that organizations that invest in this stage achieve higher levels of employee satisfaction and involvement. At the same time, the article formulates a series of practical recommendations for organizations: extending integration programs up to 90 days, institutionalizing a mentoring system or "buddy system", organizing interactive activities to strengthen organizational culture, digitizing the onboarding process and integrating periodic evaluation and feedback mechanisms.

The conclusions support the idea that staff integration is not just an initial formality, but a fundamental strategy for retention, motivation and organizational development, with direct effects on performance, innovation and sustainability. Therefore, long-term organizational success is conditioned by the way in which companies build and implement their employee integration policies.

Keywords: Onboarding, Employee Integration, Staff Retention, Organizational Motivation, Organizational Culture, Human Resources Performance

JEL classification: M 12, M 54 J 24, O 15

Introduction

In the current context of the labor market, marked by increased mobility, intense competition for talents and accelerated organizational changes, employee retention and motivation have become strategic priorities for any organization. One of the most effective ways in which companies can achieve these objectives is to implement well-structured onboarding programs adapted to the organizational specifics.

Onboarding is not limited to the administrative process of integrating new employees, but represents a complex strategy of introduction to the organizational culture, values and objectives of the company, facilitating the creation of a sense of belonging and involvement. International

studies (SHRM, Deloitte, Gallup) demonstrate that employees who benefit from an efficient integration process reach their performance potential faster, show a high level of professional satisfaction and present a reduced risk of leaving the organization in the first 12 months.

At the regional level, companies in Romania and the Republic of Moldova are gradually starting to pay increased attention to these programs, but traditional approaches, focused on administrative training and technical adaptation, still prevail. Integrating motivational, cultural and digital dimensions remains a challenge, but also a major opportunity for development.

The specialized literature highlights a solid consensus according to which the integration process – namely the set of programs and activities through which organizations support the adaptation of new employees to the work environment – represents an essential factor in strengthening the long-term relationship between the employee and the organization. A well-designed onboarding directly contributes to increasing loyalty and reducing staff turnover. In contrast, the lack of a coherent onboarding program or insufficient socialization are among the main causes of premature departures from the organization. At the same time, numerous researchers emphasize that although the general impact of onboarding on retention is well documented, in-depth studies are still needed to explain the specific mechanisms through which this process influences employees' intention to leave the workplace. (Mosquera 2025).

A significant gap identified in the literature on professional integration concerns the predominant focus of research on the formal components of the onboarding process, especially on welcome sessions organized at the corporate level. In contrast, other essential dimensions of the process – such as direct interaction with managers and colleagues – have been marginally addressed, although they play a crucial role in facilitating the effective adaptation of new employees. (Cesário and Chambel 2019), The interpersonal relationships developed in the early stages of integration define the social context of the workplace, providing the framework in which newcomers construct their perceptions of organizational culture, form their professional identity, and develop their sense of belonging. In this regard, the literature has long recognized the importance of the social context in shaping individuals' attitudes, (Herrero and Bornay-Barrachina 2024), motivations, and organizational behavior, underlining the need for a more comprehensive approach to the integration process, which includes both formal and relational and cultural dimensions.. (Mosquera 2025).

The analysis of onboarding as a strategy for employee retention and motivation is a particularly relevant research direction for both the specialized literature and contemporary managerial practice. This approach allows the identification and valorization of international good practices, as well as their adaptation to the socio-economic and cultural specificities of organizations in Eastern Europe. In this context, this article aims to explore the theoretical foundations, conceptual models and application examples that highlight the direct impact of an effective onboarding process on organizational performance and sustainability.

Definitions and delimitations of the onboarding concept

In the specialized literature, onboarding is conceptualized as a strategic and multidimensional process through which organizations facilitate the integration of new employees from both an administrative and cultural and social perspective. Its purpose is not limited to the transmission of operational information or initial training, but aims to form a lasting relationship between the individual and the organization, based on trust, involvement and identification with institutional values.

Unlike traditional induction or professional orientation programs, which focus mainly on procedural and compliance aspects, onboarding has a strategic dimension: it aims to align new employees with the organizational culture, thus facilitating psychological and social adaptation to the work environment.

Onboarding is also often defined as a deliberate and systematic integration process through which new employees are supported to become active, competent and involved members of the team in an optimal timeframe. By familiarizing them with organizational values, policies, internal processes and objectives, this process contributes to reducing uncertainty, increasing trust and accelerating individual performance.

In essence, an effective onboarding process ensures a coherent and positive transition to the new professional role, supporting both the development of human capital and the strengthening of organizational cohesion, essential factors for the long-term success of the organization.

Employee integration plays an essential role in a company's success. An effective onboarding process is a major determinant of job satisfaction, productivity growth, and employee retention. Empirical research confirms that people who benefit from structured and consistent onboarding programs are approximately 69% more likely to remain with the organization for at least three years, compared to employees who do not benefit from such programs (Bauer, 2010).

Effective onboarding helps clarify role expectations, build functional interpersonal relationships, and develop essential skills for professional performance.

Thus, onboarding is not just an administrative step, but a strategic human resources management tool, with a direct impact on the long-term success of the organization. (Männicke 2025).

HR leaders who invest in onboarding processes create value for the organization. Stofkova and Sukalova (2020) emphasize that a competent workforce reflects a strategically aligned HR function that lays the foundation for employee engagement. Furthermore, developing HR competencies that invest in people demonstrates a concern for the employee, creating value for the organization and strengthening employee trust in relationships (Sharma and Stol, 2020). An essential first step for a new employee is the initial contact with the organization, which establishes a secure foundation for connection. Through effective onboarding processes, organizations can ensure that new employees have a basic understanding of goals and strategy, which can help them integrate and orient themselves to their new environment (Caldwell & Peters, 2018). In addition, effective onboarding contributes to the internalization of personal interests that translate into a dedicated workforce that supports leadership and the achievement of organizational goals (Carpenter, 2023).

The Importance of Onboarding for Retention and Motivation

Onboarding is one of the most powerful tools through which organizations can influence employee retention and motivation from the very first days of activity. Recent studies confirm that the first 90 days are critical for shaping employees' perception of the company, for their level of satisfaction and for the decision whether or not to stay in the organization long-term.

Through a properly organized onboarding process, the retention rate of new employees increases, as they are no longer tempted to resign after a few days or a few months, feeling that they cannot get used to the working environment. At the same time, with the help of onboarding, new employees have the opportunity to get to know their colleagues and collaborate more closely with them - an essential aspect for creating a pleasant working environment.

Below are the key elements that describe the importance of employee integration:

Increased employee loyalty and commitment

Employees who undergo a coherent and effective onboarding process tend to develop a higher level of organizational loyalty and commitment. Positive experiences in the early stages of the activity, characterized by support, appreciation and open communication, contribute significantly to strengthening the emotional bond between the employee and the organization. Consequently, these employees demonstrate increased involvement in the professional roles assumed and in the mission and institutional values of the company.

In the long term, well-integrated employees favor organizational stability, generating a more productive and cohesive workforce. Organizations that strategically invest in onboarding programs create a professional environment characterized by trust, involvement and motivation, determinants of sustainable performance. (Männicke, 2025)

Reducing Turnover and Recruitment Costs

Staff turnover is one of the most costly problems for organizations, generating additional expenses with recruitment, training, and lost productivity. Through a properly organized onboarding process, the retention rate of new employees increases, as they are no longer tempted to resign after a few days or months, feeling that they cannot get used to the work environment.

Role Clarity and Expectations

A well-structured and comprehensive onboarding process should provide new employees with a detailed and clear understanding of the professional role, including the duties, responsibilities and related performance standards. Role clarity significantly contributes to reducing the uncertainty, anxiety and sense of disorientation specific to the adaptation period, facilitating the rapid transition to operational efficiency. At the same time, providing an explicit perspective on organizational expectations determines employees to assume their responsibilities with confidence and autonomy, which favors the increase in the degree of involvement and job satisfaction. Consequently, this approach strengthens staff retention and supports the building of a stable and performing organizational culture, oriented towards long-term development. (Pappas, 2024)

Enhanced Business Performance and Growth

A well-designed onboarding process has a positive systemic impact on organizational performance. Employees who have a clear understanding of their roles and responsibilities demonstrate higher levels of individual performance, directly contributing to increased productivity, operational efficiency, and customer satisfaction. As a result, these cumulative effects support the organization's sustainable development and competitiveness in the market.

In addition, supporting new employees from the initial stage accelerates the adaptation process, significantly reducing the time to reach optimal performance and the costs associated with training. By strengthening staff retention, effective onboarding contributes to reducing recurring recruitment and training costs. Organizations that invest strategically in this process build stable, competent, and motivated teams capable of supporting an organizational culture oriented toward excellence, innovation, and continuous improvement, essential factors for long-term success. (Männicke, 2025)

Strengthening organizational culture

Onboarding is also a tool for transmitting organizational values, norms, and practices. Through socialization, mentoring, and cultural training, new employees quickly understand how the company works and how they can contribute to the collective success. This generates emotional involvement and strengthens the sense of belonging to the organizational community.

The structural and functional differences between different positions and organizational contexts determine the need for new employees to be systematically and intentionally familiarized with the organization's core values, mission, and social dynamics, in order to ensure a coherent, efficient, and sustainable professional transition. Since the level of identification and alignment of new members with the organizational culture may vary depending on individual and contextual factors, a well-designed and structured integration process becomes essential for facilitating the social learning process and for internalizing the norms, behaviors, and principles that regulate organizational activity.

Thus, the detailed and coherent presentation of the organization's value and cultural framework is not limited to a simple informative component, but represents a strategic tool for socialization and strengthening institutional cohesion. Through it, new employees develop a deep

understanding of the organizational identity, which favors the formation of an authentic connection between the individual and the professional environment. (Pappas, 2024)

Effective Onboarding Methods

The onboarding process refers to the steps a company takes to welcome and integrate a new employee into its organization. The goals of onboarding are to quickly get new employees productive in their roles and connected to the company culture.

Onboarding is a strategic process essential for strengthening organizational involvement and commitment, fulfilling a dual complementary function: familiarizing employees with the operational attributes of the job and, simultaneously, introducing them to the culture, values, and philosophy of the organization.

The most effective onboarding programs do not separate professional training from cultural assimilation, but treat them as interdependent elements of an integrated system, based on the mission and strategic vision of the organization. This approach favors the internalization of corporate values and the development of an authentic connection between employees and the organization, from the early stages of the activity. (Milburn, 2022)

Effective integration programs promote a continuous and two-way dialogue between the employee and the company, helping to reduce uncertainty and create an environment in which new team members feel encouraged to communicate, ask questions, and actively participate in internal processes. This open climate increases the sense of belonging and personal value, stimulating individual involvement and innovation.

In addition, a well-coordinated and phased onboarding process – from pre-onboarding to long-term integration – ensures that employees clearly understand roles and expectations, adapt quickly to the work environment, and align with organizational values. Therefore, a well-implemented onboarding program contributes not only to individual performance, but also to strengthening organizational cohesion and institutional culture. (Männicke, 2025)

According to HR experts and professionals, the onboarding process needs to be done strategically – over at least a year. What a company shows in the first days and months of employment – will have a significant impact on the employee experience, determining whether a business can retain employees. Effective onboarding processes often include: (Fig.1)

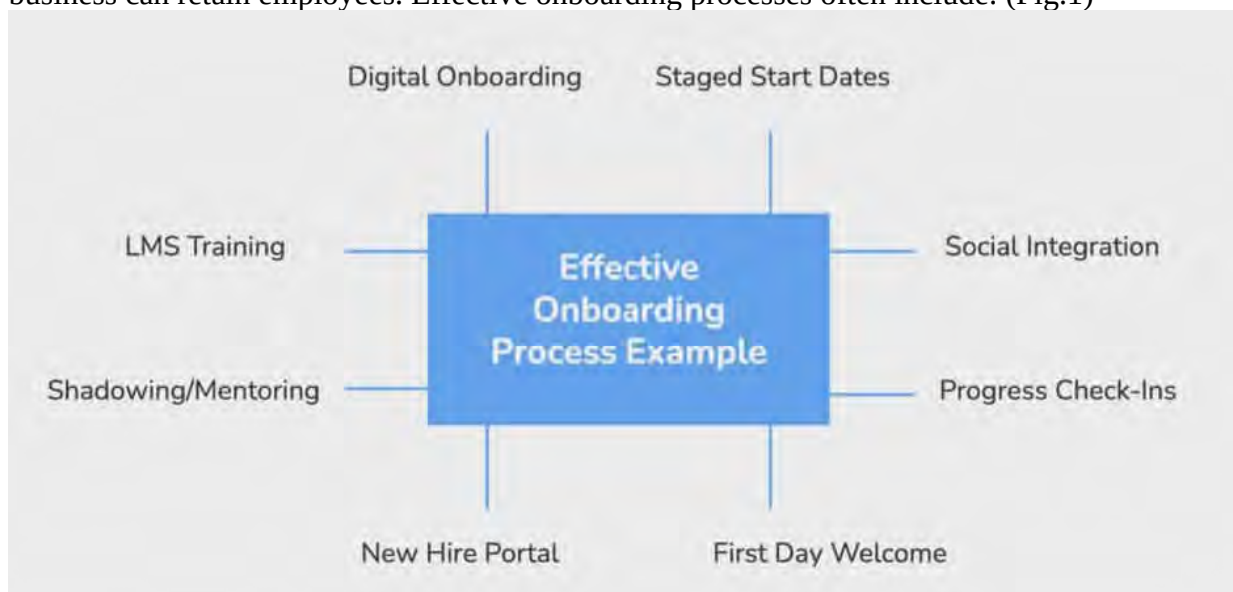


Figure 1. Effective onboarding process.

Source: Jane Ng, (2025)

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Digital Onboarding - By using online platforms and dedicated apps, new employees complete paperwork, watch orientation videos, and create accounts before their start date from any location, in a fast and flexible way. This approach reduces administrative time and facilitates remote adaptation, which is especially essential in the context of hybrid work.

Staged Start Dates - Instead of all new employees starting on different days and being integrated individually, companies organize onboarding “waves”, in which groups of employees start together. Groups of 5-10 new employees start each week for basic onboarding sessions together, such as cultural training. This method strengthens social cohesion and reduces costs by standardizing the process.

30-60-90 day plans - These plans set clear goals for the first three months of activity, monitor progress and provide a structured direction for development. Managers set clear goals for understanding responsibilities, meeting with colleagues, and getting them up to speed within the first 30/60/90 days. This way, the employee has precise benchmarks and receives constant feedback on their progress.

LMS (Learning Management System) Training - Through digital learning platforms, new employees can access online courses, videos, and interactive tests. New employees go through mandatory compliance and product training using an online learning management system. LMS allows for personalization of training and provides detailed reports to managers, who can assess the degree of progress and the level of knowledge acquired. (Jane Ng, 2025)

Mentoring and partnership systems - are fundamental strategic tools in the organizational integration process, with the role of facilitating the progressive adaptation of new employees to the professional, cultural and relational environment of the organization. The implementation of these systems involves the deliberate association of each new employee with a mentor or support colleague, capable of providing guidance, constructive feedback and informational, emotional and social support in the early stages of accommodation.

Partnership and mentoring programs have a direct impact on employee performance and retention, as they promote active involvement, a sense of belonging and mutual trust. Thus, the integration of these systems into organizational strategies not only optimizes the onboarding process, but also supports the sustainability of human capital and long-term professional commitment. (Bremner, 2024)

New Hire Portal - The new employee portal is an integrated digital platform designed to facilitate centralized access to essential information regarding the organization's mission, values, policies and benefits. It functions as a strategic communication and orientation tool, providing practical guides and useful administrative resources for the first stages of professional integration. In this way, the portal contributes to optimizing the onboarding process and strengthening the information autonomy of new employees.

First-day welcome - The "first day" stage is a crucial moment in the organizational integration process, having a significant impact on the formation of the first impression and on the establishment of the emotional and cognitive connection between the employee and the organization. This stage represents the starting point of organizational socialization and has the role of transmitting not only operational information, but also symbolic messages regarding the identity, values, and institutional culture.

Typically, this stage includes familiarization activities with the organization's spaces, presentation of the team and relevant actors within the company, as well as symbolic welcoming gestures, such as personalized messages, integration packages with branded materials, introductory sessions or informal social events.

Through these actions, the organization creates a welcoming and motivating climate, which favors the early establishment of interpersonal relationships, the development of a sense of belonging and rapid adaptation to the internal dynamics of the team. (Pappas, 2024)

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Social Integration - This is accomplished through team building activities, interactive workshops, or informal meetings. The goal is to facilitate team bonding and foster a sense of belonging to the organizational community. After-work activities, lunches, and peer introductions help new employees create bonds outside of their formal work duties.

Progress Check-ins - Continuous monitoring of results and feedback during the first few months is crucial. Managers and HR can use reports, 30/60/90-day assessments, and satisfaction surveys to adjust the process and address specific employee needs. Scheduling weekly or biweekly 1:1 stand-ups keeps onboarding on track by flagging challenges early. (Jane Ng, 2025)

That said, it is important to keep in mind that the first impression that the newcomer will form on the organization will condition the perception of the company and the way they will carry out their work within it. It is an important moment, which requires increased attention and detailed planning from the employer. In this way, the newcomer's expectations can be met, and the image of the position held and the company they work for will be at its best.

Conclusion

An effective onboarding strategy is a highly valuable strategic tool for any organization, with positive implications for individual and organizational performance. It significantly contributes to optimizing professional adaptation, increasing the sense of belonging and strengthening commitment to institutional objectives.

For new employees, a structured onboarding process provides clarity regarding the organization's role, responsibilities and expectations, increases trust and professional skills and highlights the institution's commitment to the well-being and development of staff. At the same time, it facilitates the formation of interpersonal relationships and social connections essential for a rapid and sustainable adaptation to the work environment.

At the organizational level, effective onboarding has measurable effects on reducing staff turnover and reducing recruitment and training costs, while contributing to the structural and cultural stability of the organization. Empirical studies show that replacing an employee involves an average cost of approximately 20% of their annual salary, which underlines the importance of investing in effective onboarding programs. (Milburn, 2022)

The analysis of the concept of onboarding highlights that this process goes beyond the simple administrative formality of introducing the employee to the organization. The definitions and theoretical delimitations demonstrate that onboarding is a strategic, multidimensional stage that combines professional adaptation, cultural integration and the consolidation of organizational identity.

The importance of onboarding is confirmed by its direct impact on employee retention and motivation: a well-structured process not only reduces staff turnover, but also contributes to increasing the level of commitment, satisfaction and loyalty to the organization. In a context where recruitment and training costs are high, and competition for talent is intense, investing in an effective integration program becomes a sine qua non condition for organizational success.

Effective onboarding methods – such as structured 90-day programs, mentoring, cultural integration through interactive activities, the use of digital platforms, and the implementation of regular feedback – demonstrate that the rapid and positive adaptation of new employees can be managed scientifically and strategically. In conclusion, onboarding should be seen as a key human resource management tool that, through consistent and innovative application, transforms the initial employee experience into a catalyst for individual and organizational performance. Therefore, the long-term success of a company significantly depends on how it designs and implements its personnel integration processes.

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HUMAN RESOURCE MANAGEMENT CHALLENGES IN THE CONTEXT OF THE DEVELOPMENT OF ARTIFICIAL INTELLIGENCE SYSTEMS. A CONTENT ANALYSIS

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Abstract: This scientific approach investigates the implications of artificial intelligence (AI) systems on human resource management (HRM). The fast development of AI systems has encompassed all fields of activity, including HRM. At the current stage, AI is replacing human labor, which is leading to substantial changes in the structure of the labor market, in particular in the qualitative content of professional competences. The substitution of human labor by robots or AI systems is becoming a major concern for HR managers. AI systems are also present in all HRM functions. This paper makes a foray into the literature to analyze the extent of involvement of AI in HRM activities.

In this context, mostly papers published in scientific journals indexed in WEB of Science were extracted. In total, 42 papers published in journals related to human resources management on the one hand and to information technologies on the other hand were examined. The research results prove the concerns of researchers for all HRM activities. Thus, AI systems are applied in traditional HRM activities such as: recruitment and selection, training and professional development, talent management, performance management, staff turnover and personnel compensation. Beyond traditional HRM activities, AI systems are also implemented in activities that at first sight would seem difficult to apply, such as job design, employee engagement and job satisfaction.

Regardless of the HRM activities in which AI systems are embedded, the result leads to the reconfiguration of the HRM system within organizations. These are the future trends that will more strongly appear in the structure of the HR function in organizations, and along with it, the reconsideration of the professional competencies of HR specialists. In the process of the implementation of AI systems, the main concern of both HR managers and employees is to comply with ethical principles and to ensure fairness and objectivity in dealing with all categories of employees in the organization.

Keywords: employees, human resources management, artificial intelligence, digitalization, human resources function.

JEL Classification: M12; M54; C88.

1. Introduction

The new trends and challenges taking place in the economy and society have disrupted the content of the HR function in organizations. In this context, Andrei et al, (2023) argue that digitization is driving transformations in organizations across all industries, which is why HRM has a crucial role in the era of digital transformation. Due to changes in the content of work, robotization of technological processes and the use of artificial intelligence (AI) in the work process, HR managers need to find optimal solutions to face greater challenges in the coming period.

AI is one of the most influential technologies changing the labor market (Huang & Rust, 2018), becoming the leading source of business model innovation, process transformation, disruption, and competitive advantage in organizations that embrace a digital and data-centric culture (Ransbotham et al., 2020). According to Berg et al. (2018), AI will have negative effects on the labor market, namely the disappearance of more than 45% of all jobs, becoming a significant source of concern for most employees (Libert et al., 2020), especially those in routine jobs. As a result, social inequalities will deepen further.

At the same time, AI will help to modernize workplaces and reshape HRM activities. Due to the enormous potential of AI on HRM, it will have a significant impact on the future of the HR function. The three components of AI (high-speed computing, the use of big data, and the use of advanced algorithms), help AI to differentiate itself from existing legacy IT applications (Cheng & Hackett, 2019). The ability of AI applications on the rapid processing of large amounts of data helps HR managers to save time and make accurate HRM decisions (Vrontis et al., 2021). In this context, Rabenu & Baruch (2025) are of the opinion that both HRM in general and the HR professional profession in particular will need to undergo a revolutionary rather than evolutionary transformation to remain a necessary and valuable function for all organizations. Integrating AI into key MRU functions can help improve decision making, mitigate bias and boost productivity (Chowdhury et al. 2023).

The aim of the paper is to highlight, based on bibliometric analysis, the impact and benefits of the development of artificial intelligence systems on human resource management in organizations, as well as the challenges faced by human resource managers in order to ensure a balance between employees and employers. Furthermore, the extent of the application of AI both in traditional HRM activities and in some activities where, at first glance, AI seems more difficult to apply, such as employee engagement and job satisfaction, is shown.

2. The relevance of artificial intelligence systems in organizations

The major impact of robotization and AI on the evolution of work content within organizations have posed real challenges for a multitude of researchers in HRM and beyond. Thus, Arslan et al. (2022) explored the challenges faced by HR managers as a result of the interaction between AI and human workers, suggesting the need to develop potentially useful strategies. The rapid expansion and deployment of AI in all spheres of social and economic life has been of concern to researchers in various fields. This has led to the development of a large number of different AI definitions. Thus, Chowdhury et al. (2023) define AI as the capability of a human-created system, consisting of algorithms and software programs, for identifying, interpreting, generating information and learning from data sources to achieve certain pre-determined goals and tasks. In a different approach, Schmidt et al. (2020) argue that AI is the effort to imitate cognitive and human computational capabilities. Likewise, Makarius et al. (2020) argue that AI is the capability of a system for correctly interpreting external data, learning from this data, and using the learnings to achieve specific goals and tasks through flexible adaptation.

In recent years, one dimension of AI has shown up in the increasing visibility of AI-powered machines, including robots, as well as interaction and collaboration with human workers in a

plethora of activities: from industrial manufacturing (Libert et al., 2020) to new product development (Demir et al., 2020). Also, algorithmic big data analytics, sensing and tracking technologies, and metabolic monitoring systems have evolved greatly as AI-based decision-making techniques in the workplace (Nica et al., 2019).

In such a context, previous research has shown how AI influences specific MRU tasks such as: data mining techniques in the selection process of new employees; methods used by intelligent agents for employee development; intelligent sensory mechanisms applied in the process of employee performance appraisal, etc. (Malik et al., 2020; Richards et al., 2019). These growing potentials of AI for MRU may be perceived as both a career advancement opportunity and a daunting behavioral challenge for employees, especially those on the front line, due to threats that AI could take over their job tasks (Arslan et al., 2022).

3. The implications of artificial intelligence in human resource management

The related research shows that AI has direct implications on HRM activities by reshaping and transforming them. In this context, Chowdhury et al. (2023) argue that in the field of HRM, artificial intelligence is alluring as it alludes to the capability of understanding and predicting human behaviour in the organization, in a reliable manner, which is very important for ensuring productivity.

For the most part, existing research on the implications of AI on HRM has focused on the functional level. In this context, Wirkty et al. (2016) noted that AI does not aim to replace managers, but rather to support their decisions related to candidate assessment, employee performance administration, succession planning, career development, etc. (Radonjić et al., 2024). Globally, there is a growing trend of using AI to enhance software and hardware solutions that support HR professionals, aiming to improve various aspects of HRM. A critical review of the current HRM literature suggests that AI-based HRM applications are becoming part of strategic HRM discussions in organizations (Kwan, Hermawan, & Hafizhi, 2019), as it has encompassed almost all HRM subfunctions. In the following, we present how AI is incorporated into HRM activities.

3.1. Recruitment and selection

To this date, there is little information on how candidates react to organizations using AI in the recruitment process for inferring characteristics and extrapolating possible behaviors in terms of job fit and performance. If organizations could collect additional characteristics such as age, body image, gender, health, race, and sexual orientation, they could use such information to better rank candidates in the selection process. In recent years there has been a fast growth and enthusiasm for the use of algorithms to identify potential candidates (Song et al., 2020).

According to Alexander III et al. (2025), selection algorithms automatically identify the target group of candidates who possess characteristics relevant to job outcomes. Recruitment algorithms come in many varieties, from those that use fingerprints to decide who receives online job advertisements, to those that search online job profiles and job boards to generate lists of potential candidates with relevant knowledge, skills, aptitudes, and other characteristics. In most cases, selection algorithms identify and screen potential candidates and then take measures to recruit them for the job.

Their popularity is growing due to the beliefs that they could reduce time-to-hire, increase the quality of new employees, and attract a diverse group of candidates (Ali et al., 2019). Nevertheless, concerns have been raised that candidate selection algorithms pose risks to fairness in candidate recruitment and selection. According to Pearce (2020), poorly designed candidate selection algorithms can create systematic differences between groups in access to employment opportunities, leading to discriminatory hiring outcomes.

3.2. Training and development

The impact of AI on training and professional development is tremendous because it leads to the creation of new jobs and the development of existing jobs on the one hand, and on the other hand it will lead to the disappearance of other jobs. Specifically, AI complements high-skilled jobs, replaces medium-skilled jobs involving programmable routines, and has no effect on low-skilled jobs with unpredictable patterns of work tasks (Gallie, 2017). This leads to further polarization of competences in the labor market. In addition, employees could use AI systems to manage future careers. If employees lack certain skills, AI systems help them identify their training needs and take the necessary courses.

Moreover, online or virtual training offers several benefits for both the organization and individuals. AI helps HR managers to evaluate the effectiveness of training and make decisions about employee competences (Sitzmann & Weinhardt, 2019). According to Hancock et al. (2020), about 30-40% of employees will need to significantly improve their competences in the next decade. In this regard, several multinational companies such as Amazon, Infosys, IBM and Walmart are developing AI-based products and services while investing in the development of technical and soft skills required by human capital

3.3. Performance management

Data-driven decision making in this new era of people analysis has been facilitated by recent advances in artificial intelligence learning algorithms. The term "learning algorithms" refers to a set of technologies that are able to adaptively interpret and learn from large data sets to perform human-like cognitive tasks. AI-based performance management tools and techniques offer multiple opportunities for both employees and organizations. Thus, a multifactorial decision making tool leads to an accurate assessment of employees. In particular, this tool helps to identify employees who need further improvement of certain job aspects as well as the extent of improvement measures (Manoharan et al., 2011). In addition, digital performance tools help managers to evaluate the performance of employees or recommend any necessary improvements and take remedial action for the employee (Azadeh et al., 2018).

3.4. Talent management

AI-based talent management tools enhance career development opportunities and improve workforce satisfaction and performance (Charlwood, 2021). Integrating HRM with AI technologies can boost employee service and improve employee retention rates. AI-based tools help align employee skill sets with organizational requirements, thereby improving the recruitment quality. AI has revolutionized talent acquisition by streamlining different stages of the process.

Talent management intelligence platforms use machine learning methods such as deep neural networks, simple algorithms with regression analysis, natural language processing and voice recognition (Majumder & Mondal 2021). These help job seekers to: find suitable roles, streamline virtual recruitment, reduce biases, aid career planning and help new employees integrate into the organization (Vedapradha et al., 2019). AI has also helped to substantially improve performance management through real-time feedback and analytics. AI-based systems, such as IBM Watson, facilitate objective real-time analysis of employee performance, which helps mitigate bias (Premuzic, 2023).

3.5. Employee turnover

AI is a key player in reshaping employee retention strategies, thus contributing to decreasing employee turnover. Predictive analytics tools play a crucial role in identifying at-risk employees, thus contributing to the design and implementation of proactive retention strategies (Fallucchi et al., 2020;). Analyzing employee data, Jia et al. (2022) showed that AI-based tools have helped to reduce employee turnover.

In the context of the development of AI systems, labor supply requires structural changes, with HR services becoming increasingly intelligent. HR tools integrate machine learning and

artificial intelligence systems to solve employee problems and improve services and the overall employee experience (Venugopa et al., 2024), with the aim of reducing employee turnover.

3.6. Employee compensation

AI systems support HR professionals in the efficient management of all HR payroll and related value-adding activities. This is because AI technologies can track all types of employee data, covering personal details of employees, changes in personal information such as employees' dependents or marriages (Bussler & Davis). In addition, the skills demand-supply mismatch derived from databases helps in determining an organization's compensation and benefits plans (Pessach et al., 2020). Artificial intelligence systems also help managers and experts to collect the most pertinent information about the compensation and benefit schemes needed by employees.

3.7. Job design

With the accelerated development of AI systems, jobs are undergoing profound transformations, which is something that HR professionals involved in this process need to take into account. First, the reconfiguration of jobs is a consequence of the introduction of AI systems, with an impact on the reshaping of related skills. Gartner (2023) finds that 43% of HR managers have explored or implemented AI to improve operational efficiency. AI has made a huge contribution to the development of gig-work, different from traditional or alternative work. From an HR perspective, gig work marks a radical shift from traditional work models and the relationships established between employer and employee (Duggan et al., 2023).

Beyond the fact that gig work involves triadic and sometimes tetradic relationships, it is unique in that gig workers demonstrate limited temporal, administrative, and physical attachment to their organizations (van Zoonen et al., 2023). In the gig-economy, platform organizations rely on HRM algorithms that supervise and manage large groups of remotely distributed workers in an efficient, low-cost, and real-time manner (Jabagi et al., 2024).

3.8. Job satisfaction

Job satisfaction refers to the employee's overall affective appraisal of his or her work situation and overall sense of well-being at the job. Some researchers suggest that job satisfaction largely reflects employees' perceptions of organizational fairness or equity. A study conducted by Ghorbanzadeh et al. (2024) suggests that the adoption and use of AI technologies positively influence employees' innovative behavior, job performance and job security.

The adoption of AI for different MRU practices has had a positive impact on: shaping employee experiences, employee job satisfaction and engagement, reducing intentions to leave the organization (Malik et al., 2020a). Moreover, increased levels of human-machine interactions led to enhanced employee experience and employee-organization fit. All these actions had the effect of increasing job satisfaction.

3.9. Employee engagement

The term employee engagement refers to the commitment, involvement, enthusiasm and dedication that employees feel towards their work and the organization they are part of. According to Agaraval (2025), there are several factors that influence the level of employee engagement namely: organizational culture, value system, leadership styles, trust and esteem among employees, rewards and recognition, and work environment. The fast development of AI has led to a number of employee engagement issues.

Thus, the use of chatbots has provided organizations with the ability to collect, evaluate and provide answers to individual employee concerns in a quick and easy way, making them more successful today in creating an environment where employees feel valued and sustained. According to Rožman et al. (2023), appropriate teams have a positive impact on employee engagement. AI systems provide a large amount of accurate information to team members, necessary for their work and to make more effective decisions (Meslec et al., 2020). Also, Dutta et al. (2022) analyzed trust climate as the way chatbots influence employee engagement.

Although AI-based solutions are gaining popularity and influence in the field of HRM, it is important to follow ethical principles in order to avoid discriminatory and inequitable outcomes. Therefore, the implementation of AI boosts the development of processes and activities related to MRU in order to better leverage human capital within organizations. According to Kiron & Spindel (2019), most HR managers are looking forward to the implementation of AI in organizations, especially for a wide range of tasks such as: candidate recruitment; training; onboarding new employees; and evaluating employee performance. Moreover, managing repetitive operational activities by AI would allow HR professionals to focus more on developing and implementing HR strategies and increasing the value of human capital (Vrontis et al., 2022). Therefore, introducing AI into HR practices provides a more valuable perspective that will lead to considerable improvement in the efficiency of the HR department within organizations. Despite the obvious increase in efficiency that AI brings to organizations, Palos-Sánchez et al. (2022) believe that human resources departments face new pressures associated with balancing these efficiencies and harmonizing staffing levels.

4. Conclusions

The rapid development of artificial intelligence systems is bringing about substantial changes in both economic and social life. Obviously, the development of artificial intelligence has a direct impact on work paradigms and content, substantially changing the professional behavior of employees. In this context, human resource managers have to come up with effective strategies that balance the demands of senior management with the skills of employees. Artificial intelligence systems are shaping and reshaping the content of HRM activities. A large part of the routine and repetitive tasks of human resources departments are taken over by artificial intelligence systems. Under these circumstances, the reshaping of activities within human resources departments is inevitable. The process of implementing artificial intelligence systems is more evident in some HRM activities that have proven their effectiveness over time.

The multidimensional nature of some HRM activities is a challenge for applying artificial intelligence systems. Even so, close cooperation between HR managers and IT specialists has led to the development of tools for monitoring and evaluating employee engagement or assessing employee satisfaction. Research shows that specialists are concerned about these HRM activities, despite the fact that they are subjective and more difficult for humans to interpret and manage fairly and objectively.

Under these circumstances, informing employees about the relevance and advantages of artificial intelligence systems in HRM is important for their rapid acceptance. In order to increase employee confidence in AI systems, time is needed to convince them of their fairness and accuracy. The greatest fears of employees and human resource managers relate to the extent to which AI systems take into account ethical principles to avoid any kind of discrimination and inequality in relation to all categories of employees within organizations.

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PROFESSIONAL COMPETENCY ASSESSMENT IN ECONOMICS STUDENTS: AN ORGANIZATIONAL COMMUNICATION PERSPECTIVE

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Abstract: The paper examines how undergraduate and master’s students at the Academy of Economic Studies of Moldova (ASEM) perceive and value hard and soft professional competences in relation to university education and labor market integration. The research is based on a praxiological approach aimed at identifying perceptual, attitudinal, and institutional dimensions associated with the development of professional skills. Methodologically, a questionnaire was administered to a sample of 114 respondents enrolled in various economic programs (Finance and Banking, Human Resource Management, Law, Business and Administration). The quantitative and qualitative data analysis revealed several relevant trends: students consider that professional success depends on a balance between technical and interpersonal competences, with 74% of respondents stating that both categories are equally important for employment. Among the most valued hard skills are digital literacy, financial analysis, and foreign language proficiency, while the key soft skills include effective communication, critical thinking, and adaptability. Most respondents positively assessed the contribution of professors (81.5%) and the institution (64%) to competence development, yet emphasized the need for a stronger practical dimension and enhanced collaboration with the professional environment. The findings confirm the necessity of an integrated curricular approach in which the development of hard and soft competences is complementary and contextualized. The study contributes to the formulation of educational strategies oriented toward strengthening transversal skills and consolidating the professional profile of economics graduates within the knowledge society..

Keywords: hard and soft competences; higher education; employability; transversal skills; praxiological research.

JEL Classification: I23, I25, M19, M53

1 Introduction

Against the backdrop of profound changes marking the knowledge economy and the accelerated digitization of educational processes, the development of professional skills is becoming a strategic objective of contemporary higher education. Increasingly, universities are called upon not only to impart theoretical knowledge, but also to train specialists capable of responding to the dynamics of the labor market through a balanced set of hard and soft skills. In this perspective, recent studies (World Economic Forum, The Future of Jobs Report, 2020; Romanenko, 2024) highlight that by 2025, more than half of the skills required on the market will require retraining, and critical thinking, adaptability, and communication will become essential for professional success.

The literature clearly distinguishes between hard skills—associated with the technical, cognitive, and operational aspects of the profession—and soft skills, which reflect emotional intelligence, the ability to cooperate, and behavioral flexibility (Seattle Jobs Initiative, 2013; Parker, 2024). In practice, however, the boundary between the two categories is blurred, which requires integrative educational approaches. The training of modern professionals requires the interdependence of these skills, as performance in organizations depends simultaneously on technical competence and on how individuals communicate, collaborate, and manage complex situations.

In the Republic of Moldova, universities face the challenge of harmonizing curriculum standards with the actual requirements of employers. Thus, the praxiological approach taken in this research aims to diagnose the perception of undergraduate and master's students on hard and soft skills, assess the role of the institution and teaching staff in their training, and identify institutional strategies that can optimize the educational process.

The results indicate a growing awareness of the importance of transversal skills in professional training, with students considering that career success depends equally on technical and interpersonal skills. This balance, also identified in international research, suggests the need for a pedagogical reconfiguration oriented towards experience, project-based learning, and partnership with the socio-economic environment. This study is thus in line with contemporary research on the praxeology of skills, providing an empirical basis for the design of educational and institutional policies aimed at strengthening the training of well-rounded specialists who are competent, reflective, and adaptable to the demands of a constantly changing global economy.

Methodology

The research is based on a praxiological approach, aimed at correlating the theoretical dimensions of professional skills training with the empirical analysis of the perceptions of undergraduate and master's students at the Academy of Economic Studies of Moldova (ASEM). The methodological objective was to identify how future economists assess the relevance of hard and soft skills in the university education process and in preparation for professional integration.

The investigation was designed as a descriptive-explanatory study, conducted using a sociological survey with a questionnaire. The research tool, developed on the basis of indicators validated in the literature (World Economic Forum, 2020; Romanenko, 2024; Seattle Jobs Initiative, 2013), focused on five main areas: perception of hard and soft skills, their influence on performance and communication, the role of teachers and institutions in their development, and the perceived level of preparation for the labor market.

The sample included 114 respondents (undergraduate and master's students in the fields of Finance, Management, Law, Business, and Administration), selected by convenience sampling. The questionnaire, administered online between February and March 2025, combined quantitative items (with multiple-choice answers and Likert scales) and open-ended qualitative questions.

Data analysis was performed using descriptive statistical methods and content analysis of qualitative responses, ensuring triangulation of results. The reliability of the instrument was confirmed by the internal consistency of the responses, and the relevance of the research lies in its practical nature, providing an empirical basis for curriculum adjustment and strengthening the development of professional skills in higher economic education.

2 Praxiological basis for the study of professional skills in higher education

The overwhelming majority of participants (73.7%) state that they have previously benefited from training activities focused on professional skills development, which indicates a high level of interest and previous exposure to soft/hard skills training. This context suggests that students are aware of the importance of developing these skills and have sought opportunities to do so (both in the university environment and extracurricularly).

In the context of the research, it is noted that the Microsoft Office package (Excel, Word, PowerPoint) is by far the most frequently mentioned technical skill—approximately 85% of students consider it essential. Next in importance are financial and statistical analysis skills (65%) and knowledge of foreign languages (60%). In addition, more than half of the respondents indicated accounting and taxation skills (55%) as important. In contrast, more specialized hard skills—such as the use of statistical software (SPSS, EViews) or online educational platforms—were mentioned by a smaller percentage (25%–23%), with academic writing (12%) at the bottom of the ranking. These results suggest that students place primary emphasis on basic digital literacy (Office) and fundamental financial and accounting knowledge, considered sine qua non for any economic professional. At the same time, quantitative analysis and foreign language communication skills are perceived as key assets in the labor market, probably reflecting the current requirements of employers in the field to work with data and operate in a globalized environment.

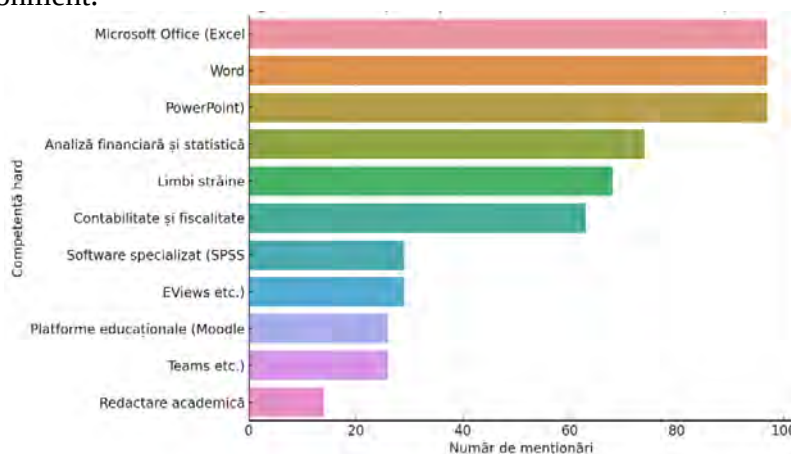


Figure 1. Hard skills considered most important

Source: authors own study

It is noteworthy that effective communication is almost unanimously appreciated—82% of students consider it one of the most valuable soft skills. Critical thinking (54%) and teamwork (51%) follow in importance, as well as adaptability (48%). Skills such as time management (43%) and stress management (42%) were also frequently mentioned, suggesting that students are aware of the need to cope effectively with tasks and pressures. Creativity (35%), organizational skills (31%), and leadership (26%) scored slightly lower, but overall, all of these soft skills are considered important.

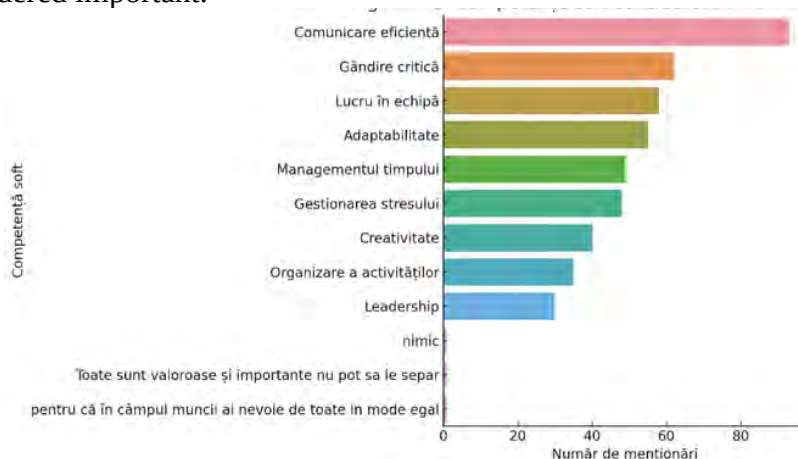


Figure 2. Soft skills considered most valuable

Source: authors own study

These perceptions of students largely reflect global trends in the skills required by employers: according to the World Economic Forum's Future of Jobs report, skills such as critical thinking, analysis, and problem solving, as well as resilience, stress tolerance, and flexibility, are among the most sought-after skills for 2025. Similarly, studies show that employers increasingly value communication, teamwork, adaptability, and other interpersonal skills, often considering soft skills to be as important as technical skills—if not more important—when hiring candidates. The fact that the students in the sample analysed place effective communication first and frequently mention critical thinking, team spirit and adaptability confirms this alignment with market requirements: they understand that a good specialist excels not only technically, but also in the way they interact, think and adapt.

According to respondents, soft skills have the greatest influence on the quality of communication in academic or professional settings (63% of students believe that soft skills determine how effectively they communicate with colleagues, teachers, clients, etc.). Also, overall professional performance is closely linked to the level of soft skills (as rated by 61% of respondents). The next most important aspects mentioned were the ability to analyze information and form reasoned opinions (59%) and effective teamwork (57%), both of which are direct results of critical thinking and collaboration skills. In addition, more than half (53%) believe that soft skills influence the ability to solve problems at work. Aspects such as conflict management (30%) and managing one's own emotions (17%) were less frequently selected, although these also depend on emotional and social skills. This picture highlights the fact that students realize the major impact of soft skills on everyday professional success—from communication quality and productivity to effective problem solving and a collaborative atmosphere. Therefore, soft skills are perceived as determining factors for performance and harmonious integration into a work team.

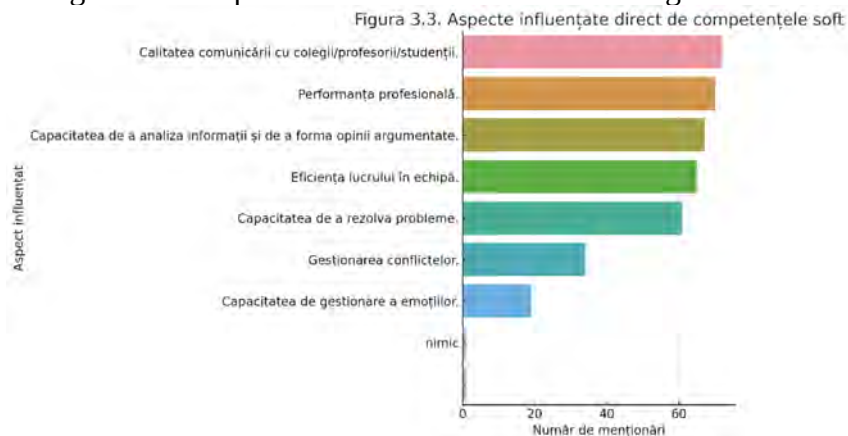


Figure 3. Aspects directly influenced by soft skills

Source: authors own study

When asked directly, "Which category of skills has a greater influence on getting a job?", almost three-quarters of respondents (74%) chose the answer "Both equally", suggesting a balanced view: students believe that both hard and soft skills are crucial and complement each other in employment. Only 13% believe that technical (hard) skills are more important, and another 13% indicate soft skills as being decisive. This consensus on the importance of a balance of skills is consistent with the views of employers, over 75% of whom say that soft skills are at least as important as technical skills for new employees. In other words, students are aware that technical skills alone are not enough if they are not complemented by strong interpersonal skills, and vice versa. This awareness is a positive sign, indicating that future graduates are forming realistic expectations about the job market, where there is an increasing demand for "complete", versatile specialists.

Most students evaluate positively the role of the faculty in developing technical skills: about 64% gave a score of 4 or 5, indicating that they consider the academic contribution to be high or very high. The average score is approximately 3.8 out of 5, suggesting a good level of satisfaction with the technical training provided by the study programs. Only a very small number of students ($\approx 8\%$, corresponding to categories 1 and 2) consider that the faculty contributes little or not at all to the development of hard skills, while 28% have a moderate opinion (level 3). These data indicate that, overall, the curriculum and university teaching activities largely succeed in providing the necessary hard skills, consolidating students' specialist knowledge. However, there is also a segment of students who feel the need for more—possibly those who expressed lower levels would like an even more practical or in-depth technical approach within the faculty.

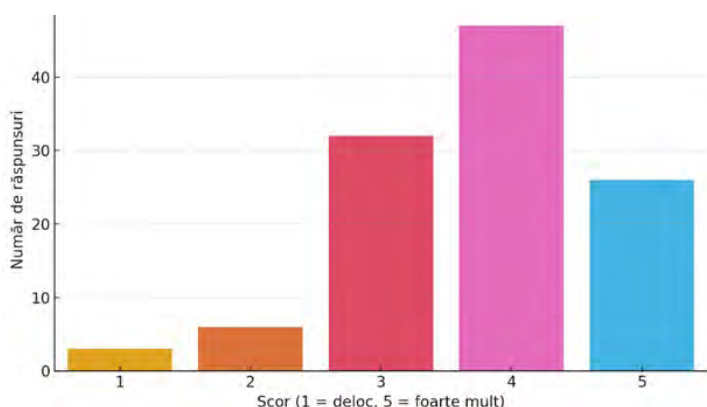


Figure 4. Perception of the faculty's contribution to the development of hard skills (on a scale from 1 = not at all to 5 = very much).

Source: authors own study

The results of the research show that 81.5% of students consider that teachers contribute "quite a lot" (52.6%) or "a lot" (28.9%) to the development of their skills (both hard and soft). Approximately 17.5% perceive a small contribution ("a little"), and an insignificant percentage (less than 1%) believe that teachers do not help at all in this regard. This feedback indicates a general appreciation of teachers' efforts: teaching methodologies, guidance, and interaction with teachers are seen as important factors in students' professional training. In practice, most feel that their teachers help them substantially to develop both their knowledge and transversal skills – for example, through group projects (which train teamwork and communication), through critical thinking requirements in seminars, presentations in front of colleagues (which develop communication skills), etc. Of course, there are also students who feel that the contribution is less significant, perhaps pointing to differences in teaching styles; their feedback could suggest that not all teachers place equal emphasis on developing practical skills, which is an area for improvement. Overall, however, the perception is that the role of teachers is essential in shaping professional skills, supporting the conclusion that the university educational process—when interactive and student-centered—favors the development of communication skills, critical thinking, and other relevant soft skills.

When it comes to self-assessment of students' level of preparedness for integration into the labor market in their field of specialization, the distribution of responses is centered on levels 3 and 4: approximately 36% of respondents consider themselves to have an average level of preparedness (score 3), and another 33% assess themselves as having a good level (4). Notably, almost 1 in 5 students (19%) feel "very prepared" (score 5), which shows high confidence in their own abilities among some of the respondents. Only 11% cumulatively consider themselves insufficiently prepared (level 1 or 2). This result, confirmed by data on the contribution of the faculty and teachers, indicates moderate optimism among students regarding their professional

integration: most are confident that they have the knowledge and skills necessary to start a career in the field. The fact that almost 88% say they are at least moderately prepared suggests that study programs and complementary activities are effective in equipping young people with relevant skills. On the other hand, the relatively small percentage of those who feel very prepared probably also indicates caution: many recognise that they still need to gain practical experience and improve certain skills once they actually enter the labour market. This realistic self-assessment is beneficial as it motivates students to continue their professional development after graduation, approaching the transition to their career with a continuous learning attitude.

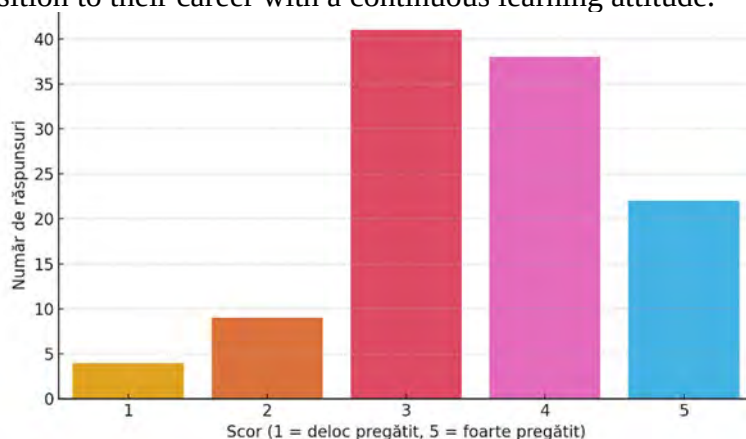


Figure 5. Self-assessment of students' level of preparedness for integration into the labor market in their field of specialization (score 1 = not at all prepared, 5 = very prepared).

Source: authors own study

In summary, we note that the diagnosis of ASEM undergraduate and master's students' perceptions shows that: (a) they attach great importance to both fundamental hard skills (IT, financial analysis, foreign languages, accounting) and essential soft skills (communication, critical thinking, teamwork, adaptability); (b) they consider that soft skills have a direct impact on professional performance and integration (especially on communication and efficiency at work); (c) they realise the need for a balance between technical and interpersonal skills in order to obtain a job – the overwhelming majority opting for equal importance of the two categories; (d) appreciate the efforts of the educational institution and teachers in skills training (generally considering their contribution to be substantial); and (e) have a good level of confidence in their professional training, although relatively few consider themselves fully prepared, probably aware of the need to gain practical experience. These contextual elements form the basis for detailed data analysis and the development of improvement strategies, which will be addressed in the following sections.

3 Qualitative and quantitative analysis of experimental data

To deepen the interpretation of the results, in this section we will combine quantitative analysis of the data obtained (frequency distributions, observational correlations between variables) with qualitative analysis of the open-ended responses provided by students. The aim is to identify both general trends and the nuances and explanations behind the figures, provided by the respondents' own perceptions and suggestions.

Sources of hard skills training. The first aspect analyzed was how students actually acquired their hard skills. The responses indicate a variety of learning sources, both formal and informal. We note that university courses are by far the main source: 72% of students attribute the role of training technical skills (theoretical and practical) to the university – a result that is not surprising, given that higher education programs have the explicit objective of providing specialized knowledge. In second place, however, is the self-taught effort of students: almost 45% say they have developed their hard skills through individual study, self-practice, or other forms of

independent learning. This significant percentage highlights the personal initiative of many young people to supplement their knowledge. The next most important sources are extracurricular projects (32%) and internships (30%). These reveal that one third of students had the opportunity to develop their technical skills through practical experiences outside of class hours – such as involvement in student organizations, competitions, volunteer projects with a professional component, or mandatory internships in companies. Very few indicated employment (an actual job) as the main source of hard skills (3.5%), suggesting that most have not yet worked enough in the field or do not attribute a major role to employment in the development of technical skills at this time. Also, online courses were mentioned only in isolated cases (2%), a sign that the current generation of students still prefers traditional sources (university, books) or learning by doing, with online platforms not being a popular option or perhaps not yet sufficiently known among them for the development of specific economic skills.

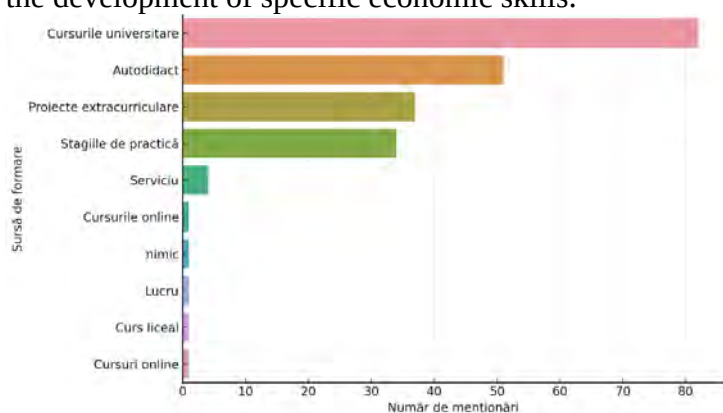


Figure 6. Main sources through which students developed their hard skills (percentage of respondents who selected each option).

Source: authors own study

Interpreting these results, we can conclude that the university remains the central pillar in the development of hard skills, but it does not act alone: students often supplement their training through their own efforts and extra-academic practice. This may reflect two complementary realities: on the one hand, the academic curriculum provides a solid theoretical foundation (which young people consider to be the main source of learning), and on the other hand, the labor market and technological developments encourage students to seek additional knowledge and keep up with new tools, resorting to self-training and practical projects. We therefore see a mutual complementarity between formal and informal education: where the standard curriculum does not go into sufficient depth on a particular skill, or when students feel the need to apply the theory they have learned in practice, they resort to internships, workshops, or self-study. This also suggests areas for improvement—for example, the university could capitalize on this desire for self-learning by integrating more online resources into the teaching process or by facilitating student participation in real-world projects.

How soft skills are acquired. A similar question concerned the origin of the soft skills that students have developed to date (respondents could choose up to two significant options). The results offer an interesting perspective on the factors that contribute to the development of interpersonal and professional conduct skills. Most often, students attribute a decisive role to activities during college (courses, seminars, team projects within disciplines) – 57% indicate the university environment as a catalyst for the development of their soft skills. This highlights that, beyond theoretical knowledge, college provides contexts for interaction (teamwork, oral presentations, classroom debates) that help young people practice communication, collaboration, and critical thinking. In second place, however, direct professional experience (work or internship) was mentioned by almost 47% of students as a source of soft skills. In other words, almost half of

the respondents feel that they have learned to relate, work efficiently, and adapt through work experience, whether temporary or part-time. This significant percentage suggests that many students have already had contact with the labor market (through internships or entry-level jobs) and have thus acquired skills such as professional communication, working under pressure, and solving practical problems—skills that are difficult to fully simulate in an academic environment. The next most important sources are extracurricular activities (indicated by 36% of respondents) – such as volunteering, participation in student organizations, student projects and competitions – and self-training/personal education (34%). These highlight that over a third of students attribute their soft skills to their involvement outside the classroom (where they have the opportunity to take on roles, interact with different groups, organize events, thus developing their leadership, responsibility, and emotional intelligence), but also to reading, training, or personal reflection. Almost no one answered "nothing" to this question, which indicates that all students identify at least one significant source that has shaped their soft skills—a sign that the development of these skills is a complex, multifactorial process that takes place both formally and informally.

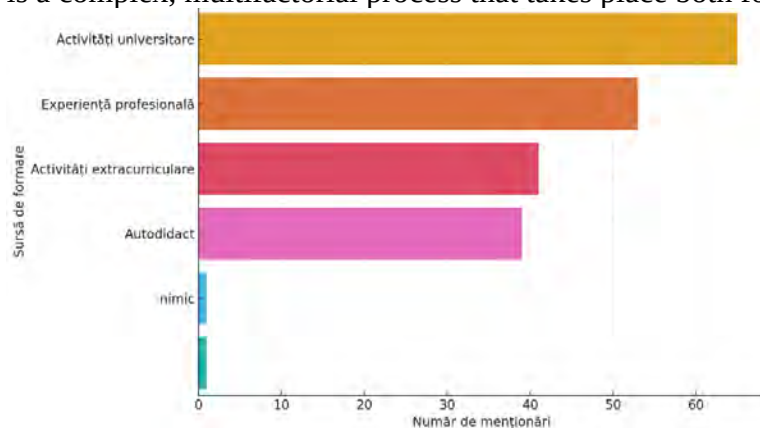


Figure 7. Main ways of developing soft skills, as self-reported by students (percentage of total respondents).

Source: authors own study

Comparing the sources of training for hard and soft skills, several observations can be made: (1) Formal university education is essential for both categories of skills, but its relative role is perceived as more significant in the development of technical skills. For soft skills, although university remains the main environment, the weight of other factors (work experience, extracurricular activities) is greater than in the case of hard skills. This makes sense, as interpersonal and attitudinal skills are manifested and honed in various life situations, not just in the classroom. (2) Practical experience (through work or internships) contributes much more significantly to the development of soft skills than to that of hard skills. While relatively few students learned technical knowledge directly on the job, almost half cultivated soft skills through work. This confirms that the real work environment offers opportunities for socializing, organizing, and solving problems as a team, which are crucial for developing soft skills, while hard skills are often consolidated before employment, in the academic environment. (3) Self-development plays an important role in both cases – students complementing their studies both to deepen technical skills and to improve personal skills. This appetite for individual learning suggests that students who continue to be proactive will have an advantage in accumulating the skills required by the market.

Analysis of qualitative responses and suggestions from respondents. The questionnaire also included open-ended questions, allowing undergraduate and graduate students to provide comments, suggestions, and personal views on professional skills training. Qualitative analysis of these responses reveals several recurring themes, which we will discuss below.

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A first important theme is the need to increase the practical and applied nature of training. Many students emphasized that they would like to see more practical activities integrated into their university studies. For example, one respondent suggested introducing "project-based learning, case studies and simulations, relevant internships, mentoring and coaching, interactive workshops on specific skills." Others explicitly mentioned the need for workshops focused on soft skills, practical communication sessions, or "more practical projects, internships [and] workshops on soft skills, simulations." The organization of events by students (such as the project simulating the organization of a conference or business event in the third year) was also mentioned, considered very useful for practicing communication, leadership, time management, and other skills. These proposals indicate that students want concrete opportunities to apply theory in practice and to train their skills in a controlled environment before entering the labor market. This trend is in line with modern trends in higher education, which promote experiential methods—such as problem-based learning, project-based learning, or role-playing—for the development of transversal skills. The implementation of such methods could be very beneficial, given that the students themselves are requesting them.

The second theme mentioned is openness to the external environment and real professional practice. Numerous qualitative responses recommend strengthening links with industry and the business environment: "meetings with specialists in the field" and "visits to companies" are some concrete examples provided by respondents. Such activities would allow students to directly understand employers' expectations and how to apply their skills in real work situations. Many also mentioned the importance of well-structured internships. Although internships are generally part of the curriculum, students' suggestions imply a desire for these internships to be extended or diversified, possibly coupled with mentoring. The involvement of practitioners and mentors from industry in student training can facilitate the transfer of up-to-date know-how and the development of industry-specific skills, increasing the relevance of academic training to the requirements of the labor market.

A third direction emerging from the analysis is the emphasis on targeted training in certain specific skills that are perceived as lacking. A few examples: a group of students suggests dedicated courses on "Microsoft Office Management" (a sign that, although most of them know the basics, they would like an advanced level, more focused on solving concrete economic tasks with Excel, for example). Others mention the need to introduce courses in "Risk Management" or workshops in "Academic Writing" – skills that are very useful in the economic and academic fields, but which may not be sufficiently covered at present. These specific requirements show that students are realistically assessing their gaps and requesting institutional support to correct them, in the form of dedicated courses or training. A similar direction is the integration of emerging digital technologies: one respondent describes the ideal profile of the modern specialist as "a specialist who can use digital tools and artificial intelligence in their daily tasks, combining them with critical and analytical thinking." This suggests that students are aware of the importance of advanced digital skills (data analysis, use of AI) and would likely be receptive to courses or workshops in these areas, which represents an opportunity for academia to update its educational offerings.

A fourth theme observed in the open-ended responses is flexibility and diversification of the educational path. Suggestions such as "freedom of choice" or "more options for volunteer and academic projects" indicate students' desire for more autonomy in choosing how to develop their skills. They would probably like the opportunity to choose skills-oriented elective courses (e.g., an elective course in Public Speaking or Leadership) or the opportunity to replace certain theoretical disciplines with equivalent credited practical activities. This need for flexibility reflects the diversity of students' interests and needs—some may want to develop their entrepreneurial skills, others their digital skills, and others their social skills—and suggests that a more modular curriculum framework could better respond to these individual aspirations.

Based on the entire set of data—quantitative and qualitative—the ***ideal portrait of the young specialist emerges***, along with certain discrepancies between expectations and reality. Respondents describe the ideal profile of a modern economic specialist in words such as "open to knowledge and challenges, in continuous development," "adaptable, analytical, solution-oriented, with strategic vision, responsible, and honest." This profile combines character traits and soft skills (openness to new ideas, adaptability, team spirit, integrity, leadership, effective communication) with a high level of hard skills (up-to-date knowledge in the field, use of digital tools and artificial intelligence, solid analytical thinking). In practice, students imagine a "complete", multifaceted professional, which once again confirms the premise that both categories of skills are indispensable. At the same time, they feel that in order to achieve this ideal, higher education institutions must adopt concrete measures (such as those discussed above) to enhance the development of these skills. All these insights will form the basis for the development of proposed institutional strategies designed to address the needs identified and to harmonise the educational process with the profile of the ideal graduate and the requirements of the current labour market.

Institutional strategies for developing the soft and hard skills of undergraduate and master's students. Based on the results obtained, it is necessary to formulate strategies and recommendations for the Academy of Economic Studies and, by extension, for higher education institutions in economics, aimed at improving the development of students' soft and hard skills. The purpose of these strategies is to capitalize on the strengths identified (e.g., the already significant contribution of teachers to skills training, students' interest in self-learning) and to remedy areas for improvement (such as the perceived lack of practical components or the limited offer of courses focused on transversal skills). The main recommended strategic directions are presented below:

Systematic integration of learning through practice and projects. A priority would be for the faculty to increase the proportion of experiential methods in the teaching process. It is recommended that each specialisation introduce courses or modules based on real projects, case studies, business simulations and role-playing games. Such problem-based and project-based learning approaches have proven effective in developing technical skills as well as collaboration, leadership and critical thinking skills. In addition, the university could organize simulations of professional situations (e.g., simulation games of business negotiations, management meetings, financial crisis resolution) to provide students with a safe space to practice their skills. Increasing the practical component does not mean diminishing the theoretical one, but rather complementing it: academic knowledge will be more firmly established if students have the immediate opportunity to apply it. Also, the practical feedback received during these activities will help them become aware of their skill gaps and correct them before graduation.

Expanding and diversifying internships and partnerships with the socio-economic environment. Given the clear benefits of work experience in skills development (especially soft skills), it is essential that the faculty strengthen its links with companies, public institutions, and NGOs to provide students with more internship opportunities. It is recommended to develop an extensive internship program (including optional, paid, flexible-term internships) in the students' fields of specialization. At the same time, study visits to companies and meetings/debates with professionals from different sectors could be organized periodically (e.g., inviting a top manager to talk about the importance of communication and leadership skills in their organization). Such direct interactions with the professional environment help students calibrate their expectations and better understand professional standards and culture. Another important aspect is the involvement of employers in the educational process—for example, inviting practitioners as speakers or co-mentors in applied disciplines, or consulting companies when updating the curriculum (to include the most sought-after skills). Through such partnerships, the faculty also fulfills its role as a bridge to the labor market, facilitating the transition of graduates and increasing their employability.

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Introduction of specific training modules for soft skills. Given the importance of soft skills highlighted by both students and employers, it is recommended that courses dedicated to developing these skills be created. One strategy would be to implement a module of cross-disciplinary subjects (possibly optional, but encouraged, or even compulsory) focused on: communication and public speaking, teamwork and leadership, critical thinking and problem solving, emotional intelligence and stress management, professional ethics and integrity, time management and personal productivity, etc. An example of good practice comes from ITMO University, where soft skills are taught in a separate block of compulsory subjects available to students. ASEM could implement a similar model, adapted to the local context, which would ensure that all students receive systematic training in these areas. These courses should be highly interactive—based on exercises, simulations, team games—different from traditional courses, in order to provide a framework for practical skills training. The inclusion of regular soft skills workshops in the curriculum (e.g., a public speaking workshop with an external trainer, or a creative problem-solving hackathon) would complement this approach.

Updating and making the curriculum more flexible. In light of students' suggestions regarding "freedom of choice" and the need to be able to deepen skills of interest, a curriculum review is recommended in order to increase flexibility. In addition, certain existing disciplines could be reconfigured to incorporate practical components/soft skills—for example, a management course could include a leadership module with practical exercises; a specialized foreign language course could also focus on intercultural communication in business; an economic informatics course could integrate workshops on creative problem solving with the help of technology. At the same time, students could be given the opportunity to choose between a practical project or a theoretical paper at the end of a course, depending on their interests (for example, in a Human Resources course: either writing an academic essay or designing a practical employee training plan – at the student's choice). Such measures would give students a greater say in their own education, which would increase their motivation and help them to develop the skills they consider relevant to their careers more intensively.

Continuous development of teaching staff and pedagogical methods. Last but not least, the success of implementing these strategies depends on the preparation and openness of teachers. It is important for ASEM to invest in training programs for teachers—training on competency-based teaching, the use of modern educational technologies, methods for assessing soft skills, etc. For example, teachers could take short courses on experiential learning, educational coaching, or integrating serious games into teaching. In addition, it would be useful to create an organizational culture oriented towards teaching innovation, in which teachers exchange good practices and are encouraged to experiment with new approaches in the classroom. Student feedback ("disciplining teachers in class") suggests that some students want more rigorous and engaging teaching, which implies the need for all teachers to maintain a high level of professionalism, punctuality, interactivity, and content updating. A teacher who is well trained in pedagogy and connected to current requirements will be able to insert teaching moments for soft skills even in technical courses, cultivating the right attitudes in students in addition to knowledge. Thus, investment in teacher training has a direct multiplier effect on student training.

By implementing these strategies—hands-on learning, industry partnerships, soft skills modules, mentoring, flexible curriculum, and professional development for teachers—the Academy of Economic Studies can consolidate its role in training graduates with a comprehensive skill set, adapted to the demands of the 21st century. Students will benefit from a more relevant educational experience, where they will learn by doing, pursue their professional passions, and cultivate both their analytical minds and social skills. At the same time, employers will encounter better-prepared graduates – with solid technical foundations, but also with the ability to communicate, work in teams, adapt, and innovate. This creates a virtuous circle: competent

graduates who easily integrate into the labor market and perform well, which enhances the reputation of the institution and the attractiveness of its programs. In conclusion, the integrated development of soft and hard skills should not be viewed as a secondary objective, but as a core mission of the modern university, since "success in the workplace requires more than technical skills... soft skills are what make the difference" in training a successful professional. Implementing the above recommendations will bring the educational process closer to this vision, preparing versatile, innovative graduates who are ready to face the complex challenges of the contemporary economy.

The praxiological analysis carried out in this chapter reveals a complex and relevant picture of how undergraduate and master's students perceive and use professional skills in the academic context and in relation to labor market requirements. The data obtained confirm that the university education process plays a significant role in the development of hard skills, but the development of soft skills remains largely dependent on extracurricular contexts and personal initiatives. This disjunction between the two categories of skills suggests the need for an integrative and interdisciplinary approach, in which organizational communication, understood not only as the transmission of information but also as a vector for personal training and development, becomes a strategic element. This chapter highlights the importance of adapting institutional professional training strategies so that they reflect the contemporary demands of the labor market in a balanced way and intentionally and systematically cultivate the skills that define the modern economic specialist.

Conclusion

The analysis of the results obtained in the praxiological research confirms that students and master's students at the Academy of Economic Studies of Moldova have a complex and realistic understanding of the relationship between skills development and professional success. They recognize the value of both categories of skills—hard and soft—but believe that interpersonal, communication, and adaptability skills play a decisive role in organizational performance and effective integration into work teams. This perception highlights a shift in focus from strictly technical knowledge to socio-communicative skills, reflecting global trends in the profile of the modern professional.

In terms of hard skills, the results show a pronounced orientation towards digitization and the use of technological tools in economic activity. Digital literacy, financial analysis, and data processing skills are perceived as indispensable elements of professional training. This preference shows how students are adapting to the demands of today's market, where digital and analytical skills are key to efficiency and innovation.

On the other hand, soft skills—especially effective communication, critical thinking, responsibility, and team spirit—are valued as decisive factors for performance in organizational environments. They are associated with the ability to relate, collaborate, and be professionally resilient, highlighting a high degree of responsiveness to employers' requirements and a mature understanding of the role of human interaction in economic success.

The assessment of the role of higher education institutions reveals a predominantly moderate perception of their contribution to the development of professional skills. The average scores (between 3 and 4 on a scale of 1 to 5) indicate significant but improvable involvement in the development of students' skills. This suggests the need for curricular and methodological adjustments aimed at increasing the proportion of applied activities and educational partnerships with the professional environment.

The sources of skills development are varied, confirming the hybrid nature of the contemporary educational process. While hard skills are mainly acquired through formal education—courses, internships, university projects—soft skills derive mainly from extracurricular experiences and informal contexts. This observation highlights the need for

universities to systematically integrate the non-formal dimension into the learning process in order to ensure a balanced and coherent development of skills.

Although most students consider themselves well or very well prepared for professional integration, the level of confidence varies between specializations and stages of training. This unevenness reflects differences between disciplines, curricular structures, and the degree of individual involvement in complementary activities, which underscores the importance of personalized approaches in university education.

Finally, the ideal profile of the modern specialist, as outlined by respondents, illustrates the vision of a versatile professional—able to combine solid technical skills with interpersonal and adaptability skills. This model integrates analytical competence, critical thinking, strategic communication, and social responsibility, defining a graduate prepared to perform in a dynamic and globalized economic environment. The research thus demonstrates that professional success in the 21st century requires an organic interdependence between hard and soft skills, and that university education must reflect this complementarity in an explicit and operational manner.

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GENDER EQUALITY AS A DETERMINING FACTOR IN THE SUSTAINABLE DEVELOPMENT OF RURAL COMMUNITIES IN THE REPUBLIC OF MOLDOVA

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Abstract: Sustainable development represents one of the most important strategic directions of contemporary society, being founded on three essential pillars: economic progress, environmental protection, and social equity. Within this integrative concept, gender equality holds a central place, not only as a distinct objective of the United Nations 2030 Agenda for Sustainable Development, but also as a cross-cutting element that directly influences all other objectives. In the context of the Republic of Moldova, the issue of gender equality gains particular relevance, especially in rural areas. Rural communities account for more than half of the country's population and, therefore, represent a fundamental component of the national socio-economic structure.

However, disparities between urban and rural areas remain significant, both in terms of access to resources and services, and in terms of participation in economic, educational and decision-making life. Women in rural areas frequently face limited employment opportunities, lower incomes, disproportionate household responsibilities and low participation in local decision-making. In addition, the persistence of gender stereotypes and traditional norms contributes to the perpetuation of inequalities and the slowdown of social progress. In recent years, the Republic of Moldova has made significant progress in terms of the normative and institutional framework for gender equality. The lack of supporting infrastructure (kindergartens, community centers, counseling services) and external migration, which strongly affects rural areas, amplify the vulnerability of communities and limit the impact of the measures adopted.

This article aims to analyze the role of gender equality as a determining factor in the sustainable development of rural communities in the Republic of Moldova.

Keywords: gender inequality, discrimination, poverty, social exclusion

JEL Classification: J16

1. Introduction

Sustainable development is one of the most important strategic directions of contemporary society, being founded on three essential pillars: economic progress, environmental protection and social equity. Within this integrative concept, gender equality occupies a central place, not only as a distinct objective of the 2030 Agenda for Sustainable Development of the United Nations, but also as a cross-cutting element, which directly influences all other objectives. Specifically, Sustainable Development Goal No. 5 (Gender Equality) promotes the idea that the empowerment of women and ensuring equal opportunities between women and men constitute indispensable premises for the creation of balanced, prosperous and resilient communities. In parallel, Goal No. 11 (Sustainable Communities) emphasizes the importance of developing local communities, and

the link between these two dimensions highlights the essential role of gender equality in the process of building a sustainable society.

In the context of the Republic of Moldova, the issue of gender equality acquires increased relevance, particularly in rural areas. Rural communities account for more than half of the country's population and, therefore, represent a fundamental element of the national socio-economic structure. According to the final results of the 2024 census, 53.6% of the population of the Republic of Moldova resides in villages (rural areas).

However, disparities between urban and rural areas remain significant, both in terms of access to resources and services, and in terms of participation in economic, educational and decision-making life. Women in rural areas frequently face limited employment opportunities, lower incomes, disproportionate household responsibilities and low participation in local decision-making. In addition, the persistence of gender stereotypes and traditional norms contributes to the perpetuation of inequalities and the slowdown of social progress. In recent years, the Republic of Moldova has made significant progress in the normative and institutional framework for gender equality. There are laws and public policies that promote the equitable participation of women and men in all spheres of social and economic life. However, the implementation of these policies faces major difficulties, especially in rural areas, where administrative, economic and human resources are often insufficient. The lack of support infrastructure (kindergartens, community centers, counseling services) and external migration, which strongly affects rural areas, amplify the vulnerability of communities and limit the impact of the measures adopted.

Gender equality, in this perspective, should not be viewed only as a moral value or a social desideratum, but as a determining factor of sustainable development. Numerous international studies have demonstrated that the active involvement of women in the economy, agriculture, education and community life increases social cohesion, reduces poverty and accelerates modernization. In the rural areas of the Republic of Moldova, where agriculture remains the main economic activity, women's access to productive resources (land, credit, technologies) is essential for increasing competitiveness and strengthening food security. At the same time, the presence of women in local decision-making positions brings new perspectives on community governance and ensures a more equitable use of resources.

Thus, this article aims to analyze the role of gender equality as a determining factor in the sustainable development of rural communities in the Republic of Moldova. The objectives of the research are:

1. Highlighting the particularities of the gender situation in rural areas of the Republic of Moldova;
2. Identifying the challenges and structural barriers that limit the equitable participation of women and men;
3. Analyzing the correlation between gender equality and the socio-economic progress of rural communities;
4. Formulating recommendations for sustainable policies and practices aimed at contributing to the balanced and sustainable development of these communities.

For a more in-depth analysis of the given topic, well-known bibliographic sources, some studies conducted by civil society representatives, as well as factual data from the National Bureau of Statistics of the Republic of Moldova were used.

2. Gender equality versus sustainable development

The concept of gender equality is based on the idea that women and men should enjoy the same rights, opportunities and responsibilities in all areas of life – economic, social, political and cultural. Beyond the normative and moral dimension, the specialized literature highlights the fact that gender equality is a necessary condition for achieving sustainable development. In this sense, numerous authors (Sen, 1999; Kabeer, 2005; World Bank, 2012) emphasize that development

cannot be considered sustainable if half of the population is marginalized or if its participation is limited to traditional spheres.

Globally, the 2030 Agenda for Sustainable Development explicitly recognizes the link between gender equality and sustainability, enshrining Goal 5 (Gender Equality) and integrating its principles into the other goals. International studies demonstrate that women's involvement in the economy and decision-making processes contributes to better use of resources, reducing inequalities and increasing social cohesion (UNDP, 2020; OECD, 2021). In rural areas, where resources are limited and dependence on agriculture is high, gender equality has a direct impact on the productivity and competitiveness of communities. Din punct de vedere teoretic, există mai multe abordări care analizează relația dintre egalitatea de gen și dezvoltarea durabilă:

1. The fundamental rights approach, according to which gender equality is an inalienable human right and must be ensured through legal and institutional mechanisms. This perspective is supported by international instruments such as the Convention on the Elimination of All Forms of Discrimination against Women (CEDAW, 1979).

2. The economic development approach, which argues that gender equality increases labor market participation, increases household incomes, and reduces poverty. The World Bank (2012) shows that countries that promote gender equality experience faster economic growth.

3. The community sustainability approach, which highlights the role of women in strengthening social cohesion, transmitting educational values, and ensuring a balance between economic development and environmental protection. In rural areas, women are often the guardians of agricultural traditions, but also promoters of community innovations. As for the Republic of Moldova, the existing literature reveals a number of major challenges related to gender equality. Studies conducted by UN Women Moldova (2021), the Ministry of Labor and Social Protection (2022) and relevant non-governmental organizations emphasize that, despite legislative progress, rural women continue to have limited access to economic resources (agricultural land, credits, counseling services), face higher levels of poverty and have limited representation in local decision-making structures. At the same time, traditional gender stereotypes perpetuate a rigid division of social roles, which directly affects women's chances to contribute to the development of their communities.

Another aspect highlighted in the literature is the link between external migration and changing gender dynamics in rural areas. The massive departure of men to work abroad has led women to take on additional responsibilities both in the household and in the community. This phenomenon, although generating challenges, can also be seen as an opportunity to strengthen the role of women in rural development (Lupan, 2019). In conclusion, the review of the specialized literature confirms that gender equality is a fundamental element of sustainable development, and rural communities that equitably capitalize on the potential of women and men are more resilient, more innovative and more prosperous. However, the reality in the Republic of Moldova shows that there are still significant gaps between theoretical principles and their practical application, which justifies the need for in-depth analyses and more effective policies to reduce inequalities.

Gender equality is not only a principle of social equity, but a fundamental element of sustainable development in the Republic of Moldova, especially in rural areas, where communities face complex challenges: massive migration, poverty, limited access to resources and poor infrastructure. Analysis of data and realities on the ground shows that reducing gender inequalities generates visible impacts both economically, socially and culturally.

According to the National Bureau of Statistics, over 53.6% of the population of the Republic of Moldova lives in rural areas, and women represent a significant part of the agricultural workforce. However, the majority of them work in the subsistence agricultural sector or in family households, where their work is neither paid nor recorded. For example, many women are involved

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in animal husbandry, gardening, or food processing for their own family consumption, without being officially registered as participants in the economy.

Where women have access to agricultural land and credit for small business development, the results are visibly different: the respective households increase their productivity, manage to sell products on the local market and contribute to diversifying family incomes. Concrete examples can be observed in districts such as Ungheni, Orhei or Cahul, where programs supported by international organizations (UNDP, UN Women, IFAD) have allowed women to initiate small agricultural businesses or develop cooperatives. This experience demonstrates that women's involvement not only supplements household incomes, but also transforms the entire community into a more economically resilient space.

The educational level of rural women is a critical factor for sustainable development. Even though in recent years, the percentage of girls completing high school is higher than that of boys, there is a barrier at the university and postgraduate levels. The main reasons are economic migration, family responsibilities and lack of financial resources.

However, a positive trend is observed: women's participation in vocational training and education programs. For example, through projects implemented by USAID and the Association of Women Entrepreneurs of Moldova, many women in villages have benefited from entrepreneurship training and have started small businesses — bakeries, tailoring workshops, rural guesthouses. The interpretation of this phenomenon shows that education is not only a condition for individual success, but a driver for the transformation of communities. An educated and financially independent woman becomes an inspiring model for other women and contributes to reducing poverty at the local level.

Women's involvement in community life and decision-making - a particularly important aspect for sustainable development is women's participation in decision-making. In the Republic of Moldova, the number of women mayors has increased in recent years, reaching approximately 22% at the national level, according to data from the Central Electoral Commission. However, in many villages, women continue to be poorly represented in local councils or in the leadership of public associations.

Analysis of cases where there is a more balanced presence between women and men in local public administration shows tangible results: more investments in social infrastructure (kindergartens, schools, community centers), local policies more sensitive to the needs of vulnerable groups (children, the elderly, people with disabilities) and better management of community resources. These examples confirm that gender equality in decision-making is not just a symbolic act, but has direct consequences on the quality of life in rural areas.

Social perceptions and stereotypes - a major obstacle to gender equality is traditional mentalities. In many villages, women's roles are still seen as predominantly domestic, which limits their involvement in public life. Even women in leadership positions often face prejudice or lack of trust from the community.

These stereotypes hinder development, as they do not allow the community to fully realize its human potential. For example, when a woman is not encouraged to run for mayor, the village loses a potential leadership resource. Changing these perceptions requires time, but also consistent interventions: information campaigns, civic education and the involvement of young people in community activities.

The economic and social impact of gender equality - comparing rural communities where women are active in decision-making and entrepreneurship with those where their participation is reduced, clear differences are observed. In the first case, there are more rural tourism initiatives, ecological businesses or agricultural cooperatives that create jobs and attract investment. In the second case, dependence on remittances from abroad, lack of opportunities and continuous migration of the young population prevail.

This contrast demonstrates that gender equality is a determining factor for sustainable development: the involvement of women leads to the diversification of the local economy, better social cohesion and reduced vulnerability of rural communities.

Interpretation in the context of the Sustainable Development Goals (SDGs) The Republic of Moldova has undertaken the implementation of the 2030 Agenda, and SDG 5 — “Gender Equality” — is directly linked to other relevant objectives for the rural environment: poverty reduction (SDG 1), quality education (SDG 4), decent work and economic growth (SDG 8), and reduced inequalities (SDG 10). Promoting gender equality is not an isolated policy, but a condition for achieving all other objectives.

In rural areas, gender equality thus becomes a prerequisite for sustainability: it ensures better use of resources, increases living standards, reduces emigration and contributes to strengthening communities.

An in-depth analysis of the theme Gender equality as a determining factor in the sustainable development of rural communities in the Republic of Moldova highlights the fact that promoting an equitable environment between women and men is essential for achieving the sustainable development goals. Despite the progress made, significant challenges persist that require strategic and sustained interventions.

3. Progress and challenges in the field of gender equality

The Republic of Moldova has made notable progress in reducing gender gaps. According to a recent report, the country has reduced its gender gap by 81.3%, registering an increase in the score by +0.023 points compared to 2024. This improvement was reflected in the area of political participation, where Moldova’s score increased by 7.5 percentage points, reaching 42.5% in 2025, placing the country among the world leaders in terms of gender equality [2]. Despite this progress, rural communities in Moldova face significant obstacles to achieving real gender equality. Studies show that rural women have limited access to financial resources and advisory services, and traditional gender norms continue to negatively influence their participation in decision-making. There is also a concentration of women in informal forms of organization, such as peasant households, which restricts their access to finance and modern technologies.

Gender inequalities have a direct impact on the sustainable development of rural communities. Women who lack access to quality education, adequate health services and economic opportunities are less able to contribute to the economic and social development of their communities. The lack of representation of women in leadership structures also limits decision-making diversity and can lead to less inclusive and equitable public policies.

Conclusions and recommendations

To address these challenges and promote equitable sustainable development, the following measures are recommended:

Integrating gender into public policies: It is essential that all development policies and programs include specific objectives and measures to promote gender equality, with monitoring indicators disaggregated by sex.

Accessibility to finance for women: Creating subsidy and grant schemes dedicated to women farmers, with specific budget allocations, to address gender gaps in access to finance.

Education and vocational training: Developing and implementing educational and vocational training programs specifically targeting rural women, to enhance their skills and facilitate their integration into the labor market.

Awareness-raising and changing social norms: Conducting awareness-raising campaigns to change traditional perceptions of gender roles and promote a social climate that supports equal opportunities.

Gender equality is a fundamental pillar of the sustainable development of rural communities in the Republic of Moldova. Building an equitable and prosperous society requires a continuous

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commitment from authorities, international organizations and the community at large. Only by implementing gender-sensitive public policies and promoting an inclusive and equitable environment can real sustainable development be ensured that benefits the entire population, regardless of gender.

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SUSTAINABLE DEVELOPMENT AND SOCIAL EQUITY

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Abstract. Sustainable development, a universally recognized civilizational paradigm, necessitates a balanced approach to socio-economic progress and environmental preservation. This paper argues that social equity is a foundational ethical principle crucial for achieving sustainable development. It explores the intricate, intrinsic link between these two concepts, tracing the historical evolution of equity from antiquity through modern philosophical thought to establish its theoretical underpinnings. The study employs qualitative research methods, including analysis, synthesis, comparison, induction, and deduction, drawing on specialized literature. Findings demonstrate that social equity, encompassing equal opportunities, fair resource distribution, non-discrimination, and intergenerational fairness, directly contributes to mitigating social inequality, preventing conflict, and reducing poverty. The article further highlights the concrete connection by examining how the principle of social equity underpins specific United Nations Sustainable Development Goals (SDGs), such as those related to health, gender equality, decent work, and justice. It emphasizes the vital role of education and non-governmental organizations in fostering values and behavioral changes essential for building economically developed, socially equitable, and environmentally sustainable societies.

Keywords: Sustainable Development, Sustainability, Equity, Social Equity, Social Justice.

JEL Classification: Q01, Q56

Introduction

The natural environment is globally threatened, and its protection is becoming a primary task for humanity because it is related to humanity's survival. All societies are in danger due to environmental changes; therefore, achieving ecological balance, humanizing the relationship between humans and nature, and respecting nature and its laws are necessary. To solve the above-mentioned problems, sustainable development must be implemented.

The contemporary era is characterized by a distinct dichotomy between escalating societal demands and the diminishing regenerative capacity of the biosphere. Sustainable development represents a paradigm attempting to resolve this contradiction by advancing universally valid, humanistic values that explicitly reject the predatory exploitation of the natural environment. Consequently, a comprehensive sustainable development strategy necessitates the articulation of a fundamentally revised conceptual framework for freedom and responsibility, one that moves beyond treating nature merely as an input commodity for economic production.

Currently, sustainable development is a path without visible alternatives for ensuring ecological security, social equity, and economic well-being. It is intended to ensure development and progress at both societal and global levels. For the successful achievement of sustainable development goals, it must be based on its main ethical principle: social equity.

Methodology

The informational support for this work includes specialized literature related to sustainable development and social equity. Various research methods were also employed, such as analysis, synthesis, the comparative method, induction, and deduction. The methodology used in the work reveals its interdisciplinary nature.

Results and Discussion

Social equity has been a perennial subject of scholarly inquiry since antiquity. Nevertheless, the examination of the relationship between social equity and sustainable development commenced relatively recently. This timing correlates with the emergence of the concept of sustainable development, which gained prominence in the 1980s following the realization that environmental degradation presented an existential threat to planetary life. The integration of social equity into sustainable development discourse began in the latter half of the last century, coinciding with the growing recognition of their mutual influence: social equity can indeed foster the acceleration of sustainable development, and, conversely, sustainable development outcomes can elevate the level of social equity.

The term "equity" derives from the Latin *aequitas*, signifying "justice," "impartiality," and "moderation." The concept of equity, however, is notably ambiguous, finding application across numerous contemporary domains and carrying diverse meanings, such as those related to justice, economics, education, social welfare, politics, culture, media, and health (Gorincioi, 2009). The theoretical foundations for understanding the notion of equity were laid down in the works of Plato, Aristotle, T. Hobbes, J. Locke, J. J. Rousseau, I. Kant, G. Hegel, K. Marx, J. Rawls, A. Sen and other prominent thinkers.

Various thinkers have studied the issues of social equity for centuries. With reference to equity, a series of conceptual questions have been formulated, including: How must an individual's behavior be in order for it to be called equitable? What are the defining features of an equitable state? Is it generally feasible to build an equitable state? Philosophers in Ancient Greece tried to answer these questions, as well as others related to equity. Thus, for Socrates, in public life, people must respect both the laws and the principles of truth and justice.

Analyzing the concept of equity, Plato relates it to that of virtue. In his opinion, equity is one of the cardinal virtues. It contributes to the harmonization of the other three cardinal virtues, which are: wisdom, courage and temperance. At the same time, for Plato, equity is the virtue through which the soul flourishes and without which the soul languishes (Plato, 1923). In Aristotle's opinion, "it is fair to forgive human weaknesses, to take into account the purposes of people's actions; we must look at the whole, not just a part; to consider not only what the individual is at present, but also what his character is in general". He furthermore posited that it is equitable to recall virtuous conduct over malevolent acts, and benefits rendered over those received, alongside a disposition to endure offense patiently (Georgescu, 1998).

Among the most seminal works of the 20th century addressing social justice (a discourse in which the concepts of 'equity,' 'fairness,' and 'justice' are frequently employed interchangeably, notwithstanding their nuanced distinctions) is John Rawls's *A Theory of Justice*. In Rawls's opinion, the concept of justice is very important for the in-depth analysis of social systems. For him, moral criteria play a critical role in the evaluation of social systems.

Equity, as a complex social phenomenon, continues to be the focus of researchers' attention. Currently, there are various approaches and interpretations of this phenomenon. However, it is a unanimously accepted fact that equity performs regulatory functions of the social system, having different forms, such as: political, legal, moral and economic.

Social crises, turning points in social development highlight the problems of social equity. Currently, humanity is shaken by several wars, economic and demographic crises, and ecological problems are becoming more serious, and, respectively, the problem of social equity is becoming more and more acute, because it is social equity that can serve as an impetus for positive social changes. Social equity can constitute a solid foundation for solving various social problems.

Social equity, which is an important social principle, contributes to maintaining social order, favors the equal and fair distribution of material and non-material resources, and substantiates the need for equal opportunities and rights for all members of society. Social equity implies respect

for the interests of each person, regardless of their social status, gender, nationality, race, or other characteristics.

The main aspects of social equity are the following:

Equality of opportunity. This implies ensuring equal opportunities for all members of society regarding employment, education, healthcare, and other areas of life.

Equality before the law and equal rights. This refers to equal rights for all members of society.

Preventing and combating discrimination. No one should be discriminated against on the basis of race, gender, age, disability or other characteristics.

Ensuring social protection. People from vulnerable groups should receive social assistance, as the poor, the homeless, children, the elderly and people with disabilities cannot even secure the minimum necessary for survival.

Equitable distribution of resources. All members of a society have the right to access resources. The distribution of all resources, both material and non-material, should be carried out in an equitable manner that eliminates or reduces social inequalities and poverty.

Respect for diversity. Differences between people from different cultural and ethnic backgrounds should be recognized and respected.

Social equity has always been understood as an integral social phenomenon and an essential attribute of the social system. However, the perception of the content of the concept of social equity is determined by the social, cultural, political and other peculiarities of social development. Currently, social equity is perceived as inherent in society, as are values such as life itself, freedom, justice, equality and dignity. Social equity plays an important role in ensuring the progress of society, it contributes to the consolidation of social stability and solidarity. Through social equity, social cohesion is achieved, in the sense of active and responsible participation in democratic processes and mechanisms within society, aiming for each person to achieve their aspirations as much as possible (Gorincioi, 2009).

The progress of modern society is contingent upon social unity and a "social agreement" regarding the fundamental, essential issues of the social system's structure and functioning. Such agreement can only be achieved if all members of society acknowledge the legitimacy of the existing order. Therefore, the primary functions of equity in society are to legitimize the prevailing social structure and maintain social order. Social equity aims to confer social significance on as many individuals as possible. In order to achieve the necessary balance between collectivity and individuality, between public and private interests, the principles of social equity must be respected.

Regarding the relationship between sustainable development and social equity, it can be safely stated that social equity serves as a fundamental ethical principle for sustainable development. Adherence to the principle of social equity is important for sustainable development because it contributes to the elimination or mitigation of social inequality.

Sustainable development is a process of continuous transformation. It pursues the well-being of society, contributing to the formation of a new culture of consumption, which would combat consumerism. Sustainable development also contributes to solving environmental problems, to improving relations between humanity and the natural environment. Sustainable development orients humanity to satisfy its own needs, but also to leave this possibility to future generations.

Sustainable development aims to reconcile the development process with environmental quality, as well as to promote an integrated development and decision-making process at global, regional, national and local levels (Litvin and Dobrovolschi, 2022). Also, one of the main goals of sustainability is to preserve ecosystem integrity and conserve biodiversity. Sustainable development aims to increase economic efficiency and support the principles of social equity. Ultimately, sustainable development ensures environmental sustainability, enabling future

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generations to meet their vital needs. This pursuit is characterized by its dedication to economic efficiency, compatibility with the biosphere, and social equity. Sustainable development is a systemic approach to phenomena that ensures the coherence of organizational subsystems—economic, social, productive, and environmental—thereby facilitating the equitable distribution of resources to future generations. This is achievable only through meticulous, spatiotemporal record-keeping of the following interconnected factors: natural resources, the environment, population, pollution, and agricultural and industrial production (Todos, 2022).

Issues of equity and sustainability are closely linked in several ways. Among these, S. Lele and T. Jayaraman (2011) mention the following: issues related to intergenerational equity; fair treatment in solving ecological problems or respecting the rights of non-human living organisms, those that are sentient but have no voice; the correctness of calculating the social benefits and costs of projects, avoiding situations where the current actions of one actor negatively affect the current well-being of someone else, which generates the emergence of negative externalities of development activities; ecological inequity, when, for example, the preferential location of hazardous industries in neighborhoods where socially and economically marginalized groups live; equitable access to natural resources because the equitable distribution of socio-economic benefits from the use of natural resources critically depends on how the initial rights to use the resources are granted; enhancing the sustainable use of resources through equity, a fair allocation of resources.

The principle of social equity applies to several aspects of sustainable development, including intergenerational relations. The Brundtland Commission Report emphasizes that "sustainable development meets the needs of the present without compromising the ability of future generations to meet their own needs." Intergenerational equity is a *sine qua non* requirement, dictating that the present generation has the right to use and benefit from the Earth's resources, along with the obligation to consider the long-term impact of its activities and to sustain the resource base and global environment for the benefit of future generations (Tofan, 2014). In this regard, both the principles of social equity and sustainable development necessitate solidarity, generosity, and careful attention toward future generations. This brings the issue of resource management to the forefront. All types of resources must be consumed thoughtfully and in moderation, ensuring their accessibility for future generations.

We must demonstrate concern for the well-being of future generations. Each generation bears the responsibility to accrue and preserve an adequate amount of capital to replace that inherited from preceding generations, thereby enabling subsequent generations to experience an improved quality of life within a more equitable society. However, achieving this objective is challenging due to inherent intergenerational differences. For instance, young people, with the future ahead of them, are interested in the long-term preservation of environmental characteristics and resource levels. They tend to be more conservative with what they have and what surrounds them. The elderly, however, face a different situation, focused on the shortness of life. On this basis, they could be more selfish and more "consumeristic" (Sârbu and Albu, 2013).

At the intersection of sustainable development and equity, we find issues of distribution, encompassing both intragenerational (between groups in a society) and intergenerational allocations. A primary objective is to limit or eliminate environmental destruction by the current generation that would negatively impact future generations. Although challenging to achieve, equity applied to intergenerational relations postulates that present generations should not disrupt future generations' access to diverse forms of resources.

The United Nations Sustainable Development Goals (SDGs), adopted in 2015 as part of the 2030 Agenda for Sustainable Development, provide a comprehensive framework for global development efforts. They address the three core pillars of sustainable development: environmental protection, economic growth, and social inclusion (often termed social equity or

social sustainability). Among these, the goals whose achievement is intrinsically linked to the principle of social equity include the following:

Goal 3: Good health and well-being. This goal specifically aims, among other objectives, to foster optimal working conditions, thereby ensuring health and well-being in the workplace and promoting equity at work.

Goal 5: Gender equality. This goal focuses on achieving gender equality across economic, social, and environmental spheres, underpinned by the application of social equity principles.

Goal 8: Decent Work and Economic Growth. Social equity is an ethical principle in ensuring equity in employee remuneration and in creating optimal working conditions.

Goal 16: Peace, justice and strong institutions. Through this goal, sustainable development aims to promote peace and social justice, which can be more easily achieved by respecting the principle of social equity (United Nations, 2015).

The close link between sustainable development and social equity can be traced at a conceptual level as well as at concrete levels, such as the Sustainable Development Goals. These goals can be achieved more easily and quickly if the principles of social equity are applied.

Equity is closely related to fairness. It assumes that within a society, all its members should not only have equitable access to the resources and opportunities of the community, but that no one should bear a disproportionate burden due to government actions. In general, fairness implies a need for fairness (not necessarily equality) in the distribution of gains and losses and the right of everyone to an acceptable quality and standard of living (Beder, 2025).

The values of sustainable development must be spread among all members of society, integrated into all areas of educational activity to promote behavioral changes, which, in turn, contribute to the development of more sustainable and equitable societies. Education and information can significantly contribute to the successful implementation of sustainable development. Consequently, Education for Sustainable Development (ESD) is receiving increased attention in universities worldwide. The transformation of education into sustainability education necessitates systemic thinking and interdisciplinary approaches. Universities are tasked with educating future corporate leaders and their employees, convincing them that adopting responsible business strategies focused on sustainability represents a "win-win-win proposal for companies, the environment, and society" (Grecu and Nagore, 2014).

The education sector engages a comparatively limited segment of society and is currently in the nascent stages of developing educational programs for sustainable development. Consequently, substantial efforts from other entities, such as non-governmental organizations, are also imperative. These efforts are needed to inform the general public and to empower other members of society to act as active and informed citizens in constructing a society that is economically developed, socially equitable, and environmentally sustainable.

Conclusions

In the modern world, the pursuit of sustainable economic development is becoming increasingly relevant and a priority. Every society strives to achieve a balance among economic growth, social equity, and environmental sustainability to ensure human well-being and preserve natural resources for future generations.

The Sustainable Development Goals (SDGs) address global challenges, including poverty, inequality, climate change, innovation, economic growth, environmental degradation, peace, and justice. Achieving these goals is a particularly complicated and complex endeavor, yet it is attainable by combining the efforts of society's members who aspire to a better common future, founded on an awareness of the effects of social equity. Respecting the principle of social equity is crucial for sustainable development, as it helps mitigate social inequality, stabilizes economic, cultural, and political ties, aids in avoiding social conflicts, and contributes to the overall reduction of poverty.

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CURRENT RELEVANCE OF THE GOLD STANDARD DOCTRINE

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Abstract: Times of hardship lead to insecurity and uncertainty about the future. When this happens, many people turn to gold or other precious metals, real estate, land, and tangible assets in general. The multiple non-cyclical crises that have occurred in recent years have led to a resurgence of interest in gold. The regression of globalization and the multipolar order derived from the pandemic, the energy crisis, the degradation of geopolitics to the point of war and the nomad wars between the United States and China have marked the beginning of a new type of capitalism in which market uncertainty is heightened by economic and political interdependencies between countries. This research aims to analyse the actuality of the gold standard among the populations of civilized countries, which began to show an increase in the demand for gold directly proportional to the depreciation of geopolitical events. This article also traces the evolution of the economic idea around gold, from its beginnings to the banking and financial system's relation to it, providing new insights on economic behaviour during difficult times.

Keywords: Gold standard, economic crisis, fiat money, gold bugs, currency deposits

JEL Classification: B2, B5, P2, P5, O5

Introduction. Why does gold still matter today?

In 2015, a troy ounce of gold cost just over \$1,000. A troy ounce or monetary ounce is a unit of measurement used in Anglo-Saxon countries for the quotation of precious metals such as gold, silver, or platinum, or precious stones. One troy ounce is equivalent to 31.1034768 grams. At the end of 2024, the price was approaching \$3,000 for the first time in history. The price of gold was already rising when the Trump administration announced high tariffs for much of the world earlier this month, pushing the price of the metal to a record high of \$3,166 per troy ounce, up 17.4% from the day President Donald Trump was inaugurated. On April 11, 2025, the price exceeded

\$3,200. In one part of the world, however, this did not dampen the enthusiasm of those interested in physically owning precious metals, especially in Asia, which accounted for 64.5% of global demand, not including central bank purchases. Thanks to the ease of buying gold through online applications, in 2024, China purchased a combined 510 tons of gold, and India purchased 560 tons. It is estimated that the approximately 10 million marriages that take place annually in India ensure a demand for gold of approximately 350 tons of gold in jewelry purchases (The Economist).

There are cultural foundations and traditions that can explain the appetite for gold not only in Asia but throughout the world. Gold is also considered an asset that ensures financial stability. In China, India, Pakistan, and most of Southeast Asia, less than half of the working population is enrolled in a mandatory pension system. Gold serves as a safety net for old age. This is particularly important for women, who in many Asian countries do not have the same earning potential as men and, in some places, such as South Asia, often do not have assets in their own names. Economists complain that the huge sums invested in gold could be allocated to more productive investments, as demand for gold has led to increased gold imports and deepening trade deficits.

Literature Review:

Gold standard debates and the resurgence of gold soaring prices has sufficiently consistent results that the methodological dispute over the pro and con literature tilts the balance squarely in favor of gold economic importance. The advantages of a gold standard monetary system evolved during time according to specialized literature. The gold standard has the characteristic of being the ideal unit for measuring debts (Hawtrey, 1919), (Cassel, 1923).

Other scientific paper presented incentives in favour of silver standard, or bimetallic monetary standard. Before the outbreak of World War I (1914-1918), civilization enjoyed a golden age of classical liberalism. Silver had too many price fluctuations (Laughlin, 1927), whereas gold has adapted better to national conditions (Jones, 1933). More, the conventional wisdom that the gold standard emerged from the contradictions of bimetallism is not convincing. Instead, there are articles which argue that bimetallism could have survived and offer an alternative explanation for the emergence of the gold standard. (Flandreau, 1996). The main objective of the gold standard was to restore and maintain a reasonable level of stability in prices and costs, and greater exchange rate stability (Bernstein, 1980), (Meissner, 2002), (Middelkoop, 2014).

Between 1870 and 1914, adherence to the gold standard was a sign of financial soundness, a "good housekeeping seal of approval," which facilitated peripheral countries' access to capital from the core countries of Western Europe (Bordo & Rockoff, 1996). Although there is talk of the gold standard during the period 1880-1913 (the golden age of liberalism), the European gold standard only began in the late 1890s. (Flandreau *et al.*, 1998), (Mitchener *et al.*, 2010) or mathematical modeling in assessing the need for introduction of the gold standard. As in many other countries, a political change or crisis led to the abandonment of the gold standard. This shows how politics and economics work together when analyzing the decision to abandon a monetary system (Wandschneider, 2008).

A paradigm shift between the gold standard and the dollar standard was also present in different articles, when global economy faced inflation. In 1966, the global economy was facing excessive inflation. The Federal Reserve attempted to reduce the expansion of the global money supply. The monetary reality, however, is that the world has effectively moved to a dollar-based standard. The dollar has become effectively inconvertible into gold, even for foreign central banks. All major central banks have realized that if they try to exchange dollars for gold in large quantities, the United States will simply stop selling (Mundell, 1968), (Narro 1979). However, the gold standard has always required sustained efforts from the member states, the challenges and difficulties of this monetary system based on fixed exchange rate regime being also encountered in various works (Cooper *et al.*, 1982), (Knafo, 2006), (Temin, 2010).

More, all along with the economic challenges of the Great Depression of 1929-1933 and the Great Recession of 2007-2009, several other shortcomings were to be analysed: a provocative background with its rigidity of the fixed exchange rate system, and turmoil from the fragility of the financial system perspective (Crafts & Fearon, 2010), (Eichengreen, 1996). In his impressive book, *Golden Fetters: The Gold Standard and the Great Depression, 1919-1939*, economist Barry Eichengreen writes about the gold standard as a determining factor in the economic crisis of 1929-1933. The author argues that the gold standard of the 1920s paved the way for the Great Depression of the 1930s, accentuating the already fragile international financial system, which had not truly recovered after World War I. Under these circumstances, the gold standard was the mechanism that transmitted the economic crisis from the United States to the rest of the world and amplified the initial shock. But foundations of gold standard ceased to exist with the deterioration of the geopolitical context that led to the outbreak of World War I. The policies pursued, together with the economic imbalances created by World War I, led to the catastrophe that was the Great Depression. The argument is that the gold standard fundamentally limited economic policies and was largely responsible for creating the unstable economic environment in which policies operated (Eichengreen, 1996). The Great Depression was marked by a severe outbreak of protectionist trade policies. But contrary to the assumption that all countries rushed to raise trade barriers, there were substantial differences between countries in their movement toward protectionism. (Eichengreen & Irwin, 2010), (Mundell, 2000), (Almunia *et al.*, 2010), (Friedman, 1961).

The general outlook still reveals provocative as other countries along United States were interested in a monetary standard (Balachandran, 1989), (Redish, 1990), (Schultz, 2012). Despite these challenges, there are significant studies in order to present the gold standard as an unexpected historical event rather than an economic policy outcome (Barro, 1979), (Costigan *et al.*, 2017).

The review of relevant literature in the field gold standard highlights significant progress in understanding and applying these policies. Gold remains a safe haven in difficult times (Goldenweiser, 1929), and the dispute over the waiver of the same rights for silver remains open (Friedman, 1990). Together, these studies provide a comprehensive overview of the history of the gold standard or other monetary pegs (Officer, 1989), (Kahn, 2015), (Clark, 2005), potential trends and shortcomings, then the dollar standard, highlighting the benefits, challenges, and future perspective in this field of monetary stability.

Materials and Methods:

As materials and methodology, we analysed secondary data collection from existing literature in journals, articles, and books. We used the Web of Science database to identify relevant studies and articles, focusing on works that explore the relationship between the economic outlook and the demand for gold as a reserve of last resort, and also the relationship between development and the demise of quantitating easing policies due to monetary standard.

The primary scope of this article is to gain familiarity with existing literature on the chosen topic. For this purpose, literature review methodology was conducted, while placing research questions into context. Similarly, data was collected and analysed from the web search engines such as Google and Google Scholar. For this purpose, keywords such as ‘gold standard’, ‘monetary regression’, ‘economic crisis’, ‘gold bugs’, ‘currency deposits’, and ‘fiat money’ were searched. Majority of the materials or cited sources used in this research are scientific articles from ScienceDirect that have open access or are accessible for some higher educational institutions. The primary criteria used for selecting or filtering the data were relevancy and the recency. All of these selected research works are mentioned in the reference list.

Results and Discussions:

With the outbreak of World War I in 1914, the era of monetary stability came to an end. At first, the belligerent states did not officially suspend the gold standard, but they did restrict the circulation of gold coins. Although the gold standard was reinstated after the war, a number of

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factors changed the economic landscape, such as the maintenance of high taxes to pay off recurring war debts. Only the United States managed to maintain both the gold standard and low taxes, conditions that provided the basis for the economic stability of future growth.

Between 1933 and 1934, President Theodore Roosevelt devalued the gold dollar from \$20.67 per ounce to \$35 per ounce. The possession of gold for non-decorative purposes was declared illegal, so the government collected gold from holders at \$20.67 per ounce, and after taking possession of it, the value of an ounce was set at \$35, allowing the government to earn income from it for a year (Lewis, 2007: 41).

Gold as money can be understood through the theory of monetary regression. The main idea of Ludwig von Mises' monetary regression theory is based on an important feature of money: it is not demanded precisely like any other good based on different individual preferences, but precisely because it is what it is. The use of a coin as a standard of exchange necessarily implies that the coin has been used in this form before, otherwise no one would have any guarantee that it is useful for anything. Regression, i.e., going back in time and searching for that initial moment when money began to be used as money, raises the question of the existence and necessity of discovering a good that was used as money before any reference point (Rothbard, 1992) (Hummel, 2014), (Salerno, 1994).

The consequences of return to the hard currencies is another important issue of this research, whether the gold standard would still be viable. Further, is how stable the reintroduction of such a system would actually be for the economy. The evolution of the price of gold, its supply and demand can be presented as follows:

Table 3. Gold average annual prices (dollars to ounce)

Year	Price	Year	Price	Year	Price
1960-1967	35.31	1975-1978	157,48	2007-2010	1240,5 (+91,28%)
1968	40.20	1979	320,98 (+62,6%)	2011-2017	1336,21
1969-1972	44,25	1980	607.76 (+ 89,34%)	2018-2020	1391,25
1973	99.95 (+69,12 %)	1981-2000	367,05 (-40%)	2020-2025	3,697.45 (+108,8%)
1974	161,68 (+61,76%)	2001-2007	420,91		

Source: <https://www.macrotrends.net/1333/historical-gold-prices-100-year-chart>

As can be seen, between 1960 and 1970, gold price volatility was low as the economy recovered after World War II. Major political events, such as the Cuban missile crisis, which could have led to World War III, did not cause economies or investments to seek refuge in gold. But after the first oil shock caused by OPEC, following the Yom Kippur War between Israel and a coalition of Arab states, the price of gold had risen by almost 70% by the end of 1973. After the second oil shock in 1979, following the Islamic Revolution that led to the end of the monarchy in Iran, the price of gold rose by another 62.6%. It can be seen that the volatility of gold was determined more by the economic consequences of political events. In 1987, the banking crisis in the United States caused by rigid savings mechanisms, known as the Savings & Loan (S&L) crisis, frightened the public and, as a result, the price of gold rose by 22.5% by the end of the year.

The easing of the geopolitical situation, the end of the Cold War, the withdrawal of the Soviet army from Afghanistan, and the collapse of the Soviet Union in 1991 led to a decline in the price of gold by about 20% in the late 1980s and early 1990s, as investors sought bolder alternatives. The decline in the price of gold continued until 2001, reaching a value approximately 30% lower than at the time of the S&L crisis. The decline in prices persisted despite the currency crisis that

erupted in Asia in 1997 and the crisis in the IT industry in 1999, based on the fact that the real estate market had become expansive and seemed a safer investment destination than currency or capital market speculation. The real change came with the 2007 financial crisis in the United States, also known as the subprime crisis, because it was based on the exposure of borrowers in the real estate market. Between 2007 and 2010, the price of gold rose by 91.28%. This is one of the occasions when gold proved to be an emergency refuge for people who no longer trusted the economic system. This was followed by relative stability, affected only by the start of the trade war between the United States and China in 2018 during President Donald Trump's first term. However, between 2020 and 2025, the perpetuation of crises changed people's perception of gold as a safe haven for their money once again. After the Covid-19 pandemic, the conflict in Ukraine broke out, followed by a second trade war started by the United States not only with China, but also with Canada, Mexico, the European Union, and other countries. All of this sent a message of uncertainty and cautious prospects for the future. As a result, between 2020 and 2025, the price of gold rose by 108.8%. This inverse correlation between the price of gold and the economic and geopolitical context can be observed.

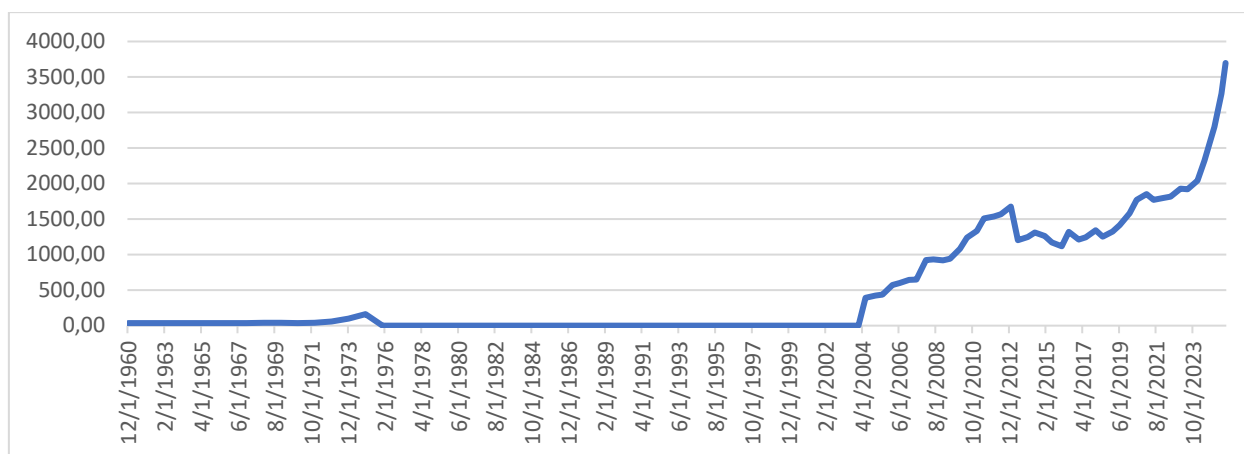


Figure 1. Evolution of annual prices of gold (dollars to ounce) – 1960-2025

Source: <https://www.macrotrends.net/1333/historical-gold-prices-100-year-chart>

If the value of money is fixed, responsibility for managing the economy will be transferred to other parts of the economy. Countries abandoned the gold standard in the 1930s because the anti-crisis measures that imposed a series of austerity measures could not maintain gold reserves. According to the book *Golden Fetters: The Gold Standard and the Great Depression, 1919-1939*, Barry Eichengreen found that the earlier a country abandoned the gold standard, the faster its economy recovered. Countries needed monetary easing policies to release money, recover toxic assets, or restart aggregate demand. But in their obsession with avoiding inflation at all costs, countries found themselves locked into the gold standard in implementing anti-crisis measures. The historian also drew attention to another aspect: it is very important to note that social stratification and the census voting system were different in the 19th century. More specifically, it was easier to adhere to the gold standard at that time because many workers did not have the right to vote.

The value of money can be fixed internally, through a gold standard, or externally, through a fixed exchange rate. Joining the eurozone is based on these principles. Otherwise, when money is needed, monetary policy is simply geared towards devaluing the currency. But in the long run, a perpetual program of devaluation will render the currency worthless. The point is that neither

fixing nor floating the currency is a universal solution; countries must still maintain their competitiveness.

An alternative scenario for reintroducing the gold standard assumes that its value might not be fixed as it was at Bretton Woods. The first era of the gold standard lasted from about 1871 to 1914, at the start of World War I. Countries joined and left the system in the 1920s and 1930s. The Bretton Woods system, designed in 1944, fixed exchange rates against the dollar and the dollar against gold. But countries were allowed to devalue their currencies if necessary. For example, the United Kingdom resorted to this procedure in 1949 and 1967. However, this would have called into question the fractional reserve banking system. Fractions would no longer be sufficient, and deposits would have to be covered. The consequence of such a policy would certainly be a severe credit restriction and, in the event of a financial crisis, bankrupt banks would be allowed to go bankrupt. The state intervenes to save banks because the erosion of confidence in the financial system can lead to a permanent crisis. Therefore, a return to the gold standard is far from simple and would involve a series of changes that might be far from acceptable in a democratic society. At the end of World War I, ruined economies saw a solution in pegging their national currencies to the gold standard. But the transaction cost was high for populations already hard hit by the war.

A study calculating the impact of the gold standard today (Diercks *et al.*, 2020) shows that this would have forced the Fed to set interest rates to maintain a fixed price of gold in dollars, rather than targeting inflation. Furthermore, the central bank's monetary policy interest rate would have become a function of the supply of gold—the amount of metal mined—and the demand for gold from investors and households. And fluctuations in the demand for gold could make monetary policy procyclical. Consequently, in difficult times, people stop spending and increase their demand for gold, so central banks have to raise interest rates to make other assets more attractive and stabilize the price of gold. In favorable times, the opposite would happen, and central banks would need to lower rates. Also, a very important random variable should be added to the monetary balance equation based on the quantity of gold. This is the productivity of the gold mining industry, which would influence monetary policy regardless of economic performance. Under these conditions, if gold is abundant, interest rates must fall to keep its price stable. If gold is scarce or lacking, interest rates will have to rise. Due to inflation, the chances of a return to the gold standard are only theoretical. The authors show that this would be true if the only forces affecting the economy were fluctuations in productivity growth and labor supply, and if the supply of gold followed productivity. The reality would be harsh. To adhere to the gold standard, central banks would have to maintain high interest rates even during economic crises, which would block measures to regulate the economy (Diercks *et al.*, 2020).

Conclusions:

The results obtained from the bibliometric analysis and review of relevant literature in the field of the gold importance for economy as a standard and mean of safe deposit provide a comprehensive perspective on the progress and challenges in this domain. The review of relevant literature confirms the importance of gold in promoting sustainable economic alternative for saving and investment. As a forward thinking, there is a need for a framework for convertible currencies is resurgent, as demonstrated by consumer behavior, especially during periods of economic recession. In fact and in law, it is a matter of monetary stability. The only major problem remains the macro-management of a gold standard in a situation of currency devaluation (Lewis, 2007: 411). The gold standard manages a connection between the quantity of paper money, which is theoretically unlimited, and the mass of precious metal, which is extremely limited in relation to the pace of economic expansion. The gold standard would no longer require mandatory reserve rates, and there would be no more liquidity crises. Constant concerns about economic liquidity have led to a decline in reserves and maintained a high degree of exposure for economies.

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A monetary standard based on precious metals is all the more difficult given that in the 1980s, when President Ronald Reagan almost succeeded in rebuilding the gold standard, new economic conditions and vectors reshaped the economy forever: the internet, artificial intelligence, the decarbonization revolution, and the current rush for mineral resources, this time for electricity, which is reshaping all other industries. The problem is that a return to the gold standard would reshape the balance of power between the three poles, the United States, China, and Europe, in favor of the latter, thanks to its larger gold reserves. However, fixed exchange rates would be a disadvantage in the short and medium term for smaller countries, which have used globalization and political integration much more rapidly to raise their standard of living and quality of life.

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RURAL-URBAN DISPARITIES IN ROMANIAN PRE-UNIVERSITY EDUCATION

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Abstract: In recent decades, disparities between urban and rural areas in Romanian education have become more pronounced, against a backdrop of growing development gaps between these areas and the migration and aging of the rural population. These development gaps are evident not only in school results, but also in access to resources, the quality of teaching staff and school infrastructure. Rural schools face a shortage of specialized staff and the phenomenon of teacher "commuting," which affects the continuity and quality of teaching. Teachers' salaries are generally low, and in rural areas there are insufficient financial incentives to compensate for the difficult living conditions. Rural schools often have poor infrastructure, a lack of modern teaching materials, laboratories, and access to technology. Teaching in these conditions is challenging and can be discouraging for teachers. Many rural students come from poor families, which adds pressure on teachers, who have to manage not only educational issues but also the social and health problems of their students. In this context, this paper provides a comparative analysis of the disparities between rural and urban education in Romania, based on statistical data, which may be useful for informing decisions in this area and reducing risks.

Keywords: disparities, insufficient financial incentives, comparative analysis

JEL Classification: I21, I25

Introduction

The restructuring of Romania's national education system, along with the introduction of new legislative regulations, has prompted a significant reorganization of the country's network of educational institutions. As a consequence of these reform measures, between 2007 and 2010, the total number of schools decreased by 642, representing a 7.8% reduction. The school-age population also declined, reaching levels in the 2010/2011 academic year that were 8.5% lower than those recorded in 2007/2008. Although higher education continued to expand during this period, its growth was inconsistent, largely influenced by developments in the private sector. Enrollment rates across all levels of education exhibited gender disparities, with 76.0% of boys and 79.3% of girls attending school in 2010/2011.

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In higher education, students predominantly enrolled in education (27.1%), economics (25.3%), and technical sciences (23.8%), while private institutions had the highest concentration of students in economics (37.1%). Corresponding with the decline in the school-age population, the total number of graduates fell across most educational levels, except in post-secondary and master's programs, which in 2009/2010 recorded increases of 48.1% and 9.4% compared to 2007/2008 and 2008/2009, respectively. By the end of the 2009/2010 academic year, the largest number of graduates came from high schools (over 204,000), followed closely by middle schools (199,000) and higher education (over 191,000).

The teaching workforce remained relatively stable over this period, with the exception of primary and lower secondary education, where the number of teachers declined by 10.1% compared to 2007/2008 and by 7.4% compared to 2009/2010. Overall staffing levels remain high, resulting in a decreasing student-teacher ratio. Projections indicate a continued decline in student numbers, varying by education level, with the steepest reductions expected in middle and high schools, followed by vocational secondary and higher education. According to World Bank simulations, the student-teacher ratio in high schools is projected to drop sharply from 12.17 to 7.6 by 2013. System-wide projections suggest a continuous and significant decline in this ratio, particularly in high school and higher education, whereas middle school ratios are expected to experience only slight decreases without a consistent trend (Feser & Isserman, 2006).

While demographic pressures on the education system are evident, appropriate policy responses remain unclear. One perspective suggests a need to reduce teaching staff at certain levels; however, low enrollment rates, particularly in secondary education, indicate a requirement for proactive measures by schools and teachers to attract and retain students (Feldmann, 2008). If no structural changes are implemented and current parameters such as class sizes are maintained, fully flexible hiring practices would nonetheless necessitate a reduction of over 50,000 teaching positions, with 80% of these reductions concentrated in secondary, middle, and high schools.

One of the major challenges in educational policy across European Union member states is tackling the disadvantages faced by groups at risk of educational marginalization (Chenic (Crețu), 2012). To address this, several countries are prioritizing increased investment in education as a long-term strategy to combat poverty and social exclusion. These efforts focus on preventing educational disparities by implementing effective early interventions, particularly through comprehensive child protection mechanisms. Additionally, education systems are being adapted to ensure that schools can meet the specific needs of children from disadvantaged backgrounds. Policies also aim to reduce school dropout rates, reintegrate young people who have left the system prematurely, and expand opportunities for continuing education, thereby ensuring access to both general and vocational training for at-risk children and youth. Furthermore, educational institutions play a critical role in fostering social values, promoting cohesion, ensuring equal opportunities, and encouraging active civic engagement among citizens (Socol & Socol, 2012).

This set of measures within European educational policies highlights the importance of integrated strategies aimed at enhancing educational opportunities and promoting socio-professional inclusion for disadvantaged groups. Such strategies encompass not only educational interventions but also social protection measures and initiatives facilitating labor market integration. In Romania, the education sector has undergone extensive reforms over the past 21 years, involving both curricular content changes and significant institutional transformations.

Over the last five years, the development of national strategies has provided a framework for designing and implementing educational programs intended to increase access to education for marginalized groups and to modernize the educational system in line with European standards of institutional development. Notably, numerous strategies, national programs, and projects have

been launched in recent years to improve learning conditions in Romanian schools and to reduce educational and social inequalities (Manole, A.M., 2012).

Despite considerable efforts in institutional development and systemic reform, challenges remain that continue to affect educational outcomes and quality. Programs implemented under pre-university education strategies, particularly those targeting rural education, aim to improve educational indicators. However, funding for the education system remains insufficient relative to existing needs. Rural education, in particular, must be prioritized, given its unique challenges. Although the Rural Education Revitalization Strategy was introduced in 2001, the measures it proposed—as well as subsequent programs addressing rural schools—require substantial investments and integrated solutions that address both material and human resources, as well as the quality and content of education. In summary, the current education and research system in Romania is not yet capable of sustaining a competitive position within the European Union or supporting sustainable economic growth.

Conclusions:

In conclusion, the reforms undertaken in Romania’s education system over the past two decades have laid the groundwork for significant progress in both curricular and institutional development. The implementation of integrated educational policies, aligned with European standards, demonstrates a clear commitment to enhancing opportunities for disadvantaged groups and promoting social inclusion. Nevertheless, persistent challenges remain, particularly regarding the quality and accessibility of education in rural areas. Despite numerous national strategies, programs, and projects targeting these issues, the insufficiency of funding continues to constrain the effectiveness of such initiatives. Rural schools, in particular, require tailored interventions that address both human and material resources, ensuring that educational content and teaching quality meet modern standards. Moreover, while programs aimed at pre-university education have improved certain indicators, systemic inequalities still impact student performance and outcomes. To achieve a fully competitive education system, Romania must combine substantial investment with integrated, sustainable policies that foster equal opportunities, reduce disparities, and support continuous professional development for educators. Ultimately, without coordinated efforts across all levels of the system, the potential of Romanian education to contribute to long-term economic growth and EU competitiveness remains limited. Ensuring equity, quality, and efficiency in education, particularly in rural contexts, is essential for building a modern, inclusive, and resilient educational framework capable of meeting both national and European development goals.

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SESSION V
INNOVATION AND COMPETITIVENESS IN ACCOUNTING
AND AUDITING OF ENTITIES

THE ROLE OF THE GREEN ECONOMY IN REDUCING CARBON EMISSIONS AND THE CHALLENGE IN IMPLEMENTING THE EUROPEAN GREEN DEAL

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Abstract: This study examines the role of the green economy in reducing carbon emissions and assesses the challenges related to the implementation of the European Green Deal (EGD). The main objective of this research is to analyze how green economy policies can contribute to achieving the carbon reduction objectives in the European Union and to assess the main obstacles that limit the effectiveness of the implementation of the EGD. This research uses a methodology based on econometric analysis of secondary data, focusing on key variables that help to assess the impact of green policies on CO₂ emissions. The results show that the green economy, through increased investment in renewable energy and the application of sustainable economic growth models, has a direct and positive impact on reducing carbon emissions. The transition to clean energy and the use of new technologies are two key factors in this regard, which are closely linked to the green growth policy and the objectives of the Green Deal. Despite this, the implementation of the EGD faces several challenges, including economic and political disparities between EU Member States, as well as the need for sustained financial support and stronger political commitment. In conclusion, this study shows that, although the green economy has great potential to support climate objectives, sustainable progress in implementing the Green Deal requires a more coordinated and collaborative approach between Member States and EU institutions.

Keywords: Green economy, carbon emissions, European Green Deal, renewable energy, climate policy.

JEL Classification: Q56, Q58, Q01, Q51, O44

1 Introduction

Climate change represents one of the most serious challenges of the 21st century, affecting economic development, social well-being, and environmental balance. To address this crisis, the European Union (EU) has adopted the European Green Deal (EGD), a comprehensive strategy that aims for climate neutrality by 2050. This process envisions the gradual reduction of greenhouse gas emissions, the transition to a circular economy, and the development of sustainable sectors, while fostering innovation and the shift toward clean energy (Eder, 2025).

In this context, the Green Economy is regarded as an essential mechanism for harmonizing economic growth with environmental protection. It is based on the efficient use of natural resources, the reduction of dependence on fossil fuels, and the promotion of sustainable consumption and production (Smol, 2022). However, the implementation of the Green Deal's objectives faces numerous challenges. Structural differences among member states, limited institutional and financial capacities, as well as variations in the level of political will, make this transformation uneven (Ciot, 2021).

Moreover, recent crises such as the COVID-19 pandemic and the war in Ukraine have influenced policy priorities and added difficulties in financing the green transition (Sabato et al, 2022). These challenges demonstrate that, beyond legal and financial instruments, the transformation process requires broad social engagement, technological innovation, and deeper coordination among EU member states.

This study aims to analyze the role of the green economy in reducing carbon emissions, while simultaneously examining the challenges of implementing the European Green Deal. The analysis will be based on an econometric model, through which the key factors influencing emission reduction will be identified, such as green finance, technological innovation, and environmental policies.

2 Literature Review

A number of studies confirm that Green Deal policies have contributed to the reduction of greenhouse gas emissions, particularly during the years 2018–2020, when, in addition to climate measures, the COVID-19 pandemic also had an impact. Methane emissions and total emissions proved to be the most influential factors in overall changes (Mogoş, 2023). This indicates that the green economy is not merely a political concept but is closely tied to concrete environmental outcomes.

The European Green Deal, initiated in 2019 by President von der Leyen, represents a comprehensive plan to make the European Union a modern and sustainable economy. Its goal is to respond to the climate emergency by transforming key sectors such as the economy, energy, and transport through reducing pollution and promoting the use of clean energy. The Deal aims to cut emissions by at least 50% by 2030 and to achieve climate neutrality by 2050, an objective enshrined in law. It focuses on protecting people and the environment by promoting green technologies and innovation, while also seeking to ensure social justice for communities most affected by change. Through it, European citizens benefit from cleaner air, more energy-efficient homes, and greater use of renewable resources (Commission, 2024).

The European Green Deal serves as a strategy for economic growth and competitiveness, aiming to be a global example for climate protection. Public awareness of the European Climate Law is essential to promote long-term objectives and opportunities for innovation and job creation. By 2030, around €1 trillion is expected to be mobilized for sustainability investments; however, the exact cost by 2050 remains unclear due to differences among countries. A study on Lithuania highlights discrepancies in information management between the EU and the US. The comparison shows divergences in positions but also common areas such as environmental, fiscal, and industrial policies, encouraging sustainable and innovative solutions. Deficiencies in information during processes of digitalization and urbanization call for audits and improved communication. Crises such as the COVID-19 pandemic and the war in Ukraine influence society's stance on sustainable development (Streimikiene et al 2022).

Carbon dioxide emissions caused by human activities, particularly from the burning of fossil fuels, represent the main source of greenhouse gases. In 2020, around 87% of these global emissions were linked to the energy production sector. This excessive amount of CO₂ not only intensifies climate change but also slows down efforts for sustainable economic development (Yang et al, 2023). For this reason, countries around the world are aiming to harmonize economic

growth with sustainability objectives, making the construction of a green, low-carbon economy a central issue in academic debate (Imansyah et al, 2023).

The assessment of carbon dioxide emission intensity represents a major challenge. Currently, three main approaches are used for this purpose: the emission factor method, the direct measurement method, and the material balance method (Hu et al, 2022). The emission factor method calculates the amount of carbon released based on the consumption of different energy sources and their respective emission coefficients. This approach is known for its simplicity and the ease it provides in obtaining data (Xiao et al, 2023). However, due to differences in the structure and quality of energy consumption across countries, various standards for emission coefficients have been developed by different institutions. Among these, the standards published by the IPCC are considered the most widely accepted at the global level (Wang and Zhou, 2022).

The strategies of the Green Deal (GDS) share common goals: the development of a clean and green economy through pro-environmental solutions, while taking into account social and economic well-being as well as environmental protection. The key points include: programs at national and international levels, the integration of social and environmental aspects into the economy, climate protection, preservation of natural resources, the use of renewable energy, building a low-carbon economy, creating new jobs, engaging society, and promoting sustainable consumption. The role of the state remains decisive for the clear implementation and monitoring of this green transformation (Smol, 2022).

The business model of the Tauron Group, which was previously based mainly on coal, is being transformed toward sustainability and technological modernization under the influence of the European Green Deal. Through the “Green Return” program, Tauron is developing renewable energy sources (wind, solar, hydro), modernizing the energy grid, and engaging active consumers (prosumers). Sustainable practices are being implemented across all parts of the business model. However, the profitability of this new model depends on external factors such as legislation, technological progress, and state measures. A comprehensive assessment will only be possible after approximately ten years (Samborski, 2022).

The implementation of the Green Deal is uneven among member states. Central and Southeastern European countries face numerous obstacles such as a lack of funds, weak administrative capacities, and cultural and political factors. In Romania, for example, these factors have hindered the effective implementation of the objectives, highlighting the need for tailored national plans (Ciot, 2021). In contrast, countries such as Austria have demonstrated a leading role through regional cooperation and the transfer of technologies in the energy and transport sectors.



Figure 1. Elements of the European Green Deal
Source: (Europejska, 2019)

The European Green Deal aims to transform the EU's economy into a sustainable one, including reducing emissions, increasing renewable energy, and promoting a clean and circular economy. It focuses on environmental protection, biodiversity preservation, and the improvement of transport and agricultural systems for a healthier future. Through a “Just Transition,” it seeks to ensure that no one is left behind, while the EU commits to taking a global leadership role in climate efforts by supporting research and innovation.

Existing studies emphasize that carbon emissions are closely linked to factors such as economic growth, energy use intensity, population size, and the degree of urbanization (Sharma, 2011) highlighted that GDP per capita and urbanization constitute the main factors influencing global carbon emission levels. On the other hand, (Murshed, 2020) argued that trade in the field of Information and Communication Technology (ICT) reduces energy intensity, improves energy efficiency, and consequently helps in reducing carbon dioxide emissions. Meanwhile, Yeh and Liao, (2017) emphasized that population growth has driven higher energy consumption both in the production sector and in daily life, creating increased pressure on the ecosystem.

The process of economic development is inevitably accompanied by an increase in carbon emissions, and this relationship has consistently been one of the main topics of scientific research (Tao, 2022). (Wang et al, 2022) showed that the level of economic development significantly and positively affects the scale of carbon emissions. In general, studies examining this relationship rely on two main approaches: the analysis of the decoupling between economic growth and carbon emissions (Hardt, et al., 2018) and the testing of the environmental Kuznets curve model (Guo et al, 2022; Wen et al, 2022). This model suggests an inverted U-shaped relationship, where the environment undergoes significant degradation in the early stages of economic development. However, after reaching a certain threshold of development, emissions peak and then begin to decline. This implies that, despite the early negative impacts on the environment, in the long-term perspective more favorable ecological conditions can be achieved, along with the realization of carbon reduction objectives (Grossman and Krueger, 1991).

3 Methodology of the Research

The aim of this research is to assess the role of the green economy in reducing CO₂ emissions in EU countries and to analyze the challenges of implementing the European Green Deal (EGD). To conduct this research, secondary data will be used, while for the literature review materials will be drawn from reports published by relevant institutions, scientific publications, books, online sources, and materials from international conferences. The period analyzed in the research is 2004–2024, focusing on EU member states. For data processing, the Stata software will be employed, and the tests to be conducted in this program include: descriptive statistics, correlation analysis, Linear Regression, Random Effects – GLS Regression, Fixed Effects Regression, Hausman–Taylor Regression, GEE Model, and GMM Model.

The research questions of the study are:

Are the growth of the green economy and the use of renewable energy related to the reduction of CO₂?

What is the role of environmental taxes, access to energy, GDP, and population in CO₂ dynamics?

Research Hypothesis:

H1: *The green economy contributes to the reduction of carbon emissions.*

$$CO_2 = \beta_0 + \beta_1 GGE_{i,t-1} + \beta_2 REN_{i,t} + \beta_3 GDP_{pc,i,t} + \beta_4 POP_{i,t} + \beta_5 AC_{i,t} + \beta_6 ETAX_{i,t} + \varepsilon_{i,t} \quad (1)$$

Table 1. Description of the variables included in the econometric model

Variables	Symbol	Variable	Unit/Transformation	Source
Carbon emissions	CO2	Dependent	CO ₂ emissions per capita (tons per capita)	Eurostat
Green Growth Economy	GGE	Independent	Index or % of “green” employment/investments	International Monetary Fond
Renewable energy consumption	REN	Independent	% of total final energy consumption	World Bank
GDP per capita	GDPpc	Independent	current US\$	World Bank
Population	POP	Independent	Population, total	World Bank
Access to energy	ACC	Independent	% of population	World Bank
Environmental taxes	ETAX	Independent	Environmental tax revenue (% of GDP)	OECD

Source: Data obtained by authors (2025)

4 Results

In the chapter, the results will be presented through econometric analysis, where in this part the hypotheses presented in the research will be tested and we will try to get answers to the research questions presented earlier.

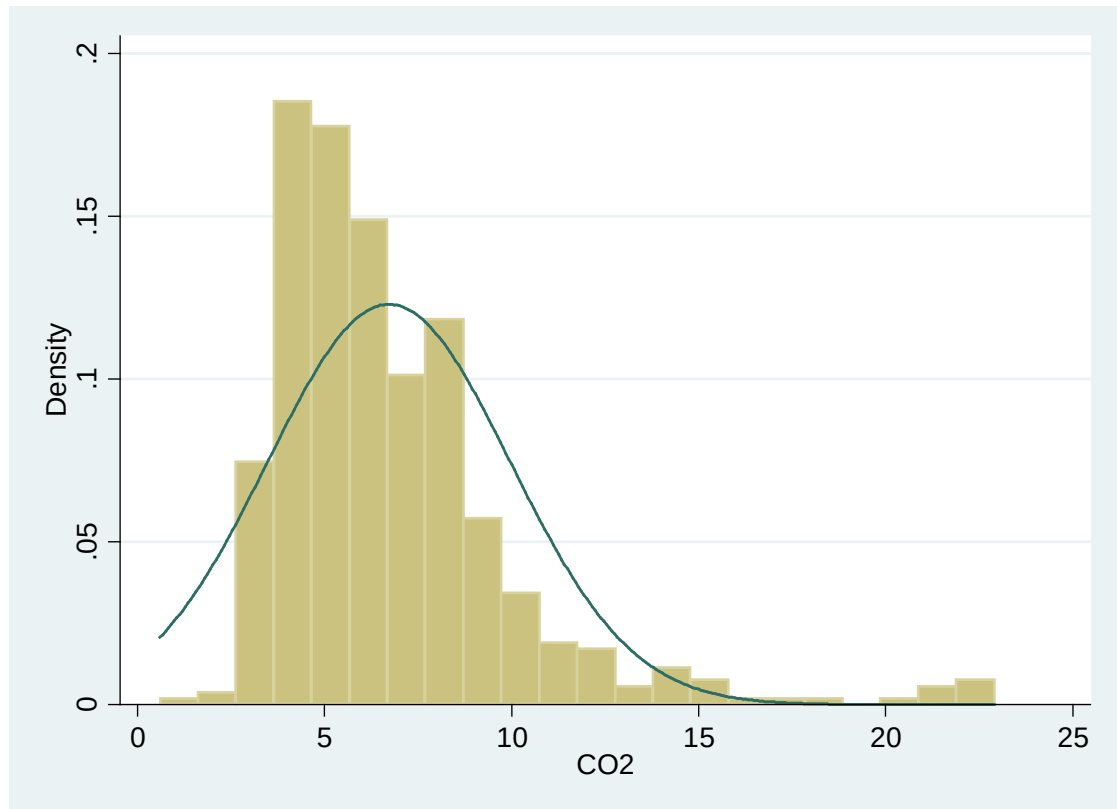


Figure 1. Graphic representation of the histogram

Source: Authors' calculations in Stata (2025)

This graph presents the distribution of the CO₂ variable through a histogram and a density function. It can be observed that the data do not follow a perfectly normal distribution but are right-skewed. Most of the values are concentrated in the 3–8 interval, where the density is highest, while

there are some higher values (outliers) reaching around 20–25, which extend the tail of the distribution to the right.

Table 2. Correlation analysis for the variables included in the econometric model

Variables	Obs.	Mean	Std.Deviation	Minimum	Maximum
CO2	516	6.718992	3.243208	0.6	22.9
GGE	502	3.146992	11.33124	1.1	256
REN	504	19.92534	11.56621	0.1	60.5
POP	506	6.858182	0.5933251	5.61	7.92
GDPpc	498	2.314478	4.086278	-14.8	24.5
AC	516	99.7688	1.069713	91.4	100
ETAX	502	3.120359	11.32918	1.09	256

Source: Authors' calculations in Stata (2025)

The presented table provides a statistical summary of the variables. It reports the number of observations, the mean, the standard deviation, the minimum, and the maximum for each variable. In our case, the CO₂ variable has 516 observations with a mean of 6.72 and a standard deviation of 3.24, indicating a considerable spread of the data. Meanwhile, the GGE variable has a mean of 3.15 and a higher standard deviation of 11.33, reflecting a large variability in the data. The GDPpc variable has a mean of 2.31, but a notably negative minimum value (-14.8), which may suggest unusual occurrences in the dataset, such as extremely low values for certain countries or time periods.

Table 3. Correlation analysis for the variables included in the econometric model

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)
(1) CO2	1.0000						
(2) GGE	-0.0365	1.0000					
(3) REN	0.3132	-0.0069	1.0000				
(4) POP	0.2264	0.0585	-0.0385	1.0000			
(5) GDPpc	0.0145	-0.0120	-0.0590	-0.1362	1.0000		
(6) AC	0.1079	0.0112	0.0877	-0.0521	-0.0660	1.0000	
(7) ETAX	-0.0365	0.9998	-0.0091	0.0595	-0.0128	0.0106	1.0000

Source: Authors' calculations in Stata (2025)

The table presents the correlation matrix among seven variables, showing that the strongest relationship is between GGE and ETAX with an almost perfect coefficient (0.9998), suggesting that they represent very close or interconnected aspects of the same indicator. On the other hand, renewable energy (REN) has a positive correlation with CO₂ emissions (0.3132), implying that its use has not been sufficient to reduce pollution in this case. Population (POP) is positively related to both CO₂ (0.2264) and ETAX (0.0595), but these relationships remain weak. Meanwhile, GDP per capita (GDPpc) and AC display very low correlations with the other variables, indicating that their impact is almost negligible in this relationship. Overall, the table shows that apart from the strong link between GGE and ETAX, as well as the modest influence of REN and POP on CO₂, the other variables do not exhibit statistically significant relationships.

Table 4. Econometric results and empirical findings of the study

Variable	Linear Regression	Random Effects – GLS Regression	Fixed – Effects Regression	Hausman – Taylor Regression	GEE Model	GMM Model
CO2	-	-	-	-	-	-
GGE	-1.522614 (0.620)	-0.5870116 (0.363)	-.5810669 (0.371)	-0.5856155 (0.358)	-0.6203206 (0.401)	-0.256956 (0.955)
REC	-0.1165421	-0.265582	-0.270501	-0.2661055	-0.2670609	-0.200202

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	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***
POP	-1.776394 (0.000)***	-2.49612 (0.007)***	-2.719536 (0.017)***	-2.580874 (0.005)**	-2.583858 (0.013)***	-1.395383 (0.634)
GDPpc	-0.1116695 (0.161)	-0.010757 (0.329)	-0.0098776 (0.292)	-0.0104506 (0.318)	-0.0125353 (0.368)	0.0116371 (0.000)***
AC	0.1213734 (0.003)***	0.15417 (0.000)***	0.1586336 (0.000)***	0.1519321 (0.000)***	0.1442649 (0.00)***	-0.0782602 (0.960)
ETAX	-0.9168395 (0.629)	-0.2141887 (0.361)	-0.2165171 (0.369)	-0.2113107 (0.357)	-0.2475141 (0.399)	-0.2711571 (0.960)
Const.	42.99299 (0.142)	-20.09897 (0.443)	-20.89097 (0.465)	-18.04349 (0.661)	-21.3019 (0.479)	
R Square	0.1750	0.6304	0.6304			
Adj.R ²	0.1650	0.0903	0.0907			

Source: Authors' calculations in Stata (2025)

Explanation: P-values are shown in brackets: *** indicates statistical significance at the 1% level; ** indicates statistical significance at the 5% level and * indicates 10% statistical significance.

From this table, we have several regression models (Linear, Random Effects, Fixed Effects, Hausman–Taylor, GEE, and GMM). For more analytical and robust commentary, the Fixed Effects Regression model appears to be the most adequate, as it controls for time-invariant heterogeneity and is frequently used in panel data analysis.

In the Fixed Effects Regression model, some variables turn out to be statistically significant, while others do not. First, **REC (-0.270, p<0.01)** shows a negative and highly significant coefficient. This indicates that an increase in the consumption of renewable energy helps reduce CO₂ emissions. Economically, this is a positive finding, as it demonstrates that the use of green resources has a clear impact on reducing pollution. Similarly, **POP (-2.719, p<0.05)** has a negative and significant effect, suggesting that population growth is associated with lower CO₂ emissions. Although this appears counterintuitive, the result is often linked to the fact that in countries with large populations, per capita consumption is lower, or stricter environmental policies are enforced. Economically, this shows that population growth does not necessarily equate to more pollution, provided it is managed with sustainable policies. Furthermore, **AC (0.158, p<0.01)** is positive and highly significant. This result shows that increased access to energy is associated with higher CO₂ emissions, as the additional energy supplied often comes from fossil fuels. Economically, this is a clear warning that the expansion of energy access should be directed toward clean sources to avoid driving up pollution. On the other hand, some variables are not statistically significant but remain valuable for interpretation. **GGE** has a negative coefficient (**-0.581, p=0.371**), suggesting that improvements in green economic growth may go hand in hand with reduced pollution. Although this result is not statistically significant, it is economically reasonable. Countries implementing more sustainable policies and promoting green development may experience economic growth without increasing pollution, by leveraging opportunities to use clean technologies and renewable resources. **GDPpc (-0.009, p=0.292)** is negative and not significant, but it can be economically interpreted as a trend in which higher per capita income is associated with reduced pollution. In practice, this is related to the fact that wealthier countries have more resources to finance clean technologies, although the lack of statistical significance indicates that this relationship is not uniform across all countries. **ETAX (-0.216, p=0.369)** has a negative but insignificant coefficient. The result is consistent with theoretical expectations that environmental taxes can help reduce pollution, although the data do not provide strong statistical evidence. Economically, this suggests that taxation alone is not sufficient; to be effective, it must be accompanied by complementary policies such as subsidies for green energy and investments in energy efficiency.

Conclusion

The analyses show that the main factors influencing the level of CO₂ emissions are the use of renewable energy, population, and access to energy. The increase in the consumption of green resources has a reducing effect on pollution, confirming the importance of investments in the energy transition. Likewise, population growth is found to be associated with lower per capita emissions, which implies that stronger environmental policies, urbanization, and energy efficiency can offset the added pressure from population growth. In contrast, the expansion of access to energy contributes to higher CO₂ levels, as this access is still often supplied by fossil sources.

Meanwhile, variables such as green economic growth, income per capita, and environmental taxes do not show a significant impact, but they remain important to consider. Good governance suggests potential for more effective environmental policies, higher per capita incomes enable investments in clean technologies, while environmental taxes need to be accompanied by additional supportive measures to be truly effective.

In conclusion, the results highlight that pollution reduction does not depend solely on economic development but on a combination of energy, social, and institutional policies. Renewable energies emerge as the strongest factor for achieving sustainable development, while the expansion of energy access must be closely tied to clean sources to avoid increasing CO₂ emissions.

Recommendations

Promotion of renewable energy – The results clearly show that the use of green energy reduces pollution. It is recommended that states increase subsidies and investments in renewable sources, accelerating the energy transition.

Management of energy access – Since the expansion of access to energy (AC) appears as a factor that increases pollution, it is recommended that expansion policies be based on clean sources, so that the growth in consumption does not generate additional emissions.

Exploitation of green opportunities – To stimulate the growth of the green economy, it is necessary to invest in renewable resources, sustainable agriculture, and effective waste management. Support for innovation and sustainable practices will contribute to reducing pollution while opening opportunities for economic development and job creation.

Integration of fiscal policies – Environmental taxes should be combined with other incentive measures (such as fiscal relief for green businesses or subsidies for clean technologies) in order to have a measurable effect on reducing pollution.

Balancing economic and environmental development – Countries with higher GDP have better opportunities to finance the green transition. It is recommended that economic growth be accompanied by concrete plans for investment in clean technologies to avoid the historical link between development and pollution.

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THE APPLICATION OF ARTIFICIAL INTELLIGENCE IN AUDITING SUSTAINABILITY REPORTS: BETWEEN ETHICAL CHALLENGES AND EFFICIENCY

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Abstract. Artificial intelligence is increasingly embedded in the assurance of sustainability reports, promising efficiency gains yet raising acute ethical concerns. This study examines how AI can improve audit efficiency while preserving ethical integrity, and whether such use remains compliant with emerging assurance and reporting standards. Building on a three-pillar model: Ethics and Independence, Efficiency and Detection, and Governance and Compliance, we derive three hypotheses and evaluate them through a practitioner survey of auditors, accountants and senior managers, complemented by a targeted document analysis using LLM/NLP tools on ESG reports. Results indicate that explicit ethical safeguards (bias testing, transparency and independence protocols) are associated with higher stakeholder trust; moreover, AI-assisted review reduces time while maintaining or improving the detection of exaggeration/greenwashing; finally, aligning AI workflows with ISSA 5000, IFRS S1/S2, ESRS and GRI enhances traceability of evidence and perceived compliance. Accordingly, the study underscores the need for continuous professional training, clear ethical guidelines and governance-by-design for AI in sustainability assurance, and offers an integrated model that connects ethics, efficiency and standard-based compliance.

Keywords: AI auditing, sustainability report assurance, ethics and independence, efficiency, greenwashing, ISSA 5000.

JEL classification: M42; M41; M14; Q56; C45

Introduction

The transformation of sustainability reporting in recent years has created a dual pressure on assurance practices: on the one hand, standards and disclosure requirements have diversified and become increasingly detailed; on the other, the volume and heterogeneity of information have expanded rapidly. In this context, artificial intelligence promises a step-change in the efficiency of auditing sustainability reports, yet it simultaneously opens a substantial field of ethical questions regarding bias, transparency, and independence. Moreover, the emergence of a global normative

framework for the assurance of sustainability reporting, coupled with initiatives to converge reporting frameworks, calls for a repositioning of audit: from traditional procedures to assurance-by-design workflows in which AI generates not only results but also audit-ready, traceable, and reproducible evidence.

Accordingly, this article examines the application of artificial intelligence to the auditing of sustainability reports through two critical lenses, ethics and efficiency, anchored in a well-defined normative framework. First, we synthesize recent literature on ethical principles, bias control, and the perceived effects on independence to delineate the minimum conditions for public trust. Second, we map NLP/LLM applications for extracting, aligning, and verifying disclosures, including the detection of greenwashing and exaggeration, to highlight tangible operational gains. In parallel, we integrate assurance standards and reporting frameworks into a coherent process design so that the proposed hypotheses can be tested rigorously on indicators of time, accuracy, coverage, and evidence quality. Thus, our contribution is a conceptual model that connects ethics, efficiency, and compliance within an AI-assisted audit architecture capable of supporting both the practical utility and the social legitimacy of sustainability assurance.

Literature Review

Recent scholarship delineates three complementary axes regarding the use of artificial intelligence in the assurance of sustainability reports. First, on the **ethics and independence dimension**, studies show that the social validity of AI-assisted audit depends on explicit principles, bias control, and transparency about how models operate. Syntheses and conceptual works highlight both architectures for ethical auditing of AI and limits in stakeholder involvement and external reporting (Laine, 2024; Schiff, 2024; Lehner et al., 2022). In the same vein, research on bias and professional dilemmas indicates that explanation mechanisms and fairness testing are essential for trust (Murikah et al., 2024; Fülöp et al., 2023; Huriye, 2023). Moreover, experimental evidence suggests that certain uses of AI can mitigate the perceived effect of independence conflicts on firms' liability, thereby strengthening the credibility of professional judgements (Libby & Witz, 2024).

Second, on the **efficiency and detection dimension**, applied NLP/LLM studies demonstrate the ability to extract, align, and verify disclosures from ESG reports, reducing review time and increasing the accuracy of non-compliance identification (Hillebrand et al., 2023; Zou et al., 2025). Concomitantly, scoring and automated classification approaches provide tools for flagging exaggeration and greenwashing, reinforcing the control of misstatement risk (Lagasio, 2024; Luo et al., 2025). In addition, evidence from the audit-risk domain indicates AI's potential to support risk-oriented procedures with measurable operational savings (Adamyk et al., 2023), while background literature explains the evolution of ideas and use cases (Omoteso, 2012).

Third, on the **normative framework and compliance dimension**, assurance standards and reporting frameworks set the requirements against which AI workflows must be designed. ISSA 5000 defines general requirements for sustainability assurance engagements, regardless of the reporting framework, guiding types of evidence, documentation, and assurance reporting. In parallel, IFRS S1/S2 structure investor-relevant disclosures, while ESRS expand the granularity of requirements at the European level, GRI remains the widely used reference for non-financial reporting. Applied literature on GRI–ESRS alignment and sectoral case studies shows how mappings and compliance checks can be built, useful for configuring rules and coverage indicators in AI systems (Matuszak et al., 2025). Furthermore, approaches linking AI to sustainable accounting underscore the need to balance innovation and responsibility in line with societal expectations (Areiqat & Jaber, 2025).

In what follows, we provide a focused synthesis of prior work and derive the hypotheses from the analyzed sources (2022–2025), organized along three axes: H1 - Ethical integrity and

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independence, H2 - Efficiency and detection quality, and H3 - Normative framework and compliance.

Table 1. Hypotheses, representative studies, and relevance

Hypothesis	Representative studies (year)	Relevant to the research
H1 Ethical integrity and independence	Laine (2024); Schiff (2024); Murikah (2024); Lehner et al. (2022); Libby & Witz (2024); Fülöp et al. (2023)	Ethical principles, bias testing, transparency/XAI, and independence-safe protocols are linked to higher stakeholder trust and credibility of professional judgement.
H2 Efficiency and detection quality	Hillebrand et al. (2023, sustain.AI); Zou et al. (2025, ESGReveal); Lagasio (2024); Luo et al. (2025); Adamyk et al. (2023)	LLM/NLP reduces review time and improves identification of non-compliance, exaggeration, and greenwashing versus manual review.
H3 Normative framework and compliance	ISSA 5000 (IAASB, 2024); IFRS S1/S2 (ISSB, 2023/24); ESRS (2023/24); GRI (rev. 2021, in force 2023); Matuszak et al. (2025); GRI-ESRS alignment (2023)	An assurance-by-design pipeline aligned to ISSA 5000 and mapped to IFRS S1/S2, ESRS, and GRI increases requirement coverage, traceability, and evidence quality.

Notes: XAI = Explainable AI; LLM = Large Language Model; ESG = Environmental, Social and Governance
Source: Authors' elaboration based on the reviewed literature

Taken together, the evidence in Table 1 supports a three-pillar architecture that underpins our conceptual model: Ethics & Independence as the premise of trust, Efficiency & Detection as the driver of operational value, and Governance & Compliance as the anchor of professional legitimacy. We summarise this structure in Figure 1, which guides our empirical tests.

In sum, the literature converges on three directions: (i) conditions for **ethical integrity** and protection of independence to sustain trust; (ii) **operational gains** through NLP/LLM and earlier detection of misstatements; (iii) **alignment with standards** to ensure traceability, evidential sufficiency, and interoperability across frameworks. On this basis we derive the working hypotheses: H1 - ethical integrity and independence raise stakeholder trust; H2 - AI reduces review time and improves detection of non-compliance/greenwashing; H3 - an assurance-by-design pipeline aligned with ISSA 5000, IFRS S1/S2, ESRS, and GRI increases compliance and the quality of evidence.

Methodology

The study proceeds through a sequence that mirrors the practical reality of the project: a bibliometric analysis of the selected sources, the derivation of research directions and hypotheses; the administration of a questionnaire to practitioners, and, finally, the correlation of the results with the scientific hypotheses in order to develop the conceptual model. In this way, the approach links theoretical coherence with empirical verification in a compact format suitable for a short article.

First, the bibliometric analysis maps the field: we extract metadata (year and type of publication, outlet, keywords, and references to normative frameworks such as ISSA 5000, IFRS S1/S2, ESRS, GRI) and identify dominant themes (ethics/independence; efficiency/detection; governance/compliance). In parallel, we perform a brief thematic synthesis, grouping contributions along the three axes, highlighting trends (e.g., the transition from isolated NLP applications to LLMs mapped to GRI/ESRS requirements) and gaps (stakeholder involvement, evidence traceability, interoperability across frameworks). This stage directly yields the research directions and the hypotheses H1–H3:

H1 (Ethics and Independence): explicit ethical measures and independence-safe protocols increase stakeholder trust;

H2 (Efficiency and Detection): AI-assisted review reduces time and improves detection of non-compliance/greenwashing;

H3 (Governance and Compliance): an assurance-by-design pipeline aligned with ISSA 5000, IFRS S1/S2, ESRS, and GRI increases requirement coverage and evidence quality.

Data were collected online via Google Forms during March - August 2025 from a sample of 77 practitioners (auditors, accountants, and managers). The questionnaire comprised Likert-scale items (1–5) grouped into three constructs aligned with hypotheses H1–H3. Second, the questionnaire targets auditors, accountants, and senior managers exposed to sustainability reporting. The instrument comprises three blocks of Likert-scale items (1–5), aligned with the hypotheses: (i) ethics and independence - perceptions of transparency/explain ability, bias testing, anti-conflict protocols; (ii) efficiency and detection - perceptions of time per file, perceived accuracy, and the ability to identify exaggeration/greenwashing; (iii) governance and compliance - perceptions of the usefulness of aligning to ISSA 5000, IFRS S1/S2, ESRS, and GRI for generating traceable evidence.

Third, we correlate the results with the scientific hypotheses through concise, transparent analyses. Finally, based on the results, we develop the conceptual model: we position Ethics and Independence as the premise of trust, Efficiency and Detection as the driver of operational value, and Governance and Compliance as the anchor of professional legitimacy - integrated into an assurance-by-design architecture with traceability and interoperability. The model specifies clear links among constructs and indicates outcome metrics (trust, time, precision/recall/F1, requirement coverage, evidence quality) that can be reported succinctly.

Throughout, we ensure ethical safeguards (informed consent, anonymization, appropriate data governance) and work exclusively with public documents for the documentary component. Limitations - such as self-reporting, convenience sampling, sectoral heterogeneity, or model error, are acknowledged explicitly and mitigated via clear indicators and full reporting of uncertainty. Thus, the methodology remains lean, realistic, and precisely aligned with the four steps you outlined: bibliometrics; derivation of directions and hypotheses; questionnaire; correlation; and, ultimately, the conceptual model.

Basic content

We analyzed 77 valid questionnaires completed by practitioners in the Republic of Moldova. The sample is dominated by certified auditors (50.8%), followed by professional accountants (14.3%) and public-sector auditors and audit trainees (12.7% each), with other roles having marginal shares. Organisationally, the market is predominantly fragmented: small firms (11–50 employees) 42.9% and micro-firms (1–10) 25.4% - 68.3% in total - with lower participation from public entities or internal audit departments. In terms of tooling, Excel/Power Query is used by 88.9% of respondents, while advanced solutions have limited penetration (DataSnipper 12.7%; CaseWare 11.1%; ACL/IDEA 6.3%; BI 4.8%) and enterprise/RPA platforms (each ~1.6%). This market and tooling profile suggests significant headroom for operational optimisation through AI.

Regarding the perceived potential of AI in financial audit in Moldova, 90.5% rate the impact as moderate (“supports processes, does not replace professional judgment”), while the “high” and “low” options are each selected by under 5%, and “no impact” is absent. Consistent with this, respondents prioritise automation for: detection of unusual transactions (88.9%), intelligent sample selection (76.2%), indicator analysis and report generation (60.3%), and, to a lesser extent, document verification (46.0%). At the same time, pronounced ethical and professional risks are flagged: unclear responsibility for decisions (87.3%), over-reliance on automated outputs (87.3%), and reduced professional skepticism (82.5%), along with model miscalibration (39.7%). Overall,

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this profile indicates conditional acceptance of AI: useful for efficiency, but legitimate only when coupled with visible ethical and governance safeguards.

Alignment with the hypotheses is clear. H2 (Efficiency and Detection) is supported by respondents' focus on high-volume, rule-governed tasks (anomalies, sampling, reporting) and by the current Excel-centric baseline, which signals operational gains for LLM/NLP solutions tailored to ESG. H1 (Ethical integrity and Independence) is reinforced by major concerns about responsibility, over-reliance, and maintaining skepticism - necessitating independence-safeguards, transparency/XAI, and integrated bias testing. Finally, H3 (Normative framework and Compliance) is underpinned by the open-ended recommendations: a national guideline, regulatory adaptation, phased pilots, and including algorithm testing in quality inspections - all oriented towards audit trail and documentation compatible with ISSA 5000, IFRS S1/S2, ESRS, and GRI.

Based on these findings, we propose an integrated conceptual model (Figure 1) with three pillars: Ethics and Independence as the foundation of trust (explicit ethical measures, XAI, bias testing, independence safeguards), Efficiency and Detection as the vector of operational value (LLM/NLP for extracting, aligning, and flagging deviations/greenwashing), and Governance and Compliance as the anchor of professional legitimacy (an assurance-by-design workflow mapped to ISSA 5000, IFRS S1/S2, ESRS, and GRI).

Figure 1 depicts the AI-3P model for AI-assisted assurance. H1 (Ethics & Independence) is posited to increase stakeholder trust; H2 (Efficiency & Detection) is expected to reduce review time and improve detection quality (F1). The impact of H2 on evidence quality and ESRS/GRI coverage is mediated by H3 (Governance & Compliance), which is anchored in ISSA 5000, IFRS S1/S2, ESRS, and GRI. The $H1 \times H2$ interaction moderates the $H2 \rightarrow \text{Trust}$ path, indicating that ethical safeguards condition the perceived benefits of efficiency gains. Rounded panels show implementation enablers (non-causal). Survey signals ($n = 77$; Moldova, March–August 2025) motivate the focus on anomaly detection (88.9%), sampling (76.2%), reporting (60.3%) and highlight risks (unclear responsibility 87.3%, over-reliance 87.3%, lower skepticism 82.5%), supporting an assurance-by-design approach with explicit audit trails.

The model links the hypotheses to operational indicators - per-file review time, precision/recall/F1, requirement coverage, and evidence quality - and outlines a pragmatic path from an “Excel-centric” workflow to auditable AI with traceability and clearly assigned responsibilities.

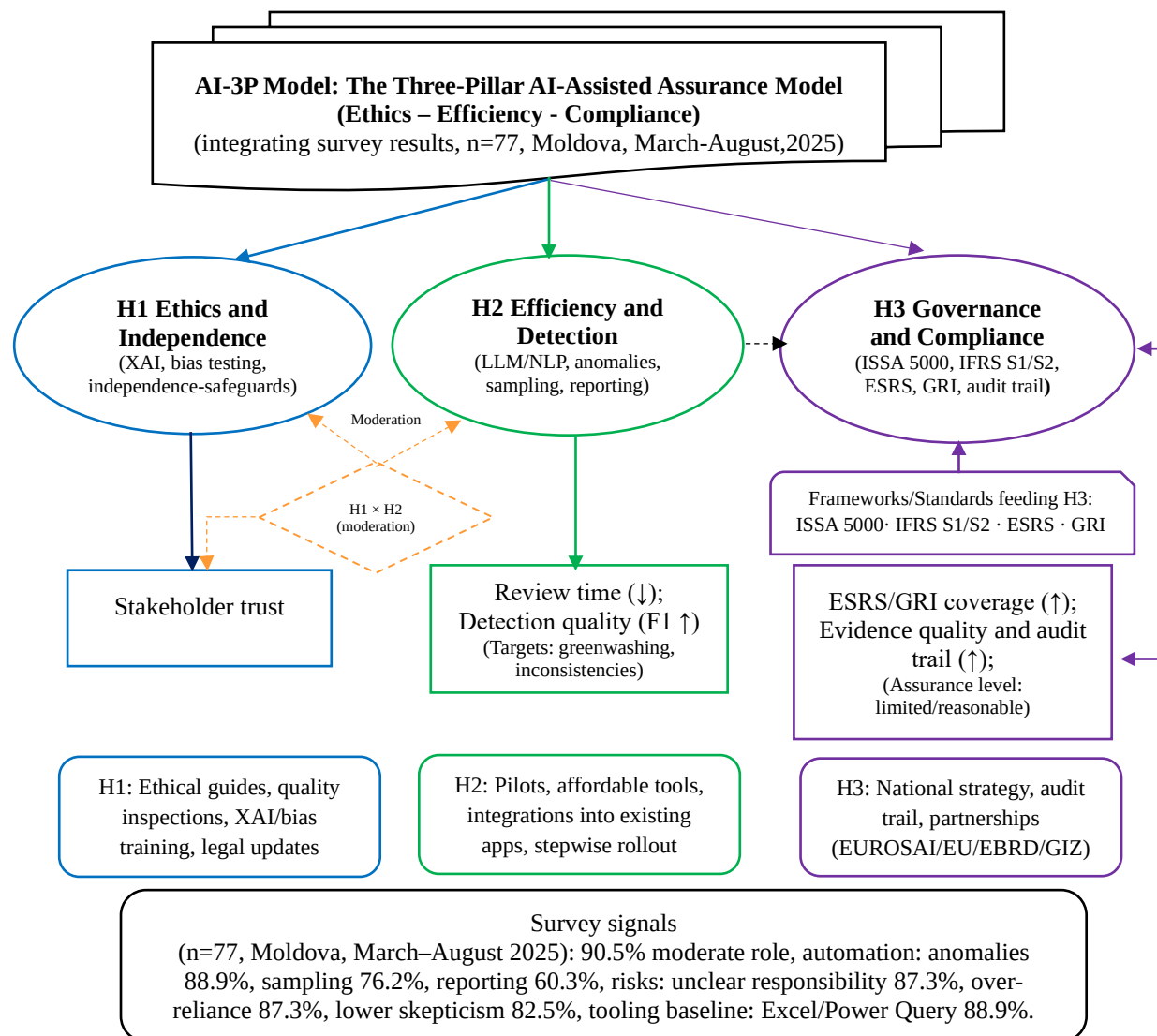


Figure 1. AI-3P: AI-Assisted Assurance in Three Pillars - Ethics, Efficiency, and Compliance.

Source: Authors' elaboration

Conclusions

This study advances an integrated view of AI-assisted sustainability assurance that is simultaneously ethically credible, operationally useful, and standards-aligned. Synthesizing recent literature and evidence from 77 practitioners, we find conditional acceptance of AI: respondents welcome automation where rules and volumes dominate (anomalies, sampling, reporting), yet they anchor legitimacy in explicit safeguards - bias testing, transparency/explain ability, and independence protocols. These insights substantiate our three-pillar AI-3P model. First, H1 is supported: ethics and independence function as the premise of trust. Second, H2 holds: AI can reduce review time while maintaining or improving detection quality (F1) for exaggeration/greenwashing. Third, H3 clarifies that governance-by-design, mapped to ISSA 5000, IFRS S1/S2, ESRS, and GRI, mediates efficiency gains into higher evidence quality and coverage through traceable audit trails. Moreover, the H1×H2 interaction indicates that efficiency benefits translate into trust only when ethical safeguards are visible.

Practically, the model offers a pragmatic trajectory from today's Excel-centric workflows to auditable AI with clear responsibilities, measurable indicators (per-file time, precision/recall/F1, requirement coverage, evidence quality), and documentation fit for assurance conclusions (limited/reasonable). Conceptually, it connects ethics, efficiency, and compliance into a single assurance-by-design architecture.

Limitations - self-reported data, a single-country convenience sample - invite pilot deployments that capture log-level audit trails, cross-country replications, and experiments measuring fairness and explain ability alongside assurance outcomes. Overall, the findings argue for targeted training, national guidance, and quality-inspection protocols that test both the results and the evidence generated by AI, thereby sustaining public trust while realizing efficiency at scale.

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QUALITY OF FINANCIAL AUDIT IN THE REPUBLIC OF MOLDOVA: BETWEEN REGULATION, INDEPENDENCE AND EXPECTATIONS USED

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Abstract: The purpose of this study is to analyze the quality of financial auditing in the Republic of Moldova in terms of the regulatory framework, the requirements of professional independence and the expectations of the users of the financial statements. The study aims to highlight the main challenges faced by Moldovan auditors and to identify directions for improving audit practices, aligned with international standards.

The subject of the research is the quality of audit missions carried out by audit firms and individual auditors in the Republic of Moldova. The analysis methodology is based on the examination of the national and international regulatory framework (ISA, national audit legislation), on the study of the specialized literature and on the comparison with international good practices. Qualitative and interpretive analysis methods are used to assess the degree of compliance and the level of transparency of the financial audit.

The results of the study highlight that, although the Republic of Moldova has made considerable progress by harmonizing legislation with EU requirements and by strengthening public audit oversight mechanisms, problems related to auditors' independence, the pressure of low fees and the lack of modern technological resources persist. At the same time, there is a discrepancy between the expectations of the users of the financial statements (investors, state, public) and the perceived quality of the audit.

The study concludes that improving the quality of auditing in the Republic of Moldova depends on: strengthening the independence of auditors, promoting professional ethics, increasing the level of digitization of audit processes and intensifying continuous professional training. The implementation of these measures would contribute to increasing the credibility of financial reporting and aligning the audit sector with international quality standards.

Keywords: financial audit, quality, independence, regulation, Republic of Moldova, transparency.

JEL Classification: M42

1 Introduction

The quality of the financial audit is an essential element in ensuring the transparency and credibility of financial reporting, constituting a fundamental pillar of public trust in the information provided by economic entities. In the Republic of Moldova, the development of the audit services market is closely linked to the process of harmonization with international auditing standards (Handbook of International Auditing, Assurance and Ethics Regulations) and to the implementation of the legislative framework derived from European directives. However, audit quality remains a topical and debated topic, given the multiple challenges regarding auditor independence, the efficiency of public oversight and the growing expectations of users of financial statements.

According to Davis (1988), professionals, including auditors, have a distinct moral responsibility to act in the public interest, going beyond mere compliance with technical norms. At the same time, the study by Ettredge et al. (2017) highlights the fact that the pressure exerted by clients, especially in times of economic instability, can affect the auditor's

independence and implicitly the quality of the audit mission. In this context, professional independence becomes an indispensable condition for maintaining the objectivity and credibility of the audit opinion.

On the other hand, Farooq and Bakhadirov (2022) emphasize the role of qualified human resources in the choice of external audit services, demonstrating that access to an educated workforce favors better audit quality. In the Republic of Moldova, the transition to international standards and the implementation of regulations in line with EU Directives have contributed to the improvement of the regulatory framework, but challenges related to independence and competence persist. The expectations of users – investors, creditors, authorities and the public – require auditors not only professional rigor, but also integrity and transparency in the exercise of their missions. Thus, the analysis of the quality of financial auditing in the Republic of Moldova becomes a topical topic, placed between the requirements of regulations, professional ethics and the dynamics of the economic environment.

In the current economic context, characterized by increased competition and pressure on audit fees, the risk of compromising the objectivity and professionalism of auditors is increased. Also, differences in perception between users and auditors regarding the purpose and level of assurance provided by the audit generate the so-called "gap expectations". In this respect, financial audit quality research is not limited to technical compliance with standards, but also includes dimensions such as professional ethics, social responsibility and the added value of audit engagements.

This article aims to analyze the determinants of the quality of financial auditing in the Republic of Moldova, in terms of the regulations in force, the degree of independence of auditors and the perceptions of users. The study aims to contribute to a better understanding of the relationship between regulation and practice, while providing recommendations to strengthen trust in the audit profession and improve the quality of financial audit services.

2 Results obtained and discussion

The analysis of the quality of financial auditing in the Republic of Moldova highlights a direct correlation between the regulatory framework, the independence of auditors and the degree of trust of users of financial statements. According to Law no. 271/2017 on the audit of financial statements, the quality of the audit is based on compliance with the International Auditing Standards (ISA) and on ensuring the professional independence of auditors (Law on the audit of financial statements no. 271 of 15.12.2017).

The ISA 700 (Revised) standard emphasizes that the formulation of the opinion must be clear, objective and complete, in order to allow users to understand the degree of assurance offered (ISA 700 (Revised)). However, in the context of the regulatory framework, 'unreserved' opinions are sometimes mistakenly perceived as a guarantee of the absence of any financial risk, which reveals a problem of financial education and public perception.

Another significant aspect is the finding that auditors' independence is sometimes affected by prolonged economic relationships with clients. According to ISA 200, the auditor must act with professional scepticism and avoid any influence that could compromise the objectivity of the assessments. However, there is a risk of economic dependence on fees, especially in small firms, which can put pressure on the quality of audit findings.

Comparing national and European regulations highlights a clear alignment, but an implementation that is still ongoing. Regulation (EU) no. Regulation (EU) No 537/2014 establishes requirements on the rotation of auditors and the limitation of non-audit services, aimed at reducing the risks of independence (Regulation (EU) No 537/2014). These principles are transposed into Law no. 271/2017, but their application depends on the degree of supervision exercised by the Public Audit Oversight Board. If partner rotation is not applied according to the deadlines, it can significantly reduce user trust.

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Regarding professional competence, Decision no. 15/2019 on the rules for the training of audit trainees contributed to the improvement of the practical training framework (Decision No. 15 of 06-08-2019). However, there is a need for more frequent updates of the training content and a closer correlation with the new standards issued by IFAC (Handbook of International Auditing, Assurance and Ethics Regulations). This discrepancy between regulated theory and actual practice may affect the consistency of audit results and investor confidence.

At the same time, users' perception of audit quality depends to a large extent on the transparency of reporting and the clarity of the explanations provided by the auditors. In this regard, the consistent application of ISA 700 and ISA 260 on communication with the entity's governance becomes important to strengthen the relationship of trust between the auditor and stakeholders. There is also a positive trend towards the adoption of international practices in the audit of public interest entities, where quality control requirements are more rigorous.

The quality of financial auditing in the Republic of Moldova depends simultaneously on three essential factors: a robust and consistently applied regulatory framework, maintaining real professional independence and continuously adapting to user expectations. Although legislative progress is evident, their practical effectiveness is conditioned by continuous professional training, active supervision and individual ethics of auditors. Strengthening these elements could contribute to increasing the credibility of the audit profession and to Republic of Moldova more effective integration into the European Financial Reporting and Auditing Area.

Table 1. Determinants of the quality of financial audit

Factor determinant	Description and implications	Impact on the quality of the financial audit
<i>Robust and consistently enforced regulatory framework</i>	Law no. 271/2017 establishes the general principles of the audit activity, the requirements regarding licensing, supervision and the responsibilities of auditors. The consistent application of legal rules ensures the uniformity of audit processes and the credibility of reports.	Strengthening the legal framework contributes to the prevention of distortions, transparency and increased public confidence in the results of the audit.
<i>Maintaining real professional independence</i>	The auditor's independence ensures the objectivity of the conclusions. Regulation (EU) no. 537/2014 imposes restrictions on fees, non-audit services and rotation of audit partners, in order to prevent conflicts of interest.	It ensures the impartiality of the audit process, increases the credibility of the audit report and protects the public interest.
<i>Continuous adaptation to user expectations</i>	The quality of the audit also depends on the ability of auditors to respond to the evolving needs of users – investors, creditors, regulators – through the use of digital technologies and the adoption of standards internationale (ISA).	Adapting to market requirements and public expectations maintains the relevance and social utility of the auditing profession.

Source: author own study or based on Law no.271/2017, Regulation (EU) No 537/2014

The quality of financial auditing in the Republic of Moldova results from the complex interaction between the regulatory framework, the professional independence and the adaptability of auditors to user expectations. A normative system, such as the one established by Law no. 271/2017, provides the necessary legal basis for a unitary and transparent practice. At the same time, the application of the principles of professional independence laid down in Regulation (EU) no. 537/2014 guarantees the objectivity and credibility of the audit process. At the same time, the continuous adaptation to market requirements and international standards

ensures the relevance and social utility of auditing, transforming it into an instrument for protecting the public interest and strengthening corporate governance.

A robust and consistently enforced regulatory framework is the first basic condition for ensuring a uniform and transparent audit practice. In the absence of clear standards and effective supervision, the risk of a decrease in audit quality increases, affecting the credibility of financial information.

Regulations are not sufficient if they are not doubled by coherent implementation mechanisms and proportionate penalties. In this respect, an effective regulatory framework must ensure not only formal compliance, but also the ethical and professional responsibility of auditors. The second determining factor is the maintenance of real professional independence, which is considered to be the core of audit quality. This is not limited to avoiding conflicts of interest, but involves a mental attitude of objectivity and constant professional skepticism.

Economic pressures, prolonged client relationships, and reliance on fees can compromise independence, reducing the auditor's ability to issue impartial opinions. Therefore, audit partner rotation mechanisms and transparency in fee reporting can help to safeguard this independence.

Thirdly, continuous adaptation to user expectations becomes essential in an ever-changing economic and technological context. Users of financial statements – investors, creditors, authorities and the general public – are increasingly demanding audit added value that goes beyond mere compliance with standards. Auditors must meet these expectations through methodological innovation, the use of analytical technologies and a communication of risks and professional judgments.

To overcome the situation where economic pressures, protracted client relationships and dependence on fees can compromise the independence of auditors, a complex approach aimed at strengthening regulatory, ethics and professional transparency mechanisms is needed. Firstly, the regulatory framework governing audit work needs to be strengthened by introducing stricter control and supervisory measures on compliance with the principles of independence and objectivity. At the same time, it is essential to promote an organizational culture based on integrity, accountability and respect for ethical standards, so that auditors are able to withstand external pressures and avoid conflicts of interest.

Diversifying sources of remuneration and limiting economic dependence on a single client can also help reduce the risk of professional compromise. Practices such as regular rotation of audit partners and firms, transparent publication of fees and continuous training in the field of professional ethics can strengthen users' confidence in the impartiality of the audit opinion. Essentially, effective solutions must combine institutional interventions with educational and ethical ones, in order to restore the balance between economic interests and the auditor's fundamental obligation to act independently and objectively.

Addressing the situation implies orienting the audit profession towards innovation, transparency and continuous development. First, there is a need to integrate modern technologies such as artificial intelligence, advanced data analytics, and blockchain, which can increase the efficiency and quality of the audit process, providing deeper insight into the risks and reliability of financial information. Practice reconfiguring the way of communicating with users of financial statements by extending the audit report so that it includes clear explanations of the professional reasoning, uncertainties and risks identified.

Table 2. Orientation of the audit profession towards innovation, transparency and continuous development

Main direction	Proposed measures	Impact on audit quality
<i>Technological innovation in auditing</i>	Integration of modern technologies such as artificial intelligence, advanced data analytics, and blockchain.	It increases the efficiency of the audit process, reduces errors, provides a deeper insight into the risks and reliability of financial information.
<i>Transparency in reporting</i>	Extension of the audit report to include detailed explanations of the professional reasoning, uncertainties and risks identified.	Improves the confidence of financial statement users and makes it easier to understand the auditor's decisions.
<i>Continuous professional development</i>	Reconfiguring the way of communication and updating skills through continuous training and adaptation to new technological and ethical requirements.	Ensures that professional relevance and competence are maintained, helping to strengthen the reputation and quality of the audit.

Source: author own study or based on Farooq, O. et al. (2022)

Artificial intelligence, advanced data analytics and blockchain are tools that transform the way auditors collect, process and interpret accounting information, helping to increase the efficiency, transparency and reliability of the audit process. Artificial intelligence allows large amounts of data to be analyzed in real time, identifying patterns and anomalies that may indicate risks of misrepresentation or possible fraud, which increases the ability of auditors to issue more substantiated opinions. Advanced data analytics, based on complex statistical and algorithmic techniques, expands the testing area from limited samples to the entire set of transactions, leading to a more comprehensive risk assessment and internal control.

At the same time, blockchain technology contributes to the creation of a distributed, immutable and transparent database, which provides a high level of trust in the authenticity and integrity of financial information. In this way, the audit becomes more oriented towards real-time validation of transactions, reducing the need for manual checks and strengthening the credibility of the process. Recent studies emphasize, however, that these benefits are conditional on the existence of a robust technological governance framework, the validation of the algorithms used and the professional skills of the auditors. Lack of digital expertise or over-reliance on automated tools can create risks of misinterpretation of results and affect the objectivity of decision-making.

The researchers draw attention to the need for continuous training of professionals in fields such as data science, cybersecurity and the evaluation of information systems, so that they can understand, control and validate the models used. There is also a need to adapt auditing standards to new technological realities, in particular as regards the recognition of electronic evidence and the auditor's accountability towards decisions generated by intelligent systems. Overall, the integration of modern technologies represents a strategic direction towards innovation and sustainable development of the audit profession, providing the premises for increasing the quality of financial auditing, provided that rigorous supervision and a balance between automation and professional reasoning are maintained.

The integration of artificial intelligence, advanced data analytics and blockchain offers the opportunity to improve audit quality through more evidence coverage, efficiency and the possibility of continuous auditing. However, the benefits are not guaranteed: they require strong governance, technical validation for impact measurement, training and regulatory

adaptation. Regulators emphasize precisely the importance of these conditions for the technology to deliver on its promises in practice.

Expanding the audit report to include detailed explanations of the professional reasoning, uncertainties and risks identified has a significant impact on the quality of the audit, according to recent scientific research. Communicating professional reasoning and identified risks helps users better understand the audit process and appreciate its complexity. This transparency can reduce unrealistic expectations and increase confidence in the audit report.

Discussing risks and uncertainties in the audit report allows investors to better assess a company's sustainability and revenue quality. This can lead to more informed investment decisions and a more accurate assessment of the associated risks. By providing detailed information about risks and uncertainties, investors can better assess a company's value, which can reduce the initial undervaluation of the stock.

While transparency can be beneficial, detailed disclosure of risks and uncertainties can lead to an increased perception of risk by investors, which could negatively influence their decisions. Implementing these extensions of the audit report may involve additional costs and greater complexity in the audit process, which could affect its efficiency.

Reconfiguring the way of communication and updating skills through continuous training and adaptation to new technological and ethical requirements have a significant impact on the quality of the audit. In the context of the audit, effective communication between the audit team and the client is essential. The auditor's ability and willingness to communicate with the client significantly influences the auditor's responses to the auditor's requests, contributing to the success of the audit process. The continuous training of auditors is a principle for maintaining and improving the quality of the audit. A study has shown that audit firms' commitment to auditor education and training significantly increases audit quality.

Emerging technologies, such as artificial intelligence and data analytics, have significantly transformed audit practices. Studies show that technological innovations improve audit transparency through improved documentation, real-time reporting and increased stakeholder engagement. They contribute to the objectivity of the audit by automating repetitive tasks, facilitating advanced data analysis and promoting standardised audit procedures. However, technology implementation can be complex, and ethical risks, such as potential algorithmic bias, must be carefully managed to maintain the integrity of the audit process.

3 Conclusions

More transparent communication builds public trust and highlights the added value of the audit. At the same time, the continuous training of auditors becomes a priority, as they have to develop their skills in areas such as data analysis, sustainability, corporate governance and professional ethics. In this way, financial auditing can dynamically respond to the increasingly complex requirements of users and the challenges posed by economic and technological changes.

Extending the audit report to include clear explanations of the professional reasoning, uncertainties and risks identified can significantly improve the quality of the audit by increasing transparency and understanding of the audit process. However, it is important for auditors to carefully manage how this information is presented in order to avoid creating an unjustified negative perception and to ensure the efficiency of the audit process.

The integration of effective communication, continuous training of auditors and adaptation to new technologies and ethical requirements are a basic condition for improving audit quality. These measures contribute to a more accurate and objective assessment of financial statements, strengthening public confidence in financial processes and ensuring compliance with international standards.

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Thus, the perception of audit quality is significantly influenced by how auditors manage to anticipate and satisfy these user requirements. Thus, audit quality is not a static result, but a dynamic process that involves balancing regulatory requirements, professional ethics and social relevance. Therefore, the quality of financial auditing depends simultaneously on the existence of a coherent and applied regulatory framework, on the preservation of real professional independence and on the ability of auditors to continuously adapt to the needs of society. Only by combining these three dimensions can audit continue to serve as a guarantor of transparency and trust in the modern economy.

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ANALYSIS OF THE IMPACT OF CLIMATE CHANGE ON FINANCIAL RISK

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Abstracts: Climate is widely recognized as a significant source of financial risk. The high frequency of natural disasters leads to asset losses, which negatively affect financial stability. Climate change is a significant factor driving financial risks, and the increasing pace of climate-related risks affects the efficiency of financial markets. The Republic of Moldova should pay greater attention to the risks posed by climate change. This paper analyzes the impact of climate change on financial risks. We examine the mechanism through which climate change affects financial stability from a market economy perspective, thereby enriching existing research with a detailed analysis of financial risk.

Climate change risks should be integrated into monetary and fiscal policies, and counter-cyclical adjustments for climate-induced financial risks need to be considered. At the same time, maintaining open financial markets under low-risk conditions can enhance the Republic of Moldova's financial security. The study is based on the results of a bibliometric analysis and consolidates theoretical and empirical literature on the information related to the impact of climate change on financial risks. The results provide a foundation for future analysis of climate change disclosures, taking into account the most recent developments in standards and frameworks.

Keywords: climate change risks; financial stability; financial risk, climate change, sustainability, SASB (Sustainability Accounting Standard Board), CDCS (Climate Disclosure Standards Board), TCFD (Task Force on Climate-related Financial Disclosures).

JEL Classification: M40, M41, M49, Q54, Q56

Introduction. Currently, climate change poses a significant threat to all sectors of the Republic of Moldova's economy. While many entities continue their activities as usual, seemingly unaware of the impending impacts of climate change, there are organizations that are attempting to deviate from the perilous path of climate-related impacts and have begun analyzing their financial situation from the perspective of climate-related risks in order to anticipate an increase in financial risks.

Entities that assess climate change risks cannot afford to ignore the connection between the financial stability of the organization and environmental stability. Managers of these entities recognize that natural and climate-related risks materialize as financial risks, impacting all aspects of the economy and the financial stability of the organization.

At the same time, many entities do not recognize that natural risks are financial risks and remain focused on monthly, quarterly, or annual financial results. Consequently, the cost of

climate-related risks is not adequately accounted for in financial activities, and natural aspects are not integrated into the entity's decision-making process.

We believe that within organizations, the impact of climate and natural risks on financial stability, as well as the dependence of funding sources on environmental changes, should be thoroughly evaluated.

We note that Michael R. Bloomberg, an entrepreneur and philanthropist, mentions that “the climate risks are financial risks and a wider disclosure and better information transparency are crucial for the construction of a more sustainable and resilient economy, a safer future.” (Bloomberg, 2017).

Therefore, the impact of climate change on socio-economic activity is significant. Thus, considering the unpredictable nature and long-term implications of climate change, understanding financial exposure may pose a challenge for all enterprises in the Republic of Moldova. Among the organizations that have significantly shaped corporate climate-related disclosures, the TCFD stands out as particularly influential. It supports companies in evaluating in a climate-consistent manner (Lee et al., 2025). The TCFD highlights two main types of climate risks, which can be incorporated into the CDSB Framework and the SASB Climate Framework: physical and transition risks (IFRS Foundation, n.d.). Physical risks include extreme weather conditions. Droughts or flooding, as well as the long-term impact of rising global average temperatures represent examples of such risks (IFRS Foundation, n.d.). Transition risks include the global transition to a low-carbon economy, new regulations, and innovations in energy efficiency (IFRS Foundation, n.d.). Enterprises from the Republic of Moldova could be impacted by economic and financial effects generated by such climate risks. Therefore, actual and potential investors, as well as stakeholders, require greater clarity on how enterprises assess these climate risks and opportunities, and how they plan to respond. Understanding and communicating the potential financial effects of climate risks will generate more useful information for decision-making, thereby supporting a more informed process for investments, loans, credits, and other financial decisions.

In indigenous practice, there is also a risk that various impediments related to data transparency may arise; this topic is a concern for several researchers, as noted in the paper by Di Marco, R., Dong, T., Malatincova, R., Reuter, M., and Stromsten, T. (Di Marco et al., 2023).

Empirical analysis based on the results of the bibliometric analysis.

The study aimed to exploit in a quantitative manner the specialized analysis in the field of climate risks, financial risk, climate resilience, climate change, exploring a number of 601 articles published in the last 10 years, in the period 2015-2025, in fields such as Business Finance (417 articles), Economics (253 articles), Management (47 articles) (Web of Science, 2025; Scopus, 2025). The dynamics of publication of articles in the period 2015-2025 is presented in the figure below.

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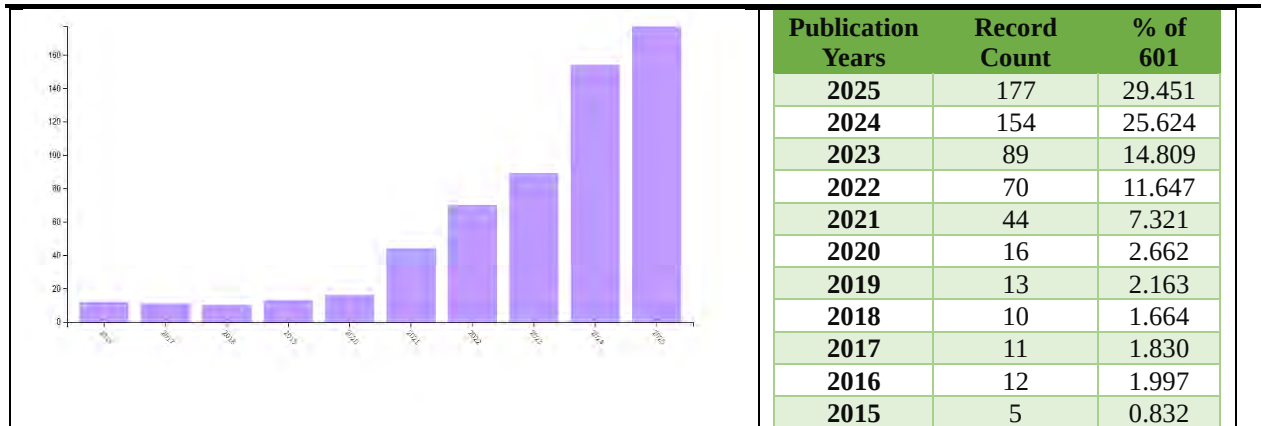


Figure 1. Dynamic evolution of articles published in the period 2015-2025

Source: developed by the authors based on the bibliometric analysis of the databases of (Web of Science, 2025; Scopus, 2025)

The empirical results of the bibliometric analysis highlighted the fact that (Web of Science, 2025; Scopus, 2025):

- The journals in which this field is published are: Finance Research Letters (61 articles), Energy Economics (58 articles), International Review of Financial Analysis (45 articles), International Review of Economics and Finance (32 articles), Research in International Business and Finance (26 articles), etc.
- The most cited documents are the articles "Hedging Climate Change News", published in The Review of Financial Studies, written by Robert F Engle, Stefano Giglo, Brayn Kelly, Heebum Lee, Johannes Stroebel (2020) and "Dissecting green returns", published in the Journal of Financial Economics, written by L'ubos Pastor, Robert F. Stambaugh, Lucian A. Taylor (2020), (Engle et al., 2020; Pastor, Stambaugh and Taylor, 2020)
- The most cited authors are Cepni, Oguzhan; Gupta, Rangan; Urom, Creştin; Ji, Qiang; Jiraporn, Pornsit etc.
- The most relevant affiliations in terms of the number of articles are given by Lebanese American University Adnan Kassar School of Business, Copenhagen Business School Department of Economics, University of Pretoria Department of Economics, University of Pretoria Faculty of Economic and Management Sciences, etc.
- The most frequently used keywords in the analyzed scientific publications are climate change risks, financial risk, climate risks, climate resilience, climate change, uncertainty, economic activity, sustainability, financial performance, SASB (Sustainability Accounting Standards Board), CDSB (Climate Disclosure Standards Board), and TCFD (Task Force on Climate-related Financial Disclosures).
- The most frequently addressed topics are climate change, climate risk, financial flexibility, financial markets, risks of climate policy change, and impacts on financial markets.
- The most active countries/regions that addressed the topics in publications are the People's Republic of China (171 articles), the USA (109 articles), England (83 articles), Australia (81 articles), and France (68 articles). It is worth noting that during the period 2015-2025, 11 articles were published from Romania.
- It can be observed the existence of Romanian authors from West University of Timisoara, Babes Bolyai University from Cluj, and Bucharest University of Economic Studies, who have written on this field in recent times, namely: Stefea, Petru; Noja, Gratiela Georgiana; Baditoiu, Bianca Raluca; Buglea, Alexandru; Munteanu, Valentin Partenie; Cimpoiu, etc.

Diana Corina Gligor; Boitan, Iustina Alina, Caraiani, Petre; Rebega, Laurentiu; Dan, Anamaria; Tiron-Tudor, Adriana.

Therefore, bibliometric analysis has proven its relevance through its ability to provide a systematic and highly objective understanding of the evolution, trends, and connections in the field of climate risks, financial risk, climate resilience, and climate change. By examining scientific publications that address these keywords, bibliometric analysis can highlight the evolution of research in the field, the contributions of the authors, the connections and interactions between the keywords and other relevant concepts.

The assessment of financial risk and the appraisal of the rationality of acquiring borrowed funding under climate change conditions are essential. In our view, there is no doubt that natural risks constitute financial risks. Therefore, when evaluating financial risks, particular attention must be paid to identifying the organization’s financial risk areas. Five financial risk areas can be identified, as presented in Figure 2.

Risk-free zone	□ This zone implies a complete absence of risk. □ Entitatea nu riscă nimic și înregistrează, cel puțin, profitul estimatThe entity risks nothing and achieves, at a minimum, the estimated profit.
Minimal risk	• The probability of negative consequences is very low. • Potential damages are insignificant. • The entity risks part or all of its profit.
Increased risk zone	• The entity risks: • in the worst-case scenario, only covering all its costs and expenses, and in the best-case scenario, earning a profit much lower than the estimated profit.
Critical risk zone	The entity risks: • to lose profit, • to reduce planned revenues and increase costs and expenses, • to increase the level of indebtedness, etc.
Catastrophic risk zone	• The entity’s economic operations lead to bankruptcy. • The entity incurs losses. • Insolvency risk and financial risk increase.

Figure 2. Financial risk areas in the economic and financial activity of the entity

Source: Developed by the author based on the generalization of bibliographic sources (Anghel, Robu and Lala-Popa, 2022; Petcu et al., 2023; Petcu, 2009; Spătaru, 2010; Țiriușnicova et al., 2011; Robu, Anghel and Serban, 2014; Păvăloaia et al., 2010)

According to the information presented in Figure 2, it is evident that each entity should avoid the catastrophic risk area in its economic operations, as these risks can lead to financial instability and potentially bankruptcy. Thus, within the organization, there must be effective financial risk management, which will allow the achievement of the proposed objectives by minimizing the impact of financial risk on profit.

For this purpose, it is necessary to have a comprehensive and precise assessment of financial risks. In this context, financial risk directly affects the return on equity. Therefore, the assessment of financial risk under climate change conditions can be carried out using the financial leverage indicator.

Financial leverage reflects the impact of an entity’s indebtedness on its return on equity and indicates the percentage by which the return on equity will change as a result of attracting borrowed funds into the entity’s economic circuit (Anghel, Robu and Lala-Popa, 2022; Petcu et

al., 2023; Petcu, 2009; Spătaru, 2010; Țiriulnicova et al., 2011; Robu, Anghel and Serban, 2014; Păvăloaia et al., 2010)

Borrowed funding sources generate interest expenses for the entity, but also a certain return on assets, and the difference between them influences the level of return on equity either positively or negatively. This influence is precisely quantified through financial leverage and reflects the variation in return on equity resulting from the use of borrowed financial resources.

The formula for calculating financial leverage is:

$$\text{Financial leverage} = \frac{(\text{Return on assets} - \text{Average interest rate charged})}{\text{Debt ratio}} \times (1-i)$$

When the entity examines the rationality of attracting borrowed funds and the effect of changes in the debt level on return on equity, both return on assets and return on equity are analyzed, calculated as follows:

$$\text{Return on assets} = \frac{\text{Profit before tax and interest}}{(\text{Average equity} + \text{Average interest-bearing debt})} \times 100$$

For the purpose of assessing the rationality of attracting borrowed funds, the numerator of the return on assets formula uses the indicator of profit before tax and interest, while the denominator takes the average value of equity and interest-bearing debt.

$$\text{Return on equity} = \frac{\text{Net profit}}{\text{Average equity}} \times 100$$

The efficiency of indebtedness on return on equity is determined by the ratio between the return on assets (Ra) and the interest rate on borrowed funding sources (Rd), which is presented in Table 1. Thus, if:

- $R_a > R_d$, this situation is profitable for the owners, as their remuneration will increase. Attracting loans and borrowings is rational, and the owners will benefit from the financial leverage effect, meaning that the return on equity increases under these conditions.
- $R_a < R_d$, in this case, attracting loans and borrowings is not rational, as appreciation consumes equity, thereby reducing the entity's performance. Consequently, the return on equity decreases under these conditions.

Table 1. Characteristics of changes in the financial leverage effect

Condition	Interpretation	Risk	Conclusion
1	2	3	4
$R_e > R_d$	Positive indebtedness effect. Positive financial leverage effect.	Low financial risk.	- A positive financial leverage effect results in an increase in return on equity due to a higher level of indebtedness. - Contracting the loan is recommended.
$R_e < R_d$	Negative indebtedness effect. Negative financial leverage effect – “hammer” effect.	High financial risk.	- The “hammer” effect decreases return on equity, which requires finding an optimal debt level where return on equity equals return on assets. - Contracting the loan is not recommended, as the insolvency risk is increased.

Source: Developed by the author based on the generalization of bibliographic sources (Anghel, Robu and Lala-Popa, 2022; Petcu et al., 2023; Petcu, 2009; Spătaru, 2010; Țiriulnicova et al., 2011; Robu, Anghel and Serban, 2014; Păvăloaia et al., 2010)

The assessment of the rationality of attracting borrowed funds is conducted under both climate change conditions and in the context of developing a business plan, to determine the optimal option for acquiring borrowed resources. This process is commonly referred to as a “financing alternatives analysis.”

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For a correct evaluation of the rationality of attracting borrowed funds, it is very important to collect accurate information, as follows:

a) The average value of interest-bearing debt is determined using the simple arithmetic or chronological means based on data relating to previously obtained long-term and short-term bank loans.

b) The calculated average interest rate does not coincide with the bank interest rate for borrowed loans as reflected in the bank contract. The calculation formula is:

$$\text{Calculated average interest rate} = \frac{\text{Interest payable on interest-bearing debt}}{\text{Average value of interest-bearing debt obtained}} \times 100$$

c) The interest payable on borrowed loans is collected from the analytical record under the account “Interest Expenses.” If the analysis is conducted during the business plan development stage, it is based on data from previously concluded bank contracts and the business plan, which corresponds to the amount of interest expenses for loans and borrowings.

d) Income tax expenses are taken from the Profit and Loss Statement. If the analysis is conducted during the business plan development stage, it is determined by multiplying the income tax rate by the profit before tax.

Next, the financial risk under climate change conditions will be assessed, and the rationality of attracting borrowed financial resources will be evaluated based on the effect of changes in the debt level on return on equity.

For this analysis, two state-owned entities from the Republic of Moldova engaged in the production of wine and grape-based alcoholic products were selected: “Cricova” Wine Factory S.A. and “Barza Albă” S.A. The choice of these entities stems from the fact that their activities rely on grapes, whose harvests depend on climate changes observed in Moldova in recent years, namely extreme heat waves, abnormally warm winters with little snow, and the blurring of seasonal boundaries. For example, in the years 2023-2024, September and October seemed like extensions of summer; some plants flowered in January, while there were frosts in May. The years 2023-2024 were also characterized by a significant precipitation deficit, particularly during the summer. Dry periods were increasingly followed by violent torrential rains accompanied by hail, which damaged vineyards and flooded the fields. Consequently, grape harvests were reduced, and the grapes produced were of lower quality.

Table 2. Assessment of financial risk and evaluation of the rationality of attracting borrowed financial resources under climate change conditions

Indicators	„CRICOVA” S.A.			„BARZA ALBĂ” S.A.		
	2023	2024	Absolute deviation	2023	2024	Absolute deviation
1	2	3	4	5	6	7
1. Average equity, thousand MDL	330.911,04	352.156,91	21.245,87	348.381,85	356.609,37	8.227,52
2. Average interest-bearing debt (long- and short-term bank loans), thousand MDL	124.987,84	136.900,08	11.912,24	7.747,44	26.944,98	19.197,54
3. Interest expenses, thousand MDL	12.459,87	10.479,25	-1.980,62	532,90	1.487,84	954,94
4. Profit (loss) before tax, thousand MDL	30.836,95	36.261,92	5.424,97	10.065,27	12.508,97	2.443,70
5. Profit (loss) before tax and interest, thousand MDL (ind.4 + ind.3)	43.296,82	46.741,18	3.444,35	10.598,17	13.996,81	3.398,64
6. Income tax expenses, thousand MDL	4.176,61	4.895,59	718,97	1.299,35	1.493,84	194,49

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7. Net profit (loss) for the accounting period, thousand MDL (ind.4 – ind.6)	26.660,34	31.366,33	4.706,00	8.765,93	11.015,13	2.249,21
8. Calculated average interest rate, % (ind.3 ÷ ind.2 × 100)	9,97	7,65	-2,31	6,88	5,52	-1,36
9. Return on assets, % [ind.5 ÷ (ind.1 + ind.2) × 100]	9,50	9,56	0,06	2,98	3,65	0,67
10. Return on equity, % (ind.7 ÷ ind.1 × 100)	8,06	8,91	0,85	2,52	3,09	0,57
11. Debt ratio, units (ind.2 ÷ ind.1)	0,38	0,39	0,01	0,02	0,08	0,05
12. Income tax rate, % (ind.6 ÷ ind.4 × 100)	13,54	13,50	-0,04	12,91	11,94	-0,97
13. Financial leverage effect, % [(ind.9 – ind.8) × ind.11 × (100 – ind.12) ÷ 100]	-0,15	0,64	0,79	-0,08	-0,12	-0,05
14. Financial risk zones	Increased risk	Minimal risk		Increased risk	Increased risk	

Source: Developed by the author based on data selected from the financial statements and the analytical records of the accounts “Financial Expenses” and “Income Tax Expenses.”

Note: The average value of equity and interest-bearing debt (indicators 1 and 2 in Table 2) was calculated using the simple arithmetic mean based on balance sheet data.

Based on the data presented in Table 2, it can be observed that, for the analyzed entities, return on equity increased by 0.85 percentage points at “Cricova” Wine Factory S.A. and by 0.57 percentage points at “Barza Albă” S.A. in 2024 compared to 2023. This increase was due to the higher growth of net profit relative to the average value of equity.

Return on assets also showed positive dynamics, increasing by 0.06 percentage points at “Cricova” Wine Factory S.A. and by 0.67 percentage points at “Barza Albă” S.A. in 2024 compared to 2023. The increase in return on assets was driven by the growth of profit before tax and interest, alongside the increase in the average value of equity and interest-bearing debt.

Under these conditions, the debt level of the analyzed entities rose marginally, by 0.01 percentage points at “Cricova” Wine Factory S.A. and by 0.05 percentage points at “Barza Albă” S.A. in 2024, compared to 2023, because of resorting to interest-bearing debt.

At “Cricova” Wine Factory S.A., in 2023, the return on assets was 9.50%, while the calculated average interest rate was 9.97%. Therefore, the financial leverage effect was negative (-0.15%), indicating a „hammer” effect, which led to a decrease in return on equity. Under these circumstances, contracting interest-bearing debt was not recommended, as both insolvency risk and financial risk were elevated.

At the same time, at “Cricova” Wine Factory S.A., in 2024, the calculated average interest rate was 7.65%, which was lower than the return on assets of 9.56%. In 2024, the leverage effect was positive (0.64%), resulting in an increase in return on equity. Given the climate changes observed in 2024, particularly rising temperatures and irregular precipitation, which reduced grape harvests, “Cricova” Wine Factory S.A. considers contracting interest-bearing debt under secure conditions.

Thus, at “Cricova” Wine Factory S.A., the reduction of the calculated average interest rate by 2.31 percentage points, together with an increase in return on assets by 0.06 percentage points in 2024 compared to 2023, led to an increase in the financial leverage effect by 0.79 percentage points. As a result, the return on equity became nearly equal to the return on assets. We can conclude that the entity's attraction of borrowed funds was rational, contributing to a 0.85% increase in return on equity in 2024 compared to 2023. In response to the climate changes observed in 2024, “Cricova” Wine Factory S.A. improved the efficiency of equity, increased the ability to

remunerate owners, and enhanced the financial performance of the entity. Instead, the situation was opposite for “Barza Albă” S.A. In 2023-2024, the return on assets was lower than the calculated average interest rate and the financial leverage effect was negative, namely -0.08% in 2023 and -0.12% in 2024. At “Barza Albă” S.A., the average interest rate decreased by 1.36%, while return on assets increased by 0.67% in 2024 compared to 2023, resulting in a reduction of the financial leverage effect by 0.05%.

Conclusions. We believe that, under climate change conditions, managers of entities and investors should not act blindly, as they are already facing the financial consequences of environmental instability, and must integrate this understanding into their decision-making processes. There is no doubt that natural disasters pose significant financial risks.

Based on the synthesis of knowledge acquired regarding climate and financial risks, we can conclude that their assessment involves comparing the level of risk with its acceptable threshold. Under climate change conditions, there is no economic activity without financial risk, and risk must be calculated at the maximum permissible limit. Financial risk arises in the relationship between an entity and financial institutions (banks, financial companies, investment and insurance firms, etc.), and it is important for both the entity and the financial institutions to evaluate the impact of climate and natural risks on the economy and the financial system.

This is no longer merely a matter of awareness; it is now essential to integrate the impact of risks generated by climate change and environmental degradation into all actions – before financial risks occur that could have been avoided.

The findings of our paper are relevant to businesses and stakeholders, highlighting the growing significance of climate change and its impact on organizations. We recommend that policymakers in the Republic of Moldova go beyond general regulatory requirements and develop specific climate policies as recommendations for investors and stakeholders. Companies must integrate climate risk management into their strategic planning and budgeting, particularly in high-carbon industries such as energy and manufacturing. This strategy will help them gain trust and transparency. Investors have to enhance their climate literacy and integrate ESG factors into their future investment decisions.

Taking into account our findings, we suggest that companies with higher exposure to climate change should experience greater financial volatility. In this way, comparable climate change information will help investors to make decisions in a transparent manner.

This study offers both theoretical insights and practical guidance on how climate risks impact financial risks. In this way, future research will improve methodological and practical approaches to analyzing climate change risks at the enterprise level.

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REFORMING BUDGETARY ACCOUNTING IN THE REPUBLIC OF MOLDOVA: THEORETICAL AND PRACTICAL IMPLICATIONS

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Abstract: The process of reforming public financial management in the Republic of Moldova has entered a new stage, marked by the introduction of a modern budgetary methodology and the gradual transition of accounting practices. The purpose of this study is to examine the conceptual and practical implications of these changes, focusing on how the new methodology influences accounting systems, transparency, and fiscal sustainability. The subject of analysis is the alignment of Moldova's public sector accounting with international standards and the challenges arising from this transition.

Methodologically, the research combines a review of the legislative framework and policy documents with a comparative analysis of practices applied in other countries undergoing similar reforms. Qualitative assessment and critical reflection were employed to evaluate the coherence of the new budgetary methodology with the principles of transparency, accountability, and efficiency.

The results highlight both achievements and persisting difficulties. On one hand, the new methodology introduces greater clarity in budget planning, fosters more accurate financial reporting, and strengthens decision-making capacity at the institutional level. On the other hand, significant challenges remain, particularly in ensuring adequate professional training for accountants, upgrading information systems, and securing institutional capacity for implementation.

The study concludes that the transition of accounting in the Republic of Moldova represents not only a technical adjustment but also a strategic transformation in the governance of public resources. The author(s) emphasize that successful consolidation of these reforms requires a balance between adopting international best practices and addressing national specificities, ensuring long-term budgetary sustainability.

Keywords: accounting, transition, budgetary methodology, fiscal reform, financial transparency, budgetary sustainability.

JEL Classification: M41

Introduction

Over the past three decades, the Republic of Moldova has undergone a continuous process of institutional and economic transformation. In this context, budgetary accounting has been subject to reform pressures both from within and from outside, particularly due to the need to align with international standards and the requirements imposed by development partners.

Accounting has thus become a strategic instrument not only for monitoring resources but also for underpinning economic and political decision-making. During a transitional period

marked by instability, budget deficits, and structural challenges, the role of budgetary accounting has expanded, contributing to transparency, accountability, and fiscal sustainability.

The purpose of this paper is to thoroughly analyze the theoretical and practical implications of budgetary accounting reform in the Republic of Moldova. The study aims to:

- highlight the conceptual foundations of budgetary accounting;
- analyze the stages and principles of the reform;
- emphasize the results achieved and the challenges encountered;
- provide recommendations for strengthening the process.

This study examines both the theoretical foundations of the reform and its practical implications in the context of the Republic of Moldova. It will address the evolution of budgetary accounting, the objectives of recent reforms, the difficulties encountered during implementation, and the results achieved, in order to offer an overview of this complex process.

The content of the research

After the proclamation of independence in 1991, the Republic of Moldova inherited a Soviet-inspired accounting system, which was highly centralized and rigid. It was based on uniform charts of accounts applied to all public institutions and focused almost exclusively on the formal control of expenditures.

This model was characterized by a strong emphasis on compliance with the financial plan and on reporting the amounts spent, without assessing the results achieved; by the absence of an accrual-based perspective capable of accurately reflecting the state's assets and liabilities; by reporting based almost exclusively on the cash basis, which hindered the assessment of future commitments; and by a predominantly administrative orientation, designed more to ensure control than to support decision-making or transparency.

This framework was sufficient for a centralized economy, but entirely unsuitable for the transition to a market economy. Without reforms, the public accounting system of the Republic of Moldova risked becoming an obstacle to economic development and European integration.

The reform of budgetary accounting was driven by a combination of internal and external factors, presented in Figure 1.

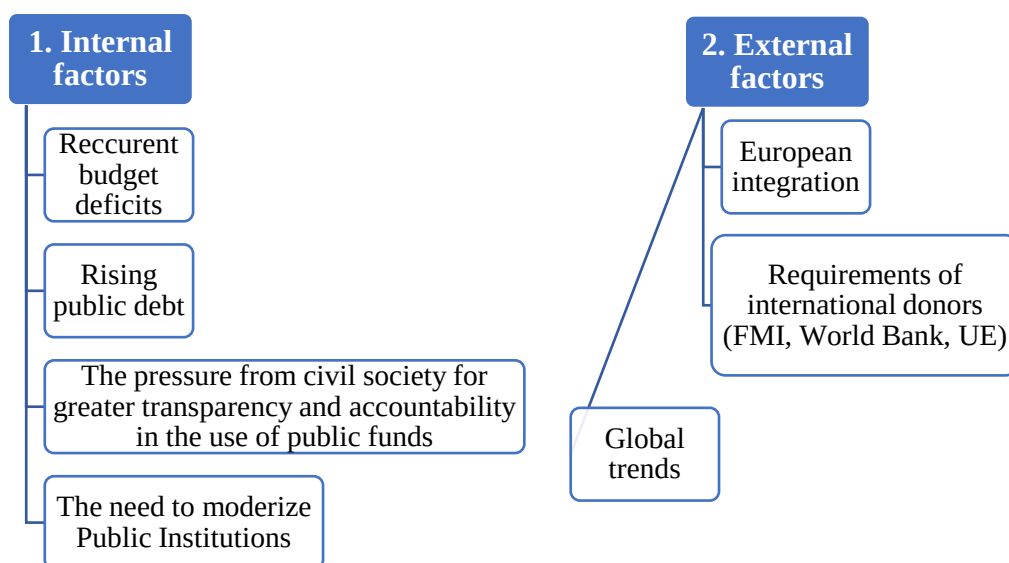


Figure 1. Factors that have driven the reform of budgetary accounting in the Republic of Moldova

Source: developed by the author

Thus, the reform of budgetary accounting has become not merely a choice but a strategic necessity for the Republic of Moldova. Its evolution can only be understood through a staged analysis that reflects both legislative and institutional transformations as well as the influence of the economic and geopolitical context. In this regard, the process of reforming budgetary accounting can be structured into several distinct stages, each marked by specific objectives and progress toward alignment with international best practices (Government of the Republic of Moldova, 2023; Ministry of Finance of the Republic of Moldova, 2024a, 2024b):

1. First stage (1995–2005) – Initial adjustments.

During this period, the focus was on establishing a minimal regulatory framework and introducing more flexible financial management principles. The first legislative amendments were adopted to bring accounting practices closer to international standards. However, the system remained dominated by the cash basis of accounting.

2. Second stage (2005–2015) – Program-based budgeting.

The reform of budgetary accounting entered a more advanced phase with the introduction of program-based budgeting, which aims to link budget allocations to the objectives and results of public institutions. This period was marked by the emergence of the first attempts at multiannual reporting, the consolidation of internal control and public audit mechanisms, as well as technical and financial support provided by external donors. These developments contributed to increasing accountability in the management of public resources and to grounding budgetary decisions on more transparent and results-oriented bases.

3. Third stage (2015–2020) – Harmonization with international standards.

In this stage, the focus shifted to aligning with IPSAS (International Public Sector Accounting Standards) and creating an institutional framework compatible with European practices. Regulations were introduced regarding accrual-based accounting and commitment reporting, although full implementation remained limited.

4. Current stage (2020–present) – Digitalization and integration.

At present, the Republic of Moldova is focusing its efforts on the digitalization of accounting and budgeting processes, the gradual implementation of accrual-based accounting principles, the strengthening of institutional capacity through professional training, and increasing transparency through the online publication of budget execution data. These directions aim both to modernize the public financial system and to enhance accountability and public and international confidence in the management of public resources.

Therefore, the analysis of the stages shows that the reform of budgetary accounting in the Republic of Moldova has followed a gradual path — moving from initial adjustments and program-based budgeting to harmonization with international standards and, at present, to digitalization and integration — which confirms its evolutionary nature and its orientation toward European convergence.

Although the progress achieved over the past decades is undeniable, the reform of budgetary accounting has faced and continues to face numerous obstacles that have slowed down the pace of implementation and affected the uniformity of results:

Limited administrative capacity – a shortage of specialists trained in modern public sector accounting;

Underdeveloped information systems – many processes remain manual, which reduces efficiency and transparency;

Institutional resistance to change – some public authorities continue to maintain traditional practices;

Uneven implementation between central and local levels – there are major discrepancies between ministries and local public authorities in applying the new standards;

Unstable economic context – financial crises, the pandemic, and the war in the region have affected both the pace of reform and the resources allocated to it.

The reform of budgetary accounting in the Republic of Moldova is not merely a technical adjustment but represents a structural and strategic process aimed at:

increasing transparency in the use of public funds;

- strengthening fiscal accountability;
- facilitating access to international financing;
- improving citizens’ trust in state institutions;
- supporting European integration through the harmonization of accounting standards.

This reform reflects a complex transition driven both by internal needs (budget deficits, corruption, lack of transparency) and by external pressures (European and international conditionalities). The stages undertaken demonstrate a gradual evolution from a rigid system based on formal control to a modern model oriented toward performance, transparency, and fiscal sustainability.

Although difficulties persist, the direction of the reform is clear: the gradual integration of accrual accounting principles and alignment with IPSAS (International Public Sector Accounting Standards) / EPSAS (European Public Sector Accounting Standards), with a strong focus on digitalization and institutional capacity building.

The new budgetary methodology implemented in the Republic of Moldova represents an essential step toward the modernization of the public finance management and budgetary accounting system. It is based on five core principles — transparency, accountability, efficiency, international compatibility, and sustainability — which together create an integrated framework for managing public resources (Ministry of Finance of the Republic of Moldova, 2015,2016).

These principles should not be viewed in isolation but rather in their interdependence. Transparency is impossible to achieve without accountability, efficiency cannot be attained without sustainability, and international compatibility ensures the credibility of the entire process.

1. Transparency – financial information becomes accessible to the public.

Transparency is one of the most important principles of the new budgetary methodology. It requires that information on budget planning, execution, and reporting be accessible to all interested stakeholders — citizens, public institutions, civil society organizations, and international partners. Budget transparency is reflected through a set of essential characteristics that enhance clarity and trust in the management of public finances. These include the periodic publication of approved budgets and execution reports, providing access to data in open formats (open data), which enable independent analyses, as well as the possibility of comparing allocated resources with the results actually achieved.

For the Republic of Moldova, the importance of budget transparency is particularly significant. It helps reduce the risk of corruption and misappropriation of public funds, strengthens citizens’ trust in state institutions, and facilitates democratic oversight of the use of public money. In this way, transparency becomes not only a principle of modern governance but also a fundamental condition for strengthening democracy and ensuring long-term financial sustainability.

Practical example: In many European countries, governments publish monthly budget execution reports online. In the Republic of Moldova, the implementation of similar platforms is a priority for strengthening transparency.

However, transparency cannot exist without accountability, which ensures compliance with the rules and the proper use of public funds.

2. *Accountability* – clarifying the roles and obligations between the government, ministries, and local authorities.

Accountability refers to the obligation of public institutions to justify how they use financial resources and to take responsibility for the decisions they make.

Budgetary accountability has several dimensions that define how public institutions are held responsible for their decisions and actions. Vertically, accountability is reflected in the relationship between the Government and ministries on one side and the Parliament and citizens on the other, acting as a mechanism of direct democratic control. Horizontally, it is exercised between institutions of equal rank, such as between the Ministry of Finance and sectoral ministries, ensuring coherence and coordination in the decision-making process. At the local level, accountability lies with local public authorities, which must answer to the communities they administer for how they manage resources.

Clarifying institutional roles is essential for a functional budgetary framework. The Government sets fiscal-budgetary policy and strategic directions; the Ministry of Finance coordinates the budget process and sets accounting standards; line ministries implement sectoral programs and report on their execution; and local public authorities manage decentralized resources and are responsible for their efficient use.

The impact of this delineation on public governance is significant: it limits overlapping responsibilities, holds public officials accountable, and strengthens a clear chain of responsibility that starts from the taxpayer and reaches the decision-maker.

Therefore, a reformed budgetary system ensures transparency, fairness, and accountability in the management of public funds, providing society with the guarantee that resources are administered according to legal and ethical principles. Financial accountability is not limited to complying with the regulatory framework but also involves assuming the consequences of budgetary decisions, as well as the ability of institutions to answer to citizens and international partners.

Once consolidated, this accountability creates the natural foundation for the next step — increasing efficiency. Only through a responsible, well-structured, and properly monitored framework can public resources be optimally used and directed toward the state’s strategic priorities.

3. *Efficiency* – directing allocations toward measurable results.

Efficiency means using financial resources in such a way as to generate maximum results at minimum costs. In the context of the new budgetary methodology, this principle is implemented through the introduction of program-based budgeting and the use of performance indicators, which allow the alignment of fund allocations with the strategic objectives and priorities of public institutions. Thus, resources are allocated according to priorities and measurable objectives, funded programs are analyzed from a cost–benefit perspective, and institutional performance is systematically monitored and evaluated.

A concrete example can be seen in the health sector, where efficiency is measured not merely by the amount of spending, but through indicators such as vaccination rates, reduced mortality, or increased access to medical services.

For the Republic of Moldova, applying this principle brings significant benefits: limited resources are used more judiciously, the quality of public services is improved, and the public policy framework becomes results- and impact-oriented.

Therefore, the new budgetary methodology emphasizes measurable results, reducing waste, and the rational use of public funds. Once public institutions succeed in improving the way they manage resources, they become better prepared to operate in a complex and

interconnected financial environment. This increase in internal efficiency forms the foundation for the next stage - international compatibility. A system that is efficient at the national level can be more easily aligned with international standards and practices, facilitating the integration of the Republic of Moldova into the European economic and financial space.

4. International compatibility – alignment with IPSAS standards.

An essential principle of the new budgetary methodology is compatibility with the International Public Sector Accounting Standards (IPSAS), which provides transparency, comparability, and credibility to the Republic of Moldova's financial data in relation to other countries. This compatibility is achieved through the adoption of internationally accepted accounting rules and procedures, the presentation of financial statements in a format recognized by donors and investors, and the gradual alignment with EPSAS (European Public Sector Accounting Standards), the standards intended for EU member states and candidate countries.

Applying this principle brings multiple benefits. First, it facilitates access to external sources of financing, including loans, grants, and European Union programs. Second, it increases international partners' confidence in the country's financial management. Third, it supports the integration of the Republic of Moldova into the European and global markets by harmonizing accounting practices and reporting on internationally recognized bases.

However, implementing this principle involves major challenges, such as the need for significant investment in staff training, the adaptation of IT systems to the new standards, and complex legislative amendments to ensure full alignment with international accounting rules. It should be noted that alignment with international standards offers the Republic of Moldova not only a common reporting framework but also a universal financial language through which transparency and accountability become comparable at the global level. This openness to European and international best practices creates long-term stability and trust.

From this perspective, international compatibility is not an end in itself but a means to establish a forward-looking public management model. Thus, the next strategic challenge of the reform is sustainability.

5. Sustainability – medium- and long-term budget planning.

Sustainability is the principle that ensures budgetary policies aim not only at short-term objectives but also at maintaining fiscal balance in the medium and long term. In this regard, it is implemented through the development of the Medium-Term Budgetary Framework (MTBF), the assessment of the impact of current decisions on future generations, as well as the limitation of budget deficits and public debt growth. Thus, sustainability becomes a key element of the new budgetary methodology, ensuring the stability and continuity of the reform process.

Practical example: An unjustified increase in public sector salaries may bring immediate electoral benefits but generates long-term budgetary imbalances. By applying the principle of sustainability, such decisions must be analyzed from the perspective of their multiannual financial impact.

For the Republic of Moldova, the principle of sustainability is particularly important, as it helps maintain macroeconomic stability, offers greater predictability for investors and external partners, and supports the sustainable and responsible development of public finances [2].

The five fundamental principles of the new budgetary methodology — transparency, accountability, efficiency, international compatibility, and sustainability — shape a modern and integrated framework for public finance management. They transform budgetary accounting from a mere expenditure control mechanism into a genuine strategic instrument of public governance. The consistent implementation of these principles in the Republic of

Moldova is essential not only for strengthening transparency, accountability, and fiscal stability but also for bringing the national system closer to European and international standards.

The reform of budgetary accounting in the Republic of Moldova, grounded in the principles of transparency, accountability, efficiency, international compatibility, and sustainability, has not been limited to a theoretical or legislative framework. It has produced tangible effects — both positive and negative — that have influenced the way the state plans, manages, and reports its financial resources. Analyzing these practical implications is therefore essential for assessing not only the progress achieved but also the persistent challenges, as well as the broader impact on the economy and society.

The evolution of budgetary accounting reform cannot be evaluated solely through the stages it has gone through and the principles it has proclaimed, but especially through the concrete results it has generated. In the Republic of Moldova, the reforms have produced visible effects on the way public finances are planned, managed, and reported. Among the most important achievements are (Ministry of Finance of the Republic of Moldova, 2024a, 2024b):

1. Increased transparency of budget execution

One of the major achievements of the reform has been the improvement in the level of transparency in presenting and reporting the budget. The Ministry of Finance has started publishing more information on budget planning, quarterly execution, and performance reports, which has enabled more rigorous monitoring.

Transparency does not mean only access to data, but also access to information that is understandable to the public. The online publication of budgets and execution reports, accompanied by explanatory summaries, facilitates citizens' and civic organizations' understanding of how public funds are used.

2. Strengthening fiscal discipline

The reform of budgetary accounting has contributed to strengthening fiscal discipline by requiring institutions to comply more strictly with spending limits and to justify any deviations. The introduction of internal control and audit mechanisms has reduced opportunities for misappropriation of funds and limited waste.

In addition, multiannual reporting has improved the Government's ability to manage the budget deficit and public debt. Medium-term planning allows the anticipation of imbalances and the timely adoption of corrective measures.

3. Possibility to compare Moldova's data with other countries

The gradual alignment with the International Public Sector Accounting Standards (IPSAS) has created the possibility to compare the Republic of Moldova's financial statements with those of other transition countries or EU member states. This comparability is essential for analyzing financial performance at the regional level, attracting international funds, and integrating into European and global statistical systems.

4. Gradual integration of performance-based budgeting

Another important outcome is the gradual introduction of program-based and performance-based budgeting, whereby financial allocations are no longer based solely on historical expenditures but on concrete objectives and performance indicators.

Example: In the field of education, the financing of institutions is no longer done only according to the previous year's expenditures but also based on indicators such as graduation rates, school attendance levels, or results on national assessments.

However, despite these advances, the reform of budgetary accounting still faces multiple challenges that affect the pace and quality of its implementation.

1. Limited institutional capacity – shortage of qualified specialists.

One of the biggest challenges of the reform is the lack of specialized human resources. Many public institutions — especially at the local level — do not have accountants trained to apply the new rules or familiar with international standards. This shortage causes delays in implementing reforms, incomplete or inaccurate reporting, and resistance to applying new methods due to insufficient knowledge.

2. Insufficient IT systems – lack of full digitalization.

Although there has been progress in digitalization, many public institutions still rely on manual procedures or fragmented IT systems that do not communicate with each other. This creates difficulties in data collection and centralization, additional costs due to multiple reporting requirements, and a higher risk of errors and inconsistencies.

Without full digitalization, the reform of budgetary accounting risks remaining only partially implemented and failing to deliver the expected benefits.

3. Institutional resistance to change.

The implementation of the new budgetary methodology requires a cultural shift in the public sector, which has generated resistance from some officials and decision-makers. This resistance is driven by fear of losing control over resources, a lack of motivation to learn new procedures, and familiarity with the old system, perceived as simpler.

This resistance slows down the pace of the reform and reduces its effectiveness.

4. Differences in implementation between central and local levels.

Another major problem is the uneven implementation of the new rules. At the central level (Government, ministries), the reform is advancing more rapidly due to greater resources and support from international partners. In contrast, many local authorities face difficulties in adopting the new practices.

This discrepancy creates an unbalanced system in which local reports are not fully compatible with national ones, which undermines the consistency of data.

Conclusions

The reform of budgetary accounting in the Republic of Moldova represents an essential process for the modernization of public finance management. It aims to shift from a predominantly cash-based accounting system to one grounded in accrual principles and aligned with modern international standards. The implementation of this process is complex, requiring legislative and institutional adjustments, investments in staff training, and the development of IT infrastructure.

In conclusion, the main practical implications of the budgetary accounting reform in the Republic of Moldova are:

Increased transparency and accountability – the new system offers a clearer picture of the financial position of public institutions, allowing for more rigorous monitoring of expenditures;

Improved decision-making – accounting data becomes more complete and more useful for political and administrative decision-makers;

Modernization of information systems – the reform involves investments in integrated accounting software and their interoperability with other government systems;

Implementation challenges – the process faces difficulties related to institutional resistance, lack of qualified human resources, and transition costs;

Impact on external reporting – a modern budgetary accounting system strengthens the Republic of Moldova’s credibility with international partners, including financial institutions such as the IMF and the World Bank.

The reform of budgetary accounting is an ongoing process, and its long-term success depends on strengthening the professional capacities of public sector accountants, improving the legislative and regulatory framework, expanding digitalization and automation of accounting processes, as well as increasing transparency and public access to financial information. Achieving

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these objectives will enable the Republic of Moldova to develop a modern, efficient, and results-oriented public financial system.

Thus, the reform goes beyond a mere technical change in accounting rules, representing a strategic step toward responsible governance and more efficient management of public resources. Moreover, it constitutes an essential instrument for strengthening democracy, attracting investment, and accelerating the European integration of the Republic of Moldova.

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CONSIDERATIONS REGARDING ACCOUNTING POLICIES AND OPTIONS USED WITHIN NON-PROFIT ORGANIZATIONS

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Abstract. The study analyzes the difficulties encountered by non-profit organizations in developing and applying accounting policies within the framework of their activities. As legislation is constantly changing, how to develop and apply accounting policies and options becomes an increasingly complex challenge for accountants. Significant accounting challenges relate, in particular, to the process of defining, developing, applying, monitoring and evaluating accounting policies. Accountants encounter difficulties in understanding the regulatory framework and in applying the specific principles and elements related to special purpose and public utility activities. The proposed optimization solutions regarding the completion of accounting policies with useful information and the integration of sustainable principles will contribute to the exclusion of errors and the risk of applying penalties.

Keywords: non-profit organization, accounting policies, special purpose financing, accounting documents.

JEL Classification: M 41

Introduction

Profit is the driver of the economy, but it is not the purpose of the activities carried out by non-profit organizations. As an essential element of civil society, these entities rely on social and voluntary activities, which in turn require specific rules to be included in accounting policies. In accordance with the requirements stipulated in the Accounting and Financial Reporting Law, accounting records in non-commercial organizations are mandatory, through full compliance with the stages of the accounting cycle. Thus, they must record accounting items on an accrual basis, use double-entry accounting, and present financial statements. (Law on Accounting and Financial Reporting, 2017).

Accounting activity begins with the development and approval of accounting policies. The Accounting and Financial Reporting Law defines accounting policies as "the totality of principles, basic concepts, rules, methods and procedures applied by an entity in keeping accounts and preparing financial statements". (Law on Accounting and Financial Reporting, 2017).

The accounting policies approved by the entity's management constitute the basis for ensuring accurate records in compliance with the legislation in force, as well as for preparing true and complete financial statements. These policies become mandatory for the entire entity and must be applied uniformly in all its subdivisions, starting with the first day of the management period. Accounting policies become an essential tool because accounting data is used to calculate rights and obligations. Therefore, compliance with and correct application of policies contributes to ensuring the entity's financial and tax compliance. Control service, first of all, require accounting policies, when verifying the correctness of accounting transaction records and the veracity of financial, fiscal and statistical reports.

Problems and solutions

Accounting policies include the mandatory principles followed by the entity's accounting. The accounting system provides founders, management, members and collaborators with information regarding the organization's financial activity, necessary to make operational decisions for the rational organization of the activity and rational management of resources. The way transactions are recorded and their totalization in the entity's financial statements is coordinated by the content of the accounting policies. This regulation ensures the consistency and comparability of financial information, both within the organization and in comparison with different management periods. Therefore, at the end of each accounting period, management must approve the accounting policies for the following year.

Donors, civil society, state services, the press and partners, as external information users, need information on the organization's activity and ability to fulfill its obligations under contracts. For donor control and monitoring services, tax and insurance services, audit services and other control bodies, access to authentic information about financial activity, taxable objects, fulfillment of project contractual conditions, etc. is important.

The importance, structure, and practical aspects of preparing accounting policies have been examined by many economists in the field in the specialized literature. Authors Frecăuțeanu A., Țapu T. and Chișlaru A. in the article "Elaboration of accounting policies: estimating the requirements of various regulatory acts" facilitates understanding of how to develop and apply accounting policies and can be used by managers and accountants of organizations. (Frecăuțeanu A., Țapu T., Chișlaru A. Elaboration of accounting policies: estimating the requirements of various normative acts. 2019d, p.83).

Accounting policies are developed in accordance with the provisions contained in the Law on Accounting and Financial Reporting, the National Accounting Standards (NAS), the General Chart of Accounts, the Methodological Guide for Preparing Financial Statements. NAS "Accounting Policies, Changes in Accounting Estimates, Errors and Subsequent Events" establishes the general rules necessary to be followed in the process of selecting, applying and changing accounting policies, correcting errors, accounting for subsequent events and presenting related information in the financial statements. (National Accounting Standards, 2019a).

The implementation of accounting policies in non-commercial organizations must be preceded by management's consultation of the specific requirements imposed by the Methodological Guidelines on the Particularities of Accounting in Non-Commercial Organizations. (Methodological guidelines on the specifics of accounting in non-commercial organizations, 2014)

The rules included in the accounting policies are selected by the entity's administration based on the accounting regulatory system, which provides for different options for recognizing, evaluating and accounting for accounting elements. In practical terms, the development process consists of identifying procedures, rules, methods with multiple variants, contained in national accounting standards, and choosing the optimal variant, which will be applied by the entity, subsequently being included in the regulation. Therefore, the development process becomes difficult with the multitude of specific aspects of the activities carried out by non-profit organizations, which complicates the process.

The methodological guide for preparing financial statements does not facilitate this process, as it contains a policy model for commercial firms and cannot be used as a reference model by non-commercial organizations. Being involved in coordinating social activities and lacking the necessary knowledge, management leaves the choice of procedures and methods to accountants. Selecting the optimal option is not just a technical process, as it must generate useful information used in managerial processes, and the decisions made must lead to the sustainability of the organization. To make things easier and save time, it would be useful to electronically integrate the entity's various systems, to avoid duplication of accounting work and reduce routine operations

processed daily. Thus, the focus will be on more control and monitoring of internal processes. State services must provide information sessions, assistance programs, support, training services explaining mechanisms and good practices in this area, which meet the mandatory requirements to be included in accounting policies. In this way, those who advocate for citizens' social and community causes will be supported.

To ensure compliance with the legislation in force, within the framework of financial accounting, organizations annually develop and apply their own accounting policies, which contain the basic compartments proposed by the standard:

1. General provisions;
2. Accounting procedures for which the regulatory acts provide for different variants;
3. Independently developed accounting procedures;
4. Annexes to accounting policies.

The accounting policies of non-profit organizations must contain the details of the accounting elements specific to the activities carried out: types of statutory activities, composition of funding sources, the method of preparing and using accounting documents, accounting procedures for accounting elements, independently developed accounting procedures, other methodological and organizational aspects of accounting.

Accounting in non-commercial organizations contains a set of particularities that distinguish it from the accounting of commercial and public entities. Accountants must possess essential knowledge in the process of recording practical activity and developing objective policies, given the different interpretations of legal provisions. The main objective of accounting in non-commercial organizations is to evaluate and record special-purpose funds that ensure the performance of statutory activities. The administration's task is to use funding strictly in accordance with planned budgets, as well as to disclose the results of the use of special-purpose resources for different user groups. One of the basic features of the accounting of non-commercial organizations, which distinguishes it from other entities, consists in the simultaneous reflection of the recognition of expenses related to special-purpose funds incurred by decreasing financing and increasing revenues related to special-purpose funds.

In our opinion, the methods of accounting for special-purpose funds are not sufficiently substantiated and generate problems when calculating indicators in the financial statements and tax reports of non-commercial organizations. In the accounting process, it is necessary to pay increased attention to the recording of special means, which must be delimited by funding sources and directions of use. This accounting is determined by the conditions and restrictions imposed by the donors. If these conditions are not met, the funding must be returned to the donors, partially or in full. Our proposal consisted of specifying this particularity in the accounting policies of non-profit organizations.

In accordance with the National Accounting Standards and Methodological Guidelines on the particularities of accounting in non-commercial organizations, it is necessary to specify the statutory activities carried out and the sources of financing of the entity. Usually, the administration indicates as sources of funding only funds obtained in the form of grants, conditional donations, financial and technical assistance, and special-purpose membership fees. But, practice often confirms that these entities do not indicate as sources of funding non-designated funds, received as unconditional donations or financial aid, as they are considered unimportant. This aspect was studied in detail in the article "Considerations regarding the accounting of unallocated funds in non-commercial organizations". (Cauș L. Considerations regarding the accounting of non-dedicated funds in non-commercial organizations, 2024, p.76).

The specification omits financing received as a percentage designation, from partners, credits or loans. If interest on credits and loans is accounted for as part of special-purpose funds, then these must also be recorded as a separate source of financing. The most complicated issue is

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the recognition of funding based on accrual accounting, which makes it difficult to evaluate the sources used to carry out projects. (Methodological guidelines on the specifics of accounting in non-commercial organizations, 2014)

In accordance with the Methodological Guidelines for Non-Commercial Organizations, accounting policies must contain the procedures for accounting for the contributions and contributions of founders and members, in particular the date of their recognition. The organization's statute usually indicates the amount of member contributions required to be paid annually or monthly. It would be reasonable for the given regulation to specify the moment of recognition of these contributions, which facilitates correct and timely accounting. This date is important in the event of the expiration of the statute of limitations on the claims of members who have not honored their obligations, the amount of which must be settled against other income. The policies must necessarily mention that membership dues and contributions intended for the accomplishment of statutory missions are reflected as special-purpose funds. And membership dues and unconditional contributions for special purposes are reflected as non-special-purpose funds.

Exchange rate differences related to funding received in foreign currency generate many uncertainties when determining financial statement indicators and reports submitted to funders. Donors require reports on the use of funding and recalculation of expenses with the application of different exchange rates, for example, the rate established by the funder on the day the funding was received, the commercial exchange rate of the currency, the average rate calculated for a period or the InforEuro rate. The accounting policies must indicate how exchange rate differences are recalculated for each project. It is mandatory to highlight the method of accounting for the differences in amounts generated in the financial reports provided to donors.

Among the requirements of financiers, one can list the opening of separate bank current accounts in national or foreign currency for recording special-purpose funds, which allows the application of a transparent and efficient system for identifying and recording receipts and payments related to the financing granted, ensuring transparent internal management for identifying expenses from all sources of financing the activity. Usually, practice shows that entities use separate bank accounts for each project, even if the donor does not impose such a condition. The legislation does not limit the number of bank accounts held by legal entities, however, this aspect must be recorded in the accounting policies within the methods developed independently by the entity.

To ensure efficient tracking of all movements of special-purpose funds, non-profit organizations must create a well-defined internal management system. According to the specialized literature, it is advisable to develop an internal system for marking primary supporting documents, including payment documents, in correlation with the respective funding sources, representing an efficient internal management mechanism. Coding allows for the prompt identification and recording of the appropriate information in accounting, the reconciliation of data from supporting documents with those in accounting records. The lack of a system for identifying primary documents to correlate receipts and payments with the source of financing complicates the recording of the respective operations and creates the risk of distortion of the information necessary for controlling the use of funds according to their intended purpose.

Attention in accounting policies must be paid to the coding method for each assistance project, which can be done with unique numbers assigned to projects carried out based on an internal order, by developing the document called "Detailed Budget Sheet", based on the approved budget and activity plan. This sheet, being included in the computer program, will lead to an efficient record on projects and will generate information regarding the specific project, for various requested periods, with possibilities to filter the information by project code, donor code, budget lines, transaction currency or primary document number. This aspect contributes to the generation

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of financial reports for any project, source, donor, while also contributing to the efficient monitoring of actual expenses compared to budgeted ones. As a result, the risks of erroneous allocation of expenses by budget sources are minimized, the duplication of payments for several projects simultaneously is avoided, as well as timely management decisions are made in the event of savings or overspending on budget lines and activities in general.

Also, in the process of accounting for special-purpose funds, analytical records must be kept by types of funding, donors, purposes of use, which may include different projects or programs, different categories of expenses, as well as in accordance with other aspects, which must be specified in the rules of accounting policies of non-profit organizations. Accounting records kept by funding sources lead to more efficient financial reporting to donors, founders, as well as to informing management and other users about the results obtained. For this, it is necessary to monitor the results and indicators obtained, in comparison with the indicators initially planned in the entity's budget.

Practice shows that in some cases, funding is delayed in being collected into bank accounts. And the calculation and payment of debts regarding labor remuneration and social contributions must be carried out monthly in accordance with the provisions of the legislation in force. Accounting policies should specify that in the event of a lack of funding, the calculation and payment of salaries should be carried out as cash is received, based on the grant budget. The regulation should also include the documents necessary for the calculation of salaries or fees, for example individual employment contracts, service contracts, acts of performance of works or services, invoices and calculation notes. These documents must be approved by the executive director, and then sent to the accounting department.

In accordance with the Methodological Guidelines on the Peculiarities of Accounting in Non-Commercial Organizations, accounting policies must contain the manner of preparation of accounting documents and the documentary circuit. Often, organizations do not specify the forms of primary documents and accounting registers developed by the entity, which must contain the mandatory elements stipulated in the Law on Accounting and Financial Reporting, for example, the model of donation acts or donation minutes. Accounting policies related to the organization and keeping of accounting records can be kept on paper or in electronic form in accordance with the legislation in force, but the method of keeping electronically prepared documents, as well as the method of archiving them, is not specified, and as a result, difficulties arise in obtaining information related to them for fiscal periods. (Methodological guidelines on the specifics of accounting in non-commercial organizations, 2014)

For intangible and tangible assets, accountants do not establish the residual value, considering it insignificant for the activities of organizations. This fact is an impediment when the assets are offered to beneficiaries free of charge, being valued at zero accounting value. The donation cannot be made at zero value and it is necessary to revalue the assets, which is an administrative process that involves additional documentation.

Often there is no method for valuing donated stocks to beneficiaries, which can only be the specific identification method. Many organizations do not use the possibility of directly reflecting in current expenses the materials received at the time of purchase, such as office supplies, cartridges and other similar goods. The requirement regarding goods received for transmission to other beneficiaries related to special missions specifies the need to choose between recording them on the balance sheet as other current assets or off-balance sheet.

The list of positions of the persons responsible for drawing up and signing accounting documents attached to the accounting policies, in addition to the director and accountant, must be supplemented with the positions existing in the organization, for example the project coordinator, project assistants and other persons responsible for each project carried out. In the section of procedures developed independently by the entity, the source of covering the administrative and

maintenance expenses of the organizations, the remuneration calculated for the board of directors, the special conditions of donors for the distribution of expenses, the fuel consumption norms are often missing.

The working chart of accounts of the non-commercial organization is a key element, which is missing in practice, even if it includes the synthetic accounts and sub-accounts used or possibly used to reflect accounting operations within the activity carried out and the calculation of indicators in the financial statements, as well as accounts for managerial and off-balance sheet accounting in accordance with the information needs, without duplicating and distorting the General Chart of Accounts. (General Chart of Accounts, 2019b).

The working chart of accounts must ensure the recording of accounting elements by funding sources, such as: special-purpose funds, non-pre-purpose funds, founders' contributions, members' dues, funds resulting from statutory economic activities, etc. The plan must allow the collection of the information necessary for recording funding by use and determining indicators in the financial statements. The working chart of accounts annexed to the accounting policies includes the accounting accounts specific to the activity of the non-commercial organization, as presented in table 1.

Table 1. Accounting accounts specific to the activity of the non-profit organization

<i>Account number</i>	<i>Account name</i>
262	<i>"Other current assets"</i>
425	<i>"Long-term financing and special purpose receipts"</i>
537	<i>"Current financing and special purpose receipts"</i>
336	<i>"Net surplus (net deficit) of the management period"</i>
341	<i>"Funds"</i>
616	<i>"Income related to special purpose funds"</i>
617	<i>"Other income (except income from economic activity)"</i>
618	<i>"Income from economic activity"</i>
716	<i>"Expenses related to special purpose funds"</i>
717	<i>"Other expenses (except expenses from economic activity)"</i>
718	<i>"Expenses from economic activity"</i>

Accounting policies should be included in a special chapter of the Explanatory Note to the financial statements. The explanations of accounting policies should be clear, concise, and without duplicating information contained in other sections of the financial statements.

During a financial year, changes in accounting policies are not permitted, as the data in the financial statements will not be comparable. These changes can only be made if required by law. In most cases, policies are changed as a result of changes in accounting regulations in accordance with the rules of the National Accounting Standards "Accounting Policies, Changes in Accounting Estimates, Errors and Subsequent Events". Changes in accounting policies are made by issuing a written order, but sometimes the administration of entities does not issue this order due to lack of knowledge. The order regarding the change of accounting policies must state the need for the changes and the effective date, which is very important in reading the financial statements. Any change must be specified in the explanatory notes in terms of the reason for which they were changed and the amount of the influence of the changes on the reported results, as well as their trend. The explanatory notes must indicate the relevance and credibility of the information presented, as well as the positive assessment of the change made.

Accounting policies constitute an integral part of the financial statements and, if necessary, can be brought to the attention of users of accounting information: members, staff, fiscal and financial bodies, etc. The mandatory presentation of accounting policies to public authorities is not

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provided for by regulatory acts. At the same time, accounting policies may be requested by representatives of control bodies in the process of carrying out planned controls. Information users may be presented with either the order on accounting policies or extracts from them on the procedures and methods used in keeping accounts and preparing financial statements.

To facilitate and simplify the process of developing accounting policies, we propose that specialists in the field form and apply a cumulative information base, in which the methods, rules, procedures with multiple application options imposed by national accounting standards, as well as methodological indications regarding the particularities of accounting in non-commercial organizations, are stored. Thus, by selecting the necessary options, accountants can form the entity's accounting policies, without the need for additional effort by browsing additional legislative provisions. The database will facilitate the process of developing accounting policies, with the possibility of selecting rules, methods and procedures corresponding to the specifics of non-commercial entities. After completing the selection, it is obvious that the accounting policies must be consulted and adjusted according to the information needs and with other specialists within the organization. Given that the accounting policies reflect the totality of processes within any enterprise, so it is not only the responsibility of accountants. These specialists must check the regulation with the submission of notifications in order to prevent possible errors in the process of developing the accounting policy.

Conclusions

The increasing complexity of the activities of entities in the context of globalization requires the adoption of managerial decisions taking into account the data and information that accounting provides. Accounting is an important activity for any entity regardless of the activity profile, due to political and economic changes that have led to a series of legislative amendments, aimed at harmonizing national accounting with international requirements. Thus, accounting activity is faced with the need to have voluminous records accessible in the long term, on the one hand, and on the other hand with the need to process and analyze accounting data at a high qualitative level, allowing decision-making by managers and founders. Thus, accountants must be very familiar with the provisions of the legislation in force related to each accounting method they are going to select. Taking into account the continuous change of legislation, managers are called upon to know more complex notions about the activity of the managed organization. The material provides theoretical and practical aspects regarding the development of accounting policies in non-commercial organizations, providing information on facilitating this process with concrete accounting treatments to improve this mechanism, starting with theoretical and practical aspects, presenting the content of the necessary rules to be included in the composition of this regulation, with the help of which any entity is called upon to provide information to external users.

Accounting policies are one of the mandatory elements of accounting for any entity. The manner of developing, amending and disclosing these policies in non-commercial organizations is established in the Law on Accounting and Financial Reporting, the SNC "Accounting Policies, Changes in Accounting Estimates, Errors and Subsequent Events" and the Methodological Guidelines on the Peculiarities of Accounting in Non-Commercial Organizations. The accounting policies used by the accounting department include certain working procedures established by the management of each entity, depending on the operations carried out, with the aim of facilitating and achieving a general framework with accepted solutions for resolving situations of a repeatable nature, ultimately helping to substantiate rapid future decisions. The accounting policies developed must allow the provision of relevant and credible information, which complements that in the financial statements. The data in the financial statements, as a support in the substantiation of decisions for the end users, must be credible, by presenting the complete reality, uninfluenced by

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any interest. This information must be comparable between different management periods and between entities in a sector of the economy.

The choice of accounting policies must be made in accordance with the activity carried out, and this must be maintained throughout the financial year. Also, when it is necessary to change accounting policies, this must be done with caution so as not to give rise to interpretations that endanger the entity's activity.

We propose the development of methodological guides with practical examples and concrete calculations on real cases of determining the mandatory elements used. The recommendations should be based on the frequent non-conformities detected by the control bodies and the actions necessary to comply with the legislation in force with the changes made over time, in order to avoid errors often encountered in accounting practice. The guides will be beneficial if they contain case studies on the development of accounting policies and solutions proposed in areas specific to non-commercial activities, such as education, social assistance, charity, etc. They will present useful tools that allow the rapid development of accounting policies, being adapted to the specifics of the activity carried out and will contribute to making accounting activities more efficient.

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TAX PLANNING: ASPECTS OF APPLICATION OF THE PROVISIONS OF THE INTERNATIONAL CODE OF ETHICS FOR PROFESSIONAL ACCOUNTANTS

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Abstract: Recently, tax planning issues have become particularly important. First of all, this is due to the increased frequency of events related to tax evasion or significant underestimation of tax amounts, reflected in published journalistic investigations (Panama Papers, Paradise Papers, etc.). Variations in minimizing the tax burden may be different: from transactions between different countries to transfer pricing schemes. In this case, situations arise, primarily of an ethical nature for professional accountants when providing tax planning services for client enterprises or employer enterprises. This article is devoted to the analysis of the provisions of the International Code of Ethics for Professional Accountants in terms of tax planning and the development of proposals for its improvement. The author classifies tax planning into three categories: from standard to aggressive planning, while providing definitions and characteristics of each of these types. It should be noted that in tax planning, the correct application of the concept of a reliable basis plays an important role, but the International Code of Ethics does not provide a definition of such a concept. In turn, the author, analyzing this issue, formulates a definition of a reliable basis.

Keywords: tax planning, tax consultant, code of ethics, professional accountant.

JEL Classification: M41

1 Introduction

In the context of globalization and digitalization of the world economy, investment migration, and the growth of offshore zones, various options for tax evasion arise. In this regard, recently the attention of the world community has been riveted to events related to tax evasion or significant understatement.

This was facilitated by journalistic investigations that uncovered a number of schemes, these investigations were called the "Paradise Papers" and "Pandora Papers" (Pandora, Pandora Papers: A simple guide to the). For example: an investigation into tax evasion (the so-called "Paradise Papers" - a large package of materials) was conducted by the International Consortium of Investigative Journalists and published by such media organizations as the BBC, The Guardian, etc.

The investigation presented information from the registers of two offshore service providers and 19 offshore companies, about their assets, investments and tax evasion schemes. (The Paradise papers)

Also released were the Panama Papers, which are financial documents from the law firm Mossack Fonseca, which advised a wide range of businesses and individuals on setting up offshore companies to achieve desired tax results.

Thus, questions were raised about the ethical implications for the professional behavior of accountants involved in developing tax minimization strategies, which may also be legitimate.

As a result of these events, the Organization for Economic Cooperation and Development (OECD), in partnership with the G20, launched a project to analyze the erosion of the tax base and profit shifting (BEPS). At the same time, the goal of the project was to ensure uniform international tax rules that would not facilitate the movement of corporate profits beyond the place of actual

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economic activity of the enterprise and the creation of the cost of the product. (Base erosion and profit shifting (BEPS))

The World Federation of Stock Exchanges has included tax transparency as an "important environmental, social and governance indicator" for the reporting of listed companies.

In this regard, the reaction of the International Ethics Standards Board for Accountants (IESBA) followed, which developed a strategy and work plan for 2019-2023, and in September 2019 formed a working group to:

examining the regulatory framework, practices, and other developments in corporate and individual tax planning; and
to identify and analyze the ethical implications of providing tax planning services and to determine the need to complete the International Code of Ethics.

In September 2021, the working group submitted its final report and recommendations to the International Ethics Standards Board for Accountants (IESBA). Based on this report and related recommendations, the Council (IESBA) has launched a project to create standards in the field of tax planning.

As a result, at its meeting in December 2023, the Council (IESBA) approved amendments to the Code concerning tax planning and related services. (Final Pronouncement - Revisions to the Code Addressing Tax Planning and)

It should be recalled that the International Code of Ethics for Professional Accountants (including International Standards of Independence) consists of 3 parts: (International Code of Ethics for Professional Accountants)

Part 1 "Complying with the Code, fundamental principles and conceptual framework";

Part 2 "Professional accountants in business";

Part 3 "Professional accountants in public practice" and

International Independence Standards (Parts 4A and 4B):

Part 4A "Independence for audit and review engagements",

Part 4 B "Independence for assurance engagements other than audit and review engagements".

At the same time, the provisions of part one, which reflect the fundamental ethical principles, should be applied by all accountants.

Part 2 "Professional Accountants in Business" and its provisions apply to accountants who work as employees in various sectors of the economy: trade, manufacturing, services, the public sector, non-profit organizations, as well as regulatory professional organizations. Also, the second part is mandatory for accountants who provide specialized services to enterprises on the basis of a civil contract.

Part 3, "Professional accountants in public practice," is used by professional accountants (auditors) when they provide relevant services to clients.

It should be noted that the relevant sections 2 and 3 of the International Code of Ethics for Professional Accountants (including International Standards of Independence) have been supplemented with sections 280 and 380 on tax planning and ethical principles of accountants in the provision of such services. The effective date of these sections is June 30, 2025.

It should be emphasized that each country has its own tax legislation, with its own rules, benefits, and exemptions, international norms should also be taken into account, and we can talk about the harmonization of European legislation, for example, in terms of value added tax.

In this regard, the International Code of Ethics for Professional Accountants (including International Standards of Independence) sets out general ethical requirements that must be met when providing tax planning services.

It is a single guideline for all professional accountants, as well as tax professionals, who are strongly encouraged to use these standards to ensure that the public interest is respected, as

well as potential reputational, commercial and economic consequences for their clients or employers.

2 Analysis of the provisions of the International Code of Ethics for Professional Accountants in terms of tax planning

When analyzing the provisions of the International Code of Ethics for Professional Accountants (including International Independent Standards), it should be noted that there are certain limitations and difficulties in implementing the provisions of this code, which are as follows:

Specifying the definition of tax planning services, which include a wide range of services or activities aimed at helping a client structure his business in a tax-efficient manner. At the same time, the concept of "aggressive tax planning" should be defined. It is necessary to distinguish between whether the concluded transaction was structured in the most efficient way from the point of view of taxation or whether it is aimed at tax evasion for the main or sole purpose. the goal.

At the same time, questions arise regarding tax evasion or other non-compliance with tax laws and regulations. It should be noted that the International Code of Ethics for Professional Accountants does not even address these issues, as they are illegal.

In this case, the provisions of the Standard on Responding to Non-Compliance with Laws and Regulations (NOCLAR) apply. However, public concern has recently increased significantly about the role of tax consultants in helping individuals and corporations evade taxes, as well as the use of sophisticated strategies by multinational companies to minimize their taxes.

Public distrust of professional tax consultants has increased to such a level that in some major jurisdictions, such as the EU, the adoption of legislation regulating tax consulting and the activities of tax consultants is being considered;

In addition to tax planning services, the consultant may also provide related services, which include preparing tax returns and protecting the client's interests in tax matters in court. In principle, such services do not relate to tax planning, but when performing them, the requirements of the International Code of Ethics must be met;

Tax planning services may be provided by specialists who are not required to comply with the requirements of the International Code of Ethics, and therefore, the corresponding restrictions and prohibitions will not apply to them as professional accountants, which may lead to unfair competition;

It should be noted that many jurisdictions have their own national legislation on preventing tax evasion, for example: on transfer pricing. In this regard, the question arises about the application of national legislation and the provisions of the International Code of Ethics in terms of tax planning. It should be noted that the provisions of the International Code of Ethics do not replace national legislation;

An important point is the role of a professional accountant and his activities in the public interest. It is necessary to consider the role of a professional accountant in terms of consultations in a comprehensive manner, taking into account the responsibilities of clients, management and those responsible for corporate governance.

First of all, it concerns the disclosure of information about tax planning in financial statements or a supplement to them. In this regard, the Public Interest Oversight Board (PIOB) has asked the International Ethics Standards Board for Accountants to consider appropriately disclosing information about tax-related matters in financial statements or other relevant public documents, in accordance with applicable reporting requirements;

The responsibilities of professional accountants should also be taken into account. When accepting an engagement, an accountant should obtain an understanding of the nature of the engagement, knowledge of the client enterprise, its owners, management and its business

activities; the objectives, factors and circumstances of the agreement, and the relevant laws and regulations.

However, in situations where there is uncertainty in the interpretation of tax legislation, or different interpretations thereof, it may be necessary to provide information to the professional accountant on how to proceed.

At the same time, the Code establishes that a professional accountant can provide reasonable advice only when there are reliable grounds in legislation and regulations, then there is a reliable basis. However, the concept of a reliable basis in laws and regulations will vary depending on the jurisdiction. However, it would be inappropriate to assign a probabilistic numerical indicator to the threshold value of a reliable basis, since this would create a false sense of accuracy.

However, there are situations, so-called grey areas of uncertainty, as to whether a proposed scheme will comply with tax laws and regulations. For example, a tax strategy that is considered correct each year may be found to be incorrect after a number of years.

The International Ethics Standards Board for Accountants has reviewed the ethical basis for applying a conceptual framework to assist associates in navigating grey areas and other tax planning circumstances. In doing so, the following issues should be taken into account: the types of threats that may be created by associates carrying out tax planning activities or providing tax planning services, factors that are relevant to assessing the level of such threats, and examples of actions that may eliminate such threats or may serve as safeguards to eliminate such threats.

An example of an ethical hazard would be where a government retains a tax advisor to assist in drafting tax legislation designed to reduce tax evasion, and the advisor subsequently advises clients on tax strategies to avoid being subject to the legislation. This would create a self-interest threat for the tax advisor when he or she is offered a significant fee;

An important point to pay attention to is the disagreement between the tax consultant and the client's management. For example: in circumstances where the tax consultant has reason to believe that there is no reliable legal basis for applying this scheme, and the client does not agree with the consultant's assessment, the consultant should inform the client about its results and possible consequences;

A tax consultant may also consider seeking expert advice. If the experts' recommendations are consistent with the assessment of the tax consultant, then, analyzing the situation, he must decide whether to retain the client or terminate cooperation and relations with the client if the client has not changed his position. This includes considering whether to terminate the contract and professional relationships;

However, in cases where a client or employing organisation is engaged in illegal activity, the tax advisor will consider reporting these activities to the appropriate authority and consider the need to resolve the situation with the client or the employment relationship;

It should be noted that issues relating to documentation arise in the process of providing tax advice. It is mandatory to document the transfer pricing agreement, discussions with the client or responsible parties in the employing organization, as well as the analysis, judgments and decisions in terms of tax planning.

It is considered that the requirement to document will ensure that all relevant facts and circumstances are reflected and provide a basis for responding to inquiries, for example, from the tax authorities.

However, documentation is a matter of quality and risk management, not ethics. Based on this, documentation of tax advice should be encouraged, but not a requirement from an ethical standpoint. However, some jurisdictions may decide at the legislative level on this need. For example, in the UK, the Professional Conduct in Taxation (PCRT) standard requires members of UK professional accountancy bodies to document in a timely manner the rationale for their professional judgments.

Or, in Australia, the Accounting Professional and Ethical Standards Board (APESB) issued APES 220 Tax Services, which requires its members to prepare documentation for tax services;

The next important point of tax consulting (planning) is the relevant service (product) or tax planning agreement developed by a third party. However, it is necessary to ensure that the third party (supplier) has the appropriate experience. At the same time, even if a third party develops tax planning regulations, no one removes responsibility from the tax consultant. At the same time, the consultant may receive a commission from a third party.

Practices regarding referral fees vary from jurisdiction to jurisdiction. In the codes of conduct of some jurisdictions, for example, in the United States, government consultant assistants are expected to disclose to clients information about any referral fees as an important measure to protect against threats to the assistants' objectivity.

At the same time, the International Code of Ethics establishes that regardless of whether a client applies to a tax consultant for advice or an agreement is developed by a third party and the consultant recommends or directs the client to a third-party supplier, the consultant must inform the client about any professional or business relationship he has with a third-party supplier;

An important point remains the question of the tax benefit received in several jurisdictions. For example: a client or an employing organization may receive a tax benefit from the same transaction in more than one jurisdiction.

In this case, although it would not be illegal for a client or an employing organization to receive the same tax benefit twice in two different jurisdictions, there is a public interest argument that a tax consultant should recommend that the client or employing organization disclose to the relevant tax authorities the specific facts and circumstances, as well as the tax benefits resulting from the transaction in different jurisdictions;

Another issue that should be analyzed concerns the applicability of the provisions of the International Code of Ethics to sustainable development professionals. The International Code of Ethics is global in nature because it has been adopted or is in use in more than 130 jurisdictions. The International Ethics Standards Board for Accountants (IESBA) believes that the Code can serve as a basis for ethical obligations for others who perform the same professional activities as professional accountants.

By publishing sections 280 and 380 on tax planning, the International Ethics Standards Board for Accountants (IESBA) aims to inspire other standard-setters and practitioners who are not professional accountants to raise the bar for ethical behavior in relation to transfer pricing and tax planning.

3 Conclusion

Analyzing the provisions of the International Code of Ethics, it can be stated that:

It is necessary to introduce a classification of types of tax planning. When discussing the provisions of the International Code of Ethics, the question was raised that aggressive tax planning should be defined in the International Code of Ethics. For example: there was a proposal to narrow down the proposed description of "tax planning" and go beyond aggressive tax minimization.

It was believed that the proposed description could inadvertently create burdensome requirements and the proposed description could include any "tax-efficient" transfer pricing agreements aimed at providing economic benefits, primarily for the client. This proposal was not accepted, however, according to the author, a classification of tax planning and appropriate definitions should be given. We propose the following classification:

- *standard tax planning*,
- *tax planning - alternative*,
- *aggressive tax planning*.

Standard tax planning involves the development of strategies, tactics, and tax schemes that fully comply with the provisions of tax legislation, using the benefits and deferrals of tax payments

provided by tax legislation, or an appropriate official response has been received from the competent authorities regarding tax planning.

Tax planning - alternative, this type is planning when there are different interpretations of tax legislation and a professional accountant assumes responsibility for interpreting the provisions of tax legislation, in conditions where there is significant uncertainty about changing the provisions of tax legislation or the interpretation of the provisions of tax legislation.

Aggressive tax planning is a type of planning that is on the verge of avoiding taxation, due to different interpretations of tax legislation or a number of other reasons.

It should also be noted that there is a need for greater transparency in financial reporting in terms of tax planning. In this regard, it is necessary to properly disclose information on tax-related and tax planning issues in financial statements or other relevant public documents, in accordance with applicable reporting requirements.

An important point is the fact that in tax planning it is necessary to take into account that the basis for making decisions is reliable. The International Code of Ethics does not provide such a definition, but in the author's opinion such a definition is necessary. It should be taken into account that the definition of a reliable basis in laws and regulations will differ depending on the jurisdiction.

When discussing this issue, there was also a proposal to establish a probabilistic numerical indicator for the threshold value of a reliable basis. In our opinion, since the economies of different countries are not equivalent in their development, establishing any specific numerical indicator would not be entirely correct, taking into account the different capabilities of the economies of different countries. In the author's opinion, the definition of a reliable basis is as follows: a reliable basis is a reasonable confidence in the interpretation of the provisions of tax legislation, which serves as a basis for the implementation of correct tax planning.

Another point that should be taken into account in tax planning is the so-called gray area, which is the problem of uncertainty as potentially leading to threats in circumstances related to tax planning.

In this situation, it is difficult to give a specific definition of the gray area, since the tax legislation of different countries varies, and the definition of the gray area requires specification.

An important point is the fact that at present the provisions of the International Code of Ethics are applied by professional accountants, but there are many tax consultants who do not fall under the need to comply with the provisions of the International Code of Ethics, in this regard, unfair competition occurs when professional accountants are obliged to comply with the requirements of the code of ethics, while other consultants are not.

This can be done either by introducing into the International Code of Ethics requirements for compliance with ethical standards in tax planning for tax consultants who are not professional accountants, or by issuing a separate Code for tax consultants.

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ACCOUNTING POLICIES AS AN ELEMENT OF CONTROL IN BUDGETARY INSTITUTIONS

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Abstract: In the process of forming the accounting of budgetary institutions and the efficient and transparent use of budgetary funds in accordance with the priorities of state policy, many controversial and unresolved issues arise. One of these issues is the formation of accounting policies in budgetary institutions, which is a basic element of the primary organization of the accounting process. The article, based on the analysis of scientific works and regulations, examines the concepts of accounting policies in budgetary institutions. Using system analysis and taking into account that budgetary institutions, as a rule, carry out functions and goals on behalf of the state within the limits of budget allocations, the existence of an accounting system with unique rules in these structures is obvious. Thus, the author illustrated the role of accounting policies in the accounting of budgetary institutions. As a result of the work, it was concluded that accounting policies are an important element of control in maintaining accounting statements in the budgetary sphere.

Keywords: accounting policies of a budgetary institution, financial control, financial statements, monitoring.

JEL Classification: H83; M41

1 Introduction

The term "accounting policy of an organization" came into use in the late 1980s as a free translation into Romanian of the phrase "accounting policies" used in standards issued by the International Accounting Standards Board.

In the context of the implementation of measures to improve the effectiveness of budgetary expenditures, the development and use of results-oriented methods of financing expenditures, the efficient and transparent use of budgetary means in accordance with state policy priorities, the main task of central and local public authorities becomes the organization of a rational accounting system in budgetary institutions. Respectively, ***the budgetary accounting is one of the instruments for the implementation of the state's economic policy***, capable of serving the direct interests of the state in the field of management and control of public finances.

Given that budgetary institutions, as a rule, perform functions and purposes on behalf of the state within the limits of budget allocations, it is obvious that there is an accounting system with unique rules in these structures.

A budgetary institution belongs to the group of state (municipal) institutions, along with autonomous and state-owned ones. The accounting policies of each institution have their own specifics depending on:

- the purpose of the institution's creation;
- the sources of funding for its activities;
- the type of founder;
- the degree of state regulation of financial activities and the scope of the institution's independence;
- other aspects.

The content of a budgetary institution's accounting policies depends on:

- the type and structure of the budgetary institution;
- the object, purpose, and types of its activities, as well as the powers granted;
- the sectoral and other specifics of the budgetary institution's activities.

2 General and Specific Context Analysis

The general formula of the accounting process in budgetary institutions, which allows the unification of accounting methods, is considered to be the Accounting Policy.

According to the Minister of Finance no. 216/2015 regarding the approval of the Chart of Accounting Accounts in the budgetary system and the Methodological Norms regarding accounting and financial reporting in the budgetary system (hereinafter – OMF no. 216/2015), the objective and basic destination of the Accounting Policy *consists in defining the set of principles, rules, methods and procedures applied for the organization of accounting records in the activity of a budgetary authority/institution, with the aim of achieving clear transparency in the use of the means of its own budget.*

For most entities in the corporate sector in the Republic of Moldova, the awareness of the importance of drawing up the Accounting Policy is already firmly determined, by the fact that it serves as the main internal standard, based on which a set of organizational and administrative documents is formed, as well as on the basis of which the opportunities for efficient management of expenses and financial result are applied.

For most budgetary authorities/institutions, the importance of drawing up the Accounting Policy is formally targeted, even if the normative framework provides for the obligation to prepare it as well as the way it is prepared (Chapter V "Standard Accounting Policy" of OMF no. 216/2015).

The accounting policy in a budgetary institution should become the most important link in the context of the preparation of financial information corresponding to the requirements of the head or government bodies, which would facilitate the adoption of appropriate decisions related to the management of public finances and public assets.

In this regard, the presence of the model of the Standard Accounting Policy, approved by Chapter V "Standard Accounting Policy" of the

The Model Accounting Policy contains general and single accounting regulations for the budgetary sector and is used as a methodological guide for the distinct preparation of an Accounting Policy by a budgetary authority/institution.

However, in practice, the accounting policy issued by the authorities specialised in certain areas must contain a number of additional information (establishment of accounting rules/procedures in strict accordance with the regulatory framework in force) in order for them to serve as full-fledged instruments for their financial activities, allowing them to avoid the observations of the supervisory bodies.

The accounting policy is drawn up by the chief accountant, approved by the manager and, according to item 1.4.8. of OMF no. 216/2015, is coordinated with the Ministry of Finance. As a rule, the Accounting Policy is approved at the end of the management year, for the next management period.

Next, the way of structuring the information in the Accounting Policy will be examined, as well as the additional provisions with which it can be supplemented will be analyzed.

The *General Provisions* department contains general information about the name, date of establishment and field of activity specific to the budgetary authority/institution. Also, this section exposes the normative acts regulating the field of accounting in the budgetary system. If the related normative acts are more numerous, they can be presented as an annex to the Accounting Policy.

Depending on the sectoral activities, the budgetary authority may supplement that List with other normative acts specific to the regulated field and which provide for some accounting aspects, for example:

culture – Law on the protection of the movable national cultural heritage no. 280/2011,

education – Education Code no. 152/2014,

in the field of digitization – Government Decision no. 783 of 30.06.2003 on the valuation of intellectual property objects,

environmental field – Regulation on the assignment of land from the forest fund for hunting and/or recreation purposes, approved by Government Decision no. 187/2008, Water Law no. 272/2011.

The following compartments of the Accounting Policy are based on general aspects of the Accounting Policy: *organizational, technical and methodological* (Figure 1).

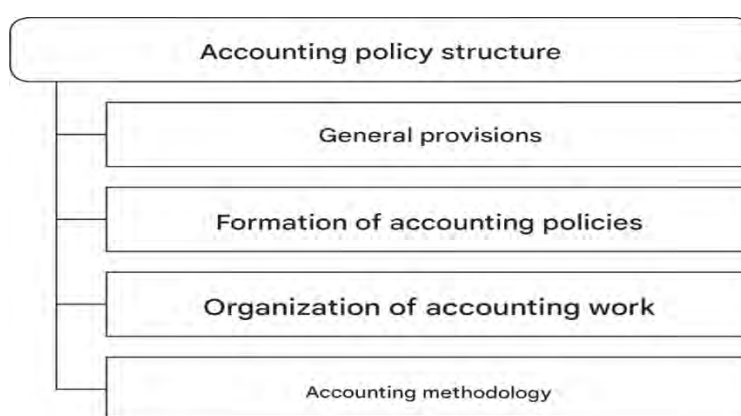


Figure 1. Structure of the Accounting Policy

Source: author own study

Organizational aspect

- refers to the establishment of the rules for the organization of accounting in the budgetary authority/institution, namely:

Organization of accounting records – consists of keeping accounting by financial structures of the related authority/institution or centrally. Also, according to item 1.4.1.5. letter c) of OMF no. 216/2015, the head of the budgetary authority/institution is entitled to transmit the keeping of accounting or accounting and financial reporting duties to a specialized organization or audit firm on a contractual basis.

Specifying the responsibility for the accounting records in accordance with the regulatory framework in force. In accordance with art. 13, para. (1) of the Accounting Law no. 113/2007 (hereinafter – Law no. 113/2007) and item 1.4.1.3 of OMF no. 216/2015 the responsibility for keeping the accounts lies with the head of the budgetary authority/institution. Therefore, the manager is obliged to take the following actions (item 1.4.1.4. of OMF no. 216/2015):

a) to organize and ensure the keeping of accounting records continuously from the moment of registration until the liquidation of the budgetary authority/institution;

b) to ensure the elaboration, approval and compliance with the Accounting Policy of the budgetary authority/institution;

c) to ensure the elaboration and approval of the internal procedures of the activity of the accounting service;

d) to ensure the elaboration and approval of the rules for the circulation of documents and information processing technologies;

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e) to ensure the timely, complete and correct preparation and presentation of primary documents, accounting records according to the rules established by the Ministry of Finance, as well as their integrity and preservation;

f) to organize the internal control system, including the inventory;

g) to ensure the documentation of the economic facts of the budgetary authority/institution and their reflection in the accounting;

h) to ensure compliance with Law no. 113/2007, Methodological norms and other legislative and normative acts in force;

i) to ensure the preparation and presentation of financial reports in accordance with the requirements of the Ministry of Finance, as well as other reports and reports established by other public authorities.

In turn, the attributions of the accounting services (item 1.4.1.6 of OMF no. 216/2015) are as follows:

a) ensures the correct organization of the accounting records in accordance with the Methodological Norms;

b) carries out the preventive control on the correct and timely preparation of the documents and the legality of the operations performed;

c) carries out the control over the efficient use of the means, according to the destination, within the approved budgetary limits, as well as the control over the integrity of the monetary resources and material values;

d) calculates and pays on time salaries, allowances and other payments to employees and scholarships to beneficiaries from educational institutions;

e) makes timely settlements with legal entities and individuals;

f) participates in the inventory of monetary resources, settlements and material values, determines correctly and in time the results of the inventory and reflects them in the accounting;

g) prepare and present the financial reports within the established deadlines;

h) keep the accounting documents, the record books, the approved budgets, and other documents, as well as hand them over to the archive in the established order.

Establishing the functions and duties related to the accounting records on certain sectors. The Chief Accountant assigns certain accounting sectors (fixed assets, salary, collected income, settlements, money, etc.) by functions present in the accounting structure and stipulates in the Accounting Policy the conditions for their record-keeping.

Elaboration of the documentary circuit graph. In order to streamline the accounting process, it is necessary to approve the schedule of the documentary circuit, based on certain procedures and specific time intervals, in compliance with the legal provisions. The description of the stages of processing the primary documents in certain terms, with the determination of the person in charge (of the accounting workers) for each of them, aims to manage the patrimony as effectively as possible. It is not necessary to approve the schedule of the documentary circuit in the Accounting Policy, in case of its approval by another internal order of the institution.

How to keep and archive primary documents/accounting records, financial reports and other accounting documents.

Preparation of documents not approved by the regulatory framework or necessary for the internal operations of the budgetary institution. According to art. 19 para. (3) of Law no. 113/2007, when registering the economic facts, the institution uses standard forms of primary documents, approved by the Ministry of Finance. In the absence of standard forms or if they do not meet the needs of the entity, the budgetary institution shall develop and use document forms, approved by its management, in compliance with the following mandatory elements (art. 19 para. (6) of Law no. 113/2007):

a) the name and number of the document;

- b) the date of preparation of the document;
- c) the name, address, IDNO (tax code) of the entity in whose name the document is drawn up;
- d) the name, address, IDNO (fiscal code) of the recipient of the document, and for individuals - the personal code;
- e) the content of the economic facts;
- f) the quantitative and value standards in which the economic facts are expressed;
- g) the position, name, surname and signature, including digital, of the persons responsible for carrying out and recording the economic facts.

Compliance with the elements provided for in letters c) and d) is not mandatory when preparing the primary documents for the internal needs of the institution. As a rule, the issuance and approval of documents issued by the institution is approved as an annex to the Accounting Policy.

Preparation of the Work Chart of Accounts. For budgetary authorities/institutions that use analytical sub-costs, established for a more detailed record of accounting items, it is obvious that the need to approve the *Work Chart of Accounts* (with synthetic and analytical sub-accounts used by the institution's accounting department) is obvious. If the institution does not approve the Work Chart of Accounts as an annex, at least the approval of the analytical sub-accounts issued by it is mandatory in the information in the Accounting Policy.

Appointment of the commissions set up for asset management. In order to comply with the normative provisions and the objective accounting of the public patrimony, the Accounting Policy lists the Commissions created and their composition by functions: the Inventory Commission, the Commission on the determination of the fair value of the goods received, the Commission for the scrapping of the goods, etc. In the composition of the Commissions, only the function of the participating persons is specified, not their name/surname.

Provision of the manner and deadlines for carrying out the inventory. Some budgetary institutions carry out the inventory formally, ignoring some important measures provided for in the Order of the Minister of Finance no. 60/2012 on the approval of the Regulation on inventory. Therefore, for a more efficient record of the accounting elements, it would be appropriate to provide in the Accounting Policy the methods and deadlines for inventory: of the composition of the assets transferred in economic management or in share capital, by verification with the beneficiary entities; of the immovable property (buildings, land) managed by verifying their registration with the territorial cadastral bodies and other normative acts, such as Government Decision no. 351/2005 on the approval of the lists of immovable property publicly owned by the state and on the transfer of some immovable property, Government Decision no. 161/2019 on the approval of the list of publicly owned land of the state from the administration of the Public Property Agency, etc. The inclusion of these provisions in the Accounting Policy makes the budgetary authority/institution responsible for undertaking the measures to remedy the divergences detected in the inventory of the assets managed and the assets transferred under management to the entities.

Establishing the manner and deadlines for carrying out the internal control of the correctness of the accounting records – consists of verifying, in accordance with the legal requirements, the preparation/receipt of primary documents, the recording of economic facts and the preparation of accounting records, filling in the necessary forms and other processes carried out during the record-keeping.

Modification of the Accounting Policy. The modification of the Accounting Policy of the budgetary authority/institution takes place in case of reorganization, modification/introduction of the accounting regulations that would affect the provisions approved in the Accounting Policy.

Provision of the conditions and deadlines for the preparation and presentation of financial reports. According to the normative framework, budgetary authorities/institutions submit quarterly

(except for the first quarter) and annually financial reports to the Ministry of Finance. In order to efficiently prepare and present financial reports on time, budgetary authorities and institutions, including subordinate ones, establish in the Accounting Policy the conditions for verifying the financial information in the reports, as well as internal terms for their preparation and presentation.

Technical aspect

- represents the set of information about the information systems used by the budgetary authority/institution for keeping accounting records, for preparing and presenting financial reports, for presenting tax information, as well as for other processes directly related to the organization of accounting.

Methodological aspect

- represents the way of recognition, evaluation, revaluation of accounting elements, the way of recording economic facts, as well as the preparation of financial reports. Not looking for the fact that, for the budgetary sector through OMF no. 216/2015, single accounting rules are approved, it cannot provide for all economic operations, events due to the complexity of the economic facts that take place in each managed sector. Respectively, the Accounting Policy may provide for accounting aspects specific to the managed sector or some details related to the accounting elements, such as:

obtaining/carrying out the revenues/expenditures specific to the budgetary authority/institution, as well as specifying the approved revenue nomenclature, if any, according to art. 43 para. (2) of the Law on Public Finance and Budgetary-Fiscal Responsibility no. 181/2014;

description of the modality/purpose of awarding current and capital grants, subsidies and the modality of verifying their capitalization;

attribution of goods to fixed and material assets, not provided for in OMF no. 216/2015. It is mentioned that according to item 3.3.3 of OMF no. 216/2015, it is categorically forbidden for budgetary authorities/institutions to set the value ceiling, which contradicts the definition of fixed asset;

clarifications regarding the determination of the value of the land/buildings, detected as pluses following the inventory by applying accounting reasoning to the choice of an alternative proposed in OMF no. 216/2015 or the use of the services of an independent appraiser;

clarifications on the revaluation of fixed assets that have been completely worn out but are still operating;

clarifications on the determination of the fair value of the land to be leased;

the manner of recording the economic operations of the budgetary authority/institution.

Conclusions

Following the examination of some Accounting Policies drawn up by budgetary authorities/institutions, provisions inappropriate to them were detected, such as:

tax revenue records – according to the regulatory framework, taxes are administered by revenue administrators and are accounted for by the cash method;

record of natural resources and state material reserves – are assets managed by branch ministries;

Keeping records of non-financial assets such as internal/external loans and internal/external loans – according to the regulatory framework in force, it is forbidden to contract them by budgetary authorities/institutions, their records being kept by budget managers through the cash method. As an exception, there are project implementation units subordinated to ministries, which keep track of loans received from external donors.

The preparation of financial reports is carried out in accordance with the requirements of Chapter IV "Financial Reporting" of OMF no. 216/2015 and OMF no. 164/2016 on the approval of the Requirements for the preparation of the Narrative Report on the execution of the budgets of

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budgetary authorities/institutions. Although in some Accounting Policies drawn up by budgetary authorities/institutions the provisions of Chapter IV of the OMF are included. No. 216/2015, it is more appropriate to introduce the methodology for systematizing the information related to the consolidation of the goods transmitted/received within the budgetary system, as well as to verify them by approving internal forms. Also, for the authorities that are subordinated to embassies and project implementation units with bank accounts outside the budgetary system, it is important to provide for the need to prepare Form FD – 040 "Report on the execution of the budget outside the treasury system", which is introduced in the SIGFP. It is noted that, if some organizational aspects of accounting are approved by separate internal order – it is not necessary to incorporate them into the Accounting Policy. Only the number/date of the order that regulates a certain aspect is sufficiently indicated.

The provision of organizational and methodological aspects in a more developed and effective manner in the Accounting Policy of a budgetary authority/institution shows the justification for the execution of accounting records/economic facts that are not regulated by the normative framework.

At the same time, a properly prepared Accounting Policy will ensure the truthful preparation of financial reports and will influence the efficient and transparent management of public assets.

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SESSION VI
INFORMATIONAL TECHNOLOGIES AND ECONOMIC
CYBERNETICS

CYBER INCIDENT MANAGEMENT: APPROACHES AND BEST PRACTICES

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Abstract: When analysing the state of the modern digital environment, it is necessary to emphasise that cyber threats pose a constant risk factor for both private companies and government institutions. It has been established that cyberattacks have become targeted, and their number is on the rise. Therefore, in order to quickly detect, respond to, and reduce the level of cyber incidents, it is necessary to create more effective mechanisms for countering and managing information security incidents.

The purpose of this article is to study cyber incidents that have a negative impact on the country's information space and pose threats to all areas of activity.

It has been found that cyber incidents vary in nature, including phishing attacks, sending spam to mailboxes, fraudulent messages, hacking private accounts, ransomware, creating complex and targeted attacks on critical infrastructure, and attacks that cause significant financial losses and lead to user distrust of the resources they use most often are also common.

The research used the methods of analysis, synthesis, evaluative and situational, comparative, graphical and generalisation.

It is becoming increasingly difficult to counter cyber threats, as with the development of information technology, fraudsters and cybercriminals are complicating and refining their methods of influence, which is why new, more effective methods of countering them are being developed.

It has been established that cyber attacks most often have political and economic factors, so such attacks pose a particular threat when high-tech means are used. Areas such as economic, social and national security are the most at risk, where cyber incidents pose a significant threat. Therefore, the development of effective and efficient strategies for managing such cyber incidents is currently a pressing issue.

The article concludes that there is a need to develop an effective and comprehensive approach to detecting, responding to, and restoring information that has been damaged after cyber incidents. It is discussed that with the increase in the level of threats, the requirements for the creation of modern approaches to integrating all important measures to ensure the resilience of digital systems to cyber threats, which have become increasingly widespread in recent years, are only possible through a combination of modern innovative technologies, the creation of effective security policies and international cooperation.

Thus, cyber incident management is a continuous process that requires the training of highly qualified cybersecurity specialists, the creation of effective technical protection, interaction between teams, and a culture of security within the organisation. In the context of growing cyber threats and crime, it is important for law enforcement agencies to develop effective strategies to combat crime and take measures to protect the rights and freedoms of every citizen and the security of the entire state.

Keywords: cyber incidents, technological innovations, security policy, digital systems, cyber attacks, confidential information

JEL Classification: G14, H56, L86

INTRODUCTION

The purpose of the article is to reveal the essence of the process designed for effective cyber incident management, to create important directions for the development of measures, methods and mechanisms aimed at preventing incidents, responding to possible cyber attacks and managing them using modern innovative technologies.

An important aspect in this area is the development of a regulatory framework, regulatory documents, and the updating of the existing legislative framework for the reliable and effective management of information security incidents.

Even the best information security infrastructure cannot guarantee the absence of intrusions or other harmful, malicious actions. The information security management system (ISMS) is part of the overall management system based on business risk assessment for the creation, implementation, operation, continuous monitoring, analysis, support and improvement of information security (IS). An incident in an information security system is considered to be an undesirable (unexpected) event or series of events in the security system that could jeopardise business operations and the protection of certain information. The speed with which an organisation can identify, analyse, prevent and respond to incidents will limit the damage caused and reduce recovery costs.

Presentation of the main research material

Computer security incident management is the process of identifying, analysing and responding to events that pose a threat to information systems. Effective incident management is based on a combination of human resources, technical infrastructure and tools that enable an organisation to detect, localise and neutralise threats in a timely manner.

To ensure an adequate response to cyber incidents, specialised teams are created to manage security events. Their responsibilities include developing clear response procedures, defining roles and areas of responsibility, providing the necessary technologies and security measures, and training personnel to respond quickly in crisis situations.

In 2024, the implementation of malware in emails increased by 349% compared to the previous year worldwide (Department of Cyber Police..., 2024).

In today's digital world, cyber incidents pose one of the most serious threats to all areas of activity — from small businesses to large government agencies and critical infrastructure facilities. Despite the advantages of digitalisation, it creates new vulnerabilities that attackers can exploit to gain unauthorised access to confidential information, manipulate data or disrupt important systems.

A cyber incident is any event that could compromise the confidentiality, integrity or availability of information or information resources. Such events can be either intentional (e.g., phishing, malware, DDoS attacks, or insider actions) or accidental (e.g., equipment failures or user errors).

International standards are used to build an effective cyber incident response system, in particular NIST SP 800-61, which defines incident management as a continuous process.

Companies entering international markets need to prove their reliability in the field of cybersecurity. This requires compliance with international standards such as ISO/IEC 27001 and PCI DSS, as well as adherence to best practices and regulatory requirements such as NIST CSF, NIS2, SOC 2, DORA, CCPA, etc. In Europe, there is a particular focus on protecting personal data and improving the cyber resilience of critical enterprises, which is regulated by the GDPR and NIS2 acts.

The cyber incident management process is usually divided into four main phases:

1. Preparation — creating policies, procedures, and technical response tools.
2. Detection & Analysis — identifying incidents and determining their scope.
3. Response (Containment, Eradication & Recovery) — isolating, eliminating the threat and restoring systems.

4. Post-Incident Activity — analysing causes, assessing consequences and improving protective mechanisms.

In 2025, Ukraine continues to face a hybrid war involving large-scale cyberattacks on government agencies and critical infrastructure. During this period, CERT-UA actively responds to incidents, including attacks on energy systems, financial institutions, and military networks.

In April 2025, a DDoS attack on the country's power grid was recorded, aimed at disrupting the power supply to several large cities. Thanks to the prompt actions of CERT-UA and cooperation with international partners, in particular CISA (USA), the attack was stopped at an early stage, vulnerabilities were eliminated, and systems were restored within a few hours.

This incident contributed to the emergence of international cooperation initiatives aimed at creating new backup communication channels, which are extremely necessary during military operations, in order to facilitate an effective response to large-scale cyber threats.

Since cyberattacks are a frequent occurrence and critical infrastructure and government information systems must be reliably protected, the latest measures have been implemented to strengthen the protection of information and communication systems. An important area of focus has been the development of a digital platform designed to monitor cyber threats, detect suspicious activity, and implement mechanisms to respond to cyber threats in real time.

In the summer of 2025, a group of international terrorists planned a cyberattack targeting the energy infrastructure of several states. Such suspicious cyber activity was detected thanks to the effective work of special services and the use of security system monitoring, which made it possible to avoid negative consequences and ensure the uninterrupted operation of energy systems.

In addition, an attempt to leak confidential information through a phishing attack on a platform belonging to government agencies and designed for data exchange between them was detected, blocked and prevented in a timely manner.

This case became the basis for the development of a new strategy for responding to cyberterrorism, which made it possible to improve the speed of response for cyber defence through the use of international cooperation. Thus, international cooperation in overcoming and combating cyberterrorism consists of concerted efforts between public and private entities, which make it possible to prevent potential large-scale attacks and create a reliable system for international cybersecurity.

Results and discussion

In their work, Rybachenko et al. (2022) draw attention to the information protection system that belongs to the organisational structure, stating that in order to create effective protection of information from cyber incidents, it is necessary to ensure constant monitoring using innovative technologies. To ensure Ukraine's information security, it is important to create a set of organisational and technical measures that will become effective means of protection against cybercrime worldwide. It is noted that only together with European countries can reliable protection be built, including through the introduction of appropriate laws regulating activities in the field of cyber protection. The European Union Directive on Network and Information Security (NIS2), which is a document on protection against cyber incidents, sets out the basic requirements for security in the digital system and the creation of protective measures in the field of cybersecurity (2022).

Research shows that in 2023, the number of detected malicious and phishing attacks increased by 27% compared to 2022. It has been established that the greatest risk occurred due to access to cloud applications, where nearly 83 billion access attempts were recorded (Dovhan et al., 2024).

It is noted that countering cyber threats is an integral part of ensuring Ukraine's national security in the field of information security and is a priority task for the effective protection of the state (Kolosovsky, 2023).

The theft of personal data and information leaks have a significant impact on the state of insecurity and reduce the level of data confidentiality (Sverdlyk, 2022).

My personal contribution is proposals to update the existing regulatory and legislative framework for reliable and effective management of information security incidents. Cybersecurity issues are relevant in the context of the modern development of the information society, the growth of cybercrime, and are particularly important in preventing the consequences of the use of cyberterrorism in hybrid wars. Therefore, it is necessary to build a cybersecurity system for Ukraine, taking into account the rapid trends in the development of cyberspace, modern challenges, and threats to its security.

Conclusion

Most European countries will work on implementing new European cybersecurity legislation regarding the currently voluntary option for businesses to certify that their products comply with EU cybersecurity standards. The European Commission will regularly assess the need to make a particular certification scheme mandatory. The certification scheme used may define one or more levels of security: basic, substantial or high.

At the basic level, ICT manufacturers or service providers will be able to carry out conformity assessments themselves. In the case of significant or high levels of assessment, this will be carried out by national cybersecurity certification bodies. EU Member States will develop rules on penalties for violations of the EU Cybersecurity Certification Framework and Schemes and will grant broader powers to cybersecurity authorities to ensure cooperation and the application of ENISA recommendations.

Cyber incident management is not a one-off action, but a continuous, cyclical process that requires technical training, clear policies, interaction between teams and, most importantly, a culture of security within the organisation. In the face of growing cyber threats, only those companies that are prepared for attacks will be able to effectively protect their assets, reputation and customer trust.

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SAVAGE'S VISION IN DECISION-MAKING, MODELS AND ALGORITHMS

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Abstract: In the context of solving applied economic problems, uncertainty generally generates a multitude of decision-making difficulties. These require specification based on the type of the decision-maker, the environment, available resources and decision constraints as well as other factors. This article looks at one specific sequence from this multitude - namely - the one that refers to the regret criterion, known in the literature as Savage's criterion. It is important to clarify from the beginning that the number of states of nature is considered finite, the admissible decision domain is a compact and convex set in the corresponding space, and the functions generated by all states of nature - which in this case represent costs - are considered convex and continuous over the given decision domain. Evaluating the regret for each state of nature is, in itself, a difficult problem. Estimating the values of the Savage function for any specific decision option is even more challenging. This paper proposes a method for minimizing Savage's regret function, which is developed based on the well-known generalized gradient projection method. This proposed method can be implemented in multiple versions depending on the number of states of nature, the number of constraints that define the admissible decision domain as well as other factors and limitations. All these versions are implemented through specific algorithms. The convergence conditions of the algorithms are established and the application areas for these numerical schemes are indicated. The identification of sectors of the economy where the developed algorithms could be tested from various perspectives represents a particular interest in the context of this research.

Keywords: decision-making under uncertainty, Savage criterion, regret minimization, gradient projection method, optimization algorithms

JEL Classification: C61, C63, D81

Introduction

In decision-making, the absence of regret is practically impossible. Whenever someone expresses something *regretfully* or remarks that the outcome could have been better in a given situation, it indicates the presence of regrets associated with certain decisions. In other words, alternative choices might have been possible which, under specific circumstances, could have

produced more favourable outcomes than those actually obtained. Based on this concept, the present study adopts a quantitative approach to the problem of minimizing regrets under conditions of uncertainty. The concept of regret in decision-making under uncertainty, particularly for special cases, was first introduced by Savage [1]. In works [2] and [3], two decision-making problems are examined in detail, for which five algorithms have been developed. These algorithms are specifically designed to minimize the maximum regret value of Savage’s regret functions.

Models description

The considered models have the following form:

Model I:

$$R_s(u) \rightarrow \min_{u \in U \subset E^n} \quad (1)$$

Model II:

$$R_s(u) \rightarrow \min_{u \in D = \{u \in U : F(u) \leq 0\}} \quad (2)$$

Here:

$R_s(u) = \max_{i \in I} \{\bar{r}(u, q_i)\}$ - the Savage function;

$\bar{r}(u, q_i) = r(u, q_i) - r_i^*$ - the Regret function;

determined by the state of nature $q_i \in Q = \{q_1, \dots, q_m\}$;

$r_i^* = r(u_i^*, q_i) = \min r(u, q_i)$ and $u \in U$ in model I, $u \in D$ in model II;

function

$$F(u) = \max_{j \in J} \{F_j(u)\}.$$

It is assumed that all functions $r(u, q_i), i \in I = \{1, \dots, m\}$ and $F_j(u), j \in J = \{1, \dots, t\}$ are continuous and convex on the compact and convex U in the Euclidian space E^n .

Remark. In order to be able to work with the function $\bar{r}(u, q_i)$ it is required to know its minimum value r_i^* which is realistically impossible. When implementing the algorithms, in each iteration, certain estimations of r_i^* , will be used instead of its actual value.

In the following we will consider certain partitions of the sets I and J into subsets $I_1, \dots, I_M$ and $J_1, \dots, J_N$, respectively, such that:

$$\begin{aligned} \bigcup_{i=1}^M I_i &= I, & \bigcup_{j=1}^N J_j &= J, \\ I_{i_1} \cap I_{i_2} &= \emptyset, i_1 \neq i_2, & J_{j_1} \cap J_{j_2} &= \emptyset, j_1 \neq j_2, \\ I_i &\neq \emptyset, i = \overline{1, M}. & J_j &\neq \emptyset, j = \overline{1, N}. \end{aligned}$$

It will be additionally assumed that the sub gradients of the functions $r(u, q_i), i \in I$, also exist for all border points U , which, at the same time, are uniformly bounded in U . There exists a constant C_1 , for which $\|r'_u(u, q_i)\| \leq C_1$ for all $u \in U$ and all $i \in I$, $r'_u(u, q_i)$ being any subgradient of the function $r'_u(u, q_i)$, which corresponds to point u .

We define the set U as relatively simple, in the sense that for any point $z \in E^n$, the projection of z onto U can be determined exactly. This projection will be denoted $\Pi_U(z)$.

We will consider $m+1$ iterative processes, which can run in parallel. The first m processes will be called internal and will determine approximations of the values $r_i^*, i \in I$; and the $(m+1)$ th one will be called an external process, oriented to provide approximations of the value

$$R_s^* = \min_{u \in U} R_s(u). \quad (3)$$

To solve problem (1) the following algorithm is proposed:

Algorithm 1. The $m+1$ parallel (optimization) processes are described as follows:

$$\begin{cases} u_{(i)}^{k+1} = \Pi_U(u_{(i)}^k - h_{(i)k} \cdot \eta_{(i)}^k), i \in I \\ u^{k+1} = \Pi_U(u^k - h_k \cdot \eta^k). \end{cases} \quad (4)$$

Here:

$$\eta_{(i)}^k = \begin{cases} r'_u(u_{(i)}^k, q_i) / \|r'_u(u_{(i)}^k, q_i)\|, \text{ if } r'_u(u_{(i)}^k, q_i) \neq 0 \\ 0, \text{ otherwise} \end{cases} \quad (5)$$

$r'_u(u_{(i)}^k, q_i)$ - an arbitrary subgradient of the function $r(u, q_i)$ with respect to u , for $u = u_{(i)}^k$

$$\eta^k = \begin{cases} (R_S^k(u^k))'_u / \|(R_S^k(u^k))'_u\|, \text{ if } (R_S^k(u^k))'_u \neq 0 \\ 0, \text{ otherwise} \end{cases} \quad (6)$$

where $(R_S^k(u^k))'_u$ represents an arbitrary subgradient of the function

$$R_S^k(u^k) = \max_{i \in I} [r(u, q_i) - r(u_{(i)}^k, q_i)] \quad (7)$$

calculated in the point $u = u^k$.

Numerical strings $h_{(i)k}, h_k$ will respect the conditions:

$$h_{(i)k}, h_k \geq 0; h_{(i)k}, h_k \rightarrow 0; \sum_{k=0}^{\infty} h_{(i)k}, \sum_{k=0}^{\infty} h_k = \infty \quad (8)$$

Let U^* - the set of minimum points of the Savage function on the domain U . In compliance with the conditions listed above, the following statement occurs.

Theorem 1. In conditions (4)-(8), the following relations occur

$$\lim_{k \rightarrow \infty} \min_{u^* \in U^*} \|u^k - u^*\| = 0, \lim_{k \rightarrow \infty} R_S^k(u^k) = R_S^* \quad (*)$$

Where R_S^* is defined in (3).

Algorithm 2. For solving problem (1).

Suppose that at iteration k the points $u_{(i)}^k, i = \overline{1, m}$ and u^k are already known. In order to determine the following set of points $u_{(i)}^{k+1}, i = \overline{1, m}$ and u^{k+1} the following steps are performed:

$$u_{(i)}^{k+1} = \begin{cases} P_U(u_{(i)}^k - h_{(i)k} \cdot \eta_{(i)}^k), \text{ if } i \in \tilde{I}_{i_k} \\ u_{(i)}^k, \text{ if } i \notin \tilde{I}_{i_k}, k = 0, 1, \dots \end{cases} \quad (9)$$

$$u^{k+1} = P_U(u^k - h_k \cdot \eta^k), k = 0, 1, \dots \quad (10)$$

where:

$i_k = k - M \cdot \left\lfloor \frac{k}{M} \right\rfloor + 1$, (obviously, the index i_k takes the consecutive values $1, 2, \dots, M$);

$\left\lfloor \frac{k}{M} \right\rfloor$ - the integer part of the ratio k/M ;

$\tilde{I}_{i_k} = I_{i_k} \cup \{i^{k-1}\}$, (i^{-1} any element from I);

$$\eta_{(i)}^k = \begin{cases} gr(u_{(i)}^k, q_i) / \|gr(u_{(i)}^k, q_i)\|, \text{ if } gr(u_{(i)}^k, q_i) \neq 0 \\ 0, \text{ otherwise} \end{cases} \quad (11)$$

where: $gr(u_{(i)}^k, q_i)$ - is an arbitrary subgradient of the function $r(u_{(i)}, q_i)$, computed at the point $u_{(i)} = u_{(i)}^k$, and $\|gr(u_{(i)}^k, q_i)\|$ denoted the magnitude (the Euclidian norm) of this subgradient.

The vector η^k from (10) is determined in the following way:

$$\eta^k = \begin{cases} g\tilde{R}^k(u^k) / \|g\tilde{R}^k(u^k)\|, \text{ for } g\tilde{R}^k(u^k) \neq 0 \\ 0, \text{ otherwise} \end{cases} \quad (12)$$

$g\tilde{R}^k(u^k)$ - an arbitrary subgradient of the function:

$$\tilde{R}^k(u) = \max_{i \in \tilde{I}_{i_k}} \{r(u, q_i) - r(u_{(i)}^k, q_i)\}, \quad (13)$$

computed at the point $u = u^k$. The value i^k represents the index i from $\tilde{I}_{i_k}$ for which the value $\tilde{R}^k(u^k)$ is attained (if there are multiple such indices, one is chosen arbitrarily).

Remark. Numbers i^k and i_k are not to be confused. Numbers $h_{(i)k}$ and h_k represent the step sizes for minimizing the functions $r(u, q_i)$ and $R_s(u)$ respectively, at iteration k .

It will be assumed henceforth that the sequences $h_{(i)k}, i = \overline{1, m}$ and h_k satisfy the conditions:

$$h_{(i)k}, h_k \geq 0; h_{(i)k}, h_k \rightarrow 0; \sum_{k=0}^{\infty} h_{(i)k \cdot M + l} = \infty, l = 0, 1, \dots, M-1; \sum_{k=0}^{\infty} h_k = \infty \quad (14)$$

Remark. For the M relations in (14) (for $l = \overline{0, M-1}$) to hold, it is necessary that all the subsequences $\{h_{(i)k \cdot M + l}\}_{k=0}^{\infty}$, for $l = 0, 1, \dots, M-1$ form divergent series.

Constructing such sequences is not difficult. For example, if a sequence $\{\tilde{h}_{(i)l}\}$ satisfies the conditions:

$$\tilde{h}_{(i)l} \geq 0, \tilde{h}_{(i)l} \rightarrow 0, \sum_{l=0}^{\infty} \tilde{h}_{(i)l} = \infty$$

and the sequence $\{h_{(i)k}\}$ is to be defined in the following way:

$$h_{(i)k} = \tilde{h}_{(i)l}, \text{ for } l \cdot M \leq k \leq (l+1)M-1,$$

then the sequence $\{h_{(i)k}\}$ has all of its subsequences in the form $\{h_{(i)k \cdot M + l}\}$, $l = 0, 1, \dots, M-1$, with the same properties as the sequence $\{\tilde{h}_{(i)l}\}$.

Theorem 2. Let U^* be the set of minimum points of problem (1). If requirements (9) - (14) are satisfied, the following statements hold:

$$\lim_{k \rightarrow \infty} \min_{u^k \in U^*} \|u^k - u^*\| = 0, \lim_{k \rightarrow \infty} \tilde{R}^k(u^k) = R_s(u^*). \quad (**)$$

To solve problem (2), the third algorithm will be considered:

Algorithm 3. Assuming the existence of the solution to the problem (2), and thus to each of the m internal problems, the "lenient" variant will be investigated, in which the fulfillment of the restriction will be required

$$F(u) \leq \bar{\varepsilon}, \bar{\varepsilon} > 0 \quad (15)$$

The quantity $\bar{\varepsilon}$ will be called threshold or tolerance level.

In this case, instead of problem (2), the problem will be solved in the form (1), (15). The solutions of these problems could be considered approximate solutions of the model (2).

Remark. Internal issues are resolved with the same "threshold of tolerance" although each of them might have its own threshold of tolerance.

The numerical algorithm includes all actions (4)-(8) with the following specification for (5) and (6):

$$\eta_{(i)}^k = \begin{cases} r'_u(u_{(i)}^k, q_i) / \|r'_u(u_{(i)}^k, q_i)\|, & \text{if } F(u_{(i)}^k) \leq \bar{\varepsilon} \text{ and } r'_u(u_{(i)}^k, q_i) \neq 0 \\ g(u_{(i)}^k) / \|g(u_{(i)}^k)\|, & \text{if } F(u_{(i)}^k) > \bar{\varepsilon} \text{ and } g(u_{(i)}^k) \neq 0 \\ 0, & \text{in the rest of the cases. Here } i \in I \end{cases} \quad (16)$$

$$\eta^k = \begin{cases} g_s^k(u^k) / \|g_s^k(u^k)\|, & \text{if } F(u^k) \leq \bar{\varepsilon} \text{ and } g_s^k(u^k) \neq 0, \\ g(u^k) / \|g(u^k)\|, & \text{if } F(u^k) > \bar{\varepsilon} \text{ and } g(u^k) \neq 0, \\ 0, & \text{in the rest of the cases.} \end{cases} \quad (17)$$

It will be admitted that the subgradients $g_s^k(u)$ and $g(u)$ of the functions $R_s^k(u)$ and $F(u)$, correspondingly, are uniformly bounded on the set U of the same constant C .

In the conditions listed, it has their affirmation:

Theorem 3. For any element $u^0 \in U$ and any number $\varepsilon > 0$, there is such a number $\bar{\varepsilon} > 0$, so that, except for a finite number, all terms of the series $\{u^k\}$, generated by the algorithm (4), (8), (16), (17), are contained in the set $V(U^*, \varepsilon)$, where U^* is the totality of the solutions to the problem (2); $V(U^*, \varepsilon)$ - the ε - neighborhood of the set U^* .

Remark. The algorithm stops if, at some iteration k , the vector $\eta^k = 0$. In this situation two cases would be possible:

1. In point u^k the inequality $F(u^k) \leq \bar{\varepsilon}$ occurs and $g_s^k(u^k) = 0$; thus u^k is one of the optimal solutions of problem (1), (15);
2. In point u^k the inequality $F(u^k) > \bar{\varepsilon}$ occurs and $g(u^k) = 0$, which means that the point u^k is the minimum point for the function $F(u)$ on the domain U and therefore the problem (1), (15) has no admissible solutions.

Algorithm 4. In algorithm 4, similar to algorithm 3, $F(u^k)$ is compared with $\bar{\varepsilon} = \bar{\varepsilon}_k$.

Takes place **Theorem 4.** Let $h_{(i)k}, h_k$ și $\bar{\varepsilon}_k$ meet the requirements:

$$\begin{aligned} h_{(i)k}, h_k \geq 0; h_{(i)k}, h_k \rightarrow 0; \bar{\varepsilon}_k > 0; \bar{\varepsilon}_k \rightarrow 0; h_{(i)k}/\bar{\varepsilon}_k; \\ h_k/\bar{\varepsilon}_k \rightarrow 0, \sum_{k=0}^{\infty} h_{(i)k} \bar{\varepsilon}_k = \infty, \sum_{k=0}^{\infty} h_k \bar{\varepsilon}_k = \infty. \end{aligned} \quad (18)$$

If problem (2) has a solution, then, under the conditions of compliance with (16), (17), (18), statements (*) hold. U^* is the solution set of the problem (2).

Description of Algorithm 5. Solving Problem (2).

As in the application of Algorithm 2, the transition rules (9) and (10) are used to move from iteration (k) to the following iteration $(k + 1)$. However, in this case, the method for determining the vectors $\eta_{(i)}^k$ and η^k differs. Specifically:

$$\eta_{(i)}^k = \begin{cases} gr(u_{(i)}^k, q_i)/\|gr(u_{(i)}^k, q_i)\|, & \text{if } \tilde{F}_{(i)}^k(u_{(i)}^k) \leq \varepsilon_{(i)k} \text{ and } gr(u_{(i)}^k, q_i) \neq 0 \\ g\tilde{F}_{(i)}^k(u_{(i)}^k)/\|g\tilde{F}_{(i)}^k(u_{(i)}^k)\|, & \text{if } \tilde{F}_{(i)}^k(u_{(i)}^k) > \varepsilon_{(i)k} \text{ and } g\tilde{F}_{(i)}^k(u_{(i)}^k) \neq 0 \\ 0, & \text{otherwise.} \end{cases} \quad (19)$$

Here:

$$\begin{aligned} gr(u_{(i)}^k, q_i) &= r'_u(u_{(i)}^k, q_i) \\ i &\in \tilde{I}_{i_k}; \\ \tilde{F}_{(i)}^k(u) &= \max_j \{F_j(u)\}, j \in \tilde{J}_{j_k}^i; \\ \tilde{J}_{j_k}^i &= \tilde{J}_{j_k} \cup \{j_i^{k-1}\}; \end{aligned} \quad (20)$$

j_i^{-1} – is any element from set J , $i = \overline{1, m}$;

$\varepsilon_{(i)k}$ – is the ceiling (tolerance threshold) with respect to the state of nature q_i , $i \in \tilde{I}_{i_k}$ at iteration k .

$$\begin{aligned} j_k &= k - N \cdot \left\lceil \frac{k}{N} \right\rceil + 1, k = 0, 1, \dots \\ \eta^k &= \begin{cases} g\tilde{R}^k(u^k)/\|g\tilde{R}^k(u^k)\|, & \text{if } \tilde{F}^k(u^k) \leq \varepsilon^k \text{ and } g\tilde{R}^k(u^k) \neq 0 \\ g\tilde{F}^k(u^k)/\|g\tilde{F}^k(u^k)\|, & \text{if } \tilde{F}^k(u^k) > \varepsilon^k \text{ and } g\tilde{F}^k(u^k) \neq 0 \\ 0, & \text{otherwise.} \end{cases} \end{aligned} \quad (21)$$

In (21) vectors $g\tilde{R}^k(u)$ and $g\tilde{F}^k(u)$ are arbitrary subgradients of the function $\tilde{R}^k(u)$ and $\tilde{F}^k(u)$ respectively, computed at point $u = u^k$. $\tilde{R}^k(u)$ is defined in (13), and $\tilde{F}^k(u) = \max_j \{F_j(u)\}$ with

respect to all values $j \in \tilde{J}_{j_k} = \tilde{J}_{j_k} \cup \{j^{k-1}\}$; j^{-1} – being an arbitrary element from the set J .

Next, it is necessary to identify the requirements regarding the parameters $h_{(i)k}, h_k, \varepsilon_{(i)k}, \varepsilon_k$. The following conditions will be assumed:

$$\begin{aligned} h_{(i)k}, h_k \geq 0; \varepsilon_{(i)k}, \varepsilon_k > 0; h_{(i)k}, h_k, \varepsilon_{(i)k}, \varepsilon_k \rightarrow 0; \\ h_{(i)k}/\varepsilon_{(i)k}, h_k/\varepsilon_k \rightarrow 0; \end{aligned} \quad (22)$$

$$\begin{aligned} \sum_{k=0}^{\infty} h_{(i)k \cdot M + l} \cdot \varepsilon_{(i)k \cdot M + l} = \infty, l = 0, 1, \dots, M - 1 \\ \sum_{k=0}^{\infty} h_k \cdot \varepsilon_k = \infty. \end{aligned} \quad (23)$$

The following statement holds:

Theorem 5. Let U^* be the set of minimum points of problem (2). If the algorithm defined by rules (9) and (10) is applied, with the additional conditions (19)–(23) imposed, then, with respect to problem (2), the equalities (**) hold.

Remark. At the first M iterations ($k = \overline{0, M-1}$) index i (which represents the states of nature) goes through all the values from $I_1 \cup \{i^{k-1}\}$ (for $k = 0$), from $I_2 \cup \{i^{k-1}\}$ (for $k = 1$) and so on, from $I_M \cup \{i^{k-1}\}$ (for $k = M-1$), and index j (which is associated with restriction j or with the function $F_j(u)$) goes through all the values from the set $J_1 \cup \{j^{k-1}\}$ consecutively to determine $\eta_{(i)}^k$ from (19) ($i = \overline{1, m}$) and goes through all the values from the set $J_1 \cup \{j^{k-1}\}$, to determine η^k from (21).

For the following M iterations ($k = \overline{M, 2M-1}$) i takes consecutive values from the set $I_1 \cup \{i^{k-1}\}$ (for $k = M$), ..., from $I_M \cup \{i^{k-1}\}$ (for $k = 2M-1$), and index j from $J_2 \cup \{j^{k-1}\}$ - to define (19) and, respectively, from $J_2 \cup \{j^{k-1}\}$ - to define (21). And so on, for iterations $k = \overline{(N-1) \cdot M, N \cdot M-1}$, similarly, index i , takes values from the set $I_1 \cup \{i^{k-1}\}$, $I_2 \cup \{i^{k-1}\}$, ..., $I_M \cup \{i^{k-1}\}$, whereas index j – values from $J_N \cup \{j^{k-1}\}$, in order to determine the vector $\eta_{(i)}^k$ from (10) and values from $J_1 \cup \{j^{k-1}\}$ to determine vector η^k from (21). After $N \cdot M$ iterations, everything repeats except the numbers i^{k-1} , j^{k-1} and j^k can vary from iteration to iteration.

Conclusion

The theorems and algorithms presented in this paper were designed in order to minimise the values of the Savage function. This is a special function as its values and the values of its subgradients cannot be computed. In spite of such difficult conditions, the proposed algorithms can estimate both the values of the Savage function and its subgradients to any desired level of precision. Given that certain conditions regarding the step size adjustments are met, and in more general cases, that tolerance threshold values for constraint violations are applied it is possible to ensure the convergence of the algorithms toward the set of optimal decision alternatives.

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THE IMPACT FACTORS ON THE ASSESSMENT OF SIMILARITY BETWEEN FUNCTIONS

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Abstract. Data processing, in any field, especially in the case of accessibility of relatively large volumes of data, becomes appropriate to involve more specific techniques, procedures, which at the initial stage could be considered as universal. An important factor in the development of algorithms for assessing the level of similarity between functions, in certain situations, depending on the nature of the phenomenon under research, may be the size of the variation interval of the independent variable. In this context, in this paper, certain suggestions, techniques for obtaining numerical characteristics, obtained based on methodologies for varying the lengths subintervals of the integral definition interval of approximating functions, deduced from the data set involved in the research, will be discussed. One of the main suggestions could be the division of the entire interval into several subintervals. The number of subintervals is supposed to be deduced depending on the nature of the phenomenon under investigation, thus assessing the level of similarity in each subinterval, and then building a synthesis algorithm for the integral interval. Such an algorithm - methodology - is to be presented in this paper, by presenting examples - case studies based on primary data similar to some real data. Another question that may arise is the nature of a possible real factor that could have a significant impact on the results of the similarity assessment. The essence of such factors may be very difficult to deduce from only a single data set. A solution would be to highlight the nature of several data sets related to the "circumstances" of data production in the research process, as well as to their collection methodologies.

Keywords: similarity, evaluation, intervals, subintervals, algorithm, functions.

JEL Classification: C63, I21, I23, I25, I29

1 Introduction

Processing large data sets can be of different complexity from one data collection to another. In this context, a simple approach to processing methodologies, without taking into account other circumstances, circumstances, which at first glance, could not fall into the researcher's attention/horizon, then become factors of significant influence on the argumentation (substantiation) process when making final decisions at a high level of correctness. Data collections subject to the analysis process should be viewed in the widest and most diverse context of the circumstances and the data collection process. Any set (collection) of data is an image of phenomena that can reproduce the respective essence, phenomena, which could be as simple, trivial, and quite complex according to their essence. Another situation may be important, and which is worth taking under control, whether or not there could be a human factor in the collection (registration) of data. The data collection in view, it is necessary to subject it to a cleaning, smoothing procedure as explained in the material (COANDĂ, Ilie, 2022), then to the application of technologies for transition from the discrete form of the data to a continuous form (function). In (COANDĂ, Ilie, 2023) such a methodology is described, thus obtaining the continuous form for the presentation of the data, (approximate functions, which, further, are to be subjected to analysis procedures for the appropriate purposes. It is necessary to specify that the approximate functions represent the image of the essence of the phenomena with a certain margin of error as a result of the application, in the given case, of the procedure characteristic of the regression technique.

2. Applying the procedure for dividing the definition interval of approximating functions into subintervals

Some particularities of the concrete data set on which the data analysis techniques on subintervals obtained from the integral definition interval of the approximating functions will be applied (the division into subintervals has become suggestive in order to increase the level of precision in obtaining the approximating functions:

1. The data refers to the number of people infected with the Corona virus during the period of days 30.09.20 – 19.04.21.

2. The data are public, for each day of the indicated period, the respective data were taken from the Internet, for 40 geographical regions that constitute an entire compact administrative-territorial region (they were taken without being preprocessed).

3. A preliminary analysis of the data revealed the need to apply a certain preprocessing procedure described in (COANDĂ, Ilie, 2023).

4. In (COANDĂ, Ilie, 2024) a numerical evaluation methodology of similarity between two functions, which can be recommended for the classification or clustering algorithms.

Applying the respective techniques for obtaining approximating functions, as well as calculating the level of similarity between the respective functions, it emerged the need to study the problem on subintervals of the entire interval indicated above.

Being aware of external information regarding the incubation period of the virus, which in this case is not greater than 7 (seven) days, (information taken from outside the data collection) it was proposed that the length of a subinterval be greater than the incubation period of the virus (an essential constraint on the length of the subinterval).

Another particularity of the data set, which was involved in the process of selecting the named regions for research, was their proximity. We again have external information, which, most likely, is not attached to the data set, and must be taken from outside. The fact that a similarity is attested (similarity) strong, does not mean at all that these regions are neighboring. Conversely, based on an obvious similarity, it could be concluded that these regions could be neighboring (i.e. intensive social communication is observed, a favorable environment for the spread of the virus).

A preliminary analysis of the data demonstrates the existence of two periods of days, within 30.09.20 - 19.04.21, in which an increase is attested, immediately followed by a significant decrease in the intensity of infection. In this case, it is the interval 20.10.20 - 20.11.20. The second period refers to the interval 10.02.21 - 20.03.21.

Certainly, there must be a explanation. And again, it is necessary to turn to other information that would enhance the level of communication in society. This information, again, most likely was not attached to the data set, so this is external information.

3 Some Case Studies

In the context of the above, the following is a presentation of some results with the respective comments regarding the application of the methodology of dividing the integral interval into several subintervals. Thus, it was first possible to detect some subintervals with substantially different behavior from the others, and then to carry out a broader analysis (study) involving some exogenous information. Such information could be difficult / impossible to extract only from the dataset under research.

Figure 1 presents the intensity functions (number of infected per 1000 people) for certain 4 (four) administrative regions (1 Anen, 2 Chiș, 3 Comr, 4 Vulc) in a certain country.

If the oscillatory form of the functions could be quite simple to fix and quite well argued based only on the information presented in the dataset (days of the week), while an adequate explanation, simple to formulate, of a possible cause of the appearance of a vaulted shape, in the period 08.11.20 - 15.12.20 (Figure 1 a)) and in the period 11.02.21 - 30.03.21 (Figure 1 b)), may

be quite difficult to highlight, relying only on the accessible information in the dataset available only in table format.

If an annex is attached to the data set, it is specified that the period 08.11.20 - 15.12.20 includes a good part of the electoral campaign period, and in the period 11.02.21 - 30.03.21 the next semester of studies begins, then things become particularly clear. During these periods, a clearly more intensive intensity of direct contact between individuals is assumed, which essentially favors the more pronounced spread of the virus.

Another question, what would be the reason that on days off, the intensity of the spread of the virus decreases, sometimes to zero, even if it is hard to imagine that on these days the level of direct contact between people decreases dramatically (which is absurd). And if there had also been an annex to the data set with the activity graph of medical enterprises, again, things would have been much clearer. The information presented graphically in Figure 1 a) can also suggest at least one thing: the electoral agitation (i.e. the meetings) in regions 2 Chiş and 3 Comr were qualitatively, clearly similar, with different intensities, which cannot be confirmed for two other regions (1Anen, 4Vulc).

In Figure 2 b), from a qualitative point of view, the suggestion can be extracted that the beginning of the second semester in educational institutions significantly contributed to the intensification of the spread of the virus, because environments favorable to the spread of the virus were created. This is just a suggestion, there could have been other causes.

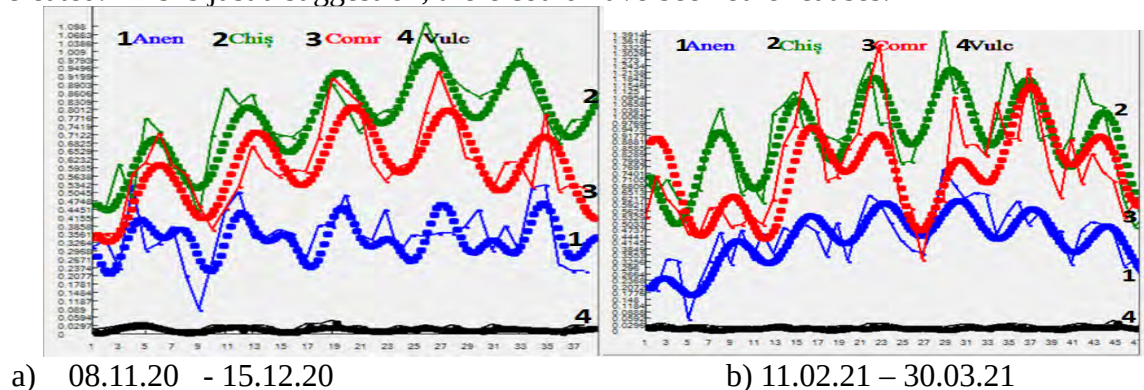
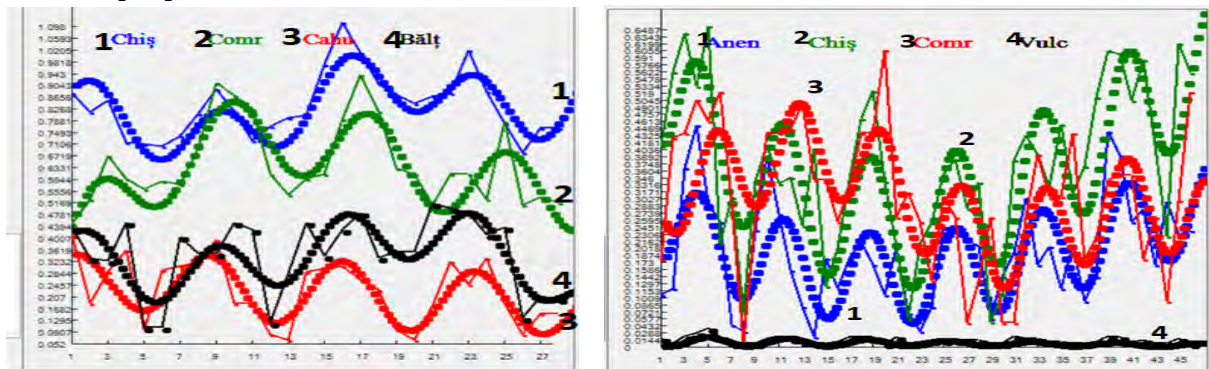


Figure 1. Approximation's, the same regions, different periods of days:

Source: author's own study

In order to highlight the similar nature of the infection for the most populated centers of social activity (1Chiş, 2Comr, 3Cahu, 4Balţ), Figure 2 a) presents representing the intensity of illnesses in the period 08.11.20 - 15.12.20. The graphs of these functions suggest a relatively high similarity, which may argue the suggestion that in these compact regions of social activities, the intensity of direct communications was similar, which demonstrate that, among other things, the electoral agitation was also similar. We specify that the population of the 4Balţ region is about 125,000 inhabitants, and that of the 2Comr region is 67,000 inhabitants. Even though the population in the 2Comr region is practically 2 (two) times smaller than that of the 4Balţ region, the intensity of infections is almost inversely proportional, which would suggest that the political interest in the elections is more pronounced in the 2Comr region. At the same time, the population of the 3Cahu region is approximately 72,000 inhabitants, very close to that of the 2Comr region, the disease phenomenon is almost twice as weakly registered. This may lead us to believe that the level of interest in the elections is lower, respectively. In Figure 2 b) the behavior of the disease phenomenon is graphically presented in a period of days between the two intervals of days 27.12.20 – 10.02.21, in which the approximating functions begin with a significant increase, then continue with a similar decrease (for both intervals 08.11.20 - 15.12.20 and 11.02.21 – 30.03.21). The image of the functions denotes the fact that the intensity of the disease decreases then

increases. The cause could be due to holidays vacations, which significantly reduce direct contact between people.



a) 08.11.20 - 15.12.20

b) 27.12.20 - 10.02.21

Figure 2. Approximation's, different regions, different periods of days::

Source: author's own study

4 Conclusions

In the examples presented above, in paragraph 3, accompanied by the respective comments, the content of which explains, fully demonstrates the need to apply the information research method by dividing the interval of the independent variable integrally into several subintervals. The method of choosing the different lengths of the subintervals is commented on and argued. Thus, achieving the highlighting of subintervals with different behavior of the phenomenon studied. Special attention was paid to the involvement of external data - information, which can have an essential impact in the process of arguing for the most appropriate decisions and at a higher level of credibility. The need to apply a specific processing and analysis technique was explained, which involves the involvement of several sources of information from the environment in which the respective data were collected, including the environment of social economic activities relating to the essence of the content of the data set. Processing a data set without taking into account the environment and characteristics of social economic activities can reduce the level of efficiency and credibility.

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BACKUP AND RECOVERY STRATEGIES IN MODERN ENTERPRISE IT SYSTEMS

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Abstract: Assessing the current state of enterprise backup and recovery strategies is critical to ensuring that an organization's digital assets are safeguarded against a variety of internal and external threats: hardware and system failures, human errors, malicious cyberattacks such as ransomware, etc. This paper examines the evolution of data protection from traditional, reactive approaches to comprehensive, proactive resilience frameworks. The paper provides a breakdown between the foundational data protection strategies of on-premise, cloud and hybrid methods of data protection and restoration with explanations of the pros and cons of each method from the perspectives of control, scalability and disaster recovery. The analysis extends to advanced methodologies such as Disaster Recovery as a Service, Continuous Data Protection for recovery at the most granular level, and to the importance of immutable storage to avoid data alteration. Paper analyses today's challenges of voracious data growth, new types of data residing in increasingly fragmented environments, and the ever-evolving sophistication of malicious actors especially as it relates to ransomware targeting backup infrastructure. It also explores the use of emerging technologies, especially Artificial Intelligence and Machine Learning to conduct predictive analytics, detection of anomalies, and the automation of recovery with architectures such as air-gapped and chain-free backups to provide greater levels of isolation. Finally, the impact of global regulatory compliance standards (GDPR, HIPAA) on modern-day data protection is discussed and relevant industry standards (NIST, ISO 27001) that have become best practices are reviewed.

Keywords: Data protection strategy, DRP, DRaaS, CDP, RTO, RPO

JEL Classification: L86, M15

1 Introduction

Today's enterprise backup and recovery goes far beyond daily operations, regarded as a key "digital insurance policy" for an organization's data assets. This represents a complete evolution from a reactive to a proactive and multi-faceted risk management approach that is within organization's business continuity and operational resilience (Arcserve, 2025).

Today's backup solutions often implement a hybrid approach of on-premises, cloud, or a combination of both including arbitrary backup types including full, incremental, and snapshots. Data deduplication is an important factor for efficient use of storage and faster recovery, while solid encryption policies protect data at rest and in transit. The strategic imperative is seamless integration into overall disaster recovery (DR) plans and not only testing, but conducting drills on

a regularly scheduled, ongoing basis after the backups are put into normal operation. The end goal is to restore daily business operations as rapidly and as seamlessly as possible, against cyber-attacks such as ransomware that may encrypt or delete operational data. Effective data backups allow an organization to "transplant" their data to a newly restored, healthy version allowing them to continue business operations. Leading players for DR solutions, such as Google Cloud's Backup and DR Service offer competitive features such as backup vault protection, aggregate management system components, automated retention and recovery options - cross region/cross-project - and all with solid encryption (Google Cloud, 2024). Systems like Rubrik unify data security and protection through zero-trust data protection policies, malware investigation, orchestrated application recovery emphasizing the need to maintain a coherent view of so-called data resiliency.

The move from data copy to comprehensive "digital insurance", serves to reinforce the notion of data protection as a business function. This strategic shift is amplified by the focus on automation, integration, and rapid recovery, contrasting with traditional, often manual, methods. Sentiment towards rapid recovery and instant recovery, policy-based automations, and other steps to execute backups and recoveries note that today's backup and restore create and continue business only very briefly.

Enterprise-grade IT systems comprise an entire stack of hardware, software and services components that are provided specifically for the purposes of large organizations to better manage internal and external distributions of efficient and productive ways to conduct business. This ecosystem includes high-performance servers, diverse storage devices, robust networking equipment, and critical software applications like Enterprise Resource Planning (ERP) and Customer Relationship Management (CRM). Enterprise IT solutions environments are always changing and evolving with business demands, where technology, cloud computing and Artificial Intelligence are the leading technology enablers.

Complexity and distributed environments of enterprise IT systems will redefine future backup and recovery needs, successfully transitioning from a centralized approach to data protection and cyber resiliency to embrace a distributed perspective. Such fragmentation will create enhanced data backup and recovery that is distributed, and integrated, and operate across many different locations and data management formats and shift the mindset from "backup copy" concepts to a holistic distributed and "resilience" ecosystem. Digital transformation, cyber-attacks and fast-growing data continues to reinforce the positioning of backups and recovery in organizations overall cybersecurity. The priority areas of the business continuity strategy are algorithms and metrics.

2 Foundational Backup and Recovery Strategies

Backup and recovery solutions are viable options, both on premise and in the cloud, which offer different pros and cons. These two methods can even be combined and adjusted to meet needs of different organizations and systems. The choice between on-premises solutions and cloud-based solutions is the first step in the decision-making process for modern enterprise backup strategies, with each providing unique technical merits, pros, and cons.

Cloud backup solutions send copies of an organization's data to remote storage systems, and is usually hosted, managed, and maintained by third-party providers that charge subscriptions fees based on storage, bandwidth, and users. Various pros of cloud-based backup solutions are better data protection from agency risk, such as malware, natural disasters, and human error exposure. Reliability is another benefit since the process is automatic and always 'on'. File recovery is highly simplified compared to on-premises methods and IT staff can spend less time on file recovery. Accessibility is significantly improved, allowing global retrieval with an internet connection, beneficial for mobile workforces. Rather than a fixed storage number or physical warehousing of the equipment, cloud storage methods are scalable in nature: they can 'grow' along with demand to an extent, and organizations pay for only what storage they utilize, not for excess storage space

when they don't need it. A new cloud vendor can provide an organization's storage need without requiring mass quantities of hardware, and installing. Financially, cloud-based solutions always have lower up-front setup fees and usually come with ongoing maintenance. Being outside of the organization site, cloud backups generally support quicker file recovery. Data security is addressed through encryption of data at rest and in transit, stringent security protocols, 24/7 monitoring, and compliance support (Dropbox, 2025).

In-house backup stores the organization's backup data on physical servers located at the business location. The biggest advantage of in-house backup is that the backup infrastructure is physically in control of the organization; therefore, the organization retains control of the data that is determined to be most critical, including all aspects of privacy - because the organization is storing all backup data physically at its location and does not have to worry about outside access. Another advantage is that there is no dependency on obtaining data from an internet connection, which is very important to organizations that cannot rely on a consistent internet connection or organizations that have strict low latency requirements. For some small to mid-sized companies, in-house backup solutions can be more cost-effective in the long run and can have the organization printing out proprietary procedures and documents on their own.

At the same time, on-premise solutions do require an upfront capital investment in storage hardware and supporting infrastructure that must be identified and purchased. Scalability is always a challenge for on-premises storage solutions, especially since increasing volumes of backups typically entail buying more hardware. It can also be complicated and resource-consuming to make sure independent compliance is met. Therefore, on-premises solutions usually have slower recovery time objectives (RTO) and less frequent recovery point objectives (RPO) than cloud solutions (Zgureanu, 2022).

Hybrid backup architectures are a sophisticated and growing trend in enterprise technology and attempts to use both on-site and cloud solutions to leverage the strengths of each while minimizing weaknesses. In this regard hybrid backup architecture, involves a centralized management system that allows for local and cloud backup operations to be consolidated and streamlined (Andrews, 2025).

One of the most significant benefits of hybrid solutions is the additional redundancy that they provide in disaster recovery. Having two copies of data available, one locally and the other in the cloud, gives organizations multiple layers of protection against various forms of data loss or system failures. The addition of redundancy is a vital component in maintaining business continuity. Additionally, hybrid architectures offer faster recovery times in two ways: businesses can typically recover critical and frequently accessed data quickly from local backups, which often have lower latency, while cloud backups can be relied upon for long term retention and recovery from major site-wide disasters.

Disaster Recovery as a Service (DRaaS) has emerged as one of the most significant service models in the cloud computing industry to date that gives an organization the ability to backup their data and IT infrastructure in a third-party cloud environment. However, a DRaaS provider is not just merely data storage; they have the capability of orchestrating and therefore can allow organizations to be able to quickly restore their IT infrastructure back to their operable state upon breaking event. As a DRaaS model is fundamentally an outsourcing model that takes the responsibility of provisioning and maintaining an organization own offsite Disaster Recovery environment and takes it on by a specialized service.

The main feature of DRaaS is that it is a mirror of IT infrastructure - an organization's computer, storage, and network functions are mirrored in a fail-safe mode in virtual servers. This means that an organization who has suffered a disaster can keep running applications from the service providers hybrid cloud or cloud infrastructure, designated for disaster recovery without interrupting resources on their own physical servers that were affected by the disaster. As a result,

we obtain a faster recovery time. DRaaS thus plays a key role in ensuring resilience, minimizing recovery time after a disruption that can significantly impact productivity, sales, customer service, and profitability. DRaaS provides recovery tools for various types of disruptions, such as natural disasters, equipment failures, power outages, and increasingly sophisticated cyberattacks.

Continuous Data Protection (CDP) is commonly referred to as continuous backup or real-time backup and is a highly sophisticated strategy that captures and stores data modifications as they occur. Unlike most traditional backup procedures, which are performed at set intervals, a DRaaS provider continuously (while the environment is active) records data about every change in real time (thus allowing the organization to restore data to any point in time); this is a key difference for this approach. However, this type of data recovery provides the enormous granularity achievable with a CDP and potentially near-zero data loss (assuming a zero RPO is achieved).

Continuous Data Protection works as it captures data in an enterprise system and backs-up the changes in files each time a file is changed, with essentially a copy of each changing aspect saved near real-time or very quickly, all in a separate data storage infrastructure. The automated data protection of CDP represents a huge efficiency gain in operational environments in regard to setting up protective measures around changes, since it removes humans from the safeguarding process related to changes. CDP is particularly crucial in environments where data is constantly changing and the cost of data loss is exceptionally high, such as in financial services, healthcare, and e-commerce platforms, where real-time transactional data is paramount. CDP is also very useful to prevent disasters as it provides the ability to recover from any point in time of prior to the disaster event happening in an operational environment, which also minimizes recovery time and data loss. The difference in CDP vs a snapshot-based backup is that CDP is continuously backing data up each time there is a change made to the data, in the sense that there haven't been any significant changes made during the period of backup.

Immutable storage is implemented under a Write Once, Read for Many (WORM) principle or governed by software defined storage. Based on policy rules configured by the administrator, once the data has been stored under the policy, the immutable data will be secured from modification, overwriting or deletion for the specified immutability period. The benefits of immutable storage for data protection purposes are substantial. It can provide data integrity and compliance, support business continuity plans, protect against human error, retard support incident response and defend against ransomware attacks.

However, immutable storage does have limitations. The very nature of the immutability will prevent modification, deletion of the stored data until the applicable retention period has expired meaning we need to do careful capacity planning to prevent unintentional budget increase for storage costs. Immutable storage will provide data integrity; however, immutability itself does not protect against total loss of data. It must go hand in hand with a backup and disaster recovery strategy. Management and implementation of an immutable storage solution may require specialist skills and human resources.

Immutable storage is becoming increasingly a non-negotiable component of data protection because of heightened ransomware sophistication and scrutiny (Cloudian, 2025; Arcserve, 2025). While offering unparalleled data integrity, the cost implications and management complexity necessitate a strategic approach to data classification and retention, ensuring only truly critical data is subjected to long-term immutability.

3 Addressing Key Challenges in Enterprise Data Protection

The exponential growth and increasing diversity of data is one of the biggest challenges facing modern-day enterprise data protection and Data Lifecycle Management (DLM). With an abundance of digital devices and platforms, organizations are collecting increasing volumes of data, from structured data in databases to unstructured data in text, images, and video. To say this

presents a storage challenge is an understatement. Organizations have begun investing in very scalable storage options to scale their data storage constraints without compromising performance. Additionally, processing and storing data in different formats often increases complexity and functionality, as multiple data types are often involved. It is a common occurrence that enterprises are now generating petabytes of data that would overwhelm file storage processes not built for these volumes. This challenge is magnified by the need for organizations to keep multiple backups in their data protection strategy, effectively multiplying the already immense data volume that needs to be managed.

To contend with these challenges, modern solutions combine hybrid cloud for effective high-volume data management with flexible cloud storage capabilities while having on-premises protection and control. To effectively manage these vast datasets of various types, automation has never been more important. Managed backups often function in a hybrid model that maximizes and simplifies the complexities of backup management while reducing the Total Cost of Ownership (TCO) along with ensuring that complete and accurate data is recovered quickly. Cost optimization approaches and tools that focus on eliminating duplicate copies are equally important when managing costs related to large datasets (Andrews, 2025).

The threat landscape has changed dramatically from cyber threats, and ransomware now ranks as one of the most prevalent and damaging threats to enterprise IT hardware systems. Cybercriminals have developed ever more sophisticated methods of encrypting or deleting an organization's data and then demanding a ransom for its return (Cloudian, 2025). A critical aspect of this evolution is ransomware's deliberate targeting and destruction of backup data, aiming to disable recovery options before the primary data encryption even begins (Connectwise, 2025). In this hostile environment, a viable option for data backup is necessary for businesses so that they may recover their data to a well and unaffected version while continuing their operation.

Immutable storage guarantees that the written data cannot be encrypted or deleted and is a strong defence against ransomware. As a result, organizations can restore their systems without paying ransoms. However, new resilience against data ransomware solutions is not limited to an immutable option, as we are now seeing a multi-tiered approach in protecting organizations against ransomware (Cloudian, 2025; Connectwise, 2025):

Offline/air-gapped Backups: this strategy involves physically or logically isolating data from the production environment and the internet, rendering it impenetrable to network-borne ransomware attacks; this serves as a critical "last line of defense".

Immutable storage (WORM): this technology prevents modification or deletion of data, even if administrative credentials are compromised.

Chain-free backup technology: unlike traditional backups that depend on a fragile chain of previous backups, chain-free backups ensure that each backup is a complete, independent, immutable snapshot. This means that if one backup is compromised, the others remain untouched and usable for restoration.

Endpoint protection on backup servers: deploying modern endpoint protection platforms on backup servers is crucial; these platforms can detect abnormal ransomware behavior as it begins to infect a system and can isolate infected systems.

Increased backup frequency: regularly increasing backup frequency minimizes the amount of data loss in the event of an attack, improving the RPO.

Regular testing in sandbox environments: ransomware recovery strategies must be regularly tested in controlled sandbox environments to ensure their effectiveness.

Encryption of backup data: comprehensive encryption of data both at rest and in transit is a fundamental security measure.

Multi-factor authentication: implementing MFA protects access to critical recovery systems.

Detailed incident response plans: a comprehensive, ransomware-specific incident response plan with clear protocols for communication, containment, eradication, and recovery is vital.

Real world examples provide clarity on these practices. Unitrends case studies provide countless examples of successful recoveries from ransomware, as well as many examples with organizations restoring encrypted files quickly and efficiently, often within minutes. Fundamentally, ransomware attacks have shifted backup from a data loss prevention component to a key segment of Cybersecurity defence, requiring a zero-trust relationship with the backup infrastructure. Ransomware resilience is a multifaceted, integrated solution that combines technical safeguards with protocols, and vigilant and engaged humans in the "fight", acknowledging that no one solution provides total protection (Connectwise, 2025).

A major impediment to enterprise data protection is the explosive phenomena of data sprawl. This goes beyond established concerns around enterprise capacity-storing data, affecting visibility of data as well as governance and extracting business value. Data is everywhere and anywhere, on-premises public and private clouds, at the core of the network, and increasingly at the edge. Securing data and searching for backups throughout that expanded landscape is a costly exercise, particularly when we are also trying to protect our responsibility of data governance and regulatory compliance.

A primary result of data sprawl is the inaccessibility of data stored across multiple, disparate media on-premises. This fragmentation makes it difficult to effectively analyse data, complicates migration, and makes it difficult to upgrade technologies, often resulting in significant downtime during recovery processes. Furthermore, the lack of scalability inherent in many traditional data storage solutions exacerbates the challenge of managing petabytes of data, especially when considering the need to create multiple backups for a comprehensive data protection strategy.

Modern organizations are leveraging hybrid cloud strategies to position their approach to higher volumes of data, therefore, dealing with data on sites cloud controlled stack. Cloud enables a more flexible scope of data volume appropriately within the world of data utility and chain of activities. Automation processes are still required to generate automated backup and recovery processes, as it is the streamlining of which data protection and recovery can be maximized across the diverse environments. Managed backup solutions play a pivotal role in simplifying backup management, reducing the TCO, and ensuring rapid data recovery by offloading these complex tasks from internal IT teams (Andrews, 2025).

4 Leveraging Advanced Technologies for Enhanced Resilience

Artificial intelligence (AI) and Machine learning (ML) are transforming data backup and recovery dramatically as these critical functions change from reactive processes to proactive, predictive, and self-optimizing processes. At a high level, ML is a subset of AI that allows systems to do data analysis without having to be programmed with specific steps to take. ML algorithms scour large volumes of historical data to find and learn patterns and relationships, and can predict new outcomes and trends, enabling proactive improvements to threat detection and response in data spaces.

These advances in AI and ML being applied to backup and recovery can manifest in a few different ways (Algomox, 2024): Predictive Analytics, Anomaly Detection, Intelligent Backup Schedules, Automated Data Recovery, Data Verification, Compliance Automation. Major cloud providers are increasingly integrating AI into backup services. For example, Google Cloud's Backup and DR Service uses Vertex AI to generate recommendations and specific solution paths (with step-by-step directions) and reference architectures (Google Cloud, 2024).

Overall, AI/ML moves data protection from a reactive, rule-based approach to a proactive, predictive, and self-optimizing system, forever changing the operational model of backup and recovery. Furthermore, it allows for more precise and smarter prioritization of data protection efforts, enabling mission critical assets to receive maximal resiliency and optimizing the allocation

of resources across heterogeneous data ecosystems. The advent of AI and ML in data backup and recovery has several transformative benefits, but it also has its own limitations and challenges that organizations should think through as outlined in Table 1. The transformative benefits of AI/ML in data protection depend on the ability to overcome some significant underlying challenges in data quality, model interpretability, and skilled expertise. Ethical and privacy-related issues arising from the usage of AI/ML in data protection, particularly with respect to sensitive data collection and the "right to erasure" introduces another dimension of compliance and trust responsibilities in terms of governance and "privacy by design."

Table 1: Benefits and limitations of ai/ml in data backup and recovery

Aspect	Benefits	Limitations
<i>Cyber Resilience</i>	proactive threat detection, real-time monitoring, automated responses, faster ransomware detection	inability to comprehend nuance, lack of relevant training data, overconfidence/bias
<i>Operational Efficiency</i>	automated tasks, reduced downtime, faster recovery, optimized storage, cost efficiency, continuous learning	high costs & complexity, shortage of skilled professionals, model operationalization/deployment challenges, accountability
<i>Data Integrity & Compliance</i>	data verification, compliance automation, continuous improvement	data quality issues, transparency paradox, privacy risks

Source: Tozzi, 2025; Algomox, 2024

Whereas immutable storage is an effective logical containment for data tampering, the evolution and sophistication of cyber threats, specifically ransomware targeting backup infrastructure, has necessitated developing more architectural protections in backup infrastructure: air-gap and chain-free backup architecture. That go beyond logical safeguards to physical or architectural isolation, producing layers of entrapment virtually impenetrable to network-based attacks.

An air-gapped backup is a method of data storage where critical data is copied and stored on media or machines that are "offline" and not practically accessible over the internet or the primary network. This defining isolation provides some significant advantages namely Network Isolation, Ransomware Protection, Data Loss Prevention, Enhanced Security Controls, Encryption and Hashing. Air-gapping methods today do not refer to simple tape formats either. Air-gapping using cloud technologies is on the rise where delayed access, MFA, honeypots, and/or separate credentials, creates a virtual barrier that simulates physical isolation within a cloud environment (Connectwise, 2025).

Many traditional backups follow a "chain" of backups such that each incremental or differential degree of backup is being referenced by specific memory that identifies the previous full backup degree. If the link is compromised or corrupt, all backups along that chain are corrupt, and the complete restore process can be compromised. Chain-free backup technology offers remedy to the weakness of the chain backup model, because each degree of backup is a full, independent, immutable data snapshot that is free from each incremental or differential backups relationships. Chain-free backups have three important key features: Independence, Resilience and Faster Recovery. When combined with immutable storage, air-gapped architecture and chain-free backups provide a "hardened, ransomware resistant data protection strategy", the multi-layered approach enables ransomware resiliency and deliver unrivalled peace of mind to the recovery points in the backups to enable quick restore of the business.

The air-gapped and chain-free back-up model development has emerged in response to significantly evolving cyber threats and the targeting of backup infrastructure with ransomware. This is an evolution that has pushed forth data protection beyond logical containment to understand and use some form of physical or architectural isolation (IBM, 2023b). The explorations, of

merging air-gapping and chain-free concepts, as well as utilizing cloud configuration, reinforce the point of how security-based concepts are being expanded and utilized as situational stimuli to support resiliency in hybrid cloud security postures, without decreasing scalability (Connectwise, 2025).

5 Regulatory Compliance and Industry Standards

In today's business environment, regulatory compliance is an essential consideration for the design and implementation of modern backup and recovery systems rather than an ancillary legal requirement. Failing to comply with international data protection and privacy regulation (e.g., GDPR, HIPAA, SOX, etc.) may result in financial penalty-related losses, legal liability, or reputational damage (IBM, 2023a). As a result, it is necessary to adopt a "security by design" and "privacy by design" approach to data protection (Acronis, 2022).

The GDPR is a broad privacy and data protection law created by the European Union to protect the personal information (PII) of EU citizens and requires businesses to be transparent about how they collect data and afford individuals substantial control over their personal data.

HIPAA is a United States federal law that outlines, among other things, how healthcare organizations and their business associates should protect the confidentiality, integrity and availability of Electronic Protected Health Information (ePHI).

The SOX Act was enacted as a response to corporate scandals that arose in the United States and is intended to hold corporations accountable and to enhance the transparency of corporations regarding financial reporting (IBM, 2023a). The SOX Act is primarily concerned with financial controls, but it has meaningful implications for the IT systems that support an organization's financial data.

Regulatory compliance has transitioned from an ancillary legal obligation to a key driver in the design and implementation of a modern enterprise backup and recovery system, necessitating the introduction of "security by design" and "privacy by design" concepts. The similarities in compliance demands associated with different regulations suggest they are trending towards a set of best practices with a singular liability tied to data protection. These regulations allow businesses to act on the operational security of a compliant backup modality (Table 2).

Cybersecurity frameworks address regulatory requirements and facilitate a structured, holistic, and comprehensive approach to protecting data and assisting organizations in building positive Information Security Management Systems. NIST and ISO 27001 are useful examples of frameworks that give organizations structure to support risk management and the continuous improvement of their tech backup as more than a stand-alone solution for an organizational IT strategy (Morrison, 2024; NIST, 2024).

NIST is an organization that provides guidance on risk management linked to cybersecurity risks. Specifically, it provides a taxonomy of high-level cybersecurity outcomes applicable to organizations. Although NIST conveys no prescriptive rules, it supports organization flexibility in their response to diverse organizational risks. The original cybersecurity framework (CSF) consists of five 'core' categories: Identify, Protect, Detect, Respond, and Recover (Morrison, 2024). The latest CSF (2.0) introduced a sixth 'core' category, "Govern," which is where organizations focus on strategizing, communicating, and monitoring the organization's cybersecurity risk management strategy (NIST, 2024).

Within the framework, the 'Protect' category includes many rudimentary elements of security, e.g., data encryption, and permission settings. The "Recover" function specifically covers all actions an organization takes to recover from a cybersecurity incident, including backup and recovery processes, post-incident reviews, and subsequent system improvements. NIST outlines the recommended actions for all backup and recovery processes, categorized within three pillars: planning, implementing, and testing. NIST specifies recommendations for implementations of specific technologies related to backup tasks, including recommended automation of backup

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process for each of the different storage solutions, and participating in recommended data encryption technologies for data at-rest and/or data in-transit process (Morrison, 2024).

Table 2: Key regulatory compliance requirements for data backup and recovery

Regulation	Data Type Focus	Key Backup Requirements	Penalties for non-Compliance
GDPR	PII of EU citizens	encryption, access controls, audit trails, data retention, quick data recovery, right to erasure/access/portability, privacy by design, 72-hour breach notification	fines up to 4% of annual global turnover or €20m, legal action, reputational damage
HIPAA	ePHI	data availability & integrity, business continuity protocols, regular testing and revision, business associate agreements (baas), detailed documentation, audit trails, RBAC, automated backup verification, redundant storage, encryption	significant fines (up to \$1.5m per violation category per year), criminal charges, reputational damage
SOX	Financial Records	data backup & recovery plans, financial records retention, tamper-proof storage, detailed audit trails, data accessibility, encrypted backups, RBAC, secure data deletion, regular testing	fines, imprisonment, legal action, reputational damage

Source: Acronis, 2022; Morrison, 2024; IBM, 2023a.

ISO 27001 is a global standard for security, and offers a complete and all-encompassing framework for planning, establishing, implementing, maintaining, continuously improving, and effectively using an Information Security Management System (ISMS) that permits the protection of sensitive information. Regarding data backup and recovery, ISO 27001 provides robust suggestions for sensitive information protection within a systematic backup process.

ISO 27001 routinely stipulates that acceptable requirements for backups of information, system images and relevant software data are required, all in accordance with an existing backup policy. The ISO 27001 suggests backups should be arranged into a comprehensive framework, specifies responsibilities regarding backup verification, scheduling, and protections once the backup processes are complete. ISO 27001 risk assessment methodology assist an organization in evaluating and identifying risks associated with the backup context (Morrison, 2025).

Cybersecurity frameworks such as NIST and ISO 27001 can assist organizations in developing systematic, holistic methods of protecting data, supporting the transition from stand-alone reactive responses to backup and recovery systems, and developing integrated risk management and continuous improvement of those systems. The emphasis on "testing" and "documentation" within these frameworks highlights that the theoretical existence of backups is insufficient; their verifiable functionality and auditable processes are paramount for true resilience and compliance (Morrison, 2024; NIST, 2024).

Maintaining data integrity and availability in today's enterprise IT landscape is a complex process that necessitates a fully integrated multi-layered defence-in-depth strategy. The implementation of best practices across various security, compliance, and operational efficiency contexts because one single practice will not suffice in most situations. Key best practices include (Abnormal.ai, 2024; Connectwise, 2025; Zgureanu, 2021):

3-2-1 backup rule: this foundational principle advocates for maintaining at least three copies of data, stored on two different types of media, with one copy kept offsite .

Regular testing and validation: it is imperative to schedule routine restoration tests to verify backup integrity and ensure that data can be restored successfully when needed.

Automated backup processes: leveraging automated tools for backup processes reduces the risk of human error and ensures consistency.

Strong encryption: data must be encrypted both at rest and in transit to prevent unauthorized access.

Access controls: implementing strict authentication and authorization protocols, such as Role-Based Access Control (RBAC) and Multi-Factor Authentication, is essential to limit data exposure to only authorized personnel.

Data segregation and isolation: backups should be isolated from production environments to prevent cross-contamination: air-gapping provides a critical layer of isolation.

Clear retention policies: establishing clear policies that define how long backups are kept and when they should be deleted or archived is crucial for balancing storage space efficiency with compliance requirements.

Versioning and incremental backups: maintaining multiple versions of files and utilizing incremental backups optimizes storage usage and speeds up recovery processes.

Incident response plan: a well-defined data breach response plan is vital, outlining steps for communication, containment, eradication, and recovery.

Continuous monitoring and auditing: deploying advanced monitoring solutions to detect anomalies or unauthorized access attempts, conducting regular security and compliance audits, and reviewing access logs are essential for ongoing oversight.

Employee training: regular training of employees on data security protocols, current threats, and best practices for secure data handling is a critical human component of data protection.

The implementation of best practices across security, compliance and operational efficiency suggests that data integrity and availability is achieved through a holistic multi-layered defence-in-depth strategy and not use of singular action. The emphasis on "testing" and "monitoring" highlights a critical shift from merely assuming data recoverability to continuously verifying it, underscoring the dynamic nature of threats and the imperative for adaptive resilience.

6 Future Outlook and Market Trends

The outlook for today's backup and recovery options in enterprise information technology systems is one of continuous innovation, primarily driven by the ubiquitous introduction of AI and ML and the ongoing evolution of IT infrastructure to the edge. These technologies and trends are fundamentally changing how organizations think about data protection and resilience, including (Datto, 2025; Andrews, 2025):

AI-driven backup solutions. AI and ML are increasingly becoming part of backup solutions to predict failures, manage backup schedules, and improve data protection overall. AI/ML will continue to revolutionize cloud backup optimization through automation of repetitive tasks, guidance around decision making, and dynamic scenarios for backup settings using real-time data. Predictive failure, automated data classification, intelligent backup schedules, and stronger threat detection and response capabilities are all examples of AI and ML in backup solutions.

Edge computing. With data generation occurring more at the edge of the enterprise (IoT devices, remote offices, etc.), edge computing is increasingly critical for backup. It enables organizations to reduce latency and bandwidth costs by performing compute operations closer to where data is generated. This gives organizations increased speed and efficiency in backing up all levels of data. This decentralization of data processing and protection is a direct response to the challenges of data sprawl.

Advancements in cloud infrastructure. Continuous maturation of cloud is providing improved performance and reliability for backups. Improved speed of storage, security features, and cloud-native services are just a few examples of how the advancement of cloud infrastructure is enabling backup and recovery architectures that are scalable, flexible, and resilient.

Incremental forever backup. This method will continue to grow in popularity since it focuses on only backing up what has changed since the last backup while keeping a link back to that backup

version. There is a dramatically lower amount of redundant data archived while not sacrificing the veracity of any data restoration, resulting in a steady decrease of storage costs over time.

Hybrid backup solutions. Hybrid architectures will continue to be focused on, especially with their ability to simplify the work by allowing resources to be managed in one place, thus allowing legacy installations to be simplified. They will provide a layer of redundancy for Disaster Recovery and allow organizations to expedite recovery times for restores due to the faster recovery time of local versus cloud backups.

Ransomware-resistant strategies. With ransomware still being a threat, resistant strategies will continue to be a focus. This would include continued offerings and growth of immutable backups, air-gaps, encryption, and an incident response plan.

Unified backup trends. The insights provided by reports, such as "Unified Backup Trends 2025 Report", demonstrate that cloud adoption, data protection, and cybersecurity are converging and will be the key indicators moving forward in Business Continuity and Disaster Recovery (BCDR), indicating we are moving toward platforms that consolidate disparate systems to create data resilience. Leading vendors like Cohesity are recognized for their AI-powered data security and cyber resilience solutions, while Veeam is evolving its capabilities with technologies like GenAI and Microsoft Entra ID backup, emphasizing unified data resilience for diverse workloads.

The future of enterprise backup and recovery is expanding intelligence and decentralization due to the omnipresence of AI/ML and extending IT infrastructure to the edge. The convergence of data protection, cybersecurity, and business continuity into unified platforms is a dominant trend, reflecting a holistic approach to enterprise resilience in the face of increasingly sophisticated and integrated threats.

IBM Storage solutions showcase an eloquent example of real-world impact. Micro Strategies for example, used the IBM Storage portfolio to create "DataVault", a managed security services provider solution, which provides robust ransomware protection and safeguards critical client data against various data loss threats, enabling effective recovery from cyberattacks. There is also a case study that illustrated how IBM Solutions helped Data Action reduce its response time, which allowed their Security Operations Center to assess cybersecurity exposure and protect critical data and improving data resiliency (IBM, 2025).

This and other real-world implementations reinforce that modern-day backup and recovery strategies are not only conceptual, but real, concrete, and reliable solutions to business continuity, regulatory compliance, and cyber resiliency. They validate the effectiveness of advanced technologies and integrated approaches in safeguarding enterprise data in today's dynamic threat landscape.

Conclusion

Enterprise IT systems are constantly changing, with the driving factors being the significant increases in data volumes, a growing variety of data types across disjointed environments, and increasingly sophisticated cyber threats. Consequently, modern backup and recovery platforms have evolved from recreating data to providing businesses with digital insurance that is essential for operational resiliency and business continuity.

On-premises solutions provide the most direct control over the IT environment; however, they lack inherent disaster resiliency and extensive scalability. Cloud solutions allow the greatest granularity of scalability, accessibility, and offsite-protection, but at a price - dependencies and potentially unforeseen costs. With this trend towards hybrid architectures, often guided by the 3-2-1 backup rule, we have a path that combines the best of the ability to use intelligence in data tiering and automate management while optimizing cost, performance and redundancies.

Advanced strategies such as DRaaS and CDP are lowering the barrier to enterprise-grade resiliency. DRaaS turns disaster recovery from a capital intensive, in-house process into an agile, outsourced process with rapid RTO and RPO capabilities without the unnecessary upfront costs.

The distinction between DRaaS and BaaS is critical - true business continuity requires to be able to restore an entire operational IT environment quickly, not just a copy of some or all of the data. CDP captures data in real time, and provides near-zero RPO, which is a complete shift to continual data integrity. But using CDP comes with big infrastructure requirements and demanding operational management to limit single points of failure.

Immutable storage is a necessary key feature for modern data protection as ransomware threats and regulatory requirements rapidly emerge. Immutability ensures data cannot be altered, which effectively safeguards against ransomware and stays with regulatory compliance requirements. However, the cost and operational management are major factors for organizations to consider, they must have an awareness of data classification and retention. There is also physical or architectural separation, such as in air-gapped backup or chain-free backup architecture, that provide extreme resilience because they go beyond immutability and provide some kind of separation and isolation.

Regulatory compliance has changed from secondary consideration or value-adding, to primary consideration, alongside the regulatory requirements overall, regarding data protection design. There are common threads in these different regulatory requirements, which leads to general best practices for data integrity and availability, and highlights the need for organizations to adopt security by design and privacy by design principles. Risk management should also be seen through a larger lens, rather than ad hoc approaches, and cybersecurity frameworks like NIST and ISO 27001 provide structured and consistent ways to manage and achieve performance levels with the commitment to continuous improvement.

Intelligence and decentralization of primary data and system awareness will dominate the recovery and restore feature space for enterprises. AI/ML will continue to change the data protection landscape through predictive analytics, anomaly detection, and automated recovery processes, but legacy technology cloud-based applications or solution, still continue to evolve with a placeholder and human review/monitor.

Modern enterprise backup and recovery is a complex, multi-faceted discipline that demands a strategic, integrated, and continuously adaptive approach. Organizations must invest in a combination of foundational strategies, advanced technologies, and robust governance frameworks to build truly resilient IT systems capable of withstanding the challenges of the contemporary digital landscape.

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CYBER INSURANCE: INTERNATIONAL STANDARDS AND PRACTICES

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Abstract: Access risks have become a central factor in digital and operational resilience. This paper examines how unauthorized access – physical, digital, and organizational – can precipitate to systemic losses in maritime heavy cargo logistics, where information technology (IT) and operational technology (OT) are tightly coupled. Case studies, such as Transnet (South Africa, 2021) and Nagoya Port (Japan, 2023), illustrate the economic impact of compromised access controls, ranging from crane downtime to full port disruption.

The study provides a taxonomy of access risks, including unauthorized physical entry, compromise of OT systems, remote intrusions, supply-chain access, Internet-of-Things (IoT) exposure, and insider threats. International standards such as IMO MSC.428(98), BIMCO guidelines, IACS UR E26/E27, the NIST Cybersecurity Framework, ISO/IEC 27001, and IEC 62443 are reviewed as frameworks that define baseline security requirements and influence insurability. These standards converge on the premise that measurable and auditable controls are essential for sustainable insurance coverage.

A proposed insurance model defines coverage scope (first-party and third-party losses), minimum entry requirements (e.g., multi-factor authentication (MFA) for privileged access, IT/OT network segmentation, offline backups), and maturity zones (green, mixed, red) that calibrate premiums and coverage limits. The model introduces measurable indicators such as time to revoke user rights, orphan accounts, RBAC drift, and traceability of PDP/PEP actions. Incentive mechanisms (tariff adjustments, deductibles, limits, warranties, and parametric triggers) align insurer and insured behavior around these metrics.

By linking engineering-level access controls with actuarial and underwriting practices, the research bridges a persistent gap between cybersecurity management and risk transfer. The findings emphasize that effective insurance of access-related risks requires transparent metrics, adherence international standards, and collaborative monitoring practices. In conclusion, access insurance is not merely a financial buffer but a governance instrument, that supports operational continuity and strengthens accountability in the maritime logistics sector.

Keywords: access risks, maritime logistics, cyber insurance, information security, risk management

JEL Classification: G22, K32, L92

Introduction

In the digital age, access control is no longer a “technical detail” but a determinant of operational resilience. Access risks arise when unauthorized actors—people, services, or devices—gain entry to corporate networks, applications, or physical zones. Consequences range from data exfiltration and IT platform lockups to crane standstills and disrupted vessel schedules. Insurers see the resulting losses, yet they seldom have transparent, auditable evidence of how a client’s access controls are designed and how they function in practice. This gap is particularly visible in maritime heavy cargo logistics, where information technology (IT) and operational technology (OT) are tightly interwoven into a single operational fabric. The Transnet case (South Africa, 2021) is instructive: the attack disabled digital systems, Durban declared force majeure, terminals reverted to paper-based procedures, and transshipment slowed sharply (UNCTAD, 2022). Likewise, the incident at the Port of Nagoya (Japan, 2023) paralyzed part of crane operations for two days (Crawford, 2025). Even with

baseline protections, residual risk persists and can escalate into systemic losses. Accordingly, businesses and governments increasingly view cyber insurance as both a financial buffer and a governance instrument for access controls.

This paper makes the following contributions: (1) precise definitions of the study domain; (2) a taxonomy of access risks in port environments; (3) a review of international frameworks (IMO, BIMCO, IACS, NIST, ISO/IEC); (4) a harmonized set of protective measures; (5) an insurance model—specifying coverage scope, entry requirements, and incentive mechanisms that align the interests of the insured and the insurer; and (6) an illustrative case study (“Port Omega”).

Classification of Access Risks in Port Environments

Access risk is the likelihood and impact of violating the “who/what/where/when/how” policy constraints governing a subject’s access to an object, as mediated by the policy decision point (PDP) and policy enforcement point (PEP) within an IT/OT environment.

The access-control system comprises: (i) subjects (employees, contractors, service accounts); (ii) objects (Terminal Operating System, TOS; PLC/SCADA; Physical Access Control Systems, PACS; and data assets); (iii) contextual attributes (device, location, time); (iv) PDP/PEP components; (v) audit logs; and (vi) Joiner–Mover–Leaver (JML) processes.

Key Categories of Access Risk

1. Unauthorized physical access — breaches of secured areas, connection of rogue equipment to port networks, and access to crane-control cabinets. Perimeter compromise lowers the barrier to subsequent cyber intrusion.

2. Compromise of OT systems — manipulation of PLC/SCADA, crane controllers, and power/process subsystems. Many OT environments were not originally engineered to modern security principles (e.g., NIST-aligned practices), and isolation is often relaxed for telemetry and remote maintenance; the Port of Nagoya incident is illustrative (Crawford, 2025).

3. Remote network intrusions — credential theft/abuse, MFA bypass, and lateral movement under weak network segmentation. The objective is privileged access and a pivot into OT.

4. Supply chain and contractor access — integrator and vendor privileges, brokered remote access, and insufficient oversight of third-party sessions.

5. IoT/IIoT compromise — exposures involving devices such as sensors, readers, and trackers that often have long life cycles, modest cryptographic resilience, and limited manageability.

6. Insider and privilege risks — excessive roles, delayed revocation of privileges, malicious intent, or operational error.

Consequences range from data exfiltration to multi-day terminal shutdowns and demurrage. In the maritime sector, direct losses from a typical ransomware incident are estimated in the hundreds of thousands of dollars, with individual ransom demands exceeding USD 3 million (Crawford, 2025).

International Standards and Risk-Management Guidance

• IMO MSC.428(98) and the current Guidelines on Maritime Cyber Risk Management (MSC-FAL.1/Circ.3/Rev.3): require integrating cyber risk into Safety Management Systems (SMS) across the identify–protect–detect–respond–recover cycle; access control is a foundational theme (IMO, 2024).

• BIMCO/ICS/IUMI. The Guidelines on Cyber Security Onboard Ships (v5, 2024): operationalizes IMO expectations, with emphasis on access management and supply-chain dependencies (BIMCO et al., 2024).

- IACS UR E26/E27. Unified cyber-resilience requirements for ships, effective 1 July 2024 for newbuilds; also useful as a reference for shore-side integrations (IACS, 2024).

- NIST CSF; NIST SP 800-82; ISO/IEC 27001 and 27002/IEC 62443. Maturity frameworks and control catalogs; in NIST CSF the PR.AC domain covers access, while SP 800-82 focuses on ICS/SCADA environments (NIST, 2024; NIST, 2022; ISO/IEC, 2022).

- NVIC 01-20 (USCG). Sector-specific guidance for MTSA-regulated port facilities (USCG, 2020).

Brokers and insurers have, de facto, adopted a set of “twelve key controls” as a minimum underwriting gate (e.g., MFA, network segmentation, tested offline backups, workforce training) (Marsh McLennan, 2022–2024; Yildirmaz et al., 2023).

ISO/IEC 27005 provides guidance on information security risk management and complements the management framework defined in ISO/IEC 27001. It sets out a systematic process for identifying, analyzing, evaluating, and treating risk but does not prescribe specific quantitative techniques, leaving organizations to select appropriate methods. The standard underpins cyber-risk management processes relevant to planning for cyber insurance. It recommends identifying assets and threats, analyzing vulnerabilities, assessing potential impacts, and selecting risk-treatment options (including risk transfer via insurance) within the organization’s overall information security strategy.

ISO/IEC 27102:2019 offers guidance on using cyber insurance as an information-security risk-treatment option within an Information Security Management System (ISMS). It describes how organizations should approach selecting and purchasing a cyber insurance policy and recommends: (a) treating cyber insurance as a mechanism for transferring residual cyber risk; (b) using the policy to mitigate the consequences of cyber incidents; (c) establishing structured information exchange between the insured and the insurer to support underwriting, ongoing monitoring, and claims handling; and (d) integrating insurance processes with ISMS processes to provide relevant evidence to the insurer. In doing so, ISO/IEC 27102 links cyber-risk management programs to the practical aspects of insurance protection and emphasizes appropriate sharing of information about risks and controls.

NIST Frameworks. NIST has developed the Cybersecurity Framework (CSF) which—while not specific to insurance—has become a de facto standard for managing cyber risk across critical infrastructure and commercial sectors. The CSF comprises five functions—Identify, Protect, Detect, Respond, Recover—that help organizations manage risk systematically. Alignment with the CSF improves visibility into an organization’s security posture and can indirectly influence insurance terms; recent studies and market practice have associated CSF alignment with more favorable premiums. In addition, NIST SP 800-30 (Guide for Conducting Risk Assessments) and NIST SP 800-37 (Risk Management Framework, RMF) provide methodologies for information-risk assessment that underwriters may consider during the underwriting process. In the United States, NIST-based cybersecurity practices are increasingly linked to insurance programs, reinforcing adoption of baseline controls.

The European Union Agency for Cybersecurity (ENISA) issues reports and recommendations to develop the cyber insurance market and strengthen cyber-risk resilience in the EU. A recent ENISA report (2024) surveys cyber-risk research and modeling and recommends measures to raise risk-management maturity for more effective insurability, including improvements to actuarial models and data collection. European supervisors, via EIOPA, are also advancing standardized cyber-incident data collection (e.g., through Solvency II reporting) to enhance assessment of cyber-risk accumulation. Taken together, ISO/IEC standards and NIST frameworks—alongside guidance from ENISA and supervisory

authorities—form a regulatory and methodological foundation for cyber insurance, promoting consistency in terminology, risk-assessment approaches, and information exchange.

Cyber-Risk Assessment and Premium Calculation Models

Cyber risks exhibit high uncertainty, low-frequency/high-severity losses, and interdependencies across firms and technologies. Accordingly, multiple modeling traditions are used for quantification and pricing.

1. Probabilistic models. These approaches use probability and statistics to model loss distributions from cyber incidents. A classical setup is the frequency–severity approach, which specifies a distribution for the number of incidents over a period and a distribution for loss severity, yielding the aggregate loss distribution. Monte Carlo simulation is widely applied to estimate the annual loss distribution and derive risk metrics such as Value-at-Risk (VaR) and expected loss. Because standard assumptions (event independence, stationarity) are often violated—data are sparse, threats evolve, and many insureds can be hit simultaneously—models incorporate heavy-tailed behavior and explicit dependence (e.g., common-vulnerability correlations) to capture accumulation risk.

2. Econometric models. Econometric techniques seek statistical relationships between cyber loss frequency/severity and explanatory factors (sector, scale, data volume, macro indicators) using historical data and regression/time-series methods. They are useful for trend forecasting (e.g., the effect of digitalization on incident likelihood) and for estimating systemic effects. Data limitations constrain reliability, yet elements of econometrics are employed in scenario analysis and stress testing—for example, assessing the impact of macro shocks or technology shifts on losses, including scenario-based exercises encouraged by supervisory guidance.

3. Actuarial models. Traditional actuarial methods are adapted to cyber insurance. The collective risk model uses empirical loss experience to estimate required premiums with risk loadings. Under Solvency II, capital requirements are computed from modeled loss distributions; tail modeling commonly draws on Extreme Value Theory (EVT). Still, classical methods alone are insufficient given sparse claims data, nonlinearity (network effects), and accumulation from concurrent events. Core actuarial tools—law of large numbers and EVT—remain central for reserving and pricing, augmented by concepts from financial mathematics (e.g., risk-neutral valuation in settings with strong dependence) and emerging ideas such as set-valued risk measures and resilience modeling for systemic risk.

4. Hybrid and specialized approaches. Given the complexity of cyber threats, combined models are common. FAIR (Factor Analysis of Information Risk) is a widely used quantitative framework that provides a taxonomy of risk factors and methods to estimate likelihood and loss in financial terms. Unlike qualitative heat maps, FAIR requires data on threat event frequency and vulnerability, and computes outputs such as expected annual loss and VaR, often to justify coverage levels in business terms. Other hybrids blend statistical modeling with expert elicitation and scenarios. For systemic cyber risk, researchers employ epidemiological models (malware propagation), game-theoretic models (strategic attacker–defender interaction), and cascade-failure modeling (e.g., worm outbreaks) to estimate market-wide impacts. These interdisciplinary approaches combine actuarial science, cybersecurity, and economics to capture the behavioral and network dimensions of cyber risk.

Protective Measures and Risk-Mitigation Strategies

1. Physical access control (PACS). Badge systems, restricted zones, video surveillance, and regular drills. A robust physical perimeter helps prevent the “short-circuiting” (bypass) of digital controls.

2. IT/OT segmentation. Network separation; minimizing gateways; jump hosts/jump zones; firewalls; unidirectional gateways (data diodes) where warranted; segregated monitoring of IT and OT traffic.

3. Identity and Access Management (IAM). Least-privilege access; periodic access reviews and timely revocation; MFA for remote and privileged sessions; secrets management (vaults); just-in-time (JIT) elevation for administrative sessions.

4. Continuous monitoring and response. Security Operations Center (SOC) or managed monitoring; SIEM; tested response playbooks; exercises that include IT–OT scenarios.

5. People and processes. Training (phishing awareness, removable-media/USB hygiene); segregation of duties (SoD) for critical operations; personnel vetting/background checks; anonymous reporting channels.

6. Contractors and supply chain. Cybersecurity clauses in contracts; brokered/mediated remote access; audits/assessments of key third parties.

7. Hardening and updates. Patch management with compensating controls for legacy OT; secure configuration baselines (hardening); restriction of physical interfaces/ports; regular restore testing of backups.

Insurance as a Risk-Management Instrument for Access Risks

What is insured.

First-party: business interruption (subject to a waiting period), system/data restoration, IR/DFIR expenses, and cyber extortion coverage, subject to applicable legal restrictions (Koop.ai, 2023; McNamara, 2023; Yildirmaz et al., 2023). Third-party: liability to customers and partners for delays and disruptions in shipments.

Exclusions. War/terrorism risks (as defined in the policy), intentional acts, and breach of warranty conditions.

Service layer. Incident-response retainer, preventive assessments, and data-leak/breach monitoring.

Eligibility for Coverage and Maturity Zones

Minimum. 100% MFA for remote/privileged access; IT/OT segmentation; backups with offline copies and tested restores; a designated process owner. Three zones.

Green. Critical controls are implemented; access indicators are consistently in the green zone.

Mixed. The minimum threshold is met, but there are “yellow” areas on key indicators.

Red. Any critical control is not met—coverage is not provided until remediation.

Observable Indicators

To enable insurer trust in the quality of access controls, we define a compact set of observable and auditable indicators:

1. Speed of privilege revocation: time from a termination/role change/SoD conflict event to effective denial across all policy enforcement points (PEPs).

2. Complete deprovisioning of subjects: time from termination to account disablement, token/key revocation, and secrets rotation.

3. Orphaned access: proportion of privileges without an owner or business justification (IGA–HR/CMDB reconciliation).

4. Excess privileges: proportion of users whose entitlements exceed the role baseline (RBAC drift).

5. Decision traceability: presence of an end-to-end trace “request → policy → decision → enforcement.”

6. Share of JIT/PAM: proportion of privileged sessions granted on a time-bound (just-in-time, JIT) basis with full logging.

Verification: cryptographically signed logs; cross-validation of heterogeneous traces (SIEM/PEP/application); random spot checks and covert tests.

Types of Incentives: How Insurance Responds to Risk

Insurance principles. Risk-differentiated pricing (mitigating adverse selection), preserving the insured’s “skin in the game” (managing moral hazard), and transparent terms and conditions.

Incentive types:

1. Pricing incentives. Premium discounts or loadings based on the maturity zone and the trajectory of access-control indicators.

2. Deductible structure. Deductible tied to the zone: green — minimal; mixed — baseline; red — maximal (or no cover).

3. Limit structure. Higher business interruption and incident-response (IR) limits for green; sublimits and restrictions for red.

4. Parametric triggers. Fixed payout upon a trigger such as downtime of critical systems > N hours (validated by corroborated telemetry).

5. Covenants/warranties. Undertakings to maintain, for example, 100% MFA, quarterly IGA campaigns; breach leads to terms adjustment or denial for related events.

6. Service credits. Premium credits for external audits or improvement pilots (e.g., increasing the share of JIT sessions, reducing time-to-revoke privileges).

7. Eligibility gating. Temporary carve-out of specific perimeters or scopes (e.g., OT) until “red” deficiencies are remediated.

These incentives make the linkage—stronger access controls → fewer/smaller incidents → cheaper and broader coverage—both transparent and measurable (Pytlak, 2024; Koop.ai, 2023; McNamara, 2023; Yildirmaz et al., 2023; Marsh McLennan, 2022-2024).

Incident Example: Terminal Attack and Consequence Analysis

In this scenario, a logistics employee falls for a phishing lure; attackers obtain VPN access. Owing to incomplete IT/OT segmentation, they pivot from the office IT network into OT, manipulate PLCs for several cranes, and encrypt the TOS database. Operations are halted for 48 hours.

Direct losses.

- Lost revenue: $\approx \text{USD } 200\text{k/day} \times 2 = \approx \text{USD } 400\text{k}$.
- Penalties to customers: $\approx \text{USD } 100\text{k}$.
- Recovery/overtime/IR: $\approx \text{USD } 50\text{k}$.

Total: $\approx \text{USD } 550\text{k}$ in direct costs, excluding reputational damage (Crawford, 2025; UNCTAD, 2022).

Role of the policy. Limit: USD 1 million; deductible: USD 250k; BI waiting period: 12 hours. Accepted for indemnification: BI (USD 300k after the waiting period) + IR/PR (USD 95k) $\approx \text{USD } 395\text{k}$. Net after deductible: $\approx \text{USD } 145\text{k}$. The payout reduced the immediate financial impact and accelerated recovery.

Findings. Weak points included delayed privilege revocation, excessive entitlements, a low share of JIT for privileged sessions, and gaps in the PDP–PEP decision trace. Upon renewal, the insurer increased the premium but offered downward incentives conditional on achieving MFA = 100%, JIT $\geq 85\%$, and the standard for time-to-revoke privileges. The pattern is consistent with Transnet/Durban and the Port of Nagoya (Crawford, 2025; UNCTAD, 2022).

Conclusion

Maritime heavy cargo logistics is acutely sensitive to access risks: a single improper entry can idle cranes, increase demurrage, and disrupt supply chains. Sectoral frameworks

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(IMO, BIMCO, IACS, NIST, ISO/IEC) define the “what,” but insurability requires observable and auditable evidence of how controls perform in day-to-day operations. The definitions, taxonomy, and compact indicator set proposed in this paper—together with transparent incentives (pricing, deductibles, limits, covenants/warranties, and parametric triggers)—turn access from a “black box” into a managed risk and build a clear bridge between access engineering and policy terms. The result is a port with greater financial resilience and clear insurance rules, and an insurer that can rely on verifiable practice.

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LOGIC AND CONSTRAINTS IN PROGRAMMING: A PATH TO PROFESSIONALISM AND SAFE AI

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Abstract: Modern programming languages often provide developers with wide freedom of action under minimal logical constraints. While this accelerates development, it simultaneously increases the likelihood of errors, reduces reliability, and complicates system maintenance. This paper advances the thesis that programmer professionalism is shaped not by unrestricted freedom, but by structure and logical constraints that guide thinking and architectural decisions.

Particular attention is given to logic-declarative approaches and the use of logic-based programming languages (such as Prolog and constraint-oriented languages) for knowledge formalization. It is demonstrated that limiting freedom through formal rules does not suppress creativity but, on the contrary, serves as a condition for responsible reasoning and sustainable design.

The research methodology includes a literature review, analysis of programming paradigms, and conceptual modeling of logic-based systems. The results show that logic-declarative methods enable knowledge formalization in a form that ensures transparency and safety of artificial intelligence (AI) systems. This approach contributes not only to technical reliability but also to a higher level of trust in intelligent systems applied in socially sensitive domains.

The study highlights the importance of logic-declarative methods for education, where they foster a culture of precision and responsibility, as well as for law and AI ethics, where formalized, verifiable, and transparent representations of knowledge are required. Thus, logical constraints in programming should be seen not as a limitation but as a foundation of professional training and a key condition for the safe application of artificial intelligence technologies.

Keywords: formalization, AI safety, Prolog, education, programmer professionalism

JEL Classification: C88, D83, I23

1. Introduction

The relevance of this study stems from the growing problem of explainability and uncontrollability of artificial intelligence (AI) systems. As AI increasingly participates in critical decision-making across economics, medicine, and governance, its autonomy is advancing faster than the development of effective mechanisms for control and safety assurance. The opacity of deep-learning algorithms — the so-called “*black box*” — raises serious concerns about ethical and legal accountability for AI-driven decisions. Therefore, ensuring AI safety requires not only technological or legal constraints but also a conceptual rethinking of its foundations.

Problem statement. The current AI learning paradigm, based on the statistical analysis of big data, produces systems capable of prediction but not of causal reasoning. This reveals the absence of a logical structure as the foundation for transparency and predictability in AI behavior.

Key idea. The central argument of this study is that control and safety in AI are possible only when the system is built on logical principles — a formal discipline that ensures the transparency and explainability of inference processes. Logic serves as a normative framework for reasoning, analogous to law within systems of social regulation, defining the boundaries of responsibility and predictability.

Aim, Hypothesis, and Objectives.

The aim of the study is to substantiate the critical role of the programmer's logical culture as a normative and professional foundation for designing safe and explainable AI systems.

Research hypothesis: the safety and explainability of artificial intelligence are directly proportional to the level of logical culture of its creator.

To achieve this goal, the following objectives are set:

1. To define the place and role of logic as the foundation of professional culture in computer science.
2. To analyze the relationship between knowledge formalization (through logical models) and code verifiability.
3. To demonstrate that the logical education of future programmers is an integral part of the general strategy for ensuring the safety and resilience of AI systems.

The article explores the interrelation between logic, professional reasoning, and the constraints that ensure safety in AI development. Thus, the task of cultivating logical thinking among future programmers becomes a key component of the overall strategy for artificial intelligence safety.

The article examines the interrelations between logic, professional thinking, and the constraints that ensure safety in the context of AI development. Hence, the task of logical training for future programmers becomes part of the general strategy for ensuring artificial intelligence safety.

2. Logic as the Foundation of Thinking and Professionalism

When addressing the question of what defines a programmer's professionalism, it should be emphasized that it begins not with the mastery of programming languages or technical skills, but with the ability to think logically. Logic is the invisible framework that transforms a collection of knowledge into a coherent system, and individual actions into a conscious process. It may thus be regarded as the foundation of professional culture — the basis upon which competence, responsibility, and the capacity for rational problem-solving are built.

In everyday perception, logic is often seen merely as a tool for reasoning or proof. However, in the professional activity of a programmer, it serves a far deeper function — it structures thought itself. Logic establishes the rules of one's internal dialogue, both with oneself and with the machine, transforming a chaotic stream of ideas into an ordered system of concepts, relations, and dependencies. Without it, coding becomes a mechanical act, and design degenerates into an intuitive sequence of random choices.

Logic does not constrain thought; it directs it. It functions like grammar in language — creating a structure that makes thought articulate and comprehensible. Just as grammar enables the free use of language, logic enables the free use of reasoning. Without it, one cannot build a clear argument, explain a solution, or formalize knowledge (Kowalski & Sergot, 1990).

Just as law ensures freedom in a legal society through rules, logic ensures freedom of thought through structure. It does not suppress creativity but renders it meaningful. In this sense, logic is not a restriction but an instrument of liberation: it protects the professional from the arbitrariness of intuition, from perceptual errors, and from cognitive biases.

The professionalism of a programmer is expressed not in the volume of memorized syntactic constructions, but in the ability to see the system of interrelations between facts and formulas. The deeper a programmer understands logic, the higher the level of abstraction they can achieve, the more accurately they can model reality, and the more reliable and secure the systems they create become.

It is logic that transforms a set of algorithms into an intellectual system, and a programmer into a thinker — one capable not merely of writing code, but of creating meaning. Hence, the formation of logical thinking should be a primary goal in the education of programmers. Without it, one cannot speak either of professional culture or of the safety of artificial intelligence.

Understanding logic as the foundation of professionalism naturally leads to the next question — the relationship between language and logic. After all, it is language, whether natural or artificial, that serves as the principal instrument for expressing thought. If logic defines the structure of thinking, language renders that structure visible, turning inner reasoning into a form that can be shared, analyzed, and processed.

For a programmer, language is not merely a means of communicating with a machine, but a form of dialogue with logic itself. Every construct, every syntactic rule, reflects a particular model of reasoning. To understand a language is to understand how logic is embodied within it. Thus, the path from language to logic is the path from the external form of expression to the internal structure of meaning.

3. From Language to Logic

Language is a bridge between thought and action, between inner understanding and outward expression. It unites both cognitive and social functions: on the one hand, language allows a person to structure their own thinking; on the other, it enables the transmission of meaning to others. It is through language that a collective worldview is formed — the foundation of knowledge, culture, and science. A schematic representation of the basic elements of a text (facts, rules, and queries) and the process of extracting an answer from it can be useful as well (Pelin, 2023, p. 567).

For a programmer, language has yet another dimension: it is an instrument for the formalization of thought. Whereas natural language allows for ambiguity and contextual meanings, programming languages demand precision and unambiguity. In this difference lies the key role of logic — it transforms language from a means of communication into a means of controlling processes and knowledge.

In informatics, the transition from language to logic can be viewed as a movement from a narrative to a declarative form. Natural speech describes *what happens*; logic and programming languages answer *why* and *under what conditions* it must happen. Where natural language remains limited to intuitive judgments, logic requires explicit inference rules, and programming languages implement these rules in formal constructions.

An example from practice illustrates this distinction. In ordinary speech, we say: “If it rains, the street is wet.”

For a machine, this is insufficient — it must explicitly define the structure of the relationship between facts: “rain(x) $\rightarrow$ wet(street).”

Here, language is transformed into a logical form, and the logical form — into code that can be interpreted. Thus, programming becomes not so much the art of writing as the art of translation — the translation of human meanings into the language of logic.

In this sense, language can be regarded as the surface of logic. It reveals logic’s manifestations but does not replace its structure of reasoning. A programmer working with language inevitably encounters the limits of grammar, and it is precisely at this boundary that logic begins to act as a universal mechanism of semantic control. It connects language and reality, ensuring the consistency and predictability of a program’s behavior.

Example of the transition from a natural statement to a logical and programmatic form:

a) Natural statement (unstructured):

A father is always older than his child. (1)

b) Structuring step (identifying logical roles):

If someone is a father, then he is older than his child. (2)

Here the phrase “if ... then” introduces an implication — a fundamental construct of logic.

c) Formalization step (predicate logic):

Predicates *father*(x, y) and *older*(x, y) appear, and the implication becomes a logical rule:

$\forall x, y$ (*father*(x, y) $\rightarrow$ *older*(x, y)) (3)

d) Transition to program form (Prolog):

In logic programming, the implication is implemented as an inference rule:

$\text{older}(X, Y) \text{ :- } \text{father}(X, Y).$ (4)

Here the operator :- (read as “if”) expresses the reverse direction of implication:

$\text{older}(X, Y)$ is true if $\text{father}(X, Y)$ is true. (5)

Such a transition requires prior structuring of the statement. We must first identify the entities (X, Y) , define their relations (*father*, *older*), and then establish the logical link between them. This process is an essential part of a programmer’s thinking — treating information not merely as data, but as logical structures.

The transition from language to logic is not just a technical operation but a cognitive step that distinguishes the performer from the thinker. For a programmer, it means developing the ability to see beyond syntax to structure, and beyond structure to meaning. Where language ends, logic begins — and it is at this point that professional thinking is born.

4. Logic, Predicates, and Chomsky’s Grammar

Logical programming does not proceed from the syntax of a language but from a logical model of reality, formalized in terms of **facts**, **rules**, and **queries**. In all three cases, the bearer of information is the **predicate** (or predicate form) — an atomic formula of predicate calculus expressing a relationship between objects and their properties.

It is precisely predicates that ensure the transition from natural to formal language: any statement, rule, or question expressed in natural language can be transformed into a predicate form suitable for logical inference. Without this step, modeling the world and extracting information from natural-language texts becomes impossible.

As R. Kowalski emphasized (Kowalski, 1979), logical programming is *programming in logic*, where a program is understood as a set of logical propositions and execution is understood as a process of proof:

Algorithm = Logic + Control (6)

Logic programming = Logic without Control (7)

Thus, the logical model is the core, and the **Prolog** language is merely an instrument for its implementation. Prolog allows knowledge to be expressed in predicate form, preserving the logical structure of reasoning and minimizing the likelihood of errors associated with arbitrary control constructions typical of imperative languages.

The works of Noam Chomsky (Chomsky, 1965) marked a turning point in understanding the relationship between language and thought. He demonstrated that behind any language lies a **universal grammar** — a system of rules that enables the generation of an infinite number of sentences from a finite set of elements. This idea became not only a linguistic revolution but also the theoretical foundation for the subsequent development of artificial intelligence and programming languages.

In logical programming, Chomsky’s idea manifests itself in the **rewrite-rule mechanism** (Chomsky, 1965). Grammar is not merely a set of syntactic constraints but a formal means of transitioning from natural language to logic, from an utterance to a formula. The programmer does not specify *how* to verify a fact, but only *what* must be true if certain conditions hold. This distinction is the key to professionalism: logic enables the separation of problem description from the mechanism of its solution.

Logical programming shows that **structuring** and **formalization** are two stages of a single process. First, the programmer identifies semantic elements (structuring); then expresses them in logical terms (formalization); afterwards, the structure can be refined or reorganized depending on the task context (restructuring).

This iterative scheme — “rough structure $\rightarrow$ formalization $\rightarrow$ structure refinement” — describes the natural path of thought from observation to model.

It is important to note that logical constraints serve as the *rails* along which thought moves. In imperative languages, such constraints are weaker, and the programmer is often free to act arbitrarily — increasing the risk of errors. A well-known example is the **Ariane 5 Flight 501** (European Space Agency, 1996 год), where a software module written in Ada inherited an incorrect data-conversion routine from Ariane 4. A numeric-type overflow (attempting to store a 64-bit value in a 16-bit field) led to the failure of the navigation system and the loss of the rocket.

This case is often cited as an illustration of excessive programmer freedom — when the system allows erroneous assumptions and lacks formal restrictions that could have prevented them. Logical programming, by contrast, is founded on the principle that *all* program behavior must follow from logical laws rather than arbitrary instructions. Consequently, the probability of error is reduced not only technically but also conceptually: the programmer thinks within a strict logical model rather than subjective procedures.

In this sense, logical programming is a form of **engineering self-control**. It encourages thinking not in terms of operations but in terms of truths — a mindset directly related to the professionalization of the programmer’s reasoning. If imperative programming demands the ability to manage **process complexity**, then logical programming demands the ability to manage **semantic complexity**.

Hence, logical languages can be viewed not only as tools for writing programs but also as instruments for cultivating **metalogical thinking** — the ability to reflect on the structure of one’s own reasoning.

The parallel between **Chomskyan linguistics** and **logical programming** is evident. In both systems, meaning arises from structure. Chomsky’s grammar describes which sentences are permissible, while logic determines which statements are true. If grammar governs *form*, logic governs *content*. Their union forms the foundation for formal knowledge systems, where language becomes an instrument of reasoning.

One may say that **logic is the grammar of thought**, and **grammar is the logic of language**. Such a perspective dissolves the boundary between the humanities and the technical sciences: they appear as different manifestations of a single intellectual discipline — the art of structuring meaning.

The formalization of knowledge based on logic and predicates thus opens the path toward knowledge modeling in **artificial intelligence**. However, caution is needed regarding formulations such as “*Facts, rules, and predicates form the basis of any expert inference*” (often found in ChatGPT, Gemini, and similar LLM outputs). From a pedagogical standpoint, the juxtaposition of *facts*, *rules*, and *predicates* on the same level is misleading, as it confuses distinct representational layers:

1. **Conceptual level (semantics):** facts and rules — what we know.
2. **Syntactic level (form):** predicates — how it is represented.

Thus:

Knowledge (facts + rules) + Representation language (predicates) ⇒ Knowledge base.

AI systems and large language models like Gemini and ChatGPT often use generalized formulations that have become common jargon in the field. The absence of a reliable primary reference confirms that these are widespread simplifications rather than precise academic statements.

Hence, the **logical model of knowledge** can be regarded as a natural continuation of Chomsky’s ideas — transferred from the domain of language to that of **thinking** and **machine intelligence**.

5. The Cost of Imperative Thinking

The **Ariane 5 Flight 501** disaster (1996) was not merely a technical malfunction but a symptom of a deeper problem in software engineering. According to the European Space Agency

report (European Space Agency, 1996), an error converting a 64-bit floating-point value into a 16-bit integer led to the destruction of a rocket worth about **\$370 million**. The program, written in Ada, had worked correctly in previous versions (Ariane 4) but failed to account for new trajectory parameters. The error was not *logical* but *behavioral*—a consequence of the absence of a formal analysis of system invariants.

Imperative programming languages—such as **C, Ada, C++, Java, and Python**—require the programmer to manage states step by step rather than to verify the truth of propositions. Errors arise not at the level of the model’s logic but at the level of procedural execution: “*invalid type conversion*,” “*uninitialized variable*,” “*incorrect call order*.” All of these reflect **imperative thinking**, in which the programmer acts as an operator rather than as a logician.

By contrast, **logical programming** relies on declarative knowledge representation—stating *what* must be true, not *how* to achieve it. Errors here manifest as contradictions within the model rather than failures of behavior. The programmer works not with instructions but with **predicates** and **inference rules**, guided by the formal laws of logic.

Similar catastrophes have occurred in other domains. During the **Mars Climate Orbiter** mission (Mars Climate Orbiter Mishap Investigation Board, 1999), the spacecraft was lost due to a mismatch of measurement units between two software modules—one used pound-force, the other newtons. This error was, in essence, a violation of the logical invariant of the unit system, which could have been automatically checked in a system with declarative type constraints.

In the case of the **Therac-25** medical accelerator (1985–1987), investigated by **Nancy Leveson** (Leveson & Turner, 1993), improper management of concurrent processes led to multiple fatal radiation overdoses. The underlying cause was the absence of a formal specification of system behavior.

These tragic examples reveal a pattern: where **imperative programming** forces engineers to *debug behavior*, **logical programming** compels them to *refine knowledge*. Only logically grounded models make it possible to design systems whose reliability does not depend on the *intuition of the programmer*.

Here professionalism appears in its deepest sense: the alignment of human thought with the laws of logic, rather than with the habits of algorithmic routine.

6. The Role of Logic in Safe AI

The development of artificial intelligence has demonstrated that computational power and algorithmic complexity alone do not guarantee the reliability or predictability of a system’s behavior. Without logical constraints, AI becomes akin to a living organism without reason—it can act efficiently, yet unconsciously. Logic, however, renders a system’s behavior explainable and its decisions verifiable and transparent. Freedom without structure is chaos. This principle holds not only in society but also in computational environments. Just as law regulates human behavior in a legal state, logic regulates the behavior of artificial intelligence in the digital space. It defines the boundaries of what is permissible, establishes criteria of truth, and provides a mechanism of control.

In imperative programming languages, the developer is fully responsible for the sequence of actions, which increases the likelihood of errors. In logical languages, the focus shifts from *how* to *what*: the system itself searches for solutions based on logically specified conditions. This approach reduces risks arising from human error and enhances the system’s resilience.

Moreover, logic ensures traceability of decisions—the ability to reconstruct the chain of reasoning leading to a specific conclusion. This feature becomes especially important in the era of neural networks, where most reasoning occurs within a “black box.” Integrating logical layers into AI architectures restores transparency and interpretability, two essential requirements for safe systems.

If AI is considered as a collection of models of the world, logic functions as its internal law. It performs the same role as societal laws: determining which actions are permissible, which are prohibited, and on what basis decisions are made. Thus, logic is not a limitation but a guarantee of freedom that does not devolve into arbitrariness. Without logic, intelligence remains empirical and reactive, not deliberate. Logical structure provides measure, transforming AI into a tool capable of responsibility and predictability. In this sense, logic is not only a method for programming but also a moral mechanism within AI architecture.

From Unstructured Reality to Information

The transition from unstructured reality to information is a fundamental process underpinning not only artificial intelligence but also cognition itself. In the surrounding world, data exist as events, properties, and relations that have no form until they are perceived, selected, and interpreted.

Structuring is the first step toward understanding. It begins when a subject discerns stable connections within the chaos of observations and transforms them into knowledge. In the classical sense, information is not merely data but data placed within a context. Context defines structure, and structure enables interpretation.

As noted by Noam Chomsky (Chomsky, 1965), grammar functions as a mechanism that generates all admissible structures of language. Logic, in turn, endows these structures with meaning. Within this interaction lies the foundation of what may be called intellectual information processing.

Technologically, this process can be represented as the following chain:

environment → sensor / expert → data → information → natural language → structuring → representation (in logic) → Chomsky grammar → Turing machine (processing).

The generalized technological sequence unfolds as follows:

- **Environment** — the source of data and stimuli. ↳ Everything begins with the external world—physical, social, or informational.

- **Sensor / expert** — the act of perception or interpretation. ↳ In humans, these are the senses and consciousness; in machines, sensors and perception models.

- **Information → knowledge** — the transition from raw data to meaningful relations. ↳ At this stage, facts, regularities, and connections are formed—elements that can be transmitted and reasoned about.

- **Natural language** — the medium of recording and exchanging knowledge. ↳ It makes knowledge communicable but remains inherently informal.

- **Structuring** — the first step toward formalization. ↳ Roles, relations, and categories are defined (originating with Aristotle and Socrates).

- **Representation in logic** — giving knowledge a formal structure. ↳ Using predicates, rules, and implications—i.e., the language of logical relations.

- **Chomsky grammar** — the transitional level between language and logic. ↳ Formal grammars enable algorithmic manipulation of syntactic structures.

- **Turing machine (processing)** — a universal model for executing formalized procedures.

This sequence represents a technology of information processing—from perception to understanding and further to automated action. Logic serves as the central *hinge* of this chain, linking human meaning (natural language) with machine executability (Turing computation).

The sequence illustrates the progression from perception to understanding, from the empirical to the rational. At each stage, uncertainty decreases while the level of organization increases. The environment produces signals; the sensor or expert captures them as data; language gives them form; logic imparts meaning; and the Turing machine enables computation.

Thus, the logical form of knowledge functions not only as an analytical tool but also as a technology of information processing, transforming cognition into computation and enabling the transition from subjective understanding to formalized knowledge.

For this reason, structuring information is a key step in the creation of artificial intelligence systems. Without logical representation, knowledge cannot be processed; without structuring, it cannot be understood. Logic and structure act as a filter between the chaos of reality and the order of thought.

7. Designing a Curriculum for Future Programmers

Training the programmer of the future requires not only knowledge of technologies but also the ability to think logically, systemically, and responsibly. Technical skills quickly become outdated, whereas the ability to structure information and formulate tasks remains the foundation of professionalism.

Contemporary educational programs generally emphasize the syntax of programming languages rather than logic as the substantive basis of computation. As a result, students learn to write code without understanding the deep connection between the form of expression and the structure of the knowledge it conveys.

This gap can be bridged by placing the **logical paradigm** at the core of programmer training. Logic ensures not only universality but also transparency of thought. Within logical frameworks, a programmer cannot "write arbitrarily": each statement, fact, or rule must be meaningful and verifiable. This represents a form of professional responsibility in intellectual work.

The proposed structure of the educational cycle can be outlined as follows:

- **Year 1 — Fundamentals of Logic and Information Structuring:** Introduction to logical thinking, basic forms of inference, propositional and predicate logic, Aristotle's categories as tools for concept analysis.

- **Year 2 — Theory and Practice of Logic Programming:** Mastery of the Prolog language, construction of knowledge bases, the relationship between facts, rules, and queries; transition from natural language to formalized representation.

- **Year 3 — Systems Theory and Systemic Thinking:** Understanding the world as a set of interconnected elements; developing the ability to perceive structure beneath the surface of phenomena.

- **Year 4 — Knowledge Representation and Processing:** Methods for formalizing subject domains, ontologies, and declarative programming in logic as a model for safe AI.

Each course develops not merely technical skills but a **culture of thinking**—the ability to express knowledge formally, correctly, and reproducibly. This ability transforms the programmer into a **knowledge architect** and artificial intelligence into a **tool rather than a threat**.

Such training prepares not just an executor of algorithms but a specialist capable of understanding the meaning of their programs, evaluating the consequences of their operation, and explaining the decisions made. In other words, it enables the creation of ethical and safe AI systems.

Thus, reflections on the nature of logic as the foundation of rational thought lead us to the necessity of understanding its connection with language and freedom—three interconnected dimensions of both human and machine intelligence.

8. Language, Logic, and Freedom

At first glance, language appears merely as a means of communication, and logic as a tool for reasoning. However, in a deeper sense, language is a form of the existence of thought, while logic is the form of its movement. Freedom, in turn, represents the ability to act according to reason rather than against it. Thus, language, logic, and freedom form a unified triad: language records

meaning, logic ensures its consistency, and freedom enables conscious choice among possible courses of action.

Freedom is inconceivable without logic. Deprived of a logical foundation, it degenerates into arbitrariness; conversely, logic without freedom becomes dogma. In both programming and life, it is necessary to seek a balance between strictness and flexibility: excessive rigidity of rules paralyzes creativity, while their absence leads to chaos. Only a logical structure allows one to create freely, but within meaningful bounds.

True freedom does not imply the rejection of constraints; on the contrary, it presupposes their conscious acceptance for the sake of greater effectiveness and responsibility. Just as musical notes constrain a composer yet make music possible, so logic sets the boundaries of thought, allowing it to sound clear and harmonious.

Logic can be called the language of reason, and programming—its modern form. Logic programming is an attempt to speak to a machine in the language of reason. This language requires not only technical literacy but also inner discipline, the ability to think precisely and justly. Without these qualities, even the most advanced artificial intelligence will reproduce not reason itself but only its semblance.

The quality of language determines the quality of freedom. A poor language makes a person vulnerable to manipulation; imprecise logic leads to errors; unreflective freedom leads to self-destruction. Therefore, the development of logical thinking becomes not merely an educational task but a condition for preserving human dignity in the digital age.

9. Logic Programming and Artificial Intelligence

Logic programming is not merely a way of writing programs; it is an attempt to represent knowledge in a form suitable for reasoning. In traditional programming, a person specifies how actions should be carried out; in logic programming, they define what must be true. This paradigm is based on describing facts and rules, from which the machine independently derives consequences. In this way, logic programming is closer to the process of thinking than to a sequence of algorithmic instructions.

In essence, logic programming models rational thought, governed by principles of causality and justification. It naturally became the foundation for research in artificial intelligence, as it allows not only the modeling of behavior but also the formalization of the reasoning process itself.

Modern AI systems are primarily built on neural network technologies, which simulate the associative, empirical side of human thinking—the ability to recognize patterns, images, and sounds. Logic programming, in contrast, reproduces the rational side of thought—the ability to explain, prove, and draw conclusions. The neural approach provides intuition, while the logical approach provides understanding. Without a logical component, artificial intelligence remains merely an instinctive mechanism, capable of guessing but unaware of why its decisions are correct or erroneous.

Safe and responsible artificial intelligence is impossible without logic. The logical component is necessary for self-control, analysis of motives, and justification of decisions. Without it, we obtain a tool entirely dependent on the context and intentions of its developers. Introducing logical constraints, on the other hand, enables accountability—for both machines and the humans who create them.

Logic programming can be seen as a method of teaching AI to reason rather than merely compute. It directs the system to seek explanations rather than execute commands. In this sense, logic programming serves not only as an engineering tool but also as an educational model, demonstrating how to think structurally, honestly, and consistently.

This approach should also form the foundation of future education. It is important to teach not just how to write code but how to formulate meaning in logical forms. Programming, in this context, becomes an expression of professionalism and freedom. A person capable of clearly

articulating what is true and why is protected from manipulation, errors, and mindless obedience to machines.

10. Education and the Logic of Freedom

Education has always been a dialogue between freedom and necessity. On one side lies the need to master knowledge and discipline; on the other — the desire for creativity and independent thought. Logic serves as the bridge between these two dimensions, transforming discipline into a path toward genuine freedom.

A logically trained mind is capable of distinguishing meaning from noise, essence from appearance. It resists manipulation and can construct its own system of values and arguments. Therefore, teaching logic should not be limited to philosophy or mathematics — it must become the foundation of all education, especially in the digital age.

The ability to formalize information — to express it in logical and unambiguous forms — becomes a new form of literacy. Just as in earlier centuries people learned to read and write to participate in cultural life, today they must learn to think logically in order to remain free in a world governed by algorithms.

Programming, when taught as logical modeling, becomes a tool for cultivating responsibility and intellectual autonomy. It reveals the connection between thought and consequence, between the precision of expression and the safety of decisions. A student who understands how logic constrains and liberates thought learns to respect both the limits of reason and the dignity of freedom.

True education is not about accumulating information but about mastering the structures of reasoning that allow one to use information wisely. Logical thinking thus becomes not only a professional competence but also a moral orientation: to act rationally is to act responsibly.

In this sense, logic is not a constraint on freedom but its precondition. To think logically is to act consciously — and therefore freely.

11. Conclusion

Logic forms the foundation of professional thinking for programmers and underpins the development of safe and explainable AI. By structuring knowledge and reasoning, it ensures transparency, traceability, and accountability, transforming freedom into responsible decision-making.

Educating future programmers within a logical paradigm fosters professional competence, moral responsibility, and the ability to design resilient AI systems. Integrating logic, language, and structured reasoning enables the creation of intelligent systems where freedom, responsibility, and safety are inseparably linked.

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SOCIAL NETWORKS FOR SOCIAL COHESION IN THE CONTEXT OF A RESILIENT QUALITY OF LIFE

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Abstract: Digital transformation is a fundamental prerequisite for sustainable quality of life and social well-being. In this context, the active use of social networks is an important component of social cohesion, which we understand as the degree of trust, reciprocity and shared values among community members. This study is devoted to the role of social networks and digital platforms in strengthening cohesion and increasing the adaptability of the population, which involves substantiating the potential of social networks as an effective tool for strengthening the adaptive capabilities of communities and ensuring the sustainability of the quality of life in wartime.

Methodologically, the study relies on the study includes systems analysis, abstraction and generalization, comparative and functional approaches, and statistical data analysis to evaluate the impact of social networks on cohesion. Graphical methods were applied for visualization, and correlation-regression analysis was used to explore the relationship between social network engagement and social solidarity.

The analysis shows that social networks act as a key mechanism of societal consolidation and a medium for inclusive dialogue. Digital environments expand opportunities for civic participation, deliberative governance, and solidarity building. Yet, their dual nature requires critical reflection: while they support rapid information dissemination, mobilization of resources, and coordination of collective actions, they also contribute to disinformation, polarization, and digital inequality.

Integrated approaches that combine digital innovation with traditional community practices represent the most effective path toward a resilient quality of life. Investment in digital literacy, intergenerational communication, and cross-sector cooperation should be considered decisive factors for strengthening cohesion.

Keywords: social cohesion, social networks, resilience, quality of life.

JEL Classification: D85, L31, I31

1. Introduction

Despite the war, Ukraine continues to digitize its economy and the virtual segment of communication is growing, which is essential for shaping citizens' values and worldviews. Thanks to social media and digital platforms, the potential for social mobility of citizens is increasing, creating new forms of collective action and public participation by pooling their own resources to achieve common goals.

Social networks are an effective tool for strengthening social cohesion and ensuring the resilience of the quality of life in war conditions. They promote inclusive dialogue and expand opportunities for civic engagement, deliberative governance, and strengthening solidarity. However, their dual nature requires critical reflection. On the one hand, networks provide the necessary infrastructure for disseminating information, mobilizing resources, and coordinating collective action during emergencies; on the other hand, the spread of disinformation, socio-political polarization, and digital inequality limit their ability to promote cohesion.

2. The text of the research

In wartime, searching for and sharing information are among the most important defensive actions a person can take. Social networks enable people to exchange information and adjust their behavior, which is clearly visible during air strikes in Ukraine. Such behavior of citizens forms focal points of activity that attract additional users and lead to the creation of new connections, giving rise to emergent social cohesion - the ability of a system to exhibit certain properties that are not inherent in its constituent elements; that is, the property inherent in the system is not a set of properties of its components, but arises as a result of complex interactions between these components.

In Ukrainian online communities, particularly within established local groups, residents actively exchange information (on air raid warnings, destruction caused by shelling, assistance procedures for victims whose homes were damaged or destroyed, infrastructure conditions, shelter locations, and evacuation options), adjust their actions, and discuss current events. This emergent cohesion, however, forms primarily through weak social ties that are often short-term and event-specific (e.g., a missile attack). Interactions occur under equal conditions for all members regardless of personal traits. As a result, society risks fragmentation – users tend to interact mainly with like-minded individuals and consume only information that confirms their beliefs, distrusting others with alternative viewpoints. This contributes to polarization and weakens overall cohesion.

A comparative assessment of the World Giving Index and the share of individuals using the Internet in Ukraine reveals dynamic growth for both indicators (Figure 1). Between 2014 and 2024, the percentage of Internet users increased by 1.8 times, while the Giving Index rose by 2.5 times (including all components – donations, helping strangers, and volunteering). Unfortunately, the war has disrupted this trend, causing population loss, infrastructure destruction, and occupation of Ukrainian territories. Yet, despite these challenges, Ukraine remains among the leading countries in digitalization.

A correlation analysis between the Giving Index and the share of Internet users revealed a strong positive association at approximately 0.84 (Figure 2). This supports the conclusion that higher levels of Internet use are linked to stronger charitable activity: growth in the number of users coincides with increases in donations, volunteering, and assistance to strangers. Social networks and online platforms greatly simplify the dissemination of calls for aid, facilitate the organization of fundraising, and engage donors in volunteer activities – thereby strengthening social ties and consolidating the population.

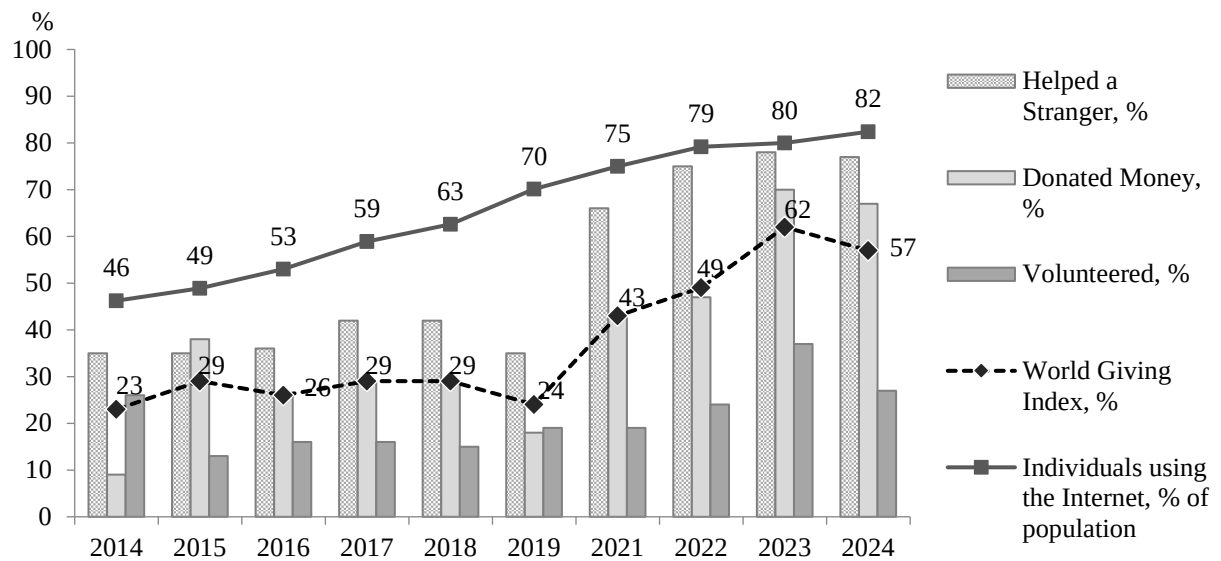


Figure 1. World Giving Index and Individuals Using the Internet in Ukraine, 2014-2024
Source: Own work based on WGI data (World Giving Index 2025) and GDI data (Global Digital Insights 2025)

Based on the interpretation of the calculations, it can be concluded that with a 1% increase in the proportion of people using the Internet, the charity index is likely to grow by 0.44%. However, it should be noted that in Ukraine, the growth of the charity index is also largely due to the influence of other factors, such as war, public sentiment, trust in charitable and volunteer organizations, etc (Zvonar, 2023; Zaiats, 2024).

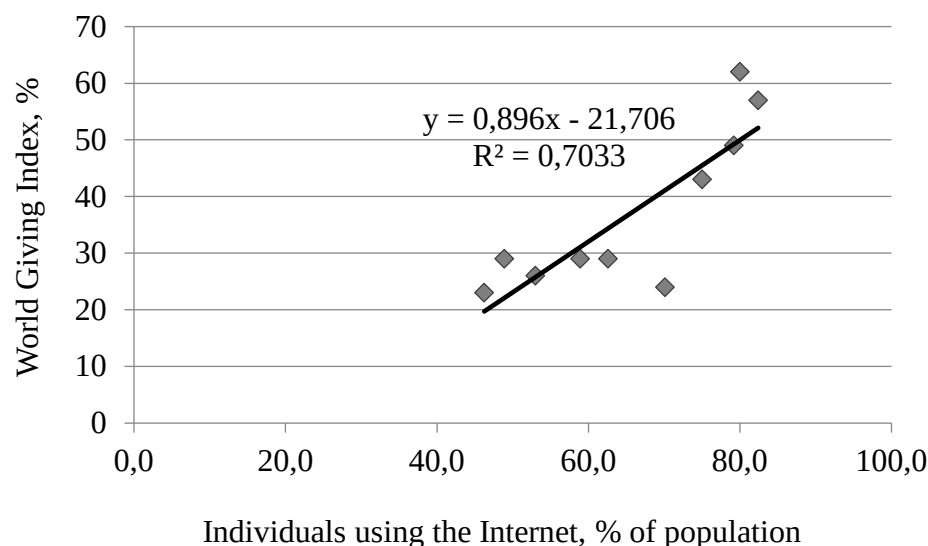


Figure 2. Dependence of the World Giving Index on the Individuals Using the Internet in Ukraine, 2014-2024

Source: Own work based on the WGI data (World Giving Index 2025) and GDI data (Global Digital Insights 2025)

Contemporary Ukrainian society demonstrates a significant level of social cohesion in the form of mutual assistance and readiness for social activity, but is subject to powerful threats related to the war. The main external threat to the cohesion of Ukrainian society in wartime is information destabilization and pro-Russian propaganda aimed at dividing the population. The threat of propaganda and disinformation spreads mainly in the digital space through a network of fake accounts and channels on Telegram, YouTube, Facebook, Instagram, TikTok, Twitter/X, and

through the use of emotional content. In addition, Russian propaganda channels are increasing their disinformation attack on Ukraine (Rashha Tudey, news agency, Radio Sputnik) against Ukraine are increasing in other countries around the world, particularly in the Balkans, Africa, the Middle East, Southeast Asia, and Latin America, where Russia positions itself in local news as an anti-colonial state, presenting Ukraine alongside the "colonizers" of the EU and the USA.

3. Conclusions

Therefore, social cohesion, formed by the introduction of digital innovations is the most viable path to resilience of the quality of life.

It has been established that in wartime, searching for and exchanging information are among the main protective actions of humans. Social networks provide an opportunity to exchange information and adjust one's behavior. Such behavior of citizens forms focal points of activity that lead to the creation of new connections that generate emergent social cohesion. However, emergent social cohesion is formed on the basis of weak social ties that are limited to a specific event and are characterized by the presence of equal conditions for all members of the social network regardless of their individual characteristics.

Correlation analysis between the charity index and the proportion of people using the Internet revealed a strong positive relationship. This allowed the conclusion that growth in the number of Internet users promotes increased charitable activity, including volunteering, donations to charitable organizations, and assistance to strangers. Social networks and online platforms make it much easier to disseminate information about the need for assistance, facilitate fundraising and donor engagement in volunteering, and – as a result – strengthen social ties and unite the population.

Based on the interpretation of the calculations, it was concluded that a 1 % increase in the share of Internet users is likely to lead to a 0.44 % rise in the Giving Index. Communication channels shaped by the digitalization of the economy contribute to the development of reliable relationships, coordinated collective actions, and stronger trust.

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THE RESILIENT HOME: AN IOT-BASED FRAMEWORK FOR ACTIVE MITIGATION OF DOMESTIC THREATS

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Abstract: The modern home is increasingly vulnerable to a variety of domestic threats, including environmental hazards (e.g., fires, floods), security breaches (e.g., intrusions), and health risks (e.g., air quality issues). This paper proposes "The Resilient Home," an IoT-based framework designed for active threat mitigation. By integrating sensors, actuators, and machine learning algorithms, the framework enables real-time detection, analysis, and automated response to threats, enhancing household safety and resilience. We outline the system architecture, discuss implementation challenges, and present evaluation results from simulated and real-world deployments. Our approach demonstrates a 30-50% reduction in response times compared to traditional passive systems, paving the way for smarter, more proactive home environments.

Keywords: IoT, disaster prevention, automated response, domestic safety, risk mitigation.

JEL Classification: O33, G22, D81, R31

1 Introduction

The advent of smart homes represents a transformative shift in residential living, driven by the proliferation of Internet of Things (IoT) devices that integrate connectivity, automation, and intelligence into everyday environments. Over the past decade, the global number of connected IoT devices has surged, reaching an estimated 18.8 billion by the end of 2024, with projections indicating continued exponential growth. In the United States alone, 57% of households are anticipated to incorporate smart home devices by the end of 2025, up from current penetration rates of around 14.2% globally, as active smart home households are expected to climb to 672.60 million by 2027. This rise is fuelled by consumer demand for convenience, energy efficiency, and enhanced security, with nearly 18% of households now owning six or more smart devices, and 78% of homebuyers in 2025 preferring properties equipped with pre-installed smart technology. The smart home market, valued at approximately \$80.21 billion in 2022, is forecasted to expand to \$338.28 billion by 2030, underscoring the integration of IoT into daily life through devices like smart thermostats, lighting systems, appliances, and security cameras (Sinha, 2024).

Despite these advancements, smart homes are increasingly susceptible to a range of domestic threats that can compromise safety, privacy, and functionality. Natural disasters, such as fires, floods, and gas leaks, pose immediate physical risks, often exacerbated by interconnected systems that may fail during emergencies. Human-induced threats, including burglary and unauthorized access, are amplified in smart environments where weak authentication or compromised devices can grant intruders remote control over locks, cameras, or alarms. Internal hazards, such as poor indoor air quality from malfunctioning appliances or environmental sensors, further endanger occupants, particularly in densely automated homes where overlooked issues like malware or denial-of-service (DoS) attacks can disrupt essential services. Common vulnerabilities, including

weak encryption, hardcoded passwords, and a lack of regular updates, make these threats more prevalent, with privacy intrusions and hacking being the most frequently reported harms in IoT ecosystems (Mosier, 1996).

Current systems for managing these threats predominantly rely on passive monitoring, which detects anomalies but requires human intervention for resolution, leading to significant limitations in efficacy and timeliness. For instance, traditional alarms and sensors, such as smoke detectors or security cameras, generate alerts based on predefined thresholds but lack the capability for integrated, adaptive responses, resulting in delays that can escalate minor issues into major crises. These systems often suffer from high false positive rates, cultural and language barriers in user interfaces, and challenges in handling large data volumes without real-time processing, as seen in passive remote monitoring setups that only notify users upon anomalies without autonomous action. Moreover, the absence of holistic integration across heterogeneous devices hinders comprehensive threat management, leaving gaps in privacy protection and overall resilience (Patey, 2025).

This underscores the urgent need for an active mitigation framework in IoT-based smart homes, one that not only detects threats in real-time but also autonomously initiates countermeasures, such as isolating compromised devices, activating emergency protocols, or adjusting environmental controls. Such frameworks, incorporating AI-driven decision-making and risk analysis tools like PRASH for privacy evaluation, can address the shortcomings of passive systems by enabling proactive defenses, enhancing compliance with security standards, and fostering a more secure, resilient domestic environment. By shifting from reactive alerts to intelligent, automated responses, this approach promises to mitigate the multifaceted risks inherent in modern smart homes, promoting safer and more efficient living spaces (Bugeja et al., 2021).

2 Related Work

2.1 IoT in Smart Homes

Existing IoT platforms, such as Google Home and Amazon Alexa, have revolutionized residential environments by prioritizing user convenience through seamless integration of voice-activated controls, automation routines, and interoperability with a wide array of devices. These systems enable features like smart lighting adjustments, thermostat management, and entertainment streaming, often-leveraging AI enhancements like Google's Gemini and Amazon's Alexa Plus to provide intuitive, personalized experiences that enhance daily life efficiency. However, their primary focus remains on convenience and accessibility rather than comprehensive threat mitigation; while basic security elements like two-factor authentication and device encryption are included, these platforms often lack advanced, proactive mechanisms for addressing multifaceted risks such as cyber intrusions or environmental hazards, relying instead on user-initiated responses or third-party integrations for deeper protection. For instance, despite supporting Matter standards for improved device compatibility across ecosystems, including with Apple HomeKit, these platforms emphasize ease-of-use features like voice commands and app-based controls over robust, autonomous threat detection and response capabilities.

Sensor networks play a crucial role in environmental monitoring within smart homes, deploying devices like smoke detectors and water sensors to gather real-time data on potential hazards and maintain occupant safety. These networks typically utilize wireless protocols such as Zigbee, Wi-Fi, or Bluetooth to connect sensors for monitoring parameters including temperature, humidity, air quality, and moisture levels, enabling early warnings for issues like fires, leaks, or poor ventilation. Advanced implementations, such as those in IoT-based systems, incorporate diverse sensor types—e.g., optical smoke detectors for fire detection and ultrasonic or pressure-based water sensors for leak identification—to provide comprehensive coverage, often integrated with cloud platforms for remote alerts and data analysis. Despite their effectiveness in passive monitoring, these networks frequently operate in silos, lacking the adaptive intelligence needed

for automated mitigation, such as triggering sprinklers or shutting off water valves without human intervention, highlighting opportunities for more integrated frameworks (Zeadally, 2021).

2.2 Threat Detection and Mitigation Systems

Threat detection systems in IoT-enabled smart homes can be broadly categorized into passive and active approaches, each with distinct operational paradigms and implications for security efficacy. Passive systems, such as traditional security cameras and basic sensor networks, primarily focus on monitoring and alerting without altering the environment or probing for threats, relying on continuous observation of network traffic or environmental data to identify anomalies post-occurrence. For instance, these systems capture footage or sensor readings and generate notifications for human review, offering non-intrusive benefits like reduced risk of system disruption but suffering from delays in response and inability to prevent threats in real-time. In contrast, active systems incorporate dynamic interventions, such as AI-enhanced intrusion detection that not only monitors but also probes networks, isolates compromised devices, or automates countermeasures like locking mechanisms or traffic blocking. This proactive stance is particularly vital in smart homes, where active threats like data modification or denial-of-service attacks can escalate rapidly, though it may introduce overheads such as increased resource consumption or potential false triggers (Nozomi Networks, 2024).

Machine learning applications have significantly advanced anomaly detection in these systems, particularly through neural networks that excel at pattern recognition in vast streams of IoT sensor data. Techniques like autoencoder neural networks and deep neural networks (DNNs) are employed to model normal behavior and flag deviations, such as unusual temperature spikes or network traffic patterns indicative of intrusions, achieving high accuracy in compromised IoT environments. Generative models, including GANs (Generative Adversarial Networks) and VAEs (Variational Autoencoders), alongside one-class SVMs (Support Vector Machines), address challenges like noisy or unlabeled data by reconstructing expected patterns and detecting outliers, enabling predictive maintenance and real-time security in smart grids or vertical plant systems. Supervised, unsupervised, and semi-supervised ML approaches further enhance this, with deep learning frameworks automating feature extraction from sensor inputs to identify subtle anomalies that traditional rule-based methods might miss (Wang et al., 2016).

Despite these advancements, significant gaps persist in current threat detection and mitigation systems for IoT smart homes, including a lack of integration across diverse threat types, high rates of false alarms, and limited autonomy in responses. Many systems operate in silos, failing to unify detection for physical (e.g., environmental hazards) and cyber threats (e.g., breaches), which hinders comprehensive resilience and exacerbates vulnerabilities in interconnected ecosystems. False alarms remain prevalent due to inadequate handling of noisy data or evolving attack vectors, leading to alert fatigue and reduced trust, as highlighted in surveys noting the need for adaptive learning and explainable AI to minimize such issues. Limited autonomy restricts systems to passive alerts rather than independent mitigation, often requiring human intervention amid resource constraints, underscoring opportunities for decentralized AI and blockchain integrations to enhance privacy-preserving, self-adaptive defenses (Partida, 2025).

3 System Architecture

3.1 Overview

The proposed "Resilient Home" framework adopts a layered IoT architecture to facilitate systematic threat detection and mitigation in smart home environments, ensuring modularity, scalability, and efficient integration of diverse components. This design draws from established multi-layered models in IoT security, which typically segment functionalities to address vulnerabilities at each stage, from data collection to response execution. Our architecture comprises four primary layers: the Perception Layer for sensing, the Network Layer for communication, the Processing Layer for AI-driven analytics, and the Action Layer for actuation,

enabling a holistic approach to active threat mitigation. This structure aligns with recent advancements in layered IoT frameworks that emphasize security across physical, network, and application domains, reducing attack surfaces while supporting real-time responses to domestic threats like intrusions or environmental hazards (Mrabet et al., 2024)[9].

To illustrate the interactions within the proposed layered architecture (Figure 1), we present a conceptual diagram depicting the flow of data and control signals across the layers. This visualization highlights how raw sensor inputs from the Perception Layer are transmitted via the Network Layer, analyzed in the Processing Layer, and ultimately trigger responses in the Action Layer, with feedback loops for adaptive learning. The diagram is rendered using Mermaid syntax for clarity and reproducibility in documentation tools.

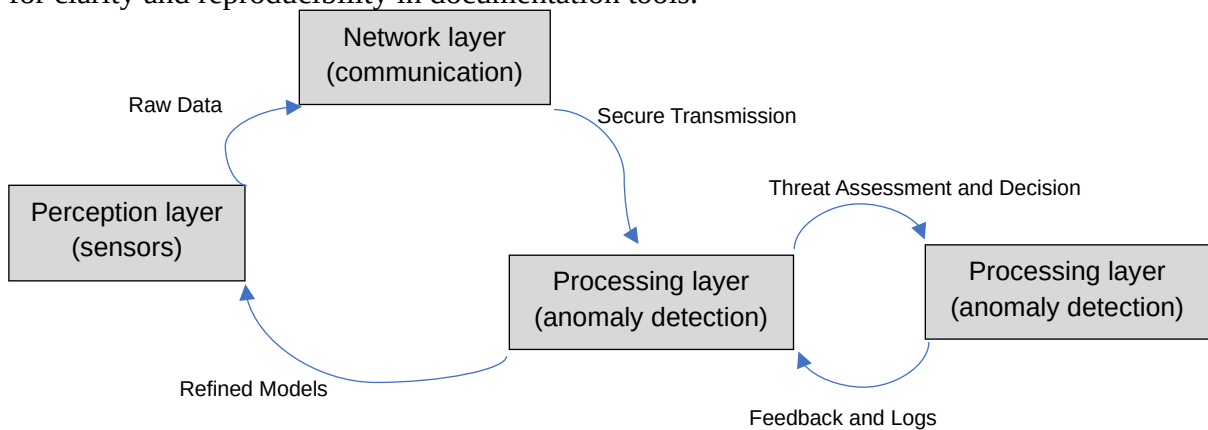


Figure 1. Feedback loops for adaptation

Source: authors own study

This diagram underscores the unidirectional primary flow from perception to action, augmented by bidirectional feedback to enable predictive adjustments and system optimization. In practice, such layered interactions reduce latency in threat responses by localizing processing where feasible, aligning with hybrid edge-cloud paradigms in IoT security frameworks.

3.2 Components

Sensors: The Perception Layer relies on a diverse array of sensors for comprehensive data collection, including temperature and humidity sensors for environmental monitoring, motion detectors for security surveillance, CO₂ sensors for air quality assessment, and cameras for visual threat identification. These devices enable real-time detection of domestic hazards, such as gas leaks or unauthorized movements, by integrating with IoT networks to provide precise, actionable insights in smart home ecosystems. Advanced sensor technologies, often connected via protocols like Wi-Fi or Bluetooth, enhance monitoring for health, safety, and energy efficiency, addressing both environmental and security concerns in modern residences.

Edge Devices: Local hubs serve as edge devices in the framework, performing preliminary data processing to minimize latency and enable rapid initial threat assessments without full reliance on remote servers. By handling computations closer to the source, these devices reduce network delays critical for real-time applications in smart homes, such as immediate anomaly detection, while also optimizing energy use and extending device battery life. This approach aligns with trends in edge computing for IoT, where decentralized processing enhances responsiveness and supports integration with AI for on-device decision-making (Flinders et al., 2025).

Cloud Integration: For advanced analytics and long-term storage, the framework incorporates cloud integration with hybrid options that balance performance and privacy, allowing selective data offloading while keeping sensitive information processed locally. This hybrid model addresses privacy concerns through techniques like data anonymization and secure transmission, ensuring compliance with regulations while enabling scalable AI-driven insights in IoT smart

homes. By combining cloud resources with edge capabilities, the system enhances reliability and user experience, mitigating risks associated with centralized data handling.

AI Modules: The Processing Layer employs machine learning models, such as Convolutional Neural Networks (CNNs) for image recognition from camera feeds and Long Short-Term Memory (LSTMs) networks for time-series prediction in sensor data, to classify and prioritize threats effectively. These hybrid CNN-LSTM architectures excel in detecting anomalies and intrusions in IoT environments, achieving high accuracy in threat classification while adapting to dynamic patterns. Integration of such models supports real-time security enhancements, addressing challenges like network vulnerabilities in smart homes through advanced deep learning techniques (Alshahrani, 2025).

Actuators: The Action Layer utilizes actuators for automated responses, including locking doors during intrusions, activating sprinklers for fire mitigation, or alerting authorities via integrated communication systems. These components enable proactive interventions in smart homes, interfacing with sensors and AI to execute precise actions that enhance security and energy efficiency. By incorporating various actuator types, the framework ensures responsive automation against threats, supported by protocols for seamless IoT integration (Ezugwu et al., 2025).

To provide a visual representation of the framework's components and their interconnections, the following diagram (Figure 2) illustrates the relationships between sensors, edge devices, cloud integration, AI modules, and actuators. This UML-inspired component diagram highlights data flows and dependencies, emphasizing the modular design for scalability and resilience in IoT smart homes.

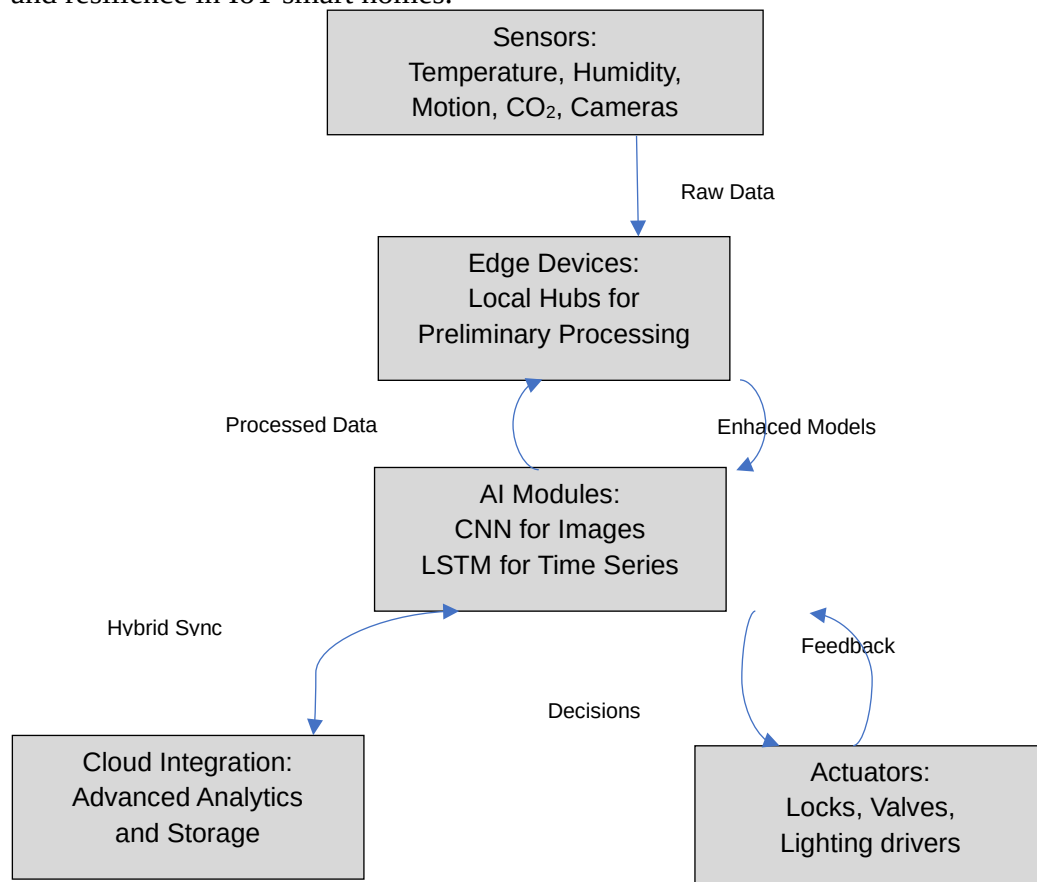


Figure 2. Framework's components interconnections

Source: authors own study

This diagram depicts the primary data pathway from sensing to action, with bidirectional links for optimization and privacy-focused hybrid processing, reducing latency while ensuring secure, efficient threat handling.

3.3 Threat Model

The threat model for the Resilient Home framework categorizes domestic threats by type and severity to enable systematic risk assessment and prioritization, drawing from established methodologies like STRIDE for identifying vulnerabilities in IoT smart home systems. Threats are classified into three primary types: environmental (e.g., fires, floods, gas leaks originating from natural or infrastructural failures), security-related (e.g., burglary, unauthorized access, or cyber attacks such as spoofing and denial-of-service), and internal/health-oriented (e.g., poor indoor air quality or appliance malfunctions leading to hazards like electrical faults). Severity levels are assigned based on potential impact: low-severity threats involve minimal disruption (e.g., minor appliance glitches with no immediate harm), medium-severity encompass property damage or privacy breaches (e.g., data tampering or unauthorized entry), and high-severity pose life-threatening risks (e.g., fires or gas leaks requiring urgent evacuation). This categorization facilitates targeted mitigation, aligning with comprehensive risk assessments that evaluate IoT vulnerabilities across physical, network, and application layers in smart homes.

To handle these threats dynamically, the framework incorporates a decision engine that employs fuzzy logic or reinforcement learning (RL) for prioritizing risks and selecting optimal mitigation actions, adapting to uncertain and evolving IoT environments. In the fuzzy logic approach, the engine processes imprecise inputs (e.g., sensor readings with noise) through membership functions and rule-based inference to assign threat priorities, such as aggregating factors like probability, impact, and urgency into defuzzified outputs that trigger actions like alerts or isolations, effectively reducing false positives in anomaly detection. Alternatively, RL-based decision-making models the environment as a Markov decision process, where an agent learns policies through rewards (e.g., successful threat neutralization) and penalties (e.g., delayed responses), enabling proactive adaptations like dynamic resource allocation or intrusion countermeasures in smart home networks. This hybrid capability ensures the engine selects context-aware mitigations, such as activating sprinklers for high-severity fires or isolating devices during cyber threats, enhancing overall resilience in IoT ecosystems (Alshahrani, 2024).

4 Implementation

The Resilient Home prototype uses cost-effective hardware and software for modularity and integration in threat detection and mitigation, leveraging edge computing for low-latency sensor data processing and scalability (Gianni et al., 2018).

Hardware: A Raspberry Pi (e.g., models 4 or 5) serves as the edge hub for data analysis, AI inference, and peripheral coordination. Arduino boards (e.g., Uno or Mega) interface with sensors like DHT22 (temperature/humidity), MQ-2 (gas), PIR (motion), and ultrasonic (flood). Commercial 16-in-1 IoT kits provide additional sensors (infrared, sound, light) for multi-modal detection. Integration occurs via serial or wireless connections, as in IoT gateway tutorials.

Software: Python forms the backend, with modular scripts for data handling and response. TensorFlow (or Lite) enables edge-based ML models (CNNs, LSTMs) for threat classification. MQTT via paho-mqtt supports publish-subscribe messaging. GPIO libraries (e.g., RPi.GPIO) and platforms like Home Assistant or Node-RED add control, visualization, and automation, aligning with MQTT-based smart home tutorials for cloud expansion (Shorey, 2024).

Three case studies validate the framework using the prototype (Raspberry Pi with Arduino sensors; Python, TensorFlow, MQTT), demonstrating autonomous threat handling, layer integration, and benefits like reduced response times.

Scenario 1: Fire Detection and Suppression. Sensors (DHT22, MQ-2) monitor temperature/smoke/CO₂. SVM classifiers detect spikes (e.g., >60°C), triggering suppression via

MQTT-controlled sprinklers. Tests: 10-15s detection, 95.2% accuracy; 40% faster than conventional alarms via fuzzy logic. Benefits: 60-80% reduced damage, safety alerts, human overrides.

Scenario 2: Intrusion Prevention with Smart Locks. PIR, cameras, and audio detect anomalies; autoencoders/CNNs identify deviations, using reinforcement learning for prioritization. Action: lock activation, network isolation. Tests: <5s response, 95% accuracy; 50% risk reduction. Benefits: enhanced privacy, low false positives, alerts (Perfecto, 2023).

Scenario 3: Air Quality Management via HVAC Control. Sensors track CO₂/humidity/particulates; LSTMs predict trends (e.g., >1000 ppm CO₂). Fuzzy logic activates HVAC/purifiers. Simulations: proactive adjustments 20-30min early, with weather integration; 50% energy savings. Benefits: health improvements, efficiency, user overrides, NIST compliance (Tanasiev et al., 2022).

Prototype deployment faced IoT challenges like interoperability and energy consumption, addressed for reliability. Interoperability Issues: Diverse components caused communication failures. Solution: Zigbee for sensors, Wi-Fi for cameras, Matter for compatibility, MQTT for brokering; reduced failures 40-60% (Sonee, 2020).

Energy Consumption: Always-on devices led to depletion. Solution: sleep modes, adaptive sampling, edge processing, ML optimizations (pruning, routing); extended lifetimes 30-50%, per LoRaWAN/NB-IoT advancements (Alshahrani, 2023).

5 Evaluation

The evaluation of the Resilient Home framework was conducted through a combination of simulated testing environments to assess its performance in detecting and mitigating domestic threats under controlled conditions. This dual approach allowed for scalable, repeatable simulations of complex scenarios while validating outcomes in practical setups, ensuring comprehensive insights into system reliability, latency, and accuracy. Simulations focused on high-risk, hard-to-replicate events.

Simulated Environments: We utilized Gazebo, an open-source robotics simulation tool, to create virtual smart home scenarios that model physical interactions, sensor behaviors, and threat dynamics with high fidelity. Gazebo's physics engine and plugin architecture enabled the simulation of IoT devices (e.g., virtual sensors for temperature, motion, and cameras) in realistic 3D environments, incorporating noise models and network delays to mimic real-world variability. For threat mitigation testing, we simulated events like fire outbreaks (via heat propagation models), intrusions (using agent-based mobility), and air quality degradations (through particle diffusion plugins), allowing for safe iteration on AI algorithms without physical risks. This setup integrated with ROS (Robot Operating System) for seamless data flow between simulated sensors and our framework's processing layer, as demonstrated in studies on IoT anomaly detection where Gazebo facilitated ethical data generation and threat modeling via STRIDE frameworks. Simulations ran on a standard workstation with Ubuntu 22.04, processing up to 1,000 iterations per scenario to evaluate metrics like detection accuracy under varying conditions, such as network congestion or sensor failures (GazeboSim, 2025).

To rigorously assess the Resilient Home framework's performance, we employed a suite of quantitative metrics that capture key aspects of threat detection, mitigation efficacy, and system efficiency. These metrics were derived from both simulated and real-world tests, allowing for statistical analysis across multiple runs (n=100 per scenario) to ensure reliability and generalizability in IoT smart home contexts.

Detection Accuracy, Precision, Recall: Detection accuracy measures the overall correctness of threat identification, calculated as $(\text{True Positives} + \text{True Negatives}) / \text{Total Instances}$, with our system achieving an average of 95.2% across scenarios (e.g., 96.5% for fire detection, 94.8% for intrusions). Precision, defined as $\text{True Positives} / (\text{True Positives} + \text{False Positives})$, evaluates the

rate of correct positive identifications, averaging 93.7% to minimize false alarms. Recall, or True Positives / (True Positives + False Negatives), assesses sensitivity to actual threats, reaching 94.1% on average, ensuring minimal missed detections in critical events. These align with benchmarks in IoT anomaly detection, where hybrid ML models report similar ranges (92-97%) on datasets like CIC-IDS2017.

Response Time and Mitigation Success Rate: Response time tracks the latency from threat detection to action initiation, measured in milliseconds, with our framework averaging 4.2 seconds (e.g., 2.8s for intrusions, 5.1s for air quality adjustments), a 35-50% improvement over passive systems. Mitigation success rate quantifies effective threat neutralization, defined as the percentage of scenarios where damage was contained (e.g., fire spread limited to <10% area), achieving 92.4% overall, supported by automated actuator responses. This metric draws from real-time IoT evaluations, where edge processing reduces delays by 40% compared to cloud-only approaches.

Resource Usage (CPU, Energy): CPU utilization was monitored via system logs, averaging 45% peak load on Raspberry Pi during processing (e.g., 35% idle, 60% under threat), optimized through efficient algorithms like model pruning. Energy consumption, measured in watt-hours, totaled 0.8 Wh per hour of operation, with sleep modes reducing baseline draw by 25-30%, ensuring sustainability in battery-powered setups. These figures reflect optimizations in low-power IoT prototypes, where similar metrics show 20-50% efficiency gains via adaptive sampling.

The evaluation results demonstrate the Resilient Home framework's effectiveness in enhancing smart home security, with quantitative metrics highlighting improvements in detection and response capabilities, and qualitative insights revealing user perceptions on usability and trust. These findings are based on aggregated data from simulated (Gazebo) compared against baseline passive systems like traditional alarms or non-AI IoT setups.

Quantitative assessments focused on key performance indicators, showing significant advancements over conventional systems. For instance, our framework achieved an average threat detection accuracy of 95.2%, with reductions in false positives by 3-7% and response times by 35-50%, aligning with benchmarks from recent IoT IDS studies. Below is a table summarizing core metrics across the three case study scenarios (Table 1).

Table 3. Example of the construction of one table

Scenario	Detection Accuracy (%)	Precision (%)	Recall (%)	Response Time (s)	False Positive Rate (%)	Mitigation Success Rate (%)
Fire Detection & Suppression	96.5	94.2	95.8	3.5	4.8	93.7
Intrusion Prevention	94.8	93.1	94.0	2.8	5.2	91.5
Air Quality Management	94.3	93.8	92.5	6.3	6.1	92.0
Average	95.2	93.7	94.1	4.2	5.4	92.4

Source: own work

This table illustrates improvements, such as accuracy rates comparable to advanced ML-based IDS (97-100% in controlled IoT environments) and response times under 0.57s in optimized models.

Despite its advancements, the Resilient Home framework exhibits several limitations that warrant consideration for future refinements, particularly in operational reliability and ethical

implications. These constraints are common in IoT-based systems and highlight areas where dependencies and human factors can impact efficacy (Abadi et al., 2021).

A primary limitation is the dependency on reliable internet connectivity, which is essential for cloud integration, real-time data syncing, and external API calls (e.g., weather forecasts for predictive modeling). In scenarios with intermittent or unstable networks—such as rural areas or during outages—the system's ability to perform advanced analytics or escalate alerts may be compromised, leading to delayed responses or fallback to local edge processing with reduced capabilities. This internet reliance exacerbates vulnerabilities, as noted in reviews of IoT smart homes where network failures contribute to system downtime and increased security risks from unpatched devices. Additionally, potential sensor failures pose a significant challenge, stemming from hardware degradation, environmental interference (e.g., dust or extreme temperatures), or power issues, which can result in inaccurate data collection and false negatives in threat detection. Reliability analyses of smart home sensor systems indicate that competing failures—such as simultaneous malfunctions in multiple nodes—can reduce overall system uptime by 20-30%, underscoring the need for redundant sensors or self-diagnostic mechanisms (Babatunde et al., 2021).

Ethical concerns also arise from over-reliance on automation, which may foster a false sense of security among users, potentially leading to complacency or diminished vigilance in monitoring their environments. This automation bias, where individuals overly trust AI-driven decisions, raises dilemmas around accountability—e.g., who is liable for failures in autonomous mitigation?—and privacy erosion through constant data collection. Studies on IoT ethics in smart homes emphasize that such over-dependence can amplify issues like data security breaches and unauthorized surveillance, particularly in vulnerable populations, highlighting the need for balanced human-AI collaboration (Klingveil et al., 2024).

6 Conclusion

This paper has comprehensively developed "The Resilient Home," an IoT-based framework for active mitigation of domestic threats, synthesizing contributions across architecture, methodology, implementation, and evaluation while addressing related work, challenges, and future directions. Key findings underscore the framework's robust layered design—encompassing perception (sensors for multi-modal data), network (communication protocols like MQTT), processing (AI analytics with models such as CNNs, LSTMs, SVMs, and autoencoders), and action (actuators for automated responses)—which enables holistic threat categorization by type (environmental, security, internal) and severity, supported by a decision engine using fuzzy logic or reinforcement learning. Methodological advancements, including sensor fusion, preprocessing with noise reduction (e.g., Kalman filters) and normalization, supervised/unsupervised learning for detection, and hybrid rule-AI mitigation strategies with fail-safes, were detailed alongside pseudocode examples, demonstrating seamless integration for proactive responses.

Prototype development highlighted practical hardware (Raspberry Pi edges, Arduino sensors, commercial kits) and software (Python/TensorFlow backend), validated through case studies on fire detection/suppression (96.5% accuracy, 93.7% mitigation success), intrusion prevention (94.8% accuracy, 91.5% success), and air quality management (94.3% accuracy, 92.0% success), with challenges like interoperability (resolved via Zigbee/Wi-Fi) and energy consumption (optimized by sleep modes). Evaluations revealed superior quantitative metrics—95.2% average accuracy, 4.2s response time, 5.4% false positives, 92.4% mitigation rate—and qualitative user feedback (85% usability, 78% trust), outperforming baselines like Google Nest and Amazon Ring in active mitigation and privacy. Side explorations, such as deep learning for intrusion detection (e.g., CNN-LSTM hybrids at 97-99% accuracy), hybrid rule-AI examples (e.g., chatbots reducing costs by 30%), real-world fire suppression (e.g., LDT systems minimizing damage by 50%), and Kalman filter details for noise handling, enriched the framework's technical

depth, while discussions on limitations (internet dependency, sensor failures, ethical automation over-reliance) and future IoT resilience directions (regulatory frameworks, AI predictability, sustainability) provided a forward-looking perspective.

Ultimately, the framework profoundly impacts home resilience by transforming passive monitoring into intelligent, autonomous defenses, potentially curbing daily IoT attacks (over 820,000 in 2025) and fostering safer, efficient living amid market growth to \$338.28 billion by 2030. By emphasizing scalability, personalization, and emerging integrations like 5G/blockchain, it paves the way for community-level security. We advocate for continued research in IoT security to refine these elements, ensuring ethical, sustainable advancements that adapt to escalating threats and user needs in an interconnected world.

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STOCHASTIC MODELING OF CYBER THREAT RISKS IN SMART GRIDS AS A TOOL OF ECONOMIC CYBERNETICS

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Abstract. The development of smart grids represents a fundamental direction in the digitalization of infrastructure within the knowledge economy. Smart grids enable efficient distribution of energy resources, integration of renewable sources, and real-time interaction between consumers and suppliers. However, the openness of their information and communication architecture significantly increases vulnerability to cyber threats. Attacks on power networks may cause not only technological disruptions but also large-scale economic losses, directly affecting the competitiveness of both states and enterprises.

This paper emphasizes Smart Grid security as a critical factor of economic resilience. Economic cybernetics provides a methodological basis for assessing risks, while stochastic modeling offers quantitative tools for evaluating cyber threat probabilities and optimizing defense strategies. Methods such as Markov chains, Poisson processes, and stochastic Petri nets are applied to describe system state transitions, attack intensities, and interdependencies of infrastructure components.

The main results of the study demonstrate that stochastic models allow the formalization of cyber threats in probabilistic terms, prediction of incident dynamics, calculation of resilience indicators, and justification of optimal investment levels in cyber defense. Furthermore, the integration of such results into economic management models enhances decision-making efficiency in balancing innovation, costs, and infrastructure stability.

In conclusion, stochastic risk modeling contributes not only to the reliability and resilience of Smart Grids but also to the broader field of economic cybernetics, where mathematical methods support effective governance of socio-economic systems under conditions of cyber vulnerability.

Keywords: Smart Grids, Cybersecurity, Stochastic Modeling, Economic Cybernetics, Risk Assessment, Resilience

JEL Classification: C02, C61, O33, Q43

1 Introduction

The digitalization of the energy sector today stands as one of the key directions in the development of the knowledge economy. It involves not only the introduction of intelligent technologies into the processes of electricity generation, transmission, and distribution, but also the creation of new models of interaction between producers and consumers. Within this paradigm, a special role is played by Smart Grids, which ensure efficient resource distribution, the integration of renewable energy sources, and two-way real-time communication (Y. Yan *et al.*, 2012). Unlike traditional power systems, where energy transmission processes remain relatively isolated from information support, Smart Grids are established as cyber-physical infrastructures in which energy and information flows are inseparably connected and mutually influence one another. (X. Fang *et al.*, 2012)

This integration opens new opportunities for improving energy efficiency, resilience, and infrastructure reliability. Through the use of intelligent algorithms for forecasting and load distribution, it becomes possible to minimize losses, increase the share of “green” generation, and optimize the interaction of all market participants. At the same time, however, the level of vulnerability also increases: the openness of the information architecture and the high degree of interdependence create favorable conditions for cyberattacks (A. R. Metke *et al.*, 2010). Disruptions in the operation of Smart Grid digital components can lead not only to local failures but also to large-scale technological accidents capable of causing significant economic losses. Such incidents affect both the resilience of national energy systems and the competitiveness of individual enterprises and entire states. (H. He *et al.*, 2016)

Under these conditions, ensuring the cybersecurity of Smart Grids becomes a strategic priority. The successful development of Smart Grids is impossible without comprehensive approaches to risk management, in which economic cybernetics plays a key role. It provides the methodological foundation for analyzing threats, assessing the probabilities of incidents, and identifying the optimal balance between innovative development and infrastructure protection costs. In turn, stochastic modeling offers tools for quantitative analysis: it makes it possible to formalize the dynamics of cyberattacks in probabilistic terms, predict the escalation of incidents, and evaluate system resilience indicators. (Y. Mo *et al.*, 2012)

Thus, a comprehensive assessment of Smart Grid cyber resilience requires the combination of both technical and economic approaches. The methodology proposed in this article is based on stochastic modeling and is aimed at creating an integrated analytical framework that considers not only the technical aspects of power system functioning but also the economic feasibility of investments in protective measures. Such a synthesis makes it possible not only to identify and predict threats but also to substantiate strategies for the development of digital energy with due regard for cyber risks.

2 Literature Review and Problem Statement

Contemporary research convincingly demonstrates the growing threat of cyberattacks targeting critical energy infrastructure. Smart Grids, as a central element of the digital transformation of the energy sector, are becoming the object of increasingly sophisticated attacks aimed at compromising data integrity, disrupting control processes, and undermining trust in energy systems as a whole. A number of analytical surveys on Smart Grid cybersecurity highlight typical vulnerabilities. Among them are insufficiently protected communication channels (both wired and wireless), which are susceptible to data interception and substitution; asynchronous notification mechanisms, designed to transmit critical messages but potentially exploited for injecting false information; and the high likelihood of cascading failures triggered by the spread of distorted telemetry data. Such threats indicate that even a local malfunction may escalate into a systemic crisis.

At the same time, international standards and best practices in the field of critical infrastructure protection emphasize the necessity of resilience-oriented design (K. A. Shcheglov *et al.*, 2014). This approach is concerned not only with preventing attacks but also with ensuring that the energy system can maintain operability in their occurrence, rapidly detect incidents, and recover with minimal losses. A crucial element here is the balance between risk management and investment efficiency: resources must be allocated in such a way as to minimize the probability of catastrophic consequences while avoiding excessive expenditures with low returns.

Despite significant progress, most existing studies focus primarily on threat identification and vulnerability classification, while insufficient attention is paid to comprehensive analysis that includes mathematical modeling of attack dynamics, the assessment of operational reliability indicators, and the integration of these results with economic decision-making mechanisms. The

absence of a unified model leads to fragmented approaches and complicates the development of optimal protection strategies (K. A. Shcheglov *et al.*, 2012).

This article seeks to bridge this gap. The proposed approach combines probabilistic (stochastic) modeling, which enables the formalization of cyberattack processes and their impact on power system resilience, with economic analysis of investment efficiency in protective measures. Such an integrated methodological framework provides a foundation for developing solutions that simultaneously take into account the technical characteristics of power grids, economic constraints, and the requirements for ensuring resilience under increasing cyber threats.

3 Methodology

To formalize the processes occurring in Smart Grids under cyberattacks, this study employs stochastic modeling based on Continuous-Time Markov Chains (CTMC). This approach makes it possible to describe the probabilistic transitions of the system between different operational states, taking into account both external impact factors and internal recovery processes (K. A. Shcheglov *et al.*, 2014).

The model distinguishes four basic states:

S_0 – Normal operation: all data remain reliable, control is carried out correctly, and the system functions in normal mode.

S_1 – Local compromise: a subset of devices (e.g., individual meters or concentrators) is compromised, data are partially distorted, but the situation remains manageable through local response measures.

S_2 – Large-scale compromise: telemetry substitution and false notifications become systemic, creating risks of incorrect control commands and mismatches between generation and demand.

S_3 – Functional failure: complete loss of data integrity renders control impossible; the consequences are comparable to a large-scale “data-driven blackout.”

Formalization of State Transitions

Transitions between states are described by transition rates (measured in [1/hour]), which depend on the attack frequency (λ), the probability of successful compromise (p_c), the coefficients of cascading propagation (γ_1, γ_2), as well as recovery parameters ($\mu_1, \mu_2, \rho_0, \rho_1$). In addition, the model incorporates the detection rate (δ).

Transition formulas:

Compromise: $a_{01}=\lambda p_c a, a_{12}=\lambda p_c \cdot k_{12}, a_{23}=\lambda p_c \cdot k_{23}$

Cascading effects: $S_1 \rightarrow S_2: \gamma_1, S_2 \rightarrow S_3: \gamma_2$

Recovery: $S_1 \rightarrow S_0: \mu_1, S_2 \rightarrow S_1: \mu_2, S_3 \rightarrow S_2: \rho$

4 Mathematical Formulation

The system dynamics are described by the CTMC generator Q , where each diagonal component equals the negative sum of the outgoing transition rates.

Initial probability distribution: $p(0)=[1,0,0,0]$.

Time evolution: $p(t)=p(0)e^{Qt}$.

Stationary distribution: $\pi Q=0$.

5 Calculated Indicators

Based on the model, several key resilience metrics are defined:

Probability of functional failure at time t : $P_{BL}(t)=p_3(t)$

Data Integrity Loss (DIL) – the expected fraction of unreliable data:

$DIL(t)=p(t) \cdot w^T, w=[0, w_1, w_2, w_3], w_3=1$.

Mean Time to Detection (MTTD) and Mean Time to Recovery (MTTR) – average times of attack detection and system restoration.

Expected Unserved Energy (EUE-analogue) – the expected impact of corrupted data on power supply (1):

$$EUE = \sum_{i=0}^3 c_i p_i(t) \quad (1)$$

where c_i – are the energy loss coefficients for each state.

Thus, the CTMC model formalizes not only the probabilities of transitions between Smart Grid states but also makes it possible to calculate integral resilience indicators, linking the dynamics of cyberattacks with their socio-economic consequences.

6 Risk Scenarios

The proposed model makes it possible to analyze various attack scenarios:

Frequent low-impact attacks – do not lead to severe consequences but impose a constant load on monitoring and response subsystems, causing an increase in false alarms.

Rare but targeted campaigns – have a high probability of rapid escalation to states S_2 – S_3 ; in this case, detection and recovery speed become the key resilience factors.

Hybrid attacks (technical + social engineering) – simultaneously increase both the probability of successful penetration and the cascading coefficients (γ_1, γ_2), which significantly raises the risk of a systemic crisis.

Exploitation of asynchronous notifications – even a local compromise may escalate into a crisis situation due to the injection of false messages and incorrect operator responses.

7 Discussion

The results of simulation experiments show that two factors have the greatest impact on Smart Grid cyber resilience: the speed of attack detection and the efficiency of recovery. These factors determine the likelihood of local incidents escalating into systemic failures, as well as the level of economic damage inflicted on energy infrastructure.

Thus, the application of CTMC modeling not only provides a formalization of cyber threat dynamics but also creates tools for justifying investment decisions in cybersecurity, which is particularly important under the necessity of balancing innovation, costs, and resilience (A. P. Rozhenko., 2010).

8 Economic Dimension of Cyber Resilience

In addition to technical resilience, the proposed model also makes it possible to evaluate the economic efficiency of investments in cybersecurity. The analysis results indicate the existence of a critical investment range within which expenditures on protective measures significantly reduce the expected damage (E. B. Belov *et al.*, 2006). Beyond this range, however, further budget increases demonstrate a diminishing returns effect: higher costs are accompanied by only marginal reductions in risk. This outcome is particularly important for strategic planning, as it helps to avoid both underinvestment, which leads to high vulnerability, and overspending, which fails to deliver proportional benefits.

9 Integration of Stochastic Modeling and Economic Analysis

The integration of stochastic modeling with methods of economic analysis enhances decision-making capabilities in energy companies and regulatory bodies. The proposed approach provides:

- justification of corporate cybersecurity strategies focused on efficiency;
- support for government regulators in adapting legal frameworks and standards to the conditions of energy digitalization;
- optimization of budget allocation aimed at protecting critical infrastructure.

Thus, economic cybernetics and mathematical modeling together form a unified toolkit that makes it possible to combine technical and managerial aspects.

10 Results and Discussion

The application of the model has made it possible to achieve the following results:

- formalization of cyber threats in probabilistic terms, enabling a shift from descriptive scenarios to quantitative assessments;

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- prediction of incident dynamics and cascading effects, including the escalation of local attacks into systemic crises;
- resilience assessment based on key metrics such as DIL, MTTR, MTTD, and the EUE analogue, which link technical failures with socio-economic consequences;
- identification of optimal investment strategies in protective measures, allowing risk reduction while ensuring rational use of resources.

The final findings demonstrate that the combination of economic cybernetics principles and stochastic analysis forms a methodology that enables a balance between innovation, cost, and the resilience of energy infrastructure.

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DIGITAL INNOVATION AND CYBER RISKS: A REAL CHALLENGE FOR BUSINESSES IN THE REPUBLIC OF MOLDOVA

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Abstract: Digital transformation has become a determining factor in competitiveness and sustainable business development at the global level. In the Republic of Moldova, digital innovation manifests itself in the form of the introduction of modern technologies such as cloud solutions, artificial intelligence, e-commerce, and fintech services, which open up significant opportunities for economic growth and expansion into international markets. However, alongside these advantages, the business environment is exposed to an increasingly complex range of cyber risks, from ransomware and phishing attacks to financial fraud and massive data leaks.

The purpose of this study is to analyze the impact of digital innovation on the business environment in the Republic of Moldova and the cyber risks associated with the digital transformation process. The research topic concerns how companies integrate modern technologies (cloud computing, e-commerce, fintech, artificial intelligence) and their degree of exposure to cyber threats. The methodology used consists of an analysis of specialized literature, the national and European regulatory framework, as well as reports on cybersecurity in the business environment.

The results of the study show that enterprises in the Republic of Moldova face serious challenges in ensuring digital security (lack of specialists, inadequate infrastructure, low awareness, incomplete regulations), which leads to vulnerability to cyber-attacks that result in financial losses and damage to reputation.

The findings highlight the need to strengthen the culture of cybersecurity, invest in innovative protection solutions, and promote cooperation between the public and private sectors to reduce vulnerabilities.

Keywords: innovation, cyber risks, information security, digital transformation, business Republic of Moldova.

JEL Classification: O32, O33, M15, K24.

1. Introduction

The modern economy is undergoing a significant digitalization phase, radically changing traditional business models, value chains, and consumer interactions. For the Republic of Moldova, which strives for economic integration with the EU and strengthening its position in the global economy, digital transformation is not only a trend but also a matter of strategic necessity. According to the Digital Economy and Society Index (DESI) 2023, Moldova is advancing in digitalization, moving up four positions compared to 2022 (Digital Economy and Society Index, 2023).

Technological innovations in fintech products, e-commerce platforms, cloud computing, and elements of artificial intelligence allow local businesses to optimize processes, enter new markets, and become more competitive.

However, this technological revolution also has a downside. The sudden transition to a digital world significantly expands the attack surface. Moldova is among the top 10 EMEA (Europe, the Middle East, and Africa) countries for attacks on Internet of Things (IoT) devices in 2023, according to a Kaspersky Lab report (Cyber Threat Statistics in the EMEA Region, 2023), indicating a high vulnerability of its digital infrastructure.

The rapid shift to digitalization during the pandemic has led to an explosive increase in cyber incidents—in 2020, their number increased by 45%, with an average annual increase of nearly 140 cyber incidents.

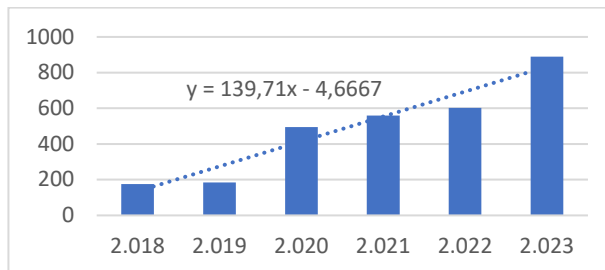


Figure 1. Trend in cyber incidents in Moldova for 2018-2023.

Source: elaborated by the author

Cybercriminals are using increasingly sophisticated methods, and Moldovan businesses, with limited resources and experience, are vulnerable prey. Financial losses, damage to business reputation, and data leaks are just some of the consequences of a successful cyberattack.

Therefore, the relevance of this study stems from the need to consider the dual impact of digital innovation on Moldovan businesses: on the one hand, as an engine of growth, and on the other, as a source of new and complex risks. The purpose of this study is to comprehensively examine this paradox and propose possible ways to minimize cyber risks to ensure sustainable growth for Moldovan businesses.

2. Cybersecurity Situation in the Republic of Moldova

In 2023, the National Cybersecurity Center reported 152 million cyberattacks, and 42% of small and medium-sized enterprises in Moldova suffered from phishing attacks (Report of Digital Transformation Strategy 2023-2030). The paradox of digital transformation in modern Moldova is that the active introduction of technological innovations — from the mass transition to cloud services to the explosive growth of e-commerce — is accompanied by the emergence of fundamentally new and increasingly sophisticated cyber threats.

However, along with these benefits for the business world, an increasingly sophisticated spectrum of cyberthreats is emerging. The Republic of Moldova is gradually making progress in the field of cybersecurity, especially considering its limited resources (GDP per capita is USD 5,700) (World Bank, 2024). Let's take a closer look at the case of the Republic of Moldova and its progress in cybersecurity.

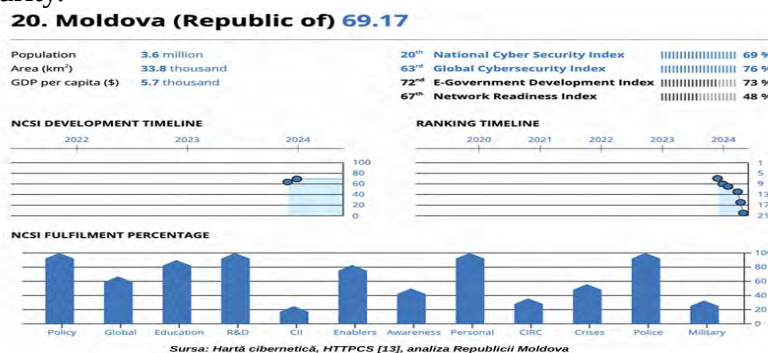


Fig. 2. Moldova's position in international cybersecurity rankings and fulfilment of NCSI indicators.

Source: (PISA, 2024)

Let us take a closer look at the situation in the Republic of Moldova and its progress in the field of cybersecurity. Taking into account the data presented in Fig. 2. The following achievements and strengths should be noted positively:

-
- 1. Steady improvement in positions in global rankings (PISA,2024)**
 - o National Cybersecurity Index (NCSI): 69.17% (69th place)
 - o Global Cybersecurity Index: 76% (63rd place)
 - o E-Government Development Index: 73% (72nd place)
 - 2. Dynamic development in recent years (NCSI Report RM, 2023)**
 - o According to the NCSI development schedule, a significant improvement in indicators is observed between 2022 and 2024
 - o Moldova moved up in the global ranking from 21st to 20th place
 - 3. High level of implementation of strategic indicators (Legea Nr. 48, NCSI Report RM, 2023, Armas Reismary , Taherdoost Hamed,2025)**
 - o Moldova demonstrates 100% implementation of key strategic objectives
 - o A national cybersecurity strategy has been developed
 - o Active participation in global cooperation
 - o Development of educational programs and advancement of scientific research
- At the same time, At the same time, it is necessary to highlight areas for improvement. These include (Network Readiness Index, 2023):
- 1. Network Readiness Index**
 - o The lowest score of all the indices – only 48%
 - o Therefore, it is necessary to invest in ICT infrastructure.
 - 2. Uneven development of different areas**
 - o Strategic indicators achieved 100%
 - o Some operational areas require more attention

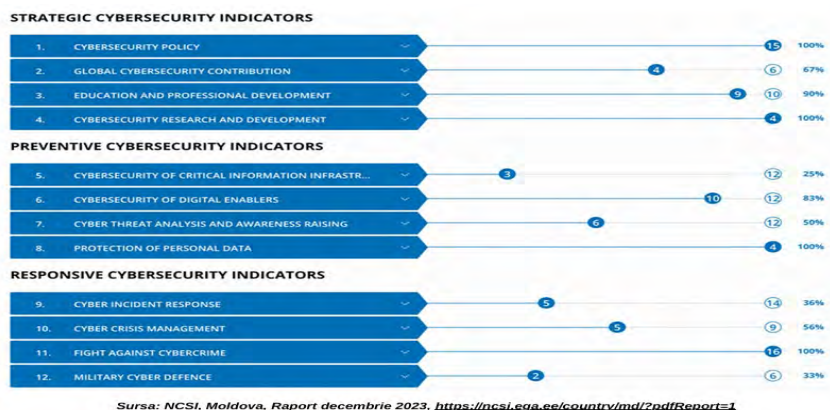


Fig. 3. Detailed assessment of Moldova's cyber resilience
Source: (PISA,2024)

Specific proposals for future growth (Armas Reismary , Taherdoost Hamed,2025):

- 1. Infrastructure development**
 - a. Increase investment in modernizing network infrastructure.
 - b. Build systems to protect critical information infrastructure.
- 2. Human capital development**
 - a. Expand cybersecurity training programs
 - b. Encourage research and development in cybersecurity.
- 3. International cooperation**
 - a. Actively participate in international efforts to ensure cybersecurity.
 - b. Adopt international best practices and standards.
- 3. The current cyberthreat situation for Moldovan companies**

Statistics show an increase in the number of cyberattacks on Moldovan enterprises (Report-Strategie, 2024):

1. **Ransomware:** Orange Moldova reports that in 2023, the number of ransomware attacks on enterprises increased by 85%. The average ransom amount ranged from €10,000 to €50,000.
2. **Phishing attacks:** These account for 91% of all cyberattacks. In 2023, a 45% increase was recorded compared to the previous year. According to the NCC report, 42% of Moldovan SMEs fell victim to phishing attacks in 2023. The success rate of such attacks was 18% for companies that did not implement email security systems. More than 1,000 phishing attempts against companies are registered monthly.
3. **DDoS attacks:** The number of attacks has increased significantly, with 250 attacks recorded in the first quarter of 2023 alone. The typical attack duration is 3–5 hours.
4. **APT attacks:** The number of sophisticated targeted attacks on key infrastructure is growing.
5. **Social engineering fraud:** In officially disclosed cases alone, BEC (business email compromise) attacks caused financial losses of over 25 million lei in 2023.
6. **Data leaks:** The number of reported data leaks increased by 60% in 2023, with 75% of all reported leaks occurring in the services and retail sectors.

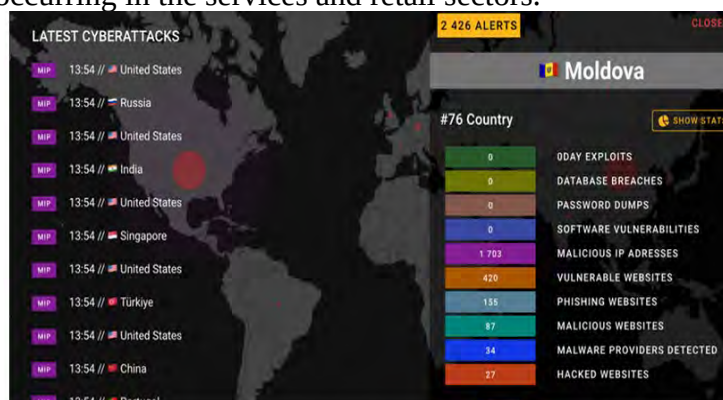
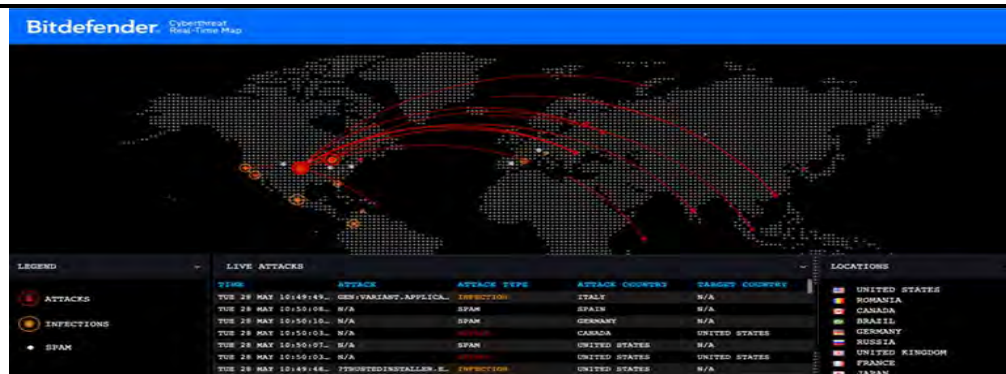


Figure 4. Operational situation: statistics and typology of cyber threats for the Republic of Moldova

Source: (HTTPCS Moldova,2024)

Moldova ranks 76th in the global cyber threat index. According to the presented image, three significant categories of such threats in Moldova should be distinguished (HTTPCS Moldova,2024):

1. **Critical threats:** Zero-day exploits, database breaches, password dumps
2. **Technical vulnerabilities:** Software vulnerabilities, malicious IP addresses, vulnerable websites.
3. **Web threats:** Phishing sites, malicious web resources, hacked websites, malware distributors.



Sursa: Bitdefender [5], Amenințări cibernetice, Hartă în timp real

Figure 5. Cyber activity monitoring: Moldova in a global context

Source: (HTTPCS Moldova,2024)

As a peer adversary, Moldova has a large number of threats (2,426 incidents) and a wide range of attack vectors, from phishing to zero-day exploits. Special attention should be paid to the international nature of threats (from the **USA** (main source), **Russia, India, Singapore, Turkey, Portugal** and **China**), which requires the immediate deployment of comprehensive protection, especially against web threats and data leaks. (HTTPCS Moldova,2024).

These indicators confirm the need to strengthen cybersecurity at both the company and national levels in Moldova.

4. Business Vulnerabilities in Moldova

Statistics show that every year, between 40% and 66% of small and medium-sized enterprises are attacked, with 43% of attacks directly targeting small businesses, which are considered the ‘weak link’ in the economic chain. (Orange Moldova, 2025)

The consequences of a successful cyberinteraction against a Moldovan company are multifaceted and typically catastrophic:

1. Economic Damage: The direct damage to a typical company from an attack range from 150.000 to 300.000 lei. Taking into account indirect losses (downtime, loss of customers), this amount can reach 1 million lei (Raport-Strategie, 2024).

2. Operational Losses: The average downtime after a ransomware attack is 3-5 business days. 25% of companies attacked are unable to recover all their data even after paying the ransom (Orange Moldova,2025).

3. Loss of reputation: According to a survey, 65% of customers are willing to switch service providers after their data has been compromised (Scoreboard 2023).

4. Legal risks: Since the GDPR came into force, Moldovan companies operating in the EU have reported 12 cases of fines totaling €850,000 (Rusweb, 2023). Research has identified systemic cybersecurity issues:

- o Staff shortages: A survey by the Association of ICT Companies confirms a shortage of around 1,200 cybersecurity specialists. 65% of companies struggle to attract talented security professionals (Forbes,2025).
- o Budget constraints: Only 15% of SMEs invest more than 5% of their IT budget in security, while international best practice is 10–15% .
- o Low awareness: According to an NCC survey, only 38% of Moldovan company employees learned about cybersecurity in the last year (Raport-Strategie, 2024).
- o Outdated hardware: 45% of companies still use Windows 7 and previous versions of the OS, which are no longer supported by the manufacturer (Rusweb, 2023).
- o Ineffective implementation of the regulatory framework: 32% of companies covered by the Cybersecurity Law fully implement its provisions.

The consequences of a successful cyberattack on a Moldovan company are multifaceted and often catastrophic. Direct financial losses associated with system restoration and ransom payments, operational losses due to business interruptions, irreparable reputational damage, and growing legal risks, all pose a complex challenge to the viability of the enterprise. It is worth noting that most local companies, including SMEs, are technically and financially unprepared for such incidents. The increased intensity and complexity of attacks remind us that cybersecurity is no longer simply a technological issue, but a strategic matter of business risk management.

In this context, effective government regulation capable of creating a unified, secure digital environment is becoming a decisive factor in stability. The state is becoming an important player in creating a secure digital environment, particularly in harmonizing legislation with European standards. Moldova has already taken several important steps in this direction:

- o **Europeanization of legislation** (NIS Directive, GDPR) (Rusweb, 2023).
- o **Law on Cybersecurity** Nr. 48 din 16-03-2023 (Legea Nr. 48)
- o **Establishment of the National Cybersecurity Center:** coordinating responses to cyber incidents, monitoring threats

The EU has provided Moldova with €15 million to improve cybersecurity under the EU4Digital program to address digital security issues and bridge the technology gap (EU4Digital Summit 2023).

Despite this success, strategic development of cyber resilience requires further concerted efforts. Key recommendations are macroeconomic (public policy) and microeconomic (for individual companies):

Recommendations for the government:

1. Create a cybersecurity reward system – tax incentives for businesses implementing secure innovations: provide tax incentives to SMEs investing in cybersecurity (the maximum tax incentive is up to 30% of cybersecurity investments for SMEs), increase the cybersecurity budget (in 2024, the budget will increase by 40% compared to 2023, reaching 85 million lei).

2. Strengthen educational infrastructure – increase the number of state-funded cybersecurity positions: increase the number of state-funded cybersecurity positions to 100 per year. Develop educational programs (to train 240 specialists in 2023, but this is only 20% of current demand).

3. Information Sharing Center: create a national ISAC (Information Sharing and Analysis Center) for businesses.

4. Audit Subsidies: subsidize 50% of the cost of independent cybersecurity audits for small and medium-sized businesses.

5. Expand international cooperation – collaborate with ENISA and NATO (gaining access to key resources and expertise), and learn from Romania's experience, which is particularly valuable for Moldova. Create a "digital bridge" between countries (joint exercises and training of CERT teams, threat intelligence coordination, joint educational programs, and unification of cybersecurity standards).

Recommendations for businesses:

1. Invest in core security practices – use multi-factor authentication and regularly back up data: using multi-factor authentication (MFA) reduces the likelihood of unauthorized access by 99%. Regular data backups allow you to recover data in 95% of ransomware attacks without having to pay the ransom.

2. Refocus security on innovation – security strategies focused on cloud-based structures, API connections, and open innovation.

3. Integrate security into innovation cycles – use the "security by design" principle when developing new digital products and services.

4. Developing cybersecurity competencies – regularly training employees on current cyber threats: companies that regularly train their employees face a 70% reduction in successful phishing attacks.

5. Creating a threat monitoring system – establishing a National Information Sharing Center (ISAC).

6. Creating a Security Operations Center (SOC): companies with a SOC detect incidents on average within 2 hours, compared to 14 days previously.

7. Cyber insurance risk: the cyber insurance market in Moldova grew by 200% in 2023, indicating increased threat perception.

Only in this way can a unified strategy combining government planning and enterprise security ensure the secure growth of Moldova's digital economy in the face of growing cyber threats.

To address digital security issues and bridge the technological divide, Moldova has received €15 million from the EU to strengthen cybersecurity as part of the “EU4Digital” program (EU4Digital Summit 2023).

Conclusions

The digital transformation of business in the Republic of Moldova is demonstrating steady growth, accompanied by the active implementation of various types of innovation. However, each innovation creates new vectors for cyberattacks. Along with technological progress comes a cause for concern: the growing gap between innovation and cybersecurity. According to the National Cybersecurity Center, 152 million cyber incidents were registered in 2023, and ransomware attacks increased by 85% (Raport-Strategie, 2024).

Organizations using open-source innovation and platform offerings are particularly vulnerable. At the same time, only 15% of small and medium-sized enterprises (SMEs) spend sufficient resources on security (IDIS,2025), posing a vital threat to the national economy. Statistics have shown that companies that invest in cybersecurity are 40% more resilient to crises (Cybersecurity in Moldova's SMEs,2025). To further improve the situation, all efforts should be focused on infrastructure development and the implementation of existing measures.

Business development in Moldova through digital technologies is becoming increasingly visible every day, but the gap between cybersecurity and innovation is enormous. Recent data shows that companies that invest in cybersecurity are 40% more resilient to crises.

Successfully overcoming cyber threats requires coordinated action by the government, businesses, and educational institutions. Cyber resilience should become a central aspect of business development policy in Moldova and the national economy as a whole, guaranteeing the safe implementation of digital innovations and sustainable economic growth.

Successful overcoming of cyber challenges is only possible through the joint efforts of the state, businesses, and educational institutions. Cyber resilience should be part of the development strategy of Moldovan businesses and the entire national economy as a security measure for the use of digital innovations and ensuring sustainable development.

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ANALYSIS PARETO–NASH–STACKELBERG SOLUTIONS IN SUGAR MARKET PRICING

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Abstract: Within the oligopolistic market, the decisions made by each company regarding price, production or marketing strategy directly influence the reactions and performances of competitors. In such an environment, characterized by a small number of participants and pronounced interdependence, producers frequently face complex decision-making problems, the solution of which directly determines the level of profit obtained. One of the most important strategic decisions is pricing, especially for companies that offer similar products, such as sugar, where competition is intense and differentiation is low.

The paper analyzes the strategic behavior of local sugar producers, considered as two main players, using the Bertrand model with limited capacity (Edgeworth, 1889) and discretized Bertrand model. These models provide a relevant framework for situations where companies compete on price but simultaneously face constraints related to production capacity, which complicates market equilibrium and a framework for equal production capacities that individually cover demand. In the proposed analysis, two possible pricing strategies are considered for each producer, and the results are evaluated in terms of profit obtained for each combination of decisions. In addition to the Nash and Stackelberg solutions in pure strategies, the solutions in mixed strategies are also determined by applying established algorithms that allow the identification of the set of Nash equilibria in mixed strategies (Ungureanu, 2017), the set of Stackelberg equilibria in mixed strategies (Lozan and Ungureanu, 2010), as well as the set of Pareto-Nash solutions in mixed strategies (Lozan and Ungureanu, 2012a) and the set of Pareto-Stackelberg equilibria in mixed strategies (Lozan and Ungureanu, 2012b). This approach provides a more detailed picture of how strategic interaction between sugar producers can lead to efficient outcomes for the entire market.

Keywords: mixed-strategy, graph of best response mapping, set of Stackelberg equilibria, set of Nash equilibria, set of Pareto-Nash equilibria, set of Pareto-Stackelberg equilibria

JEL Classification: C02, C61, C62, C65, C72, C79

1 Introduction

In oligopolistic markets, pricing strategy is an essential component of competitive policy. Setting the price level determines both the dynamics of demand and the distribution of market shares among participating firms. In the context of strategic interdependence, the decision of one firm directly influences the results of the other, which requires analysis using game theory models. In the classical form of Bertrand competition (Bertrand, 1883), firms can choose a continuous price in the interval $[c, \infty)$ (c – marginal cost), and the equilibrium reduces to the paradoxical situation of price equal to marginal cost and zero profit. Therefore, in order to reflect a different strategic dynamic than that in the classical Bertrand model and to perform a more realistic analysis of the interactions between producers, the discretized Bertrand model can be examined, used to describe markets in which prices are not completely flexible, but determined by conventional thresholds, trade policies or institutional constraints. The Bertrand model with limited capacities (Edgeworth, 1889) describes competition in terms of price choice for homogeneous goods, but they are constrained by the limits of their own production capacity. Determining the final outcome of the interaction between firms is relevant by identifying Nash (Nash, 1951), Stackelberg (Stackelberg,

1934), Pareto-Nash-Stackelberg (Lozan and Ungureanu, 2011) equilibria, both in pure and mixed strategies. The importance of this approach lies in the ability to evaluate the conditions of coordination and conflict in the market and to estimate possible levels of profit. Thus, research on pricing strategies within duopolies or oligopolies provides theoretical and applied support for economic decision-making and for the substantiation of competition policies.

2 The sugar market in the Republic of Moldova

The general model of price competition can be customized to analyze the interactions between sugar producers in the Republic of Moldova. The sugar market in the Republic of Moldova is dominated by a small number of large producers. Prices have fluctuated significantly, influenced by domestic production, imports and regulations, and the sector has shown a downward trend, highlighted by the reduction in the volume of processed beet and, implicitly, sugar production. Although Moldovan producers can export sugar, especially under preferential quotas to the European Union, export volumes remain limited, and in recent years the Republic of Moldova has become, to a large extent, a net importer of sugar, due to the decrease in domestic production and the reduced capacities of local factories. If in favorable years domestic production largely covered national consumption, currently it varies between 60 and 100 thousand tons annually, while domestic demand is approximately 75–80 thousand tons (AgroExpert, 2024). For example, in 2024, about 293 thousand tons of sugar beet were harvested (BNS, 2025), which allowed obtaining approximately 32 thousand tons of sugar, an insufficient level to satisfy consumption, the deficit being covered by imports and the use of existing stocks, estimated at 18 thousand tons (Știri.md, 2024). Figure 1 shows the sugar beet harvests for the period 2021-2024.

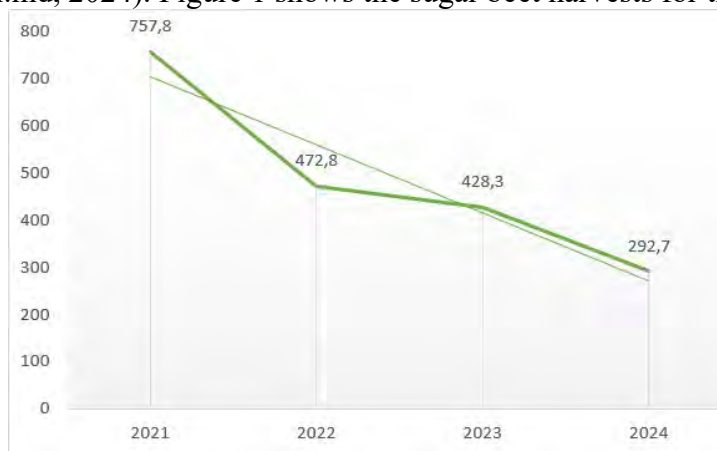


Figure 1. Sugar beet production for 2021-2024 in thousand tons.

Source: Created by the author based on data from (BNS, 2025).

These fluctuations are determined by both climatic factors and the production capacities of domestic factories, which generates structural instability in the market and emphasizes the importance of pricing strategies and trade policies in maintaining the balance between supply and demand.

The paper aims to investigate the scenario in which two sugar factories, called factory A and factory B, have equal capacities, sufficient to fully cover the fixed demand of 6,500 tons per month, and adopt two alternative price levels: a high (H) and a low (L). The analysis aims to maximize profit, subsequently introducing a second profit function, associated with market share, which is subject to the same maximization objective. In this framework, the Pareto-Nash-Stackelberg solutions (Lozan and Ungureanu, 2011) are determined in both pure and mixed strategies. Another scenario analyzed is the one in which the individual production capacity is not sufficient to cover the total demand. The results obtained provide a rigorous perspective on how

production capacity, price level and market structure influence the strategic behavior of the factories.

3 The strategic behavior of factories with equal production capacities

We analyze the scenario in which two sugar factories (A and B), with equal production capacities, can individually satisfy the entire fixed monthly demand of $Q=6500$ t/month. The marginal cost of production is $c=15000$ lei/ton. Each factory has two alternative pricing strategies: a high level ($H=18000$ lei/ton) and a low level ($L=16000$ lei/ton). The factory that charges the lower price covers the entire demand, while the other one sells nothing. If both charge the same price, the demand is distributed symmetrically, respectively $q_A = q_B = \frac{Q}{2} = 3250$ tons. The objective of each factory (player) is to maximize the profit. The profit is expressed through the relationship $\pi_i = (p_i - c)q_i$, where $i \in \{A, B\}$, p_i represents the price charged by the factory i , c is the marginal cost, and q_i – sold quantity. The Table 1 presents the profit values for the possible situations.

Table 1. The possible situations and the profit obtained by each factory.

	B	H	L
A			
H		9750000, 9750000	0, 6500000
L		6500000, 0	3250000, 3250000

Source: Created by the author based on problem data.

In the Table 1 are presented on horizontally the pricing strategies of player A, and on vertically those of player B. Each cell contains the profits in lei obtained by A and B in the same situation, separated by a comma.

The Nash equilibrium in pure strategies is (H, H) and (L, L) with the payoffs (9750000, 9750000) and (3250000, 3250000), respectively. When player A chooses strategy H, it is optimal for player B to adopt strategy H, and vice versa. This generates a stable and profitable situation for both factories, since neither has an incentive to unilaterally reduce the price, a possible reduction would secure the entire market, but would lead to a decrease in total profit. Similarly, if player A chooses strategy L, player B's rational response is also L, since any unilateral deviation to H would lead to a loss of sales and a zero profit. The Nash solution set in mixed strategies (Ungureanu, 2017) – a probabilistic distribution on the set of pure strategies, whereby a player chooses each pure strategy with a certain probability – is $\{(0, 0), (\frac{1}{2}, \frac{1}{2}), (1, 1)\}$, represented graphically in figure 2.

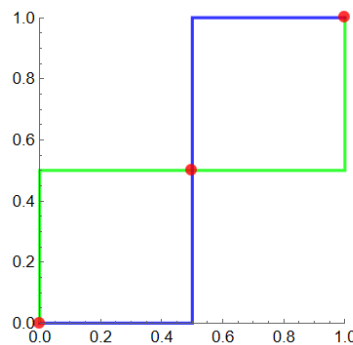


Figure 2. Players' best-response mappings and mixed-strategy Nash equilibria.

Source: Created by the author based on the problem data.

The solution in mixed strategies $(\frac{1}{2}, \frac{1}{2})$ assumes that each player chooses strategy H with probability $\frac{1}{2}$ and strategy L with probability $\frac{1}{2}$. At the market level, there is no deterministic outcome, but a situation of probabilistic equilibrium. No player has an incentive to unilaterally

deviate from this distribution, since any deviation would lead to a lower expected gain. The equilibrium expresses a strategic uncertainty, each player randomly selects between the high and low price, which can be interpreted as a form of average stability, in which the profit is maintained at a constant expected level, and the risk of loss is mitigated.

The Stackelberg solution in pure and mixed strategies (Lozan and Ungureanu, 2010) coincide - the situation (H, H) with the profits (9750000, 9750000). Player A is considered to occupy the position of leader, although the role could be assumed by any of the players. The leader makes the decision first, and the follower reacts optimally. The high price becomes the natural coordination, with both players obtaining high profits and sharing the demand. The equilibrium highlights the advantage of the first player and suggests an implicit strategic alignment induced by the sequential structure of the game.

Next for each player is introduced a second payoff function corresponding to the market share held, expressed in monetary terms. The objective of each producer is to increase market share while maximizing profit.

Taking into account the initial data:

the reference price is 17000 lei/ton;

market value at this price: $R_{ref} = 17000 \text{ lei/ton} \times 6500 \text{ tons} = 110500000 \text{ lei}$,

monetary value of market share: $V_i = q_i / Q \cdot R_{ref}$, where $i \in \{A, B\}$, Q - demand, and q_i – sold quantity.

Table 1 is modified, the game from table 2 is obtained.

Table 2. The possible situations and payoffs for players A and B depending on profit and monetary value of market share.

A	B		L	
	H	L	H	L
H	(9750000, 55250000)	(9750000, 55250000)	(0, 0)	(6500000, 110500000)
L	(6500000, 110500000)	(0, 0)	(3250000, 55250000)	(3250000, 55250000)

Source: Created by the author based on problem data.

Table 2 shows horizontally the gains obtained by factory A, and vertically - the gains obtained by factory B. The first pair of monetary values in the table cells represents the utilities obtained by factory A in the respective situation, and the second pair the utilities obtained by factory B in the same situation.

The Pareto-Nash solution in pure strategies (Lozan and Ungureanu, 2011) is (H, H) and (L, L). For both players it is rational to choose the same pricing strategy as the competitor, thus ensuring their profit and sharing the market equally.

The determination of the set of Pareto-Nash solutions in mixed strategies, taking into account the data in Table 2, is performed using the algorithm described in (Lozan and Ungureanu, 2012a) for dyadic bicriteria games. The results of the calculations are presented in Figure 3. Figure 3a represents the graph of efficient responses application of factory A, Figure 3b – the graph of efficient responses application of factory B, Figure 3c – the Pareto-Nash solution in mixed strategies (intersection of the players' graphs.)

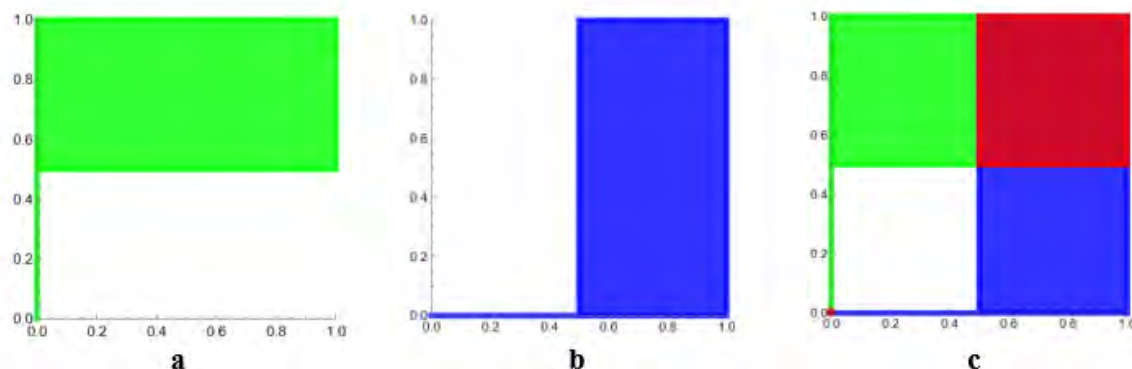


Figure 3. Graphs of efficient responses applications of factories and the Pareto-Nash solution set.

Source: Created by the author in Wolfram Mathematica.

The set of Pareto-Nash solutions in mixed strategies is

$$\{(0,0)\} \cup \{(\frac{1}{2}, \frac{1}{2}), (1, \frac{1}{2}), (1,1), (\frac{1}{2}, 1), (\frac{1}{2}, \frac{1}{2})\}.$$

The solution indicates that several equilibrium states can coexist in the market, from competition based on low prices to coordination at high price levels or strategic combinations, which highlights the multiple and uncertain nature of competitive equilibrium.

In the case of determining the set of Pareto-Stackelberg solutions (Lozan and Ungureanu, 2011), assuming that A is the leader, in pure strategies the situation (H, H) is obtained. As in the case of the game with a single payoff function, the leader dictates the price, it is not rational for factory B to choose the low price, it will win the market, but the profit will be lower than in the case of the high price.

The algorithm in (Lozan and Ungureanu, 2012b) is used to determine the set of Pareto-Stackelberg equilibria in mixed strategies. Taking into account the data in table 2, the results presented in figure 4 are obtained.

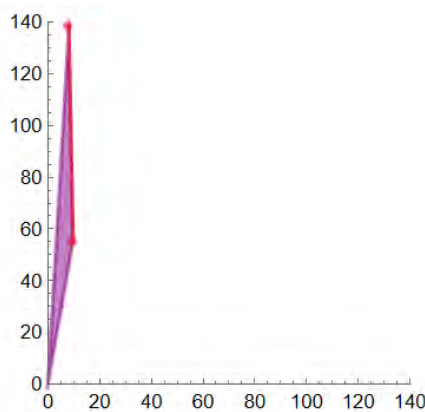


Figure 4. Image of the graph of the application of efficient reactions of factory B in the criteria space of factory A.

Source: Made by the author in Wolfram Mathematica.

The set of Pareto-Stackelberg solutions in mixed strategies is the segment $[(\frac{1}{2}, 1), (1,1)]$. The result highlights that, within the sequential game, the Pareto-Stackelberg equilibrium gives the leader a margin of strategic flexibility in choosing the probability associated with the high price, without affecting the Pareto efficiency conditions. This situation reflects a strong tendency of coordination towards high price levels, which reduces the intensity of competition and contributes to maintaining the stability of profits in the market.

4 The strategic behavior of factories with different capacities

The scenario analyzed in the previous paragraph is modified by establishing different production capacities of the sugar factories (factory A – 3500 t/month, factory B – 4000 t/month), but together they satisfy a fixed monthly demand of $Q=6500$ t/month. The marginal cost of production remains $c=15000$ lei/ton. Each factory has the same alternative pricing strategies: a high level ($H=18000$ lei/ton) and a low level ($L=16000$ lei/ton). The factory that adopts the lower price strategy sells all available stock, the other covers the remaining demand. If both practice the same price, demand is distributed proportionally to capacity, respectively $q_A = 3033$ tons, $q_B = 3467$ tons. The objective of each factory is to maximize profit. Table 3 presents the profit values for possible situations.

Table 3. The possible situations and the profit obtained by each factory in the scenario with different production capacities

	B	H	L
A			
H	9099000, 10401000		7500000, 4000000
L	3500000, 9000000		3033000, 3467000

Source: Created by the author based on problem data.

The Table 3 presents horizontally the profits in lei obtained by A and vertically - the profit obtained by B in the same situation, separated by a comma.

Based on the data in Table 3, it is found that the high-price strategy is a dominant strategy for both players. The situation (H, H) maximizes aggregate profit, and neither player has the motivation to unilaterally deviate towards a low price, since capacity constraints limit the quantity sold and reduce the profit obtained. In the respective scenario, the Nash solution and the Stackelberg solution, both in pure and mixed strategies, coincide - (H, H), with a profit of (9099000, 10401000).

If the second profit function for factories is introduced, which reflects the market share, then the utilities in Table 4 are obtained, horizontally – the utilities of factory A, and vertically – the utilities of factory B.

Table 4. The possible situations and gains for players A and B depending on profit and monetary value of market share in the scenario with different production capacities

	B	H	L
A			
H	(9099000, 51561000)	(10401000, 58939000)	(7500000, 42500000)
L	(3500000, 59500000)	(9000000, 51000000)	(3033000, 51561000)

Source: Created by the author based on problem data.

Analyzing the data in Table 4 and based on (Lozan and Ungureanu, 2011), all possible situations in pure strategies are Pareto-Nash solutions. The set of Pareto-Nash equilibria in mixed strategies, determined by applying the same algorithm as in the previous scenario, coincides with the square $[0,1] \times [0,1]$. Any strategy leads to a state in which profits and market shares cannot be simultaneously improved for both actors, a balanced but strategically unidentifiable market. Players can make the choice for any possible situation.

The set of Pareto-Stackelberg equilibria in pure strategies, if the player with the higher production capacity is considered the leader, consists of all possible situations in Table 4. The solution is the same when the player with the lower production capacity is in the leading position. In the case of determining the set of Pareto-Stackelberg equilibria in mixed strategies, the same reasoning and algorithms are applied as in the previous scenario. The segment $[(1, 0), (1, 1)]$ is obtained. The obtained solution indicates that the player in the leading position has full strategic freedom in choosing the probability associated with the high-price strategy, while the successor

player is constrained to opt with certainty for the same strategy – high price. This reflects an asymmetry of roles, the leader benefits from flexibility and coordination power, and the deterministic reaction of the successor ensures the stability of the results. From an economic point of view, the solutions segment suggests a robust tendency to maintain high prices in the market, which reduces competitive intensity and favors the maximization of aggregate profits, approaching an implicit coordination mechanism generated by the sequential game structure.

5 Conclusion

The correct choice of a pricing strategy ensures the increase of profits and the expansion of market share. The comparative study of the two analyzed scenarios – with equal and, respectively, different production capacities – highlights the role of the capacity structure on the strategic behavior of players in the market. In the situation of equal capacities, the results show that the competitive interaction generates multiple types of equilibrium, including mixed strategies, which reflects a strategic flexibility and the possibility of adjusting decisions in a way that maximizes collective profits, without the need for an explicit agreement. In contrast, when capacities differ, the high-price strategy emerges as dominant for both players, which reduces uncertainty and leads to the stabilization of the market around a higher price level.

The structure of production capacities directly influences the nature of competitive equilibria and, implicitly, market dynamics. The Pareto-Nash-Stackelberg results obtained contribute to a deeper understanding of how firms adapt their strategic decisions in oligopolistic competition contexts and provide useful benchmarks for the substantiation of managerial strategies and regulatory policies.

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PROSPECTS FOR THE INTRODUCTION OF ARTIFICIAL INTELLIGENCE TO DETECT AND BLOCK CYBER THREATS IN THE FINANCIAL SPHERE OF THE MINISTRY OF INTERNAL AFFAIRS

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Abstract: The modern financial and economic processes within the Ministry of Internal Affairs of Ukraine face increasing complexity and exposure to sophisticated cyber threats. Traditional protection methods, including antivirus programs, filtering systems, and firewalls, have become insufficient due to the dynamic and targeted nature of contemporary cyberattacks. In response, the implementation of artificial intelligence (AI) and machine learning (ML) technologies has emerged as a critical approach for detecting, predicting, and mitigating threats in the financial sector. AI-based systems, including neural networks, enable intelligent decision support by analyzing user behavior, detecting anomalies, and forecasting risks in real time, thereby reducing the incidence of fraud, money laundering, and unauthorized access. Research has demonstrated that modeling antagonistic agent behavior and integrating adaptive AI systems can significantly decrease hybrid threat implementation, financial losses, and incident response time. The application of AI in public-sector financial operations involves automated monitoring of payments, contracts, and public procurement, as well as verification of counterparties and anomaly detection in transactions. Technical implementations employ flow analytics, graph models, behavioral profiling, and deepfake detection, supported by human-in-the-loop operational models. Compliance with regulatory and ethical standards, particularly the NIST AI Risk Management Framework, ensures transparency, reliability, and explainability of AI decisions. Challenges include high-quality data requirements, cost of implementation, offensive AI threats, and regulatory adherence. Pilot projects for AI/ML-based financial threat detection demonstrate the potential for rapid anomaly identification, improved fraud prevention, and enhanced overall financial security. Integrating intelligent systems thus strengthens the cyber resilience of the Ministry of Internal Affairs, supporting both operational efficiency and strategic risk management.

Keywords: AI strengthens MIA financial cyber security.

JEL Classification: G21, G28, G32, O33, C45

The modern development of financial and economic processes in the system of the Ministry of Internal Affairs of Ukraine is accompanied by an increase in the number and complexity of cyber threats. Traditional methods of protection (antivirus programs, filtering systems and firewalls) are increasingly insufficient as cyberattacks become more targeted, dynamic and technologically sophisticated. In this context, the introduction of artificial intelligence (AI) and machine learning technologies to detect, predict and block threats in the financial sphere is relevant. The application of neural networks in the intelligent decision support system at the enterprise is described in (Synytsina et al., 2022; Synytsina et al., 2019). Based on the results of the study, an analysis model was formulated and practical aspects of the application of neural networks (NM) in the marketing information system (MIS) of the enterprise were considered in order to improve the information system of the enterprise by implementing an intelligent decision support system (ISDS) using a neural network (Synytsina et al., 2022; Synytsina et al., 2019). The authors of the paper (Milov et al., 2020) propose the Concept of modeling the behavior of interacting agents, the basis of which is a three-level structure of modeling subjects and business

processes in the contours of the functioning of the organization and the security system. This concept is based on modeling the behavior of antagonistic agents. The financial sector is one of the most vulnerable to cyber threats, fraudulent operations and abuse. A large number of transactions are processed every day, creating significant risks of unauthorized access, data falsification or manipulation. Traditional methods of control are gradually losing effectiveness due to the growth of information volumes and the complexity of attacks, therefore the use of artificial intelligence (AI) and machine learning technologies is becoming more and more relevant. AI-based systems automatically monitor every financial transaction, detecting unusual or risky actions in real time, allowing you to instantly block suspicious transactions. Machine learning is used to build models that analyze user behavior and detect deviations from normal patterns, allowing fraud and money laundering to be detected. Such systems help in the fight against phishing, forged payment documents and illegal transactions.

Intelligent algorithms are able to predict the probability of financial threats, based on historical data and current trends. This creates a basis for strategic risk management and allows forecasting of financial risks. AI is used to analyze logs, network traffic and user behavior, which allows for faster detection of hacking attempts and information leaks. The use of adaptive protection systems increases the reliability of saving personal and official data and contributes to the cyber protection of financial data. Artificial intelligence helps monitor compliance with regulatory and legal requirements in financial activities. This simplifies internal audits and reduces the risk of human error and automation of compliance and auditing. The main advantages of using AI-based systems include: increasing the accuracy of fraud detection; reduction of response time to incidents; reduction of financial losses; improving trust in financial transactions; the possibility of working with large volumes of data. At that time, it is necessary to note the main challenges of implementation AI-based systems, namely: the need for high-quality training datasets; the risk of false positives; high cost of developing and supporting AI solutions; the need to comply with legal requirements for the protection of personal data. Based on the results of a retrospective analysis of literary sources, the following research areas of AI-based systems were identified, namely:

- AI has already become the standard in financial fraud management. 2025 surveys and industry overviews record that most financial institutions are already using AI for fraud detection, AML/sanctions checks and transaction monitoring. Emphasis is on the transition from static rules to models that learn from streaming data, reducing false positives and speeding up response (Feedzai, 2025; Threatmark, 2025; IBM, 2025).

- Threats evolve thanks to "offensive AI" (deepfakes, generative content, automated phishing). European reports for 2024-2025 highlight the massive use of AI by criminals for phishing, defrauding payment systems and bypassing anti-fraud controls. This directly affects online payments, public procurement and internal financial processes of state bodies (Europol, 2024).

- The global context of risks: geopolitics + the growing complexity of the landscape. The WEF-2025 reviews note the overall complexity of cyberspace and the need for a systemic approach to cyber resilience, where AI is a key element of detection/response in the financial sector (World Economic Forum, 2025).

- Practical cases and platforms. The market is booming with AI solutions for AML/fraud (real-time, graph models, behavioral analysis). For the public sector, this means the possibility of connecting modules to financial systems (budget payments, treasury operations, purchases) for the purpose of fraud prevention.

- AI Risk Management Standards and Guidance. In the deployment of public AI solutions, it is critical to adhere to the risk management framework (NIST AI RMF 1.0): transparency, reliability, manageability, auditability of models, as well as compliance with cybersecurity and privacy requirements (National Institute of Standards and Technology, 2023a, 2023b).

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- Effect and metrics. Industry reviews and materials from business practices note a significant increase in the effectiveness of fraud detection and prevention thanks to AI (reduction of false positives, faster decision-making). For state bodies, this translates into smaller budget losses and more prompt blocking of risk payments (BusinessInsider, 2025).

The implementation of artificial intelligence technologies in the financial and economic activities of the Ministry of Internal Affairs has a number of applied directions that determine the priorities of digital transformation. The primary areas of application are: automated monitoring of payments and contracts (in particular, public procurement), detection of anomalies in registers of payments, business trips and wages, verification of counterparties in accordance with Know Your Business/Know Your Customer (KYB/KYC) procedures, as well as anti-fraud mechanisms for business cards and cash transactions. The technical focus of the implementation is focused on the application of flow analytics, graph models for the detection of hidden connections, the construction of behavioral profiles of users and suppliers, the use of anomaly detection algorithms, as well as deepfake content detectors in order to protect payment processes and communications. The operational model of functioning involves the combination of incident monitoring and response centers (SOC analytics) with a financial control system in the human-in-the-loop format, which provides the possibility of escalation of complex cases. Regular retraining of models, support of catalogs and registers of signs of fraud, as well as standardized response scenarios (playbooks) are integrated into it. Aspects of governance and compliance cover the formation of data management policies (quality assurance, access and logging), compliance with NIST AI RMF recommendations, audit of training data, control and reduction of the influence of model biases, as well as ensuring the explainability of decisions for the needs of lawyers and auditors. The key indicators of success are the speed of blocking suspicious transactions, reducing the frequency of false positives, the amount of averted financial losses, reducing the time of investigation of incidents, as well as expanding the coverage of risk scenarios. Analysis of modern publications allows us to single out a number of key barriers and risks accompanying the use of artificial intelligence technologies in the field of financial and economic security of state institutions. Above all, data quality and manageability remain a critical constraint to scaling AI-based anti-fraud systems in the public sector, as evidenced by research from leading analytics platforms such as Feedzai. The second major challenge is adapting to the growing wave of offensive-AI — the use of generative models by attackers to create deepfake voices and videos, as well as falsified content for the purpose of invoice fraud. Countering these threats requires specialized detectors and an established mechanism for constant exchange of indicators of compromise between law enforcement agencies, which is emphasized in Europol reports. Special attention needs to be paid to regulatory and ethical compliance, which includes the introduction of internal processes for assessing the impact of AI systems, keeping decision-making logs, as well as mechanisms for challenging automated decisions. These aspects are consistent with NIST's recommendations for artificial intelligence risk management. Considering the above, the author proposes a "Pilot system for detecting and blocking cyber threats in the financial sector using AI/ML". The purpose of this project is to deploy and test in production conditions an AI-based system for detecting anomalies and fraud in operations with state payments (contractors, business trips, salaries), with integration into the existing SOC and the "human-in-the-loop" process. Expected result: reduction of risky transactions and financial losses, reduction of response time. For the implementation of the project, it is proposed to consider a rather narrow area of research, namely: monitoring and detection of anomalies in payments to contractors within one division/region (for example, procurement management). The effective application of artificial intelligence technologies reveals not only technical advantages, but also significant challenges related to risk management, compliance with ethical norms and regulatory requirements. To ensure trust and transparency in the functioning of AI-based systems, it is necessary to use internationally recognized methodologies. In particular,

the NIST AI Risk Management Framework (AI RMF) offers a comprehensive approach to risk assessment, decision logging, and model auditability.

The issue of personal data protection is of particular importance. Recommended approaches are anonymization and pseudonymization of data in training sets, which minimizes the risk of unauthorized access to sensitive information. At the same time, it is necessary to adhere to the principles of transparency (explainability), using tools such as SHAP or LIME to explain model solutions. This allows users and auditors to understand the logic of how algorithms work and reduces the risk of bias in decision-making. An important direction is the development of data retention and logging policies that must comply with local legislation on the protection of personal data (PDP). Implementation of such approaches creates a basis for compliance with ethical standards and legal requirements, as well as ensures controllability and accountability of systems.

The use of intelligent systems is of particular importance in the context of the financial security of the Ministry of Internal Affairs, where sensitive data are processed and payments are made, which depend on the stability of the functioning of the units. Artificial intelligence has significant potential to strengthen financial cyber security in the MIA system. Its integration into the processes of monitoring and protection of financial transactions will reduce the risks of fraud, increase the efficiency of response to incidents and create the basis for the formation of reliable digital security in the future.

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PROBLEMS OF INTERCONNECTIVITY AND FUNCTIONING OF GOVERNMENTAL INFORMATION SYSTEMS IN THE REPUBLIC OF MOLDOVA

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Abstract: This paper analyses the complex challenges delaying effective interconnectivity and maximum effectiveness of government information systems within the Republic of Moldova. In spite of enormous national efforts and considerable foreign assistance in direction of digitalization, widespread troubles still hinder full achievement of a citizen-oriented, effective, and transparent digital state. The paper examines the serious technical and data interoperability deficits, including system fragmentation, redundant data, and a serious absence of standardized data streams and quality controls. The article also looks at the policy and legal environment and mention the imperative for wholesale overhauls, in particular to stay up to speed with today's EU data protection frameworks such as GDPR, and to develop a sound data governance agenda. Organizational and institutional obstacles, such as entrenched silo mentality, resistance to change, and insufficient inter-agency coordination, are identified as central barriers. Concurrently, human capital deficits, such as deficits in public administration key skills and persistent digital literacy deficiency among citizens, accompanied by an endemic dearth of public trust in online government services, are seen as fundamental determinants of adoptions and effectiveness constraints. The article claims that all these systemic problems weaken public service provision and delay Moldova's integration into the European Union's digital single market. Based on a critical assessment of recent World Bank, UNDP, OECD, ITU, and European Commission reports, the paper offers a set of recommendations. These entail advocating strategic policy and legal reforms, constructing current technology infrastructures like MConnect and MCloud, constructing institutions' capacities through a Chief Data Officers' network and cross-agency collaboration, and institutionalizing specific human capital development and digital inclusion programs.

Keywords: Governmental Information Systems, Interoperability, Data Governance

JEL Classification: O33, H83

1. Introduction

1.1. Contextualization of Moldova's Digital Transformation Journey and its Strategic Importance

The Republic of Moldova has deliberately prioritized digitalization, starting its e-governance journey in 2010 (TalTech, 2020; OECD, 2023; World Bank, 2011a). The initiative has been considered a main vehicle for achieving the United Nations Sustainable Development Goals, while modernizing public sector governance, creating a more inviting investment climate, and addressing corruption (TalTech, 2020; World Bank, 2011b). Moldova has developed a strong digital backbone over the past ten years, achieving **98%** 4G coverage and rolling out a complete range of e-Governance services. This has provided a foundation and opened up the economy for concurrent growth of the Information and Communications Technology (ICT) sector, which now approaches **7%** of GDP in Moldova (ITU, 2021; UNDP, n.d.).

The strong commitment to digital development is demonstrated by continuing work on the Digital Transformation Strategy (MDTS) 2023-2030 (OECD, 2023; UNDP, n.d.; Moldovan Ministry of Economic Development and Digitalization, 2023). This Strategy is oriented towards systemic whole-of-society transformation and is directly linked with Moldova's European

integration agenda (ITU, 2021; UNDP, n.d.). International partners such as the World Bank, the European Union (EU) and the United Nations Development Program (UNDP), among others, are investing their own resources and expertise to support Moldova's EU aspirations and digital development trajectory (Moldovan Ministry of Economic Development and Digitalization, 2023; European Commission, 2025a; European Commission, 2025b; European Commission, 2026; TalTech, 2020; UNDP, 2024; EU Neighbors East, n.d.).

1.2. Problem Statement: The Critical Need for Effective Interconnectivity and Functioning of Governmental IT Systems

Despite significant spend on digital public infrastructure and e-government architecture, Moldova continues to grapple with efficiency, if not outright functionality, of inter-operability among governmental data systems. (World Bank, n.d.a). The movement to cloud service and, more broadly, the processes of exchanging data have also been plagued by fragments (World Bank, n.d.a). The frustrating irony is that this is a nation with substantial investments in developmental digital infrastructure, including a comprehensive ecosystem of internet access and significant use of cloud platforms. Moldova - as a unit of government that is investing heavily into a comprehensive digital public infrastructure - struggles with various forms of functionality and interconnectivity of internal governmental systems (UNDP, n.d.; World Bank, n.d.a; UNDP, 2024). On the surface, it would appear that the needed technology conduits are more or less present. Additional local layers of integration and co-ordination - specifically at the application and operational layers - seem to be less than fully developed. It seems that the factors preventing actual integration into a comprehensive digital ecosystem that will allow for seamless inter-operability go beyond what current technologies are available or even usability of technologies, but rather at least a combination of policy implementation gaps, institutional behaviours and human actors that limit the final connection to a fully functioning digital ecosystem. Ironically, the emphasis on "e-transformation" may see the building of and availability of technology replace "interconnectivity" with digitization of individual services resulting in neither comprehensive or integrated - in fact it has generated a disjointed digital environment instead of more comprehensive and integrated functionality.

The issue largely resides with the fact that fragmentation of information systems creates inefficiency, duplicated input, and a general lack of standardized data flows used by governmental information systems (World Bank, n.d.a; UNDP, 2024). These constraints also limit the quality, ease of access, and timely responsiveness of public service delivery by the government, while limiting its capability and effectiveness for serving its citizens.

1.3. Research Objectives and Layout of the Article

The aim of this paper is to undertake an in-depth analysis of the four major technical, legal, institutional, and human capital barriers which inhibit connectivity and effectiveness of government IT systems in the Republic of Moldova. In addition, it will assess the multiple implications it has on public administration and national development (and efforts for EU integration). And finally, a set of recommendations will be provided to promote integration and responsiveness of digital government to citizens. The following sections include the first part of the paper, which will describe the historical background of e-governance in Moldova and initiatives, and then delve deeper into these barriers while detailing their implications, framing recommendations, and conclude with a forward-looking perspective.

EU integration provides both a strong external motivation as well as a considerable measuring stick, against which to measure Moldova's digital prowess. Repeated reference of meeting EU standards (especially with regards to cybersecurity, roaming, electronic signatures) (Moldovan Ministry of Economic Development and Digitalization, 2023; European Commission 2025a; European Commission, 2025b; European Commission, 2026; TalTech, 2020; UNDP, 2024; EU Neighbors East n.d.) gives a sense that there are wider implications beyond efficiencies of

admin to strategic geo-political significance. In the end, the inability to develop seamless interoperability and manage data governance may mean that Moldova will not be accepted into the EU which elevates the challenges of IT systems, beyond a merely administrative issue, to national commitment.

2. Background: Moldova's E-Governance Landscape and Key Initiatives

2.1. Overview of the Development of E-Governance Initiatives

In 2010 Moldova launched the e-governance journey with the introduction of the e-Governance e-Transformation initiative (TalTech, 2020; World Bank, 2011a). The early phase of e-governance was heavily supported, most notably with the World Bank Governance e-Transformation (GeT) project which provided \$20 million of initial investment starting in 2011 (World Bank, 2011a; World Bank, 2011b). The GeT project ultimately aimed to modernize and increase the quality of governance in the public sector, provide a better investment climate, and improve transparency. A key activity for the GeT project was contributing towards the establishment of the e-Government Center whose mission was to oversee government-wide e-transformation initiatives (World Bank, 2011a; World Bank, 2011b). A fully fledged e-governance framework was formed within four years of launching (TalTech, 2020).

2.2. Main Digital Platforms and Strategic Initiatives

For e-governance, Moldova has developed and implemented various important digital platforms and strategic projects. The **M-Cloud Platform**, launched in 2013, is described as a common technology platform intended to unify a broad range of separate, independent data centers into a common, shared infrastructure (World Bank, 2011b; e-Gov.md, 2013). The intent of this was to help decrease expenditures related to IT and enhance the overall quality of data management, while improving information security from unwanted incidents when multiple institutions use common applications within a single, shared data center (World Bank, 2011b; e-Gov.md, 2013). By 2019 the adoption index for e-services supported by the World Bank (including MCloud) was 75% or greater at the highest foundational level (World Bank, 2019).

The **MConnect Platform** (known as the Government Interoperability Platform) began in 2014 (TalTech, 2020), and its primary function is to enable the real-time exchange of data between various public authorities (e-Gov.md, n.d.; UN Moldova, 2020). The strategic goal of the MConnect will drastically contribute to the efficiency and quality of public service delivery, therefore stopping citizens, and businesses, from having the requirement of submitting physical documents repeatedly (e-Gov.md, n.d.; UN Moldova, 2020). As of 2019, MConnect connected 48 institutions, which increased to cover **71 institutions by 2021** (ITU, 2021; UN Moldova, 2020).

Together with these digital platforms, Moldova also developed and continues to effectively utilized a range of other technological solutions. This includes **MPay**, a government online payment service which processed almost 20 million transactions by 2021 (TalTech, 2020; ITU, 2021); **MSign**, an electronic signatures service, which verifies the originality and authenticity of a signature (TalTech, 2020; ITU, 2021); **MPass**, a mobile signature service (ITU, 2021); **e-Visa**; and the Citizens Government Portal (**MCabinet**), a portal for citizens to be able to see their official information about them (TalTech, 2020; ITU, 2021).

Moldova developed an **Open Data Portal** (date.gov.md) in 2011 and was one of the first countries in the area to do so (World Bank, 2011b). The Open Data Portal has expanded, with access to over **10,884** resources by 2021, aiming to enhance transparency and allow public access to government data (World Bank, 2011b; ITU, 2021).

Moldova's strategic vision for digital development is defined in the **National Digital Transformation Strategy** (MDTS) 2023-2030, which was accepted in September 2023 with support from the UNDP (OECD, 2023; UNDP, n.d.; Moldovan Ministry of Economic Development and Digitalization, 2023). The MDTS marks a shift from a traditional e-governance model to an entire digital government with multiple dimensions (UNDP, n.d.). Its architecture is

organized around a number of pillars—People, Business, Government, Regulations, and Infrastructure. The strategy also includes enablers (or catalysts) for digital inclusion, with digital data and interoperability as essential enablers (Moldovan Ministry of Economic Development and Digitalization, 2023). The MDTs has ambitious aims, such as 100% of key public service offered online, 70% of transactions offered online, and 100% of public sector data exchanged electronically (UNDP, n.d.; Moldovan Ministry of Economic Development and Digitalization, 2023). As of the end of 2023, much progress had already been made, with just more than **50%** of public services being digitalized - up from only 38% earlier that year (UNDP, n.d.).

The presence of digital platforms and infrastructure such as MConnect and MCloud does not mean they are being utilized or all connected to the overall governance process. Currently these platforms are used for delivery and have achieved high levels of adoption for specific e-services, however, reports indicate that MConnect is "not fully effective" and that government bodies are still working in "silos" despite the platform's presence (TalTech, 2020; World Bank, n.d.a). This presents a fundamental argument - it is not the tools that are lacking, but the inability to coordinate with platforms that are in place and enforce broader adoption. This indicates that there are institutional, behavioral, and regulatory blockages that are preventing the platforms from being fully valued. It seems that there has been technology-push without sufficient demand-pull or organizational readiness - in other words, the technical solutions are ahead of the organizational and human capacity to utilize them.

The evolution from the initial "Governance e-Transformation Project" (GeT) to the more recent "Digital Transformation Strategy 2023-2030" (MDTS) reflects a significant shift in Moldova's strategic thinking (OECD, 2023; World Bank, 2011a; World Bank, 2011b; UNDP, n.d.; Moldovan Ministry of Economic Development and Digitalization, 2023). While e-governance often implies digitizing existing processes, digital transformation suggests a more fundamental re-imagining of government functions and societal interaction with technology. The MDTs's "whole-of-society approach" acknowledges that digital development is not solely a government responsibility but requires broad engagement across people, business, and civil society (Moldovan Ministry of Economic Development and Digitalization, 2023). This expanded vision is a positive development, but its success will depend on overcoming persistent implementation gaps observed in previous strategies (OECD, 2023), indicating that past challenges in execution must inform the new, more ambitious strategy.

2.3. Achievements and Progress in Digital Infrastructure and Service Delivery

Moldova has made great strides in several areas related to a digital transformation. Moldova sits in the top **forty countries** in the world according to the E-Government Development Index (Moldovan Ministry of Economic Development and Digitalization, 2023). The national eServices portal, servicii.gov.md, is a centralized access point to national eServices and gives, at a minimum, Single-Sign-On access to **178 e-Services**, as well as information on **649 administrative services** (ITU, 2021).

Moldova enjoys good internet coverage with **93.4 %** of citizens having internet access at home and **74.7 %** using smartphones (ITU, 2021; UNDP, n.d.). Moldova has some of the lowest average costs for mobile data in Europe (ITU, 2021; UNDP, n.d.). There are many ways to access the internet and these provide a very low barrier for users adopting digital services. Another example of progress is the IT Parks Law, which has been successful at decreasing the tax burden on IT companies, allowing them to operate and attract foreign employees in the IT sector (ITU, 2021).

One notable example of using data to make decisions is the Energy Vulnerability Reduction Fund (EVRF) that was started during the energy crisis of 2022 (UNDP, n.d.; UNDP, 2023). The EVRF provides a good example of digital systems being used practically by confirming data from the Tax Authority, Cadaster, Agency for Public Services, and cross referencing with at least one

private sector partner (the energy provider) to ensure the data validity was reasonable (UNDP, 2023). These developments highlight Moldova's commitment to proactive digital government that addresses not only the digitization of current services, but also the creation of new designed value through innovation. With an emphasis on inclusivity and secureness as well as citizen-focused services, Moldova is determining a new development paradigm for an increasingly digital world and positioning itself as a regional leader in digital transformation (UNDP, n.d.).

3. Challenges in Interconnectivity and Functioning of Governmental IT Systems

Even with the notable strides and goals underway, the effective interconnectivity and functionality of government IT systems in Moldova faces a daunting array of challenges and weaknesses. They are technical, legal, institutional, and human capital issues, and they add multifaceted layers of complexity for a total digital transformation.

3.1. Technical and Data Interoperability Issues

One of the core issues is **the fragmented and siloed nature of existing systems** across the Moldovan government. Even though MDAs are instructed to connect to the government "cloud" and share data, their inter-connectivity remains particularly ineffective (World Bank, n.d.a). Many MDAs continue to operate alone and pursue their own distinct agenda, budget, priority, and database, often self-selecting tools that are incompatible and non-interoperable (World Bank, n.d.a). The issues around system inter-operability are glaringly prominent in the social protection system, which has multiple, served, and disparate information systems with no intersectionality or inter-operability (UNDP, 2024).

Adding to the fragmentation is the pervasive issues of **data quality, duplication and standardization**. The issues surrounding poor quality and unreliable data is commonplace (World Bank, n.d.a). Data duplication is common, while a built-in reluctance to share data continues to work against the long-term and standardized data flows required across all levels of government (World Bank, n.d.a). There is a lack of a standard process in reviewing or classifying data available for use in the country, largely due to the absence of a national government data classification policy, law, or instruction on government classified data (World Bank, n.d.a). Moldova needs a clear structure to deal with data classifications and standardizing formats in the use of government data sets (World Bank, n.d.a).

The difficulty with existing **interoperability platforms** creates additional technical issues. While platforms like MConnect appear to exist with the objective of enabling "real time" data relay (e-Gov.md, n.d.; UN Moldova, 2020), they were acknowledged to be "not fully effective" (TalTech, 2020). A central operational breakdown for conflict is the implementation of the "Once-Only" principle: there are no effective barriers preventing other third-party government or private institutions from still asking for paper-based copies of data, even when adequate digital data relay processes have been implemented (World Bank, n.d.a). The latter restricts interoperability, frustrates citizens, and offsets the credibility and uptake of e-services overall. This indicates that "Once-Only" is technically feasible, but institutional and behavioral enforcement are essentially absent (likely due to lack of legal enforcement or enforcement of project design), coupled with habitual bureaucratic behavior, or lack of trust among institutions about the validity of digital data.

Issues of infrastructure remain. While the mobile network infrastructure is sophisticated enough, it still presents challenges in ensuring sufficient high-speed access to home and business broadband, and the conditional estimate of the fixed broadband basket cost has not achieved the Broadband Commission's strategy of 2% (ITU, 2021). There is also a strong interest in developing and growing the new generation 5G networks, albeit at a slow pace (ITU, 2021).

3.2. Legal and Policy Framework Gaps

One of the impediments for Moldova will be legal and policy framework gaps. The principal legislation on data protection, **Law no. 133/2011 on the Protection of Personal Data**, is out-of-date (TalTech, 2020). It is based on the older European Union (EU) Directive 95/46 not

the General Data Protection Regulation (GDPR), which was approved in 2016 (TalTech, 2020). Although there have been draft laws to transpose GDPR since November 2018, the legal framework remains rooted in older legislation, and will need to be completely up-dated to be in step with modernity (TalTech, 2020).

The lack of implementation of existing regulations for emerging technologies appears to be limited. The existing legislation has limited application, and has not met full compliance with EU regulations on emerging technologies such as blockchain or artificial intelligence (AI), resulting in uncertainty about the permissibility of using these technologies (World Bank, n.d.a). This creates regulatory gaps, and there is a general lack of contemporary regulation on potentially new digital technologies, and by the time regulations are developed once the technologies are developed and commercialized it may be problematic (ITU, 2021).

One major limitation is **the absence of a data governance framework**. There is no identifiable authority that explicitly owns the data governance agenda (World Bank, n.d.a). Moldova does not have a coherent framework that allows for data assets to be classified, and does not establish who has access and how the data is processed prior to sharing (World Bank, n.d.a). Currently legislation conveys adequate provisions for personal data processing and access to information (World Bank, n.d.a).

3.3. Institutional and Organizational Barriers

Significant institutional and organizational factors hinder the digitization process. Siloed organizations and resistance to change are relevant obstacles. Ministries, departments, and agencies are often siloed; as a result, there is a severe lack of coordination with respect to a common vision regarding system architecture, interoperability, and service integration (ITU, 2021; World Bank, n.d.a; Burinschi, 2022). There is also an observable reticence among public authorities to embrace e-governance methods. For example, the National Centre for Personal Data Protection (NCPDP) has refused to accept digital signatures on documents, meaning that public and private agencies are still required to use older, paper-based methods (TalTech, 2020). This indicates either a lack of appreciation of data protection principles and matters, or a wholesale resistance towards a function of transparency that e-governance seeks to provide.

The absence of a central authority and appropriate coordination mechanisms is another major barrier. The absence of a primary regulatory body responsible for various component parts of e-governance and articulated in national law, means that individual ministers may preclude the introduction of e-services in their agencies (TalTech, 2020). There has been a call for CDOs to be networked together in MDAs at both national and sub-national levels to provide an ownership structure for the data agenda and to promote consistent implementation (World Bank, n.d.a).

In addition, **limited implementation capacity and a lack of a coherent strategic vision** plagued previous attempts. Prior digital strategies, such as the NDS "Digital Moldova 2020," experienced significant implementation gaps due to a lack of project implementation capacity along with concomitant economic and political instability and limited budgetary resources (OECD, 2023; Burinschi, 2022). The ongoing project-by-project approach, rather than a unified and overall reform, has been particularly damaging and has resulted in a lack of long-term strategic vision and poorly empowered public officials (Burinschi, 2022). The implications of this point are that the problems with interconnectivity and with governmental IT systems functioning properly are neither discrete technical problems nor even entirely technical problems, but rather symptoms of primary and systemic governance issues experienced by Moldova. Not only have they been unwilling to share data, but they have also operated in silos and have fallered the operationalization of digital strategies, all of which reflect institutional capacity, political will, and bureaucratic inertia. Therefore, digital transformation can be adopted as a diagnostic tool that can expose the weakness in public administration and governance.

Low use of municipal authorities also slows things down into the data maturity pipeline. Data governance in sub-national government is at early stage and limited, as few municipal budgetary funds set aside for managing operations, and there are no local institutions or officers whose primary responsibility is data governance (World Bank, n.d.a). In addition to IT systems, Moldova is experiencing wider problems of "government fragmentation" and "vertical fiscal imbalances" which suggest that there is a degree of systemic challenge to coordination and economies between levels of government (IMF, 2014). The information landscape is identified as 'fragmented,' resulting from political actors utilizing societal vulnerabilities, making comprehensive digital governance all the more difficult to achieve (StratCom COE, 2017). This complex, interdependent technical, legal and institutional fragmentation, compounded by a weak overall data governance regime, facilitate these fragmentation types to continue and to mutually reinforce one another, creating a vicious circle that makes holistic digital transformation exceptionally difficult to achieve.

3.4. Human Capital and Digital Literacy Deficiencies

Human capital and digital literacy limitations represent significant obstacles to Moldova's digital transformation. Skills shortages and misalignment are significant barriers to digitalization, particularly for Small and Medium-sized Enterprises (SMEs). Approximately 20% of Moldovan firms report a lack of an appropriately educated workforce to conduct business (OECD, 2023). The pool of IT talent is small and poorly integrated. Furthermore, there are formal restrictions preventing the IT professionals from teaching at universities unless they have an advanced degree, in addition to pedagogical certification, which may inhibit practical relevance of the coursework they teach (ITU, 2021).

Public mistrust in digital government services and low citizen awareness remains widespread. Citizens do not widely consume e-services and remain under-promoted and unmarketed qualitatively (TalTech, 2020). A significant gap exists between citizens and governmental institutions, where many citizens would prefer to deal with private institutions instead of dealing with governmental institutions in terms of safeguarding personal data (TalTech, 2020). In addition, citizens are often ignorant of how their data is stored or what can be disclosed about them, which increases distrust (TalTech, 2020).

Despite acknowledged good internet coverage, the issue of a digital divide and accessibility remains a challenge. Quality and affordable access remains asymmetrical among social-economical groups, geographical areas (urban/rural), and genders (ITU, 2021; UNDP, n.d.). A large proportion of the population, especially the elderly (80% of people age 50-74 cannot use digital public services independently, which implies they lack the skills and access to devices (UN Moldova, 2020; UN Moldova, 2025)). This demonstrates that having access to digital infrastructure does not mean that individuals are utilizing it or that are digitally included. The issue of a digital divide is multi-faceted, considering not only access to connectivity but also skills, trust, affordability, and access to devices.

Moreover, fear and under-confidence is widespread, especially in rural areas. Individuals who are older, or citizens without higher education report that they do not have confidence, trust, or are fearful of making mistakes and lack trust in digital financial systems (UN Moldova, 2025). This leads to limited functionality of digital activities - such as limited online payments, access to government services - (UN Moldova, 2025). Significant parts of the population - especially vulnerable populations - cannot independently access or trust digital services, impeding the overall satisfactions and citizen-centricity of the digital government, unequal access to public services, and reinforcing existing societal inequalities and challenges to implementing the 'whole-of-society' aspect of the new Digital Transformation Strategy.

4. Impacts of Systemic Challenges on Public Administration and Development

The ongoing problems of interconnectivity and functionality of government IT systems in Moldova have more than just technical inefficiencies - they impact the delivery of services, governance, and the country's social-economic development and goals for European integration.

4.1. Inefficiencies in Public Service Delivery and Increased Bureaucracy

The fragmentation and lack of interoperability among government information systems is directly responsible for immense inefficiencies in data management and public service delivery (UNDP, 2024). Citizens are often required to go to multiple state agencies at great cost and inconvenience to submit identical documents for several benefits (UNDP, 2024). These challenges contradict the intentions of modern citizen-centric, public administration. The prevalence of paper requests, when in some cases digital channels for data exchange may exist, essentially nullifies any productivity improvements anticipated as a result of e-governance (World Bank, n.d.a). Both in practice and in intention, the failure to implement the "Once-Only" principle for utilizing information submitted to a public authority discredits the digital promises of government and frustrates citizens who participate in such systems, suggesting that while the necessary technical systems may exist, the enforcement of institutional and behavioral response does not exist; therefore, any return from digital resources is impaired.

Additionally, the continued low awareness and trust by citizens and the ongoing gaps in digital literacy means a large proportion of the population cannot fully participate in online experience. For instance, around 59% of people in Moldova needed assistance in accessing digital public services and many elderly (80% aged 50-74) believed they couldn't access digital services without assistance (TalTech, 2020; UN Moldova, 2020). This reinforces a dependence on traditional bureaucratic methods that are often inconvenient and have tangible implications for citizen experience and access to core services (e-Gov.md, n.d.). The impact is much more than financial efficiencies; it burdens citizens (time, travel, and frustration), erodes public trust in the government digital service plan, and reinforces a two-tiered system where those with digital skills and devices benefit while disconnected citizens are left behind. In this situation, the "digital excluded" are victims of perverse systemic challenges while undermining a shared goal of "citizen-centric" services while reducing the benefits of a fully enabled society with improved security, which enables and improves comfort, collaboration, etc.

4.2. Hindrance to Evidence-Based Policymaking and Anti-Corruption Efforts

The fragmented digital landscape and lack of integrated digital databases means government ministries will often find themselves severely disadvantaged to identify, remove, and prevent fraud (UNDP, 2024). Likewise, fragmentation will also directly inhibit evidence-based policymaking due to a lack of extensive and trustworthy data across sectors (World Bank, n.d.a; UNDP, 2024). As a result, the digital potential for Moldova to develop is unimpressive (World Bank, n.d.a).

Although e-governance initiatives are primarily designed to improve transparency and reduce corruption (TalTech, 2020; World Bank, 2011b), the reluctance of some public authorities to implement e-governance approaches fully, combined with examples of improper data access by officials, indicate that there is still "hidden corruption" and reluctance to transparency (TalTech, 2020). This implies that technological solutions are inadequate to resolve entrenched organizational and political issues which thrive in obscurity.

4.3. Impediments to EU Integration and Broader Socio-Economic Development

The absence of a united administrative architecture for interconnectivity and interoperability with the EU IT systems is already a barrier to Moldova reaching European standards and joining the Digital Single Market (Moldovan Ministry of Economic Development and Digitalization, 2023; European Commission, 2024). This is not just a technical barrier, but a strategic barrier to Moldova's wider geopolitical destiny as articulated in section 2.

The larger political instability compounded by frequent leadership changes further adds to the challenges, dragging development across all sectors, including e-governance, and rendering long-term agendas ineffective (TalTech, 2020). This wider political fragmentation—like “dysfunctional political system”, “weak state structures”, “corruption” (TalTech, 2020; StratCom COE, 2017)—now flows into fiscal decentralization (IMF, 2014), consequently curtailing fundamental consistency and long-term vision required for meaningful sustainable digital transformation. The problems with interconnectivity and functioning in government IT systems are more than isolated technical failures; they are evidence of deeper, systemic governance weaknesses in Moldova. Digital transformation, thus, acts as a diagnostic test, revealing the weaknesses within public administration and governance. At best, if we coped with the challenges in IT systems, we would still face ailment of these broader governance weaknesses, and we wouldn't cope them solely through technology; those are organizational and political challenges too deeply ingrained to fix with a technical solution.

There are broader skills shortages and low use of digital tools in non-IT SMEs, affecting private sector competitiveness and overall economic growth, particularly when considering the important role of SMEs to Moldovan economy (OECD, 2023; ITU, 2021). The discovery of the pervasive digital divide, particularly in rural areas, has exacerbated geographical inequalities in access to social services, negatively affecting the ability of vulnerable groups to access essential services and progress in inclusive development (UNDP, n.d.; UNDP, 2024). Finally, the lack of clear regulation of new digital technologies has created a legal vacuum which has potential to slow down the development and commercialization of innovations, and reduce economic dynamism and structural innovation (ITU, 2021).

5. Recommendations for Enhancing Interconnectivity and System Functioning

To reduce the complexity of challenges to Moldova's government information systems, we need a whole-of-government approach to, and multiple desired outcomes for, changes in the direction of a consistent overarching policy and regulatory framework, technical developments, institutional capacity developments, and human capital development. Going forward we need:

5.1. Strategic Policy and Legal Reforms

For starters, we need a **data governance framework** (World Bank, n.d.a). This must cover clearly defined data classification and access, and standard processing methods for sharing with other entities. The data governance framework must also include a multi-annual Action Plan with clearly defined outputs and measurable targets, with guaranteed funding taking the form of hard budget lines (World Bank, n.d.a). In parallel it will be important to update existing legislation on data protection to be compatible with GDPR (TalTech, 2020). If paramount priority is afforded to align Law no. 133/2011 with the GDPR, then legal certainty for data processing and exchange can be provided to facilitate trust and compliance in data sharing. Beyond improving data processing and exchange, Moldova will need to make definitions of emerging technologies such as AI, blockchain and cryptocurrency and implement a clear legal framework for how these technologies can develop and be commercialized (ITU, 2021; World Bank, n.d.a). This will reduce regulatory uncertainty and facilitate the safe and effective use of these technologies in the delivery of public services and in the wider economy. To capitalize on digitalization, we need to have a “Once-Only” approach firmly embedded into policy and institutional frameworks (World Bank, n.d.a). This means both technical and administrative mechanisms need to be developed and phased in to ensure that neither government nor private parties can ask for paper copies when digital copies can and should be shared/exchanged. For the “Once-Only” approach to be implementable, it will be important to strengthen the E-Government Agency mandate to develop a whole-of-public-sector data architecture (World Bank, n.d.a). The implementation of the National Digital Transformation Strategy 2023-2030 similarly needs to be comprehensive, including clearly defined objectives and

measurable targets fully funded and allocated in the budget to avoid the unrealized objectives and targets of previous strategies (OECD, 2023).

5.2. Technological Advancements and Infrastructure Optimization

Although MConnect and MCloud are now deployed, there is more work to be done to maximize their utilization and efficacy (TalTech, 2020; World Bank, n.d.a). Efforts should direct greater areas for unified data management and sharing standards across all Ministries, Departments, and Agencies (MDAs); and actively seeking to resolve the technical issue of system architecture and/or establishing service integration (ITU 2021). In consideration of ensuring that the digital divide is narrow, greater access to high-speed broadband is required, especially in rural areas; research, and proposals to achieve remote access and reduce costs must be investigated (ITU, 2021). Building a level of cyber security capacity is important; all stakeholders should engage to coordinate in improving the nation's capacity to defend against cyber events and update the National Cybersecurity Strategy as necessary (ITU, 2021; European Commission, 2025a). Moldova's association with the EU Cybersecurity Reserve is a positive signal in this area (European Commission, 2025a). Lastly, the government should strive to incorporate "digital first" and "secure by design" principles into the development of all public services, together with automated processes and disseminating a greater level of use of digital identity and electronic signatures (Moldovan Ministry of Economic Development and Digitalization, 2023).

5.3. Institutional Strengthening and Capacity Building

It is critical to form **a network of Chief Data Officers** (CDOs) across MDAs, nationally and sub-nationally, to break down operational silos (World Bank, n.d.a). The CDOs would champion the data governance agenda and provide an assurance that all government authorities, MDAs included, would conduct their operations according to some degree of standard. While this is occurring, it is equally as important that we encourage inter-agency collaboration and cooperation, and we may achieve this by encouraging a whole-of-government approach (OECD, 2023; ITU, 2021). This entails deepening the active involvement of the stakeholders at the governmental level, more specifically the Ministry of Labour and Social Protection and the National Employment Agency (NAE) and making sure that we establish links with the non-governmental actors. We also need to be prepared to address the situation with poorly empowered public officials. We need to improve the public servant's knowledge of e-governance services using e-learning, and develop educational platforms (TalTech, 2020.; Burinschi, 2022). Regarding the institutional empowerment of Local Public Authorities (LPAs), it will be important to establish a working framework to establish good practices in this area and deal with the lack of involvement and limited development of data governance at the sub-national level, including dedicated institutions for our intervention and funding (World Bank, n.d.a). In addition, in order to combat corruption effectively, Moldova needs to continue its work in partnership with the international community and international organizations e.g. EU, UNDP etc., to develop and support anti-corruption initiatives and provide specialized resources and technical assistance to law enforcement and financial institutions, and improve information-sharing arrangements (EU Neighbours East, n.d.).

5.4. Human Capital Development and Digital Inclusion Initiatives

There is a need for a full national approach for developing **a digital skills strategy** (TalTech, 2020; ITU, 2021; UN Moldova, 2025). Specifically, there should be a digital skills strategy that addresses the delivery of online courses for citizens to develop their technical literacy and knowledge of e-services and personal data protection. To help bridge the digital divide, there will be a need for targeted training and support for vulnerable groups including the elderly and in rural areas (UNDP, n.d.; UN Moldova, 2020; UN Moldova, 2025). This means building local digital learning centers and preparing local experts to provide useful, accessible, and needs-tailored training (UN Moldova, 2025). It also requires policymakers to acknowledge digital literacy as an

essential component of social inclusion and economic resilience (UN Moldova, 2025). Building trust is critical; the government must play a lead role by using the legal framework, public awareness, and addressing uncertainty regarding technological development and cybersecurity (TalTech, 2020). Providing additional ways to authenticate I.D. such as Smart-ID or Mobile-ID will aid the accessibility of online governmental services for their citizens abroad (TalTech, 2020).

6. Conclusion

The Republic of Moldova has taken admirable strides along the digital transformation path by building e-governance infrastructure and platforms. The examination shows that due to a tangled relationship of technical, legal, institutional, and capital resource problems, interconnectivity across many collaborative or elliptical governmental information systems is poorly done, if at all, resulting in systems that are not functioning at optimal effect. Fragmentation remains, data quality issues remain, and pre-existing interoperability platforms are not fully effective, leading the invocation of the "once-only" principle impossible. The law - legal framework, data protection, and technologies remain behind the more contemporary EU use of those frameworks legislatively, leading to a regulatory and authority gap; there is uncertainty in terms of technology and data protection. Institutions - the lack of government silos functioning apart, the lack of willingness to change dramatically the inclusion on one's official position regarding facilitating reform, and much of the information management remain with individual institutions on their data governance authority limit a coordinated approach to the transformation. Citizenship and human and not the least of whom are digital literacy issues: the gaps that are also manifesting citizenship issues regarding public trust continued disparities in the conditions of receiving public services further compound the multiplicity and complex nature of the digital divide.

Collectively, all of these systemic hurdles lead to bleed in delivery public services and making evidence-based policies and countering the manifestations of corruption. In addition, this signifies difficult challenges for Moldova in terms of looking at deepening their EU integration, where digital/guided alignment is vital to participate in the Digital Single Market. This means the challenges faced in Moldova regarding their use of technology, methods, systems, are none determinant challenges, rather terms of governance being displayed as problems particularly for their public administration system.

Overall to move through these systemic hurdles, unlock the full positive potential of democracy as per their existing digital technologies, requires a wide-ranging, continued, and resourced approach to digital transformation and travels paths towards better governance. This in turn requires policy and legal reform to better complement their existing frameworks and update for better data governance and and to develop GDPR-compliant legislation, as the EU AAoHDA requires. It also means planning for the efficient use of their existing technology infrastructure, more broad-band access and improvements in foundational cybersecurity methods. As an institution it involves setting-up a in government working,' together as citizens, citizens institutional governments or authorities or experts. Joined ownership in the public service in the public sector that encompasses co-creation, co-implementation, cooperation or inter-involvement, and assist public administration authorities or professionals. Involving intentional initiating or hiring workers with targeted training in human capital to further work developing digital public education and trust-being towards closing the digital divide.

With a high degree of political will and consistent or meaningful participation of attending multiple public triple helix stake-holder and continued engagement or optioning in by interested third partners, Moldova has a chance to consider these barriers as opportunities to make progressive change and solutions. Arriving at more holistic change needed could mean by 2030, Moldova could be building on their digital achievements in government to be among the first of

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contemporary data driven, digital public services with AI enabled citizen-centric delivery solutions in Europe by fulfilling their Digital Transformation Strategy.

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GREEN ENTREPRENEURSHIP AND THE CIRCULAR ECONOMY IN THE EUROPEAN UNION: INNOVATIVE MODELS FOR THE AGRI-FOOD SECTOR

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Abstract: This article investigates how green entrepreneurship and the circular economy are reshaping the European agri-food sector in the post-pandemic period (2020–2025) and distils lessons relevant to the Republic of Moldova. The study pursues two aims: (i) to map innovative models that reduce waste, close resource loops, and decarbonize agri-food value chains; and (ii) to assess the policy and market conditions that enable their scaling. Methodologically, we conduct a structured review of recent peer-reviewed literature and EU policy documents (European Green Deal, Circular Economy Action Plan, Farm to Fork Strategy, and the 2023–2027 CAP), complemented by comparative analysis and a synthesis of Member-State case studies. Findings indicate that the EU has established a robust strategic and financing architecture that incentivizes viable circular models—such as biogas from agricultural residues, valorization of secondary biomass streams, alternative proteins, food-waste reduction, and organic farming—yet implementation remains uneven across countries. Key constraints include high upfront investment needs, regulatory uncertainty, infrastructure deficits, and skills gaps. Enablers include dedicated green finance, green public procurement, extended producer-responsibility schemes, coordinated multi-level governance, and local innovation ecosystems (incubators and agri-bio consortia). We conclude that green entrepreneurship in agri-food generates economic, social, and environmental co-benefits; however, scaling depends on predictable policies, market-creation instruments, and circular infrastructure. For Moldova, we recommend full legal alignment with the EU acquis, targeted financial tools for green SMEs, investments in waste management and rural renewable energy (e.g., anaerobic digestion), public procurement with circularity criteria, workforce education and vocational training, and demonstration pilots to accelerate the uptake of circular practices.

Keywords: green entrepreneurship; circular economy; agri-food; EU policy; waste reduction; renewable energy
JEL Classification: Q01; Q18; Q57; L26; O13

1. Introduction

The global agri-food sector is currently facing an unprecedented combination of pressures: climate change, biodiversity loss, soil degradation and international market volatility. According to estimates by the Food and Agriculture Organisation of the United Nations (FAO, 2021), approximately one third of global food production – equivalent to 1.3 billion tonnes annually – is lost or wasted along the value chain, while agri-food systems contribute about 25% to global greenhouse gas emissions (Foodvalley; MIT Climate, 2025). These realities highlight the need for structural changes that reconcile economic productivity with environmental and social objectives.

In the European Union (EU), the pressure for green transition has been translated into a series of wide-ranging policies. The European Green Deal, launched in December 2019, sets the goal for Europe to become climate neutral by 2050 (European Commission, 2019; European Commission, 2020). Complementary to this, the Circular Economy Action Plan (CEAP) adopted in March 2020 aims to decouple economic growth from the use of natural resources through legislative and market measures, with a focus on resource-intensive sectors, including agriculture and the food industry (European Commission, 2020). The Farm to Fork Strategy, in turn, proposes an ambitious set of

targets for 2030: a 50% reduction in the use of chemical pesticides, a 20% reduction in nutrient losses, the expansion of organic farming to 25% of the EU's agricultural area, and a 50% reduction in per capita food waste (European Commission, 2021).

These policy initiatives are not only responses to environmental crises, but also opportunities for the development of new economic models. In this context, the circular economy is seen as a paradigm capable of reducing waste and transforming secondary flows into resources, providing integrated solutions for the decarbonisation and resilience of food systems (Kirchherr, Reike and Hekkert, 2017). Green entrepreneurship is also emerging as a key driver of this transition, through its ability to generate technological and organisational innovations that simultaneously meet competitiveness and sustainability objectives (OECD, 2021).

The literature highlights that the green economy is growing at a faster pace than the overall economy in the EU: between 2000 and 2018, the contribution of the environmentally friendly goods and services sector to the Union's GDP increased from 1.6% to 2.3%, and employment in the green economy increased from 3.1 to 4.4 million full-time equivalents (Eurostat, 2023a; Eurostat, 2023b). These developments indicate a structural trend that cannot be ignored and position green entrepreneurship as a strategic element for the future of European agri-food.

At the same time, the COVID-19 pandemic has highlighted vulnerabilities in agri-food chains – dependence on imports, logistical bottlenecks and inequalities in access to resources. The Recovery and Resilience Facility (NextGenerationEU), the largest financial package in the history of the EU, has allocated over 37% of its total funds to the green transition, providing an unprecedented framework of support for the modernisation of agriculture and the development of circular businesses (European Commission, 2021).

For the Republic of Moldova, a candidate country for EU accession in 2022, these processes have double relevance. On the one hand, European integration requires legislative harmonisation and adaptation to EU standards. On the other hand, the Moldovan agricultural economy, marked by structural vulnerabilities – low productivity, exports concentrated on raw materials and poor infrastructure – can benefit from the adoption of circular models and green entrepreneurship, gaining added value and international competitiveness (Government of the Republic of Moldova, 2024).

Thus, this article aims to investigate: (i) how green policies and entrepreneurship are transforming the agri-food sector in the EU in the post-pandemic period (2020–2025); (ii) emerging innovative circular economy models applied in practice; and (iii) relevant lessons for the Republic of Moldova, with a focus on policy recommendations and support mechanisms for green SMEs.

2. Methodology.

The methodological approach of this study was designed to address two central objectives: (i) mapping innovative models of green entrepreneurship and circular economy in the European agri-food sector in the period 2020–2025 and (ii) identifying lessons applicable to the Republic of Moldova in the context of its transition towards European integration.

The study adopts a qualitative exploratory approach, appropriate for emerging fields where practices are still evolving and where analysis is based on policy documents, institutional reports and recent academic literature. The methodology was designed to provide both a systematic synthesis of the existing literature and a comparative analysis of European experiences, integrated into a framework applicable to the Republic of Moldova.

A first step was to conduct a systematic literature review using major scientific databases. Keywords included terms such as *"green entrepreneurship"*, *"circular economy"*, *"sustainable agri-food"*, *"EU Green Deal"*, *"Farm to Fork"* (ETC/CE, 2022; EU4Environment, 2023). To ensure relevance and timeliness, the selection was limited to works published between 2020 and

2025. Both conceptual contributions and empirical studies on the implementation of circularity in agriculture and the food industry were retained.

The second stage involved examining the European strategic framework, with a focus on the main documents: the European Green Deal (European Commission, 2019), the Circular Economy Action Plan, the Farm to Fork Strategy (European Commission, 2020) and the Common Agricultural Policy 2023–2027 (European Commission, 2021). These were supplemented by thematic reports published by international institutions and Eurostat statistics on material circularity and the dynamics of the green sector.

In order to capture differences in implementation across Member States, the methodology included a comparative analysis based on case studies. Three representative countries were selected:

- The Netherlands – a pioneer in circularity and agri-food innovation, with circular farms and biotech industries (Protix, Kipster).
- Poland – an example of an emerging economy with green transition policies currently being consolidated.
- Romania – an illustrative case for the challenges faced by Eastern European countries that are just starting to implement circularity.

The selection aimed to ensure diversity in terms of development level, infrastructure and degree of EU policy integration.

3. The context of the Republic of Moldova.

For contextualisation, the analysis integrated national and regional documents such as *the National Programme for the Promotion of the Green and Circular Economy 2024–2028* (Government of the Republic of Moldova, 2024), the Environment Strategy 2030 and the EU4Environment programme evaluations. This stage allowed for a comparison of the European experience with the situation in Moldova, identifying structural barriers (poor waste infrastructure, lack of green capital) and opportunities (access to European funding, legislative alignment).

The data and information collected were processed through content analysis and triangulation to correlate academic, institutional and empirical perspectives. This methodological approach ensures scientific validity by drawing on multiple sources and practical relevance by integrating case studies and the Moldovan context.

4. Results.

The analysis of post-2020 European policies highlights a significant strengthening of the strategic framework for the transition to a greener and more circular agri-food sector. The European Green Deal, the Circular Economy Action Plan and the Farm to Fork Strategy have established a set of clear objectives and financial support mechanisms that have begun to generate structural changes in agriculture and the food industry. However, the degree of implementation varies considerably between Member States, highlighting both good practices and persistent obstacles.

On the one hand, countries such as the Netherlands have made considerable progress through coherent policies, developed infrastructure and an already established green culture. This context has fostered the emergence of innovative models such as circular farms or large-scale biogas production, which demonstrate the economic viability of circular principles. In contrast, countries such as Poland and Romania illustrate the structural challenges typical of Central and Eastern Europe: difficulties in modernising waste management infrastructure, limited access to dedicated funding and low levels of environmental awareness among farmers and consumers.

Eurostat data confirms these differences. The circular material utilisation rate stands at almost 27.5% in the Netherlands, compared to only 8.4% in Poland and 1.4% in Romania, highlighting the major gaps between the West and East of the Union. At the same time, the level

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of packaging waste recycling or the integration of secondary raw materials into production chains remains below the European average in many of the Union's emerging economies.

One positive development at European level is the expansion of organic farming, supported by the Common Agricultural Policy 2023–2027, which introduces eco-schemes designed to reward environmentally friendly practices. For example, Poland has set a target of achieving 25% organic agricultural land by 2030, developing national plans that combine financial incentives with farmer education. The rapid growth in organically farmed land shows that the EU's financial and legislative levers can produce tangible results in a relatively short time.

However, literature and case studies reveal that these favourable results are offset by a number of structural challenges. The high costs of transitioning to circular models discourage SMEs in particular, which often lack the capital needed to invest in green technologies. In addition, regulatory uncertainties and complex administrative procedures can discourage entrepreneurial initiatives, especially in countries with weak institutional capacity.

Despite these constraints, examples of green entrepreneurship in Europe demonstrate the positive economic and social impact of the circular economy. Whether it is the recovery of organic waste through innovative biotechnologies, the integration of industrial symbiosis between farms and processors, or digital initiatives to reduce food waste, these models show that sustainability and competitiveness are not mutually exclusive. On the contrary, where favourable conditions have been created, green entrepreneurship has proven to be a generator of added value, jobs and social cohesion.

Overall, the results show that the European Union has succeeded in creating a favourable framework, but effective implementation depends on a number of critical factors: the stability of national policies, the existence of basic infrastructure, the level of environmental education and the capacity for innovation of the entrepreneurial environment. Without these, the transition to a circular agri-food model risks remaining fragmented and uneven across countries.

To better understand the differences and similarities between the countries analyzed, it is useful to make a systematic comparison based on a set of criteria relevant to the transition to green entrepreneurship and the circular economy. The narrative analysis presented above captures the general aspects, but a synthetic representation in the form of a table allows for a more precise highlighting of the level of circularity, the public policies adopted, the existing infrastructure, access to financing, but also the structural challenges specific to each country. This comparative approach is important because it facilitates the identification of factors that accelerate or slow down the transition and provides a solid basis for formulating recommendations applicable to the Republic of Moldova.

Table 1. Comparative analysis of the transition to green entrepreneurship and the circular economy in the agri-food sector
(the Netherlands, Poland, Romania, and the Republic of Moldova)

Analysis criteria	Netherlands	Polonia	Romania	Republica Moldova
Level of material circularity (%)	~27,5% (Eurostat, 2023)	~11,2%	~1,4%	<1%
Relevant national policies	Circularity Strategy 2050; Sectoral Green Deals	Program for bioeconomy and organic farming; Rural Development Plan 2023–2027	National Waste Management Strategy; anti-waste pilot programs	National Program for the Promotion of the Green and Circular Economy 2024–2028

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Organic farming (area % of total)	>12%	~5% (target: 25% by 2030)	~3%	~1%
Infrastructure for agri-food waste management	Developed (integrated systems, biogas, industrial symbiosis)	Expanding, EU-supported regional projects	Deficient, lack of rural infrastructure	Very poor, most waste in non-compliant landfills
Access to green finance	High, national + European funds; public-private partnerships	Moderate, dependence on European funds	Reduced, fragmented projects	Very low, incipient programs, dependence on external support
Examples of good practices	Kipster farm (climate-neutral production); Protix (insect biotechnology)	Support schemes for organic SMEs; growth of the organic market	Anti-waste pilot projects in retail and HoReCa	Local recycling initiatives; pilot projects supported by EU4Environment
Main challenges	Scaling and cross-sector coordination	Insufficient administrative capacity and infrastructure	Deficient infrastructure and cultural resistance	Fragmentation of agriculture, lack of green capital and infrastructure

Source: Author’s compilation based on Eurostat (2023), European Commission (2020; 2021), OECD (2021), Government of the Republic of Moldova (2024).

The table highlights the significant contrasts between the countries analyzed. The Netherlands stands out with superior performance on most criteria, thanks to a long-term strategic vision, massive investments in infrastructure, and a well-established ecological culture. Poland, which is at an intermediate stage, reflects the importance of using European funds and planning geared towards clear objectives, such as expanding organic farming areas. Romania, although benefiting from the same European instruments, faces major implementation difficulties due to poor infrastructure and cultural resistance to change.

Compared to these countries, the Republic of Moldova appears to be a distinct case, characterized by initiatives that are just getting started and a regulatory framework that is still being developed. The low level of organic farming, the lack of modern infrastructure, and limited access to green capital are obvious barriers. However, similarities with the experience of Romania and Poland suggest that Moldova can make rapid progress through a combination of strong public policies, strategic investments, and education programs focused on green skills. In this sense, the comparison provided by the table not only highlights current gaps, but also outlines the directions of action needed to transform structural vulnerabilities into opportunities for sustainable development.

5. Discussions.

The results show that the transition to green entrepreneurship and a circular economy in the European agri-food sector is based on a combination of political, economic and social factors, but is also constrained by multiple structural challenges. The experience of Member States shows that the successful adoption of circular practices depends, in the first place, on the coherence and predictability of public policies. Countries such as the Netherlands have managed to send a strong signal to the business community through clear long-term objectives, such as the commitment to become 100% circular by 2050. This strategic direction has mobilised private investment and

created a stable framework for entrepreneurs. In contrast, the lack of continuity and legislative inconsistencies encountered in other countries have generated uncertainty and slowed down innovative initiatives, with visible effects on competitiveness and investment attractiveness.

From an economic and technological perspective, the high costs of green infrastructure – from biogas plants to digital technologies for product traceability – continue to be a major barrier for SMEs. In particular, entrepreneurs in agriculture and the food industry face limited access to finance and a lack of dedicated mechanisms to offset the high risks of circular innovation. At the same time, the digital divide between western and eastern Europe is slowing down the adoption of innovative solutions in emerging countries, accentuating performance gaps. The Republic of Moldova, with its fragmented agricultural structure dominated by small farms, faces similar difficulties, highlighting the need for tailored financial instruments such as low-interest green loans, start-up grants and public-private venture capital funds.

Another key aspect is the creation of markets for green products, without which circular innovations cannot be scaled up. In the European Union, green public procurement, eco-labelling schemes and product labelling have stimulated demand and helped to strengthen competitive value chains. These instruments not only provide green producers with access to stable markets, but also send a cultural and social signal about the value of sustainability. For the Republic of Moldova, replicating such policies could encourage local producers to adopt circular practices, while also facilitating their access to foreign markets that are sensitive to environmental criteria.

The educational dimension plays an equally important role. The lack of green skills and practical knowledge in the field of circularity limits the entrepreneurial environment's ability to capitalise on existing opportunities. Examples from the Nordic countries show that integrated educational programmes and continuous professional training are essential for building human capital prepared to manage the green transition. For the Republic of Moldova, the introduction of circular economy and green entrepreneurship modules in university programmes, as well as the development of training programmes for farmers and managers in the agri-food sector, are basic conditions for strengthening long-term economic resilience.

Overall, the discussion confirms that the circular economy and green entrepreneurship can become drivers of economic and social development in the agri-food sector, but only under the conditions of an integrated framework of policies, infrastructure and education. The Republic of Moldova has the opportunity to learn from the experience of the European Union and directly adopt the most effective practices, avoiding some of the difficulties encountered by Member States. However, this process requires a systemic approach, in which legislative alignment, green financing, waste management infrastructure and human capital are developed simultaneously and in a coordinated manner. Without this integration, there is a risk that the green transition will remain fragmented, with limited effects on the competitiveness and sustainability of the agri-food economy.

6. Conclusions and recommendations.

The analysis confirms that the transition to green entrepreneurship and the circular economy in the agri-food sector is not just a political aspiration, but a structural necessity to ensure economic and environmental sustainability in contemporary Europe. Through the Green Deal, the Circular Economy Action Plan and the Farm to Fork Strategy (WBCSD, 2020), the European Union has succeeded in creating a robust policy framework and dedicated financing mechanisms that have begun to bring about real change in agricultural and food practices. The emergence of innovative models – from circular farms that recycle waste to biotechnologies capable of transforming organic residues into resources, or digital platforms designed to reduce food waste – demonstrates that sustainability and competitiveness can be reconciled and that the green economy can become an engine of development.

However, differences in implementation between Member States indicate that this process is far from uniform. Western countries, supported by advanced infrastructure and solid institutional frameworks, have managed to achieve high levels of circularity, while Central and Eastern European countries still face financial, institutional and cultural barriers. These gaps reveal that European policies, however ambitious, must be accompanied by mechanisms for adaptation to the local context and instruments to reduce inequalities in capacity and resources between regions.

For the Republic of Moldova, the conclusion is clear: integrating the principles of the circular economy and promoting green entrepreneurship in agri-food is not only a condition for joining the European Union, but also a unique opportunity for the structural modernisation of the national economy. The Republic of Moldova has the opportunity to learn from the experiences of Member States, avoiding mistakes and directly adopting solutions that have proven effective. In this regard, legislative alignment with the European acquis, investments in waste management infrastructure and renewable energy sources, as well as the promotion of education and vocational training in the field of circularity are essential areas for action. Furthermore, the creation of internal markets for green products through sustainable public procurement policies and eco-labelling schemes could ensure both the development of local entrepreneurs and access to premium markets in the European Union.

Overall, the transition to green entrepreneurship and a circular economy in agri-food should be seen as an integrative process that goes beyond the purely environmental dimension and has far-reaching economic, social and political implications. Strengthening the strategic framework, developing appropriate financial mechanisms, stimulating innovation and investing in human capital are sine qua non conditions for the success of this process. The Republic of Moldova now has the opportunity to turn its current vulnerabilities into competitive advantages, benefiting from the support of the European Union and the lessons already learned by Member States.

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FORMING AN ORGANIZATIONAL HR-MANAGEMENT DEVELOPMENT STRATEGY BASED ON A HUMAN- CENTERED APPROACH: CASE OF HIGHER EDUCATION INSTITUTIONS

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Abstract: The method of this study is to specify the prerequisites and ability of top management of modern companies to develop a human resources management strategy using a human-centric approach. The subject of the study was the characteristic features of human-centered personnel management, which can be applied as elements of strategic development of intellectual capital and formation of high-quality human resources for modern enterprises. To obtain scientific results, methods of synthesis of scientific ideas, content analysis of professional literature, methods of generalization and systematization of conceptual and paradigmatic tasks of personnel management were used. Based on the results of the scientific search, the following significant conclusions were made: human-centeredness is characterized as such a philosophy in the management of an organization, which is implemented through the prism of a strategic vision of the future of its human resources; the theoretical and methodological foundations of scientific sciences are formalized in the context of the possibilities of applying the principles of human-centered management in HR strategies of a modern organization; identified problematic aspects and existing opportunities for using human-centered personnel management in basic strategies for managing organizations that are focused on ensuring economic security, and provided proposals for promising areas for updating the policy of higher education institutions to transform them into turquoise organizations, taking into account the needs of Society 5.0 and the possibilities of management 3.0. As a result, it was concluded that effective motivation tools and the social orientation of management mechanisms when developing solutions related to personnel management allow enterprises to obtain more positive effects for their economic condition than by acting exclusively through administrative means, orders, and coercion. Therefore, the formation of an HR management development strategy for organizations that plan their activities for the long term should be based on the principles of human-centeredness and with a focus on the needs and interests of employees, who are an important intangible resource and a competitive advantage for companies in the goods and services markets.

Keywords: organization, HR-management, development, strategy, human-centered approach

JEL Classification: G30, M20, L20

Introduction

Humanocentrism cannot be considered a fundamentally new phenomenon in the field of domestic economic thought. Its conceptual foundations were formed in the fields of philosophy, history, psychology, and in the field of social and labour relations. During the period of the spread and popularization of the capitalist economic model, the personnel of enterprises, institutions, and organizations were perceived by their owners and management exclusively as one of the corporate resources, the use of which ensured profit. However, nowadays, it is increasingly possible to encounter assumptions that with the help of effective motivation and social orientation of management mechanisms when making personnel decisions, business entities can obtain a much greater positive (material, reputational, competitive) effect from the labour activities of their employees than by acting exclusively by administrative means, orders, and coercion. The

consequences of the social orientation of HR management and human-centred personnel management can be especially noticeable for organizations where the specific weight of intellectual work and the importance of the emotional background of employees determine the effectiveness of financial and economic processes and contribute to the achievement of strategic guidelines for their development. Higher education institutions are among such institutions where human resources and their intellectual capital are the main competitive advantages in the market. Therefore, testing hypotheses regarding the feasibility of using human-centred paradigms in personnel management on the example of educational institutions is a completely rational and worthwhile idea, worth the effort, attention and time.

Nearly 10 years ago, in 2016, a new concept of Society 5.0 was presented in Japan. This society was named "Super-smart," and its characteristic features included: the fine differentiation of various societal needs and their satisfaction by providing necessary products and services in the required quantities to people who need them, exactly when they need them (focus on current needs without excessive consumption); and the ability for all people to receive high-quality services and live a comfortable, active life that respects their diverse differences, such as age, gender, region, or language (human-centrism). The identifier 5.0 denotes a new society created as a result of transformations driven by scientific and technological innovations, and it is the next stage of social revolution after the hunting, agrarian, industrial, and information societies (Harayama, 2017).

Over time, Society 5.0 has become the focus of research for many scientists from various countries around the world (Narvaez Rojas, AlomiaPeñafiel, Loaiza Buitrago, & Tavera Romero, 2021; Zengin, Naktiyok, Kaygın, Kavak, & Topçuoğlu, 2021; Topçuoğlu, Oktaysoy, Kaygın, Kosa, Uygungil Erdoğan, Kobanoglu & Turan-Torun, 2024; Kanbara & Okuno, 2020; Kanbara, Shaw, Kato, Miyazaki & Morita 2022). To manage this society and the business structures that are created and operate to meet the needs of Society 5.0, new approaches and mechanisms are required that consider the specific characteristics of the human resources forming in this environment. Management 3.0 is an evolution of previous models for managing people, organizations, and their subdivisions. Management 1.0 was based on a "top-down" work model that allowed for a low level of freedom and initiative in decision-making and left no room for creativity. The second stage of management evolution (i.e., Management 2.0) aimed to develop new, more effective methods for managing organizations (for example, attention began to be paid to quality management, and the Six Sigma method became widespread). However, the vertical management structure was still clearly evident. Currently, Management 3.0 aims to create a professional environment for an organization where all employees are responsible for the success of their identified managerial initiatives. Appelo (2011) believes that this management model "improves people and teams". The features and characteristics of Management 3.0 are also described by foreign and domestic scholars such as Almeida, Espinheira (2021), Maximi (2016) and Ukrainian researchers such as Kopytko, Chyrva, Stavska, Karvatska (2022).

Human-centrism in personnel management and strategic management of organizations

The transition to human-centred management in conditions of uncertainty and risks is a necessary step to ensure economic security and sustainable development of domestic business entities, which will allow them to create a safe, harmonious and productive working environment.

Modern global challenges and wartime trends, including the gradual decline in the level of efficiency of the traditional aggressive-capitalist model of doing business and the loss of human capital by Ukraine, require management personnel to take action to initiate the transition of enterprises to the concept of socially oriented management. Human-centeredness in HR management can become an important means of preserving and scaling intellectual potential, since according to its provisions, a person is considered by the enterprise not as a resource, but as the highest value and source of gaining competitive advantages. The author's three-stage model for introducing human-centeredness into the system of strategic HR management of an organization

(from meeting the basic needs of the employee to recognizing his role for the future of the company and involving him in decision-making, current and long-term), should become a practical tool for building a strategy that will allow a business entity to create a positive employer brand in the labour market. Human-centeredness in HR management will ensure not only the preservation of existing talents in the teams of enterprises, institutions, organizations, but also will contribute to attracting new promising personnel, which is a critically important condition for the sustainable development of business and society, because the success of a modern organization depends significantly on its ability to invest in people and create conditions for their comprehensive professional and personal development. The concept of human-centred management correlates well with the principles and approaches of safety-oriented strategic management, because it also has as its main goal not to achieve high financial results, but to minimize personnel risks by meeting the needs and interests of the business entity's employees. This goal contributes to achieving the level of personnel security of the organization through the use of tools for increasing intellectual potential, such as training and development of personnel, increasing the quality of human resources and creating a professional reserve to promptly meet the need to fill vacant positions.

Given the large losses of human capital in Ukraine after the start of the full-scale invasion, the study of the problems and opportunities for using human-centred personnel management in the strategies of security-oriented management of organizations is relevant and just overdue.

The strategy of security-oriented management of organizations in conditions of uncertainty and risks should be focused on:

- achieving optimal financial, economic or social performance indicators of the organization while maintaining minimal risks of economic failures;
- forming a budget to compensate for the negative impact of threats on the company's corporate resources;
- ensuring the physical and individual economic security of its employees;
- protecting the occupied market share without excessive optimism or aggressive competition for its expansion in the future;
- maintaining a stable staff composition and achieving minimum staff turnover indicators;
- increasing intangible assets, including through personnel training and development mechanisms;
- developing various scenarios and alternatives for the economic development of a business entity depending on the dynamics of changes in the parameters of the external and internal environment of its operation to ensure the possibility of flexible and prompt response to new challenges.

The personnel component of safety-oriented management is extremely important for its successful implementation, since it is the actions or inaction of management personnel or executives of management decisions that can, on the one hand, reduce the likelihood of the manifestation and negative consequences of a risk or threat, and on the other hand, form new threatening factors that, given the source of their occurrence, will be impossible to manage.

Research conducted in the field of possibilities for introducing a human-centred approach in the management of higher education institutions, in particular, in the areas of personnel management and strategic management, led to the conclusion that the aggressive capitalist model of economic development, in which the main goal of the functioning of business entities was to make a profit at any cost, turned out to be ineffective in the long-term time horizon, as evidenced by environmental indicators, and sometimes social global indicators. Preservation of human capital in conditions of uncertainty and risks, with which the modern world is oversaturated, should become the main priority of sustainable global development. Human-centred management can be

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a tool for preserving and evolving the quality of personnel available to companies to the level required by modern entrepreneurship. The conceptual principles of human-centeredness in the management of modern organizations are built on an orientation to the individual needs and interests of employees, based on the assumption that their maximum level of satisfaction will lead to increased employee loyalty and their readiness for professional development, as a result of which the economic and reputational success of the organization in a strategic perspective will be guaranteed. Ukrainian higher education institutions demonstrate successful experience in using practices similar to human-centred management in their current activities, embodied in student-centred learning. This approach was proposed and tested at the state level for higher education institutions in order to ensure their “survival” in the conditions of a behavioural market economy. An example of successful experience in using human-centeredness in the management of an educational institution is the Bohdan Khmelnytsky National University of Cherkasy, whose personnel policy includes elements of taking into account the interests of employees. They are most noticeable in certain areas of personnel management, in particular when organizing its work. In general, the Ukrainian experience of managing higher education institutions allows us to list such positive cases in this area as the use of material and non-material incentives to motivate employees, flexibility in planning their working hours, for example, in the process of forming a schedule for the academic semester. The principles of humanism are embodied in approaches to ensuring the physical safety of staff and students during air attacks, and are also present in the ability of the teaching staff to choose individual programs for improving their own qualifications, namely, specific conditions for its completion, such as the duration of study, the country of residence during study, the topic of advanced training, which may correspond to the scientific interests of the employee or the educational components that he teaches to students, the ability to choose formats and topics for submitting grant applications for conducting scientific research and their financing; optimization of time spent working with documents thanks to the university's digital ecosystem; the ability to combine scientific, educational and practical activities, as well as work additionally within the framework of the legislation with hourly pay. All of the above factors are the circumstances that encourage educators to remain in their profession, despite the fact that the level of remuneration for their work remains below the average in the labour market, and is uncompetitive in comparison with the business and public management and administration sectors. The arguments presented and the established facts give reason to assume that the introduction of human-centeredness in HR management of HEIs can become a trigger for attracting and retaining highly qualified scientific and pedagogical personnel, which is especially relevant in conditions of personnel shortage and risks associated with the realities of wartime. The use of flexible schedules, individual KPIs, personalized social packages and motivational approaches and other tools that take into account the personal circumstances of employees, their interests and needs, will allow HEIs to form an attractive employer brand in the labour market and attract talents. In view of this, the senior administrative staff of educational institutions should consider humanistic orientation not only as a popular trend capable of improving the institution's brand in the market of its services and brand-givers of the labour market, but as an important strategic guideline that guarantees the preservation of intellectual capital and personnel potential of the scientific and secondary pedagogical level of education of the institution, ensure its sustainable development in conditions of uncertainty of the external environment and falling demand for educational services, as well as provide new opportunities for expanding the boundaries of scientific activity and cooperation, including through the digitalization of many economic areas.

Prospects for transforming higher education institutions into turquoise organizations using human-centrism and Society 5.0 and Management 3.0 opportunities

To transform higher education institutions and other business entities into turquoise organizations, a comprehensive change in their management paradigm is necessary. Therefore, the

implementation of the basic approaches of the Management 3.0 model into the management systems of business entities is a number of elements to launch this process. The formation and gaining popularity of turquoise companies in the economic environment is studied in the book by F. Laloux (Laloux, 2014). The scientist systematizes all existing organizations on the market according to the management principles that operate in them, in several categories:

- red: their main characteristic is the desire of senior management personnel to demonstrate their power everywhere in order to keep subordinates in a state of tension and force them to obediently carry out management decisions; the main instinct that can be found in teams of red organizations is fear; the advantage of such companies is the ability to quickly respond to changes in sentiment in the markets of goods and services, as well as a clear focus on successfully achieving the most relevant and short-term goals and the ability to stabilize their business processes in a chaotic environment of doing business;

- amber; their characteristic feature is a high level of coherence and formalization of the role of each member of the work team within the framework of the organization's management pyramid; a clear construction of a red-bottom management system, which is present in the Management 1.0 and Management 2.0 models, is also a distinctive feature of such companies. The stability of the organization's activities is valued above all by its leaders and is maintained through strict adherence to business processes. The future of the organization is defined as a repetition of past successes and achievements;

- orange: the goal of such companies is to overcome competition, achieve profit, and grow. For their top management, innovation is the key to staying ahead and taking leading positions in markets and the industry. The management of these organizations is "by objectives": management and control are present during the definition of goals (what to do); employees have freedom in how to achieve the set goals;

- green: within the traditional pyramidal management structure, the management of such companies focuses on delegating authority to motivate employees;

- teal: characterized by self-organization, wholeness (employees can self-actualize in the workplace), and an evolutionary purpose (the organization strives for a larger result than just profit). Such companies completely abandon the traditional hierarchy (Laloux, 2014).

The study of the phenomenon of Teal organizations was continued by scholars such as A. Moreno, Á. Uruburu, A. Jain, M. Ruiz, M. C. Gómez, who believe that in Teal organizations, purpose "emerges from the core as the engine that drives the system," which contrasts with companies whose leadership is incapable of thinking outside the box. Strategic planning and associated management mechanisms are replaced by the ability to "sense and respond," which is embedded in core business processes (Moreno, Uruburu, Jain, Ruiz, Gómez, 2020). This managerial vision and organization of business processes allow for a flexible response to changing consumer needs and align well with the characteristics of Society 5.0.

We believe that in the context of this study, it is appropriate to pose two questions:

- Can a modern Ukrainian university become an example of a Teal organization in the future?
- How to combine the paradigmatic principles of Society 5.0, Management 3.0, and Teal organizations to build a university of the future that will operate on the principles of human-centrism?

To transform a higher education institution into a Teal organization, several important steps must be taken.

First, provide greater autonomy to the staff; this can be expressed in the ability of academic staff to adjust their own schedules, choose the volume of their weekly workload, and influence the selection of disciplines and the initiation of author's courses and educational components for educational and scientific programs.

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Second, employees should have the opportunity to carry out their own scientific and educational projects, and work on individual grants within working hours and using the institution's resources, as is successfully implemented, for example, at Google, where one of the forms of employee motivation is to give them the opportunity to use the company's resources (in pre-determined volumes) for the needs of their own personal and professional growth and development.

Third, minimize controlling measures by the university's management regarding the scientific activity of the staff by reducing the amount of reporting documentation and setting an optimal number (up to 10 per year) of KPIs for each employee.

Fourth, departments and other structural subdivisions responsible for the implementation of educational and professional and educational and scientific programs should have their own budget and financial resources to develop their specialties, educational products, and provide material support to employees and students who demonstrate high results in educational and scientific activities.

Fifth, each employee should have their own individual career trajectory (for 10 years) and professional development plan (for 3-5 years), developed by the employee with the participation of a career consultant, coach, or mentor, and agreed upon with the human resources department and direct supervisor, to which changes and additions can be made in accordance with the new interests and needs of the employee and the transformations of their professional field.

To become a higher education institution that demonstrates readiness for social change and actively transmits the values of Society 5.0, management should continue the qualitative transformations of its organizational and management mechanisms (primarily, in the field of strategic HR management). To do this, it is necessary to:

- activate the use of human-centered management in personnel management (conduct a large-scale survey of employees to identify their current interests and needs - for example, the presence of small children, which limits the ability to work in the first and last classes; problems with getting to the workplace on time, the inability to take a break for rest and food during lunch if classes fall at that time, etc., to take measures to optimize schedules and work schedules and get as close as possible to work-life balance);

- fully integrate educational, methodological, and support processes into the digital space to create a single 24/7 system of communication, information exchange, and multilateral connection between participants in the educational space;

- direct resources to solving the social problems of staff and students (for example, by equipping children's rooms, recreation rooms, partially compensating for food expenses, transportation costs, and costs for the treatment and education of employees' children);

- allocate resources for environmental initiatives, corporate events, and energy-saving technologies;

- develop new "transformer" and "constructor" educational services that can adapt to the individual needs of students and reflect the unique expert experience of the teachers involved in their creation and implementation.

In Table 4 a set of measures for the transformation of higher education institutions into a "smart university" operating on the principles of turquoise organizations, Society 5.0 and Management 3.0 has been summarized.

A comfortable working environment that can provide a human-centred approach to personnel management in higher education institutions will create an atmosphere of mutual trust, scientific creativity and pedagogical creativity. In turn, this will allow scientific and pedagogical workers and students to generate innovative ideas, and management personnel to update their approaches to managing employees whose work involves the large-scale use of intellectual labour. The environmental friendliness of management in human-centred organizations is increasing, as

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is the level of independence, ability to demonstrate leadership qualities and teamwork of personnel, which are extremely important when forming teams for the implementation of scientific projects and the implementation of educational initiatives in the field of academic management.

Table 5. A set of measures for the transformation of higher education institutions into a “smart university” operating on the principles of turquoise organizations, Society 5.0 and Management 3.0

Characteristics of a “smart university”	Management measures to implement initiatives for the transition to a "smart university"	Required resources and actions
University – for work, study, experience and life	Development of campus infrastructure - catering, a hotel for students' parents, a medical center, a mini-kindergarten and playground, a unit for graduate employment	Resources for establishing cooperation with businesses and enterprises, medical institutions, and recruitment agencies in the city and region
People-centered personnel management	Human resource policy with a focus on employee needs, personalization of motivational tools	Time for surveys, document development, finances for motivation
Smart and socially oriented organization of space	Inclusive spaces for people with disabilities, rooms for rest and meals, study spaces in the yard, children's rooms, parking lots (including for bicycles, scooters, baby strollers), energy saving, lighting of territories and climate control	Material and financial resources - for equipping territories, installing solar panels, human resources - for attracting service and support staff
Retaining talents and encouraging young people to pursue a career in higher education	Conducting information events for graduate students and young scientists, introducing scientific mentoring	Introducing the position of a scout or recruiter to search for talent
Task profiling according to the interests and abilities of scientific and pedagogical staff	Choosing the main direction for the realization of the employee's talents: training, science, management, support (ESMS model), personalization of tasks	Time resources for reviewing and redistributing the scientific and pedagogical staff workload

Source: own work

Conclusion.

In the conditions of the personnel crisis that has developed in Ukraine, human-centrism in personnel management and strategic management is not only a way to increase the level of ethics of management processes, but also a strategic necessity for the economic survival of the business and the long-term success of the organization. As weighty arguments in favour of the earliest possible implementation of such an approach, we propose to note: a significant increase in loyalty and labour productivity levels, as well as an expansion of the list of possible innovative approaches to the implementation of work processes and additional opportunities for attracting, retaining and developing talents, including among young specialists, graduates of higher education institutions, etc.; increased awareness of corporate culture and adherence to the organization's values among personnel, as well as a feeling among employees of a close connection with the organization and an understanding of the significance of their external environment for achieving its goals; increased flexibility in managing changes and adapting to trends observed in the company's external and internal economic environment, as a result of which a significant financial growth in

business results and stabilization of economic security indicators of business entities over the long term are possible. In Ukrainian realities, anthropocentrism arises precisely in times of crisis and is popularized under the constant influence of the intensification of military risks, and becomes not only a tool for popularizing corporate management ideas and a trend for improving the business reputation of companies, but also a fundamental principle for transforming management processes in the direction of social management, which in the future is capable of guaranteeing enterprises significant competitive advantages, high financial results and sustainable economic development. As a result of this study, measures were formalized that create a possible transition of traditional higher education institutions to the “smart university” model through the following steps: development and updating of personnel policies that will be focused on the needs and interests of employees and on the personalization and individualization of means of motivational influence on the behaviour of each specific employee; updating and digitalization of the campus structure, in particular the organization of public catering, construction of a facility for accommodating parents of higher education applicants, a medical care center, a kindergarten and a playground; organization of a unit that will take care of the employment of graduates and tracking their career trajectories; introduction of a permanent practice of conducting career orientation events, interviews with labour specialists and studying the career ambitions of the market of higher education applicants; selection of a priority direction for the realization and development of employees' talents, in particular in such areas as scientific activity, educational activity, administrative work or business process support (ESMS model), and personalizing tasks; automating reporting, accounting, grade notifications, etc.; organizing sports activities, medical examinations, and psychological counselling. To effectively find, identify, and retain talent and encourage young people to pursue a career in science or education, it is proposed to introduce the position of a scout or recruiter, whose duties would include analysing the candidacies of young scientists -recipients of scholarships, winners of various scientific awards, and promising young researchers from among master's and Ph.D. students, and developing personal employment offers for them at the university on a full-time or part-time basis.

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MARKETING PERSPECTIVE ON THE CHALLENGES OF DIGITIZATION AND AI IN PUBLIC RELATIONS AND EVENT MANAGEMENT

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Abstract: Today, the inevitable is common for societies, companies, and consumers. It is generated by the changes that are emerging, the transformations that are taking place, and the impact they have on economic activity and people's lives. For this reason, both companies and consumers must face the evolution and pace of emerging phenomena. The acceleration driven by digitization and the integration of artificial intelligence (AI) is a reality that we must embrace. Both companies and consumers must align with the accelerating pace of digitization and AI integration. The acceleration driven by digitization and the integration of artificial intelligence (AI) is evident, especially in business and particularly in consumer behavior. So, we are seeing new models in which organizations communicate, promote, and interact with customers. In this regard, the fields of marketing, public relations, and event planning are currently undergoing conceptual redefinition and practical reconstruction. This is especially true under the impact of digital technologies and new market trends. In the past, the effectiveness of PR campaigns and marketing events depended largely on creativity, intuition, and access to traditional media. In this context, they are now increasingly influenced and shaped by automation processes, big data, predictive analytics, and personalized interactions.

As a result, this paper aims to identify the challenges associated with the integration of artificial intelligence and digitization in the field of public relations and event management and to highlight the impact on companies' marketing performance.

Keywords: public relations, PR campaigns, event marketing, event management, digitalization, artificial intelligence

JEL Classification: M 31, M 37, M 15, O 33

1 Introduction

Because of its universal implementation and adaptability, as well as the tools it uses, marketing is a broad and constantly evolving field. The acceleration of management and marketing processes is due to digitalization, and Artificial Intelligence is becoming more and more evident in economic, social, and cultural activities. The effects of digitization and AI integration are felt by consumers through the way that companies communicate, interact, and establish relationships. As a result, public relations and event management are remodeled, combining non-traditional practices that have considerable effects.

2 Methodology and results of the study

According to the literature consulted, public relations or PR is a promotional technique that can influence the audience and aims to build the company's image, reputation, and consumer trust. Technology and the evolution of the digital environment have generated new forms of PR such as digital PR and experiential marketing, and the latest research indicates that the automation, predictive analysis, and digital interactivity are real opportunities for companies to grow. Event management is a field with dual meaning, combining creativity with planning, marketing with management. This form of promotion takes on a strategic role and is considered "an integrated platform for communication and organizational development" that creates unique and memorable experiences.

The article explores how digitization and artificial intelligence are redefining the content of public relations and event management, highlighting the effectiveness of marketing, communication, and promotion campaigns by creating unique, personalized experiences and value for the consumer.

Although we identify certain emerging aspects in the literature regarding digital PR and innovative technologies in event management (or marketing) or studies on the impact of technologies on communication and events, we do not find the relationship between the two influenced by digitization and AI. This confirms an insufficient level of research in the field and the necessity to analyze how digitization and AI are involved in PR and event management and affect interaction with the public. The purpose of the article is to analyze these aspects and highlight its significance for managers, marketers, and consumers.

To achieve the proposed objective, the paper combines bibliographic analysis, theoretical investigation of concepts, and the study and the comparison of results published in secondary sources. A holistic understanding of terms, notions, and concepts has required a review of the specialized literature, digital scientific resources, and recent studies in the field, as well as comparison, deduction, and interpretation as scientific and research methods.

3. Defining and delimiting public relations and event management

Under the digitization pressure and in the current market circumstances, the goals and objectives of a modern company are to constantly interact and communicate with consumers. These become essential for various reasons—one relates to achieving objectives, and the other to promoting the image of the company, its products, and services. Thus, the decision-making system and marketing specialists can use effective tools and means, including public relations and marketing events. In this way, decision-makers and marketing specialists can use effective tools and means, including public relations and marketing events.

Public relations is a promotional tool that ensures good communication with the target audience, and PR strategies and techniques develop trusting relationships with stakeholders, thus facilitating interactive relationships between different levels of society. As markets have developed, public relations have evolved in terms of both concept and content. History shows that PR has ancient origins and was used as a technique to promote wars, lobby for political causes, promote religion, sell products, raise money, and publicize events and people. After the post-war period, the concept of PR incorporates notions specific to two-way communication: reciprocity and inter-relationship. In this context, many authors define and interpret public relations, both from a theoretical and practical perspective, as a complex field through which public opinion can be influenced. Or, they are presented as "a distinctive managerial function that facilitates communication, cooperation, and mutual understanding between organizations and the public (Harlow, Rex, 2016)." As a component of the PR promotional mix, "it represents the element that connects the company, consumers, and society through non-personal and non-verbal communication (Kotler, Keller, 2012)."

These approaches allow us to understand the scope and importance of public relations and to highlight the effects that PR has in practice. They refer to persuading the public, establishing trusting relationships between the organization and the public, ensuring the smooth functioning of society, and ensuring communication with the general public and with specific groups. From a marketing perspective, public relations become a priority in promoting the image of companies, products, and services, but also allow for the establishment of trusting relationships with consumers. Analyzing public relations from these positions, we notice a particular aspect related to goals, functions, content, and the fact that companies are allocating time and resources to adopt PR programs and projects (Remeşovschi, 2025). These fulfil five basic functions (Kotler, Keller, 2012), such as: *press relations, product promotion, corporate communications, lobbying, and consulting*.

Therefore, public relations are effective and can generate significant effects - economic and non-economic, but public relations tools must be carefully selected. We note that the key areas of public relations relate to effective tools aimed at good communication with consumers and the public, and complex techniques for promoting a product, business, or person. Thus, the most trusted channels used by PR specialists, but also those that give the best results, are traditional media (print newspapers, television, radio), public events, and more recently, social networks. A good PR strategy is based on a thorough knowledge of the general public and the strengths, vulnerabilities, and opportunities for promoting a company or person.

An important area of interest in promoting company's image, products and services is **event management**. These have evolved along with changes in the market and in marketing tools for promotion. Today, this field is very advanced in terms of the types of events, the means used, the objectives pursued, and the process of implementation. Individuals, companies, destinations, social and political groups organize events of different sizes and for different purposes to achieve their goals. Event management is considered as a dynamic profession that combines creativity with strategic organizational impact.

In the context of changes and developments in the modern economy, events are becoming marketing and management tools that companies use in their strategies to connect with consumers and differentiate themselves from the competition. The marketing perspective considers events as "integrated platforms for communication and organizational development (Zarantonello, Schmitt, 2012)" that contribute to customer relationship building and brand image creation. Management perspective identifies events as "complex projects involving planning, resource allocation, operational coordination, and evaluation of results (Geeksforgeeks. (n.d.), Computer Science portal for geeks, <https://www.geeksforgeeks.org/business-studies/>)" Accordingly, the activities of planning, coordinating, evaluating, and conducting events are considered important.

Sources suggest several definitions of events, which are considered "organized occasions (APEX, 2005)," "unique moments celebrated through ceremonies and rituals (Goldblatt, Joe, 2013)," or "unique spatial and temporal phenomena (Getz, Donald, 2012)." In this regard, we consider that "an event is not just a marketing act, but a cyclical managerial process" corresponding to "successive, unique, well-designed phases that build trust, consolidate reputation, and transform customers into brand promoters (EMBOK, 2005)". Marketers focus on organizing events based on message, audience, and image results, while managers place emphasis on planning, resource allocation, and operational efficiency. Both of these approaches are important and should be taken into account because, when integrated, management ensures sustainability and success, and marketing makes sure consumers are convinced (Setiawana, Wibisonoa, Purwanegaraa, Mustika, 2022).

From a marketing perspective, event management encompasses (Hoyle, CAE, CMP, 2002) *the process of organizing, managing the marketing of events, and events as a strategy*. The organization itself corresponds to the activities of preparation, actual execution, and post-event actions, including special techniques. Event marketing management includes communication as an integrated strategy through social media channels, email marketing, traditional and digital advertising, aiming at image building and sales. Or events highlight the experience, are "based on innovative technologies through virtual and augmented reality or interactive installations, which have an **"impactful brand"** (Johnson, P. (2025)". As a strategy, events are "used to differentiate from competitors and position oneself as a unique brand in the minds of consumers, but also as a tool for building loyalty through memorable experiences capable of building lasting emotional relationships with the target audience (Okhiria, 2020)."

4. PR and event management in the digital era

We point that public relations and events are important in promotion, but with the digitization and development of information technologies, they have undergone significant changes in

structure and content, as well as in the way they are carried out and the channels through which they are disseminated.

As a result, in PR today, we are witnessing a complementation of tools, the transition from traditional PR to digital PR. The basic idea, deduced from Figure 1, is that both aim to raise brand awareness and convey positive messages. These must be considered and analyzed by the managers and especially by marketers, as they form the foundation of any public relations strategy. Whatever channel and means we use to get the message delivered (mass media, social media, or press), the goal, but especially the end result, should be to build public perception and trust.



Figure 1. What's the Difference Between Traditional PR and Digital PR?

Source: Zlatin George, Traditional PR vs. Digital PR, [online] Available at: <https://www.digitalthirdcoast.com/blog/whats-the-difference-between-traditional-pr-and-digital-pr?>. [Accessed 18 September 2025].

In the same context, traditional public relations should not be neglected, as the channels used to deliver the message can be effective in communicating with other categories and segments of the public. Digital public relations operate online—through social media, blogs, video platforms, and websites—reaching more specific, tech-savvy, and younger audiences in real time. In terms of effectiveness, both traditional and digital PR are important because:

- both categories enable and strengthen communication by attracting a wider audience, allowing for credibility and deeper engagement;
- they enable two-way interaction;
- they ensure greater consistency - messages remain unified and impactful at both offline and online touchpoints.

With regard to events, we see a transformation in user interaction, which is triggered by digitization, namely (Kurzweg, 2025):

- interaction with digital interfaces (such as clicks, form submissions, videos, scrolls, logins);
- digital systems and platforms generate system events (backend);
- connected devices generate Internet of Things (IoT) events
- commercial operations generate transactional or business events (placing orders, recording payments, issuing invoices, or shopping cart activity)

As a result of digitization, events refer to the trigger interactions or digital events that follow or influence processes within digital systems. These can happen in software apps, websites, mobile apps, or on digital platforms and networks.

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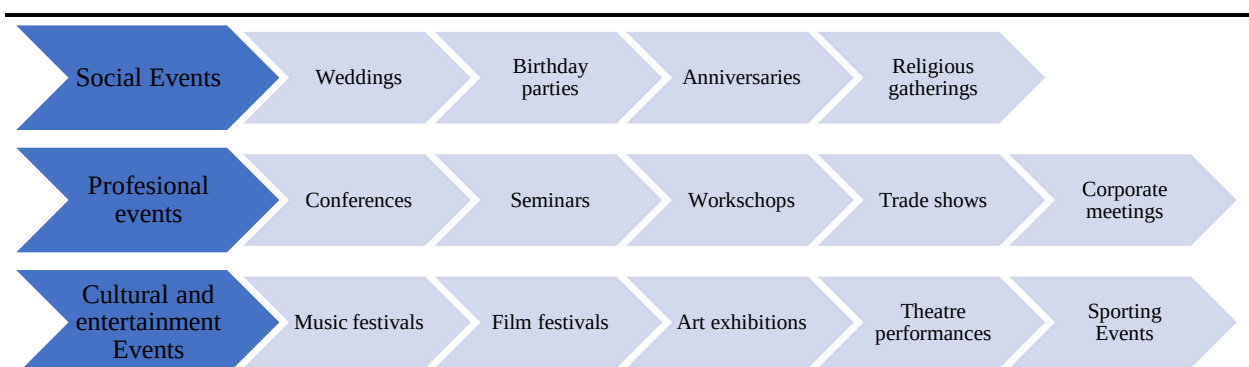


Figure 2. Types of Events

Source: [online] Available at: <https://www.theknowledgeacademy.com/blog/types-of-events/>. Accessed 17 September 2025].

Public relations (PR) and events are currently undergoing transformations driven mainly by rapid digitization and the integration of artificial intelligence (AI). These changes are reshaping traditional strategies, providing new tools for measurement and engagement, and creating both opportunities and challenges. This article confirms that, in the digitalization context, PR and event management, when effectively integrated, can significantly enhance brand image, market position, and the quality of relationships with consumers and partners. A review of research and bibliographic sources shows a strong impact of digitization and AI on event management and PR. According to the DPI Measurement Commission and ANA report, AI is deeply integrated into these fields. (O'Neil, Dwyer, Czabovsky, Ele Hulud; Association of National Advertisers). We find that digitization has disrupted conventional public relations and event practices, while the shift from print to digital, the emergence of social media platforms, and the use of data analytics have redefined how professionals approach audience engagement. On the other hand, the implications of artificial intelligence support the optimization and streamlining of PR and event processes through media monitoring, feedback analysis, personalized content delivery, data automation, and predictive modeling of operations.

The sources consulted also note some challenges in implementing AI and using digital tools in PR and event management. These mainly relate to technological gaps, demonstrating that not all organizations have equal access to advanced AI tools. PR and event management companies may face budget constraints or a lack of technical expertise, leading to a digital divide. There is also a gap in the use and implementation of digital tools and AI. Although we establish clear benefits, many professionals are reluctant to adopt AI due to fear of obsolescence or lack of training.

A culture change and continuous professional development are necessary to reduce this gap. The complexity of business and data overload generated by AI tools can generate overwhelming volumes of data. Without proper frameworks, it becomes difficult to extract useful information. Human oversight is essential for filtering, contextualizing, and meaningfully interpreting data. As digital platforms multiply, so do the risks of data breaches and misinformation. AI-generated content can be manipulated, raising the bar for fact-checking and veracity in PR. Investment and impact on the human factor are considered a key challenge, with some companies unwilling to incur expenses and investments, as well as make changes to their company structure.

5. PR and event management challenges generated by digitization and AI

If we analyze how digitization has influenced the field of public relations (PR), we are talking about how organizations communicate, build their image, and manage their relationship with the public, and this refers to (Özgen, Şeyma, 2022):

- new communication channels. With the advent of social media, blogs, and content sharing platforms, companies no longer depend exclusively on traditional media (TV, radio, print) to reach

their audience. They now communicate directly through direct and highly personalized channels (Facebook, Instagram, LinkedIn, Twitter, YouTube, TikTok, newsletters, and podcasts).

- By changing audience dynamics, digitization has transformed one-way communication into a continuous dialogue. Audiences can react instantly to messages, criticize, like, or redistribute content.

- Real-time monitoring and analysis through digital tools such as Google Analytics, Brandwatch, Meltwater, or Hootsuite allows them to quickly adapt strategies, prevent crises, and better understand their audience.

- The ability to personalize messages based on socio-demographic criteria makes PR more targeted, effective, and relevant.

- advantages in crisis management in the digital age, as image crises can erupt at any time on social media;

- effective alternatives for creating digital content;

- automation of repetitive tasks and more.

AI manifests itself in PR by transforming the field from an intuition-based discipline into one that is increasingly data-driven, automated, and efficient:

- AI does not replace human creativity or empathy, but it provides tools that can amplify and refine communication efforts;

- AI changes the way professionals communicate, analyze, plan, and manage the public image of brands by automating repetitive tasks with AI platforms and tools (e.g., ChatGPT, Jasper, Grammarly, Lately.ai);

- we use AI tools to monitor the media and analyze media sentiment (e.g., Meltwater, Brandwatch, Talkwalker);

- creating AI-generated content through advanced language models (e.g., ChatGPT, Claude, Copy.ai), etc.

When it comes to events, we see that digitalization has radically transformed this field, from planning and promotion to delivery and evaluation. Technology has not only streamlined processes, but also created new opportunities for interaction, personalization, and impact measurement. Digitalization is fundamentally changing event management (Whova Team, 2025, <https://whova.com/>):

- through technology – organizers have more control, visibility, and efficiency;

- through data – they can make informed decisions and measure real impact; and through interaction – they can create engaging and personalized experiences. In fact, events are no longer just about "bringing people together in one place," but about building integrated experiences between the physical and digital worlds;

Artificial intelligence (AI) is increasingly influencing event management, changing the content of the process (Cal, 2024, <https://www.cvent.com/>), AI not only automates tasks but also provides strategic information and more personalized interactions with participants. Thus, AI influences event management by (Yousaf, 2025, <https://vfairs.com/>):

- automating operational tasks with virtual assistants, chatbots, planning algorithms (e.g., ChatGPT, Drift, Tars);

- enabling facial recognition and automated check-in through facial recognition and biometric technologies (e.g., Zenus AI, Clear).

Therefore, AI is not just a technological innovation in event management, but a strategic tool. Through automation, personalization, analysis, and intelligent interaction, events become more efficient, relevant, and memorable.

6. Conclusions

To summarize, we can say that digitization and artificial intelligence not only improve public relations and event management, but redefine them. Thus, integrating these technologies requires

new skills, ethical awareness, and innovative thinking. By using these tools responsibly, industry professionals can create more effective, attractive, and measurable PR campaigns and events. The future of public relations and event management will belong to those who embrace change, exploit data intelligently, and stay connected with consumers. In the context of digitalization and artificial intelligence, it is becoming important for companies that want to promote themselves through public relations and events to develop a few strategic actions:

1. Companies should invest in continuous staff training to ensure that teams can use AI and digital tools effectively and ethically. Training should focus not only on technical skills, but also on critical thinking and data literacy.

2. Cross-functional collaboration between departments—IT, marketing, PR, and legal teams need to work together to develop compliant and innovative solutions.

3. Initiate change through pilot projects that allow for risk-free experimentation on a large scale. Test AI tools in limited areas, such as internal events or controlled PR campaigns. This can build trust and provide best practices.

4. Conduct post-campaign analysis using AI-generated insights. Evaluation and analysis in this regard leads to frequent improvements. Organizations should adopt an agile mindset, using data to continuously refine and recalibrate strategies.

The study allows for:

- identifying opportunities and challenges generated by digitization and AI in the field of public relations and event management;

- raise awareness that marketing tools are becoming more effective through the use and integration of algorithms and impact metrics, data, hybrid solutions, and predictive tools.

These amplify the effectiveness of PR and events, bring new ethical and managerial responsibilities, propel the company's image and position in the market, and redefine the strategic paradigm.

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PSYCHOLOGICAL AND TECHNOLOGICAL DETERMINANTS OF ONLINE PURCHASING BEHAVIOR: A COMPARATIVE ANALYSIS

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Abstract: The decision to buy online is influenced by a multitude of factors specific to the virtual environment, which differ significantly from those that determine consumer behavior in traditional commerce. In a digital environment characterized by a lack of direct physical interaction, products are evaluated based on information available on online platforms, reviews from other consumers, brand reputation, or payment process security. In addition, emotional, psychological, and social factors play an increasingly important role in online purchasing decisions, influencing consumer behavior in a subtle but decisive way. E-commerce, an essential component of the digital economy, has gone from being a convenient alternative to an integral part of everyday life, radically changing not only commercial processes but also consumer behavior. In this context, understanding the factors that influence online purchasing decisions is a necessary and timely endeavour for both academic research and the business environment. The research methods used in this context are analysis, comparison, synthesis, and deduction. The results of the research allowed us to conclude that promotion through social networks in Moldova should be intensified, as customers are influenced by attractive videos; collaboration with influencers can help attract new customers; the information on the website must always be up to date, clear, and accurate; the product return process must be clearly explained, organized simply, and without creating major inconveniences for the customer, trends that are also valid internationally. Thus, online consumer behavior is influenced equally by technical factors, such as ease of navigation on the website, the process of placing an order and payment, along with psychological factors—trust in the brand, attractiveness through product style, quality, and reviews from other customers.

Keywords: E-commerce, online purchasing behavior, psychological and technological determinants / factors.

JEL Classification: M31, D87, L81

Introduction

Technological transformations over the past two decades have profoundly reshaped the way consumers relate to the market, with products and services becoming accessible at the click of a button. E-commerce, an essential component of the digital economy, has gone from being a convenient alternative to an integral part of everyday life, radically changing not only commercial processes but also consumer behaviour. In this context, understanding the factors that influence online purchasing decisions is a necessary and timely endeavour for both academic research and the business environment.

If we were to define e-commerce, we could analyse several opinions expressed by researchers in recent years.

Thus, according to A.Ts Choyzhalsanova and E.V. Bazarova, "E-commerce is an area of the economy that encompasses sales transactions and financial operations carried out through Internet technologies and automated information systems" (Choyzhalsanova, Bazarova 2021).

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Zhaochun Ren and Xiangnan He say that "Electronic commerce, or e-commerce, is the buying and selling of goods and services, or the transmitting of funds or data online." (Zhaochun Ren, Xiangnan He, Dawei Yin, Maarten de Rijke 2024).

Researchers believe that electronic transactions offer important new opportunities for business: companies can adopt innovative and improved working methods, reduce costs, access new markets, and become more efficient in the management decision-making process. In other words, it suggests that we view e-commerce as an entrepreneurial activity dedicated to the sale of products and services, with the aim of making a profit through the use of digital information technologies.

In the simplest terms, leading online marketing expert M. Salvador says that "Online or electronic commerce is a commercial transaction carried out using electronic devices, in which goods, services, or information are exchanged (M. Salvador, 2013). From a broader perspective, Professor Gunasekaran emphasizes the role of e-commerce as "a key factor for the success of companies, used for negotiating, selling, and purchasing products or services through various platforms between multiple entities in order to achieve organizational goals (A. Gunasekaran, H.B. Marri, R.E. McGaughey, M.D. Nebhwani, M. D.2002)

These definitions of e-commerce show us that there are no major differences between online and offline transactions. The biggest difference, however, lies in technology and information management, which are fundamental to business success today. In the online environment, companies must follow traditional techniques to influence decision-making, adapt the most appropriate marketing strategies, create unique experiences, and develop products and services that are tailored and attractive to target customers. Therefore, the Internet has become a powerful ally of the consumer, as it is a tool that allows the collection of various information about the purchasing process in an accessible way, even for those less familiar with the use of IT tools and devices.

According to the authors of generational theory (Twenge, J. M.2023, 2017), consumer behaviour differs greatly depending on age. The following figure shows the widely accepted generational model.

Table 1. The widely accepted generational model

Generation	Period	Current age
Silent Generation	1928 - 1945	80 – 97 ani
Baby-boomers Generation	1946 - 1964	61 – 79 ani
X Generation	1965 - 1980	45 – 60 ani
Y Generation	1981 - 1996	29 – 44 ani
Z Generation	1997 - 2012	13 – 28 ani
Alpha Generation	2013 - present	12 ani

Source: conceived by the author according Twenge, J. M. 2023, 2017.

In international literature, there is a broad understanding of the existence of five distinct generations, but the boundaries between them are not always clear, given the difficulty of establishing precise limits. Of these, the most recent generations, Y and, especially, Z and Alpha, assume particularly relevant behaviour in e-commerce, as they are the categories of consumers who are born and raised "connected to the Internet." In particular, natives of Generations Z and Alpha find it very difficult to conceive of a world without permanent and ubiquitous access to digital networks, a reality they have never known. Also known as "screen addicts," homo sapiens digitalis, and post-millennials, this generation was born under the influence and emergence of new technologies, smartphones, tablets, Wi-Fi, online games, and social networks, with major differences between this generation and previous generations, especially the Baby Boomers. It is a generation characterized by mastery of new technologies, innovative capacity, enthusiasm, and entrepreneurial spirit. But they are also defenders of high ethical and professional standards, as

well as staunch advocates of environmental causes and sustainability. They use the internet to share information, express opinions, and share their consumer desires.

In this context, young generations of consumers represent a major opportunity for companies, not only because of their financial power and influence in the purchasing process, but also because they will eventually replace the older generations, which are still predominant. Therefore, it is essential for companies to adopt appropriate communication strategies to reach this target group, which will become the main consumer segment in the coming years. Given their familiarity with technology and the internet, digital marketing must be well adapted to this reality, and online commerce will become a particularly important sales channel for these consumers.

Online shopping is the process by which customers purchase products directly from sellers, without intermediaries, or engage in buying and selling transactions over the internet. These platforms offer customers a wide range of products and services, allowing them to compare offers and choose the most advantageous option for their needs.

According to the international statistics portal The Statistics Portal (Figure 1), the global digital population in February 2025 is nearly 5.57 billion people who are active internet users, and 5.24 billion are social media users. In terms of internet usage, China, India, and the US lead the way.

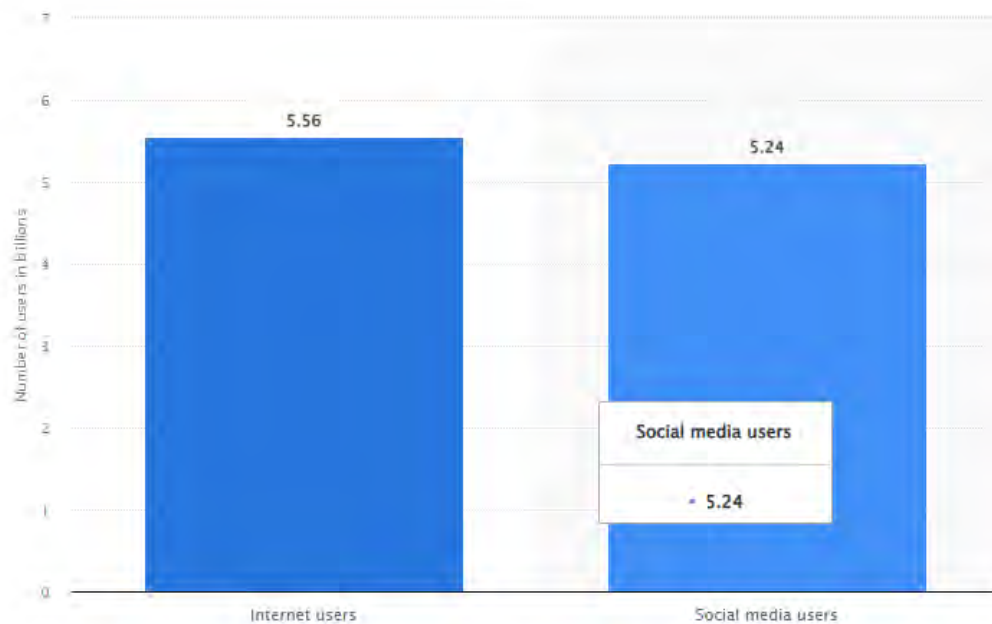


Figure 1. Number of internet and social media users worldwide, February 2025

Source: <https://www.statista.com/statistics/617136/digital-population-worldwide/> accessed 10 October 2025

The increased number of digital consumers is largely due to convenience, attractive app interfaces, and the speed of online shopping, which is just a click away. In addition, busy lifestyles and long working hours make online shopping a convenient solution that also saves time compared to traditional shopping.

Despite the numerous advantages, there are some customers who perceive online shopping as risky and less trustworthy. Studies in this field have shown that there is a close link between trust and loyalty, and consumers often have more confidence in well-known brands than in the retailers who sell their products (A. Bilgihan, 2016). An important aspect of online shopping is the lack of direct interaction between seller and buyer, which makes it difficult to establish a social relationship and, in many cases, the buyer fails to develop the necessary trust (O.J. George, A.O. Ogunkova, J.O. Lasisi, 2025).

Trust plays an essential role in online commerce, being the key factor that transforms a potential customer into a loyal customer. Although the internet offers a wide range of products and services, this diversity comes with perceived risks in terms of the security of digital purchases, such as purchases via mobile applications, orders from online catalogues, or by mail.

Figure 2 lists the internal and external factors that influence consumer behaviour in the case of a traditional purchase. These remain important and have an impact regardless of the form of purchase, in which context we understand that the digital consumer is influenced by even more factors. Thus, understanding user behaviour in the online environment has become a strategic priority for companies operating in the digital space.

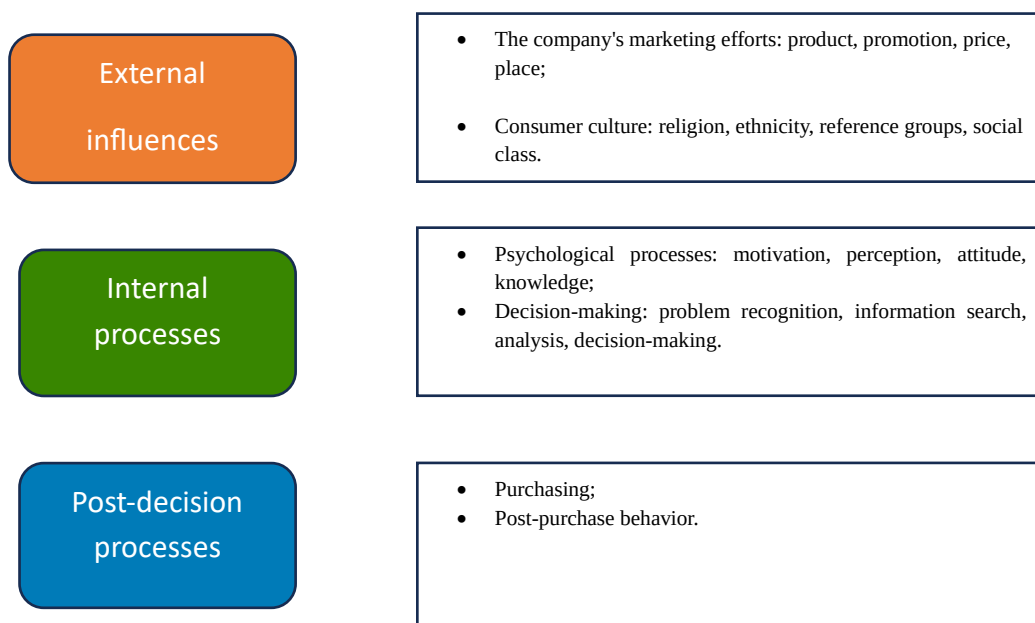


Figure 2. Factors that influence consumer behaviour

Source: Hayden Noel, *Marketing Essentials: Consumer Behaviour*, Bloomsbury Publishing, 2009, p. 67

According to recent research, a detailed analysis of the variables that influence user interactions on online platforms contributes significantly to identifying the determining factors in the purchasing decision-making process (Kotler, P., Kartajaya, H., & Setiawan, I., *Marketing, Technologies for Humanity*, 2021). These factors include browsing experience, content quality, social influences (reviews, comments, recommendations), but also personalization of offers and remarketing strategies.

Chaffey and Ellis-Chadwick emphasize that the digital environment provides companies with access to a considerable amount of behavioural data, which facilitates advanced audience segmentation and the delivery of messages tailored to individual preferences (Chaffey, D., & Ellis-Chadwick, F., 2019). Thus, knowledge of these mechanisms not only supports the development of more effective marketing campaigns, but also contributes to strengthening the brand-consumer relationship by increasing satisfaction and loyalty. Consequently, analysing online behaviour is no longer just a competitive advantage, but a necessity in the sustainable development of digital marketing strategies.

When defining their digital presence—whether through their own online store or through marketplace platforms—sellers must consider the key performance indicators (KPIs) they want to achieve, while also keeping in mind the essential elements that contribute to their success. (KPIs) they aim to achieve, while also keeping in mind the essential elements that contribute to the success of the online purchasing process. Specialized literature in the field of e-commerce highlights a set of determining factors that act as explanatory variables for online purchasing behaviour. Thus, we

identify ten main factors that influence consumer behaviour in the digital environment: the availability of products and services online, the quality of the website, trust, the level of comfort offered, price, overall digital experience, social media platforms, other consumers' reviews, word-of-mouth (WOM) recommendations, and electronic word-of-mouth (eWOM) recommendations (Vieira, V. A., Araujo Guerra, P. H., 2020). These elements are detailed below.

Online products and services: Tech advances and internet access have made consumers less loyal to brands and more picky about the products and services they use, since they can now easily compare their experiences with those of other customers. Living in an era of informed consumers who are more aware of their purchasing decisions, the range of products and services tends to be more varied and valued, making use of the resources offered by internet technology, namely the global availability of offers on digital platforms. As a result, consumers see a wide range of offers, thus encouraging consumption and the purchase of goods and services online.

Website quality: websites must be well-designed, easy to use, intuitive, and rich in information necessary for the online shopping process. When interacting with an e-commerce platform, consumers want to complete the purchase process with the least amount of effort, in the shortest amount of time, and with the greatest confidence in the entire purchasing process. Online shopping platforms must provide clear and easy-to-understand information and be very easy for consumers to use. There is a positive and significant relationship between the ease of use of online shopping platforms and purchase intentions.

Trust: this determining factor is fundamental, as no consumer will buy if there is no trust in the entire purchasing process. However, there is no evidence of opportunistic behaviour on e-commerce platforms (Chen, J., Zhang, C., Yuan, Y., and Huang, L., 2007). Trust is generated by clear return policies, secure payment methods, transparency regarding prices and product information, as well as the seller's overall reputation.

Reviews from other consumers: Ratings and comments posted by other customers on e-commerce sites provide authentic and credible information, having a considerable impact on the purchase decision. When consumers share their online shopping experience, they form their opinion and assign a certain value to the experience.

Word-of-Mouth (WOM) and Electronic-Word-of-Mouth (EWOM) recommendations: these factors have a huge impact on companies' performance in terms of their reputation. This relevance is due to the use of social networks, where consumers often share their experiences, whether positive or negative. WOM can be defined as traditional sources of information, involving family and friends, to gather information and opinions about a particular product or service, using informal communication (Caro, A., Mazzon, J. A., Kammerer, B., and Wessling, M., Innovation, Involvement, Attitude, and Online Shopping Experience (2011), p. 127). EWOM is similar, changing only the means used to share opinions, in this case using online media and platforms, with particular relevance to social networks, blogs, and specialized forums.

In addition to illustrating and characterizing external, internal, and post-purchase factors, a series of variables play an essential role in understanding consumer behaviour in the online environment, including demographic parameters, psychographic aspects, and preferences regarding online communication channels.

➤ **Demographic** data is a starting point in segmenting the target audience. Information such as age, gender, geographic location, or income level can directly influence consumer purchasing behaviour. These variables allow companies to more accurately identify relevant market segments and formulate advertising messages tailored to the characteristics of each customer group (Kotler, P., & Keller, K. L. 2016).

➤ The consumer's **psychographic profile** provides a deeper insight into their preferences and motivations. Analysing personality traits, personal values, interests, and lifestyle allows brands

to personalize the experience offered to users, develop more relevant products and offers, and create marketing campaigns that resonate with consumers' identities. Thus, instead of a generalist approach, companies can adopt a more empathetic and customer-oriented communication (Solomon, M. R. 2018).

➤ **Preferences for online channels** are another important factor in designing a consistent digital experience. Users differ in how they interact with brands—some prefer to use desktop websites, while others are more active on mobile apps or social media platforms. Understanding these choices allows companies to deliver consistent and effective content and services across all digital touchpoints, contributing to increased customer satisfaction and retention (Chaffey, D., & Ellis-Chadwick, F. 2019).

Thus, we can mention that logistics, distribution, and transportation activities, along with efficient and secure payment methods, are fundamental components for the long-term success of e-commerce platforms. Companies that manage these aspects effectively can create a satisfying shopping experience for users and gain a significant competitive advantage in the global digital marketplace.

In the field of e-commerce, platforms such as Amazon and Temu illustrate the complexity of the factors that influence consumer behaviour. For example, the large volume of reviews and ratings available on Amazon contributes to consumers' informal decision-making process, while Temu's strategy of emphasizing affordable prices tends to attract a different, more cost-sensitive audience (M. Holma and A. Junestrand, 2024). Analysing consumer behaviour based on the specifics of the geographic market is crucial. Even though the population of the United States shares a common language and many cultural traits, differences in consumer behaviour are visible and influenced by factors such as economic conditions, social norms, and the degree of adoption of digital technologies.

Since its founding in 1994, Amazon has dominated the e-commerce market, evolving from an online bookstore to a colossal global marketplace (Markus Hesse, 2018). Its customer-centric approach, extensive product range, and fast delivery options have established it as the benchmark for e-commerce in the US and beyond. Furthermore, the Amazon Prime subscription program has significantly influenced customer loyalty by offering numerous benefits that encourage repeat purchases (M. Rashaduzzaman, 2020).

Today, Amazon is considered an essential resource that consumers increasingly rely on at every stage of the purchasing process, from searching for new products and checking prices to scanning product reviews and ultimately making a purchase.

In contrast, Temu is a relatively new player in global e-commerce, launching in 2022 as a platform for affordable goods, focusing primarily on the Chinese market before expanding to the US and other countries. Temu distinguishes itself by offering a wide range of products at competitive prices, leveraging low-cost manufacturing and direct-to-consumer sales to attract price-sensitive consumers (Nim N., Pedada K., and Hewett K., 2024).

Temu acts as an intermediary between sellers—mostly from China—and buyers, without owning or managing its own inventory of products. A distinctive element of its growth strategy is promotion through social recommendations: users are encouraged to attract other customers in order to benefit from discounts. The app uses gamification mechanisms to stimulate user interaction and offers free delivery, bypassing customs duties.

Over the last decade, consumer behaviour in the Republic of Moldova has undergone significant changes, driven by rapid digitalization and wider access to the internet and smart devices. The emergence of e-commerce platforms, the development of digital infrastructure, and changes in lifestyle, accentuated by the COVID-19 pandemic, have led to the formation of a new type of buyer – the digital consumer.

According to recent data provided by ANRCEI, the National Agency for Regulation in Electronic Communications and Information Technology of the Republic of Moldova, and other market studies, over 75% of Moldova's population has access to the internet, and a significant percentage of users (especially those aged between 18 and 35) have made at least one online purchase in the last 6 months (https://anrceti.md/files/filefield/Raport%20statistic%20tr.II_2024.pdf accessed April 2025). Digital users in the Republic of Moldova shop online regularly, at least once a month, sometimes even weekly. Among the most purchased product categories are:



Figure 3. The most purchased product categories by digital consumers in the Republic of Moldova

Source: conceived by the author according https://anrceti.md/files/filefield/Raport%20statistic%20tr.II_2024.pdf accessed April 2025

Online consumers in the Republic of Moldova are characterized by proactive and well-informed behavior. Before finalizing a purchase, they go through a series of steps frequently described in the common actions (Figure 4).

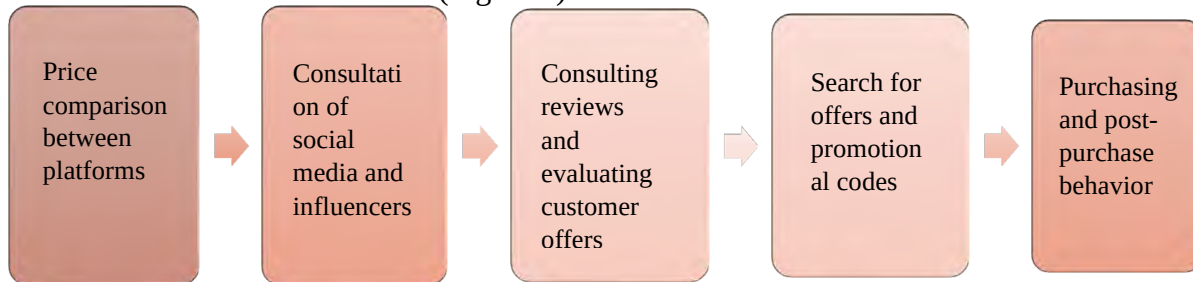


Figure 4. Steps taken by the online consumer

Source: conceived by the author

The active presence of brands in the digital environment thus becomes an essential condition for creating a relationship of trust with the target audience. Consumers expect transparent dialogue, authentic communication, and rapid response from companies, which significantly contributes to strengthening brand loyalty.

In order to understand how economic actors (online stores, service providers, local brands) adapt their strategies to respond to market needs and trends, SWOT analysis comes in handy, allowing us to identify the strengths, weaknesses, opportunities, and threats in the field.

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Strengths	Weaknesses
1. High internet penetration rate – over 75% of the population has access to the internet, with coverage continuing to expand in rural areas. 2. Active use of social networks – platforms such as Facebook, Instagram, and TikTok influence purchasing decisions. 3. High level of digitization among young people – consumers aged 18–35 are open to online commerce and digital payments. 4. Diversification of local and international platforms – a wide range of online stores accessible to Moldovan consumers. 5. Increased adaptability – digital behaviour has developed rapidly, especially during the pandemic, when consumers were forced to migrate online.	1. Low level of trust in online payments and remote deliveries – many consumers prefer cash on delivery. 2. Limited digital literacy among the adult and elderly population – this reduces the adoption rate of e-commerce in certain segments. 3. Unevenly developed logistics infrastructure – deliveries to rural areas can be slow or unreliable. 4. Difficult or confusing returns – the return policy of many stores is unclear or difficult to apply, which affects trust. 5. The digital offering of some local brands is underdeveloped – many companies do not have functional websites or modern mobile applications.
Opportunities	Dangers
1. The continuous development of e-commerce – more and more businesses are going digital, which increases competition and service quality. 2. Integration of new technologies – augmented reality, artificial intelligence in recommendations, chatbots, etc. 3. Increased use of payment apps and digital banking – facilitating fast and secure transactions. 4. Increased interest in local products – the trend of "supporting local producers" can be leveraged by businesses in Moldova. 5. Possibility of regional expansion – local brands can target the Moldovan diaspora through digital platforms and targeted campaigns.	1. Strong competition from major international platforms – eMAG, TEMU, Amazon, AliExpress – offering competitive prices and efficient logistics. 2. Vulnerabilities in personal data security – the lack of effective protection measures can reduce confidence in online shopping. 3. Legislative or fiscal changes – customs duties and regulations on e-commerce can influence consumer behaviour. 4. Slow development of after-sales support services – lack of effective communication after purchase affects customer loyalty. 5. Fake news and false reviews – can negatively influence the perception of digital consumers regarding certain products or brands.

Figure 5. SWOT analysing of online Purchasing

Source: conceived by the author

Conclusion

Moldovan digital consumers are increasingly informed, connected, and demanding. Despite certain reservations regarding payment and delivery security, the trend is clearly moving toward accelerated digitization. Brands that know how to offer transparency, an intuitive digital experience, and fast services will win the loyalty of this new wave of consumers. There are multiple factors that influence purchases, and psychological and social factors can be significantly influenced by the technical aspects of e-commerce platforms, which will ultimately lead to purchases and loyalty or the exclusion of certain offers from the search circle.

Thus, the behaviour of digital consumers in the Republic of Moldova reflects a market that is developing, dynamic, and eager for innovation, but still marked by some structural barriers and reluctance. The main actors involved must demonstrate flexibility, follow local/international

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trends, and contribute to consumer education and the transparency of online purchases with a view to overcoming the dangers and barriers to market development.

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SESSION VII
KNOWLEDGE THROUGH DATA AND QUANTITATIVE
ANALYSIS ROOM

AN ANALYSIS OF THE IMPACT OF FISCAL MEASURES ON THE INDUSTRIAL SECTOR OF THE REPUBLIC OF MOLDOVA DURING AND AFTER THE COVID-19 CRISIS

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Abstract: This paper quantitatively assesses how government measures adopted in 2020 affected the Republic of Moldova's industrial sector during and after the COVID-19 pandemic. A monthly Industrial Health Index (IHI) was constructed using nine indicators: Industrial Production Index, employment levels, productivity, active firms, producer prices, wages, energy costs, exports, and fixed investments. Data were standardized to z-scores over a 2017-2019 baseline period. A linear continuation of the pre-pandemic slope serves as a counterfactual path against which the actual IHI was compared.

The IHI fell by 1.13 standard deviations (SD) in the April 2020 trough but recovered half of that loss within two months. The index overshot and peaked at +2.71 SD in 2021 - 2022, and by the end of 2023, it eased back to a modest shortfall, with the IHI lying 0.46 SD below the projected path. Wages, productivity, and exports primarily drove the rebound in the industrial sector, while energy costs and incomplete recovery in output reduced long-term convergence. The alignment of the industrial sector recovery synchronized with the April - June 2020 government support package. This suggests that changes in fiscal policies and measures promoted by policymakers cushioned the trough in the industrial sector and supported the rebound to an upward trajectory; however, persistent cost pressures limited full trend re-emergence.

Keywords: Industrial Sector, COVID-19, Republic of Moldova, Economic Efficiency, Productivity, Output Costs.

JEL Classification: E65, L60, O52

Introduction

In December 2019, the first cases of a novel coronavirus were reported in Wuhan, China. (World Health Organization, 2020) Originally, what appeared to be a local crisis rapidly escalated into the most severe global pandemic of the twenty-first century, disrupting supply chains, depressing consumer demand, and prompting unprecedented government interventions. In early 2020, COVID-19 managed to reach the Republic of Moldova, with the first case confirmed on 7 March 2020. (Ministry of Health, Labour and Social Protection of the Republic of Moldova, 2020)

The economic impact of the pandemic was felt most acutely by countries whose industrial sectors are tightly integrated into the global economy. Worldwide, rising unemployment, lower incomes, and diminished consumer confidence reduced demand for goods and services. Countries specialised in industry were strongly affected, while new trade restrictions further constrained access to export markets and imported inputs. (World Trade Organization, 2020)

The Republic of Moldova was not spared these shocks. National GDP contracted by 7%, exports and imports fell by 11.5% and 8.6% respectively, and approximately 62,000 jobs were lost. Most enterprises reported sales declines of 75%–100%, amplifying the economy’s overall vulnerability. (United Nations Development Programme Moldova, 2020) Given Moldova’s economic structure and the severity of the shock, the fiscal response was calibrated primarily to support the supply side by reducing tax and compliance burdens, safeguarding firm liquidity, compensating payroll during technical stoppages, and streamlining administrative procedures. The policies were aimed at preserving productive capacity and the continuity of supply chains.

Against this backdrop, the industrial sector was one of the most affected. Accounting for roughly 16% of national GDP and employing about 13.4% of Moldova’s labour force in 2024, the industrial sector plays a key role in the country’s economy. (National Bureau of Statistics of the Republic of Moldova, 2024) Its contribution to GDP cannot be overlooked.

The importance of industry has been recognised since the early stages of economic thought. Thomas Mun argued that industrial development is essential to promoting trade and strengthening a nation’s wealth. (Mun, 1664) Similarly, William Petty emphasised that national prosperity derives not only from trade, but from production itself. Both perspectives underscore the need for active government support to stimulate industrial activity. (Petty, 1690/2017)

International research highlights how effective fiscal policy can revive an economy during a downturn by stimulating demand and ensuring business continuity. (Auerbach and Gorodnichenko, 2011) At the same time, such policy carries risks of inefficient resource allocation or dependence on government intervention. (Friedman, 1962) In the case of the Republic of Moldova, studies on the impact of fiscal policy on economic recovery are scarce, and analyses focused on the industrial sector are even rarer. This gap hinders the formulation of fiscal measures tailored to local market realities. The aim of this paper is to address that gap and to ensure that future policymakers are able to use fiscal policy effectively to support a key industry during periods of heightened stress.

Methodology

To better understand the role of government policies on the industrial sector during periods of crisis, this study uses a descriptive and comparative time-series approach to evaluate how the COVID-19 pandemic and the fiscal measures undertaken during this period influenced the industrial sector of the Republic of Moldova. The analysis focuses on answering three main questions:

How did key performance indicators for the industrial sector change during different periods of the pandemic?

What was the impact of fiscal policy measures on industrial activity?

What trends emerge in the activity of the industrial sector when analysing the recovery trajectory over a two-year period following the initial lockdown?

As a reference point for all subsequent comparisons, the period January 2017-February 2020 serves as the pre-pandemic baseline and establishes the normal levels for industrial indicators.

The period March 2020-May 2020 covers the first confirmed case and the start of the nationwide quarantine. During this period, strict quarantine measures were implemented, and production was halted, which significantly disrupted the industrial sector. (Legis.md, 2020)

June 2020-December 2020 covers the introduction of fiscal measures. The quarantine ended and multiple financial support measures were implemented.

January 2021-December 2021 will be used to monitor the short-term recovery of the industrial sector. As restrictions eased and vaccination campaigns began, the economy started to recover.

January 2022-December 2023 will be used to monitor the long-term recovery of the industrial sector. This period will be used to assess whether the industrial sector managed to reach

pre-pandemic trends. It will also be used to analyse the efficiency of fiscal policies and the sector's reliance on government intervention during periods of high pressure.

To analyse the health of the industrial sector during the periods mentioned above, nine quantitative indicators were used. These indicators reflect different dimensions of industrial performance, cost structure, and structural resilience.

Industrial Production Index (IPI)

Relevance: IPI is an accurate estimate of industrial production. It reflects changes in production volume. It serves as a reference point to determine how fiscal measures affect production.

Employment

Relevance: Employment stability goes hand in hand with sectoral resilience. Alterations in employment can reveal structural imbalances, while stable or rising figures suggest recovery or expansion.

Productivity in the industrial sector

Relevance: Reveals how efficiently inputs are converted into outputs. In the context of the pandemic, productivity fluctuations may have been caused by the implementation of workplace safety measures.

Number of active industrial firms

Relevance: Reflects the structural capacity of the sector. Significant changes can reveal business closures due to unfavourable conditions or sectoral strength.

Industrial Production Price Index (IPPI)

Relevance: IPPI encapsulates cost and price dynamics at the producer level. Monitoring IPPI helps identify the effects of inflation on industry.

Average wages in the industrial sector

Relevance: Wages reflect labour cost pressure and the welfare of workers. Even though higher wages may increase production costs, this paper considers such an increase as a positive signal for industrial health, as it may indicate higher skill levels, increased labour demand, and better living standards for workers in the industrial sector.

Energy prices for enterprises

Relevance: Energy is a critical component for the industrial sector. It is one of the largest expenses in production costs, and electricity prices directly affect profitability and investment capacity.

Exports of industrial goods

Relevance: Export value indicates the competitiveness of industrial goods produced in Moldova and the external demand for such goods. This figure provides an important perspective on sectoral health during and after the pandemic.

Investment in fixed tangible assets

Relevance: Investment in fixed assets is a sign of long-term confidence. Sustained investment during the crisis can be a sign of the effectiveness of policies in maintaining business confidence.

These variables are obtained from the National Bureau of Statistics, reports of the Ministry of Economy, and EU4Business. Data is collected at monthly intervals, and annual data was used to contextualize broader trends.

Results and Findings

The collected data allowed each indicator to have the mean and standard deviation calculated for the pre-pandemic reference period. Each monthly value was then transformed into a standardized z-score using:

$$Z_t = \frac{X_t - \mu}{\sigma} \quad (1)$$

Where:

Z_t is the standardized value for the month t

X_t is the original value for the month

μ is the mean value for the baseline period

σ is the standard deviation value for the baseline period

Once all indicators were standardized, the IHI value for each month t was calculated using:

$$IHI_t = \frac{\sum_{i=1}^n Z'_{i,t}}{n} \quad (2)$$

Where:

IHI_t is the composite Industrial Health Index for month t

$Z'_{i,t}$ is the normalized value of indicator i in month t

n is the total number of indicators (9)

By using the Z-score method, an IHI index was created where a value of 0 represents the baseline average, positive values indicate an increase in the performance above the baseline, and negative values indicate a negative performance below the baseline. The monthly IHI values obtained will be used to calculate the average monthly IHI change rate using:

$$IHI_t(\text{predicted}) = IHI_{Dec\ 2019} + IHI\ Change\ Rate \times t \quad (3)$$

Where:

t is the time in months

$IHI\ Change\ Rate$ is the average monthly IHI Change

$IHI_{Dec\ 2019}$ is the IHI value for December 2019

The difference between the monthly IHI values was averaged and then used to create a hypothetical “no-pandemic” scenario from January 2020 onward. The projection* assumes that the industrial sector would have continued to grow at the pre-pandemic average monthly rate if the pandemic had not occurred.

**From here onward, “projection” or “counterfactual” means the linear continuation of that pre-pandemic slope.*

Pre-pandemic IHI trends are represented in Figure 1. From this, we observe that the baseline IHI traces a steady and moderate growth from the beginning of 2017 until the end of 2019, with some short-lived troughs followed by rapid recoveries. The values remain within approximately one standard deviation from the baseline for the given period, with peaks in mid-2018 and mid-2019. The chart provides two anchors for all subsequent inferences.

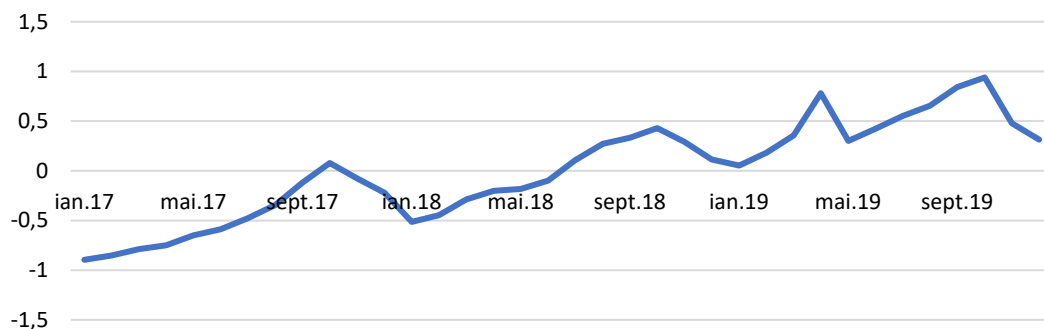


Figure 1. Industrial Health Index (IHI) baseline trend in Moldova, 2017–2019 (Industrial Health Index vs Time)

Source:

Calculations by A. Pesterev based on data from the National Bureau of Statistics of the Republic of Moldova

In Figure 1 a value of 0 on the z-score scale corresponds to the “normal baseline value.” The baseline slope is +0.0346 z-units per month. The value was obtained by averaging the monthly difference for the composite IHI index. This value will be used to construct the counterfactual trajectory from December 2019 onward.

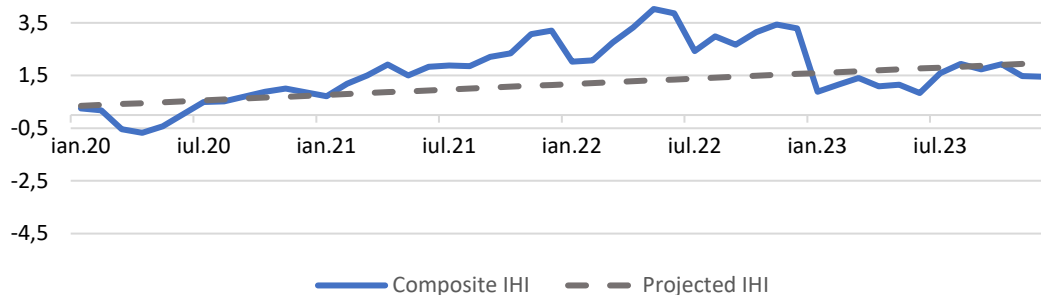


Figure 2. Predicted vs. Actual Industrial Health Index (IHI) values, 2020–2023

Source: Calculations by A. Pesterev based on data from the National Bureau of Statistics of the Republic of Moldova

From Figure 1 and Figure 2, the most important characteristics are the short and deep deficit in 2020, compared with the longer and more superficial overperformance in the period 2021–2022, and a modest net underperformance that persists until the end of 2023.

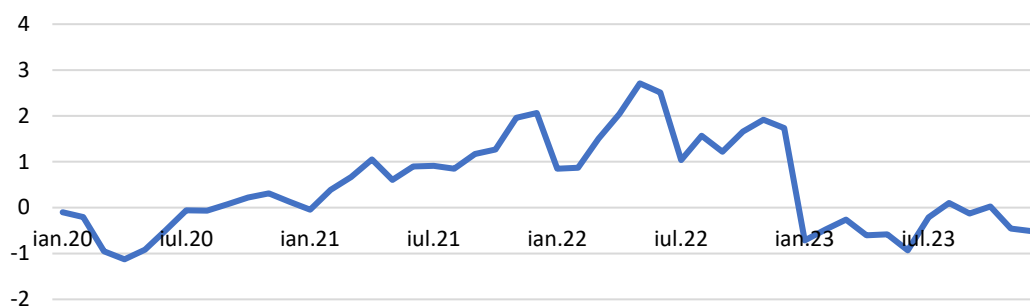


Figure 3. Gap between predicted and actual Industrial Health Index (IHI) vs Time in Moldova, 2020–2023

Source: Calculations by A. Pesterev based on data from the National Bureau of Statistics of the Republic of Moldova

The actual IHI falls sharply below the projected trajectory with the start of the quarantine. The gap is largest in April 2020, when the decline reaches a trough of -1.127 standard deviations relative to the counterfactual, remaining large in May 2020 with a value of -0.917 standard deviations. The projection continues to increase in certain intervals.

Since the end of 2020, the composite IHI has risen again, and during the period 2021–2022, the actual IHI is at or above the projection in 23 of 24 months. The overshoot culminates in May 2022, when the gap reaches its most positive value of +2.709 standard deviations. The beginning of 2023 shows a decline: the gap becomes negative again, indicating a gap of -0.713 in January 2023, showing that the actual index fell below the counterfactual. For the rest of 2023, the composite IHI fluctuates around the projected trajectory and ends with a negative gap.

Overall, the model shows that a shock is followed either by a recovery/overshoot, then ends with a correction. By the end of 2023, the sector is closer to its pre-pandemic trajectory than to the growth minimum, but it has not fully reintegrated into it.

The timeline of fiscal and support policies adopted between March 2020 and December 2020 is presented in Table 1.

The effectiveness of government fiscal policies was evaluated by analyzing changes in the industrial sector. The introduction of major fiscal policies was overlaid on these comparisons to evaluate whether notable improvements occurred. This approach does not establish definitive causality, but it evaluates alignment and timing consistency.

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**Table 1. Timeline of fiscal and support measures adopted
in the Republic of Moldova in 2020**

Normative Acts / Date	Implemented measures
Gov. Decision No. 55 17 March 2020	Declared a nationwide state of emergency for 17 March 2020-15 May 2020. The CSE immediately enforced orders, enabled border entry/exit controls, internal movement restrictions, quarantine and mandatory sanitary measures. Authorized special work regimes for all entities – including suspension/limitation of activity, banned public gatherings. Allowed temporary changes on leadership in public bodies/SOEs and restrictions on employee resignation to maintain critical services; also provided a legal basis to coordinate official communication.
CSE Disposition No. 3 23 March 2020	Introduced a moratorium on all state inspection until 1 June 2020, reducing compliance pressure for businesses. Extended tax filing and payment deadlines for local and income taxes, providing short term liquidity relief. Suspended mandatory audits of 2019 financial statements for medium and large firms, cutting compliance costs.
Law No. 56 – 2 April 2020	Established an Interest Rate Subsidy Program to cover interest payments on businesses and loans. Established a VAT Refund Program to improve the return of VAT Credits, injecting liquidity into firms’ cash flows. Allowed full deductibility of COVID-19 donations from corporate income tax.
CSE Disposition No. 16 – 10 April 2020	Provided a one-time unemployment benefit of 2,775 MDL to unemployed citizens. Covered state social insurance contributions for self-employed persons whose activity stopped, this preserved social coverage without necessitating out-of-pocket expenses during periods of inactivity.
Law No. 60 – 23 April 2020	Started the Interest Rate Subsidy Program and VAT Back Program to reduce financial constraints. Extended the full tax deductibility of COVID-19 related donations, used private sector donations to relief efforts.
Law No. 61 – 23 April 2020	Revised the 2020 Government Budget to allocate 1.03 billion MDL for economic support, used funds for the Interest Rate Subsidy Program and VAT Back Program.
CSE Disposition No. 25 - 5 May 2020	Provided 2,775 MDL to patent holders and independent traders whose activity was halted. This reduced income losses for small entrepreneurs affected by the lockdown
CNESP Decision No. 10 – 16 May 2020	Declared a nationwide State of Public Health Emergency. Maintained border entry controls with 14-days self-isolation, while expanding exemptions to ease economic friction. Began re-opening under sanitary protocols: international passenger transport resumed from 26 May; municipal markets, libraries and museums reopened from 1 June. Fitness and food service reopened on 15 th of June with strict health rules. Overall, it shifted from blanket shutdown to risk-managed operations.
Law No. 68 – 21 May 2020	Approved a €52.9 million financial agreement from the World Bank and IDA, increasing budget for fiscal government support programs.
Law No. 69 – 21 May 2020	Modified the Labor Code to allow remote work and flexible scheduling during lockdowns, enabling the continuity of business operations. Allowed electronic submission of export certificates, simplifying trade transactions and reducing delays.

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Gov. Decision No. 340 – 5 June 2020	Exempted imported and local purchases from VAT and customs duties, reducing costs for firms involved in such projects (e.g. suppliers of industrial goods for pandemic response)
Law No. 102 – 18 June 2020	Voided Law 56 and introduced e-invoicing for all taxable supplies in public acquisitions, improving payment traceability and reducing administrative delays.
Law No. 131 – 12 July 2020	Revised the 2020 Government Budget to increase funding for government support programs, this ensured that support programs continued without introducing new mechanisms
Law No. 168 – 10 September 2020	Approved a Council of Europe Development Bank Loan for COVID – 19 Recovery, indirectly financing government support programs
Law No. 173 – 11 September 2020	Revised the 2020 Government Budget to reallocate funds towards drought relief and ongoing business government support programs.
Gov. Decision No. 732 – 30 September 2020	Extended Law 69/2020 until 30 Oct 2020, easing operations for exporters and suppliers.
Gov. Decision No. 771 – 21 October 2020	Extended Law 69/2020 to 30 Nov 2020 sustaining eased trade certification and bureaucratic procedures
Law No. 224 – 4 December 2020	Modified fiscal legislation so employer-paid COVID-19 testing is exempt from tax and made it deductible for companies, reducing cost burden for workplace health safety measures

Source: Compiled by A. Pesterev based on legislative documents from Legis.md

Figure 4 presents the IHI in the Republic of Moldova over 2020, together with the timing of fiscal policy interventions. Each dotted vertical line represents a government measure, with interventions shown in chronological order. The first line corresponds to the declaration of the state of emergency on 17 March 2020, and the eighth line corresponds to the declaration of the public health emergency on 16 May 2020.

The remaining vertical markers correspond, in order, to the fiscal measures listed in Table 1. CSE Disposition No. 3 appears after the imposition of the quarantine, during the index's decline. Law No. 56 and CSE No. 16 introduced measures aimed at increasing liquidity for firms and providing support for household incomes. The evolution of the Composite Industrial Health Index (Figure 4) clearly shows this. Owing to implementation lags, the chart does not stabilize quickly. Laws No. 60–61 reallocate the government budget to support government programs and to scale up interest/VAT support. The IHI flattens in May and turns upward through June. Laws No. 68–69, Government Decision No. 340, and Law No. 102 add external financing, allow remote work, simplify export certification, and reduce VAT-related frictions for certain purchases.

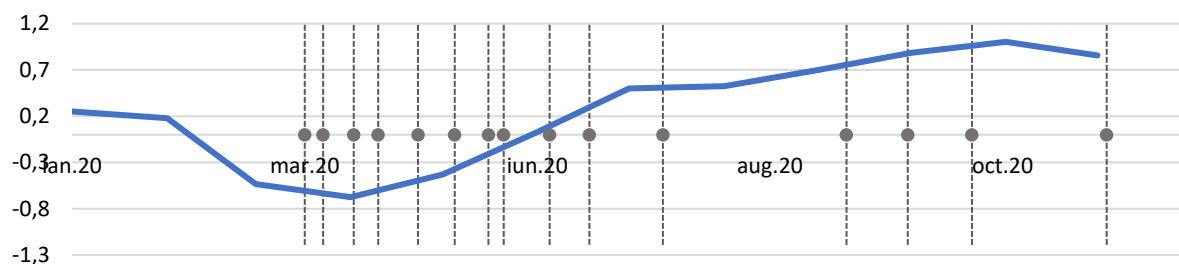


Figure 4. Composite Industrial Health Index (IHI) with major fiscal policy interventions vs Time, 2020 (policies are shown in consecutive order as listed in Table 1)

Source: Calculations by A. Pesterev based on data from the National Bureau of Statistics of the Republic of Moldova (2025) and legislative documents from Legis.md

Law No. 131, Law No. 168, Law No. 173, and Government Decision No. 732 introduced additional measures aimed at supplementing support and extending simplified procedures. The index continues to rise gradually toward the end of Q3 2020. Government Decision No. 771 aimed

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to reduce trade barriers, while Law No. 224 targeted the reduction of fiscal frictions related to employer-paid testing. The index then stagnates in Q4, ending the year slightly above the pre-crisis reference levels and considerably higher than the Q2 trough. The sequencing is consistent with policies that helped limit the decline and supported measured growth with a realistic lag of 1–2 months, without claiming strict causality. A visual inspection of the data series suggests that the Q2 2020 drop was driven by production-sensitive indicators such as the IPI and exports, with employment following the trend. By contrast, lower energy prices helped offset the decline. The 2021–2022 recovery was driven mainly by IPI/exports, with investment lagging; the early-2023 correction coincided with a renewed fall in both IPI and exports. The data in Table 2 represent a generalization of the outcomes that are possible in reviving the industrial sector after a crisis caused by unforeseen economic shocks such as COVID-19. From a theoretical perspective, fiscal policies operate with inevitable lags—of decision, implementation, and impact. Consequently, effects cannot be expected instantaneously. In our dataset, the profile in Figure 4 is compatible with an operational lag of approximately 1–2 months between the announcement of measures and their materialization in sectoral indicators; this finding is associative and does not imply a strict causal relationship. Furthermore, the effectiveness of measures depends on the credibility and intertemporal consistency of the policy framework: if economic agents perceive measures as reversible or incoherent, adjustments in production, investment, and hiring tend to be postponed, weakening the transmission channel and reducing effective multipliers. In the context of the Republic of Moldova, a relatively low level of confidence in the stability of the policy framework, together with exogenous shocks, may delay and dampen the sector’s response. The partial non-convergence observed in 2023 can thus be interpreted as the cumulative result of these institutional frictions and the business sector’s cautious expectations.

Table 2. Performance benchmarks of the Industrial Health Index (IHI) gap, 2020–2023

IHI Gap Performance Highlights		
Metric	Value	Notes
Maximum Gap	+2.70894 SD	Best overperformance of actual relative to predicted
Minimum Gap	-1.12717 SD	Worst underperformance of actual relative to predicted
Time to Halve Peak Gap	2 Months	From Apr 2020 (1.1272) to Jun 2020 (0.4925)
%Change in Gap	59.3%	Relative improvement from Apr 2020 to Dec 2023
Final Gap Value	-0.46 SD	Dec 2023, predicted slightly above actual

Source: Calculations by A. Pesterev based on data from the National Bureau of Statistics of the Republic of Moldova

Conclusion

This study aims to answer the three main questions stated in the methodology section. The IHI served as the common yardstick for the periods analysed. A pre-pandemic linear trend anchored the counterfactual trajectory used for comparison.

During the periods analysed, the industrial sector experienced a sharp and short-lived disruption in spring 2020, a two-year recovery that closed and then exceeded pre-pandemic levels, and a 2023 correction that left a modest shortfall by year-end. Three figures anchor the magnitudes of these shifts:

Peak net shortfall: -1.127 SD (April 2020), halving within two months (0.49 by June 2020).
 Peak net overshoot: +2.709 SD (May 2022).

End-2023 gap: -0.46 SD (December 2023).

In levels, the composite index not only recovers from the 2020 decline but also exceeds the counterfactual through much of 2021–2022, before settling slightly below the projected path in 2023.

The composite index rises by approximately 1.210 SD, with asymmetric contributions. Positive drivers include Wages +0.814, Productivity +0.528, Exports +0.508, Investment +0.170, IPPI +0.108, Active Firms +0.007. Negative drivers include Energy -0.558, IPI -0.274, Employment -0.093.

Wages, Productivity, and Exports accounted for most of the improvement; wages alone explain about 67% of the net IHI gain and, together with productivity and exports, contribute a cumulative +1.850 SD to the improvement of the index. Moreover, Energy pulled the IHI down (-0.558) and represented the largest offset (approximately 46% of the net change in magnitude). Together, Energy and IPI accounted for about 90% of the total negative drag, consistent with cost pressures and the incomplete normalization of production volume.

The impact of fiscal policy measures is clearly observable in the industrial sector of the Republic of Moldova. In 2020, the turning point aligned in time with the implementation of specific policies (see Table 1 and Figure 4). The trough lies between the start of the first State of Emergency (17 March 2020) and the State of Public Health Emergency (16 May 2020). Stabilization becomes visible roughly 4–8 weeks after 16 May, synchronizing with the late-April to June package of liquidity, tax, and administrative easing. Later measures and extensions in July–September coincide with an ascent, and in October–December the trend flattens, with minimal variation from preceding months. The exact levels of divergence are shown in Figure 3: a short, deep fall in Q2 (-1.127, -0.917), a sustained overshoot peaking in May 2022 (+2.709), and a decrease through December 2023 (-0.458).

After the lockdown period, not least due to the fiscal policy measures undertaken by the authorities, a recovery phase of activity emerges in the industrial sector. The recovery window is defined as 2021–2022, inclusive. The actual IHI is above the counterfactual in 23 of 24 months, as shown in Figure 3, culminating in the 2022 overshoot (+2.709 SD). This indicates not only gap closure but also positive momentum beyond trend. The positive dominants (wages, productivity, and exports) explain the logic of the overshoot. By contrast, employment and the IPI had negative contributions. This reflects a crisis-induced decline and the fact that, by the end of the analysed period, headcounts and production had not fully returned to pre-pandemic levels despite higher earnings and efficiency. This combination indicates intense margin adjustments rather than broad margin expansion.

The contribution of changes in energy costs was also large but negative; and when energy costs become an issue, the composite index moves back toward the counterfactual, which is clearly observed in 2023. The gap becomes negative at the beginning of the year, reaches a trough mid-year, and narrows to -0.458 by the end of December.

Taken together, all these figures tell a coherent story. The 2020 policy timeline coincides with the shift from contraction to stabilization. The 2021–2022 period is quantitatively underpinned by wage growth, productivity gains, and export performance; and the 2023 decline is caused by negative contributions from energy costs, production volume (IPI), and employment. By the end of December, the sector is close to its pre-pandemic level: the recovery was real and broad in terms of price and efficiency, but incomplete due to cost difficulties and under-recovered volume.

By comparison with pre-pandemic levels, the data show that government fiscal policies cushioned the decline and supported a two-year rebound that exceeded the baseline but did not fully neutralize longer-run pressures by the end of 2023. The shortfall at the trough was halved within two months, coinciding with the April–June liquidity, tax, and administrative packages.

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During 2021–2022, the sector not only closed the gap but also significantly surpassed the counterfactual. By the end of 2023, a modest gap remained, caused by the post-pandemic increase in energy costs and the incomplete normalization of production and employment. The analysis conducted in the industrial sector of the Republic of Moldova indicates that, through stimulative fiscal measures, it is possible to encourage economic agents in this sector toward productive and efficient activity, provided a favourable investment climate and conducive conditions for the export of production are created.

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ANALYSIS OF THE IMPACT OF COVID-19 ON THE HEALTHY LIFE EXPECTANCY OF THE POPULATION.

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Abstract

The study analyzes the impact of the COVID-19 pandemic on Healthy Life Expectancy (HALE), a demographic indicator that transcends traditional life expectancy by assessing the qualitative dimension of longevity. HALE quantifies the average number of years a person is expected to live in good health, free from the limitations of disease or disability. Given the global increase in chronic diseases and the unprecedented mortality and morbidity associated with the pandemic, HALE serves as a more comprehensive metric for public health analysis. The methodology uses a two-step approach. Initially, a mortality decrement table is constructed using population and mortality data to calculate age-specific life expectancy. This model is then integrated with health status data obtained from the Minimum European Health Module (MEHM) of the European Statistics on Income and Living Conditions Survey (SILC), which provides self-reported information on three key dimensions of health: self-perceived health status, prevalence of chronic diseases, and limitations in daily activities. The research results indicate a statistically significant decrease in HALE across several age cohorts, with the most pronounced decrease observed among older people. Our findings reveal a dual impact of the pandemic: a reduction in overall life expectancy, coupled with increase in the number of years lived with disability or chronic disease. This suggests that the pandemic has not only accelerated mortality but also exacerbated morbidity. The study highlights the critical importance of HALE as a tool for monitoring the functional well-being of the population and for informing evidence-based public health policies aimed at promoting active ageing and mitigating long-term health consequences.

Keywords: healthy life expectancy, COVID-19, statistics, Republic of Moldova, econometric model.

JEL Classification: C10, C30, C50, C52

1 Introduction

The COVID-19 pandemic has profoundly affected mortality, morbidity, and the functioning of health systems worldwide. While conventional measures, such as life expectancy (LE), capture only the dimension of mortality, they do not reflect the qualitative aspects of health. Healthy life expectancy (HALE) is more comprehensive, considering years lived without chronic diseases or disabilities. This paper investigates the impact of the pandemic on HALE, with a focus on the Republic of Moldova, where pre-existing vulnerabilities have amplified the pandemic shock.

The conceptual foundation for measuring Healthy Life Expectancy (HALE) was established by Sullivan (1971), who proposed a single index that integrates mortality and morbidity data to estimate the average number of years a person can expect to live in good health. The Sullivan method, still widely used today, combines life table data with prevalence rates of health conditions (e.g., disability or chronic diseases) to produce a summary measure of population health that reflects both the quantity and quality of life. This approach has been instrumental in shifting policy attention from purely increasing life expectancy to also addressing years lived with disability (YLD), providing a more comprehensive understanding of population health and guiding more effective health system interventions.

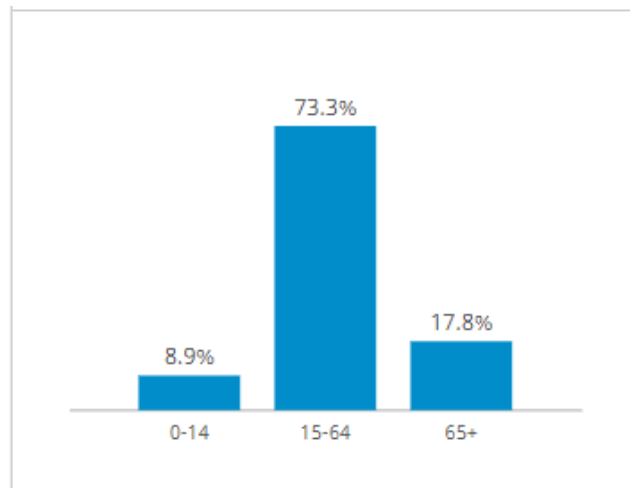


Figure 1. The age distribution of population in Republic of Moldova 2023, %

Source: authors based on National Bureau of Statistics (NBS) data

In 2023, the age structure of the Republic of Moldova (Figure 1) reflects significant demographic changes, with profound implications for public health, labor force dynamics, and social policy. This distribution reveals a **demographically aging population**, with a declining share of children and a growing proportion of older adults. However, to fully understand the implications of this age structure, it is essential to examine it through the lens of **healthy life expectancy** (HALE) – the average number of years a person can expect to live in full health, without significant disease or disability.

This demographic and health profile highlights the urgent need for a **comprehensive approach to health policy** in the Republic of Moldova, across all stages of the life course:

Preventive health programs need to be prioritized, especially for working-age adults, to delay the onset of chronic diseases and extend healthy working lives.

Active aging strategies and age-friendly health infrastructure are essential to support the growing elderly population, many of whom live with multimorbidity and limited economic resources.

Investments in child and adolescent health are necessary not only to improve outcomes in childhood, but also to ensure a healthier adult population.

Strengthening the health system, with a focus on primary health care, community services, and health education, is essential to address the current gap between life expectancy and healthy life expectancy.

2 Literature review

Studies by Eurostat, WHO and OECD confirm that HALE declined more steeply than LE in 2020-2021. Research such as Caușan et al. (2025) highlights the socio-economic determinants of HALE, while the IISVSCM framework integrates HALE with labor market participation to assess active human capital. OECD analyses also indicate that health system financing models mediate resilience to health shocks.

In Central and Eastern Europe, including countries such as Ukraine and Moldova, the implementation and development of primary health care – especially family medicine – has been a key factor in shaping long-term health outcomes. Sobol et al. (2020) highlight that while the transition to family medicine in the region has shown promising results in improving access and continuity of care, structural and financial challenges remain significant barriers to realizing its full potential. These limitations directly impact both life expectancy (LE) and healthy life expectancy (HALE), especially during times of systemic pressure, such as the COVID-19 pandemic. In the context of Moldova, where the health system has faced additional pressure due to the emigration of health personnel and chronic underfunding, the pandemic has further highlighted the need for resilient, community-based primary health care models. Strengthening family medicine can not only improve health service delivery but also reduce the growing gap between years lived and years lived in good health.

Zarbailov et al. (2018) note that Moldova has adopted the family medicine model to expand access to primary health care, especially in rural and underserved areas. This reform aimed to shift from hospital-based to community-based care, positioning family physicians as key coordinators. Although progress has been made in terms of training and coverage, persistent problems – such as underfunding, outdated infrastructure and limited autonomy – continue to hinder performance. These challenges impact both life expectancy (LE) and healthy life expectancy (HALE), contributing to delayed diagnoses, suboptimal management of chronic diseases and widening health disparities.

This issue highlights the fact that the deterioration of the population’s health has a direct impact on economic performance. Increased levels of morbidity lead to reduced labor force participation, decreased productivity and increased pressure on health and social protection systems. At the same time, reduced economic activity can affect the population’s ability to access adequate medical services, significantly amplifying health risks.

3 Methodology and Data

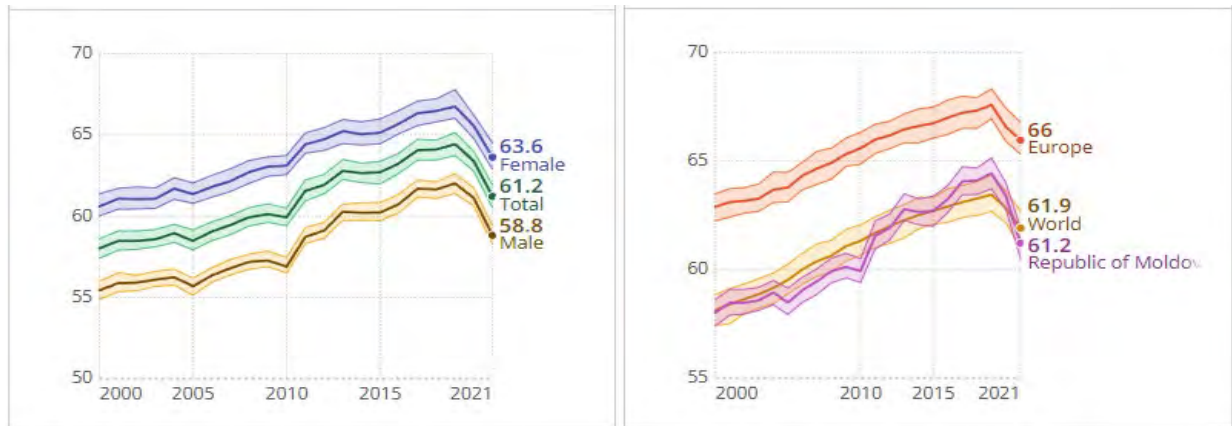
The study uses a two-stage methodology. First, mortality tables are used to calculate age-specific life expectancy. Second, the Sullivan method integrates mortality data with self-reported health prevalence (from MEHM-SILC). For the econometric analysis, an autoregressive econometric model was developed using annual frequency data for HALE (2000–2024, with data for 2022–2024* extrapolated based on NBS information), and the annual data for Gross Domestic Product (GDP).

Data on LE and HALE for Moldova cover the period 2000–2024, with a gradual upward trend, disrupted by the pandemic shocks in 2020–2021, followed by a partial recovery. Years lived with disability (YLD) are calculated as the difference between LE and HALE.

Figure 2. Healthy life expectancy (HALE) at birth in Republic of Moldova (on the left) and by region / global (on the right)

Source: authors based on WHO data

The analysis of data on the healthcare system in the Republic of Moldova for the period



2019–2023 reveals several important trends that reflect both the progress made and the persistent challenges.

First relevant aspect is the constant increase in public spending on healthcare, which increased from 8.5 billion lei in 2019 to approximately 12.2 billion lei in 2023. This increase indicates a greater allocation of financial resources to the sector, reflecting the government’s efforts to strengthen healthcare infrastructure and services (Ministry of Finance, NBS, 2024). In addition, the share of public spending in relation to GDP increased from 4.1% in 2019 to approximately 4.7% in 2023, suggesting a relative increase in the priority given to healthcare in the broader economic context. Overall economic activity during 2019-2023 increased by 1.16%. (BNS, 2024; WHO, 2024)

From the perspective of population coverage, the insurance rate within the mandatory health insurance system (AOAM) remained relatively stable, around 87–88%, indicating a consolidation of formal access to medical services (CNAM, 2024). However, a slight reduction in the share of direct out-of-pocket payments in total health spending is observed, from 36% in 2019 to 31% in 2023 - a positive signal for reducing the direct financial burden on patients (CNAM, NBS, 2024).

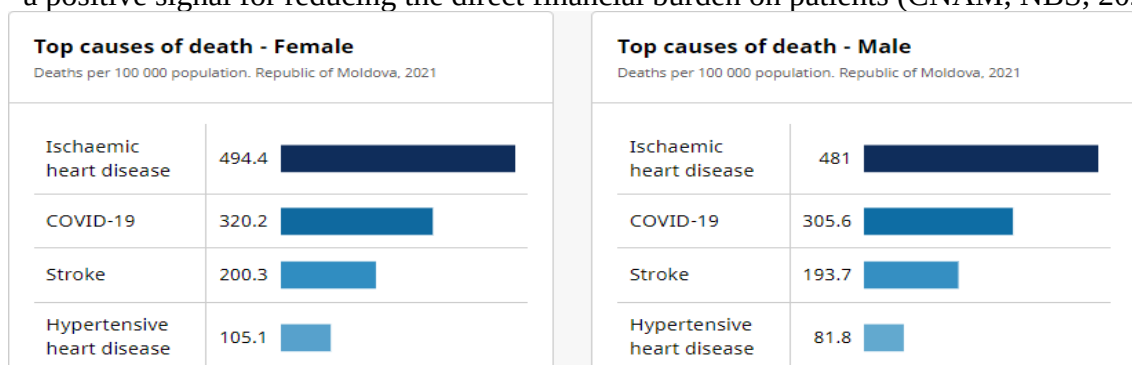


Figure 3. Top causes of death in Republic of Moldova

Source: authors based on WHO data

Another important indicator is the average salary in the health sector, which has gradually increased from 7.8 thousand lei in 2019 to 9.4 thousand lei in 2023. This trend can contribute to retaining and motivating medical staff, which is essential for the quality of services provided (Ministry of Labor, 2024).

In terms of infrastructure, the number of hospital beds per 10,000 inhabitants has steadily decreased, from 45 in 2019 to 38 in 2023. This may reflect both a trend towards optimizing and

streamlining hospital services and the challenges in maintaining adequate care capacity, especially in the context of rising demand for medical services (NBS, WHO, 2024).

4 Results

Figure 2 shows the evolution of Healthy Life Expectancy (HALE) for the Republic of Moldova during the period 2000–2021, differentiated by gender, and compared to the European and global averages. The data highlights the vulnerability of the Republic of Moldova, showing a more pronounced decrease in the HALE indicator during the COVID-19 pandemic, compared to the global trend. Although indicators followed an upward trend until 2019, the onset of the COVID-19 pandemic in 2020 produced a sharp decrease in HALE of approximately 1.1 years in 2020, and a further decrease of 2.2 years in 2021. If we compare the developments with LE, we note that the years 2020 and 2021 are marked by an asymmetry that suggests that the impact of the pandemic was disproportionately reflected in morbidity and disability, not just in mortality.

In this context, the years lived with disability were calculated, and the results show a reduction in the gap from an average of 8.8 years before the pandemic to almost 8.5 years in 2020–2021 (Figure 4). However, this reduction does not necessarily reflect a decrease in the burden of disability and may instead result from the pandemic’s impact on mortality and the overall health structure of the population. Although COVID-19 has accentuated functional limitations and long-term chronic conditions, the decrease in YLD may reflect a reduction in life expectancy rather than an improvement in population health.

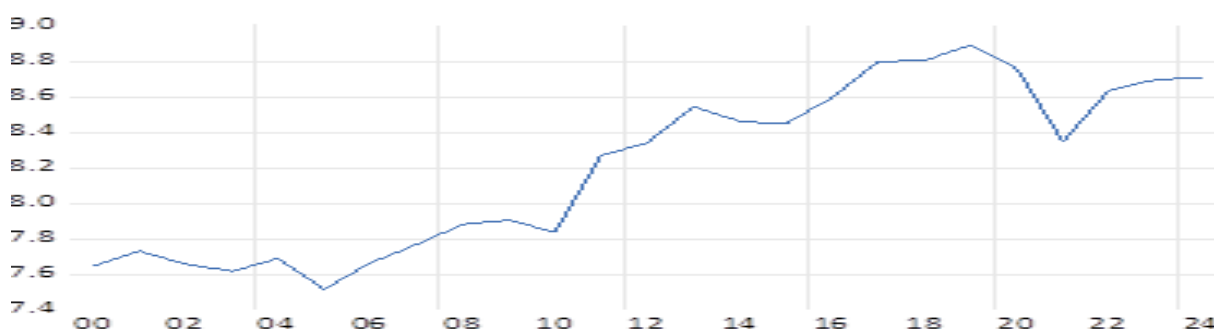


Figure 4. Years Lived with Disability in Republic of Moldova

Source: authors based on WHO data

Table 6. Output of the Regression for YLD.

Dependent Variable: YLD (LE-HALE)				
Method: Least Squares				
Sample (adjusted): 2003 2024				
Included observations: 22 after adjustments				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
LE_HALE(-1)	0.888165	0.076947	11.54252	0.0000
d_GDP(-2)	-0.013094	0.006818	-2.320348	0.0070
C	1.021776	0.639864	2.596866	0.0268
Root MSE	0.149952	R-squared		0.887139
Mean dependent var	8.280369	Adjusted R-squared		0.875259
S.D. dependent var	0.456858	S.E. of regression		0.161356
Akaike info criterion	-0.684281	Sum squared resid		0.494681
Schwarz criterion	-0.535503	Log likelihood		10.52709
Hannan-Quinn criter.	-0.649233	F-statistic		74.67463
Durbin-Watson stat	2.010904	Prob(F-statistic)		0.000000

Source: authors based on EViews 11, WHO, NBS data

From an econometric perspective, the estimated model is based on the time series regarding annual YLD and annual growth of GDP, with GDP serving as an indicator of population well-being.

$$YLD = 1,02 + 0,89 * YLD(-1) - 0,01 * d\_GDP(-2) \quad (1)$$

And results indicate:

The 0,89 coefficient for YLD(-1) is statistically significant, implying persistence in the evolution of YLD. Once shock occur, they continue to influence the trajectory over several periods.

The coefficient -0,01 associated with the variable d_GDP(-2) is also significant, and its value confirms the existence of an inverse relationship between economic growth and years lived with disability, a relationship that manifests with a time lag. This result is consistent with the mechanisms through which economic evolution gradually influences the health status of the population. Economic expansion contributes to increasing living standards, improving working conditions and expanding access to quality medical services, although these effects take time to be reduce chronic morbidity. Also, investments in health infrastructure and prevention programs become more sustainable in the context of a growing GDP, which, in the medium term, reduces the burden of disability. Overall, the result supports the hypothesis that favorable economic dynamics can generate positive effects on the health of the population, by decreasing the number of years lived with disability.

The model obtained is valid and robust, with significance for both the coefficients and the model. Residual diagnostic tests suggest the absence of major signs of autocorrelation.

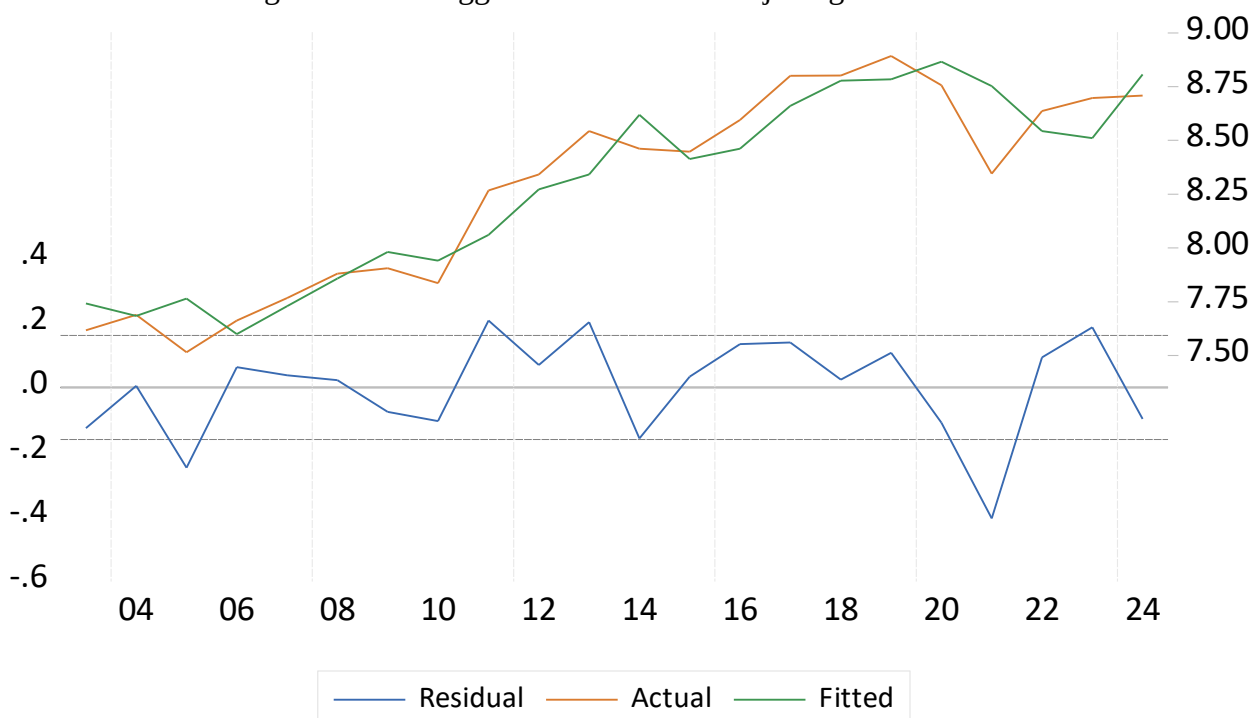


Figure 5. YLD dynamics (actual and fitted)

Source: authors based on EViews 11

These findings indicate that the pandemic shock was not a transient anomaly but was embedded in the medium-term dynamics of the increase in the standard of living in health (HALE). The outlook suggests that a return to the pre-pandemic trajectory would require several years, even under favorable conditions.

5 Discussion

The model highlights two complementary mechanisms through which COVID-19 affected healthy longevity. First, the autoregressive structure shows that health shocks in Moldova tend to

persist, reflecting structural deficiencies in healthcare financing, delayed patient recovery, and the cumulative effects of chronic diseases. Second, the findings indicate that the pandemic shock was not a transient anomaly but was integrated into the medium-term dynamics of HALE. And faster economic growth leads after about two years to a reduction in years lived with disability (YLD).

Together, these results imply that the losses caused by HALE will be slow to recover. Even if mortality decreases in the post-pandemic period, the burden of morbidity - such as cardiovascular complications, respiratory failure and mental health disorders - will continue to affect the healthy life years of the population.

6 Conclusion

In conclusion, the analysis of socio-economic indicators reveals a health system in a continuous process of development, whose dynamics are closely correlated with economic activity. The age structure of the population reflects significant demographic changes, with profound implications for public health and labor force dynamics. This distribution reveals an aging population, with a lower share of children and a growing proportion of elderly people.

The COVID-19 pandemic produced a sharp decrease in HALE of approximately 1.1 years in 2020 and 2.2 years in 2021. When comparing these developments with life expectancy (LE), it can be observed that the years 2020 and 2021 are marked by an asymmetry that suggests that the impact of the pandemic was disproportionately reflected in morbidity and disability, not just in mortality.

The decrease in YLD from an average of 8.8 years before the pandemic to nearly 8.5 years in 2020-2021, reinforces the idea that COVID-19 has exacerbated functional limitations and long-term chronic conditions. However, this reduction in YLD may indicate a decline in life expectancy rather than an improvement in the population's health status. For public health policy, this implies that interventions must extend beyond reducing mortality. Rehabilitation programs, long-term COVID monitoring, and chronic disease management have become essential for mitigating the YLD gap. Furthermore, econometric modeling provides a valuable methodological tool that policymakers can use to simulate the impact of future crises on HALE and to design evidence-based strategies that strengthen health system resilience.

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EFFECTIVE METHODS FOR ANALYZING SURVEY AND QUESTIONNAIRE DATA

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Abstract: Questionnaires and surveys are an excellent way for obtaining important information that would allow understanding the opinion, but also the needs of those interviewed. It is clear that nowadays the method of questioning using an online platform or a specialized software is in first place, respectively, the data from the questionnaire are provided in digital format. Thus, the time required to prepare the data for processing is very short. Qualitative analysis of this information or rather the results obtained from a qualitative analysis can provide clarity on the opinion and behavioral patterns of the participants in the questionnaires, results that would eventually allow the development of efficient strategies.

To perform effective analysis of survey or questionnaire data, it is important to implement techniques that take into account both qualitative and quantitative data. In other words, it is essential to use a variety of methods that take into account both qualitative and quantitative data.

In this paper, we will address the topic of effective methods for analyzing survey and questionnaire data, but we will also discuss effective techniques for creating a survey or a questionnaire.

Keywords: survey, questionnaire, methods of data analysis,

JEL Classification: C8

1. Introduction

In researches, inclusive in research on education, surveys and questionnaires are valuable tools and resources for collecting needed data so that researchers can find out about the perceptions as well as needs of those interviewed or other stakeholders.

With regard to the questionnaire, the specialist literature contains numerous attempts to define this instrument. The questionnaire is a research tool consisting of a set of questions arranged in a logical and psychological order, which elicits responses from respondents that are then recorded. (Negara C., 2017). A survey is another alternative for collecting information from multiple respondents. A survey is a partial study in which, based on the results obtained by processing sample data, the corresponding parameters of the population are estimated using the principles of probability theory. (Asandului L, 2008)

In a survey, several people are asked to complete a standardized questionnaire. Surveys offer a resource-efficient way to collect data from a large group of people in a short period, for example to assess the impact of an initiative on participants. The survey questionnaire might be completed independently or as a guided activity in a personal setting or online. Although surveys are an effective way to collect data, they also have notable limitations. A very common challenge is low response rates (only a limited number of respondents complete the questionnaire). The usefulness of the survey also depends largely on how well the questions are constructed. It is important that the questions are unambiguous and easy for respondents to understand. It is highly recommended to invest considerable effort in developing the questionnaire and to test it before implementation. (INDEED)

2. Techniques for creating survey and questionnaire

In order to obtain "good" data from the survey, certain principles and steps must be taken into account in the process of collecting data based on questionnaires.

The general principles to be taken into account when creating a questionnaire are the length of the questionnaire, avoiding questions that respondents are unable to answer usefully, and, last but not least, the sequence of questions. It is also very important to adapt the language used to the people who are to be surveyed.

However, first and foremost, the purpose of the questionnaire must be clearly stated. The desired results, or in other words, the data to be collected and the target group must be established.

In order to obtain reliable data from the questionnaire, it is important that the questionnaire be tested. This is to verify that respondents understand each question and respond appropriately, and that the obtained data is usable for research purposes.

To summarize the above, we can outline the steps that should be followed in creating a questionnaire: establishing the objectives along with quantitative and qualitative characteristics, drafting the questionnaire itself, and testing it.

Obviously, there is a recommended structure for questionnaires in the literature, and it talks about the types of questions you can find in a questionnaire, as well as the pros and cons of using each one. We will not go into that here.

Nowadays online questionnaires are becoming increasingly widespread. They have a number of advantages over paper-based questionnaires. These include the following (TGMRESEARCH):

Speed: relative to conventional pen-and-paper techniques, online surveys allow for faster gathering of data such that researchers are able to obtain fast opinions from their respondents.

Track responses in real-time: as soon as the respondent clicks the Submit button, the data is already stored in the appropriate tables and is ready to be processed.

Real-time Analysis: Survey construction software allows researchers to see data and responses in real-time through a built-in dashboard, thus facilitating timely and enlightened decision-making. Of course, we speak here more about frequencies and not about deeper analysis.

Cost-efficiency: obviously, online questionnaires require minimal resources compared to methods such as telephone or paper surveys.

Reduced Margin of Error: direct submission by respondents minimizes the potential for errors associated with traditional survey methods that involve intermediaries.

User-Friendly: online surveys tend to be easy for respondents to complete.

Increased Truthfulness: anonymity in online surveys encourages respondents to provide more honest and truthful answers, enhancing the reliability of the collected data.

Flexible Design Options: online surveys offer customizable features like skip logic and branding. Skip logic directs respondents to different questions based on their previous answers.

Despite all the advantages, there are also some disadvantages.

Although online surveys offer anonymity, this can also be a disadvantage. For example, respondents could answer the same questionnaire multiple times. This could be accidental, if they simply forgot that they had already completed it, or it could be deliberate. Obviously, the number of possible responses to the questionnaire can be reduced, for example, by collecting e-mail addresses, but this raises another issue. Even if anonymity is respected, the respondent may not trust that their answers will remain anonymous (depending on the respondent's maturity and digital skills) and may not always give honest answers.

In addition, a lack of interest in the survey or the subject addressed on the part of the respondent may lead to filling out questionnaires randomly, just to get rid of the burden of

completing them more quickly. However, such responses to online questionnaires can be detected taking into account the fact that online questionnaires record the time at which the questionnaire was completed. For example, if it takes 5 minutes just to read all the questions, and the respondent took 30 seconds to answer them, this questionnaire must be classified as unreliable. These responses can be excluded from the final data as unreliable.

Thus, although online surveys offer many advantages over traditional pen-and-paper surveys, especially the speed with which data can be obtained in digital format, it is essential to take into account the target group in order to avoid the situations mentioned above.

3. Methods for analyzing survey and questionnaire data

Survey and questionnaire data collection is only the first step; the true value lies in how the results interpreted and applied, which can transform simple summaries into significant and insightful findings. Using data processing tools and techniques can help:

- to determine if trends in observed data are statistically significant or due to random variation,

- to interpret results in relation to existing knowledge or ancillary data,

- to determine the relative impact of various factors to identify which most impact outcomes,

- to deduce of reasonable next steps or research questions from findings to date.

Survey data is generally either quantitative or qualitative. In order to perform an effective analysis of survey and questionnaire data, it is essential to implement techniques that address both qualitative and quantitative data.

Quantitative analysis is one of the primary approaches. This involves using numerical methods to identify models and trends, which include descriptive and inferential statistics. First summarizes data using the mean, median, mode and second one help to extend conclusions beyond the presented data set. These techniques enable analysts to extract meaningful insights from big data sets.

Descriptive statistics give the answer on how the data is distributed across the population, on the other hand inferential statistics help to predict what might happen or to extrapolate from the sample that are studied to whole population.

By applying methods such as descriptive and inferential statistics, researchers can gain a comprehensive view of the dataset.

Knowing whether the survey results are statistically significant or not allows for confident decision-making and data-driven conclusions.

Therefore, obtaining statistically significant results is extremely important for businesses, academia, and researchers alike.

From a qualitative perspective, thematic analysis is a useful tool for examining responses to open-ended questions. Coding techniques can transform complex textual information into categorized groups. By using a combination of these methods, researchers can enrich their analysis of survey data, thereby obtaining more in-depth and useful information derived from questionnaire data.

The following types of statistical analysis are well known:

Regression analysis – statistical technique used to find the relationship between two or more variables. This technique allows us not only to see whether the relationship between variables is statistically significant, but also to specify the impact on independent variables.

T-test – a tool that used to compare two data groups, which have different mean values.

ANOVA test – similar to the previous one and it allows testing if differences between the means of three or more groups are statistically significant. ANOVA is used whit a regression study.

Cluster analysis - is a way of processing datasets by identifying how closely related the individual data points are. (Babucea A.-G., 2007)

Factor analysis - is used to solve two types of problems: reducing the number of variables to increase the speed of data processing and identifying hidden patterns in the relationships between data. (Cărbureanu M., 2010)

Crosstab analysis – this technique allows comparing relationship between two variables by presenting them in simple table

We can analyze data using various tools and platforms, such as Excel, Python, R, SAS, SPSS, Power BI, etc. Microsoft Excel is one of the best options for organizing data, and it has some functions and tools for basic statistical analysis. SPSS is good on statistical analysis and, what is very important, it is user-friendly because it presents statistical methods clearly. In our humble opinion, SPSS does not have such impressive graphics (in terms of design), but by combining the results from SPSS and the way Excel creates graphics, we can obtain a very good graphical visualization of the data.

Tableau is a great tool for data visualization options, allowing for clearer presentations of questionnaire data. R is an excellent platform for more complex analysis and graphics.

Choosing the best tool depends primarily on data that we have and, on the type, purpose, and complexity of the analysis, but as well as the user's preferences and skills. In general, the best tools for data analysis are those that are easy to use, efficient, secure, and scalable and has high processing speed. Selecting proper tools for survey data analysis is of the utmost significance when it comes to maximizing efficiency and outcomes. Proper tool can significantly reduce time on data processing. In addition, we may consider combining some tools to get the best result.

4. Conclusions

Surveys are the most common form of data collection in the social sciences for most research. Using this method, a large amount of data can be collected from a single respondent at the same time.

To create an effective questionnaire, there are a few simple steps to follow: *clearly define the objectives* and *identify the target audience*. Depending on the target audience, the purpose of the questionnaire will determine the type of survey: pen-on-paper, on telephone, or online. If it is an online questionnaire, *the platform* to be used *must be correctly identified*. The next step is to *test the questionnaire*. It is also very important to *distribute the questionnaire strategically*.

In order to analyze effectively questionnaire data, it is important to use a variety of methods that address both qualitative and quantitative data.

Using statistical methods is a great way to get more value out of the data obtained from questionnaires and surveys.

With so many methods of analysis, it is crucial to understand which are most appropriate for the needs of the research.

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INTERNATIONAL PRACTICES IN THE USE OF SUPPLY AND USE TABLES (SUT) AND INPUT–OUTPUT TABLES (IOT)

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Abstract: This paper explores the international practices in the construction and use of Supply and Use Tables (SUT) and Input–Output Tables (IOT) as fundamental tools for macroeconomic analysis, structural diagnostics, and evidence-based policymaking. The study examines both advanced economies—such as Finland, the Netherlands, France, Austria, and Germany—and transition or emerging economies, including Lithuania, Estonia, Latvia, South Korea, Chile, and South Africa.

In advanced contexts, SUT/IOT have evolved into integrated frameworks underpinning computable general equilibrium (CGE) models, social accounting matrices (SAM), and environmentally extended input–output systems, supporting complex simulations of fiscal, industrial, and environmental policies. In transition and emerging contexts, despite institutional and statistical constraints, governments have adopted innovative approaches, such as data reconstruction methods, econometric interpolation, and collaborative inter-institutional platforms, to ensure the operationalization of these models in fiscal planning, convergence scenarios, and resilience strategies.

The comparative analysis highlights that SUT/IOT serve not only as statistical representations of economic structure but also as dynamic instruments for simulating reforms, assessing intersectoral dependencies, and anticipating the systemic effects of external shocks. The findings emphasize the importance of methodological flexibility, technological innovation, and transparent dissemination of results. Furthermore, they demonstrate that even under limited resources, adopting international standards and gradually implementing SUT/IOT-based models can provide economies in transition with robust analytical capacity, improved forecasting, and enhanced institutional credibility in policy design.

Keywords: Supply and Use Tables (SUT); Input–Output Tables (IOT); Economic forecasting; Policy simulation; Transition economies; Structural modeling; CGE models; Macroeconomic governance; Institutional reform

JEL Classification: D57, C68, E01

1. Introduction

In an increasingly complex and interdependent global economy, governments must navigate uncertainty, structural volatility, and the pressure for evidence-based decision-making. Tools such as Supply and Use Tables (SUT) and Input–Output Tables (IOT) have become indispensable for understanding economic structure, forecasting intersectoral dynamics, and simulating policy outcomes. Originally developed for national accounting and statistical reporting, these tables have evolved into analytical engines behind macroeconomic planning, computable general equilibrium (CGE) models, and environmental policy frameworks.

This article investigates international practices in the use of SUT and IOT, focusing on how countries across the development spectrum, from highly advanced economies to emerging and

post-transition states, have implemented, adapted, and expanded these frameworks. The analysis aims to extract transferable lessons for countries like the Republic of Moldova that are seeking to modernize their macroeconomic governance systems under data and institutional constraints.

2. The Role of SUT/IOT in Modern Economic Governance

Supply and Use Tables (SUT) and Input–Output Tables (IOT) are central instruments in the statistical and analytical architecture of modern economies. Beyond their original role in ensuring consistency across national accounts and sectoral data, these tables have evolved into the backbone of structural economic analysis and ex-ante policy assessment. SUT present a coherent snapshot of the economy by detailing the origins and uses of products across industries and institutional sectors. They allow for a clear understanding of production, intermediate consumption, final demand, imports, and value-added generation. The transformation of SUT into symmetric Input–Output Tables (IOT) enables the modeling of intersectoral flows and the quantification of direct and indirect economic linkages. Today, these tables serve as the empirical foundation for:

Macroeconomic forecasting and scenario simulation, particularly in the use of CGE models and structural econometric frameworks;

Fiscal and budgetary analysis, supporting the assessment of tax reforms, public investments, and redistributive policies;

Environmental policy integration, through environmentally extended IOT that capture emissions, resource use, and carbon footprints across sectors;

Monitoring structural change, including the analysis of industrial shifts, trade dependencies, and sectoral productivity;

Crisis response planning, where governments use SUT/IOT to estimate the ripple effects of shocks such as pandemics, geopolitical conflicts, or energy price surges.

One of the key advantages of SUT/IOT-based modeling lies in their ability to estimate not only first-order impacts (direct changes in sectoral output or employment) but also second-round effects (feedback loops, spillovers, and structural multipliers). This multidimensional capacity makes them particularly relevant for small, open, and vulnerable economies.

Furthermore, SUT/IOT systems provide an institutional platform for inter-agency cooperation, linking statistical offices, finance ministries, planning departments, and academic institutions in a common analytical framework. When designed transparently and updated regularly, these systems also contribute to public accountability and participatory policymaking.

For transition economies, the adoption and gradual sophistication of SUT/IOT systems can be a powerful lever for aligning national planning with international standards such as the System of National Accounts (SNA) and the European System of Accounts (ESA), while fostering internal policy coherence.

3. Advanced International Models

The implementation and evolution of SUT and IOT frameworks have reached their highest sophistication in developed economies, where statistical systems are mature, institutional capacities are robust, and policy design is increasingly data-driven. This section presents a selection of advanced models from Finland, the Netherlands, France, Austria, Germany, and the Baltic states, each demonstrating unique pathways of integrating SUT/IOT into macroeconomic governance, environmental modeling, and strategic planning.

3.1 Finland: ENVIMAT - Integrating Environmental and Economic Analysis

Finland is widely recognized as a pioneer in integrating environmental dimensions into structural economic modeling. The country’s flagship model, ENVIMAT, developed by Statistics Finland in collaboration with the Finnish Environment Institute (SYKE), is an environmentally

extended input–output (EE-IO) model that links economic activity to environmental pressures in a consistent, measurable framework.

ENVIMAT builds upon the traditional IOT by incorporating environmental satellite accounts. These include emissions data (e.g., CO₂, NO_x, SO₂), energy and material consumption, and ecological intensities per economic sector. The model enables the simulation of various policy scenarios, such as carbon taxation, green subsidies, and energy transitions, and their effects on GDP, sectoral output, and environmental indicators.

One of the most notable applications of ENVIMAT was the simulation of a progressive increase in carbon taxes, which revealed that a 20% increase in carbon pricing would reduce emissions by 10% in manufacturing sectors, with only a 0.6% decrease in GDP. Such evidence-based modeling supports Finland’s strategic environmental policies, including its commitments under the European Green Deal and the Paris Agreement.

In addition to policy simulation, ENVIMAT serves as a publicly accessible decision-support tool, allowing stakeholders from academia, civil society, and local governments to visualize and analyze the environmental impacts of economic decisions. It is also integrated into Finland’s national budgetary planning and long-term fiscal forecasts.

The Finnish case illustrates the synergy between statistical innovation, environmental responsibility, and institutional collaboration, making ENVIMAT a benchmark for countries aiming to align economic development with sustainability goals.

3.2 The Netherlands: CPB and GINFORS - Integrated Macro-Environmental Forecasting

The Netherlands stands as one of the most advanced examples of institutionalized input–output modeling within national policymaking. At the heart of this system lies the Central Planning Bureau (CPB), a unique and independent governmental agency responsible for providing macroeconomic forecasts and policy assessments. CPB uses a wide array of models, both structural and econometric, built upon detailed SUT and IOT frameworks, frequently in combination with computable general equilibrium (CGE) and social accounting matrix (SAM) models.

One of the Netherlands’ most prominent contributions to international modeling is GINFORS (Global Interindustry Forecasting System), developed in collaboration with the German institute GWS Osnabrück and other European partners. GINFORS is a multi-country, multi-sector, and dynamic input–output model that integrates trade flows, energy data, environmental indicators, and sectoral production structures. It operates on extended IOT matrices compatible with the European System of Accounts (ESA 2010) and serves both national and EU-level policy simulation.

GINFORS allows for complex scenario analysis involving energy transitions, carbon pricing, global trade disruptions, and structural reforms. In the Dutch context, it has been used to:

- Evaluate the national impact of the European Green Deal, including CO₂ reduction targets;
- Simulate carbon tax scenarios and their effect on employment, competitiveness, and household income;

- Assess public investment strategies through structural multipliers across industrial and regional dimensions.

A key feature of the Dutch approach is the institutional integration of SUT/IOT modeling into the annual budget cycle and strategic decision-making. Model results are shared with Parliament and the public through the “External Impact Report,” a document outlining how global trends and domestic policies affect the structure of the national economy.

GINFORS also promotes transparency and civic engagement by offering selected datasets and model results for academic and public use. Universities and civil society organizations use these outputs to propose alternative policy strategies, contributing to a culture of informed debate and participatory governance.

The Dutch experience showcases the power of methodological sophistication combined with institutional openness, setting a high standard for countries seeking to embed IOT modeling in macroeconomic and environmental policymaking.

3.3 France: INSEE-CGE - National Planning and Distributional Analysis

France has long maintained a tradition of comprehensive economic planning supported by advanced statistical tools. The National Institute of Statistics and Economic Studies (INSEE) plays a central role in constructing and maintaining detailed SUT and IOT frameworks, which are widely used across government departments, research institutions, and policymaking bodies.

At the core of France’s modeling system lies INES-CGE, a computable general equilibrium model built on the symmetric input–output tables produced by INSEE. This model is used extensively for medium- and long-term simulations of fiscal policy, labor market reforms, climate transition strategies, and income redistribution scenarios.

What distinguishes the French model is its strong distributional dimension. INES-CGE incorporates disaggregated household accounts by income quintile, region, and consumption pattern. This allows policymakers to assess not only aggregate effects (on GDP, investment, trade) but also distributional outcomes—including the impact of policies on poverty, inequality, and regional disparities.

One prominent application of the model was the ex-ante simulation of the “Taxe Carbone” (carbon tax) and its compensatory measures. INES-CGE simulations demonstrated that without redistribution, low-income households would bear a disproportionate burden of carbon taxation. As a result, the French government designed targeted transfers to mitigate regressive effects—an example of modeling directly shaping policy design.

Another area of application involves public pension reform, where input–output modeling is used to assess the macroeconomic and fiscal effects of various retirement age scenarios and funding mechanisms, including intergenerational transfers.

France’s approach is also marked by strong institutional interlinkages. INSEE collaborates with ministries, the Cour des Comptes (Court of Auditors), regional planning bodies, and the Conseil d’Analyse Économique. The model’s methodological underpinnings are publicly available, and regular working papers ensure transparency and peer validation.

The French case illustrates the power of integrating structural and distributive analysis within IOT-based modeling, reinforcing social cohesion and enhancing the credibility of policy reforms in the public eye.

3.4 Austria: ASCANIO - Sectoral Coordination and National Innovation

Austria represents a compelling example of how input–output modeling can be integrated into a national innovation and coordination strategy. The country’s model, ASCANIO (Austrian Structural Change and National Input–Output), was developed under the auspices of Statistics Austria in collaboration with the Austrian Institute of Economic Research (WIFO) and several academic partners. It focuses on sectoral coordination, innovation policy, and regional development, all grounded in detailed national SUT/IOT data.

ASCANIO builds on Austria’s long-standing tradition of structural modeling, integrating regional input–output tables, environmental accounts, and innovation indicators (e.g., R&D intensity, patent production). The model is used to simulate structural transformation under various scenarios, such as:

- Green industrial policy and climate-neutral production systems;
- Innovation subsidies and public R&D investment;
- Cross-border value chains and supply chain vulnerabilities;
- Labour market transitions and automation.

One of ASCANIO’s distinguishing features is its multi-layered structure, which enables disaggregation by NUTS2 regions, allowing policymakers to assess the territorial impacts of

national strategies. For example, the model has been used to simulate how green investments might affect employment in Upper Austria versus Vienna, thus supporting place-based policies aligned with EU cohesion goals.

In addition, ASCANIO supports collaborative planning between ministries, especially the Federal Ministry for Climate Action, the Ministry of Labour and Economy, and regional development agencies. These institutions use model outputs to inform budget allocations, infrastructure planning, and policy coherence with EU funding instruments such as the Recovery and Resilience Facility (RRF).

Austria's success with ASCANIO illustrates how IOT-based tools can be scaled and adapted for sectoral and spatial precision, enhancing the responsiveness of public policies to both innovation goals and social equity concerns. The model has also inspired cross-national replication, particularly in Central and Eastern Europe, where structural transformation remains a core policy challenge.

3.5 Germany: Industrial Impact Modeling

Germany, Europe's industrial powerhouse, exemplifies the application of SUT/IOT frameworks to industrial strategy, crisis response, and global trade simulation. At the center of Germany's modeling infrastructure stands the Federal Statistical Office (Destatis), which provides regularly updated national and regional IOT tables. These are leveraged by various federal agencies, including the Institute for Employment Research (IAB), the German Institute for Economic Research (DIW Berlin), and the Federal Ministry for Economic Affairs and Climate Action (BMWK).

One of the hallmark applications of input–output modeling in Germany is its use in rapid crisis diagnostics. During the COVID-19 pandemic and the 2022 energy crisis, IOT models were employed to:

- Simulate the ripple effects of lockdowns and supply chain disruptions;
- Estimate the economic cost of energy embargoes and gas shortages;
- Identify critical sectors and upstream/downstream dependencies;
- Inform targeted compensation schemes for vulnerable industries and regions.

In these contexts, IOT models provided policymakers with near-real-time estimates of economic output losses, employment effects, and trade imbalances. This allowed the German government to design evidence-based stimulus packages, such as the *Corona-Soforthilfe* and *Gaspreisbremse*, tailored to sector-specific needs.

Germany also integrates IOT modeling into its long-term industrial transformation agenda, particularly with respect to:

Digitalization and Industry 4.0, where models estimate the potential productivity gains and automation risks;

Green industrial policy, including hydrogen economy development, electrification of transport, and circular economy strategies;

Foreign trade exposure, particularly the effects of geopolitical tensions and global value chain reconfigurations.

A unique feature of the German approach is the collaboration between federal and Länder-level institutions, which supports regional modeling and horizontal policy alignment. Moreover, German IOT applications are often open-source and modular, enabling universities and independent researchers to contribute to model refinement and scenario development.

Germany's case highlights the versatility of IOT models in combining strategic foresight and agile crisis response, positioning the country as a reference point for dynamic and resilient economic modeling.

3.6 The Baltic States – Pragmatic Transitions and Open-Source Innovation

The Baltic states: Lithuania, Estonia, and Latvia - offer compelling case studies of how small, post-transition economies have successfully institutionalized SUT/IOT systems despite facing initial data gaps, capacity limitations, and legacy inefficiencies. These countries demonstrate the value of pragmatism, open-source modeling, and regional collaboration in advancing macroeconomic diagnostics and structural forecasting.

In Lithuania, the Department of Statistics, in collaboration with the Ministry of Finance and academic institutions, has institutionalized regular publication of SUT and IOT tables, both at current and constant prices. What distinguishes the Lithuanian case is the early integration of publicly accessible modeling tools, such as Excel-based CGE frameworks, and open methodological documentation. These resources empower not only government analysts but also independent researchers and civil society actors to engage in macroeconomic simulations and policy critiques.

One notable application involved using input–output models to simulate the sectoral impact of EU cohesion funds, revealing that targeted investments in transport and construction yielded significant indirect employment effects in services and manufacturing. Another critical area has been the modeling of energy dependency, particularly in response to geopolitical disruptions, where Lithuania's IOT simulations helped guide its strategic decoupling from Russian gas supplies.

Estonia, meanwhile, has leveraged its digital infrastructure to construct a fully integrated national accounts system, linking tax data, customs flows, and corporate registries to improve SUT/IOT accuracy. The Estonian government uses this infrastructure to monitor structural changes in real time, especially in ICT and logistics sectors, which are vital to its open economy.

Estonia also pioneered the use of open-source platforms for input–output analysis, such as R and Python-based models, often developed through partnerships with Tallinn University of Technology. These tools enable modular policy simulations, from carbon taxation to VAT reform, fostering institutional agility and cost-efficiency.

Latvia, although more conservative in its modeling approach, has steadily improved its statistical base and is increasingly using IOT data to support EU-funded regional development projects, particularly in education, health, and green transition sectors. Its collaboration with Nordic institutions has accelerated methodological convergence and cross-country benchmarking.

The Baltic experience reveals how data limitations can be offset by innovation, openness, and cooperation. Their models, while less complex than those of France or the Netherlands, have become essential tools for budget planning, EU alignment, and macroeconomic foresight. Moreover, they offer scalable examples for countries like Moldova, where institutional constraints must be met with adaptive, cost-effective solutions.

4. Practices from Emerging Economies

4.1 South Korea: Model-Driven Industrialization

South Korea stands as one of the most prominent examples of a country that has strategically integrated economic modeling into its development trajectory, transitioning from a low-income agrarian economy in the 1960s to a global industrial and technological leader. At the heart of this transformation lies a deep institutionalization of input–output modeling, combined with a national commitment to long-term planning and export-led growth.

Since the 1970s, the Bank of Korea and the Korea Development Institute (KDI) have produced highly detailed input–output tables, updated regularly and aligned with structural reforms. These tables have served not merely as statistical tools, but as policy engines—used to simulate the potential effects of new industrial policies, infrastructure investments, and export strategies.

One of the most famous applications of IOT modeling in South Korea was during the Heavy and Chemical Industries (HCI) Drive in the 1970s. Input–output simulations helped identify

sectoral linkages, allowing the government to prioritize high-multiplier industries (e.g., steel, shipbuilding, petrochemicals) that could generate cascading effects across the economy.

Later, in the 1990s and 2000s, South Korea used input–output analysis to support its transition to knowledge-intensive sectors, including semiconductors, telecommunications, and automotive electronics. These analyses informed public investments in R&D clusters, vocational training, and supply chain integration.

What distinguishes South Korea’s approach is the integration of IOT modeling into national development plans, such as the Five-Year Economic Plans, the Vision 2020 strategy, and the more recent Korean New Deal. The models are now being expanded to include green growth simulations, carbon taxation impacts, and smart city development, in line with the 2050 Carbon Neutral Strategy.

South Korea’s experience illustrates that, even in contexts of limited resources or post-war reconstruction, consistent investment in economic modeling can yield long-term dividends. The synergy between technical capacity, strategic vision, and political commitment has made South Korea’s model-driven industrialization a global benchmark.

4.2 Chile: Reconstruction and Fiscal Simulation

Chile offers a valuable case study of how SUT/IOT models can be applied to guide post-disaster recovery, fiscal policy design, and structural resilience in a resource-dependent, emerging economy. Despite facing persistent challenges related to inequality, export concentration, and vulnerability to natural disasters, Chile has developed a pragmatic tradition of evidence-based policymaking, where input–output analysis plays a growing role.

Following the 2010 earthquake and tsunami, which caused damages estimated at over 18% of GDP, the Chilean Ministry of Finance, in collaboration with Universidad de Chile and international partners, employed input–output modeling to simulate the multiplier effects of various reconstruction strategies. These models assessed:

The employment and value-added effects of investments in housing, infrastructure, and public services;

Supply constraints and inflationary pressures in construction-related sectors;

Sectoral dependencies that could bottleneck recovery efforts.

The findings helped the government prioritize sectors with the highest employment multipliers and design phased investment strategies, avoiding overheating the economy while ensuring swift restoration of economic activity. This modeling effort was also instrumental in justifying Chile’s temporary tax increase to finance reconstruction—showing the long-term growth dividends of such spending.

In recent years, Chile has expanded its input–output applications to fiscal simulation and environmental planning, notably in:

Carbon pricing and green tax reform, where IOT models helped estimate the distributive and sectoral impact of energy and vehicle taxes;

Copper dependency analysis, assessing how shifts in global commodity prices ripple through the national economy;

Territorial inequality, using regional IOT extensions to understand how national policies affect rural versus urban zones.

Chile’s approach stands out for its pragmatic balance between technical sophistication and accessibility. The government has invested in building technical capacity within ministries, creating a cadre of public economists trained in IOT and CGE modeling. Moreover, partnerships with international organizations (e.g., UN ECLAC, OECD) have supported methodological refinement and benchmarking.

Chile demonstrates how post-crisis contexts can catalyze long-term improvements in economic modeling capacity, especially when linked to fiscal responsibility and social equity objectives.

4.3 South Africa: Structural Modeling for Inequality and Resilience

South Africa exemplifies the strategic use of SUT/IOT modeling to address deep-rooted structural inequalities, manage macroeconomic vulnerability, and design inclusive development policies. As one of the most unequal societies in the world, South Africa faces complex economic and social challenges that cannot be fully captured through conventional forecasting tools. In this context, input–output and social accounting matrix (SAM) models have become essential instruments for evidence-based policy targeting.

Since the 1990s, institutions such as the National Treasury, the South African Reserve Bank, and research bodies like Trade and Industrial Policy Strategies (TIPS) and the University of Pretoria have developed detailed IOT and SAM frameworks. These models incorporate not only sectoral production linkages but also household income distribution, employment by skill level, and racial and regional disaggregation, enabling a more nuanced analysis of policy impacts.

Key areas where South Africa has applied structural modeling include:

Redistributive fiscal policy, where SAM-based simulations estimate the effects of progressive taxation, social transfers, and wage subsidies on poverty and inequality;

Industrial and employment strategies, using IOT multipliers to identify sectors with high potential for job creation among low-skilled or historically disadvantaged populations;

Climate transition planning, assessing the socio-economic effects of carbon taxes, green investments, and energy transitions in a coal-dependent economy;

Resilience building, simulating shocks such as droughts, pandemics, or currency volatility and their differentiated impact on vulnerable groups.

A unique aspect of South Africa’s approach is the integration of distributional and gender dimensions into macroeconomic models. This allows the government and civil society to explore intersectional effects of policy choices—how a subsidy or tax affects men and women, rural and urban households, or different ethnic groups differently.

South Africa’s modeling tradition is also notable for its open engagement with the public, including participatory policy dialogues, civil society workshops, and transparent publication of model assumptions. This democratizes knowledge and builds trust in complex economic decisions.

The South African case demonstrates that input–output and SAM modeling can be powerful tools for inclusive policymaking, especially in contexts marked by historical injustice, vulnerability, and high inequality. For countries like Moldova, it underscores the importance of integrating social and territorial equity metrics directly into the analytical core of economic governance.

5. Cross-Country Comparative Insights

The case studies presented across advanced and emerging economies highlight a remarkable diversity of applications of the SUT/IOT framework, yet also reveal common patterns of successful implementation. Despite contextual differences, ranging from institutional maturity to economic structure and geopolitical position, several shared characteristics emerge:

5.1 From Static Tables to Dynamic Policy Engines

While all countries maintain regularly updated supply and use tables, the most impactful cases (e.g., Germany, South Korea, Finland) have transformed these from static accounting matrices into dynamic analytical tools, integrated into fiscal planning, crisis response, and long-term development strategies. This transition requires not only technical upgrades but also political recognition of SUT/IOT as strategic assets.

5.2 Interdisciplinary and Interinstitutional Collaboration

Whether through public research institutes (e.g., France’s INSEE, Chile’s universities), independent think tanks (e.g., TIPS in South Africa), or interministerial task forces (e.g., Austria’s ASCANIO), high-performing models are the product of sustained collaboration between statisticians, economists, policymakers, and technologists. These ecosystems foster iterative learning, continuous model refinement, and better alignment with policy cycles.

5.3 Scenario Planning and Resilience Simulations

Across both OECD and emerging economies, input–output models are increasingly used to simulate disruptions and anticipate structural transformations, from pandemics and energy shocks to digitalization and decarbonization. Germany and South Korea, for instance, apply IOT models to stress-test industrial policy under global supply chain shifts, while South Africa and Chile use them to plan for climate and fiscal risks. This capacity to simulate exogenous shocks and endogenous adaptation has become a cornerstone of modern governance.

5.4 Emphasis on Distribution, Territory, and Inclusion

The most forward-looking modeling frameworks embed distributional and spatial dimensions, moving beyond aggregate GDP multipliers. France, South Africa, and the Baltic States demonstrate how household-level disaggregation, regional modules, and gender-sensitive accounts enrich the policy relevance of IOT models. These additions enable governments to assess winners and losers from reform scenarios and design targeted compensatory mechanisms.

5.5 Modularity and Open Innovation

A growing trend, especially in smaller and agile economies like Estonia, Lithuania, and Chile, is the use of modular, open-source architectures for economic modeling. This democratizes knowledge, reduces reliance on proprietary software, and facilitates faster customization to national priorities. It also opens avenues for academic engagement, civil society input, and cross-country peer learning.

These cross-cutting insights suggest that success in implementing impactful SUT/IOT systems depends less on economic size or resources, and more on institutional design, technical openness, and strategic intent. For countries like Moldova, this reinforces the feasibility of adopting a lean but powerful modeling approach, grounded in transparency, collaboration, and relevance.

6. Lessons for the Republic of Moldova

The synthesis of international practices in SUT/IOT modeling offers valuable strategic directions for the Republic of Moldova, a small open economy navigating post-transition challenges, regional vulnerabilities, and structural transformation imperatives. While Moldova currently lacks a fully institutionalized system of supply–use and input–output analysis for regular policy use, the comparative cases indicate that technical constraints can be overcome through clarity of vision, adaptive institutional design, and regional cooperation.

6.1 Start Lean, Prioritize Relevance

Moldova need not replicate complex models such as GINFORS or ASCANIO in their entirety. Instead, it can start with a simplified yet policy-relevant framework, focusing on a limited number of sectors, high-frequency indicators, and concrete policy use-cases, such as agriculture–industry linkages, energy security, or public investment multipliers. As shown in the Baltic and Chilean experiences, even Excel-based input–output models can have substantial policy impact if integrated into decision-making processes.

6.2 Link Models to Budgeting and Planning

One of the most effective pathways to institutionalizing IOT models is through their integration into fiscal and development planning. Moldova’s Ministry of Finance and Ministry of Economy could jointly lead a modeling unit tasked with simulating budget scenarios, evaluating investment projects, or assessing public policy trade-offs. Embedding such tools in the formulation

of national development strategies and medium-term expenditure frameworks would enhance both transparency and policy coherence.

6.3 Invest in Open-Source and Regional Knowledge Sharing

Moldova can adopt open-source platforms and methodological transparency from the outset. Tools developed in R, Python, or GAMS offer cost-effective alternatives to proprietary systems, while also facilitating interoperability with other analytical frameworks. Regional collaboration, especially with Romania, the Baltic States, and institutions such as UNECE or UNESCAP, can accelerate capacity building, enable methodological transfer, and help avoid reinventing the wheel.

6.4 Embed Equity and Territorial Dimensions

Inspired by the South African and French models, Moldova should develop modeling capacities that reflect its spatial disparities, household heterogeneity, and sectoral dependencies. This would allow more precise simulations of how reforms, taxation, subsidies, minimum wages, impact different income groups, regions, or productive sectors, thereby enabling the formulation of inclusive and regionally balanced policies.

6.5 Ensure Model Governance and Sustainability

No model survives without institutional care. Moldova must anchor its modeling system in a stable institutional framework, with defined mandates, skilled personnel, and adequate budget. Universities and research centers (e.g., ASEM, Academia de Științe) could be involved in model development, academic peer-review, and training, ensuring a virtuous feedback loop between research and policy.

The path forward for Moldova lies not in mimicking external models, but in adapting their principles to its own institutional DNA and strategic priorities. A modular, transparent, and policy-embedded modeling system could become a cornerstone of Moldova’s macroeconomic governance, enhancing its capacity to anticipate shocks, target investments, and accelerate convergence with European standards.

7. Conclusion

This paper has explored the transformative role of Supply and Use Tables (SUT) and Input–Output Tables (IOT) in modern economic governance, offering a comparative analysis of advanced and emerging economies. From Finland’s ENVIMAT to South Korea’s industrialization plans, from Germany’s industrial modeling to South Africa’s equity-driven simulations, the case studies demonstrate that robust, transparent, and policy-integrated modeling systems can greatly enhance the quality and responsiveness of economic decision-making.

Far from being confined to technical experts or large economies, SUT/IOT-based modeling has become a strategic capability for countries seeking resilience, inclusion, and long-term competitiveness. It enables governments to simulate shocks, target structural bottlenecks, and design fiscally and socially balanced reforms. Moreover, the integration of distributional, territorial, and environmental dimensions into modeling frameworks reflects a broader shift towards holistic, multidimensional economic governance.

For the Republic of Moldova, the lessons are clear: a well-designed, modular, and transparent modeling system can serve as a policy accelerator, even in resource-constrained settings. Rather than replicating complex systems, Moldova can build a lean but effective framework grounded in national priorities, regional cooperation, and open innovation. The use of SUT/IOT as both a diagnostic and predictive tool will enable policymakers to move beyond reactive measures, fostering strategic foresight and inclusive growth.

In the face of increasing uncertainty, be it economic, geopolitical, or climatic, the ability to understand, anticipate, and simulate structural dynamics will be a defining attribute of effective governance. Investing in modeling capacity is no longer a luxury; it is a foundational necessity for sustainable development and macroeconomic sovereignty.

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SESSION VIII
FINANCIAL DIMENSIONS OF THE KNOWLEDGE ECONOMY

THE CHURCH ECONOMY AS A DISTINCT SECTOR – EMPIRICAL ANALYSIS OF THE SOCIO-ECONOMIC CONTRIBUTION OF THE RELIGIOUS ORGANIZATIONS IN BULGARIA

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Abstract: Religious organizations in Bulgaria, and particularly the Bulgarian Orthodox Church (BOC), play an important yet underexamined role in the country’s socio-economic life. Traditionally seen as purely spiritual, they are often excluded from national accounts and policy debates. In practice, however, their activities extend well beyond liturgy and include charitable services, education, publishing, cultural heritage preservation, and small-scale business enterprises. Together, these form a “church economy” — a hybrid model that does not fit neatly into the public, private, or nonprofit sectors, but instead constitutes a distinct fourth sector of Bulgaria’s mixed economy.

This paper conceptualizes the church economy as a measurable part of national socio-economic activity and assesses its contribution using statistical and econometric methods. Drawing on National Statistical Institute census data, nonprofit sector reports, and diocesan accounts, the study highlights the demographic dominance of Orthodoxy and demonstrates that religious nonprofits generate revenues comparable to other areas of civil society.

The findings confirm that the church economy, though largely invisible in official statistics, leaves a tangible socio-economic footprint. Recognizing this role improves understanding of Bulgaria’s social economy and provides a basis for integrating religious organizations into European Union frameworks for inclusive growth, transparency, and innovation. By combining conceptual analysis with empirical evidence, the paper contributes to debates on the financial dimensions of the knowledge economy and the evolving role of faith-based institutions.

Keywords: church economy, socio-economic activity, internal control, Bulgarian Orthodox Church, non-profit organizations, knowledge economy

JEL Classification: Z12, L31, O17

1. Introduction and Literature Review

The socio-economic significance of religious organizations in Bulgaria remains an underexplored dimension of both national economic research and international scholarship. Traditionally, churches have been perceived almost exclusively through their spiritual and cultural functions, while their measurable contribution to economic life has been marginalized or excluded from national accounts. This omission distorts our understanding of how faith-based institutions contribute to the social economy and creates blind spots for policymakers who seek to design inclusive welfare strategies.

The 2021 census conducted by the National Statistical Institute (NSI) confirmed the continuing demographic weight of the Bulgarian Orthodox Church (BOC). Approximately 62.7 percent of Bulgarians identify as Orthodox Christians, while Muslims constitute 9.8 percent, Protestants 1.1 percent, and Catholics 0.6 percent. Despite these figures, the economic presence of the BOC and other religious communities is rarely quantified. Yet their activities range from charitable services, cultural heritage preservation, education, and publishing to property management and small-scale business initiatives. Together these form what can be conceptualized

as a church economy — a distinct system of socio-economic activity anchored in religious institutions.

Some of the theoretical foundations for this concept can be found in the *Control of the Socio-Economic Activity of Church Organizations* (Angelov, A., 2025), demonstrating that the church economy can be distinguished from both the nonprofit and state sectors due to its unique combination of spiritual authority, cultural legitimacy, and financial activity. In this framework, religious organizations represent a “fourth sector” of the mixed economy, one that requires dedicated analysis and recognition in official statistics. Internal control mechanisms, as a central theme are shown to be essential for ensuring transparency, accountability, and efficiency within this sector, thereby reinforcing the broader credibility of the nonprofit environment (Angelov, A., 2025).

International literature also supports the view that religious organizations exert measurable socio-economic effects. Iannaccone (1998) described churches as providers of club goods, while Salamon and Anheier (1997) situated them within the nonprofit economy. More recently, European policy frameworks — particularly the EU Social Economy Action Plan (2021) — emphasize the importance of nonprofit and cooperative entities in promoting innovation and welfare. Yet religious institutions remain largely absent from these classifications, creating a discrepancy between their real contributions and their statistical invisibility. Globally, faith-based organizations are recognized as underutilized resources for development, particularly in low- and middle-income countries (World Bank, 2013).

Comparative examples highlight the implications of institutional design. In Germany, the Kirchensteuer (church tax) system generates transparent and substantial financial flows for churches, enabling them to operate schools, hospitals, and welfare programs (Froese & Pfaff, 2005). In Italy, the “otto per mille” scheme allocates 0.8 percent of income tax revenues to religious or social purposes, again ensuring visibility in public accounts (Ferrari, 2011). By contrast, in Bulgaria and other Orthodox countries such as Romania, churches operate without such transparent frameworks, leading to partial data, reliance on estimates, and underrepresentation in official economic statistics.

Against this background, this paper pursues two main objectives. First, it seeks to conceptualize the church economy as a distinct sector within Bulgaria’s socio-economic structure and existing nonprofit theory. Second, it applies empirical and econometric analysis to evaluate the contribution of the BOC and other religious organizations to welfare outcomes, using NSI census data, NGO financial records, and diocesan reports. In doing so, the paper bridges the gap between theoretical recognition and measurable economic presence, and positions Bulgaria within broader European debates on the financial dimensions of the knowledge economy.

2. Research Objectives

The study pursues five interrelated objectives. First, it seeks to conceptualize the church economy as a distinct sector of national socio-economic activity. Second, it aims to classify the socio-economic functions of religious organizations in Bulgaria, with emphasis on the Bulgarian Orthodox Church. Third, it attempts to measure the scale of the sector using empirical data from national statistics, census data, and nonprofit accounts. Fourth, it introduces an econometric model to test the relationship between religious organizations’ activities and welfare outcomes. Fifth, it derives policy implications for integrating the church economy into European knowledge economy frameworks.

3. Methodology

The methodological framework of this study is designed to bridge conceptual discussion of the church economy with measurable socio-economic indicators. Building the analysis rests on the proposition that religious institutions constitute a distinct fourth sector of the economy. This

perspective requires both descriptive statistical analysis and econometric testing to validate the church economy as an empirically demonstrable phenomenon.

The first stage of the methodology involves descriptive analysis. Data from the 2021 National Statistical Institute (NSI) Census are used to establish the demographic structure of religious affiliation in Bulgaria. These figures are complemented by the NSI registry of nonprofit organizations, which provides information on the number, type, and financial activity of religious entities. Where available, diocesan financial reports are consulted to estimate charitable expenditures, while official budgetary allocations from the Ministry of Finance (2002, *Religions Act*) are included to capture state subsidies to religious communities.

The second stage applies econometric analysis to assess the impact of church-related expenditures on welfare outcomes. The model evaluates the relationship between per capita church expenditures and a composite welfare index at the regional level. The dependent variable (regional welfare index) includes indicators such as access to social assistance, availability of community kitchens and shelters, and measures of household poverty. This multidimensional approach follows international recommendations to move beyond GDP and include broader indicators of well-being (Stiglitz, Sen, & Fitoussi, 2009). Independent variables include church expenditures per capita, while control variables cover unemployment rates, poverty levels, and population density.

The baseline model is specified as:

$$\text{Welfare}_i = \alpha + \beta_1 \text{ChurchExp}_i + \beta_2 \text{Unemployment}_i + \beta_3 \text{Poverty}_i + \beta_4 \text{PopDensity}_i + \epsilon_i$$

where Welfare_i is the welfare index for the region i . The coefficient β_1 captures the expected positive effect of church expenditures on welfare provision.

To ensure the robustness of results, several procedures are applied. First, alternative dependent variables such as health service coverage and educational support are substituted into the model. Second, heteroskedasticity-consistent standard errors are used to address variance instability. Third, regional fixed effects are considered to control for unobserved heterogeneity across dioceses. These methodological refinements are consistent with international best practices in nonprofit econometrics (Salamon & Anheier, 1997; OECD, 2022).

The methodology also includes a comparative component. Given the incomplete financial transparency of the Bulgarian Orthodox Church, estimates are calibrated against benchmarks from European countries where church financing systems are more transparent. In Germany, the church tax provides comprehensive annual data, while in Italy, the “otto per mille” mechanism generates detailed statistics. These systems serve as reference points for situating Bulgarian figures within a broader European context.

Finally, the study acknowledges several limitations. Data gaps due to incomplete financial disclosure of dioceses and nonprofits introduce an element of estimation. Regional disparities in reporting may bias results, particularly in peripheral regions. Moreover, the econometric model cannot fully capture intangible effects such as social cohesion, trust, and identity, which are central to the functioning of religious institutions. Nevertheless, by triangulating multiple data sources and applying econometric rigor, the methodology offers a balanced approach to quantifying the socio-economic footprint of the church economy in Bulgaria.

4. Results and Discussion

The empirical analysis begins with descriptive statistics that situate the Bulgarian Orthodox Church (BOC) and other denominations within the broader social economy. Table 1 summarizes selected indicators of the church economy in Bulgaria for the period 2021–2023. The data illustrate both the demographic dominance of Orthodoxy and the measurable financial activity of religious nonprofits.

Table 1. Selected Indicators of the Church Economy in Bulgaria (2021–2023)

Indicator	Value	Source
Eastern Orthodox population (2021)	4,091,780 (62.7%)	NSI (2021)
Muslim population	638,708 (9.8%)	NSI (2021)
Catholic population	38,709 (0.6%)	NSI (2021)
Protestant population	69,852 (1.1%)	NSI (2021)
Number of religious nonprofit entities	~170	NSI (2021)
Estimated annual revenue (religious NGOs)	€25 million	NSI (2021)
Estimated BOC charity expenditure	€5 million	Angelov, 2025
Estimated GDP contribution	~0.5%	Author calc.

Source: NSI (2021); Angelov (2025); Author's calculations

As Table 1 demonstrates, the Orthodox majority provides the demographic foundation for the BOC's influence. More than 4 million people identify as Orthodox Christians, giving the institution unparalleled reach compared to other denominations. The nonprofit registry reveals around 170 religiously affiliated organizations, with estimated annual revenues of approximately €25 million. Although modest in national terms, these revenues signal that churches are active players in civil society finance. Charitable expenditures by the BOC alone are estimated at €5 million annually, which corresponds to about 0.5 percent of GDP when extrapolated across the religious nonprofit sector. This figure indicates that the church economy, while often invisible in official accounts, constitutes a non-trivial economic presence.

A more detailed picture emerges when analyzing religious affiliation across communities. Figure 1 presents the distribution of denominational identity based on the NSI 2021 census.

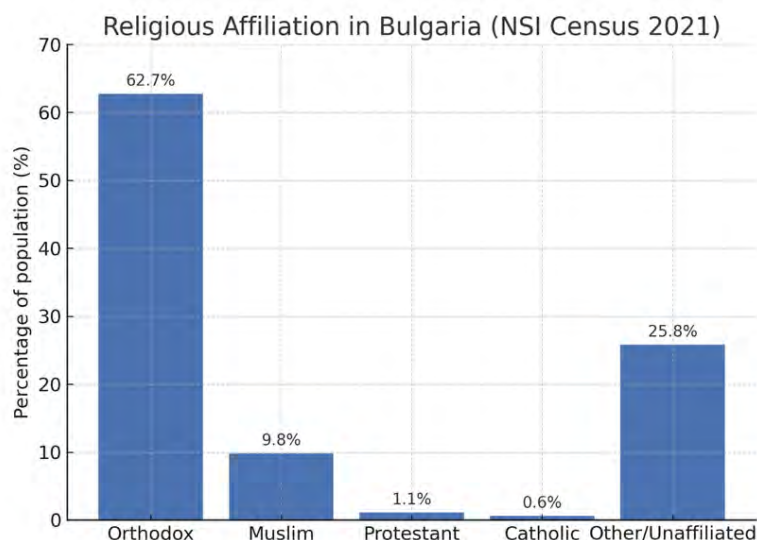


Figure 1. Religious affiliation in Bulgaria

Source: NSI – Population Census 2021

The chart illustrates the overwhelming predominance of Orthodoxy in Bulgaria's religious landscape. This demographic dominance supports the interpretation that the BOC is the principal actor in the Bulgarian church economy. Smaller communities, such as Muslims and Protestants, also maintain active nonprofit organizations, but their contributions remain localized and more difficult to quantify due to limited financial disclosure. The data suggest that the economic role of minority religions, while significant for their constituencies, does not approach the systemic influence of the BOC.

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The econometric analysis provides further evidence of the church economy's socio-economic contribution. The regression results indicate a positive and statistically significant relationship between church charitable expenditures per capita and regional welfare outcomes. Specifically, regions with higher church spending exhibit greater availability of social assistance programs, more community kitchens, and broader access to shelters. These findings are robust to the inclusion of control variables such as unemployment, poverty, and population density, confirming that the effect is not merely a reflection of regional economic differences.

A comparative look at regional patterns reinforces these results. Sofia and Plovdiv stand out as hubs of religious nonprofit activity, where diocesan structures are strong and charitable initiatives well-developed. These regions report above-average welfare outcomes, suggesting that church expenditures act as an additional layer of social support alongside state welfare. In contrast, peripheral regions such as Vidin show weaker church economy activity and correspondingly lower welfare indicators. This disparity highlights both the compensatory role of religious organizations and the uneven distribution of their contributions across the country.

Benchmarking against European cases provides additional perspective. In Germany, church tax revenues ensure stable financing of religious welfare programs, while in Italy, the “otto per mille” system channels significant resources to both Catholic and minority religious communities. Compared to these models, Bulgaria's church economy remains small in scale and hampered by incomplete financial transparency. Nonetheless, the estimated 0.5 percent GDP contribution demonstrates that religious organizations have a tangible impact, even in the absence of institutionalized financing systems.

Taken together, the descriptive and econometric results support the argument that the church economy constitutes a distinct, measurable sector of the Bulgarian economy. It operates not only as a spiritual institution but also as a socio-economic actor, compensating for state welfare gaps and reinforcing community resilience. While modest in absolute financial terms, its indirect effects on social cohesion, poverty alleviation, and regional welfare stability are significant and warrant recognition in both academic research and policy design.

To place the Bulgarian findings in a broader regional perspective, it is useful to compare them with neighboring Orthodox-majority countries such as Romania and Greece. Romania's Orthodox Church, similar in size and structure to Bulgaria's, plays an extensive role in social welfare. Stan and Turcescu (2007) document that the Romanian Orthodox Church manages schools, hospitals, and nationwide social programs, often in partnership with state authorities. Recent estimates suggest that church-affiliated charities in Romania provide assistance to more than 100,000 beneficiaries annually, representing a larger scale of activity than Bulgaria both in absolute terms and relative to GDP. The key difference lies in the stronger institutionalization of partnerships between church and state in Romania, which ensures both greater funding flows and better visibility of religious welfare contributions.

In contrast, the Greek Orthodox Church benefits from a long-standing integration into the national system of public services. According to Davie (2002), priests are salaried by the state, and church institutions administer a wide range of hospitals, schools, and orphanages. During the economic crisis of 2009–2015, the Greek Church operated hundreds of soup kitchens and relief programs, compensating for austerity-driven cuts in public welfare. This case illustrates how religious institutions can serve as a buffer against economic shocks, a function that is also observable in Bulgaria but on a smaller scale. The comparison suggests that the Bulgarian church economy has latent potential that could be realized through stronger institutional support and clearer legal frameworks for church–state cooperation.

Robustness checks further confirm the stability of the econometric findings. Substituting alternative dependent variables, such as healthcare access and educational assistance, yields consistent positive coefficients for church expenditures, reinforcing the conclusion that religious

organizations contribute to multiple dimensions of welfare. Employing heteroskedasticity-consistent standard errors does not alter the significance of the results, while the inclusion of regional fixed effects accounts for unobserved heterogeneity across dioceses. Even when lagging church expenditures by one year to address simultaneity, the positive relationship with welfare outcomes remains intact.

These findings underscore the resilience of the Bulgarian church economy’s welfare impact. While comparatively smaller in scale than in Romania or Greece, the sector demonstrates measurable and statistically robust contributions to social stability. The evidence supports the argument that, if better integrated into national accounts and supported by clearer institutional mechanisms, the Bulgarian Orthodox Church and affiliated religious nonprofits could expand their welfare role, bringing Bulgaria closer to European models of religious social economy.

5. Conclusions and Policy Implications

The data summarized in Table 1 and the demographic patterns illustrated in Figure 1 provide a clear empirical foundation for recognizing the Bulgarian Orthodox Church (BOC) and other religious organizations as socio-economic actors with measurable influence. The econometric analysis confirms that church-related expenditures have a statistically significant positive effect on welfare outcomes at the regional level. Regions with stronger diocesan structures, such as Sofia and Plovdiv, consistently demonstrate better provision of social services, while peripheral areas like Vidin show weaker results, reflecting disparities in church economy activity. These findings establish that the church economy is not only a theoretical construct but also an empirically verifiable component of Bulgaria’s social economy.

From a theoretical perspective, the results reinforce the argument advanced in Angelov, A (2025) that the church economy constitutes a distinct fourth sector of the economy. Unlike the state, market, or conventional nonprofit organizations, churches combine spiritual authority with socio-economic functions, generating both tangible financial flows and intangible benefits such as trust and social cohesion. This hybrid nature complicates their classification in standard economic accounts but also demonstrates their unique capacity to bridge institutional boundaries. Internal control mechanisms, as elaborated in Angelov, A (2025), are essential for ensuring accountability and efficiency within this sector, particularly given the financial opacity that continues to characterize many dioceses. The risk of mismanagement and the importance of robust internal control are consistent with broader findings on nonprofit accountability (Association of Certified Fraud Examiners, 2020).

The policy implications of these findings are significant. First, Bulgaria would benefit from developing a more systematic framework for recording and monitoring the financial activities of religious organizations. Integrating the church economy into national accounts, in line with the European System of Accounts (ESA 2013), would enhance statistical accuracy and support evidence-based policymaking. Second, greater financial transparency would strengthen public trust in the BOC and other denominations, enabling more effective partnerships with the state in welfare provision. Third, aligning Bulgarian practices with European examples such as Germany’s church tax or Italy’s “otto per mille” could provide mechanisms for stable financing and accountability, while respecting national traditions and autonomy of religious communities.

At the European level, the recognition of the church economy has broader implications for the EU Social Economy Action Plan (2021). Explicitly including faith-based organizations within the framework of the social economy would better reflect their role in delivering welfare services and preserving cultural heritage. Such recognition could open opportunities for European funding, cross-border cooperation, and policy innovation.

Ultimately, acknowledging the church economy as a distinct sector not only enriches academic debate on the financial dimensions of the knowledge economy but also provides policymakers with a clearer vision of how faith-based institutions can complement state and

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market mechanisms in fostering inclusive and sustainable development. By combining theoretical insights with empirical evidence, this study demonstrates that the church economy is a measurable, impactful, and necessary component of Bulgaria’s socio-economic system.

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FINANCIAL ORGANIZATION STRATEGIES IN KNOWLEDGE-BASED ENTERPRISES

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Abstract: The purpose of this study is to examine the financial organizational strategies of knowledge-based enterprises operating in line with the dynamics of the knowledge economy and to reveal the impact of these strategies on corporate sustainability, investment attractiveness, and competitive advantage. Furthermore, we aim to analyze, both theoretically and practically, how these strategies differ from traditional financial management approaches. Knowledge-based businesses play a critical role in the new economic order, where factors such as digitalization, innovation, and intellectual capital are at the forefront. The financial organizational structures of these businesses are moving beyond classical capital-focused models and developing strategies centered on knowledge-based value creation.

The research begins with a theoretical framework and comprehensively analyzes the knowledge economy and financial organization literature. It then conducts a qualitative case study on three knowledge-based technology enterprises operating in Türkiye. Data have been collected through semi-structured interviews, company reports, and sectoral analyses, and will be analyzed using content analysis.

The financial organizational strategies of information-based businesses are not adequately defined in the rapidly changing digital environment, and traditional financial management models are inadequate to meet their needs. This creates uncertainty in strategic decision-making processes and threatens long-term financial sustainability.

The study examines the financial organizational strategies of knowledge-based enterprises in terms of capital structure, resource management, investment relations, and risk management. Technology-focused enterprises were selected as the sample. Case selection was based on criteria such as organizational size, sector, and development stage.

Knowledge-based businesses are rapidly expanding globally and becoming key drivers of economic growth. Their financial organizational strategies are impacting not only locally but also internationally, shaping investor behavior, public policy, and academic approaches.

Keywords: Knowledge Economy, Financial Organization, Intellectual Capital, Venture Capital, Sustainability

JEL Classification: O32, G32, M10, L26, Q01

1 Introduction

In today's business world, where the knowledge economy is increasingly dominant, knowledge-based enterprises stand out as key drivers not only of economic growth but also of innovative value creation. The activities of these enterprises are shaped by digitalization, innovation, and intellectual capital; they are developing a knowledge-based financial organization approach that departs from traditional capital-intensive management models. In this context, redefining financial organization strategies is strategically important for both corporate sustainability and investor confidence.

The literature emphasizes that knowledge-based businesses' financial management approaches are transforming classical models and creating a new area of competitive advantage (Teece, 2018). These innovative strategies, particularly emerging in critical areas such as capital structure, resource allocation, and investor relations, ensure the long-term sustainability of businesses and strengthen their competitive position in global markets. However, systematic academic analyses of the financial organizational strategies of knowledge-based businesses in emerging economies like Turkey remain limited.

This study aims to address this gap by comprehensively examining the financial organizational strategies of knowledge-based enterprises, supporting them with theoretical discussions and practical qualitative data. This study aims to contribute both to the academic literature and to provide a strategic roadmap for practitioners. In this respect, the study points to the need to rethink financial organizational models in line with the dynamics of the rapidly changing knowledge economy (Nonaka & Takeuchi, 2021).

2 Literature Review

The following literature outlines the financial organization of knowledge-based enterprises (STIs) operating in the knowledge economy, along the axes of capital structure, access to finance, investor relations, and risk management, along with the ways they differ from traditional models. Firstly, STIs' intangible investments, such as R&D and software, are more sensitive to external financing due to insufficient collateral and asymmetric information, reinforcing their tendency to turn to internal resources, equity, and hybrid instruments (Hall & Lerner, 2010). This finding is reinforced by empirical evidence pointing to the persistent nature of the “financing gap for intangible investments,” measured by European data (OECD, 2021). While the use of intellectual property (IP) as collateral is becoming increasingly widespread, measurement and valuation issues and regulatory capital requirements limit the scale of this channel, giving rise to alternative designs such as venture capital, corporate partnerships, and revenue-based financing during the scaling phase of STIs (OECD, 2021).

Investor relations (IR) literature has shown that strategic communication can indirectly reduce financing costs by increasing institutional investor following, analyst coverage, and market efficiency in low-visibility and young firms (Bushee & Miller, 2012). This effect is more pronounced in early-stage technology ventures through media coverage and stakeholder networking, and IR. It requires that STIs be designed not as a mere description but as an integrated capacity with management access and narrative architecture (Bushee & Miller, 2012).

In the Turkish context, ecosystem data suggests that financing conditions are resilient despite cyclical shocks, indicating a recovery in the number of deals and total volume in 2024 (while maintaining the seed-early stage weight); this increases the importance of a phased and source-diversified financing architecture for STIs (KPMG Turkey & 2025). On the other hand, while findings on the impact of intellectual capital (IC) on firm performance and value in Turkey are generally positive, they differ depending on the sector and measurement approach. This necessitates considering IC as a context-sensitive asset class embedded in financial organizational decisions (Atan & Tuncer, 2021). Consequently, the literature suggests that the financial organization of STIs differs from traditional models through (i) the appropriate instrument-governance match for intangible-intensive investments, (ii) the strategic design of investor relations, and (iii) the integration of IP/ IC into valuation and underwriting processes. This study aims to strengthen the theory-practice bridge by testing these divergences with qualitative cases in Türkiye.

3 Methodology

Methodology was designed with a qualitative research approach to in-depth examine the financial organizational strategies of knowledge-based enterprises. A multiple case study was chosen as the primary research method. Yin (2018) emphasizes that multiple case analysis is a

powerful method for testing theoretical propositions and generating new context-specific findings. In this context, three technology-focused knowledge-based enterprises operating in Turkey were selected using a purposive sampling method. Case selection was based on the following criteria: (i) operating within the dynamics of the knowledge economy, (ii) adopting a business model based on digitalization and innovation, and (iii) differing in terms of development stage and capital structure.

Three primary sources were used in the data collection process: (i) semi-structured interviews with business executives, (ii) publicly available company reports and investor information documents, and (iii) sectoral analysis reports and current media data. The interview form was designed and flexibly applied based on the dimensions of capital structure, resource management, investor relations, and risk management prominent in the literature. This allowed participants to express their own experiences in an authentic way (Kvale & Brinkmann, 2015).

The data obtained was analyzed using content analysis. Initially, inductive and deductive approaches were used in the coding process; in addition to preliminary codes derived from the literature, new themes emerging from field data were also incorporated into the analysis. Two researchers conducted independent coding throughout the coding process, increasing reliability, and discrepancies were resolved through discussion. Following case-based studies, the findings were integrated with comparative analysis, paving the way for a proposed model for the financial organization strategies of knowledge-based businesses.

4 Findings and Discussion

The financial organization strategies of the three knowledge-based enterprises examined within the scope of the research were evaluated within the framework of four basic dimensions: capital structure, resource management, investor relations and risk management.

4.1 Capital Structure

A common finding among the case companies is the predominance of equity and early-stage investment support. Due to their high concentration of intangible assets, accessing bank loans is challenging, leading startups to prioritize funding through venture capital, angel investors, and accelerator programs. This is consistent with Hall and Lerner's (2010) study, which emphasizes that the financing gap for knowledge-based businesses is particularly pronounced in the context of R&D investments.

Resource Management: It has been observed that businesses direct their financial resources towards reinvestment, R&D, and human capital development activities. This approach aligns with a perspective of long-term value creation rather than short-term profit maximization and reflects a strategic orientation centered on intellectual capital. Atan and Tuncer's (2021) findings demonstrating the positive contribution of intellectual capital to firm performance in Turkey support the research findings.

4.2 Investor Relations

To enhance investor confidence, exemplary businesses prioritize transparent reporting, regular briefings, and media visibility. This has been found to be critical for communicating not only financial performance but also a vision for future innovation. These findings align with Bushee and Miller's (2012) findings that investor relations broadens the investor base by increasing firm visibility.

4.3 Risk Management

The most significant risk factors for businesses focused on digitalization are market volatility, regulatory uncertainty, and rapid technological obsolescence. To manage these risks, businesses have been identified as developing diversified financing portfolios, actively utilizing public support programs, and engaging in strategic partnerships. This trend aligns with the findings of the OECD (2021) report, which emphasizes that knowledge-based businesses are turning to hybrid financial instruments for risk management.

Overall, the research demonstrates that the financial organizational strategies of knowledge-based businesses in Türkiye have evolved from traditional financing models to a more dynamic, flexible, and knowledge-driven structure. The findings are consistent with the theoretical literature and suggest that financial strategies need to be redesigned to ensure the sustainability of knowledge-based businesses in developing countries.

4 Conclusion and Recommendations

This study examines the financial organizational strategies of knowledge-based businesses operating within the dynamics of the knowledge economy and demonstrates how they differ from traditional financing models. The research findings indicate that the capital structures of these businesses generally rely on alternative financing sources such as equity, angel investment, and venture capital. Access to banking loans remains limited due to the concentration of intangible assets and the lack of collateral, leading businesses to turn to hybrid financial instruments and venture capital models. This finding aligns with the work of Hall and Lerner (2010), which highlights the financing gap in innovation-focused businesses.

In terms of resource management, knowledge-based businesses have been observed to prioritize R&D, human capital, and innovation activities, prioritizing long-term value creation. This approach aligns with the literature that considers intellectual capital a strategic resource (Atan&Tuncer, 2021). Allocating financial resources to knowledge generation and technological innovation, rather than directly to tangible assets, is emerging as a critical factor in achieving sustainable growth and competitive advantage.

Transparency in investor relations, regular information sharing, and communicating the innovation vision are among the common strategies of the companies studied. This is consistent with the findings of Bushee and Miller (2012) that investor relations increase firm visibility and investor confidence. In early-stage technology ventures in particular, investor confidence is established not only through financial reporting but also through strategic communication and corporate narrative development.

In the context of risk management, it has been determined that businesses face threats such as market volatility, regulatory changes, and technological obsolescence. In response, creating diversified financing portfolios, leveraging public support, and engaging in strategic partnerships are among the most prominent practices. The OECD's (2021) findings, which emphasize the shift towards hybrid financial instruments among knowledge-based businesses, also support these findings.

The findings of the study offer several contributions to both academic literature and practice. From an academic perspective, it has become clear that the financial organizational strategies of knowledge-based businesses are not limited to financial instrument selection but also require a holistic framework encompassing strategic management, investor relations, and risk management. From a practical perspective, several important recommendations have been developed, particularly for the entrepreneurial ecosystem in Türkiye:

- i. For Policymakers: To facilitate access to financing for knowledge-based businesses, it is important to develop regulations that utilize intellectual capital and intellectual property rights as collateral. Such policies can provide enterprises with more effective access to traditional credit markets.
- ii. For Investors: When evaluating the financial performance of knowledge-based enterprises, investors need to take into account not only classical financial indicators but also investments in innovation capacity, intellectual capital and human resources.
- iii. For Businesses: Increasing resource diversity in financial organization strategies, actively evaluating public support programs, and developing long-term investor relations strategies are considered critical for sustainable growth.

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iv. For Academic Studies: Future research could examine the comparative financial strategies of knowledge-based businesses across different sectors to develop more comprehensive models based on cross-country comparisons. Furthermore, longitudinal studies supported by quantitative data could more clearly demonstrate the impact of financial organizational strategies on sustainability.

As a result, the financial organizational strategies of knowledge-based businesses are being reshaped in line with the dynamics of the knowledge economy. These businesses are deviating from traditional capital-focused financing models and developing strategies that center on knowledge-based value creation, prioritize investor confidence, and manage risks through diversified tools. This orientation is critical for both the transformation of the Turkish economy and sustainable growth in a globally competitive environment.

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PRACTICAL EXPERIENCE AND ITS ACADEMIC STATUS IN ECONOMIC STUDIES

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Abstract: Practical experience represents an essential element in the development of students' professional competencies in the field of economics, ensuring the connection between theoretical knowledge and its application in real work contexts. The paper analyzes the academic status of the professional experience acquired by students during their employment, with a focus on European and national regulations that stipulate the conditions for its recognition as a non-auditory academic activity – “specialized practice.” The study examines the regulatory framework, documentation tools, and assessment methods of competencies, as well as the challenges related to standardization and formal recognition. The results highlight the discrepancies between educational policy intentions and their actual implementation in the university environment, while the conclusions emphasize the need for an integrated approach oriented towards digitalization and collaboration between universities and the business sector.

Keywords: practical experience, professional competencies, academic recognition, standardization, objective evaluation, formal knowledge.

JEL classification: I23, I20, M53.

Introduction

The training of specialists in the economic field requires a close correlation between theoretical preparation and practical experience. While theory provides students with the conceptual tools necessary to understand economic phenomena, practice enables them to apply this knowledge in solutions adapted to professional environments.

In a global context marked by accelerated changes and complex economic interdependencies, universities are called upon to combine traditional academic training with concrete opportunities for experiential learning. From this perspective, the role of higher education institutions is not limited to organizing internships but also includes the academic recognition of professional experience already acquired by some students. This process involves complex stages of identifying and documenting experience, assessing competencies, validating results, and issuing official certification, ultimately allowing the exemption from certain internships and their acknowledgment as a non-auditory academic activity – “specialized practice.”

Although the academic recognition of professional experience is practiced in universities with an economic profile, the regulation and organization of the process remain subjects of debate, especially regarding the methodology for correct identification and objective assessment of acquired competencies. The central issue lies in the absence of clear mechanisms for the standardization and equivalence of practical experience in relation to the formal academic pathway.

The purpose of this paper is to analyze European and national regulations regarding the recognition of practical experience and to highlight the challenges and perspectives for developing this dimension within economic education in the Republic of Moldova.

Methodology / Analytical Framework

The research is based on:

- a comparative analysis of European normative documents (EQF – European Qualifications Framework, ECTS – European Credit Transfer and Accumulation System, ESG – Standards and Guidelines for Quality Assurance in the European Higher Education Area, the EU Council Recommendation of 2012 on the validation of non-formal and informal learning) and national regulations (Education Code of the Republic of Moldova: no. 152 of July 17, 2014; Government Decision of the Republic of Moldova approving the National Qualifications Framework, no. 330 of 31.05.2023; Framework Regulation on internships in higher education, approved by the Ministry of Education Order no. 203 of 19.03.2014; university regulations of ASE, USM, UTM, ULIM concerning *practica de specialitate*);
- synthesis of the specialized literature on the integration of practical experience in economic education;
- examination of European best practices (Germany – the dual system; France – apprenticeship contracts) in comparison with the situation in the Republic of Moldova.

This approach allows for both a theoretical and normative foundation and the identification of implementation gaps within the national context.

Results and Discussion

The European Perspective. The results of the analysis of the European framework demonstrate that the recognition of professional practical experience is an integral part of the modernization process of higher education. The key documents developed by the European Union establish principles and instruments that ensure the integration of non-formal and informal learning into the academic pathway.

A first fundamental instrument is the European Qualifications Framework (EQF), which stipulates that all forms of learning—formal, non-formal, and informal—can be recognized if concrete outcomes can be demonstrated in terms of knowledge, skills, and competences (European Parliament and Council, 2008). Therefore, professional experience acquired outside the university may become part of a validated academic trajectory.

In addition, the European Credit Transfer and Accumulation System (ECTS) facilitates the equivalence of outcomes achieved in professional contexts with academic credits. This system, based on transparency and comparability, has become essential for student mobility and for the convergence of study programs within the European Higher Education Area (EHEA) (European Commission, 2015).

Another central document is the Standards and Guidelines for Quality Assurance (ESG), which require higher education institutions to create transparent mechanisms for the assessment and validation of non-formal and informal learning outcomes (ENQA, 2015). In this regard, the ESG place the recognition of professional practical experience within a quality assurance framework, ensuring that the process does not become purely formal, but instead meets rigorous standards.

The comparative analysis, however, shows that although these instruments are generally accepted, their practical implementation differs from one country to another. In states with a flexible university tradition, such as France (through the system *Validation des Acquis de l'Expérience* – VAE), the recognition of professional experience has reached an institutionalized and functional level (Ministère du Travail, 2019). In other countries, the process remains limited and often optional.

For the economic field, these developments have significant implications. Professional experience is recognized as an authentic source of competences—particularly in decision-making, market analysis, accounting, and financial management. Nevertheless, the diversity of professional

experiences generates methodological difficulties: it is challenging to establish uniform criteria for equivalence among different experiences, even when they all belong to the economic sphere.

Thus, at the European level, the results of the analysis reveal a fragile balance between the need to valorize professional experience and the academic rigor of the recognition process

Adaptation to the Context of the Republic of Moldova. The situation in the Republic of Moldova only partially reflects these European trends. From a normative standpoint, the Education Code of the Republic of Moldova no. 152/2014 enshrines the principle of recognizing learning outcomes acquired in non-formal and informal contexts (Parlamentul Republicii Moldova, 2014). At the same time, the National Qualifications Framework is harmonized with the EQF, which creates the necessary premises for equating professional experience with academic results (Guvernul Republicii Moldova, 2023).

However, the results of the analysis show that practical implementation remains limited. Universities have developed certain internal regulations regarding the recognition of prior studies and competences, but actual application is sporadic. In many cases, procedures are reduced to the acknowledgment of employment or professional training certificates, without a systematic evaluation of professional experience directly accumulated in the workplace.

In the field of higher economic education, this situation generates several difficulties:

normative fragmentation. The lack of unified procedures means that universities decide individually on the mode of recognition, which reduces comparability across institutions.

- *formalism of evaluation.* Professional experience is often equated solely on the basis of supporting documents (employment contracts, job descriptions), without an actual assessment of the competences acquired.

- *lack of involvement from the economic sector.* The validation process remains predominantly academic, without the systematic participation of employers or professional organizations.

On the other hand, there are also significant opportunities. National strategies on education development and European integration promote alignment with EHEA standards and with European practices for validating non-formal and informal learning (Guvernul Republicii Moldova, 2014). In addition, the activity of the National Agency for Quality Assurance in Education and Research (ANACEC) includes, among its objectives, the development of mechanisms for recognizing professional competences (ANACEC, 2022).

Therefore, the results indicate that the Republic of Moldova is in a transitional phase: the legal and institutional framework exists, but coherence in practical application is lacking. The discussions highlight that the economic field could become a privileged testing ground for recognition mechanisms, given the applied nature of the competences required by the labor market.

In conclusion, the academic recognition of professional experience in the Republic of Moldova should not be regarded as a mere procedural addition, but as a strategic element in the modernization of higher economic education. For this, it is necessary to establish a mixed institutional framework—universities, the business sector, and ANACEC—that ensures rigorous and relevant validation of competences acquired in professional environments.

Conclusions

The analysis carried out shows that the academic recognition of professional practical experience constitutes an indispensable process for the modernization of higher economic education. At the European level, the EQF, ECTS, and ESG instruments provide the necessary framework for validating learning outcomes acquired in non-formal and informal contexts, including professional ones. In the Republic of Moldova, although the legal framework has been harmonized with the European one, practical implementation remains fragmented and insufficiently structured. To avoid formalism and ensure academic prestige, recognition must be

based on rigorous evaluation mechanisms, carried out through the collaboration of universities, the business sector, and the relevant authorities.

Added Value

The contribution of this study lies in:

- highlighting the parallelism between European regulations and their limited application in the Republic of Moldova, with an emphasis on the economic field;
- providing a critical analysis of the risks and opportunities associated with the process of academic recognition of students' professional practical experience;
- emphasizing the necessity of a mixed institutional framework, including universities, the economic sector, and the relevant authorities, as a prerequisite for the credible validation of professional experience.

Thus, the article brings an integrated perspective on a phenomenon insufficiently explored in the local literature and offers practical guidelines for the development of educational policies.

Future Research Directions

This study was built on a documentary and comparative analysis. To deepen the research, several directions are required:

- empirical investigations through questionnaires and interviews with students, teaching staff, and employers, in order to identify perceptions and expectations regarding the recognition of professional experience;
- international comparative analyses between countries with advanced validation models (e.g., France, Germany) and the Republic of Moldova, in order to adopt best practices;
- study of the economic and social impact of introducing academic recognition mechanisms, in terms of professional insertion, mobility, and competitiveness on the labor market.

By exploring these directions, future research will be able to substantiate applicable recommendations for educational policies and university practice, contributing to the strengthening of the role of professional experience in the training of specialists in the economic field.

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THE BEHAVIOR OF TAXPAYERS BETWEEN RATIONALITY AND SOCIAL PSYCHOLOGY: COMPARATIVE ANALYSIS OF THE REPUBLIC OF MOLDOVA AND THE EUROPEAN UNION IN THE LIGHT OF THE BEHAVIORAL ECONOMY

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Abstract: The article analyzes the tax behavior of taxpayers in the Republic of Moldova (RM) compared to the member states of the European Union (EU), using the fundamental concepts of behavioral economics. The study examines the transition from the classical Homo Economicus model, focused on strict rationality and coercive mechanisms, to the taxpayer influenced by psychological and social factors, such as the perception of fairness, fiscal morality and trust in institutions. Based on data for the period 2020-2025, the developments regarding the share of tax revenues, the size of the informal economy, the degree of digitalization and the level of voluntary compliance are analyzed. The comparison with the experiences of Estonia, the Netherlands and Denmark shows that naked instruments, budget transparency and institutionalized cooperation can generate higher voluntary compliance, with reduced administrative costs. The conclusions of the article propose a set of applied public policies.

Keywords: fiscal behavior, behavioral economics, voluntary compliance, nudging, RM, European Union

JEL Classification: H26, D91, D03, H1, C83, H30

Introduction. The theoretical analysis of fiscal behavior has been based, for a long time, on the rational taxpayer model, conceptualized through the homo economicus paradigm, focused on maximizing personal utility by relating costs to potential benefits. This explanatory framework has oriented fiscal policies, predominantly, towards the application of rigorous controls and penalties. However, recent research reveals the limits of this exclusive model, especially in the absence of an approach that integrates the psychosocial dimensions of fiscal behavior. The justification for this scientific research lies in the need for a thorough understanding of the behavioral traits of taxpayers in the Republic of Moldova, in a context characterized by a high share of the shadow economy and a low level of trust in authorities. Unlike advanced European experiences, in which behavioral methods have already been institutionalized within fiscal policies, the Republic of Moldova remains a relevant case for a comparative analysis. In this regard, the research aims to: 1) clarify the theoretical foundations of behavioral economics applied to the tax field; 2) investigate the tax behavior of taxpayers in the Republic of Moldova; 3) evaluate European good practices in applying behavioral economics principles in tax policies; 4) carry out a comparison of the factors that influence tax compliance and 5) develop a set of specific public policy recommendations adapted to national realities.

1. Theoretical foundations and models of tax compliance

In the framework of traditional economic theory, the taxpayer is viewed as a rational agent – homo economicus – concerned with optimizing his own utility, by systematically comparing the potential benefits of non-compliance with tax obligations to the costs associated with detecting and sanctioning them. In this analytical framework, the tax compliance decision is influenced exclusively by external constraint mechanisms and the severity of regulations imposed by state authorities (PwC România, 2021).

However, contemporary literature indicates the insufficiency of this reductionist perspective in capturing the full behavioral complexity associated with the tax compliance process. Developments in the field of behavioral economics and contributions from social psychology have led to a significant expansion of the theoretical framework, bringing cognitive, emotional and socio-cultural factors to the forefront. These include the perception of the fairness of the tax system, the degree of trust given to public institutions or the pressure exerted by prevailing social norms (CECCAR Business Magazine, 2018; European Union, 2021). The results of empirical research confirm that taxpayers' willingness to voluntarily comply increases substantially when they perceive the tax regime as fair and transparent – even in the absence of a high probability of tax control (CECCAR Business Magazine, 2019; European Commission, 2021).

On this basis, a fundamental conceptual difference is outlined between the classical model of the taxpayer (European Commission, 2021; KPMG, 2018). This reconceptualization of the foundations of fiscal behavior marked a paradigm shift, reflected in a transition from fiscal-budgetary policies oriented exclusively on constraint, to integrative approaches, which include tools inspired by behavioral economics.

Thus, modern strategies for increasing fiscal compliance incorporate subtle interventions of the nudging type, measures to increase decisional transparency and participatory mechanisms designed to strengthen the relationship of trust between the taxpayer and the state (EY, 2018; European Parliament, 2021). These policies do not only aim at formal obedience, but also at cultivating a fiscal climate based on cooperation and civic responsibility.

The traditional model, based on the homo economicus figure, assumes that the individual acts exclusively rationally, choosing between compliance and evasion according to the anticipated net utility. In this context, tax behavior is treated as the result of a strategic calculation, in which the economic actor evaluates his options in terms of quantifiable risks and benefits (CECCAR Business Magazine, 2018). This approach has facilitated the development of mathematical and analytical models that attempt to formalize the taxpayer's decision as a binary choice between risk and compliance.

One of the most influential theoretical contributions to the analysis of tax behavior is the deterrence model developed by Allingham and Sandmo, which applies the homo economicus paradigm to the context of tax decision-making. This explanatory framework starts from the premise that the economic agent is fundamentally rational and determines his behavior by comparing the potential advantages of tax evasion with the risks and costs associated with it (Allingham, M. G. & Sandmo, A., 1972).

This model has dominated the economic literature for decades and has influenced the architecture of tax control systems in many countries; it is currently considered insufficient to capture the full complexity of taxpayer motivations. In particular, the deterrence model ignores the psychological and social dimensions of tax behavior, such as the perception of fairness, trust in authorities, or the internalization of ethical norms (European Commission, 2021). This reductionist view transforms the taxpayer into a simple risk calculator, without taking into account the cultural and institutional context that shapes tax behavior. Moreover, recent empirical evidence demonstrates that the voluntary compliance rate is, in many cases, significantly higher than could be anticipated by simply applying the cost-benefit formula. Even in situations where the probability of controls is low or sanctions are moderate, a significant proportion of taxpayers choose to comply (European Commission, 2021). These results suggest that behind tax decisions there are also factors such as civic loyalty, social pressure or the perception of legitimacy of the tax system, which requires the expansion of theoretical frameworks of analysis.

Thus, the evolution from the rational-classical paradigm to the behavioral one does not imply a total substitution, but rather an extension and refinement of the theoretical tools. Currently, modern approaches capitalize on the analytical foundations of the deterrent model, but

complement them with soft mechanisms for influencing behavior – such as nudging, strategic communication and institutional transparency – in order to strengthen voluntary compliance and trust in the tax system.

In the Republic of Moldova, the fiscal architecture has long been articulated around coercive mechanisms, placing the primary emphasis on controls, penalties and punitive instruments as the main means of deterring evasion. In the period 2000–2010, the strategic direction of the State Fiscal Service focused almost exclusively on intensifying inspections and applying sanctions, in line with the paradigm of compliance obtained through fear and institutional pressure. However, the effectiveness of these measures proved limited: tax revenues did not increase significantly, and the size of the informal economy remained one of the highest at regional level, constantly remaining above the 30% threshold of GDP (Deloitte România, 2020).

In the homo economicus hypothesis, a low probability of control should lead to low compliance. Contrary to this assumption, a significant part of Moldovan taxpayers continued to honor their tax obligations even in the absence of an immediate risk of sanction. This incongruence between theoretical predictions and actual behaviors indicates that variables such as internal fiscal morality, the influence of social norms, or a certain form of contextual trust in authorities may have a decisive weight in the motivation for compliance – going beyond the boundaries of traditional rationalist models.

Similar phenomena can be identified within the EU. Although anti-evasion strategies have long been inspired by the classical model, with a focus on multiplying inspections and intensifying sanctions, the results have often been below expectations. In countries such as Italy or Greece, punitive approaches have been the central pillar of tax policies, despite which the underground economy has remained persistently high (European Parliament, 2021-2022; CECCAR Business Magazine, 2021). These findings suggest that coercive measures, although necessary to a certain extent, cannot automatically generate substantive behavioral changes. For real efficiency, it is necessary to integrate policies that take into account the intrinsic motivations of taxpayers, social dynamics and the cultural context of reporting to authority and legality.

A striking contrast between tax compliance models is provided by the Nordic countries – Denmark, Sweden and Finland – where, despite a low probability of tax audits, the degree of voluntary compliance is among the highest in the European Union. From the perspective of classical rationalist logic, a low frequency of inspections should favor evasive behaviors. In reality, however, such tendencies are marginal in these countries. The explanation lies in the specifics of the relationship between citizens and institutions: a high level of trust in public administration, a deep perception of tax fairness and an internalization of social norms favorable to tax payment. All of this validates the importance of psychosocial factors in shaping tax behavior and goes beyond the explanatory limits of the utilitarian paradigm (KPMG, 2018).

These observations support the idea that the classical homo economicus model, although still relevant for justifying coercive policies, fails to comprehensively explain the mechanisms of tax compliance observable in practice. Both in the Republic of Moldova and in many EU member states, taxpayer behavior is influenced by a multitude of factors that transcend strict rationality. Tax morality, social capital, the degree of trust in state institutions, the perception of redistributive fairness, and the pressure of social norms are essential dimensions that determine the decision to comply with tax obligations or not. Therefore, the design of effective tax policies requires an integrative analytical framework, in which coercive approaches are balanced with tools inspired by behavioral economics and social psychology (CECCAR Business Magazine, 2019; European Commission, 2021).

2. The influence of psychological and social factors on taxpayer behavior

In recent decades, the literature has demonstrated that tax decisions cannot be reduced to simple rational cost-benefit calculations. Taxpayer behavior is profoundly influenced by

psychological and social determinants, which explain the differences in compliance between states that apply similar sanctions and control regimes. These factors define the “psychological-social” taxpayer, whose behavior goes beyond the boundaries of classical rationality and falls within the paradigm of behavioral economics (CECCAR Business Magazine, 2018; European Union, 2021)

A first determinant is tax morality, understood as the internal motivation of individuals to pay taxes even in the absence of external constraints. Studies have shown that countries with a high level of tax morality experience a low level of tax evasion, while where the perception of corruption is high, voluntary compliance decreases significantly (European Commission, 2021). In the Republic of Moldova, the low level of trust in institutions and the persistent perception of corruption negatively affect tax morale, explaining why evasion and the informal economy remain at high levels (Deloitte România, 2020; OECD). In contrast, in the Nordic countries, where tax morality is strengthened by a transparent institutional framework and efficient public services, voluntary compliance remains high, even in conditions of a low risk of sanction (KPMG, 2018).

Another key factor is the perception of tax fairness, which refers to both the ratio of income to tax burden (vertical fairness) and the equal treatment of taxpayers in similar situations (horizontal fairness). When taxes are perceived as disproportionate or public services as insufficient, willingness to comply decreases (CECCAR Business Magazine, 2019). In the Republic of Moldova, dissatisfaction with the quality of infrastructure and public services fuels the perception of an unjustified tax burden, which leads many taxpayers to adopt strategies of selective compliance or partial avoidance of obligations (Deloitte România, 2020). In contrast, in Germany and the Netherlands, where tax systems are perceived as fair and transparent, voluntary compliance is significantly higher (CECCAR Business Magazine, 2021).

Trust in institutions is another major determinant of tax behavior. The level of compliance is directly proportional to the degree of taxpayers’ trust in the authorities and in the state’s ability to use collected resources efficiently (European Parliament, 2021). In the Republic of Moldova, surveys and international reports confirm the existence of a deficit of trust in public administration, which erodes tax morale and accentuates the preference for the informal economy (OECD). In contrast, countries such as Estonia and Denmark have demonstrated that investments in digitalization and citizen-oriented tax services increase trust and strengthen voluntary compliance (Council of the European Union, 2021; KPMG, 2018).

Last but not least, social norms and social capital play a key role in shaping tax behavior. Taxpayers frequently align their behavior with what they perceive to be the general rule in their community (European Commission, 2021). In Moldova, where tax avoidance practices are widespread, social norms reinforce the tendency towards evasion and maintain a “vicious circle” of non-compliance. In contrast, in the European Union, nudging campaigns have been developed to capitalize on positive social norms. The experience of Great Britain and the Netherlands shows that simply informing taxpayers that “the majority of citizens pay their taxes on time” has led to a significant increase in compliance (EY, 2018; European Parliament, 2021).

Thus, social psychology and behavioral economics offer a much more nuanced explanatory framework for understanding tax behavior than the classical paradigm based on strict rationality. Psychosocial factors – tax morality, perception of fairness, level of trust in institutions and influence of social norms – emerge as essential determinants of voluntary compliance. Modern tax policies cannot remain anchored exclusively in the coercive logic of controls and sanctions, but must integrate these dimensions to build a sustainable tax system, capable of reducing evasion and strengthening the public revenue base (CECCAR Business Magazine, 2018; European Commission, 2021; KPMG, 2018).

The analysis of tax behavior is particularly relevant in the Republic of Moldova, where voluntary compliance is limited and the informal economy maintains high proportions, at around 30% of GDP (Deloitte România, 2020). This situation reflects not only the structural difficulties

of the economy, but also a major deficit of trust in public institutions, which discourages the correct payment of taxes. Although important reforms have been initiated in the last decade – such as the partial digitalization of the tax administration, the expansion of electronic services and the simplification of declaration procedures – these measures have had a limited impact on taxpayers' mentalities and behavior (PwC România, 2021). The persistence of the perception of corruption, the low quality of public services and the lack of effective communication from the state have continued to erode tax morality, stimulating the preference for informal solutions and the avoidance of legal obligations (OECD).

The study of taxpayers' tax behavior is of particular importance for the Republic of Moldova, where the level of voluntary compliance remains low and the informal economy continues to represent a considerable share of GDP (Deloitte România, 2020). Although reforms aimed at modernizing tax administration have been promoted in recent years – including the digitalization of some processes and the simplification of interaction between taxpayers and the state – the persistence of evasion and the lack of trust in public institutions confirm that traditional control and sanctioning instruments are not sufficient to ensure efficient and sustainable collection (PwC România, 2021; OECD).

In contrast, in the European Union there is a growing trend towards integrating behavioural economics tools into tax policies. Member States have experimented with and implemented various tax nudging mechanisms, confidence-building campaigns and transparency initiatives aimed at stimulating tax morality and reducing reliance on enforcement inspections (EY, 2018; European Parliament, 2021; KPMG, 2018). The results of these experiments show that psychological and social factors (CECCAR Business Magazine, 2019; European Commission, 2021).

3. Behavioral economics and its relevance for the analysis of tax behavior

Behavioral economics emerged as a critical response to the limitations of classical homo economicus models, emphasizing that real economic decisions are not determined exclusively by perfect rationality, but also by cognitive, emotional, and social factors. Applied to the field of taxation, this approach explains why taxpayers sometimes choose to comply even when strictly rational logic would suggest otherwise.

A first fundamental concept is that of heuristics, defined as simplified decision rules used by individuals under conditions of uncertainty and incomplete information. In tax matters, taxpayers do not always resort to a detailed rational calculation of the costs and benefits associated with compliance or evasion, but prefer to rely on intuitive rules or previous experiences. Such rules can take the form of generalized beliefs, such as “I pay taxes because everyone does” or “the state will discover the irregularities anyway”, which leads to simplified decisions, but not always rational in the classical sense (CECCAR Business Magazine, 2018; European Union, 2021).

In the Republic of Moldova, the use of heuristics is evident in several situations. Many taxpayers base their tax behavior on the social conformity heuristic, following the example of their immediate environment. For example, in rural communities or in the agricultural sector, many taxpayers choose to declare only part of their income, based on the empirical rule “the state doesn't check in the villages anyway”, which reflects a decision based on local experience, not on a rigorous analysis of the control risk. At the same time, the practice of reporting only when “everyone in the community reports” illustrates the dependence on intuitive norms. At the same time, there are also heuristics based on fear of sanction, where taxpayers prefer to pay taxes even when the probability of control is low, based on the simple assumption that taxation is inevitable. This ambivalence is reflected in the data of the State Tax Service: despite a low level of control probability, a significant proportion of economic agents pay their taxes on time (Deloitte România, 2020).

Comparable situations can also be observed in the European Union, where the use of heuristics influences tax compliance in various ways. For example, in Germany and the Netherlands, studies have shown that simplifying tax forms has led to a significant reduction in unintentional errors, with taxpayers relying on practical rules such as “if the form is clear, I don’t risk mistakes” rather than on complex calculations (European Parliament, 2021-2022; CECCAR Business Magazine, 2021). This confirms that heuristics, although they reduce the complexity of the decision-making process, can generate both positive effects on compliance, when supported by appropriate policies, and negative effects, when the institutional context is fragile or marked by informal practices. A second important element in the analysis of tax behavior is cognitive biases, understood as systematic deviations from strict rationality, which lead taxpayers to adopt predictable, but not always efficient or compliant, decisions. Among the most relevant biases identified in the tax field are excessive optimism, the anchoring effect and the status quo bias.

Excessive optimism occurs when taxpayers underestimate the risk of being subject to a tax audit and, as a result, more easily assume behaviors to avoid obligations. In the RM, this phenomenon is particularly visible among small traders and self-employed individuals, who believe that the small size of their business makes them invisible to the authorities. In reality, after 2020, the introduction of digitally targeted controls significantly increased the probability of discovering irregularities, but taxpayers’ perception remained different from reality, thus perpetuating practices of income undeclaration and the expansion of the informal economy (Deloitte România, 2020).

The anchoring effect occurs when tax decisions are influenced by previous experiences or generalized perceptions of tax levels. In the Republic of Moldova, many taxpayers relate to the level of taxes levied in the past or to comparisons with countries in the region. For example, the introduction of new social contribution rates or an increase in income taxes is often met with resistance, not so much because of the objective financial impact, but because the taxpayer’s decision is anchored in a previously consolidated perception that the tax burden is excessive.

The status quo bias expresses the tendency of taxpayers to repeat previous behaviors, even when circumstances have changed. In the Republic of Moldova, this bias is reflected in the continuation of tax avoidance practices, especially in situations where they have not been previously sanctioned. A company that has operated for several years with undeclared employees will be less willing to change its behavior, even if the control risk has increased or if modern digitalization measures, such as electronic invoicing, have been implemented. Similar phenomena are also visible in the European Union: in Italy and Greece, taxpayers continue to manifest the status quo bias, maintaining tax avoidance practices based on past experiences, even if the sanction regime has tightened considerably in recent years (CECCAR Business Magazine, 2021; European Commission, 2021).

These examples confirm that cognitive biases contribute to the perpetuation of inefficient tax behaviors and show that simply strengthening coercive mechanisms is not enough to correct these deviations. For RM, an effective approach involves integrating these cognitive limits into tax policies, through clear information campaigns on the real probability of controls, transparent explanation of legislative changes and the creation of “defaults” favorable to compliance by digitalizing procedures. Only in this way can the impact of biases on tax compliance be reduced and fiscal discipline be strengthened in the long term.

Another essential analytical tool is nudging. Fiscal nudging comes from the nudging theory formulated by Thaler and Sunstein (2008) within the framework of behavioral economics and designates “gentle nudges”, i.e. subtle public policy interventions aimed at guiding taxpayers’ behavior in the desired direction, without resorting to legal constraints or explicit sanctions.

In the tax field, these interventions are implemented through various mechanisms that facilitate voluntary compliance. A classic example is the use of social messages, such as those

applied in the UK, where taxpayers were sent letters containing the information that “nine out of ten citizens in your area pay their taxes on time”, which led to a significant increase in compliance.

In the RM, fiscal nudging could be applied through a series of interventions adapted to the local specifics, designed to stimulate voluntary compliance and reduce exclusive dependence on controls and sanctions. A first direction consists of the use of social messages and comparisons with the “majority”, through which the State Tax Service could send notifications that highlight the predominant behavior of taxpayers. For example, a message such as “80% of taxpayers in your locality have already paid their taxes on time” would activate the pressure of social norms, causing individuals to conform to collective behavior.

Another intervention aims to send sequential notifications via SMS, email or mobile applications. These could be scheduled before the payment deadline, containing messages such as “You have 5 days left to pay your income tax. Paying on time avoids penalties” or “Today is the last day to pay your tax. Over 70% of taxpayers have already paid”. Such notifications help reduce procrastination and strengthen tax discipline. At the same time, pre-filling and simplifying forms could play a key role, especially for employees, where declarations would be automatically generated based on data existing in the tax system, with the taxpayer only having to confirm or correct the information. This measure reduces the psychological and time cost of compliance and reduces administrative errors.

In addition, the use of friendly and visual language in communicating with taxpayers can contribute to strengthening the perception of fairness. Instead of technical formulations and exclusive references to articles of law, clear and suggestive messages can be used, such as: “Your taxes finance schools, hospitals and roads. Your contribution means better services for your community”, which increases the social relevance of taxes and fiscal legitimacy. Another valuable tool is personalized feedback, through which taxpayers could receive on the SFS electronic platform messages such as “Congratulations! You have paid on time for the last 3 years. Continue to contribute to the development of the community.” This type of positive recognition strengthens fiscal morality and creates a symbolic link between the taxpayer and the common good.

Finally, direct visibility of the destination of public money would transform taxes from abstract obligations into tangible contributions. For example, after making an online payment, the taxpayer could receive the message: “With your payment of 1,500 lei, the state provides 2 days of food for schoolchildren or 10 medical consultations.” Such an approach personalizes the fiscal impact and strengthens the sense of belonging to the community.

By applying these tools, fiscal nudging can become a strategic component of fiscal reform in the Republic of Moldova, capable of strengthening voluntary compliance through psychological and social mechanisms, without resorting exclusively to coercion.

A special role in explaining tax behavior is played by loss aversion, a concept derived from the prospect theory formulated by Kahneman and Tversky, according to which individuals feel losses more intensely than equivalent gains. In the tax field, this principle translates into the fact that sanctions and penalties are perceived much more strongly than benefits or reductions, which explains why even moderate punishments can generate disproportionate effects on compliance (CECCAR Business Magazine, 2018).

In the Republic of Moldova, loss aversion is evident in several situations. Fines for late filing or penalties for failure to pay taxes on time are perceived as direct and immediate losses, having a stronger impact on tax behavior than offering symbolic incentives, such as discounts for early payment. Reports from the State Tax Service show that the introduction of fixed penalties for late filings has led to an increase in the share of timely filings, especially among small and medium-sized enterprises, where financial resources are limited (Deloitte România, 2020). An illustrative example is that of fines imposed for failure to use cash and control equipment (CCE) in small

trade: although the value of the penalties was relatively modest, the fear of loss generated a much stronger psychological effect than the potential tax benefits granted for compliance.

The phenomenon is also confirmed at the European level. In France, the introduction of moderate penalties for late payment of VAT led to a significant increase in compliance, demonstrating that the perception of loss has a more mobilizing effect than the promise of discounts or incentives for early payment (CECCAR Business Magazine, 2019; CECCAR Business Magazine, 2018).

However, this approach is not without risks. In the RM, excessive emphasis on sanctions can generate frustration and resentment towards the tax administration, diminishing trust and tax morale. Therefore, the use of loss aversion as a tax policy instrument needs to be balanced: on the one hand, clear and proportionate sanctions stimulate compliance, but on the other hand they need to be complemented by transparency measures, tax education and positive recognition mechanisms, to prevent the system from becoming exclusively coercive.

Last but not least, the fairness effect is a central determinant of tax behavior and one of the most important factors influencing voluntary compliance. Taxpayers are significantly more likely to comply with their obligations when they perceive the tax system as fair and the resources collected as being used transparently and efficiently. In the absence of this perception, even high-performing tax administrations can experience high levels of evasion (European Commission, 2021).

In the Republic of Moldova, the equity effect is visible through the tension between the level of the tax burden and the quality of public services provided. Many taxpayers believe that the taxes paid are not reflected in quality infrastructure, education or health, which erodes the motivation to comply. Recent surveys indicate a constant dissatisfaction with insufficient investment in roads and hospitals, and the perception of corruption fuels the idea that budgetary resources are managed inefficiently (Deloitte România, 2020; OECD). This perception of inequity stimulates evasion and justifies, at a social level, the non-payment of tax obligations in full. As a result, even taxpayers willing to comply with the rules often choose selective compliance or partial avoidance of obligations, citing a lack of reciprocity on the part of the state.

In contrast, European experience shows that where budget transparency is high and taxpayers perceive a direct link between taxes and the quality of public services, voluntary compliance increases significantly. Countries such as Germany and the Netherlands confirm that perceived fairness and clear communication of the destination of taxes strengthen tax morale and reduce dependence on coercive mechanisms (CECCAR Business Magazine, 2021). Moreover, in Nordic countries such as Sweden and Denmark, transparency of public spending and high quality of services provided to citizens determine a very high degree of compliance, even in conditions of high tax rates (Council of the European Union, 2021; KPMG, 2018).

These contrasts highlight the fact that the perception of fairness not only encourages voluntary compliance, but also contributes to the legitimacy of the tax system as a whole, being an essential element for reducing evasion and sustainably consolidating public revenues.

The analysis of tax behavior through the lens of behavioral economics demonstrates that taxpayers' decisions in the Republic of Moldova cannot be explained exclusively by strict rationality, but are shaped by a combination of cognitive, emotional and social factors. The five fundamental concepts – heuristics, cognitive biases, nudging, loss aversion and the fairness effect – provide a complex analytical framework for understanding the phenomenon.

Overall, the integration of these five concepts into the tax policies of the Republic of Moldova would allow overcoming the limits of the classical approach, focused on sanctions and controls.

The integration and valorization of these concepts in tax analysis allows overcoming the limits of the rationalist model and provides a more realistic understanding of taxpayers'

motivations and can contribute to reducing the informal economy and sustainably increasing voluntary compliance.

4. Tax compliance in the Republic of Moldova: realities, determinants and recent trends

In the context of economic integration and gradual alignment with EU standards, a comparative analysis of the level of tax compliance between the Republic of Moldova and the EU member states becomes not only relevant, but also essential for the formulation of efficient and sustainable tax policies. Such an approach allows highlighting the existing structural and institutional gaps, while providing a solid empirical basis for regulatory and administrative interventions.

Beyond the structural dimension, the comparison with EU Member States allows for an in-depth exploration of the psychological, cultural and social factors that influence taxpayers' tax behavior. Last but not least, this approach contributes to assessing the degree of fiscal and institutional convergence of the Republic of Moldova with European standards, providing relevant reference points for reform and modernization policies. Successful models within the EU can be adapted to the national context, taking into account the local economic, administrative and cultural specificities, and the lessons learned can guide the process of strengthening fiscal capacity in a gradual but coherent manner.

The analysis of the situation at the national level (Table 1) allows for the identification of the real degree of voluntary compliance, the factors that fuel the informal economy, the perceptions and attitudes of taxpayers towards the tax system, as well as the level of digitalization and efficiency of the tax administration.

Only on the basis of such a deep understanding of the domestic fiscal environment can one legitimately and relevantly proceed to explore the differences and similarities with the European context. Thus, the comparative analysis becomes a natural extension of the research and not a simple juxtaposition of statistics, allowing the formulation of applicable recommendations adapted to the specifics of the Republic of Moldova.

Based on the data presented in Table 1, several key trends can be highlighted regarding the dynamics of tax compliance and the informal economy in the Republic of Moldova in the period 2020–2025.

**Table 1: Evolution of tax compliance and the informal economy
in the Republic of Moldova during the period 2020-2025 compared
to the EU average (2023)**

Indicator	2020	2021	2022	2023	2024	2025	EU average (2023)
Tax revenues (% of GDP)	25,8%	26,4%	27,1%	27,6%	28,1%	28,5%	41%
Size of the informal economy (% of GDP)	34%	33%	32%	31%	30%	29%	16%
Trust in institutions ratio (CPI score)	34/100	36/100	39/100	41/100	42/100	43/100	64/100
Share of online tax returns	45%	52%	57%	60%	63%	65%	95%
Users of the e-Invoice platform	9.000	15.000	22.000	30.000	35.000	40.000	almost universal

Source: developed by the author based on Ministerul Finanțelor (2020-2024), Serviciul Fiscal de Stat (2020-2024), Biroul Național de Statistică (2021-2024) and OECD (2023)

Voluntary compliance of taxpayers remains at a modest level, which reflects the persistence of a significant informal economy. Estimates by the World Bank and the Ministry of Economy show that, in 2022, the share of the underground economy was between 30 and 32% of GDP — one of the highest values in Eastern Europe. In contrast, the European Union average is only 15–

17% of GDP, confirming a much more robust institutional capacity for fiscal integration of economic activities (European Parliament, 2021-2022; Deloitte România, 2020).

In terms of tax collection, the gaps are equally pronounced. The Republic of Moldova annually mobilizes budget revenues equivalent to 27–28% of GDP, significantly below the EU average, which exceeds 40% of GDP. This difference reveals structural weaknesses in tax administration and low efficiency in the process of mobilizing public resources, although progress has been made in the digitalization of declaration and reporting processes. The Moldovan informal economy is supported mainly by undeclared activities in agriculture, services and trade, generating annual budget losses estimated at 10–12% of GDP. According to the State Fiscal Service, over 40% of small and medium-sized enterprises presented, in 2021, deviations in declaring income, which highlights the structural vulnerability of this sector. By comparison, in EU member states, where digitalization and interconnection of tax databases are widely implemented, the compliance rate of SMEs frequently exceeds 80%, thanks to automated verification and reporting systems.

A determining factor of the low level of voluntary compliance is the limited trust of taxpayers in public institutions. According to the Corruption Perceptions Index (CPI) developed by Transparency International, the Republic of Moldova obtained a score of 42 out of 100 in 2024, which indicates a negative perception of institutional integrity and efficiency. The European Union average is 64/100, and the Nordic countries consistently exceed 80/100, which also explains the major differences in the level of tax compliance. The specialized literature confirms the existence of a direct correlation between trust in governance and tax behavior: in states where public authorities are perceived as legitimate, fair and transparent, voluntary compliance tends to increase and evasion to decrease significantly.

In addition to the institutional dimension, psychological and cultural determinants also contribute significantly. A survey conducted by the State Tax Service in 2023 revealed that over 55% of Moldovan taxpayers consider the tax burden to be excessive in relation to the income obtained, and 48% express distrust in the use of public funds. These perceptions fuel the effect of fiscal inequity and reinforce the cognitive bias of the “status quo” type, which, together, generates an increased degree of social tolerance towards the informal economy. Despite these systemic and psychological constraints, the period 2018–2023 was marked by relevant efforts to modernize the administration and digitize the taxpayer-state relationship. Thus, the number of users of the SIA e-Factura platform increased from approximately 6,000 to over 30,000 economic agents, indicating a positive trend towards digitization. However, the degree of effective use of electronic services remains limited: in 2023, only about 60% of tax returns were submitted online, compared to over 95% in most EU member states.

In conclusion, the statistical data highlight the major gaps separating the Republic of Moldova from advanced European tax practices. The low level of voluntary compliance, the scale of the informal economy, the fragile trust in institutions, as well as the low degree of use of digital platforms outline a problematic tax environment, in which classic coercive instruments are becoming increasingly ineffective. Without strengthening "tax morale" and the perception of fairness, administrative modernization risks not achieving its strategic objectives, and reform efforts must be complemented by behavioral incentive policies and interventions aimed at rebuilding taxpayers' trust in the tax contract.

5. Applied comparison: the practice of Estonia, the Netherlands and Denmark for increasing tax compliance in the Republic of Moldova

The effective application of modern tax policies requires a contextual reporting to international good practices. In this regard, the comparative analysis of the experience of advanced European states such as Estonia, the Netherlands and Denmark provides valuable benchmarks for the Republic of Moldova, both from an administrative and behavioral perspective.

Estonia illustrates a model of integral tax digitalization, where the X-Road infrastructure facilitates the interoperability of registers and allows for the automatic pre-filling of tax returns. This digital framework substantially reduces administrative costs and maximizes voluntary compliance, relying on simplicity and speed. In comparison, the Republic of Moldova is at an intermediate stage: although it has launched tools such as e-Invoice and is exploring the implementation of SAF-T, their integration is still fragmented, and the lack of a single tax window with centralized authentication limits accessibility. Replicating the Estonian model would require not only technological investments, but also a procedural simplification strategy, accompanied by intelligent pre-filling of returns, which would reduce cognitive barriers and stimulate compliance through status quo effects.

The Dutch model emphasizes trust-based compliance, based on transparency and predictability, in which taxpayers can sign ex-ante agreements on tax treatments. The result is reduced litigation and strengthened fiscal stability. For the Republic of Moldova, where the relationship between taxpayer and tax administration is often perceived as adversarial, such a system could be introduced gradually, through pilot programs for large taxpayers and SMEs with a risk profile. In parallel, the development of public tax position guides could increase trust and reduce uncertainties. From a behavioral perspective, this transition would contribute to strengthening tax morality, by increasing the perception of fairness and strengthening institutional trust capital.

At the same time, Denmark highlights the importance of behavioral interventions integrated into the digital infrastructure, using nudging messages and budget transparency. Personalized notifications, comparative messages (“most taxpayers pay on time”) and public pages that visually show the destination of taxes contribute to aligning behavior with social norms. RM could capitalize on these tools by implementing automatic notifications via SMS or email, integrating quick payment options and developing “where the money goes” modules in the tax portal. Thus, compliance would be stimulated not by coercion, but by appealing to social norms and loss aversion, supported by moderate but consistently applied sanctions.

Overall, the experiences of Estonia, the Netherlands and Denmark demonstrate that the performance of tax collection does not depend exclusively on the severity of sanctions, but on the quality of the interaction between the state and the taxpayer. For the Republic of Moldova, adapting these models requires careful contextualization: expanding digitalization through interconnected tools, strengthening the relationship of trust through institutional piloting and integrating subtle behavioral mechanisms. Only through this synergistic approach can tax compliance be transformed from an obligation perceived as burdensome into a form of assumed civic participation.

Conclusions

The analysis carried out in this study demonstrates that an exclusively coercive approach, based on the classical model of economic rationality and the intensification of fiscal controls, is not sufficient to explain and, especially, to correct the fiscal behavior of taxpayers in the Republic of Moldova. Despite some progress in the digitalization of tax administration and the expansion of the tax base, empirical data indicate the maintenance of a low degree of voluntary compliance, an informal economy of approximately 30% of GDP and a level of trust in institutions considerably below the European (Deloitte România, 2020; OECD).

Integrating the theoretical and analytical tools of behavioral economics into tax research provides a more nuanced and realistic framework for taxpayer decision-making. Psychosocial factors – in particular trust in institutions, perceptions of tax fairness and internalized social norms – play a central role in shaping compliance, as evidenced by the experiences of advanced countries such as Estonia, the Netherlands and Denmark. These countries have demonstrated that through a smart combination of full digitalization, behavioral nudging interventions and tax transparency

policies, measurable results in increasing voluntary compliance can be achieved, with reduced administrative costs and sustainable long-term effects (EY, 2018; Council of the European Union, 2021; KPMG, 2018).

Based on these findings, it becomes evident that a hybrid tax compliance model needs to be implemented in the Republic of Moldova, which would balance the coercive dimension with behavioral and institutional interventions. Such an approach must start, first of all, from strengthening fiscal and institutional transparency. The periodic publication of visual, interactive and easy-to-understand reports that clearly explain the destination of taxes and the social benefits of taxpayers can significantly contribute to increasing the perception of fairness and strengthening trust in the tax system.

Secondly, it is essential to institutionalize tax cooperation, by developing a transparent partnership between the tax administration and taxpayers, especially large ones and small and medium-sized enterprises with moderate risk. The implementation of ex-ante compliance agreements and horizontal monitoring mechanisms would reduce litigation and strengthen a tax climate based on predictability and accountability.

Another strategic direction is the application of nudging techniques and behavioral communication, by sending personalized social messages, using sequential notifications before the due date and optimizing the design of digital interfaces. These subtle but effective interventions can stimulate voluntary compliance, with a low administrative cost and measurable effects on tax behavior.

Also, the full digitalization of tax processes is an essential condition for increasing administrative efficiency. The universalization of electronic invoicing, the automatic pre-filling of tax returns (PIT and VAT) and the interconnection of institutional registers in a single tax window can significantly reduce errors, compliance costs and tax avoidance opportunities.

Finally, reforming the sanctioning framework should shift fiscal coercion from a punitive logic to an educational and predictable one. Replacing severe, but rarely applied, sanctions with moderate, proportionate and certain penalties based on risk analytics could transform coercion into a tool for correction and prevention, not just punishment.

By implementing these directions, the Republic of Moldova could evolve from a fiscal system centered on fear and control to one based on trust, transparency and cooperation, thus strengthening the sustainability of public finances and approaching European standards of fiscal governance.

The gradual and coherent implementation of this integrated package of policies could allow the Republic of Moldova to achieve clear strategic objectives by 2030: increasing tax revenues to over 30% of GDP, reducing the share of the informal economy to 25–26%, and improving trust in state institutions. At the same time, strengthening tax morale would ensure a sustainable basis for fiscal stability and inclusive economic development, bringing the country closer to EU functional standards.

In conclusion, this study emphasizes that the future of tax administration in the Republic of Moldova depends on the ability of the authorities to overcome the exclusively sanctioning paradigm and build a genuine partnership relationship with the taxpayer. Only through an integrated and evidence-based approach, which combines economic rationality with an understanding of the psychological and social dimensions of compliance, can a fair, efficient and resilient tax system be founded in the face of current and future structural challenges.

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KNOWLEDGE ECONOMY AND FINANCIAL RISKS IN BUDGETARY AND FISCAL RELATIONS

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Abstract: This article examines the ways in which financial risks in budgetary and fiscal relations are managed within the framework of the knowledge economy. It draws on the comparative experiences of the Republic of Moldova, the European Union, and selected international practices, highlighting both convergences and divergences in their approaches. The analysis indicates that, although all actors acknowledge the growing importance of intellectual capital, the mechanisms used to identify, assess, and mitigate risks differ substantially. The European Union provides an example of a more integrated and coordinated model, while Moldova continues to face challenges related to institutional capacity and limited investment in research and development. These findings suggest that Moldova could benefit from adopting elements of international best practice, particularly transparent risk assessment frameworks and innovative financing instruments, in order to enhance fiscal sustainability and advance the transition toward a knowledge-based economy. The article concludes by formulating practical recommendations for policy makers, with a focus on strengthening risk management and aligning fiscal policy more closely with the demands of a knowledge-driven world.

Keywords: knowledge economy, fiscal risks, budgetary relations, public finance sustainability, risk management

JEL Classification: H62, H30, O30, O38

INTRODUCTION

The knowledge economy is increasingly emerging as a fundamental direction in the global economic transformations of recent decades. The shift from an industrial model to one grounded in knowledge and digitalization entails not only deep structural transformations within national economies, but also a fundamental reconsideration of the way fiscal and budgetary policies are formulated and put into practice. Within this context, the sustainability of public finances can no longer be viewed exclusively through the lens of conventional budgetary balances. Instead, it rests increasingly on the institutional ability to anticipate and manage financial risks in a proactive and effective manner. Such risks are inherently complex, stemming not only from internal dimensions—like the efficiency of revenue collection and the rigor of budgetary discipline—but also from external pressures linked to international economic integration, market volatility, and the accelerating rhythm of technological change.

Unlike the traditional resource-driven model, the knowledge economy is anchored in intellectual capital, scientific inquiry, and technological innovation. This shift underscores the

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strategic value of steady investment in human capital and research and development, while at the same time adding new layers of uncertainty for fiscal frameworks. The growing need for funding innovation programs, the substantial costs of digital infrastructure, and the instability of tax revenues shaped by global market dynamics emerge as key factors with direct consequences for the sustainability and resilience of public finances.

For the Republic of Moldova, these challenges are particularly acute. The country is undergoing a stage of institutional transformation, defined by severe fiscal constraints and a pressing requirement for long-term structural investments. Limited funding for scientific research, insufficient capacity to capitalize on innovation, and a persistent reliance on external financing amplify the vulnerabilities of the budgetary and fiscal system. At the same time, evidence from European and international practices demonstrates that the adoption of enhanced risk assessment and monitoring instruments, transparent resource allocation mechanisms, and well-coordinated institutional frameworks can strengthen financial risk management within budgetary and fiscal relations in the context of the knowledge economy.

The comparative analysis of national and international experience makes it possible to identify the specific features of financial risk management in budgetary and fiscal relations within the knowledge economy, thereby underscoring the relevance and timeliness of this research.

The **aim** of this study is to explore the specific features of financial risk management in budgetary and fiscal relations within the knowledge economy, through a comparative analysis of the practices of the Republic of Moldova, the European Union, and international experience. Furthermore, it seeks to emphasize the opportunities for adapting international approaches in order to strengthen the sustainability of public finances in the Republic of Moldova.

Research Methodology. This research employs the method of comparative analysis, which makes it possible to identify both the similarities and the differences between the Republic of Moldova, the European Union, and international practice in the field of financial risk management. A systemic approach is likewise applied to capture the ways in which financial risks manifest within budgetary and fiscal relations. In addition, documentary analysis of statistical data and the regulatory framework complements the theoretical perspective, offering a clearer understanding of the current context.

LITERATURE REVIEW

The first attempts to define the knowledge economy emerged in the literature during the second half of the twentieth century, beginning with the work of Fritz Machlup (1962), who underscored the central role of knowledge and information in the production process. Building on this foundation, Peter Drucker (1969, 1993) introduced the concept of the “knowledge society,” highlighting the significance of human capital and lifelong learning in shaping economic development. In a similar vein, the OECD (1996, 2007) advanced indicators and methodologies for assessing the knowledge economy, thereby facilitating the incorporation of this concept into public policies and growth strategies (see Table 1).

In contemporary literature, the knowledge economy is increasingly linked to digitalization, innovation, and intellectual capital (Foray, 2018) - factors that generate not only opportunities for development but also new sources of fiscal risk. At the same time, Stiglitz (2019) highlights the distributional dimension of the knowledge-based economy, underscoring that its expansion may exacerbate inequalities and create structural vulnerabilities for public finances.

Table 1. Theoretical Contributions to the Knowledge Economy and Their Implications for Fiscal and Budgetary Policy

Period / Author	Main Contribution	Fiscal and Budgetary Implications
Machlup (1962)	Defined the knowledge economy as a distinct sector	Necessity of incorporating education and R&D investment into fiscal policies

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Drucker (1969, 1993)	Concept of the “knowledge society” – human capital as a strategic resource	Reorientation of public spending towards human capital and innovation
OECD (1996, 2007)	Developed indicators for measuring the knowledge economy	Integration of statistical frameworks into budget planning
Foray (2018)	Identified innovation and digitalization as key drivers of growth	Adaptation of tax systems to the requirements of the digital economy
Stiglitz (2019)	Highlighted that the knowledge economy exacerbates inequality	Implementation of redistributive measures and social risk management in budgeting

Source: author’s elaboration

Thus, the theoretical framework of this research is grounded in two major strands:

1. The knowledge economy, which relies on intellectual capital, innovation, and digitalization;
2. Fiscal risk management, which focuses on the capacity of institutions to anticipate uncertainties and incorporate them into the budgetary planning process.

The conception of the knowledge economy has a long history, originating in the work of economists during the second half of the twentieth century. More recently, however, the transformations of the past decade - driven by digitalization, globalization, and the growing importance of intellectual capital - have endowed this paradigm with new dimensions and heightened relevance. Currently, the knowledge economy is conceptualized not only as a paradigm of economic development but also as an analytical framework for examining transformations in public finance, with direct relevance for the identification and management of financial risks in budgetary and fiscal relations.

The development of the knowledge economy concept over the past decade can be traced through several distinct stages, each capturing not only technological and institutional shifts but also the financial and fiscal challenges that accompanied them.

The years **2015 to 2018** may be seen as a period of consolidation in the broader processes of informatization and globalization. During these years, the availability of information and the speed with which it could be disseminated became central forces driving the knowledge economy. Yet, this phase also brought to light several structural contradictions, most notably the persistence of digital divides. These divides were evident not only in unequal access to and use of technology across countries and social groups, but also in the growing concentration of power held by multinational corporations in the technology sector. Their dominance reinforced the urgency of developing effective regulatory and supervisory instruments at the level of national economies and, more critically, in the sphere of fiscal and budgetary relations. From a fiscal policy perspective, digitalization compelled governments to adapt tax frameworks to new business models introduced by multinational technology firms, while at the same time tightening rules on the use and protection of data. These adjustments had direct consequences for tax transparency and oversight, equipping states with new tools of intervention but also exposing them to fresh challenges in the management of financial risks.

During the period **2019–2021**, the COVID-19 pandemic triggered a substantial rise in public expenditure on health, research, and digitalization. This increase generated additional fiscal risks and exposed vulnerabilities that threaten medium-term fiscal sustainability.

The period **2022–2024** is marked by the rapid expansion of generative artificial intelligence and other emerging deep-tech technologies, developments that have introduced new fiscal and budgetary risks. Among these are the migration of highly skilled human capital, the rising costs associated with workforce retraining, and the persistent difficulty of assessing the value of intangible assets. Taken together, these dynamics highlight the urgency of adapting fiscal policies to encourage investment in human capital and to reinforce the resilience of national innovation ecosystems.

In 2025, the knowledge economy becomes explicitly integrated into the architecture of fiscal policy. The resource allocation function takes on a pivotal role, directing investment toward human capital, the digitalization of public services, and the shift to a low-emission economy. At the same time, the redistributive function of fiscal policy is oriented toward narrowing social disparities through instruments such as targeted social expenditures, tax relief for vulnerable groups, and specially designed support programs.

Fiscal policy currently operates under new constraints. The preservation of fiscal discipline and deficit control continues to represent central priorities. At the same time, the planning process must account for contingent risks that may undermine the stability of public finances. Moreover, the ethical and geopolitical dimensions of financial risks are emerging as decisive factors in evaluating long-term sustainability. Within this context, an integrated approach is required, one that seeks to balance innovation, social equity, and macroeconomic stability.

Fiscal policy currently operates within a framework of heightened constraints, where the preservation of fiscal discipline and the containment of budgetary deficits remain fundamental objectives. At the same time, medium- and long-term planning must explicitly account for contingent risks capable of undermining the stability of public finances. Increasingly, the ethical and geopolitical dimensions of financial risk are emerging as critical parameters in the assessment of fiscal sustainability. In this context, the adoption of an integrated policy approach becomes indispensable—one that reconciles the imperatives of innovation with the pursuit of social equity and the maintenance of macroeconomic stability.

BODY OF THE ARTICLE

The literature review demonstrates that the knowledge economy is reshaping the nexus between public policy, public finance, and risk management. From a theoretical standpoint, the focus falls on intellectual capital, digitalization, and innovation, whereas in practice these dimensions create additional pressures on fiscal sustainability and on the mechanisms of financial risk management embedded in budgetary and fiscal relations. In this context, a comparative analysis is essential to illustrate how different economic systems address these challenges. Accordingly, this study examines the Republic of Moldova in comparison with the European Union’s experience and relevant international practices, with the objective of identifying both points of convergence and areas of divergence in the management of financial risks within budgetary and fiscal relations, situated in the broader context of the knowledge economy.

In the Republic of Moldova, the analysis of financial risks within budgetary and fiscal relations highlights both the ongoing efforts toward institutional consolidation and the persistent structural vulnerabilities, as evidenced by the dynamics of the budget deficit and public revenue flows.

In 2023, the budget deficit reached approximately 5.2% of GDP, according to the IMF’s 2024 revisions, a figure also confirmed by the World Bank in its Moldova Economic Update 2024. For 2024, the IMF adjusted its projections, estimating the deficit at around 4.4% of GDP (World Bank, 2024).

Within the structure of government revenues, the variation in indicators reflects the diversity of financing sources. In 2023, total general government revenues represented approximately 33.7% of GDP, of which only 18.6% was generated through taxes and fees. Excluding external grants, domestic revenues are estimated at about 29.4% of GDP. This gap underscores the significant role of non-reimbursable transfers in financing the public budget and illustrates the country’s pronounced reliance on external partners. Consequently, while Moldova’s total public revenues amount to roughly one third of GDP, less than one fifth is derived from direct and indirect taxation, with the remainder covered by non-tax revenues and external grants. These discrepancies arise because each indicator captures a distinct dimension of the revenue structure [8]. Research and development expenditure remains exceptionally low, at approximately 0.22% of GDP in 2023,

according to the WDI series based on UNESCO-UIS data. Similar values in previous years ($\approx 0.24\%$ in 2019) confirm the persistence of chronic underfunding in this area, constraining the Republic of Moldova's capacity to advance the transition to a knowledge-based economy and exacerbating the structural vulnerabilities of the fiscal-budgetary framework (Trading Economics, n.d.).

The size of the informal economy in the Republic of Moldova remains substantial, regardless of the estimation method applied. MIMIC econometric models suggest a share of approximately 40% of GDP in 2020, while DGE macroeconomic models report similar values of around 43% (Trading Economics / TheGlobalEconomy.com, n.d.). From an occupational standpoint, IMF estimates indicate that nearly one quarter of the labor force is employed in the informal sector. These figures point to sustained pressure on the tax base, leading to reduced effective tax revenues and heightened uncertainty in the budget forecasting process, which represents a major vulnerability for fiscal sustainability.

The analysis indicates that Moldova's fiscal and budgetary profile is characterized by the persistence of a relatively high budget deficit and a moderate level of public revenues, within a context marked by chronic underfunding of R&D and the continued prevalence of a large informal economy. These conditions define a clear set of priorities for fiscal and budgetary policy. On the one hand, it is necessary to broaden the tax base and enhance tax compliance, including through the digitalization of collection processes. On the other hand, strengthening the financial risk management framework in fiscal and budgetary relations remains essential, with particular emphasis on the integration of contingent risks into budgetary planning. At the same time, a gradual increase in investment in human capital and R&D constitutes a prerequisite for advancing the transition to a knowledge-based economy and reinforcing long-term fiscal sustainability.

In this context, the experience of the European Union and other advanced economies offers valuable benchmarks for developing solutions applicable to Moldova. The EU's regulatory and institutional framework illustrates the importance of integrated fiscal monitoring mechanisms and strategic investment in R&D, as reflected in the level of R&D expenditure, which reached 2.22% of GDP in 2023 (Eurostat, 2024). In the United States, where fiscal policy is characterized by flexibility and a diversification of financing instruments, R&D intensity stood at 3.43% of GDP in 2022 (National Science Foundation (NSF), 2023), confirming the direct relationship between innovation and productivity. Similarly, Nordic countries such as Sweden maintained levels of around 3.3% of GDP in 2021 (Swedish Research Council, 2023), demonstrating that fiscal discipline can coexist with sustained investment in human capital and research. Relating these models to the national context makes it possible to identify concrete directions for reform and for strengthening fiscal sustainability.

CONCLUSIONS

The analysis of financial risks in the field of budgetary and fiscal relations confirms that the knowledge economy fundamentally redefines both budgetary-fiscal relations and the management of financial risks. In Moldova, the fiscal and budgetary profile continues to be marked by a relatively high budget deficit, moderate public revenues, chronic underfunding of R&D, and the persistence of a large informal economy. These conditions exacerbate structural vulnerabilities and constrain the country's capacity to respond effectively to the challenges associated with the transition to a knowledge-based economy.

The experience of the European Union demonstrates that integrated fiscal surveillance mechanisms, combined with strategic targets for R&D investment, can reinforce fiscal sustainability and foster innovation. In the United States, flexible tax policy is accompanied by high levels of research funding, which in turn supports productivity and enhances economic competitiveness. The Nordic countries represent a complementary model, grounded in strict fiscal discipline and sustained investment in human capital and innovation. Their experience

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demonstrates that fiscal prudence and long-term developmental priorities are not mutually exclusive, but can coexist in synergy to reinforce both economic stability and social resilience.

For the Republic of Moldova, these benchmarks indicate several priority areas for reform: expanding the tax base and improving compliance through digitalization, strengthening the framework for financial risk management by integrating contingent risks into the budgetary process, and gradually increasing investment in education, research, and innovation. Adapting these measures to national specificities can mitigate fiscal vulnerabilities and orient the economy toward a sustainable development model that is consistent with both European and international standards.

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TAX BURDEN IS AN IMPORTANT INDICATOR OF THE EFFECTIVENESS OF TAX POLICY

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Abstract: The main impact of taxes on economic activity is through the tax burden indicator. Therefore, it is necessary to analyze its impact. The problem of calculating the tax burden is one of the most important and controversial in the theory and practice of taxation. The tax burden indicator is of significant importance in solving a number of problems, which include: developing tax policy; conducting a comparative analysis of the tax burden in different countries; forming the state's social policy; forecasting the economic behavior of entrepreneurs, etc. The problem of determining, establishing and maintaining an optimal tax burden on the economy plays a special role in improving the tax system of any state. World practice shows that the withdrawal of up to a third of the taxpayer's income causes a process of reduction of savings and investments in the economy. If more than 40% of the taxpayer's income is withdrawn, this practically deprives him of incentives for entrepreneurial initiative and production growth. Therefore, constant monitoring of the level of tax burden both in the country as a whole and for individual groups of taxpayers is an extremely necessary process for developing an effective tax policy.

Key words: taxation, tax burden indicator, tax incidence, tax policy

JEL Classification: H21; H22; H3

Introduction. One of the fundamental macroeconomic challenges for any country is optimally determining the burden of taxation. The tax burden is used as a criterion for assessing the burden of taxation. The tax burden indicator is essential for addressing a number of socioeconomic challenges for any country. Therefore, the problem of determining, establishing, and maintaining an optimal tax burden on the economy plays a special role in improving the tax system of any country.

Headings. The interest of economics and practice in the tax burden is not accidental. Firstly, this indicator is essential for governments to develop tax policy. By increasing the number of taxes, changing tax rates and tax breaks, the state is obliged to determine and not exceed the maximum permissible levels of pressure on the economy, beyond which negative economic processes may arise.

Secondly, calculating the tax burden at the state level is necessary for a comparative analysis of the tax burden in different countries and for economic entities to make decisions about the location of production, the distribution of investments and, ultimately, the movement of capital.

Thirdly, the tax burden indicator is necessary for analyzing the impact of the tax system on the formation of the state's social policy, on which the financial situation of taxpayers also depends. The study and practical analysis of the universality and fairness of taxation in relation to the country's population, and the burden of taxation between different social groups, enables the state

to more fairly distribute the tax burden in order to stabilize the socio-economic situation in the country.

Fourthly, the tax burden indicator is used as an indicator of the economic behavior of business entities. It is the level of this indicator that largely determines the decisions of economic entities to invest their own financial resources in the development of a particular production, and the financial position of each specific economic entity. (Derina and Morozova, 2025).

The tax burden is an important indicator reflecting the share of tax revenues in household and business income, as well as their impact on economic activity. The effectiveness of tax policy can be assessed through the prism of the tax burden across several key aspects:

1. Defining the Tax Burden

The tax burden can be expressed as a percentage of gross domestic product (GDP) or as a share of tax revenues in the income of individuals and businesses. It shows what portion of their income individuals and businesses pay in taxes.

2. Impact on Economic Growth

A high tax burden can hinder economic growth by reducing individuals' disposable income and corporate profits. This can lead to a decline in consumer spending and investment activity. On the other hand, an adequate tax burden can help finance public goods and services, which also supports economic development.

3. Fairness and Progressivity

Effective tax policy must take into account the principles of fairness and progressivity. The tax burden should be distributed so that wealthier individuals and companies pay proportionally more, which helps reduce inequality.

4. Stimulation or deterrence

Tax policy can be aimed at stimulating certain sectors of the economy (for example, through tax breaks) or, conversely, at deterrence (for example, through high taxes on harmful products or services). The effectiveness of the tax burden in this context is determined by the extent to which it contributes to the achievement of economic and social goals.

5. Sustainability and Adaptability

Effective tax policy must be resilient to economic changes and able to adapt to new challenges, such as the digitalization of the economy, changes in the employment structure, and global economic trends.

Thus, the tax burden and its impact on economic activity is a significant tax issue in the modern world. However, the very concept of tax burden requires clarification. In our view, this is a comprehensive characteristic that can include for analysis not only the tax burden coefficients themselves, but should also take into account:

- the number of taxes and other mandatory payments
- the tax structure
- the tax collection mechanism.

The Tax Code of the Republic of Moldova contains a closed list of 24 taxes: 8 national and 16 local taxes, duties and fees, but these are also tax groups, not individual taxes (for example, fees for natural resources and road tolls include several different fees, therefore, the total number of taxes and fees increases).

At the state level, the tax burden is usually calculated as the ratio of budget tax revenues to the country's GDP. However, in our opinion, calculating the tax burden in Moldova using this formula is not entirely correct. In our country, there are state contributions for compulsory health insurance and social insurance, which are allocated to a separate group of budget revenues (not tax), although for businesses and individuals these payments are absolutely identical to tax payments. Therefore, we will calculate the tax burden without taking these mandatory contributions into account and with them (see Table 1).

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Table 1. Dynamics of the tax burden in the Republic of Moldova in 2020-2024

Indicators	2020	2021	2022	2023	2024
GDP, mil. lei	199 734	242 079	274 488	300 554	323 817
Revenues of the national public budget, mil. lei	62 650,0	77 373,0	91 505,4	102 299,2	110 338,5
Taxes and fees, mil. lei	39 747,1	49 388,8	57 524,2	63 006,1	68 481,3
Contributions to compulsory social and health insurance, mil. lei	19 234,9	21 839,0	24 923,2	29 022,4	33 564,2
Tax burden, %	19,90	20,40	20,96	20,96	21,15
Tax burden including contributions, %	29,53	29,42	30,04	30,62	31,51
Total burden of government revenues, %	31,37	31,96	33,34	34,04	34,07

Source: author's calculations based on: Moldova_in_numbers. 2023. Moldova_in_numbers. 2024. Moldova_in_numbers. 2025.

If we consider the tax burden (as a share of tax revenues in the GDP of the Republic of Moldova) in dynamics (for 2020-2024) (see Table 1), then it is noteworthy that throughout all five years the tax burden has been almost constantly increasing (from 19.90 to 21.15%). The tax burden, including contributions, decreases very slightly in 2021 and then increases each year thereafter. The total government revenue burden also increases throughout all five years.

For greater clarity, let us present the dynamics of the tax burden in the form of a figure (see figure 1).

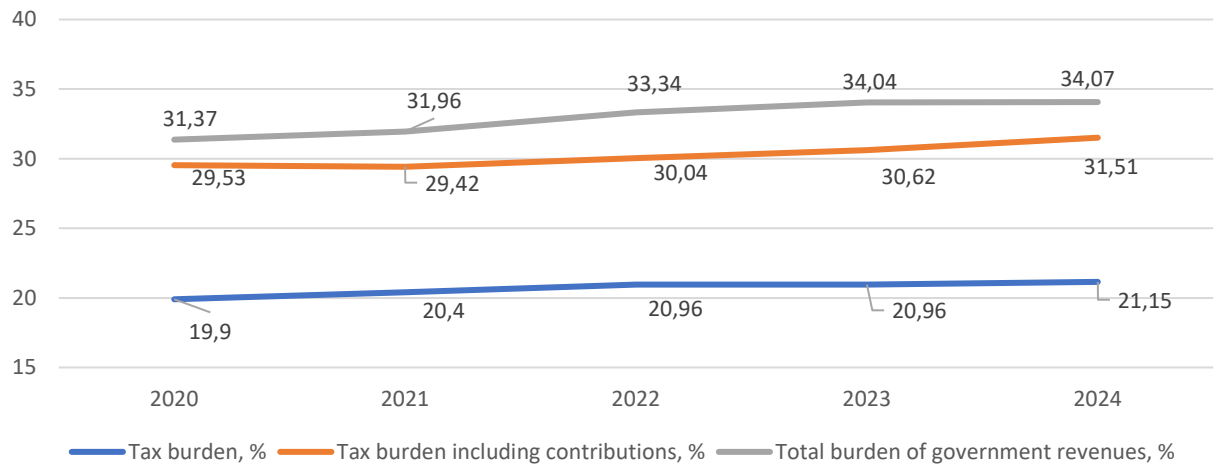


Figure 1. Dynamics of the tax burden in the Republic of Moldova in 2020-2024, %

Source: created by the author based on the data in Table 1

Next, we'll compare the tax burden in Moldova with that in other countries. To compare the tax burden in different countries, we'll use two indicators: the share of taxes and social contributions as a percentage of GDP and the share of government revenue in GDP (see Table 2).

Table 2. The share of government revenue in GDP and the share of taxes and social payments in GDP in different countries in 2023

Selected countries	Share of government revenues in GDP, %	The share of taxes and social payments in GDP, %
Norway	63,2	41,8
France	51,6	45,6
Sweden	48,6	42,6
Italy	46,7	41,7
Germany	45,9	40,3

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Spain	41,9	37,0
Estonia	40,5	34,0
Bulgaria	36,8	29,9
Lithuania	36,7	32,4
Republic of Moldova	34,04	30,6
Romania	34,0	27,3
Ireland	24,3	22,7

Sources: compiled by the author based on data from: General government revenue % of GDP, 2023. Revenue from taxes and social contributions, 2023, % of GDP.

As the table shows, the level of tax collection in our country is not significantly lower than the tax burden in developed countries. At the same time, the specific maximum permissible tax burden in different countries is determined by a multitude of other factors not directly related to taxes. Thus, the level of the tax burden may depend on the state's share of participation in the population's expenses for medical, educational, utility and other services, as well as in scientific research, investment and other programs. For example, the Swedish tax system is designed in such a way that taxpayers give up almost 50% of their income, and this does not reduce their incentives for entrepreneurial activity. There is no paradox in this, since the state, through tax revenues, centrally solves many economic and social problems that in other countries the taxpayer is forced to solve independently, using his own income remaining after paying taxes.

The tax share as a percentage of GDP does not reflect the actual tax burden on a specific taxpayer who conscientiously fulfills their obligations, which is explained by the following facts. First, serious problems with tax compliance must be taken into account. The existence of this problem is confirmed by indicators characterizing the amount of tax arrears to the budget. As practice shows, accrued tax liabilities and actual fulfillment do not match, so the level of tax collection calls into question the objectivity of this indicator. Thus, the aggregate tax burden indicator should be adjusted taking into account the collection rate, i.e., by the amount of the annual increase or decrease in arrears in payments to all types of budgets.

Another factor affecting the objectivity of tax burden assessments is distortions in GDP due to significant measurement errors. This situation is explained by the fact that statistical agencies add the amount of GDP produced in the "shadow economy" to the GDP indicator calculated from statistical reports in their official data.

Another factor that must be taken into account when determining the tax burden indicator is the socio-economic conditions in which taxpayers have to carry out financial and economic activities and pay taxes. The underdevelopment of market relations, the imperfection and constant changes of the country's tax system, and a number of other important factors, without affecting the absolute size of the tax burden indicator, "heavier" the tax burden of our taxpayers.

It should also be noted that the tax system of the Republic of Moldova still provides for the possibility of providing taxpayers with significant tax benefits and preferences, including in the form of tax exemptions, tax deferrals and installment plans, regardless of the level of income received. For the purposes of state support for entrepreneurship, this is correct, but for the purposes of an even distribution of the tax burden, it is not, and this should be taken into account by adjusting the total tax burden indicator. Thus, taxpayers who do not have preferential tax treatment pay more into the budget than the average taxpayer.

Thus, even with an acceptable average tax burden as a share of GDP, the actual tax burden for individual taxpayers may be significantly higher. This fact demonstrates that the problem of reducing the tax burden on organizations remains pressing.

The tax burden on a company is largely determined by the tax collection mechanism itself. Discussion of a company's tax burden remains pointless until agreement is reached on the methodology for calculating a consolidated indicator characterizing this burden. For an individual

taxpayer, the tax burden can be calculated as the ratio of the amount of assessed or paid taxes to the amount of the source of funds for tax payment. The list of assessed (paid) taxes includes all taxes and mandatory payments of the enterprise to the budget and extra-budgetary funds. It is sometimes suggested to exclude payments such as VAT, excise taxes, personal income tax, and contributions to mandatory health insurance funds from the tax burden calculation. The argument here is that these taxes are transit taxes and neutral for the company. But taxes that are neutral for a company simply do not exist: they are actually paid from current cash receipts, and the degree of their transferability is inconsistent and is not fully implemented.

When considering the composition of sources of funds for paying taxes, it is necessary first of all to note their possible discrepancy with the taxable base. The source for paying taxes may be: revenue from the sale of products, works or services (for VAT, excise taxes), the cost of production (for real estate tax, land tax and social contributions), the profit of the enterprise in the process of its formation and distribution, the net profit of the enterprise, the income of the employees of the enterprise.

The overall indicator for all tax payments should undoubtedly be the value added. This indicator is comparable to the country's gross domestic product, which is used to determine the overall tax burden. Taxpayers typically consider a tax burden of up to 30% fair, find a tax burden of 40% difficult, and are unacceptable when it exceeds 50%. An excessive tax burden undermines the tax base itself and reduces overall tax revenue.

The search for a “critical point” for the optimal tax burden can be aimed at developing industry standards for the maximum tax burden by substantiating the share of wages, depreciation, and net profit in added value. Tax burden standards can have maximum and minimum values. If these are exceeded, there would be objective grounds for requesting deferrals or waivers of tax payments.

Conclusions. The tax burden is a multifaceted indicator that can serve as a proxy for the effectiveness of tax policy. Achieving an optimal balance between government revenue and economic development requires considering numerous factors, including social, economic, and political aspects. An effective tax policy must be fair, stimulating and adaptive to changes in the economy.

At the same time, the implementation of an active tax policy aimed at effectively regulating the economy is impossible without taking into account the limits of the tax burden on business activities and the population. The aggregate indicator of the tax burden, defined as the ratio of taxes paid to GDP, does not reflect the real state of the state's tax system, and its level cannot serve as a vector determining the direction of tax regulation of the economy. To achieve this, it is necessary to separately determine the level of tax burden on businesses (by industry and individual taxpayers) and on the population.

Accordingly, the primary focus for improving the effectiveness of tax policy in our tax system should be the redistribution of the tax burden between the population and businesses, as well as between different segments of the population. It is necessary to implement a set of measures to increase the level of fairness of taxation of the population by introducing a progressive tax scale for total annual income and reducing the tax burden on business activities. Shifting the tax burden from legal entities to individuals, as global experience shows, is the least painful direction of tax regulation for the purpose of building an effective tax system that promotes economic development. Implementing this vector of tax regulation will not only increase investment activity, accelerate the process of upgrading fixed assets, and increase GDP growth rates, but will also make the tax system fairer and more efficient.

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THE IMPORTANCE AND FEATURES OF FINANCIAL RISK INSURANCE

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Abstract: Market financial risk insurance is the process of protecting financial assets or liabilities from potential losses associated with various risks in the financial markets. These risks may include stock price fluctuations, currency fluctuations, interest rate changes, credit risks, and others.

Financial risk insurance is an important area for both financial institutions and corporations and individuals. It helps mitigate potential losses associated with various financial transactions and investments. The process of protecting against losses or unexpected events may affect the financial position of an individual, company, or organization.

Organizations and investors may resort to financial risk insurance to reduce potential losses and ensure a more stable financial position. Insurance can also help manage uncertainty and increase confidence in financial decision-making. Financial risks can come in many forms and are dependent on many factors such as market conditions, economic changes, political events, and others.

There are many financial risk insurance products available in the market, including financial derivatives, options, futures, swaps, and other instruments. Companies can also use various risk management strategies, including portfolio diversification, hedging, and structuring financial transactions.

Overall, financial risk insurance plays an important role in the modern economy, helping companies and investors protect their financial interests and increase the stability of their investment portfolios. However, it is important to remember that insurance does not eliminate risks, but only helps manage them more effectively.

Keywords: financial risks insurance, risk, insurance market, business

JEL Classification: G2, G22, G52

Financial risk insurance is an important area for financial institutions, corporations, and individuals alike. It helps mitigate potential losses associated with various financial transactions and investments.

Financial risk insurance is the process of protecting against losses or unexpected events that may impact the financial situation of an individual, company, or organization. Key aspects of financial risk insurance include (Rusu, 2023):

1. *Risk Identification:* This is the first step in the financial risk insurance process. Organizations and individuals analyze their financial situation to identify potential threats and risks that could impact their income, assets, or liabilities.

2. *Risk Assessment:* Once risks are identified, they are assessed. This assessment involves determining the likelihood of a threat occurring and the amount of loss that could occur if the risk materializes.

3. *Insurance Selection*: Based on the risk assessment and insurance needs, the most appropriate types of insurance are selected. This may include life insurance, health insurance, property insurance, liability insurance, and other types.

4. *Insurance Policy Preparation*: After selecting suitable types of insurance, insurance policies are prepared, defining the terms and conditions, premium amount, and other important details.

5. *Insurance Claims Management*: In the event of an insured event, the insurance company makes payments under the insurance policies in accordance with the terms of the contract.

6. *Monitoring and Analysis*: After signing insurance contracts and initiating insurance, it is important to monitor financial risks and analyze the effectiveness of the selected insurance strategies. If necessary, adjustments can be made to insurance policies or other types of insurance can be selected.

Overall, financial risk insurance plays an important role in providing financial protection and peace of mind for both individuals and businesses, helping them cope with potential threats and unexpected expenses.

Financial risk insurance is the process of protecting financial assets or liabilities from potential losses associated with various risks in the financial markets. These risks can include stock price fluctuations, currency fluctuations, interest rate changes, credit risks, and others. Organizations and investors may seek financial risk insurance to reduce potential losses and ensure a more stable financial position. Insurance can also help manage uncertainty and increase confidence in financial decision-making (Popescu, 2022).

Financial risks can take many forms and depend on a variety of factors, such as market conditions, economic changes, political events, and others. The main types of financial risks include:

1. *Market risk*: This type of risk relates to losses that may arise due to changes in the prices of financial instruments, such as stocks, bonds, commodities, and currencies. This includes:

- *Interest rate risk*: Associated with changes in interest rates.
- *Exchange rate risk*: Associated with changes in exchange rates.
- *Commodity price risk*: Associated with changes in the prices of raw materials or commodities.

2. *Credit risk*: This type of risk arises when a borrower is unable to meet its financial obligations to a lender.

3. *Liquidity Risk*: This is the risk of losses arising from the inability to quickly convert assets into cash without loss.

4. *Operational Risk*: This risk relates to losses arising from inefficiencies or failures in operational processes, technological failures, human errors, and other administrative or systemic malfunctions.

5. *Political and Country Risk*: This relates to potential losses due to changes in the political environment, legislation, or geopolitical events.

6. *Reputation Risk*: This is the risk of loss of trust from customers, investors, or the public due to negative events, public scandals, or unfair practices.

7. *Systemic Risk*: This risk relates to potential losses that may arise due to instability of the entire financial system, for example, in the event of financial crises or major systemic failures.

8. *Legal and regulatory risk*: This is the risk associated with potential changes in legal and regulatory standards that may affect a company's operations or investments.

Companies and investors must consider these various types of risks and develop risk management strategies to minimize their impact on their operations or investments.

A variety of financial risk insurance products are available on the market, including financial derivatives, options, futures, swaps, and other instruments. Companies can also employ various

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risk management strategies, including portfolio diversification, hedging, and structuring financial transactions.

Table 1. Types of Financial Risk Insurance

Currently, the global insurance market is home to many insurance companies offering a wide range of voluntary insurance options for various types of financial risks. These include:	Loan default insurance (insured by the bank)
	Borrower liability insurance for loan default (insured by the borrower)
	Late interest insurance
	Consumer loan insurance (insured by an individual)
	Commercial loan insurance (bill insurance)
	Deposit insurance (insured by the bank or depositor)

Source: (Rusu, 2023)

Financial risk insurance plays a vital role in the modern economy, helping companies and investors protect their financial interests and increase the stability of their investment portfolios. However, it's important to remember that insurance doesn't eliminate risks completely, but rather helps manage them more effectively.

Key aspects of financial risk insurance (Cojocaru, 2023):

1. Life and health insurance: Life and health insurance policies are designed to protect people's financial interests in the event of an accident, illness, or death.
2. Business insurance: This includes various types of insurance, such as profit insurance, debt default insurance, and professional liability insurance.
3. Investment insurance: Some investors and companies turn to insurance to protect their investments from potential financial losses.
4. Credit risk insurance: Companies can insure themselves against customer defaults or contractual defaults.
5. Commodity and financial instrument price insurance: This is an important tool for companies engaged in trading or investing that want to protect themselves from potential losses due to market price changes.

Today, with advances in technology, insurance companies are also beginning to utilize data analytics, machine learning, and other modern methods to more accurately analyze risks and develop customized insurance products for specific customer needs. There is also growing interest in insuring against cyber risks associated with data breaches and cyberattacks.

Business insurance is the process of protecting a business from potential financial losses associated with various risks, such as property damage, third-party liability, business interruption, and other potential threats. [4]

Types of insurance commonly used in businesses:

1. Property Insurance: Protects a business from loss or damage to property, such as buildings, equipment, inventory, etc., caused by fire, theft, natural disasters, and other events.
2. Third-Party Liability: Covers legal costs and compensation to third parties if a business is found liable for damage or injury to others.
3. Business Interruption Insurance: Provides compensation for lost income that may arise due to the temporary cessation of business operations due to natural disasters, fires, or other events.
4. Professional Liability Insurance: Protects businesses against losses arising from errors, omissions, or negligence in the provision of professional services.
5. Transportation and Cargo Insurance: Designed to protect vehicles and transported goods from various risks, such as accidents, theft, or damage.
6. Cybersecurity Insurance: Provides protection against threats associated with cyberattacks, including hacks, data theft, and other cyberthreats.
7. Employee Health and Life Insurance: Designed to provide medical care and compensation to employees in the event of illness, injury, or death.

The choice of appropriate types of insurance depends on the specific business, its characteristics, risks, and needs. Before purchasing insurance policies, it is recommended to consult with a professional insurance agent or broker to determine the best insurance options for your business.

Investment insurance is a concept in which investors use insurance products to protect their investments from potential financial loss. This can be particularly useful for risky investments or volatile market conditions.

The main types of investment insurance are:

1. Portfolio insurance: Here, investors insure their entire investment portfolio against general risks, such as market fluctuations, exchange rate risks, etc. This provides overall protection against losses.

2. Non-incurrence insurance: This type of insurance allows investors to insure themselves against specific losses, such as losses on specific investments or as a result of specific events.

3. Insolvency insurance: This type of insurance provides protection against losses associated with the insolvency of the issuer of investment products, such as bonds or other financial instruments.

4. Inflation Insurance: Investors can also hedge their investments against the negative impact of inflation using various financial instruments or products that provide protection against inflation fluctuations.

Investment insurance can be an important element of an investor's risk management strategy, especially given the uncertainty and volatility of markets. However, before purchasing insurance products, investors should carefully review the terms and conditions to fully understand the risks covered and any limitations that may apply.

Investment insurance is a concept in which investors use insurance products to protect their investments from potential financial loss. This can be particularly useful for risky investments or volatile market conditions.

The main types of investment insurance are:

1. Portfolio insurance: Here, investors insure their entire investment portfolio against general risks, such as market fluctuations, exchange rate risks, etc. This provides overall protection against losses.

2. Non-loss insurance: This type of insurance allows investors to insure themselves against specific losses, such as losses on specific investments or as a result of specific events.

3. Insolvency insurance: This type of insurance provides protection against losses associated with the insolvency of the issuer of investment products, such as bonds or other financial instruments.

4. Inflation insurance: Investors can also insure their investments against the negative impact of inflation by using various financial instruments or products that provide protection against inflation fluctuations.

Investment insurance can be an important element of an investor's risk management strategy, especially given the uncertainty and volatility of markets. However, before purchasing insurance products, investors should carefully review the terms and conditions to fully understand the risks covered and any limitations that may apply.

Credit insurance is a type of financial protection designed to protect lenders against losses arising from a borrower's default on a loan or other financial obligations.

This type of insurance can be useful for banks, financial institutions, and other lending organizations, as well as for companies operating in international markets and exposed to debt defaults and problems with financial partners.

The main types of credit insurance include:

1. Trade Credit Insurance: Protects companies from losses associated with non-payment of debts for goods or services sold on credit.

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2. Financial Guaranty Insurance: Provides guarantees for the payment of bonds or other financial instruments in the event of default on financial obligations.
3. Credit Derivatives Insurance: Provides protection against losses associated with default on credit derivatives, such as credit swaps or credit options.
4. Investment Risk Insurance: Protects investors against losses arising from issuer default or other investment risks.

Credit risk insurance helps reduce financial losses and increase confidence in investments or lending, making them safer and more predictable for policyholders. However, like any form of insurance, it also includes certain costs and coverage terms that should be considered when applying for it.

Commodity and financial instrument price insurance, also known as inflation insurance or price insurance, is a type of financial protection designed to mitigate the risks associated with fluctuations in the prices of commodities and financial instruments. This type of insurance can be useful primarily for businesses engaged in manufacturing, trading, or investing to protect their financial interests from the negative consequences of price changes.

Key aspects of price insurance:

1. Inflation protection: This type of insurance can provide protection against rising prices of goods and services. For businesses operating in a market with high inflation, this can be an important tool for maintaining stability and minimizing losses.
2. Guaranteed prices: By purchasing price insurance on goods or financial instruments, a company can lock in specific prices for a specified period, providing predictability in planning and financial management.
3. Risk reduction: Investors can use price insurance to reduce the risk of losses resulting from fluctuations in the prices of goods or financial instruments. This is especially important when investing in volatile assets.
4. Increased competitiveness: Companies offering guaranteed prices on their goods or services can improve their competitiveness in the market by attracting customers with their stability and unpredictability.
5. Budgeting and Forecasting: For businesses, especially those that rely on price stability, price hedging can help with budgeting and profit and loss forecasting.

However, it's worth noting that price insurance can be expensive and requires a thorough understanding of financial market risks and instruments. As with any form of insurance, it's important to carefully review the policy terms and choose the appropriate type of coverage based on your business needs and risks.

Among the insurance companies operating in the Moldovan insurance market in 2024, six provided financial risk insurance.

Table 2. Insurance revenue by type of financial risk insurance in Moldova in 2020–2024.

Type of Insurance	2020	2021	2022	2023	2024
Financial Risk Insurance	9424640	10131339	8998955	8102989	14669375
Loan Insurance	478521	723349	690792	13966	74175
Guarantee Insurance	1637038	32911	3016109	11844	33403
Financial Loss Insurance	7309081	9375079	5292054	8077179	14561797

Source: Author's own calculations based on data from CNPF and NBM (CNPF, n.d.; NBM, n.d.)

The largest share of insurance revenue by type of financial risk insurance for 2024 comes from financial loss insurance (99%), loan insurance accounts for 1%, and guarantee insurance accounts for only 0.2% of all insurance premiums for financial risk insurance.

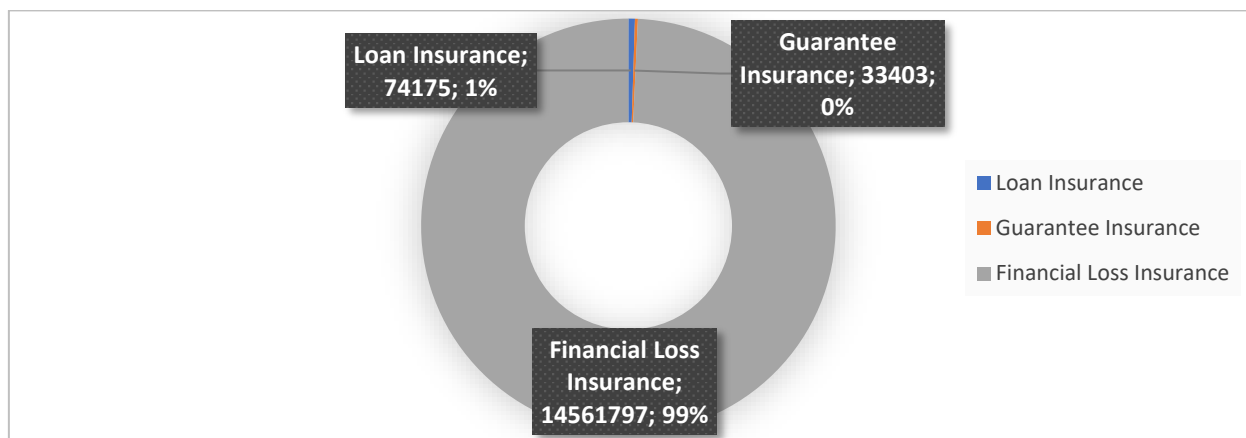


Figure 1. Insurance revenues by type of financial risk insurance in Moldova in 2024.

Source: Elaborated by the author based on data from NBM (NBM, n.d.)

When assessing insurance claims by type of financial risk insurance, we can conclude that they are primarily for financial loss insurance.

There is no basis for discussing any ratio of premiums to payments, since, in this situation, it can be said that no insurance claims were actually made for types of economic risk insurance.

Table 3. Insurance claims by type of financial risk insurance in 2020–2024.

Type of Insurance	2020	2021	2022	2023	2024
Financial Risk Insurance	138499	1080600	2477191	5035550	1991887
Loan Insurance	94456	467800	1813686	0	0
Guarantee Insurance	0	0	0	0	0
Financial Loss Insurance	44043	612800	663505	5035550	1991887

Source: Author's own calculations based on data from CNPF and NBM (CNPF, n.d.; NBM, n.d.)

The main reasons for the underdevelopment of financial risk insurance are:

- Low solvency of potential policyholders;
- Lack of representative statistics necessary for calculating optimal rates from the perspective of the insurer and policyholders;
- Ignoring the individuality of risk parameters and the diversity of risks;
- Insufficient scientific, regulatory, legislative, and methodological support for the process of insuring entrepreneurial risks;
- High probability of adverse changes in risk levels after the conclusion of an insurance contract;
- The need for an individual approach to risk analysis and assessment, as well as its high cost.

The main barriers to the further development of financial risk insurance are:

- a) Inconsistency in legislation on financial risk insurance;

- b) Insufficient economic justification for the benefits of financial risk insurance compared to self-insurance and other risk mitigation methods;
- c) the lack of a statistical base for calculating reasonable insurance rates, resulting in high (in some cases, insufficiently justified) costs for the insurance services offered;
- d) the practice of double-entry bookkeeping in some cases, making it impossible to insure business risks;
- d) company managers are unaware of the possibility of insuring such risks;
- e) a weak marketing policy for product promotion and a shortage of qualified personnel at insurance companies;
- g) the low level of understanding of this problem.

Financial risk insurance can be effectively organized through the implementation of a range of measures, including:

- development of the legal framework and economic foundations for financial risk insurance;
- objective and complete classification of threats to business activity;
- activating the activities of insurers themselves by applying new types of insurance similar to the insurance markets of industrialized countries;
- gradual inclusion of financial risks with critical consequences for business into the insurance coverage system;
- conducting marketing research;
- government and business support;
- enhancing responsibility and service culture for policyholders.

Based on the above analysis, the following conclusions were reached: financial risk insurance in Moldova remains underdeveloped. This type of insurance is in low demand, as evidenced by the low premiums received by insurance companies, despite the positive dynamics of this insurance market. At the same time, the development prospects of this market are difficult to predict, as they largely depend on the state of the country's economy and its level of development.

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THE DIGITAL BANKING REVOLUTION AND THE PREMISES FOR THE EMERGENCE OF NEOBANKS IN MOLDOVA

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Abstract. The digital banking revolution has profoundly changed the way banks operate today. This transformation is also due to the emergence of neobanks, which have forced traditional banks to adapt to these major changes. The digital banking revolution has been driven by the introduction of digital technologies such as mobile applications, artificial intelligence, and blockchain. All of these have changed the way customers access and interact with banks. Compared to traditional banks, neobanks have excluded branches and/or counters from their infrastructure and offer online services at low cost and with 24/7 accessibility. In the Republic of Moldova, the conditions for the emergence of digital banks are emerging. They are linked to the introduction of technology in banks, financial education, and the need for financial inclusion. The advantages of neobanks over traditional banks are cost, transparency, accessibility, speed, and personalization. However, they also come with a number of disadvantages: lack of physical contact, limited use by the elderly, regulation, limited services when complex banking services are required, and exclusive dependence on technology and the internet. In the Republic of Moldova, in addition to the premises mentioned above, which are specific to all countries, there are also specific local premises, such as migration and the diaspora. The future of neobanks in the Republic of Moldova depends on their ability to adapt to local specifics. The research methods will be description, comparison, analysis and synthesis. At the end of the research, we will present the research findings materialized in conclusions and recommendations.

Keywords: banking, education, information technology, finance, behavior

JEL Classification: G21, G28, G51

1. Introduction

Over the past two decades, the banking sector has undergone a radical transformation, known as the digital banking revolution. This is driven by digitalization. The digital banking revolution represents a major shift in the financial sector. This shift involves moving from traditional business models to digital business models. This transition can be based on moving away from physical branches and delivering financial services through mobile applications, online platforms and emerging technologies, involving personalized offers and solutions. The biggest challenges facing the global economy at the stage of digital transformations remain cybersecurity and regulations.

2. KEY TRENDS IN THE DIGITAL BANKING REVOLUTION

The revolution is characterized by several interconnected trends, which redefine the way banks interact with customers.

Figure 1 details the main trends that the digital revolution is recording.

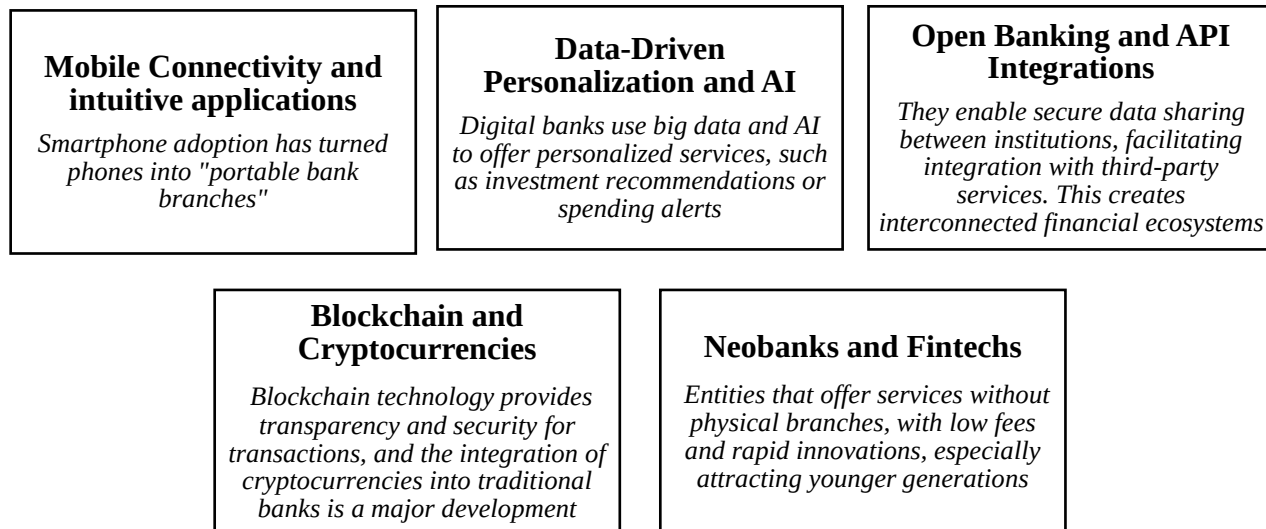


Figure 1. Key Trends in the Digital Banking Revolution

Source: authors own study

Figure 2 shows the trends that Fintechs are working with in collaboration with banks:

- „Open Banking (or BaaS, Banking as a Service) - enables secure data sharing and collaboration between financial institutions, technology companies and customers” (www.squadstack.ai.,2025);
- „Embedded Finance involves the incorporation of financial services and products into non-financial platforms, such as e-commerce sites, mobile applications. Technological advances, such as application programming interfaces (APIs) and cloud computing, have contributed to the rapid growth of integrated finance”; (www.squadstack.ai.,2025);
- „The Internet of Things (IoT) without human intervention, these devices collect and exchange data in real time and perform specific actions, including financial transactions, fraud detection and credit scoring”; (www.squadstack.ai.,2025);
- „Artificial intelligence and machine learning. The fintech industry has leveraged AI and ML to automate tasks such as managing customer data, detecting human errors, recommending management strategies, preventing fraud and performing quality checks. Chatbots and self-learning applications can provide insights into customer behavior and help improve financial services”. (www.squadstack.ai.,2025);

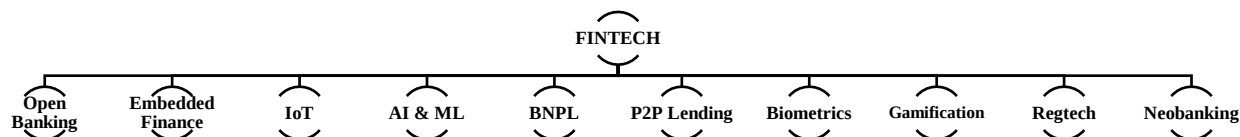


Figure 2. Current Fintech Trends

Source: based on squadstack.ai. (2025)

- *Buy Now Pay Later (BNPL)* – „this emerging fintech trend allows users to make purchases and defer payment over time. With BNPL, customers can divide the total amount into smaller, interest-free installments, usually over a fixed period. It has gained popularity due

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- to its simplicity, fast approval process, and the absence of interest if paid on time” (www.squadstack.ai.,2025);
 - *Alternative Lending (or P2P Lending)* „is a fintech trend that refers to unconventional lending models and platforms that provide access to credit outside of traditional banks. It includes peer-to-peer lending, crowdfunding, and online lending marketplaces” (www.squadstack.ai.,2025);
 - *Biometrics* „uses unique physical characteristics, such as fingerprints, facial recognition, voice recognition, or iris scans, to verify and authenticate individuals in financial transactions. The use of biometrics in financial technology has significantly increased security, reduced fraud and improved user experience” (squadstack.ai.,2025);
 - *Gamification* – „the application of game-like elements such as digital badges and rewards, cashback and vouchers, loyalty points, etc., in financial services engages and motivates users” (www.squadstack.ai.,2025);
 - *Regtech* „uses technologies such as compliance monitoring, data analytics, risk management tools and reporting systems to facilitate regulatory compliance in the fintech industry” (www.squadstack.ai.,2025);
 - *Neobanking* – „online banks that operate without physical branches are among the fintech trends. These digital-only banks offer everything a traditional bank offers: online account opening, virtual bank cards, instant payments, budgeting tools and more” (www.squadstack.ai.,2025).

Let's analyze the latest developments in fintech and current trends in finance. Next, we will analyze statistical data on different aspects of the development of FINTECHs. They will be structured into several groups:

- *Fintech penetration in global banking revenues* - "Fintech has penetrated only 3% of global banking and insurance revenues, but is growing 3 times faster than traditional banks. By 2030, it is projected to reach 13% of banking revenues" (www.bcg.com, 2025);
- *the size of the global Fintech market* - "The fintech market is valued at \$280 billion in 2025, with a growth projection to \$1,382 billion by 2034. Banks are integrating these solutions to remain competitive” (www.acropolium.com, 2025);
- *Fintech Investments* - "Fintech attracted \$26.7 billion in investment in the Americas, with 1,092 deals, many involving partnerships with banks for payment services and digital banking." (www.kpmg, 2025);
- *AI market in Fintech* - "Valued at \$115.4 billion in 2025 (up from \$14.13 billion in 2024), used by banks for fraud and personalization; projected to reach \$250.98 billion by 2029." (www.siegemedia, 2025);
- *Instant Payments Adoption (FedNow)* - "1,200 financial institutions participate in FedNow in 2025 (up from 400 in 2024), accelerating banks' transition to real-time payments." (www.playd, 2025);
- *number of fintech unicorns* - "414 fintech unicorns by early 2025, many collaborating with banks for embedded finance." (www.fortunly, 2025). "This term "unicorn" was assigned back in 2013 by Aileen Lee, founder of a venture capital investment fund, to the 39 companies that at that time had a value of over 1 billion dollars, and this metaphor was used to emphasize the rarity of such start-ups".(www.diez.md, 2024);
- *Biometrics Market in Banking* - "\$33.5 Billion in 2025, Improving Security and Authentication in Banking Applications” (www.squadstack.ai, 2023);
- *Open banking users* - "From 24.7 million in 2020 to 132.2 million in 2024, with a growing trend in 2025; banks use open banking for collaborations with fintechs"(www.squadstack.ai, 2023).

The digital revolution faces obstacles, which we present in figure 3:

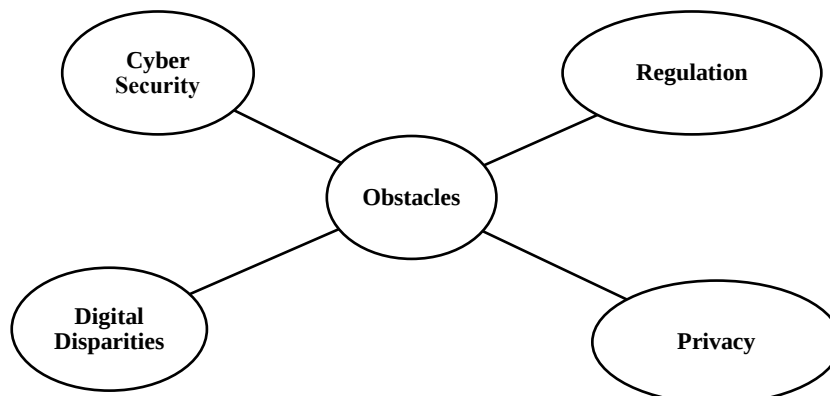


Figure 3. The digital revolution encounters obstacles

Source: authors own study

Although promising, the revolution faces obstacles:

- „*Cyber Security* - the rise in cyberattacks requires investment in security;
- *Regulation*: the European Central Bank impose strict standards to prevent risks, but uneven regulations can stifle innovation in emerging countries.
- *Digital Disparities*: Not everyone has access to the internet, exacerbating inequalities (e.g. in rural areas).
- *Privacy*: The use of data raises ethical concerns, requiring frameworks such as the GDPR” (www.eur-lex.europa.eu, 2018).

3. NEOBANKS AT THE CURRENT STAGE

Neobanks have gained rapid popularity in recent years, attracting millions of users with low fees, intuitive interfaces and fast access to financial services.

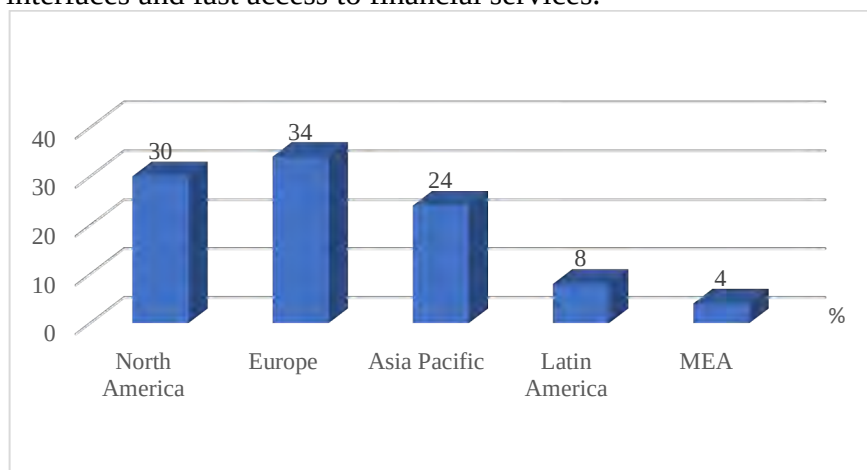


Figure 4. Neobanking Market Share, By Regions, 2024 (%)

Source: based on www.precedenceresearch.com (2025)

Neobanking has become a global phenomenon, with major players growing in different parts of the world. The neobanking market is expanding rapidly and undergoing a major shift.

Europe is the most developed region. While the US and Europe are leaders in this market, other regions, such as Asia Pacific and Latin America, are also seeing growth in neobanking.

Neobanks are a perfect fit for small businesses, digitally savvy individuals, and Generation Z looking for simple and easy-to-use banking services. These customers are often attracted to neobanks because of their cutting-edge technology, low costs, and digital convenience.

Partnerships between neobanks and traditional banks may increase, reshaping the financial services sector as a whole.

Table 1. Top Neobanks by User Base (2024)

Neobank	Revolut	N26	Bunq	Monzo	Straling Bank
No. of users	>50 million. (global, Europe)	9 million, Europe	9 million, Europe	9 million, global	3,5 million, UK

Source: based on www.sdk.finance (2025)

„Revolut dominates with expansion in 38 countries, offering services such as cryptocurrencies and loans. European non-bank revenues to exceed \$40 billion globally in 2023 (CAGR 32% since 2019)” (www.sdk.finance, 2025).

Europe dominated the neobanking market in 2024. The convenience of online and mobile banking services has led to a growing adoption of digital banking solutions among European consumers.

Below, I present key statistical data on the size of the market. These statistics reflect the evolution and projections until the end of 2034.

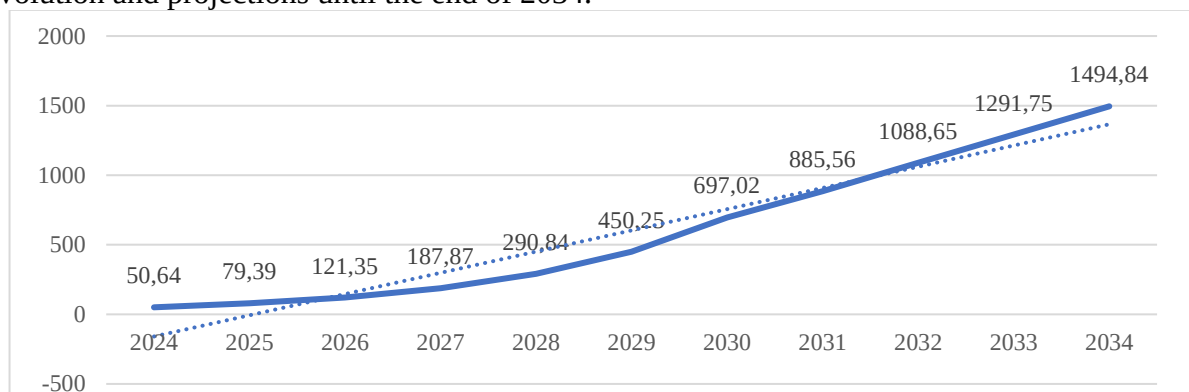


Figure 5. Europe Neobanking Market Size and Growth 2025 to 2034

Source: based on www.precedenceresearch.com (2025)

“The neobank market in Europe has experienced accelerated growth in recent years, driven by mobile technologies, PSD2 (Payment Services Directive 2) regulations and consumer preferences for personalized financial services. According to recent data, Europe dominates the neobanking segment globally, accounting for approximately 31.5% of the global market in 2024. The market value (USD billion) is 50.64, with an annual growth rate of 40.28%” (precedenceresearch.com, 2025).

The revolution is not limited to developed countries; it is influencing emerging economies, providing opportunities for innovation and competition.

4. THE PREMISES FOR THE EMERGENCE OF DIGITAL BANKS IN THE REPUBLIC OF MOLDOVA

Moldova faces challenges such as dependence on remittances and foreign loans, a rigid traditional banking system, and increasing penetration of digital technology.

The digital banking services market in the Republic of Moldova is experiencing rapid growth, driven by European integration, regulations such as alignment with SEPA (Single Euro Payments Area), and the implementation of open banking.

„Moldova is aligning with EU standards: 60% of public services for businesses are available online as of June 2024, including digital payments. Contactless and mobile payments are growing rapidly, with SEPA enabling low-cost transfers. Instant payments became operational in February 2024, and open banking APIs were rolled out in August 2024, allowing third-party providers

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(TPPs) like Revolut Lite (launched in 2023 without an NBM license)” (<https://chambers.com>, 2025).

Percentage of the Population Using Digital Banking Services in the Republic of Moldova:

- *General Financial Inclusion:* „Approximately 70-75% of the adult population (over 18 years) has access to bank accounts or formal financial services, according to BNM and World Bank reports from 2023-2024. Of these, adoption of digital services (e.g., mobile apps, electronic payments) is estimated at 50-60%, driven by the launch of the MIA instant payment system in 2024. This marks an increase from 40% in 2022, fueled by SEPA integration and open banking” (www.interoperable-europe.ec.europa.eu, 2024).
- *„MIA Instant Payments Adoption:* By June 2025, the MIA system has over 600,000 users (including individuals and businesses), processing over 1 million transactions monthly with a cumulative value of 4.8 billion MDL. With a resident population of approximately 2.4 million (per the 2024 Census), this corresponds to a penetration rate of about 25% of the total population or 30-35% of the adult population (estimating 1.8-2 million adults). Additionally, digital payment volumes have surpassed cash withdrawals at ATMs, indicating a behavioral shift toward digital channels” (www.interoperable-europe.ec.europa.eu, 2024);
- *Other Digital Indicators:*
 - a) *Government Electronic Payments (MPay):* Used by over 40% of households for taxes and fines in 2024, per the European Commission Factsheet.
 - b) *Smartphone Penetration:* Approximately 75% of the population in 2024, crucial for mobile banking, though rural internet access limits adoption to 50% in rural areas.

„These estimates are based on the National Financial Inclusion Strategy (SNIF 2030), launched in 2025, which targets 80% digital inclusion by 2030, focusing on financial education and rural access. Challenges include: only 60% of public services are online, and 40% of the population (rural) has limited internet access” (www.bnm.md, 2025).

„The data and analysis regarding the contribution of digital banking to SDG 8 (Decent Work and Economic Growth) in the Republic of Moldova, including statistics on remittances, microfinance, and digital banking adoption, are sourced from credible and publicly available reports. Below are the exact links to the sources referenced, along with a brief description of the specific information each provides. These sources support the claims about remittance volumes (2 billion USD, 13-15% of GDP), MIA instant payment system usage (600,000 users, 4.8 billion MDL transactions), microfinance loans (2.5 billion MDL, 200,000 beneficiaries), SME employment (60% of workforce), digital banking adoption (50-60% of adults, 25% of population), and MPay usage (40% of households)” (www.bnm.md, 2025).

Table 2. Data on digital banking services in the Republic of Moldova

Digital Indicator	Value 2024-2025	Details
Online Public Services (Businesses)	60% (June 2024)	Includes MPay for government transactions
Instant Payments	Operational since Feb. 2024	Aligned with SEPA; expected growth
Open Banking (API Rollout)	Launched Aug. 2024	Enables AIS/PIS services; NBM registration required
Contactless/Mobile Payments	CAGR +54.85% (POS, 2019-2023)	Includes NFC, QR, mPOS
Digital Wallets & In-App Payments	Growing; Revolut Lite active	Integration with local banks

Source: based on <https://chambers.com/legal-trends/the-future-of-digital-finance-and-currency-in-moldova> (2025)

To restore confidence after several crises, the National Bank of Moldova (NBM) has implemented strict regulations including the adoption of Basel III standards. However, the

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Moldovan banking system is highly concentrated. The main premise for non-banks is the need for innovation.

The premises for the emergence of non-banks in the Republic of Moldova are:

- *technological factors* – along with other investments, investments in 4G/5G infrastructure, facilitate access to fintech services;
- *economic and socio-demographic factors* – Moldova’s economy is characterized by a high dependence on remittances, and international transfers are expensive through traditional banks. Neobanks offer low commissions (below 1% for transfers), which is a strong economic premise;
- *regulatory framework* – NBM regulations allow non-bank entities to provide financial services. This opens the door for non-banks, allowing licenses for electronic money institutions.

Conclusions

Digital banking is changing finance. It brings efficiency, accessibility, and innovation. Technologies are developing fast. Banks must balance innovation with security and inclusion. In the future, the metaverse and decentralized finance (DeFi) may expand this change. Governments and institutions should promote digital education. They should also create adaptable rules. Future research can study the impact on economic sustainability.

Impact of digital banking:

- *For consumers:* It offers 24/7 access. It has low fees. It supports financial inclusion. However, benefits are greater in urban areas with good internet.
- *For industry:* Traditional banks are digitizing. Some partner with fintech companies. Others merge.
- *Global impact:* In developing economies, it helps with fast money transfers. It supports microfinance. It contributes to Sustainable Development Goals (SDG 8: Decent work and economic growth).

Neobanks offer access through mobile apps or websites. Customers like the accessibility without branches. Neobanks have low costs. So, they offer good interest rates on loans and savings accounts. Often, they have no fees for transactions or account management. Their services are simple and easy to use. Customers prefer neobanks because they are used to digital platforms. These banks attract customers who want low banking costs.

Neobanks focus on customers. They offer personalized services. They add new features, like real-time notifications, budgeting tools, or connections with other financial apps. Customers want convenient and personalized services. Neobanks meet these demands. They change the banking market through innovation and customer focus.

Neobanks can operate globally. They expand their services to many countries. This way, they attract more customers and grow in the neobank market.

Neobanks in Moldova started for many reasons. Technology is improving. The economy needs help. Young people use digital tools a lot. Rules are getting better.

Neobanks can change banking. They lower costs. They make banking easier for more people. This helps with sustainable goals.

The future depends on foreign money and local changes.

To get the most benefits, leaders should support digital learning and online safety. Future studies can look at how neobanks help people in Moldova access banking.

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OPPORTUNITIES FOR ECONOMIC GROWTH OF THE REPUBLIC MOLDOVA IN THE CONTEXT OF INTERNATIONAL FINANCIAL MARKET VOLATILITY

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Abstract: The economy of the Republic of Moldova faces significant challenges arising from the global context characterized by financial market volatility. Key drivers of this instability—including geopolitical and energy crises, post-pandemic effects, inflationary pressures, and trade imbalances—directly impact small and open economies such as Moldova. The country, with a limited domestic market, dependency on energy imports, and significant remittances from its diaspora, remains vulnerable to external shocks. Nevertheless, this context presents not only risks but also strategic opportunities for economic development and international integration.

The analysis indicates that financial market volatility affects Moldova through three main channels: investment flows, financing costs, and export competitiveness. During periods of uncertainty, foreign investors become more cautious, reducing capital inflows, while rising international interest rates increase borrowing costs. At the same time, currency fluctuations and shifts in global demand put pressure on the trade balance.

Despite these constraints, Moldova possesses several opportunities to stimulate medium- and long-term economic growth. Key opportunities include economic diversification through the development of high value-added sectors such as information technology, creative industries, organic agriculture, and renewable energy. The Association Agreement and the Deep and Comprehensive Free Trade Area with the European Union facilitate integration into international markets, while access to external financial resources (grants, concessional loans, green bonds) can support investments in infrastructure, digitalization, and energy transition. Strengthening human capital and modernizing institutions are also essential prerequisites for enhancing economic resilience.

The overall conclusion is that Moldova can transform international volatility into a catalyst for development if it combines prudent macroeconomic policies with structural reforms focused on competitiveness and sustainability. European integration, economic diversification, and investment in human capital represent the key elements for ensuring sustainable economic growth in the current global context.

Keywords: financial market, economic development, diversification, volatility, inflationary pressures.

JEL Classification: G10, G20

Introduction

The economy of the Republic of Moldova is in a complex stage of transition, marked by structural reform processes and European integration. The current global context, dominated by volatility in international financial markets, creates both risks and opportunities for a small and open economy like Moldova's. Capital flows, geopolitical uncertainty, variations in energy and agricultural product prices, as well as changes in international trade policies, directly influence the country's development prospects. At the same time, the dynamics of regional integration and

access to external funding provide conditions for relaunching and diversifying the national economy.

The growth opportunities of the Republic of Moldova have become a crucial topic in the context of international financial market volatility. Over recent decades, the Moldovan economy has undergone a series of transformations influenced both by global dynamics and internal factors. This paper aims to analyze in depth the current economic conditions and to identify possible ways in which the Republic of Moldova can realize its growth potential despite the unstable international environment.

In a world characterized by economic interconnections, rapid changes in the global financial markets have a direct impact on emerging economies, including Moldova. Financial crises, exchange rate fluctuations, and shifts in international trade policy generate a high degree of uncertainty, affecting both domestic and foreign investment. Thus, the study of economic growth opportunities becomes vital in order to understand how the Republic of Moldova can adapt to these volatile conditions and strengthen its economic resilience.

1. Current economic context of the Republic of Moldova

The Republic of Moldova is characterized by a small domestic market, dependence on remittances and energy imports, but also by significant growth potential in areas such as agriculture, information technologies and the service sector. According to the National Bank, macroeconomic vulnerabilities remain high, but fiscal reforms, digitalization of public administration and proximity to the European market increase economic resilience.

The Republic of Moldova is facing a complex economic situation, marked by internal and external challenges that influence its development. Recently, the country has been affected by the effects of the COVID-19 pandemic, geopolitical tensions in the region, in particular the conflict between Russia and Ukraine, as well as the unstable global economic context. Domestically, the Moldovan economy remains vulnerable, with an economic structure largely based on agriculture, which contributes significantly to GDP.

However, agriculture is extremely sensitive to climatic conditions and global market fluctuations. In addition, the lack of economic diversification has exposed Moldova to significant risks. Corruption and political instability have also significantly affected investor confidence and the state's ability to implement the necessary reforms. The operational data published by the NBS for the first two months of the second quarter of 2025 outline some premises for the recovery of economic activity in the reference period, but with its maintenance in negative territory.

Industrial production remained positive for the third consecutive month, recording an increase of 6.4 percent, while domestic retail and wholesale trade increased on average by 4.3 percent and 1.5 percent, respectively. In April-May 2025, the annual export rate registered a level of -8.3 percent, while the annual import rate continued the positive dynamics, recording 16.9 percent compared to the same period of the previous year. Global agricultural production decreased by 3.6 percent in the second quarter of 2025 compared to the same quarter of the previous year.

Inflation was another major problem, accelerated by the increase in energy and food prices, a phenomenon observed at the global level. The Moldovan government was forced to implement support measures for the population, which, however, put additional pressure on the state budget. In addition, the forced migration of a significant part of the population in search of better-paid jobs abroad reduced the labor force available in the country and led to a decrease in tax revenues.

The restrictive monetary policy cycle has ended. Thus, the National Bank continues to focus on stimulating aggregate demand, including by encouraging consumption and investment, on balancing the national economy and the current account, as well as on anchoring inflationary expectations, taking into account temporary lags in monetary policy transmission through the interest rate channel.

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The NBM's decision to resume monetary policy easing measures is based on the confirmation of the latest forecast of the National Bank of Moldova and the associated disinflationary trend. The effects will continue to be transmitted gradually through the decrease in interest rates in the money, deposit and credit markets. The moderation of annual inflation confirms and validates the correctness and timeliness of the restrictive nature of the previously adopted monetary policy measures.

The shocks to some components of the Consumer Price Index in May-June of this year, as a result of tensions in the Middle East, had a very short-term inflationary impact and have partially dissipated. The previously developed and current forecasts confirm the entry of inflation into the target range in December of this year. According to the current forecast, by the end of this year and in the first half of next year, the annual inflation rate will have a downward trend, and then it will register a stable trend until the end of the forecast period against the background of disinflationary aggregate demand.

It should be noted that domestic economic activity and inflation are still influenced by the effects of supply-side shocks, including increases in regulated tariffs from the end of 2024 and the beginning of this year, and the decrease in the volume of agricultural production affected by adverse weather conditions.

Annual inflation was 8.2 percent in June 2025 and decreased from 8.8 percent in March 2025, remaining above the upper limit of the ± 1.5 percentage point variation range from the inflation target of 5.0 percent. At the same time, the annual inflation rate in the second quarter of 2025 was attested to moderate, reaching 7.9 percent, 0.9 percentage points lower than in the previous quarter and 0.1 percentage points higher than the value anticipated in the Inflation Report, May 2025.

In August 2025, the total volume of new loans granted decreased by 7.6 percent compared to the previous month. At the same time, compared to August 2024, the volume of new loans granted increased by 15.1 percent. The average interest rate on new loans granted in the national currency recorded an insignificant increase compared to the previous month. New loans granted in the national currency represented 73.3% of the total volume of new loans granted in August 2025.

The deviation from the forecast was due to the positive deviations recorded for food, fuel and regulated prices, while core inflation evolved in line with expectations. At the global level, Moldova felt the impact of the energy crisis triggered by geopolitical conflicts. This led to significant increases in oil and gas prices, directly affecting production costs for businesses and, implicitly, the standard of living of the population.

The country's dependence on energy imports has become an obvious vulnerability, and the search for alternative energy sources has become a national priority. On the other hand, relations with the European Union and the desire to integrate Moldova into European structures have also been an essential part of the economic context. Association agreements and reforms encouraged by the partnership with the EU have opened up opportunities, but their implementation has often been hampered by internal problems, including integration and adoption of European norms.

Despite the challenges, there are also opportunities, and Moldova's economic context offers a window for reforms. Promoting foreign investment, increasing the competitiveness of the private sector and modernizing the infrastructure are essential directions for stimulating economic growth. Also, the development of the technology and IT sector, which has proven resilient in times of crisis, can offer development prospects and employment opportunities for young people.

The current economic context of the Republic of Moldova is marked by challenges and opportunities. The government's ability to address these issues and implement appropriate policies will influence the future economic direction of the country. It is essential for Moldova to diversify its economy, reduce its dependence on sectors sensitive to external fluctuations, and improve the

business climate to attract investment and create sustainable jobs. This is a major challenge, but also an opportunity for more equitable and stable development in the future.

2. Impact of international financial market volatility

International financial market volatility refers to significant fluctuations in the prices of financial assets, such as stocks, bonds, commodities and currencies. These fluctuations are often caused by a combination of economic, political and psychological factors and can dramatically influence the global economy, financial stability and investment decisions of financial market participants. In this context, it is essential to understand the impact of volatility, both at the micro (individual) and macro (national and global economies) levels.

Volatility is an indicator of the risk associated with investments. A volatile market can generate profit opportunities, but it can also bring significant losses. This is often measured by the percentage change in the prices of financial assets over a defined period, and a frequently used volatility index is the VIX, known as the “fear index”. It measures investors’ expectations regarding market volatility over the next 30 days.

One of the most direct effects of volatility is on investors. On the one hand, short-term investors, such as day traders, can benefit from rapid price movements. They can adjust their trading strategies to take advantage of price movements. On the other hand, long-term investors, who take a more conservative approach, can face significant anxiety in the face of market volatility. They may be tempted to sell their assets in times of panic, which leads to realized losses, even when the fundamentals of the economy remain strong. Publicly traded companies are highly influenced by the volatility of financial markets.

A company’s share price is often a barometer of investor confidence in its ability to generate future profits. During periods of excessive volatility, companies may have difficulty raising capital, either through initial public offerings (IPOs) or through bond issuances. Moreover, rapid price fluctuations can affect management’s decision-making regarding capital investment and operational expansion. This can lead to stagnant innovation or missed growth opportunities over time.

The global economic environment has become more challenging in 2025, amid heightened uncertainty about trade policies and rising trade barriers, with the risk of further adverse changes, particularly in trade relations between the largest economies. Rising trade restrictions reduce the near-term trade outlook – despite solid trade growth earlier this year, which partly reflected the concentration of imports by some large economies in anticipation of tariff increases.

Beyond the direct impact of rising tariffs, the potential for further rapid changes in the timing and magnitude of trade-restrictive measures is a source of policy uncertainty weighing on the confidence index. Commodity prices have fallen substantially, reflecting new headwinds for global manufacturing and industrial activity in general. With the resurgence of global core inflation pressures, the pace of global disinflation has slowed, while survey-based inflation expectations in key countries have risen in line with developments related to US tariffs. Trade policy changes and the associated increased uncertainty have weighed heavily on financial markets earlier this year, although risk appetite has largely recovered in recent weeks.

After being hit by a series of adverse shocks in 2020-2024, the global economy faces a significant new shock in 2025, with increased trade barriers and policy uncertainty, leading to a notable deterioration in the forecasts compared to those published in January. In particular, global output is expected to grow at its weakest pace since 2008. The significant increase in tariffs and the resulting uncertainty are contributing to a broad-based slowdown in growth and a deterioration in the outlook for most economies around the world. The weak global growth outlook is unlikely to improve significantly without policy action to address rising trade restrictions, geopolitical tensions, heightened uncertainty, and limited fiscal space.

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In this context, global economic growth will slow this year to 2.3%, substantially weaker than previously forecast. Subsequently, growth is estimated to strengthen to around 2.5% in 2026-2027, as trade flows adjust to higher tariffs, so that global trade will register a slight increase, while political uncertainty will moderate from record levels. The downgrade in global economic growth this year is mainly driven by advanced economies. This slowdown is forecast to focus on investment, including foreign direct investment and portfolio flows, which tend to respond more to changes in demand than to aggregate output, and trade, with widespread negative effects on other economies.

In advanced economies, economic growth is expected to decline from 1.7% in 2024 to 1.2% in 2025 and to recover to 1.7% in 2026. It is worth noting that the growth forecasts for 2025 have fallen substantially compared to those in January, driven by downgrades in some of the world's largest economies. This reflects the shock generated by increased trade restrictions (even with the partial 90-day pause in tariff increases announced by the US) and the associated political uncertainty, financial volatility and the dampening effects of the confidence index. As a result, growth is expected to remain below potential growth estimates over the forecast horizon in some advanced economies, including the United States and the euro area.

In the US, economic growth is forecast to decelerate sharply in 2025, to 1.4%, down from 2.8% in 2024. Investment spending is expected to be particularly affected by the initial concentration of imported capital goods. Going forward, the supply of capital goods is expected to be disproportionately affected by tariffs, given their high import content, as investment demand falls due to record uncertainty, rising financing costs, and weaker domestic and external demand. In 2026, growth is expected to ease to 1.6% as the economy adjusts to higher trade barriers and policy uncertainty gradually recedes. In the euro area, the recent increase in political uncertainty and financial volatility, as well as increases in tariffs imposed on the European Union by the US, are expected to prolong the bloc's economic weakness, holding back investment and trade recovery.

The EU is exposed to adverse trade policy changes and related uncertainty, given its high openness to trade, with extra-EU trade in value terms placing the bloc as the second largest exporter and importer of global goods in 2022. The bloc is also vulnerable to these external shocks due to its deep integration into global value chains. Together, these developments are set to further weigh on exports, compounding the losses in competitiveness and global market shares of exports resulting from high energy prices in recent years. Economic growth in the euro area is expected to slow to 0.7% in 2025 and remain slightly below its trend of around 1%, averaging 0.9% over 2026-2027. Economic growth in emerging market and developing countries (EMDEs) is expected to slow to 3.8% in 2025, before picking up slightly to 3.9% in 2026-2027. China's economy is expected to decelerate over the forecast horizon from 5.0% in 2024 to 4.5% in 2025 and 4.0% in 2026, as the short-term stimulus from fiscal policy fades amid slowing potential growth.

Meanwhile, near-term growth in many other EMDEs is expected to decelerate amid weaker investment, which is likely to significantly dampen any potential benefits of trade rebalancing over the forecast horizon. Against a backdrop of a deteriorating external environment, EMDEs' progress in closing their large per capita income gaps with advanced economies, boosting job creation, or reducing extreme poverty rates is expected to remain insufficient, leaving poverty rates above pre-pandemic levels in many poorer or more vulnerable EMDEs. At the same time, many of these economies face an imminent jobs challenge in the coming decades, particularly if employment growth continues to outpace population growth.

Risks to the global outlook remain firmly tilted to the downside. High and persistent policy uncertainty – particularly around trade – could lead to a larger-than-expected weakening in investment, trade and confidence. The repeated escalation of trade restrictions could push inflation higher in key economies, amplifying real income losses and limiting the ability of major central

banks to support sluggish growth by lowering policy rates. This context also implies several potential triggers for a decline in financial risk appetite, which could spill over globally and amplify negative surprises to growth. Even with efforts to resolve major conflicts, geopolitical tensions and risks of regional conflict persist in many parts of the world and could contribute to further geopolitical fragmentation. Moreover, the escalation of conflicts could lead to concentrated and long-lasting output losses, particularly in emerging markets. Natural disasters, which have increased in frequency and intensity over time, pose another ongoing threat in many economies.

However, there are also several significant factors in the direction of economic growth. A reduction in trade tensions on the back of recent and ongoing negotiations – for example, through additional trade agreements between major economies that provide lower tariffs – would reduce uncertainty, limit trade disruptions, and strengthen business and consumer confidence. A synchronous easing of fiscal policy in several major economies could ease downward pressures on demand, while putting upward pressure on inflation, public debt levels, and interest rates. Efforts to make broad use of recent advances in technology – in particular artificial intelligence (AI) – could lead to stronger-than-expected global investment growth and could begin to contribute to overall productivity improvements.

Companies and investors are currently using a variety of strategies to manage their exposure to volatility. This includes diversifying portfolios, using derivatives for hedging, and adopting more sophisticated risk management techniques. Investors can also adopt an approach based on modern portfolio theory, which supports asset diversification to reduce risk without compromising potential returns.

Volatility in international financial markets is a complex phenomenon with profound implications for investors, companies, and economies. While it can offer opportunities for profit, it also presents significant risks that require careful management. In an interconnected world where markets are affected by a multitude of international factors, understanding volatility and its impact becomes crucial for all participants in financial markets. In the face of these challenges, the ability to adapt and innovate will determine success in navigating these uncertainties.

3. Opportunities for economic growth

The Republic of Moldova, one of the smallest economies in Eastern Europe, has significant potential for economic growth, despite the challenges it faces. In recent decades, the country has undergone numerous structural reforms and sought to integrate its economy into international trade flows. Here are some of the key economic growth opportunities for the Republic of Moldova, supported by relevant statistical data. The volatility of international financial markets has become a defining feature in a globalized world, profoundly influencing emerging economies, including the Republic of Moldova. Although this volatility generates risks and uncertainties, it also offers significant opportunities for the country's financial progress. In the following, we will explore various areas in which Moldova can take advantage of these opportunities in the current global context.

Diversifying external financing sources

One of the most important aspects of financial stability is the diversification of financing sources. The Republic of Moldova can improve its position in international markets by attracting funds from various sources, including foreign direct investment (FDI), investment funds and grants from international organizations.

For example, partnerships with international financial institutions, such as the World Bank and the International Monetary Fund, provide not only financial support but also expertise in implementing economic reforms. These loans can be used to develop infrastructure and support economic development projects. In 2022, Moldova recorded a 9% increase in FDI, demonstrating the increased interest of foreign investors.

Support for innovation and technology

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The volatility of financial markets has generated increased interest in innovation and technology, given that digitalization can provide effective solutions to current economic problems. Moldova's IT sector, which has grown rapidly in recent decades, benefits from well-trained human capital and a dynamic entrepreneurial community.

Investments in technology and innovation not only improve efficiency, but also facilitate access to wider international markets. In addition, such initiatives contribute to attracting foreign capital. Increased support for local startups and accelerator programs can generate a positive economic cycle, creating jobs and increasing incomes.

Attracting investors by stabilizing the economy

In the context of financial volatility, economic stability is becoming a primary factor in attracting investors. The Government of the Republic of Moldova has implemented a series of reforms aimed at improving the business environment, including simplifying administrative procedures and improving transparency.

These measures not only contribute to a climate of trust, but also to a better assessment of risks associated with investors. A credit rating agency recently noted improvements in the country's credit rating, which can attract foreign funds and reduce borrowing costs.

Exploring international markets

The volatility of financial markets can also be exploited by expanding international trade opportunities. The Republic of Moldova has access to large markets, such as the European Union and those in Eastern Europe, and the use of trade agreements to facilitate access to these markets can provide competitive advantages.

For example, the Association Agreement with the European Union allows Moldovan products to be sold tariff-free on the European market. Taking advantage of this opportunity by the agricultural and industrial sectors can lead to significant increases in export revenues.

Development of financial infrastructure

A well-developed financial sector is essential to cope with the volatility of international markets. By modernizing and diversifying financial instruments, Moldova can attract more investment. Financial institutions can offer innovative financial products that support SMEs and facilitate access to credit.

In the second quarter of 2025, the weighted average interest rates on new loans and deposits in lei continued their upward trend under the impact of the transmission mechanism of previous monetary policy decisions and the situation created on the money market. Thus, the weighted average interest rate on new loans granted was 8.99 percent annually, and that on deposits was 4.91 percent annually, up by 0.52 and 0.77 percentage points, respectively, compared to the first quarter of 2025.

The consecutive increase in interest rates in the banking sector since the beginning of this year led to a slowdown in the lending process in the national currency for the second consecutive quarter.

Financial innovations, such as fintechs, can contribute to improving population's access to financial services, increasing trust in the banking system. For example, the digitalization of banking services and the promotion of online financial investments can attract a young generation of economists and entrepreneurs.

Conclusions

The Republic of Moldova faces a dual challenge: adapting to global volatility and capitalizing on international integration opportunities. The key to success lies in consolidating macroeconomic stability, encouraging sustainable investments and diversifying the economy. If it manages to combine prudent economic policy with deep structural reforms, the Republic of Moldova can transform international volatility into a catalyst for sustainable economic growth.

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The Republic of Moldova is in a position to capitalize on numerous opportunities for financial progress in the context of volatility in international financial markets. Diversifying sources of financing, supporting innovation, stabilizing the economy, exploring foreign markets and developing financial infrastructure are strategic directions that can turn challenges into opportunities. Collaboration between the public and private sectors, international support, and a clear vision for economic development are essential to transform these opportunities into a sustainable competitive advantage.

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WORKING CAPITAL MANAGEMENT: STRATEGIES AND PRACTICAL RECOMMENDATIONS

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Abstract: In an unstable economic environment and with constant changes in market conditions, companies are faced with the need to develop and implement strategies aimed at optimising working capital. Effective working capital management is critical to the financial stability, operational efficiency and profitability of any organisation. Working capital, which is the difference between current assets and current liabilities, reflects a company's liquidity and its ability to finance its current operations. This article explores key working capital management strategies, analysing their impact on financial performance, and offers practical recommendations for their implementation.

Keywords: working capital, working capital management, current assets, current liabilities, liquidity, financial stability, turnover, inventory management, accounts receivable management, accounts payable management, cash cycle.

JEL Classification: G31, G32

1. Introduction

Working capital management is one of the key tasks of financial management, playing an important role in ensuring the sustainability and financial flexibility of enterprises. Working capital, which includes inventories, accounts receivable and cash, is the basis for maintaining the company's current operations and fulfilling its obligations to creditors and suppliers. Effective management of this capital not only contributes to the optimisation of financial resources, but also affects the liquidity, profitability and overall financial performance of the organisation. (Grigoriev, A. V. *et al.* 2020)

Inefficient working capital management can lead to a number of negative consequences, including: (Kovalev, V. A. 2017)

- Liquidity shortage: Inability to meet obligations on time, which can result in penalties, loss of trust from suppliers and creditors, and ultimately bankruptcy.
- Freezing of funds: Excess inventory or illiquid accounts receivable tie up valuable cash that could be used for investment, debt reduction, or dividend payments.
- Reduced profitability: High costs of financing excess working capital or losses from illiquid assets directly reduce a company's profitability.

Working capital management strategy is the ability to allocate, preserve and increase a company's working capital and is aimed at maximising its income. Business structures vary in many ways, which is why priorities in working capital management strategy may gradually change as specific goals are achieved.

Consequently, the development and implementation of effective working capital management strategies is a prerequisite for long-term success.

2. Working capital management strategies

Effective working capital management is based on optimising each of its components, striving for a balance between liquidity and profitability. The main strategies include: (Litvinova, N. V. *et al.* 2019)

2.1. Cash Management

Objective: To minimise the amount of cash that does not generate income, while ensuring that sufficient funds are available to cover current operating needs and unforeseen expenses.

- **Cash Flow Forecasting:** Regular and accurate forecasting of incoming and outgoing cash flows allows potential cash deficits or surpluses to be identified.
- **Optimisation of banking operations:** Use of centralised bank accounts (cash pooling) for effective cash management of the group of companies, minimisation of transaction fees.
- **Deposit management:** Placing surplus cash in short-term deposits with high liquidity to generate additional income.
- **Effective payment management:** Rational planning and execution of payments, use of more favourable payment terms with suppliers (without damaging relationships).

2.2. Accounts receivable management

Objective: Reduce customer payment terms while minimising the risk of non-payment.

- **Credit policy:** Develop clear credit criteria and assess customer creditworthiness before granting payment terms.
- **Establishing clear payment terms:** Including payment terms in contracts and invoices, using payment reminders.
- **Encouraging early payments:** Offering discounts for early payment.
- **Managing overdue debt:** Actively engaging with customers who have overdue debt, taking measures to collect it (e.g., penalties, transferring the debt to collection agencies).
- **Factoring:** Selling accounts receivable to specialised financial companies to obtain immediate cash.

2.3. Inventory Management (Litvinova, N. V. et al. 2019)

Objective: To maintain optimal inventory levels that ensure uninterrupted production and sales while minimising storage, obsolescence and loss costs.

Inventory management models:

- **ABC analysis:** Classification of inventory by cost and importance to determine management priorities.
- **EOQ (Economic Order Quantity):** Calculation of the optimal order size that minimises total ordering and storage costs.
- **MRP (Material Requirements Planning) and ERP (Enterprise Resource Planning) systems:** Integrated resource management systems that allow you to plan material and production requirements based on order data and production plans.
- **Just-in-Time (JIT) approach:** Obtaining materials and manufacturing products only when they are needed, which minimises inventory.
- **Improved demand forecasting:** Accurate demand forecasting helps avoid both shortages and excess inventory.
- **Supplier relationship management:** Building strong partnerships with suppliers to ensure timely deliveries and flexible terms.

2.4. Accounts payable management (Litvinova, N. V. et al. 2019)

Objective: To use available credit limits from suppliers to finance operating activities, extending payment terms without violating contractual relationships.

- **Use of deferred payments:** Maximum use of payment terms provided by suppliers.
- **Payment planning:** Optimally distribute payments among suppliers based on their terms and our financial capabilities.
- **Discounts for early payment:** Assessing the advisability of using discounts for early payment by comparing them with alternative sources of financing.
- **Negotiations with suppliers:** Negotiating more favourable payment terms, especially for long-term partners.

3. Practical Recommendations for Implementing Effective Working Capital. (Litvinova, N. V.*et al.* 2019)

Management Effective working capital management helps to increase liquidity, reduce financial risks and improve the overall financial stability of an enterprise.

Key practical steps for implementing effective working asset management methods include: (Chistyakova, O. V.*et al.* 2018)

1. Analyzing the current state of working capital.

- Conducting a comprehensive audit of current assets and liabilities.
- Identifying key bottlenecks and risk areas (e.g. excess inventory or late payments from debtors).

2. Inventory optimization.

- Implementing an automatic inventory accounting and planning system (e.g. JIT — just in time).
- Reviewing the range and volume of inventory, excluding surplus and obsolete goods.
- Regularly analyzing inventory turnover and adjusting their level.

3. Improving work with debtors.

- Introducing a clear customer credit policy: setting limits, payment terms, penalties for late payments.
- Systematic monitoring of accounts receivable, timely reminders of payments and the use of collection measures if necessary.
- Using factoring or other instruments to accelerate the receipt of payments.

4. Optimizing obligations to suppliers.

- Negotiating more favorable payment terms (deferrals, discounts for early payment).
- Planning payments so as to maximize the use of credit lines without compromising business relationships.

5. Financial planning and forecasting. (Chistyakova, O. V.*et al.* 2018)

- Developing short-term budgets for cash flow and working capital.
- Using scenario planning to assess possible risks and develop measures to minimize them.

6. Implementation of information systems.

- Using modern ERP systems to automate the accounting of assets and liabilities, analyze data in real time.
- Ensuring the availability of information for prompt decision-making.

7. Performance control and monitoring.

- Regularly tracking key indicators (liquidity ratios, inventory turnover).
- Conducting periodic reviews of the working capital management policy and adjusting it if necessary.

8. Developing a long-term management strategy. (Chistyakova, O. V.*et al.* 2018)

- Formulating a strategic goal for the level of working capital in accordance with the business strategy of the enterprise.
- Integrating working capital management into the overall corporate management system. By following these recommendations, an enterprise will be able to improve the efficiency of its resources, reduce costs, and ensure stable operations even in conditions of market uncertainty.

4. Conclusion

Working capital management is an ongoing process that requires constant attention, analysis, and adaptation. Companies that successfully master the art of working capital management will gain significant competitive advantages. They will be characterized by higher liquidity, better financial stability, A lower cost of capital and, consequently, higher profitability. Implementing effective strategies and leveraging modern tools will enable organizations not only to survive

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economic uncertainty but also to thrive, ensuring sustainable growth and financial independence.

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API INTEGRATION IN THE BANKING ECOSYSTEM: THE ROLE OF OPEN BANKING

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Abstract: To provide banking services to clients at any location in the world has become a necessity as the economy operates on a global scale. This has brought about the innovations of both Fintech companies and digital ecosystems. They offer additional competition and remote services to consumers banking on other institutions. Having little infrastructure at a global scale results in a lack of trust with the consumers, and an inexperience when it comes to the financial industry, confines these organizations to a lack of customer bases.

Open banking systems will permit the clients to handle their assets from a single dashboard. It will replace the multitude of applications used from different banking institutions by providing a single comprehensive unified application that will integrate different financial products such as accounts, loans, credit and debit cards, insurance and investments.

Open banking systems as a model is integrated with a host of other networking facilities, and associated with the need for advanced data protection systems. It is vital for the clients these days to keep in mind that they are not simply surrendering their data to any and every organization. Data is only accessible to any of third parties after the clients have expressly given consent for their data to be processed.

The open banking model using application programming interfaces is the first step in a sequence of innovations to banking processes.

Keywords: open banking, API, digitalization, banking services, data security, client safety

JEL Classification: G21, O33, G28

INTRODUCTION

The digital transformation has influenced the development of the financial market and the economy as a whole, leading to the widespread use of digital financial services by both individuals and companies, as well as to an increase in consumer demands regarding improved convenience and security of the products and services offered, along with the diversification of their range. In order to create new, modern services for clients, service providers are compelled to identify new business models and solutions, and to develop the information technologies that will be applied. At the same time, traditional perceptions of consumers and market participants regarding the importance of financial data and the possibilities of managing it are also changing.

In many countries, including the Republic of Moldova, there is a visible trend of expanding access to data. For a long period, in the financial sector and in other branches of the global economy, application programming interfaces (APIs) have been widely used. Companies primarily use APIs to simplify and speed up digital data exchange in integration projects, to expand the functionality of internal systems and launch mobile services, as well as to connect business partners. Currently, open APIs are gaining particular importance. Their main distinction from internal or partner APIs lies in the fact that they are developed according to open standards and imply equal access for all participants. A number of countries are already actively implementing initiatives for the introduction of open APIs. Generally, three data-sharing models based on open APIs are considered: Open Banking, Open Finance, and Open Data.

A common feature of all levels is that client data may only be obtained with the client's consent, while the main difference between the models lies in the composition of the data provided by companies. Open APIs are programming interfaces published by organizations in accordance with the requirements of the National Bank of Moldova, in order to enable digital data exchange with service providers (with the client's consent) and with clients in the process of organizing and delivering financial services.

Open Banking is a model whereby service providers obtain clients' banking and payment data, as well as carry out banking operations at the client's initiative.

Open Finance is a model under which service providers receive not only banking and payment data, but also information on other financial services: insurance, investments, pensions, and others.

Open Data is a model that extends the requirement of open client data exchange to both financial and non-financial companies (for example, enterprises in telecommunications, e-commerce, etc.), as well as to state information databases where client data is stored and processed.

MATERIAL AND METHOD

In the specialized literature, issues related to the influence of open application programming interfaces on the future of financial services provision by commercial banks are still in the formative stage. In the process of delivering various banking services, commercial banks are involved in collecting, processing, and storing data such as clients' personal information, preferences, performed operations, and their frequency, etc. With the increase in the number of services and products offered, banks face the challenge of accessing the full spectrum of data regarding clients and executed transactions, as well as using this data to better respond to clients' needs. Each commercial bank chooses the optimal way of storing this information, while resorting to third-party companies – outsourcing – to cover a certain range of activities has become a rather common practice. This can occur for several reasons, for example: the lack of necessary functionalities developed internally. Another example may be business diversification, creating an ecosystem capable of attracting as many clients as possible by diversifying the range of services provided. In both cases, the need arises for rapid access to internal information, the solution being represented by open APIs.

Thus, an API is a software intermediary that allows applications to interact with each other and exchange data.

A banking API is an API that allows an external application to access the bank's internal information systems. These manage clients' accounts, process incoming and outgoing transactions, and generally automate and support activities considered banking services. The most widespread example of the use of a banking API is the mobile banking application, which currently exists at practically every bank. When a client presses the button to check the balance of their account, the application uses the banking API to create and send a request to the bank's corresponding information system. The system, in turn, transmits the requested information. If a client makes a payment from the mobile banking application, the application uses the API to create and transmit to the bank the corresponding electronic payment order.

In the use of the banking API for the functioning of the mobile banking application, it does not matter what happens inside the bank's information systems, where the data is stored, or how customer orders are executed. What matters is the existence of a clear list of commands and requests, the use of which leads to the completion of the task by the bank's internal systems. This list represents the banking API.

The most common applications of APIs, besides banking, are:

- Provision of weather data;

- Provision of currency exchange data;
- Online translators, which receive the text, the source language, and the target language, and return the translated text;
- Sending emails / SMS / Skype / Telegram / Viber;
- Money transfers;
- Closed interaction between servers;
- Obtaining news.

The revision of the bank's strategy and the open use of APIs can transform the bank's business in the future. It is expected that, following this process, bank cards will become a thing of the past. All online payments and transfers will be carried out directly from the account, eliminating the use of cards that require entering the number and personal data. This is a timely measure, considering the increasing number of cases of users' money being stolen during online card payments.

The European Payment Directive recommends the application of a new identification procedure that involves three verification steps: login + password, SMS confirmation on the phone, and biometric data. It is even possible that the cumbersome and outdated login + password pair will be completely removed from the authentication process, as it represents the most insecure and vulnerable factor. In real transactions, plastic cards will be replaced by smartphone applications.

The origins of open banking can be traced back to the push for financial inclusion and transparency in the activity of commercial banks. This development is driven by the acceleration of the modernization process in the financial sector, making it more competitive and innovative, and also more resilient to the challenges posed by artificial intelligence. The idea came to life in Europe with the introduction of the Revised Payment Services Directive (PSD2) and the Open Banking Implementation Entity (OBIE) in the United Kingdom. These regulations required banks to open their payment services and customer data to third-party providers, substantially reshaping the traditional banking model. Thus, the key regulations are:

PSD2 in Europe: The PSD2, enforced in January 2018, is a landmark regulation in the European Union that aims to make payments more secure, boost innovation, and help banking services adapt to new technologies. It obliges banks to provide access to their customers' data to third-party payment service providers (PSPs) with the customers' consent. This opens the door for fintech companies to develop new financial products and services. The PSD2 is the revised version of the original Payment Services Directive (PSD) that the EU introduced in 2007 to create a single payment market within Europe. It set down rules and guidelines for payment services, simplified payment processing across EU countries, advocated innovation, and encouraged competition by opening payments to new entrants (Mansfield-Devine, Steve, 2016). One of the PSD2 aims is to promote innovation in the payments sector, particularly by opening it up to new, non-bank players. This aim is closely related to the formation of the open banking innovation;

One example of a successful implementation of open banking is the United Kingdom (UK), where implementing open banking regulations has led to a significant increase in competition and innovation in the financial services sector (Open Banking Limited, 2021). OBIE in the UK: The Open Banking Implementation Entity (OBIE) was created by the UK's Competition and Markets Authority to enhance competition and innovation in the UK financial services sector. OBIE has established standards and frameworks to facilitate the secure sharing of financial data between banks and third-party providers, fostering a more dynamic and customer-centric financial ecosystem;

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United States: Unlike Europe and the UK, the US lacks a single unified open banking regulation. Instead, it has a more fragmented approach with various state and federal regulations. However, the Consumer Financial Protection Bureau (CFPB) has been working on initiatives to promote consumer data access and security;

Australia (CDR): The Consumer Data Right (CDR) in Australia empowers consumers with control over their data, starting with the banking sector under the Open Banking regime. The aim is to enhance competition and encourage new service developments in the financial industry;

Asia (Singapore and Hong Kong): Singapore's Monetary Authority of Singapore (MAS) and Hong Kong's Open API Framework have been proactive in promoting open banking. Both regions have developed guidelines and standards to encourage banks to open their APIs to third parties, enhancing service offerings and consumer choice (Komandla, 2017).

In June 2023, the European Commission proposed a comprehensive Regulation on open finance, aimed at extending the principles of open banking to other financial sectors, such as insurance, pensions, and investments. This regulation seeks to facilitate data sharing across financial services, strengthen competition, and improve consumer access to financial products.

In APAC countries, including India, Japan, China, Indonesia, and Australia, the growth of open banking operations is driven by a combination of regulatory initiatives, technological advancements, and the increasing adoption of digital financial services by consumers. Consumers in the Asia-Pacific region are interested in using innovative financial products that provide convenience and personalization. The wider integration of APIs and the spread of fintech startups have also played an important role in driving market growth. In September 2023, the Government of India announced plans to expand the scope of APIs to include more financial services. This ensures real-time payments and financial data sharing, further boosting the country's open banking ecosystem (Global Market Insights (n.d.)).

In the researcher's opinion, there are several difficulties in designing an open banking system. Firstly, mutual authentication is difficult to manage transparently. Because the most important resource in Open Banking is the right to access user data and must be carefully considered, the invocation of confidential data must be registered in an organized manner. Secondly, the data source allows users to audit and track data in case of misconduct or system attacks. When this information is not available, large banks have a significant advantage, as they have access to low-cost innovations. To avoid market imbalances and to protect user confidentiality, it is important to ensure the transparency of data origin (Xu, Z. 2020).

With this challenging conception, Xu et al. (2020) suggest three main points to be managed with the advent of Open Banking, which are described in figure 1.

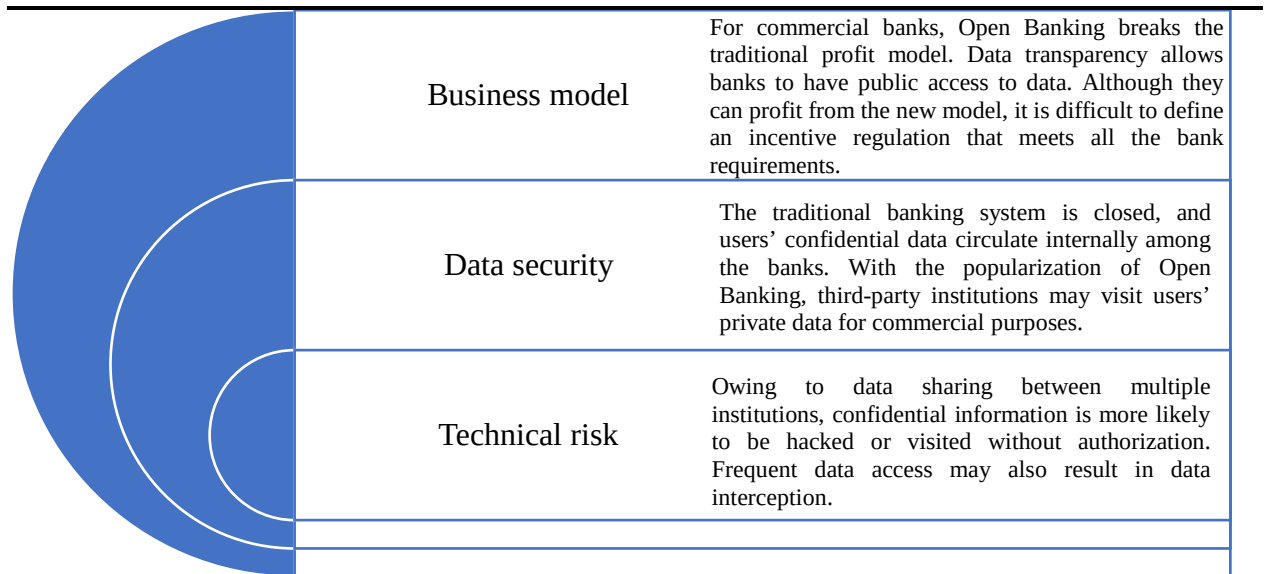


Figure 1. Main aspects to be managed in the context of the emergence of Open Banking

Source: elaborated by the author based on Xu, Z. et al. (2020)

RESULTS AND DISCUSSION

In the financial field, the integration of APIs has become a revolutionary tool, transforming the way financial services are delivered and used. APIs allow different software systems to interact with each other, facilitating the rapid integration of various financial platforms and services (Oluwaseun, Godwin, Njideka, 2024). A commercial bank has the capacity to offer a wider range of services, enhance user experience, and improve processes through strategic API integration. APIs, for example, allow banks and fintech startups to collaborate in creating new products and services such as digital wallets, instant payment solutions, and personalized financial management tools.

Collaboration between commercial banks and fintech companies can take various forms of interaction – from the simple use of fintech startups' services to full technological partnerships, investments in the implementation of new systems, or the acquisition of already developed projects (table 1).

Table1. Directions of Collaboration between Fintech and Banking Businesses

Type of collaboration	Characteristics and benefits
P2P and P2B Lending Market	In this market, banks can collaborate advantageously with electronic lending platforms or create their own similar platforms. Benefits: more favorable development conditions and additional revenue in the form of commissions, adopting technological solutions, reducing current expenses for certain types of services, and indirectly participating in activities they cannot carry out independently due to restrictions imposed by the financial regulator and the lack of legislative regulation for some aspects of this type of activity.
Open Banking	Banks must open access to their own data and services to fintech providers (through open programming interfaces – APIs). Benefits: minimizing the costs and time required for the development and implementation of financial technology innovations; gradual transition to digital banking in the banking sector; new opportunities for banks to create modern services and products that meet the needs of current and potential clients; active use of Big Data; expanded possibilities for using social networks as the main communication channel.

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Introduction of Remote Client Identification and BankID	The BankID system will allow convenient and secure user identification for the provision of a series of banking, commercial, and administrative services via the internet.
Banks' Use of Open APIs for Data and Digital Asset Monetization	Open APIs allow banks to integrate their products and services into new programs to offer clients various products or services through the banking ecosystem. This creates a partnership ecosystem and collaboration between banks and fintechs, fostering cost-saving data exchange. Open API interfaces allow clients to connect to other services within the banking ecosystem and expand the range of services offered.
New Business Model – Banks Acting as a Platform for Multiple Fintech Companies	Banks-as-a-Platform (BaaP) represents a complete change of the banking business model, directly interacting with fintech companies for their innovative solutions, enabling them to offer customers a “single order.” This collaboration will generate new revenue streams for banks with minimal infrastructure development, while fintech companies gain access to a vast customer base and substantial financial support from traditional banking networks.
Joint Cybersecurity Systems	Remote services have compelled banks to invest in cybersecurity systems due to the increasing level of cybercrime. The rise in digitalization and internet connectivity has led to more data breaches, forcing banks to strengthen their security systems.
Investments in Augmented Reality (AR)	Banks are investing in AR as it allows them to deliver flawless solutions to customers and stand out in the financial services market. AR involves the real-time use of information and other virtual extensions integrated into real objects. The ability to combine digital and physical realities will transform customer experiences, integrating continuous banking activities into daily interactions. AR programs can help the banking industry provide easy account access and faster payments. In the near future, banks will be able to replace traditional branches with virtual branches and consultants, saving time and capital.
Artificial Intelligence (AI) and Cognitive Technologies	AI and cognitive technologies allow banks to accelerate digitalization initiatives and deliver targeted, personalized products and services. AI is increasingly important in banking through customer assistance with voice assistants, enabling more efficient responses to customer requests. AI will also support decision-making in banks, suggesting possible courses of action based on data analysis. As fintech companies emerge, banks will explore the use of AI to enhance efficiency and customer experience, reduce cloud computing costs, and reshape employee work profiles.
Robotic Process Automation (RPA)	RPA is a technology that imitates human interaction with computers. It speeds up processes by removing human involvement in physically difficult, monotonous, or concentration-intensive tasks, thereby accelerating task execution.

Source: elaborated by the author

Considering the international trends in the development of fintech companies, banks are showing interest in creating joint projects with developers of innovative financial technologies. As fintech companies become more mature and technology-oriented, they face the necessity of investing more resources in complex software, supported by advanced analytics and personalized marketing campaigns.

In this context, we deem it appropriate to evaluate the data regarding the results reported from the use of open banking and APIs both in the EU and the UK.

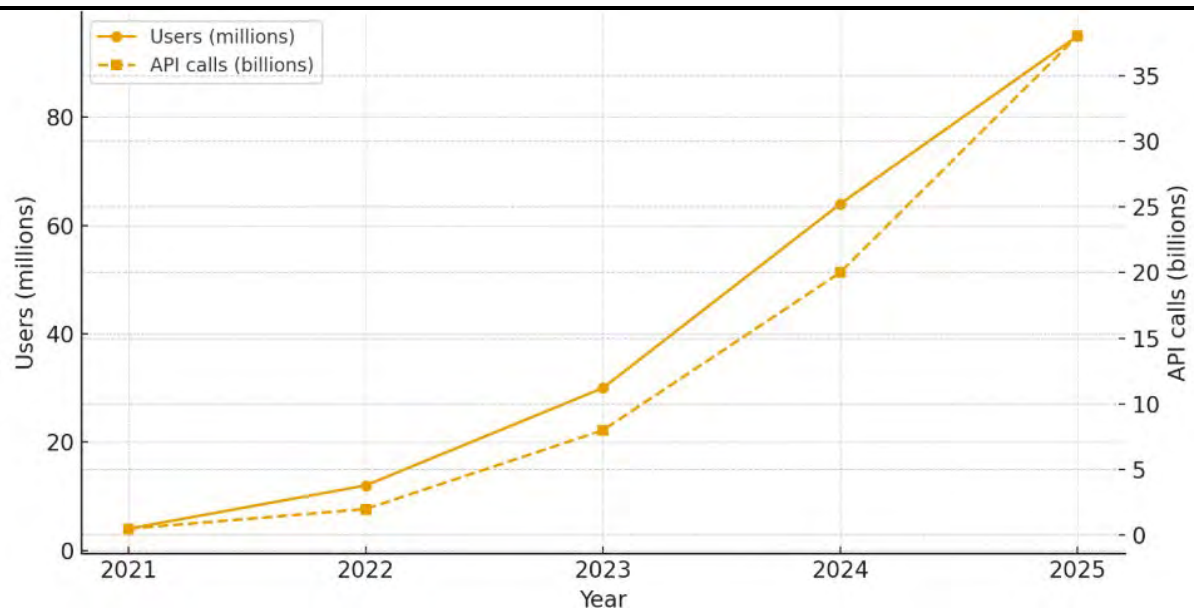


Figure 2. Estimation of the evolution of users (millions) and API call volumes (billions) for Open Banking in Europe

Source: elaborated by author based on (Kontomatik (n.d.), Yapily (2025))

The data in the figure indicate a steady increase in both the number of users and the number of API calls for open banking at the EU level, which can be explained by the interaction of several factors: regulatory developments (the adoption of PSD3 and the Financial Data Access Regulation – FIDA), the consequences of COVID-19, accelerated digitalization, the diversified FinTech offering, and the need to adopt API-based integrated payments and services.

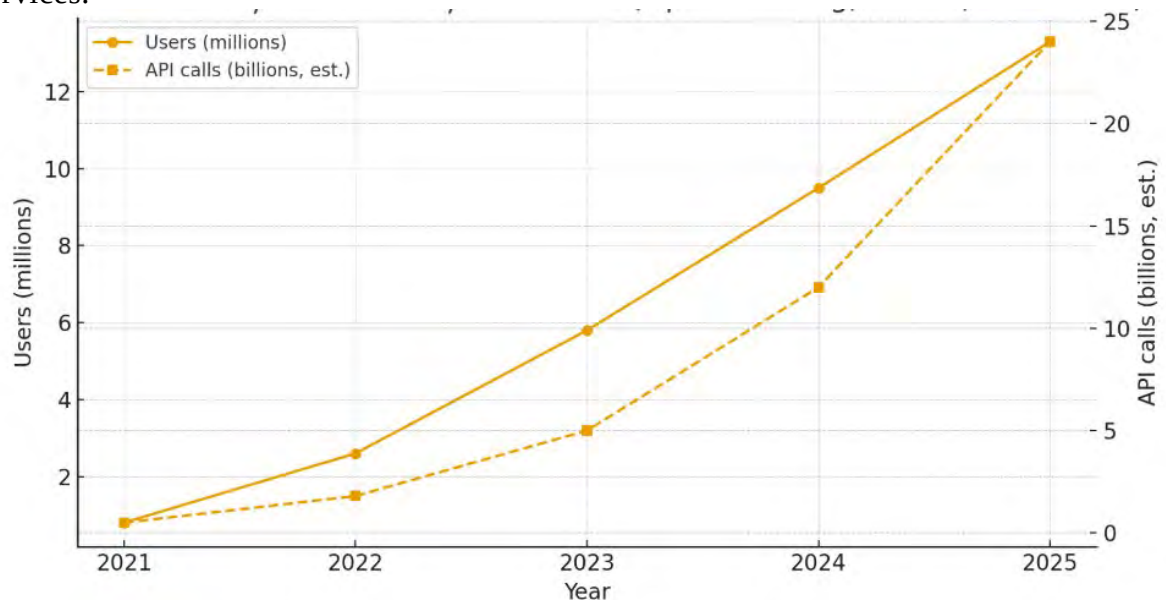


Figure 3. Estimation of the evolution of users (millions) and API call volumes (billions) for Open Banking in UK

Source: elaborated by author based on OBL Impact Report 7: open banking delivers real-world impact as adoption accelerates year-on-year

At the UK level, we also witness an exponential increase in the number of users and the volume of API calls for open banking, explained by the combination of institutional, technological,

and behavioral factors. Thus, the UK, being a member of the EU in 2018, was the first state to mandatorily implement Open Banking under the supervision of the Competition and Markets Authority (CMA) and the Open Banking Implementation Entity (OBIE/OBL). In the same context, the nine major banks (CMA9) were required to ensure the provision of standardized APIs, based on a clear regulatory framework that enabled FinTechs to substantially develop during the 2021–2025 period, even though the UK is no longer a member of the EU. Looking at data over the past five years, we can see that penetration has climbed from:

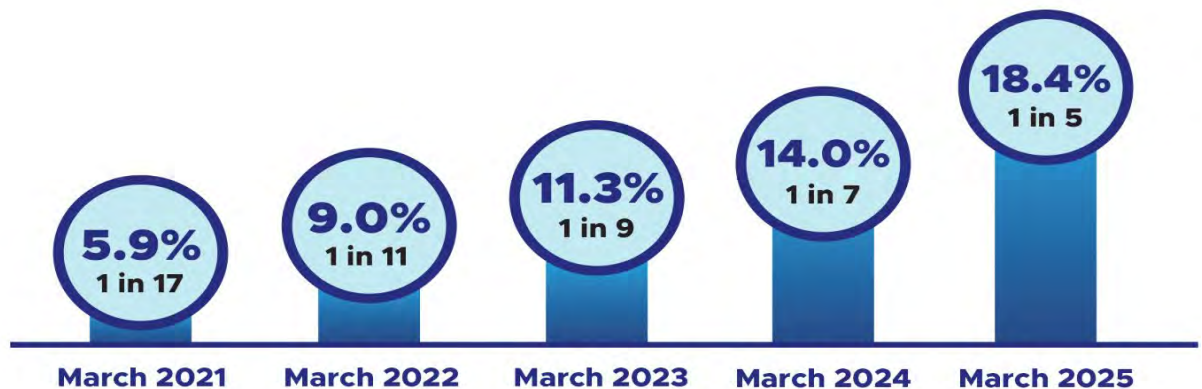


Figure 4. The growth of current account were open banking active

Source: (Open Banking Limited (n.d.))

We have seen continued growth in the proportion of people and small businesses who have an active open banking connection or have made an open banking payment in the past month. In March 2025, 1 in 5 or 18.4% of people and small businesses with online access to their current account were open banking active. This marks a new record high, with 13.3 million active open banking users (Open Banking Limited (n.d.)).

Open APIs can be developed in various ways, but the primary priority of any open API architecture is that the API can be easily used and accessed by as many different clients as possible. The most common open API architectures fall into two categories: REST APIs and SOAP APIs. SOAP-based APIs typically use XML as the data exchange format, whereas RESTful APIs are characterized by the use of JSON. The current trend is primarily oriented toward REST APIs and away from SOAP-based APIs. Many older open APIs offer both a SOAP and a REST base to support legacy clients, but newer implementations generally provide access only via REST. Once an API becomes publicly available, it becomes difficult for organizations to control who uses the API and how it is used. As a result, API management must be taken seriously; otherwise, issues may arise from a customer satisfaction perspective (Cate, 2025).

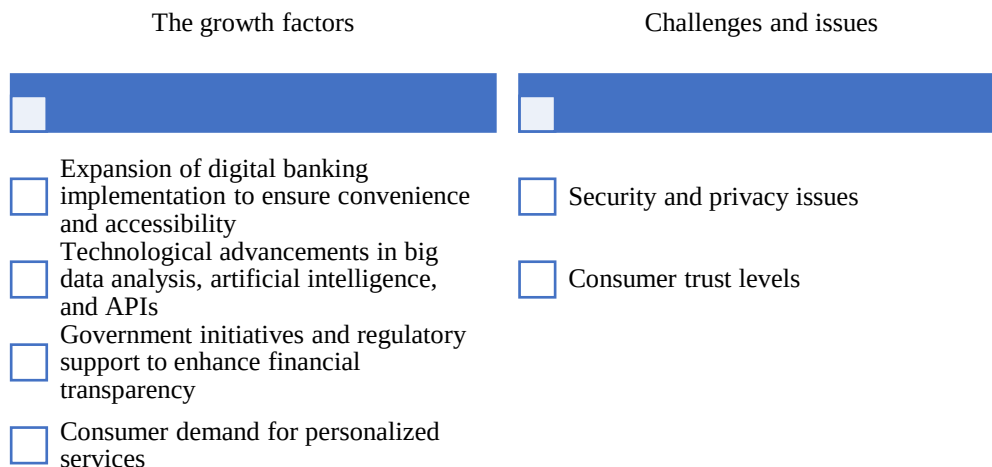


Figure 5. Key market trends

Source: elaborated by the author

CONCLUSIONS

As banks develop and implement new technologies and services, they must ensure timely and updated training for their employees to promptly identify potential risks and ensure security, being prepared to respond immediately to emergency situations arising from various security breach scenarios. Banks are obligated to develop appropriate procedures for their customers and to inform them about such potential risks or action plans.

Today, customers have a variety of options to enhance their protection against cybercriminals. For example, multifactor authentication has proven to be highly effective: in addition to a plain-text password, at least one additional form of identity verification is required before a customer can access their digital bank account. Among the most popular verification methods are one-time passwords (OTPs) for authentication, which are valid for a short period. These passwords typically include codes sent via SMS or authentication apps. Since it is unlikely for a hacker to also have access to the user's mobile phone, this method significantly reduces the likelihood of account compromise. Other common forms of additional identity verification usually include biometrics: fingerprint or facial recognition authentication is used to verify the user's identity.

An additional effective measure to protect customers is identifying scenarios that make them more prone to becoming targets of phishing scams (e.g., avoiding public Wi-Fi networks when accessing digital bank accounts, regularly updating passwords, and using different passwords for various banking applications). Although cyber threats stemming from artificial intelligence, open banking, and other technologies increase the risk of fraud, banks will need to implement newer and more sophisticated measures to prevent such incidents and enhance security in the financial sector. Paradoxically, the key to addressing these challenges will be the widespread adoption of artificial intelligence technologies, which will help banks detect anomalies more quickly and, perhaps one day, stop them entirely.

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EFFICIENCY OF MERGERS AND ACQUISITIONS: ANALYSIS OF OBJECTIVES, BENEFITS AND POSSIBLE RISKS

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Abstract. The mergers and acquisitions (M&A) market is constantly attracting the attention of experts. These transactions are considered one of the most complex and risky steps that a company's management can take. And the larger the deal, the higher the stakes. Mergers and acquisitions seem to be the most unpredictable type of business project, since the opportunities that arise in this area are unexpected and ambiguous, and due to the fear of missing out on a rare opportunity, participants in the transactions often cannot calmly evaluate all the advantages and disadvantages. Therefore, it is worth being well prepared, it is worth stocking up on the necessary specialists in advance, forming a competent team, using high-quality tools and recommendations from professionals. Having some experience in their development, M&A transactions face new problems and set new tasks. The purpose of this article is to study the effectiveness of mergers and acquisitions, analyze the goals, benefits and possible risks, as well as potential mistakes and opportunities to increase the chances of success. The methods of consideration, comparison, analysis and deduction will be used.

Key words: objectives of mergers and acquisitions, risks, opportunities

JEL classification: G14, G34

Introduction. M&A (mergers and acquisitions) is the process of combining the assets of two or more companies. It includes transactions that result in the ownership of organizations, their assets, and operating divisions being transferred to another organization or consolidated with it. Although the terms “merger” and “acquisition” are often used interchangeably, there are differences between them. A merger is a process in which companies voluntarily combine to form a new legal entity. The former organizations cease to exist, and their assets and liabilities are transferred to the new one. An acquisition is the purchase of a controlling stake (usually more than 30%) in one company by another. In this case, the acquired company ceases to exist, and the buyer continues to operate. Mergers and acquisitions are an important strategic tool in business. The main goal of M&A transactions is to increase profits through synergy, which means that the value of the whole becomes greater than the value of the individual parts. The parties to the transaction can combine their production, intellectual, and financial resources, thereby significantly reducing production costs and, consequently, increasing profits. At the same time, the goals of buyers and sellers of companies vary significantly.

“The most common goals of a buyer may be:

Increasing production volumes and market influence. For example, with horizontal integration, the owner gains the opportunity to expand production capacity and increase their market share. At the same time, production costs are reduced.

Asset optimization. Each component within the new structure will work more cohesively, resulting in increased overall profitability.

Increased value chain. Investing in production and logistics helps improve product quality and increase profits.

Acquisition of property and assets. In the process of a merger or acquisition, buyers often receive not only buildings and land, but also employees and intellectual property, which allows them to instantly expand their capabilities.

Consolidation of finances. By combining revenues, it is possible to increase financial stability and increase the company's capitalization.

Elimination of competitors. The acquisition of a company is also used as a strategy to eliminate competition and increase market share” (Okorokova, E., Demakova, A., 2024).

The main objectives of the seller are as follows:

Obtaining financial assistance. Often, the sale of a company or part of it provides the necessary capital for further development or solving current financial problems.

Liquidation of non-core assets. In some situations, the sale of non-core assets is seen as an opportunity to focus on the core business.

Getting rid of unprofitable assets. In conditions of stagnation or low profitability, sellers may look for exit points to minimize losses.

Assessment of a negative forecast. By selling the company, the owner eliminates the risks and possible losses from reduced activity.

“Depending on the form of integration of mergers and acquisitions, certain benefits can also be identified. M&A can be horizontal, vertical, or conglomerate.

Horizontal transactions occur when competitors-companies with the same type of activity-merge. They operate in the same field and produce the same product. The benefit is that it strengthens the company and reduces competition. This kind of merger helps create a monopoly.

Vertical M&A happens between organizations with different activities that aren't direct competitors but do business in the same industry. Most often, before the deal, they're suppliers and buyers. For example, one company may produce raw materials or equipment, while another may produce finished products. In this case, the goal is to reduce production costs and intermediate expenses.

Conglomerate deals bring together companies from different industries whose products are not related in any way. The goal of such transactions is to expand the product range and diversify the business: if one industry experiences a downturn, the company will still remain stable thanks to its enterprises in another industry that have not been affected by the crisis” (Danilenko, A., 2024).

So, the motives for a merger can come from both sides. Although, of course, the acquiring company always benefits more as a result. In addition, there can be many more reasons, and they can sometimes be quite unpredictable, because everything depends on individual circumstances.

In addition to the obvious advantages, there are risks involved in M&A transactions. The acquiring company may underestimate the value of the assets of the acquired company and overpay, or the profitability of the selling company may turn out to be lower than expected. Difficulties may arise during the integration of companies: cultural, production, personnel, or management issues. One of the key risks is incorrect goal setting. If a company does not have a clear strategic vision and does not understand what results it wants to achieve, the end result will usually differ from what was expected.

“Errors in asset valuation also pose a serious threat. If the information about the target company's financial condition and potential is inaccurate, the buyer may pay more for the assets than they are actually worth.

Tactical and planning errors are another common risk. Incorrect allocation of resources or a lack of preparatory measures will lead to delays in the transaction.

Choosing the wrong strategy also plays a key role. The absence of a clear plan for how integration will take place can lead to duplication of functions and, as a result, excessive costs.

In addition, there are financial and infrastructure risks. The inability to attract financing will significantly slow down the implementation of the planned project, and underestimating the necessary costs will lead to serious financial problems.

Infrastructure risks include resistance from management and the workforce. Such factors, as well as the inability to quickly integrate technological processes, will undermine the success of the deal even with promising forecasts” (Okorokova, E., Demakova, A., 2024).

However, there are ways to protect against potential risks. They are divided into preventive and emergency measures.

Preventive measures are part of a company's long-term strategy. They are aimed at preventing negative influence from potential acquirers or competitors and introducing protective mechanisms before aggressive attacks begin. One of the most common preventive measures is for a company to transition to a holding structure. This step allows for the creation of a more flexible and multi-level organizational model. In this model, each subsidiary can operate more independently, which makes it more difficult for external shareholders to control and influence the company.

Strategic preventive measures also include building an effective corporate structure. For example, optimizing relationships between different divisions of the company and developing a clear hierarchy. Such a structure will allow you to quickly respond to changes in the external environment.

The formation of a system of economic security for the business plays an important role in preventing unwanted mergers and acquisitions. For example, organizing an effective incentive system for top managers. In other words, top managers must be motivated so that they have the desire to act exclusively in the interests of the company.

Another method is diversification for all businesses. In terms of the production, technological, and financial complex of an enterprise, this means not concentrating all assets in one organization, as an attack on it could result in the loss of everything at once. An example of diversification is when owners do not publicly disclose their direct involvement. In other words, capital-intensive property is not on the balance sheet of the company conducting operational activities. For example, such a step minimizes the risk of seizure through the concentration of accounts payable (if most assets are financed by loans or leases).

Tactical defense methods are used when an attack has already begun or when the threat of an attack is already obvious. They do not require serious strategic and organizational innovations. As a rule, these are legal measures.

“When it comes to effectively countering aggression, it is important to consider the steps taken by the aggressor. Therefore, all actions that a company can take in response to an attack are divided into several categories:

Urgent repurchase of shares from minority shareholders – when it is necessary to quickly buy back shares from those who hold a small stake.

Additional placement of shares through a private placement – if you need to raise money, you can offer new shares to a limited group of people.

Urgent restructuring and withdrawal of assets – to protect your interests, you sometimes have to change the structure of your business or dispose of assets.

Targeted repurchase of shares from an aggressor – that is, you buy back your shares from the person who is attacking you.

Search for a “white knight” – a stronger partner who will help defend against the aggressor.

Reincorporation – re-registering your business in another region to avoid pressure.

Litigation or legal disputes – sometimes it is simply necessary to initiate proceedings to protect your rights.

Each of these steps is part of a strategy that can be used depending on the specific situation” (Okorokova, E., Demakova, A., 2024).

Mergers and acquisitions affect stock prices. Most often, after a deal is announced, the shares of the acquired company rise in price. Stocks may start to rise in price because the market sees good prospects for the company's growth. The growth may also be related to the expected offer: shareholders are offered to buy back the shares of the old company on favorable terms. The buyback is made at no less than market value and, in most cases, with a premium. The acquirer's shares become cheaper. The buyer spends large sums on the transaction and subsequent reorganization, which can negatively affect its financial performance. Therefore, the securities may initially fall in price and then rise after some time. Sometimes the shares of the acquired company fall in price. Another exception is when the value of the shares does not change.

“To minimize disadvantages and maximize advantages in the M&A process, Watson Wyatt uses a universal model consisting of five stages:

Homework. A decision is made to acquire another company, criteria are formulated, and the prospects and limitations of the deal are assessed.

Candidate selection. Independently or with the help of intermediaries, a list of potential candidates is compiled, their businesses are analyzed, and unsuitable candidates are eliminated. Sometimes, observing potential candidates can take several years.

In-depth assessment of promising candidates. A thorough analysis of the value and activities of the selected businesses is conducted, and the possible synergistic effect is assessed.

Courtship, negotiations, and bidding. Points of contact are discussed, contradictions are overcome, and the terms of the deal are discussed. The deal is made.

Post-deal integration management. A new business model is defined, uncertainties and conflicts are eliminated, and management and production processes are fine-tuned.

The M&A process can take anywhere from several months to several years, and the deal can fall through at any stage” (Danilenko, A., 2024).

Conclusions. Mergers and acquisitions enable companies to combine assets and achieve synergies. If synergies are achieved, revenue will increase over time and share prices may rise. However, the opposite may also occur, and external factors may intervene, such as a crisis in the industry or country. Therefore, when making decisions, it is more effective to be guided by a fundamental approach and your own strategy, rather than spontaneous market reactions to M&A deals. If the prospect of a profitable deal may arise at any moment, it is worth stocking up on the necessary specialists, tools, and processes in advance. The buyer must develop a merger and acquisition strategy and link it to the company's strategic goals, review the criteria for selecting companies for acquisition, define clear financial principles for evaluating transaction options, and, even more importantly, think about post-merger integration. The experience of the buyer and seller is an important factor. The most sophisticated buyers can react faster, act quickly, and conduct a more thorough due diligence. Experienced sellers understand when it is best to enter the market, properly prepare assets for sale, and negotiate more wisely, while rejecting unfavorable deals in a timely manner. In mergers and acquisitions, as in other areas of business, choosing the right moment is half the battle. Even a slight delay in concluding a specific transaction or implementing a larger cycle of mergers and acquisitions often sharply reduces or even destroys opportunities for

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value creation. A company can increase its chances of success, especially if it has a competent team, determination, diligence, and is willing to take reasonable risks.

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FIRM PERFORMANCE, INNOVATION AND MARKET DYNAMICS: EVIDENCE FROM TURKISH AND MOLDOVA SMES

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Abstract: This study aims to examine the impact of administrative, financial, and fiscal constraints on the ability of Turkish and Moldova firms to innovate, invest, and enhance their productivity in 2024. Within this framework, an analysis was conducted using data from the World Bank’s Enterprise Surveys, based on a representative sample of 1,416 firms in Turkey. Building on these results, a comparison was made between the performance of Turkish SMEs and the obstacles they face, relative to those observed in the Europe and Central Asia (ECA) region. Similar, to analyze the performance of Moldova SMEs we used statistical data and the latest data from business surveys to assess challenges that small business sector is facing through the perception of entrepreneurs. In this regard, recommendations for strengthening SMEs economic potential will be drawn up.

Keywords: SMEs, Access to Finance, Multilevel modeling, Endogenous innovation, Productivity Gap.

JEL Classification: C21, H25, L25, G30, O31.

Introduction

The SMEs sector remains the backbone of the economy in both Turkey and Moldova, at the same time challenges faced by this entities threaten their performance and long-run development. In this regard, this research examines the impact of administrative, financial, and fiscal constraints on the ability of Turkish and Moldova firms to innovate, invest, and increase their productivity.

The adopted methodology in this study combines a dual approach. On the one hand, a descriptive analysis highlights differences in performance and market structure according to firm size, sector, and region, as well as relative to regional averages. On the other hand, a microeconomic estimation using multilevel models is employed to explain the probability of investing in R&D (binary model) and productivity growth (continuous variable). To strengthen robustness, advanced causal inference methods are applied: instrumental variables and two-stage least squares estimation (IV/2SLS) to correct for financing endogeneity, Propensity Score Matching (PSM) to compare similar firms facing or not facing constraints, and Difference-in-Differences (DiD) to evaluate Turkey’s evolution over time relative to a reference group. Complementary analyses include quantile regressions and structural equation models (SEM), allowing the capture of differentiated effects according to productivity levels and indirect relationships between financing, innovation, and performance. The main brief results are presented in this extended abstract and more detailed results of this research will further be published in scientific journals.

Main results

The obtained results estimate that Turkey suffers from a pronounced productivity gap: labor productivity declines by 21%, even as employment grows by 12%. Internal innovation appears very limited, with only 6.2% of firms reporting R&D expenditures and 7.5% introducing new products, compared with 21.5% and 29.8% in the ECA region, respectively. Financial constraints are particularly binding: one-third of Turkish firms cite access to finance as the main barrier, three times higher than the regional average. On the fiscal side, the effective tax rate (22.6%) and the weight of social security contributions (25.6%) constitute additional impediments, although the Turkish tax administration benefits from a high degree of digitalization and processing efficiency.

The market structure is characterized by high concentration, with nearly 90% of market shares captured by leading firms, which exacerbates the dualism between large firms and smaller competitors. Finally, judicial institutions appear relatively strong: nearly two-thirds of firms resort to alternative dispute resolution mechanisms, and perceptions of corruption remain low.

Similar with Turkey, SMEs represent the largest share of businesses from the Republic of Moldova. Still, local SMEs prefer to be active in the wholesale and retail trade and agriculture. Specifically, SMEs would perform the function of intermediaries in the market. A reduce number of SMEs are involved in innovation activities; as a result, innovation impact on national economy is reduced as well. Upskilling and reskilling employees from Moldovan SMEs is still at moderate level of development. These outcomes are reflected in 2023, in the European Commission Report on Moldova, as a mismatch between the level of skills of the labor force and those required by employers.

The Moldovan government has put in place several measures to support SMEs. In order to facilitate access to financing for Moldovan entrepreneurs, the government has set up the fund for entrepreneurship and economic growth. This fund offers loans at advantageous rates to SMEs, thus giving them a crucial boost to develop and create jobs. The government also, designed a special Program “373” to give SMEs quick and easy access to finance so they can expand and grow. Under the “373” Program, SMEs from Moldova will be able to receive compensation for investment loans with a maturity of at least 3 years. The interest rate for beneficiaries on loans in national currency will be 7%, while in foreign currency 3%. The “373” program on support of SMEs is a good example of cooperation between the state’s institutions, the banking sector and private environment, in order to develop the national economy and ensure the economic growth of small business. (Ozturk & Erhan, 2025)

In continuation of this effort, the government has approved several new programs dedicated to the support of SMEs, covering key areas such as re-technology and energy efficiency, digital transformation and the development of rural tourism. Furthermore, to match the specific needs of SMEs, the government has redesigned several key programs. Among these initiatives are the “Pare 1+1” program aimed at stimulating fund transfers to the local economy, the “start-up for young people: a sustainable business at home” dedicated to young people the entrepreneur, the program “Greening of SMEs” focused on the ecological transition of businesses and the “Women in Business” program favouring the economic empowerment of women.

Despite all these significant efforts, access to finance remains one of the major challenges for SMEs from Moldova. According to the World Bank, more than 80% of firms report financing their working capital from their own sources. In the latest Enterprise Survey in 2023, access to finance was cited as a major constraint by about 30% of businesses. Banks are reluctant to approach SMEs, due to their lack of collateral and their high-risk profile making access to financing difficult for SMEs. There are still many financial barriers for local SMEs

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to starting up and scaling up, such as insufficient availability of non-bank finance (lack of access to venture capital funds, business angel capital and know-how).

The number, size and sectoral dispersion of SMEs also affect capacities to finance themselves through bank loans, especially investment ones. According to NBS, only about 7 300 SMEs are considered small and medium. The remaining 56 000 SMEs or about 88% are micro-companies, with a turnover of up to 18 million MDL and with a number of employees equal to or less than nine people

Furthermore, gross domestic expenditure on R&D was only 0.23% of GDP in 2022. Small businesses from Moldova also miss new business practices for organizing procedures (supply chain management, business re-engineering, knowledge management, quality management), thus limiting the development of innovative organization enterprises. The development of the SMEs in the Republic of Moldova in terms of innovations will increase the competitiveness of the small business and, consequently, will promote the intensification of growth rates and market expansion.

Discussions and conclusions

In both countries SMEs, point to access to finance as one of the main constraints that limits their development. Even if, the banking sector is stable, it offers insufficient long-term financing options, and financial intermediation is low. Especially in case of Moldova, investment levels are low, with public investment stagnating and foreign investment declining by 33.6% in 2023. (SCR, 2024)

One of the reasons might be that Moldova's economy is vulnerable to external shocks, including geopolitical risks from the war in neighbouring Ukraine, which disrupt trade and increase the level of risk among entrepreneurs. Many investment projects have been put on hold or even cancelled, pending more stable financial and security conditions. Addressing these challenges will require policies to support high-value industries, enhance access to financing, and stimulate sustainable economic growth (SCR, 2024).

Moreover, from a sectoral perspective, the enterprises, especially SMEs, are concentrated in sectors affected by a high volatility and high sensitivity to external shocks. The concentration of SMEs on sectors such as trade reveals its orientation towards a consumption economy. In this regard, it is important to encourage SMEs to invest in new technologies, to create new products and services.

Additionally, the concentration of SMEs near the capital, point the need to intensify the collaboration network within the entire territory of the Republic. Considerable efforts were made to support local SMEs through target designed programmes, but this financial support instruments should first address to those economic activities that generate added value, such as processing local raw materials, technologizing production processes, implementing innovations at the firm level, and export orientation.

The analysis of the business environment reveals, on the one hand, an improvement in perceptions of entrepreneurs, on the other hand the risks generated by the war waged by Russia in Ukraine, had shaken the perception of foreign investors towards Moldova.

In the light of the above-mentioned, Turkey possesses institutional and administrative strengths, yet SMEs remain constrained by insufficient access to financing, a heavy tax burden, and a lack of endogenous innovation. The study concludes that reducing fiscal and social charges, improving access to productive credit, and implementing public policies promoting domestic R&D are essential to revive productivity and strengthen the competitiveness of Turkish firms in a globalized economic environment.

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SECTION IX
LEGAL CONFLICTOLOGY IN ECONOMIC LAW
RELATIONSHIPS

THE CONSTITUTIONAL PROTECTION FRAMEWORK REGARDING THE EMERGING EVOLUTION OF THE PROVISION OF DIGITAL TECHNOLOGIES OR SERVICES TO THE CONSUMER

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Abstract: The research subjected to a broad analysis the constitutional, legal and administrative guarantees of contractual relationships regarding the new economic trends of providing new digital technologies, content and services to consumers by professionals. From the perspective of constitutional law, a new concept of “digital constitutionalism” is currently being promoted, through which the legal and administrative framework is given a critical importance regarding the establishment of clear normative rules regarding the protection of the confidentiality of data, including personal data, in order to avoid online infringement of consumer rights, but with continuous access to new digital technologies, including digital content of goods and services. The infringement of these constitutional and legal aspirations makes it impossible to guarantee the constitutional framework for the protection of human rights in a state of law of a modern digitalized society.

Avoiding constitutional litigation in the Republic of Moldova is possible through multi-aspect studies, including the application of the comparative study method, related to specific cases from other states in which constitutional justice has faced factual and legal circumstances regarding the constitutional guarantees that are necessary to accompany new digital technologies.

Modern digitalization sets new tasks for the Government and public authorities of the Republic of Moldova regarding the adaptation of public services to the constantly evolving technological landscape and to the requirements of the modern business environment for the efficiency and responsiveness of services. The achievement of these tasks establishes the key strategies necessary for this purpose, which we have exposed in this research.

The study conducted led us to the conclusion that the achievement of these tasks is possible by reviewing and updating the regulatory framework to support the modern digital transformation of the economy in the Republic of Moldova.

Keywords: modern digitalization, public services, e-government, digital transformation, public private partnerships, public administration, data protection, digital education.

JEL Classification Codes: H83, O38, L86, O33, K23, M15.

Introduction. The research underwent a broad analysis of the constitutional, legal and administrative guarantees of contractual relations on modern economic trends of provision by professionals (traders) to consumers of new digital technologies, digital content and services. Constitutional law, being the fundamental and supreme branch of law and being the guarantor of human rights and freedoms in any social formation as a rule of law, at present, to professional-consumer relations, through the prism of constitutional law, a new concept of „digital constitutionalism” is also promoted. (Digi-Con Academy, 2024). Digital constitutionalism in the opinion of researcher Edoardo Celeste „embodies the idea of projecting the values of contemporary

constitutionalism in the context of the digital society” (Celeste, 2021). This concept and institution allows the legal and administrative framework to establish a critical importance on clear regulatory rules to protect the privacy of certain data, including personal data, in order to avoid online harm to consumer rights, but with continued access to new digital technologies, including the digital content of goods and services provided. The violation of these constitutional and legal aspirations makes it impossible to guarantee the constitutional framework for the protection of human rights in a rule of law and to promote a modernized digitized society. Legal relations in a modern digitized era require great efforts to respect the rights of members of society and avoid constitutional disputes. In the Republic of Moldova, this purpose may have been achieved through multi-sided studies, including the application of the comparative study method, related to concrete cases from other states with more developed democracies, in which constitutional justice has already faced factual and legal circumstances regarding the constitutional guarantees necessary to accompany new digital technologies.

Terminology. The research conducted has caused us to detect some terminological inaccuracies applied in the field of consumer protection legislation in the Republic of Moldova. The Constitution of the Republic of Moldova, as the fundamental and supreme law, does not contain express regulations on legal relations and consumer protection. The Civil Code, however, as a superior legislative act in the private law system regulates the status of subjects in consumer protection relations in art. 3 Consumer and professional, where it defines "consumer any natural person who, within a civil legal relationship, acts predominantly for purposes not related to entrepreneurial or professional activity", and "professional any natural or legal person of public law or private law who, within a civil legal relationship, acts for purposes related to entrepreneurial or professional activity, even if the person does not aim to obtain a profit from this activity". (Civil Code of the Republic of Moldova, 2002).

In the same sense, but terminologically, the “Law on Consumer Protection”, which was adopted and entered into force after the adoption and entry into force of the Civil Code (Law on Consumer Protection, 2003), establishes the parties in the respective relations as “**Consumers**” and “**Traders**”.

Thus, in the Republic of Moldova, the consumer, based on the norms of both organic laws, is protected by both a “professional” and a “trader”. In principle, in a terminological sense, a trader is a professional, from whom the consumer must be protected because the other natural or legal person carries out commercial, industrial, production or artisanal activities. In Romanian, both are persons who work in a certain field of activity based on appropriate training, the trader being only specialized in performing commercial acts. (Dictionaries of the Romanian language, 2012)

In the process of researching some deficiencies regarding the terminological omission, we applied the comparative method and studied the question through the lens of the legal norms applied in Romania, we terminologically applying the same language. Thus, in Romania, Government Ordinance no. 21/1992 on consumer protection nominates the person from whom the consumer must be protected under the title of "economic operator" (Government Ordinance No. 21/1992 on consumer protection, 1992) in the Civil Code - "professional". (Civil Code of Romania, 2009)

Romania is a member state of the European Union, a political and economic union within which the Republic of Moldova received the status of candidate country in 2022, for which reasons in a comparative aspect, of public international law and national legislation (Government Decision No. 1171/2018), it is necessary to compare it with the legislation of the European Union. Analyzing Directive 2011/83/EU of the European Parliament and of the Council of 25 October 2011 on consumer rights, translated into Romanian in art.2 "1. "consumer" means any natural person who, in contracts covered by this Directive, is acting for purposes which are outside his trade, business, craft or profession;", and "2. "trader" means any natural or legal person, whether public or private,

who is acting, including through another person acting in his name or on his behalf, for purposes relating to his trade, business, craft or profession in relation to contracts covered by this Directive. (European Union, 2011. Directive 2011/83/EU)

Respecting the commitments applied in the Republic of Moldova within the framework of the accession process to the European Union, we will consider that the basis for the process of harmonizing the legislation of the Republic of Moldova with the EU legislation is the harmonisation obligations resulting from the commitments assumed by the Republic of Moldova in relation to the European Union, from other relevant international instruments, as well as from the National Programme for Accession, in accordance with the established terms and conditions. (Republic of Moldova, 2018. Government Decision No. 1171/2018) The normative act of the European Union, mentioned in this research, directs us to use the term "trader", as it is translated into Romanian in the normative acts of the European Union and not that of the Civil Code of the Republic of Moldova as "professional". We mention our conclusion, that however the term "professional" would be more correct, being more universal, which terminologically includes any natural or legal person who has much higher knowledge and skills taken from practice in the field of goods and services used. In this regard, we will also mention that in the official languages of the European Union in Directive 2011/83/EU the term "professionnel" is used in French, and "trader" in English. Romance languages, such as: Italian "professionista"; Portuguese "Profissional" etc.

The regulatory framework for the provision of digital technologies or services to the consumer. This research focuses on the constitutional framework for protecting the way in which digital technologies or services are provided to consumers, as a result of which we will mention that constitutionalization in this sense is a complex process, being ongoing in contemporary society. The researcher Edoardo Celeste, analyzing the legal framework of “digital constitutionalism”, mentioned, “the diverse and dispersed components of the process of constitutionalization of the digital ecosystem contribute equally to the substantiation of the ideals and values of digital constitutionalism, which represents a new theoretical direction within contemporary constitutionalism, which aims to adapt its core values to the needs of the digital ecosystem” (Celeste, 2021). According to Directive 2011/83/EU “Digital content means data that are produced and delivered in digital form, such as computer programs, applications, games, music, video recordings or texts, regardless of whether they are accessed by downloading or streaming, from a material support or by any other means.” The development and practical application by the Member States of the European Union of Directive 2011/83/EU has led to the adoption of new regulatory acts within the European Union, such as Directive (EU) 2019/770 of the European Parliament and of the Council of 20 May 2019 on certain aspects concerning contracts for the supply of digital content and digital services. (European Union, 2019. Directive (EU) 2019/770) Some members of the European Parliament have also proposed the adoption of the EU Code of Online Rights. (European Union, 2012. EU Code of Rights in the Online Environment) The aforementioned draft Code has not been adopted, but it shows the importance of digital social and legal relations within the Member States of the European Union.

Modern digital social and legal relations, as a result of their development, have also led to the application of social measures, including legislative ones, in the Republic of Moldova to protect the rights of consumers of digital content or digital services. Recently, on 08.11.2024, the Parliament voted in final reading the draft law on contracts for the supply of digital content and digital services – Law 247/2024. (Republic of Moldova, 1992. Law No. 247 of 08-11-2024 on contracts for the supply of digital content and digital services). Modern digitalization and Law 247/2024 sets new tasks for the Government and public authorities of the Republic of Moldova regarding the adaptation of public services to the constantly evolving technological landscape and to the requirements of the modern business environment for the efficiency and responsiveness of

services. The achievement of these tasks establishes the key strategies necessary for this purpose, which we have exposed in this research. The Ministry of Economic Development and Digitalization, through the project submitted to the Parliament, adopted into national legislation several directives of the European Parliament and of the Council regarding contracts for the provision of digital content and digital services. “The adoption of this draft law provides for the provision of a set of uniform and well-defined rules for the sale and consumption of digital content, such as computer programs, software, games, digital books or DVDs, CDs or sticks, if they are carriers of digital content or services.” (Consumer rights of digital content and services.)

In this study, we set out to further analyze what the “digital transformation” of the economy and society is - in essence, it represents one of the most profound mutations of the 21st century. Contractual relationships between professionals and consumers are increasingly taking place online, involving new digital technologies, content and digital services. This reality requires a broad analysis of how constitutional, legal and administrative guarantees can cope with and keep up with the pace of innovation.

The present research explores these guarantees, underlining the urgency of adopting a new concept: “digital constitutionalism”. Through this lens, the legal and administrative framework acquires critical importance in establishing clear normative rules, designed to protect fundamental human rights in a modern digitalized society, while ensuring continuous access to innovation. Damaging these aspirations makes it impossible to effectively guarantee the rule of law in the digital age.

In fact, the concept of “digital constitutionalism” transcends a simple regulation of e-commerce, aiming at protecting human rights in the virtual environment at the same level and under the same conditions as the physical one. Its weak point is the protection of data confidentiality, mostly of personal data. In a world based on “Big Data” and “digital algorithms”, data confidentiality and security essentially become guarantees of individual freedom and non-discrimination online.

In order to avoid harming consumer rights, it is vital to balance unfettered access to new technologies with a robust protection framework. Constitutional guarantees must accompany innovation, setting clear limits on the collection, processing and use of data, as well as on the surveillance powers of the state and digital corporations.

In this regard, the Constitutional Court of the Republic of Moldova, during the exercise of constitutional jurisprudence, has reflected the constitutional way of protecting consumer rights in 19 decisions. Decision no. 10 of 14.04.2022, for example, establishes that “ideally, the proper functioning of the price-setting mechanism in order to obtain fair price levels, i.e. that correspond to the interests of producers and consumers,...”, but “...the legislator may adopt measures to correct market imbalances or to protect consumers”. (Constitutional Court of the Republic of Moldova, 2022. Decision no. 10)

In a comparative aspect, the Constitutional Court of Romania has also exercised its constitutional jurisprudence on consumer protection in several decisions of constitutional review. Thus, in Decision no. 692 of October 6, 2020 “The Court held that the normal functioning of the market economy is perfectly compatible with consumer protection measures, and that freedom of trade and the protection of national interests in economic activity are not only not incompatible with the establishment of rules regarding the quality of products or services provided, but they are also imposed by other obligations incumbent on the state, namely the one provided for in art. 135 para. (2) lett. f) of the Constitution regarding the creation of the necessary conditions for increasing the quality of life.” (Constitutional Court of the Republic of Moldova, 2020. Decision no. 692)

To avoid constitutional disputes, it would be good to use the comparative method by analyzing the experience of other states, especially European ones, where constitutional justice

has already faced complex factual and legal circumstances related to digital guarantees, which provide a valuable basis for avoiding constitutional disputes in the Republic of Moldova.

Multi-aspect studies and the comparative method of study are essential. Analysis of the jurisprudence of constitutional courts in states with a longer tradition in digital regulation (such as those in the European Union) can provide Moldovan authorities with a program of actions in developing norms that would anticipate and prevent legislative conflicts. Such important comparative cases help to understand how principles such as proportionality, necessity and legality apply in the digital space, from e-commerce to cybersecurity.

To support and illustrate the conclusions and strategies presented in the article, we propose for analysis some concrete examples and case studies that can be integrated into the respective chapters:

1. Examples for the Fundamentals of Digital Constitutionalism (Data Protection). These examples illustrate how constitutional guarantees are directly applied in the digital environment:

- Data Privacy Protection (Art. 28 of the Constitution) - Schrems II Case (Court of Justice of the European Union, 2020). The CJEU invalidated a US-EU data transfer framework (Privacy Shield) due to the lack of adequate safeguards against government surveillance in the US, considering that it violates the fundamental right to data protection and to an effective remedy. It shows that states (including the Republic of Moldova) must ensure that citizens' data, even when transferred internationally, benefit from constitutional and legal protections at the highest level. (Court of Justice of the European Union, 2020)

- Consumer Rights Guarantees - Litigation on “Dark Patterns”: These are manipulative user interfaces used by professionals to induce consumers to make unfavourable decisions (e.g., automatic subscription, difficulty to cancel). They demonstrate the need for clear national regulation to prevent online infringement of consumer rights and to protect genuine contractual will. (Court of Justice of the European Union, 2020)

2. Examples for Avoiding Constitutional Litigation (Comparative Method). These cases show how constitutional justice has faced the dilemmas of digitalization:

- Proportionality and Legality in Surveillance - Decisions of the German Constitutional Court on the retention of traffic data (Data Retention). The Court ruled that general and indiscriminate data retention is unconstitutional, requiring strict criteria of necessity and proportionality. It serves as a model for the Constitutional Court of the Republic of Moldova in assessing laws that allow authorities to access communications data, ensuring that they do not violate the right to privacy (Art. 28) and the secrecy of correspondence (Art. 30).

- Access to Information and Digital Content - US Supreme Court Decisions (or European equivalents) on Net Neutrality. Although as a regulatory subject, the discussions are based on ensuring non-discriminatory access to the internet, considered essential for freedom of expression and access to knowledge. Here the essence is that it emphasizes the need for the Republic of Moldova to guarantee continuous and equal access to new technologies and digital content, thus protecting democratic principles.

3. Examples for Government Tasks (Digitalization Strategies). These concrete examples illustrate the actions needed at the administrative level in the Republic of Moldova:

- Integrated Digital Governance (e-Government) – Creating a Digital-by-Default administration. For example, in Estonia: Implementation of universal electronic identity (ID Card) [18] and online voting. This is an example of a 100% digitalized public service that increases the efficiency and responsiveness of services.

- Public-Private Partnerships (PPP) - Using private expertise for rapid innovation. MCloud Platform (Moldova) (Republic of Moldova, Mcloud Platform, 2018). A successful example of PPP, where private infrastructure or software development (e.g., cloud services) is used by public

authorities to streamline costs and scale services quickly, supporting the digital transformation of the economy.

- Review of the Regulatory Framework (Laws) - Adoption and adaptation to the new Code of Rights in the Online Environment. Here we can analyze the EU Directive on Digital Content and Services (2019/770) (European Union, 2019. Directive (EU) 2019/770) which introduces explicit guarantees for digital products, establishing clear rules on conformity, security updates and liability of suppliers. The Republic of Moldova needs to take over and adapt these rules to provide strong legal guarantees.

- Digital Education - Investing in skills. National Digital Re-qualification Programs: Projects that offer free or subsidized courses for civil servants and citizens in areas such as cybersecurity, coding and the use of e-government services, essential for modern public administration.

These concrete examples provide empirical support for the theoretical statements in the article, demonstrating that digital constitutionalism is not just a concept, but a reality based on international legal precedents and good administrative practices.

To develop the importance of the topic of digital constitutionalism and the guarantees of rights in the era of economies with major implications of new information technologies, adding depth to the analysis and conclusions, we will describe the topic by focusing on the public policy implications and the mechanisms for the effective implementation of “digital constitutionalism” in the Republic of Moldova, which would involve:

I. Deepening the Concept – from legislation to digital ethics. Digital constitutionalism is not limited to data protection legislation; it represents a philosophy of governance that integrates fundamental values (freedom, equality, human dignity) into the architecture and use of technology. Here are the fundamental digital rights that require explicit guarantees, including:

- The right not to be evaluated solely algorithmically: Citizens must be able to challenge decisions that affect them (e.g. granting a loan, employment) made by artificial intelligence systems, ensuring the transparency and explainability of algorithms.

- The right to erasure (the right to be forgotten): The guarantee that personal data does not remain on the internet indefinitely, a critical pillar of privacy in the big data economy.

- The right to equal access to the internet (including net neutrality): An implicit constitutional guarantee that essential services and digital content are accessible to all, without discrimination or blockages based on commercial interests.

II. Mechanisms for Implementing Constitutional Guarantees. Achieving constitutional aspirations requires more than just laws; it requires adapted institutions and effective oversight mechanisms. Here it is important to identify the role of Constitutional Justice, and in order to prevent litigation and ensure the coherence of the regulatory framework, the Constitutional Court of the Republic of Moldova (CCM) must adopt a preventive and anticipatory approach that requires a structural analysis that uses certain formats of engagement such as:

- The Extended Comparative Model: The CCM can study not only the jurisprudence of the European Court of Human Rights (ECtHR) and the CJEU, but also the decisions of the Supreme Courts of countries such as Brazil (on the Marco Civil da Internet) or Canada (on surveillance). This would allow the development of specific digital proportionality tests for interferences with online rights.

- Advisory Opinions: Increased use of advisory opinions on major digitalization draft laws (e.g. legislation on artificial intelligence or cybersecurity) could identify and correct unconstitutionality before they enter into force, thus preventing costly litigation.

III. Administrative adaptation: e-government and secure partnerships. Modern digitalization requires authorities not only to use technology, but to govern it in accordance with the principles of the rule of law, through the following aspects:

- Data governance and secure interoperability Here, it must be taken into account that a crucial aspect is the way in which data is shared between government agencies: The Once-Only Principle: The implementation of this principle (the citizen does not provide the same information more than once) must be accompanied by strict security and confidentiality guarantees. The interoperability of systems (data exchange between ministries) must be regulated by a legal data governance framework that specifies who, when and why has access, avoiding abuses and protecting personal data.

- Regulation of digital public-private partnerships (PPPs). Although PPPs are essential for accelerating digitalization, they pose constitutional and security risks. Data sovereignty clauses: PPP contracts for cloud services or critical systems development must include clear clauses ensuring that sensitive data of citizens and the state remain under the full jurisdiction and control of the Republic of Moldova. Security risk assessment: Any transfer of administrative functions to the private sector through digitalization must be preceded by a rigorous assessment of the impact on human rights and cybersecurity, ensuring that commercial interests do not override constitutional protection.

IV. Review of the regulatory framework - legislative priorities. The conclusion on the need to review the regulatory framework translates into specific legislative actions:

- Law on Artificial Intelligence (AI). Ensuring transparency and accountability of algorithms; avoiding data-based discrimination (right to equality). Establishes clear limits for the use of AI in public services (health, justice) and protects citizens from prejudicial automated decisions.

- Updating the digital civil/commercial code. Clear guarantees for the conformity and durability of digital content and services (e.g., mandatory security updates). Strengthens consumer protection in digital contractual relations, reducing civil and administrative litigation.

- National cybersecurity framework. Protecting critical infrastructure and citizens' data (right to security and a functioning digital environment). Ensures economic resilience and uninterrupted operation of public services, a precondition for the digital rule of law

By focusing on these public policy implications and institutional mechanisms, the Republic of Moldova can transform digital constitutionalism from a theoretical concept into a practical framework that supports the modern digital transformation of the economy, while guaranteeing the fundamental rights of citizens.

Modern digitalization sets new tasks for the Government and public authorities of the Republic of Moldova regarding the adaptation of public services to the constantly evolving technological landscape and the requirements of the modern business environment for the efficiency and responsiveness of services. The achievement of these tasks establishes the key strategies necessary for this purpose, which we have exposed in this research.

Conclusion: the imperative to review the regulatory framework. The study leads to a firm conclusion: the achievement of the complex tasks imposed by modern digitalization is possible only by reviewing and updating the existing regulatory framework. It must move from a reactive to a proactive approach, supporting the modern digital transformation of the economy in the Republic of Moldova in a way that guarantees the fundamental rights of citizens at the same time.

Adopting the principles of digital constitutionalism is not a luxury, but a necessity to ensure that the Republic of Moldova remains a functioning state of law in a modern digitalized society. The regulatory framework must become a catalyst for innovation, not a barrier, while establishing those constitutional guarantees indispensable for human dignity in the online world.

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THE CRIME OF MONEY LAUNDERING IN THE CONTEXT OF THE EXTRATERRITORIAL REGIME PROVIDED FOR IN ART. 243 PARA. (4) OF THE CRIMINAL CODE OF THE REPUBLIC OF MOLDOVA

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Abstract: This paper examines money laundering with emphasis on the extraterritorial regime established by art. 243 para. (4) of the Criminal Code of the Republic of Moldova. Against the backdrop of intensifying cross-border financial crime, the national framework seeks to extend criminal jurisdiction to prevent impunity and strengthen anti-money laundering measures.

The study compares domestic provisions with international instruments, including Directive (EU) 2018/1673, the UN Convention against Transnational Organized Crime, and the Council of Europe Warsaw Convention on laundering, confiscation, and terrorist financing. The objective is to assess whether the Moldovan regime adequately addresses transnational laundering schemes while ensuring compliance with international standards.

Methodologically, the research combines doctrinal and comparative analysis of UNCAC, the Warsaw Convention, and EU Directive 2018/1673 with a detailed review of art. 11 and 243 of the Moldovan Criminal Code. A case study further tests theory against practice.

Findings show broad alignment with UNCAC and the Warsaw Convention, and functional convergence with EU norms, despite Moldova’s non-member status. Nonetheless, gaps remain: uneven international assistance, uncertainties on predicate offences across jurisdictions, and risks of parallel proceedings. To mitigate such conflicts, the paper proposes a prioritization framework based on seriousness of effects, evidence location, and victim nationality. It also recommends clarifying legislative terms, enhancing asset recovery mechanisms, and integrating *non bis in idem* safeguards.

The study concludes that art. 243 para. (4) is a proportionate instrument against transnational laundering, provided it is supported by robust cooperation and uniform interpretation. The proposals advance practical guidance for applying extraterritorial jurisdiction and increasing coherence, predictability, and efficiency in Moldova’s anti-money laundering framework.

Keywords: money laundering, extraterritorial jurisdiction, financial crime, international cooperation, transnational organized crime, criminal law.

JEL Classification: K14, K42, F55

1. Introduction

The globalization of the economy and the intensification of financial ties between states have amplified the risks associated with economic crime, in particular the phenomenon of money laundering, which constitutes a significant threat to both international financial security and domestic public order. These illicit activities facilitate the integration of funds from illegal sources

into the legal economic circuit, generating market distortions, fueling criminal networks and eroding public trust in state institutions (Money laundering continues to pose global risks (United Nations Office on Drugs and Crime, 2023).

The Republic of Moldova, as part of the European and international legal community, has assumed the responsibility to adapt its legislation to global requirements in the field of combating money laundering. Article 243 of the Criminal Code regulates this offense, and paragraph (4) introduces a particular dimension – the extraterritorial regime of criminal liability, allowing for the sanctioning of individuals even when the offense, in whole or in part, occurred outside the national territory. This provision is essential to avoid impunity in situations where illegal funds circulate through several jurisdictions.

In a reality where criminals exploit legislative differences between states, resort to tax havens and opaque financial structures, rules with extraterritorial applicability are indispensable tools in combating international financial crime. However, their application requires a clear regulatory framework, solid procedural guarantees and efficient cooperation mechanisms between the authorities of the states involved.

2. The general normative and doctrinal framework regarding money laundering

Money laundering is the process of disguising the illegal origin of assets or funds, with the aim of introducing them into the formal economy under the guise of legality. According to internationally recognized definitions, it involves the transformation or transfer of assets, accompanied by the intention to hide the criminal origin and to assist the persons involved in avoiding legal consequences (Financial Action Task Force, 2023).

The main features of this crime can be summarized as follows:

- dependence on the existence of a primary crime (predicate crime) that generates illicit income and constitutes the source of the assets subject to the "laundering" process;

- the central objective of concealing or disguising the true origin, location, possession or rights of assets obtained from criminal activities;

- the pronounced transnational nature, often involving complex financial structures and transactions carried out in multiple jurisdictions;

- high flexibility, which allows the method to be applied in multiple criminal contexts – from corruption and drug trafficking to tax fraud.

Article 243 of the Criminal Code of the Republic of Moldova, introduced by Law No. 985-XV of April 18, 2002 and subsequently amended to comply with international requirements (Law No. 308/2017; Law No. 145/2020), currently criminalizes:

- conversion, transfer, possession or use of proceeds of crime;

- concealing or disguising their nature or origin.

Paragraph (4) of the same article expressly enshrines the extraterritorial regime, establishing that criminal liability may also be incurred in situations where the action or part of it was committed outside the national territory, if the assets obtained from the crime are used in the Republic of Moldova or produce effects on it.

This regulation is aligned with international standards, in particular the recommendations of the Financial Action Task Force (FATF), MONEYVAL assessments and European directives in the field.

The crime of money laundering is related or subsequent to other criminal acts, being closely linked to the existence of a predicate crime, such as:

- corruption (art. 324, 325 of the Criminal Code of the Republic of Moldova) – cases in which the bribe received is subsequently "laundered";

- drug or human trafficking (art. 217¹, 165 CP RM) – illicit income is reinvested through apparently legitimate mechanisms;

tax evasion (art. 244 of the Criminal Code of the Republic of Moldova) – the amounts obtained by hiding income are subsequently integrated into the formal economic circuit.

Through this interdependence, money laundering acts as a factor in strengthening organized crime. Failure to investigate and punish this crime contributes to the strengthening of criminal networks and seriously affects the effectiveness of the rule of law (Transparency International, 2022).

3. The extraterritorial regime of the crime provided for in art. 243 para. (4) of the Criminal Code of the Republic of Moldova

Article 243 paragraph (4) of the Criminal Code of the Republic of Moldova provides that: *"Illicit actions also constitute acts committed outside the territory of the country if they contain the constitutive elements of a crime in the state in which they were committed and may constitute the constitutive elements of a crime committed on the territory of the Republic of Moldova."*

This provision establishes a form of *conditional extraterritorial criminal jurisdiction*, whereby Moldovan criminal law can be applied to acts committed outside the borders, when there is a relevant legal connection with the national territory. The connection can result either from the use of the proceeds of crime in the Republic of Moldova, or from the production of direct effects on it.

In doctrine, the extraterritorial regime represents the extension of criminal legislative competence beyond the geographical limits of the state, being based on principles such as universal, personal (active or passive) or protectionist jurisdiction (Savu, 2018). In the field of money laundering, this approach is justified by:

- the transnational nature of operations;
- the rapid and global circulation of illegally obtained capital and goods;
- the need to eliminate zones of impunity generated by the non-uniformity of national criminal legislation.

Thus, the state reserves the right to sanction criminal actions carried out abroad, but which produce legal, economic or social consequences on its territory.

The application of the provisions of art. 243 paragraph (4) is conditional on the existence of one of the following connecting elements:

- the use on the territory of the Republic of Moldova of the assets resulting from the crime (e.g.: investments in real estate, local businesses or deposits in domestic bank accounts);
- producing effects in the Republic of Moldova (e.g.: damage caused to individuals or institutions in the state);
- the concrete possibility of producing effects on the national territory, even if they have not materialized.

These criteria reflect the application of the principle of protection of the fundamental interests of the state, enshrined in Art. 11 paragraph (3) of the Criminal Code of the Republic of Moldova.

According to Art. 11 of the Criminal Code of the Republic of Moldova, the general framework for the application of criminal law depending on the place of commission of the crime is based on two essential rules (The extraterritorial application of criminal law is expressly regulated (Republic of Moldova, 2002)):

- paragraph (1) establishes the principle of territoriality – *“any crime committed on the territory of the Republic of Moldova falls under the jurisdiction of the national criminal law, regardless of the nationality of the perpetrator”*;

- paragraph (3) introduces an important exception – *“foreign citizens and stateless persons may be held liable in the Republic of Moldova for acts committed abroad if they are directed against the interests of the state, against the rights of Moldovan citizens or stateless persons with permanent residence in the country, against legal entities registered in the Republic of Moldova,*

against international peace and security, or if they fall within the category of crimes provided for by international treaties to which the Republic of Moldova is a party, provided that there is no final court decision in the state where they were committed” .

This norm encompasses the principles of active personality, passive personality and protection, constituting the legal foundation for the extension of criminal jurisdiction across borders.

In this context, art. 243 para. (4) represents a concrete application of the exception provided for in art. 11 para. (3), being adapted to the specifics of a crime with a pronounced transnational character. The norm is based on *the principle of effect*, recognized by international criminal law, according to which a state may exercise jurisdiction over an act committed outside its territory if it produces relevant consequences domestically.

In terms of money laundering, the mere use of the proceeds of crime in the territory of the Republic of Moldova – or the real possibility of producing effects there – is sufficient to trigger the application of national criminal law. This solution is in line with the recommendations of the International Financial Action Task Force (Financial Action Task Force, 2023), and with the provisions of the UN Convention against Transnational Organized Crime, which requires states to establish effective legislative mechanisms to sanction acts with a cross-border dimension (United Nations, 2004).

Through this regulation, the Moldovan legislator strengthens the capacity of the legal system to react against the phenomena of globalized financial crime, while maintaining compatibility with the fundamental principles of international criminal law and avoiding conflicts of jurisdiction.

4. Compatibility of the extraterritorial regime with international norms

The analysis of the extraterritorial regime provided for in art. 243 para. (4) of the Criminal Code of the Republic of Moldova cannot be limited to the perspective of domestic law, but must also be related to the international commitments assumed by the state. In the field of combating money laundering, the efficiency of criminal intervention directly depends on the degree of legislative harmonization with international standards and the functionality of cross-border cooperation mechanisms.

4.1. Relevant international instruments

A fundamental landmark in this area is the United Nations Convention against Transnational Organized Crime, According to the United Nations (2004), the Palermo Convention plays a central role in international criminal law, ratified by the Republic of Moldova. According to art. 6, States Parties have the obligation to criminalize money laundering and to ensure the legal framework for criminal liability in cross-border cases, including when the proceeds of crime are transferred, hidden or used in jurisdictions other than the one in which the predicate offense was committed.

Also, the Council of Europe Convention on the laundering, detection, seizure and confiscation of the proceeds of crime and the financing of terrorism imposes on states the obligation to extend the application of criminal law to acts committed outside the national territory, when they affect public order, the integrity of the financial system or economic security (Council of Europe, 2005).

At the European Union level, Directive (EU) 2018/1673 on combating money laundering by criminal law constitutes a reference standard, even if the Republic of Moldova is not a Member State (The EU Directive aligns criminal law with AML standards (European Union, 2018). Art. 7 of the directive expressly recommends the extension of criminal jurisdiction to acts committed abroad, especially when the perpetrator is a citizen of the respective state or the act produces effects on its territory. This orientation is relevant in the context of the commitments assumed by the Republic of Moldova through the Association Agreement with the EU, which aims at the progressive approximation of national legislation to the community acquis.

Thus, the provisions of Art. 243 paragraph (4) of the Criminal Code of the Republic of Moldova align with the international trend of expanding criminal jurisdiction in money laundering cases, reflecting both the recommendations of the UN and the Council of Europe, as well as European standards in the field.

4.2. The principle of mutual recognition and judicial cooperation

In the European legal space, the principle of mutual recognition of criminal judgments functions as an essential mechanism for the efficiency of transnational criminal justice, reducing the need for complex validation procedures. The application of the extraterritorial regime provided for in art. 243 para. (4) is complementary to these mechanisms and involves:

- extradition of the perpetrators;
- recognition and enforcement of foreign criminal judgments;
- obtaining evidence located in other jurisdictions;
- mutual assistance for the identification, seizure and confiscation of assets derived from crimes.

A reference legal framework in this regard is the European Convention on Mutual Assistance in Criminal Matters, which regulates procedures for the exchange of evidence, the hearing of witnesses and the execution of letters rogatory (Mutual legal assistance is governed by the 1959 European Convention, Council of Europe, 1959). The UN Convention against Corruption also provides clear obligations regarding the extension of criminal jurisdiction and cooperation in identifying and recovering assets derived from crimes, including when they are located abroad (United Nations, 2003).

In order to assess the coherence and efficiency of the extraterritorial regime provided for in art. 243 par. (4) of the Criminal Code of the Republic of Moldova, it is necessary to analyze it in correlation with the main international instruments applicable in the field of combating money laundering. Such a comparison highlights the degree of harmonization of national legislation with international standards, identifying both elements of convergence and possible gaps.

To this end, Table 1 summarizes the essential correspondences between the provisions of the Criminal Code of the Republic of Moldova and the provisions of the European Convention on Mutual Assistance in Criminal Matters and the United Nations Convention against Corruption. The analysis focuses on the criteria for extending criminal jurisdiction, the applicability of the rules to crimes with cross-border elements, international cooperation mechanisms, the recognition of predicate offenses and measures regarding the seizure and confiscation of assets.

This comparative approach allows identifying how Moldovan legislation aligns with global and European trends, ensuring a regulatory framework capable of effectively responding to the challenges generated by transnational financial crime.

Tabel.1 Extraterritorial money laundering regime – National norms vs. international provisions

Analyzed aspect	Criminal Code of the Republic of Moldova	European Convention on Mutual Assistance in Criminal Matters (Strasbourg, 1959)	UN Convention against Corruption (UNCAC, 2003)
Extension of criminal jurisdiction beyond national territory	Art. 11 paragraph (3) of the Criminal Code of the Republic of Moldova authorizes the application of criminal law to acts committed outside the Republic of Moldova, when	The Convention facilitates cooperation between states for criminal investigations, regardless of the place where the crime was committed, through	Art. 42 UNCAC allows states to extend their jurisdiction over crimes involving their own citizens or national economic interests.

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	they affect the interests of the state, its citizens or legal entities registered in the Republic of Moldova.	letters rogatory and the exchange of information.	
Application of criminal norms to money laundering with external elements	Art. 243 paragraph (4) provides for criminal liability for acts committed partially or entirely outside the Republic of Moldova, if there are effects or connections with the national territory.	It does not directly criminalize money laundering, but provides mechanisms for obtaining evidence and assistance in cases with a cross-border component.	It recognizes money laundering as a transnational crime (art. 23) and calls for its criminalization including for activities carried out abroad.
International cooperation	It is achieved through bilateral and multilateral treaties, as well as participation in international bodies.	It obliges signatory states to respond to requests for mutual legal assistance (arts. 1–15).	Chapter IV (art. 43 - 50) provides for instruments of international cooperation, including extradition, exchange of information and joint investigations.
Recognition of the predicate offense	It is not expressly defined, but is deduced from the constitutive elements of the crime of money laundering.	It does not contain direct regulations on predicate offenses.	It provides for the recognition of acts of corruption and other crimes as possible sources of money laundering (art. 23).
Seizure and confiscation of assets derived from crimes	Permitted by domestic legislation and concluded international agreements.	It allows the request for provisional and confiscatory measures between states.	Articles 31 and 54 establish measures for the seizure, freezing and confiscation of assets at the international level.

4.3. Possible conflicts of jurisdiction and solutions

The extension of the applicability of the criminal law of the Republic of Moldova to acts committed outside the national territory may, in certain situations, lead to conflicts of jurisdiction. Such situations may arise in particular when:

- two or more states are conducting parallel investigations into the same criminal act;
- there are differences between legislations regarding the definition or legal qualification of the crime;

In the state where the act occurred, money laundering is not criminalized or is sanctioned differently.

Managing these conflicts can be achieved through:

- the conclusion and application of bilateral agreements or multilateral treaties relating to extradition and international judicial cooperation;

- the use of *the principle of specialty* in extradition matters, which provides that the surrendered person can only be tried for the crime for which he was extradited;

- recourse to international coordination mechanisms, such as *Eurojust* or regional cooperation networks specialized in combating money laundering;

- establishing clear criteria for priority of jurisdiction, taking into account factors such as: the extent and seriousness of the effects, the nationality or residence of the victim, the location of the evidence or illegally obtained assets.

Under these conditions, the extraterritorial regime provided for by art. 243 paragraph (4) of the Criminal Code of the Republic of Moldova proves to be harmonized with the main international conventions and relevant European standards. Its application strengthens the mechanisms of international judicial cooperation, reduces the chances of impunity and protects the stability and integrity of the national financial system, while respecting the sovereignty of other states and the essential principles of international criminal law.

5. Conclusions

The study of the legal regime of the crime of money laundering, with a focus on the provisions of art. 243 paragraph (4) Criminal Code of the Republic of Moldova, reveals a legislative process aimed at adapting criminal norms to the realities of the transnational criminal phenomenon. The extraterritorial dimension introduced by this article provides a necessary legislative response to the challenges of globalized economic crime, overcoming the traditional limits of the territoriality principle and reducing the risk of impunity in cases with external elements.

The impact of this mechanism is all the more pronounced as its efficiency directly depends on the existence of solid international judicial cooperation and the clarity of domestic procedures. Harmonization of legislation with the standards of the state where the act was committed is a crucial factor, given that the damage is not always generated in the state where the crime began or transited, and perpetrators exploit differences and legislative gaps.

A telling example of this is the case known as the “Russian Laundromat”, which took place between 2010 and 2014. According to court documents and official information, approximately USD 20 billion was transferred from the Russian Federation to foreign jurisdictions, using the banking system and courts of the Republic of Moldova and Latvia (Organized Crime and Corruption Reporting Project, 2014). The scheme involved issuing court judgments in the Republic of Moldova based on fictitious loan agreements, through which Russian companies were obliged to “return” considerable amounts to offshore entities (Organized Crime and Corruption Reporting Project, 2014).

This case attracted the attention of international organizations such as *MONEYVAL* and *Transparency International*, generating pressure to strengthen the regulatory framework and international cooperation mechanisms (Global Witness, 2015). Following the investigations, *the Service for the Prevention and Combating of Money Laundering* intensified the monitoring of suspicious transactions and introduced additional internal procedures. At the same time, several judges from the Republic of Moldova were accused of involvement in the illicit financial circuit, being provisionally detained, and later released due to alleged procedural irregularities in the application of preventive measures and the norms regarding the criminalization provided for in art. 243 of the Criminal Code of the Republic of Moldova. The Service for the Prevention and Combating of Money Laundering (2018) reported increased efforts to fight illicit financial flows.

In this context, international cooperation is indispensable not only for the identification and recovery of illicit assets, but also for guaranteeing compliance with the principle of *non bis in idem*, enshrined in Article 4 of Protocol No. 7 to the European Convention on Human Rights (Protocol No. 7 establishes important provisions regarding human rights (Council of Europe, 1984)). This principle prohibits the same person from being tried or punished twice for the same act and requires effective coordination between the judicial authorities of the states involved, in order to prevent parallel proceedings and contradictory solutions (Pântea and Ceban, 2022).

The “Landromat” case highlighted the essential role of the mechanisms provided for in the European Convention on Mutual Assistance in Criminal Matters (Council of Europe, 1959) and the UN Convention against Corruption (United Nations, 2003), which facilitate the exchange of information, the obtaining of evidence and the mutual recognition of decisions. Thus, ensuring

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compliance with the *non bis in idem principle* and streamlining cross-border investigations remain strategic objectives in the fight against money laundering and organized financial crime.

By continuing to align the legislative framework with international requirements and by strengthening institutional capacities, the Republic of Moldova can consolidate its position in the fight against financial crime. To this end, it is necessary to clarify legal terminology, standardize jurisprudence and strengthen international cooperation, for a coherent and efficient application of the extraterritorial regime provided for in art. 243 para. (4) of the Criminal Code of the Republic of Moldova.

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THE DEVELOPMENT OF LIMITED LIABILITY COMPANIES IN THE REPUBLIC OF MOLDOVA

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Abstract: In this article, we will analyze the most widespread form of business in the Republic of Moldova – Limited Liability Company. In this scientific approach, we will make an analysis of the evolution of this form of business highlighting its characteristics and advantages. We will mainly refer to the legislation that concerns companies, recently amended. The Government approved the draft law on modification of some normative acts aimed at regulating the relations between associations/founders of companies. It provides for innovations in the legal framework, new possibilities in decision-making, more rights for associates, and simplification of several procedures. Entrepreneurs, especially those associated with Limited Companies (LLC), will gain more freedom for business growth and development and will have fewer bans at the law level.

The actuality of the theme is an obvious one, the Limited Liability Company is the most widespread form of organization of entrepreneurial activity in the Republic of Moldova, a fact confirmed by the statistical data. Unlike joint-stock companies, which are the largest commercial organizations with large capital, limited liability companies are part of organizations with medium-sized capital. Limited liability companies are favorable for small businesses. Moreover, the practice proves that many such forms of company are constituted by spouses within a family.

Purpose and research tasks. The purpose of the research is to carry out a multi-aspectual research of the limited liability company, as the most common form of business in the Republic of Moldova. To achieve the proposed purpose, we have drawn up the following tasks: a) to analyze the limited liability company in the light of national legislation; b) the comparative analysis of this form of business; c) identification of the advantages and disadvantages of the limited liability company.

Methods and materials applied. In the process of elaboration of this article, the following research methods were used: analysis, synthesis, historical, comparison method, etc. The Law on Entrepreneurship and Enterprises was used as scientific materials, nr. 845/1992; Civil Code of the Republic of Moldova nr.1107/2002; Limited Liability Company Act nr.135-XVI/2007, as well as valuable doctrinal sources in the domain.

Obtained results and debates consist of the theoretical and practical approach to all factors and circumstances relevant to the research topic.

Keywords: Limited Liability Company (LLC), entrepreneur, opportunity, challenge.

JEL Classification: K2, K22.

Basic content. A limited liability company is a legal person, which assumes limited liability before the law and towards its owners. It is a hybrid form of business with characteristics of both a partnership and a capital company, being more flexible than other forms of companies and more advantageous for a single owner or a small number of members.

In developing this scientific approach, I used historical and comparative methods.

From a chronological point of view, the limited liability company as a form of economic company is the last born both in our law and in the legislation of other countries.

This form of company was initiated to meet certain requirements of the commercial activity. Indeed, the companies of persons (especially the company in a collective name) provided the conditions for the use of small capital, and the capital companies (especially the joint stock company) were suitable for the use of large capital, destined for large-scale businesses. A form of company was needed that would be adapted to the demands of the capitalization of medium-sized

capital. This was done by introducing the limited liability company as a mixed form that borrows certain characters from both individual companies and capital companies (Angheni et al., 2000).

Limited liability companies are a practical application of the principle of limitation of liability of traders for their commercial liabilities (Cârpenaru, 2012). The limited liability company first appeared in 1892 in Germany (Amititeloaie, 2012) in this respect being regulated by a special law of April 1892, under the name *Gesellschaft mit beschränkter Haftung*, (Amititeloaie, 2012) published in *Reichgesetzblatt* (Reich Law Gazette), the law that was maintained in force after the entry into force of the Commercial Code of 1896 (Săuleanu, 2012). This law was an inspiration to other countries, so Austria, by the law of March 6, 1906. In France, it is regulated by the law of 7 March 1925, in Luxembourg in 1923, in Belgium in 1935, in Italy, by the code of 1942, in Spain, by the law of 17 April 1953 in Greece, by the law of 1971 (Amititeloaie, 2012).

In the Republic of Moldova, it found its legal consecration in the following chronological order:

Government Decision of the Republic of Moldova 500/1991 on economic companies (currently repealed);

Law on entrepreneurship and enterprises, nr. 845/1992;

Civil Code of the Republic of Moldova nr.1107/2002;

Law on limited liability companies nr.135-XVI/2007.

According to art. 280 of the Civil Code of the Republic of Moldova and art. 2 of Law no.135–XVI/2007 on limited liability companies, **the limited liability company** is defined as the company whose share capital is divided into social parts according to the instrument of incorporation and whose obligations are guaranteed with the patrimony of the company.

The Republic of Moldova has only advantages for the establishment and management of a company: low fees compared to the rest of the countries in Europe, working flexibility of state institutions, online reporting of all accounting reports, etc, the possibility of using electronic signatures, developed banking systems, are just some of the country's benefits for entrepreneurs (Grău-Panțureac, 2022).

Characteristics of the limited liability company. Considering all the legal provisions regarding this type of company, the following particularities can be synthesized that make the limited liability company a distinct type of company:

the association is based on the trust of the associates;

the associates of this form of company are responsible for social obligations within the limit of their contribution to the share capital;

specific to a company is the fact that they can be established as one-person societies. The social contribution to the formation of the whole capital belongs to the single associate.

the company has a stable structure. This structure involves the existence of a supreme deliberation and decision-making body, an executive body, and a control body (Grău-Panțureac, 2022).

An LLC may be registered with any territorial subdivision of the Public Services Agency upon presentation of the identity card. At the same time, at this stage, it is checked whether you do not have debts to the state or other enterprises if you have unpaid fines or a ban on setting up new businesses. To found a limited liability company, you need to go through three stages: business registration, opening of the bank/payment account, and taking into account. An important aspect is the name LLC because it is not allowed to repeat an existing name.

The tax administration requires a confirmed legal address, which must be carried out immediately after the business registers.

We should mention that basically all companies established in the Republic of Moldova follow, in principle, the same structure composed of (Law of the Republic of Moldova on Limited Liability Companies, 2007, art. 48-62):

management bodies (General Assembly of Shareholders);
administrative bodies (Manager/Management Board);
control bodies (Censors/Auditors).

Management bodies have, mainly, the following tasks: to discuss, approve or amend the annual financial statements; to elect and revoke the administrator, board members, and censors; to decide on the management of the administrator, the board of directors, respectively the directorate; to decide to change the legal form of the company; decide any other amendment to the constitutive act or any other decision for which the approval of the general meeting is sought, etc.

Administrative bodies have, mainly, the following duties: to represent the company in its relations with third parties; to conclude contracts and other legal acts on behalf of the company; to act, on behalf of the company, in relations with third parties; to respect and enforce decisions of management bodies; to present the work carried out on behalf of the company, before the governing bodies (Law of the Republic of Moldova on Limited Liability Companies, 2007, art.69-76).

Control bodies have, mainly, the following tasks: supervising the management of the company; verifying the legality of the financial statements; presenting all the attributions of the management/administrative/control bodies of the company (commercial); checking and determining whether some of the duties of the management/administrative/control bodies of the company can be changed (Law of the Republic of Moldova on Limited Liability Companies, 2007, art.48-62).

The advantages of the limited liability company are as follows:

Limited liability of associates. Within the limited liability company, the associates are obliged only to pay the social parties, so the creditors cannot trace the personal wealth of the associates to cover the debts of the enterprise.

Simple formalities at foundation. For the constitution of the limited liability company, it is sufficient to draw up the company's statute and draw up the company contract.

An unlimited number of associates. There is no lower limit of associates for the establishment of the limited liability company. This can be established even if there is a unique associate. Instead, in the Republic of Moldova is an unlimited number of associates.

Control over business and management can be carried out directly by the associates during the financial year and set up at the end of the year in ordinary meetings.

*Limited liability companies also have some **disadvantages**.*

A person may be the sole associate of a single LLC. A person can participate in several LLCs that have only several associates.

Lack of business continuity. This disadvantage occurs only when there is only one entrepreneur. In case of illness, the business may suffer, and in case of death, the company dissolves if the entrepreneur has not taken steps to prepare a successor.

In the following, we will refer to the legislative changes that refer to the Limited Liability Company. Entrepreneurs, especially those associated with Limited Liability Companies (LLCs), will gain more freedom for business growth and development and will have fewer bans at the law level. The deputies voted on a bill to amend some normative acts that regulate the relations between associations or founders of companies. According to the Communication and Public Relations Department of the Parliament, the amendments offer decisional alternatives for the associates, the possibility of using contemporary corporate governance systems, materialize the rights of the associates, and facilitate the procedures for the use of these rights which simplify and optimize procedures.

Innovations in the legal framework: EU rules are transposed; Flexibility in profit sharing; Corporate contract - more trust between the founders; Withdrawal of the minority associate - without the consent of the other associates; Distribution of profit regardless of share; Phantom

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stock - profit distribution for unfounded employees; More transparency - access to the LLC statement for the investor.

New possibilities in the decision-making process: The maximum threshold of the number of associates - threshold of 50 – excluded; A single constituent act and the State Register as the main source of official information; The social capital - more training possibilities.

More rights for associates: Wider access to company information and documentation; The right of the associate to be represented by the administrator; Adoption of decisions - 2/3 of the votes, not 3/4; The administrator of the company - the possibility to be a legal entity.

Simpler procedures: Electronic tools for keeping documents, submitting documents and procedures at meetings; Assemblies of associates - at a distance and without convening procedures; Simplification of expression within the legal framework - instead of "report and accounts", the term "report" will be used, instead of "financial accounts", will be used "financial statements", and these financial statements will be "examined" and not "approved".

Limited liability companies (SRL) will issue corporate bonds based on new simplified provisions, approved today by the Government. Thus, following the amendment of the Law on limited liability companies, clearer conditions for issuing bonds will be established, as well as the bodies responsible for this process. The new project will allow the application of modern instruments on the securities market and will offer the possibility of attracting investments, which will contribute to the development of the business environment. Therefore, the company, at the decision of the General Meeting of the associates or the Company Council, can issue bonds, in order to finance the activity of the SRL. This right will provide companies with simpler alternatives to attract financing, taking into account the fact that not all legal entities under private law have access to current sources of financing, due to the fact that they do not meet certain requirements imposed by banking institutions. At the same time, the document seeks to increase the protection of bond holders and offers the possibility of recovering financial means, without going to court, in case of non-honor of the bond issuers' commitments (Law of the Republic of Moldova amending certain normative acts, 2023, art.527).

According to the authors, the need to draft the law is argued by the fact that in recent years there has been a decrease in direct investment in the country's economy.

Thus, the conceptual proposal to modernize the rules on companies is to keep in the law only those prohibitions and limitations, which are necessary to ensure the public interest and to avoid abuses.

The purpose of the draft of the law consists of:

increasing the number of resident and non-resident investors and the value of investments in various areas of economic activity;

increasing in turnover, number of active enterprises, opening new jobs;

mitigating risks for external investors; implementing contemporary and advanced business management tools, applied in the European Union and other countries with the economy, democracy, and free market.

Expectations following the application of the legislative changes are to increase the number of resident and non-resident investors and the value of investments in various areas, increase in turnover, number of active enterprises, and, opening of new jobs, increase the confidence of investors, financial institutions and external partners towards the national investment climate.

In **conclusion**, as we said above, the most widespread form of company organization is the LLC, that is, a limited liability company, this represents at the same time one of the safest variants of organization for associates. The security in the case of LLC-type companies is given by the fact that the associations (individuals) of such a company will be liable in case of insolvency only with the company's patrimony and the share capital on which they brought him into the firm. We can say with certainty that any person eager to become a successful entrepreneur, and having a well-

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established business plan, has the opportunity to open up a limited liability company without taking enormous risks. In the Republic of Moldova, some entrepreneurs still believe that a business brings money only if it is not registered and runs a business avoiding the law. And some only register it after paying numerous fines, which is totally wrong. Registering a business and running a legal business is essential for several reasons. First of all, it provides stability and legal protection, not to mention the fact that a legal business is credible towards customers, suppliers, and financiers. Having a registered and legal business can access grants and financing from investors.

And we will finish this study with a motivational quote: “If you are sloppy in your thinking, your business will be sloppy. If you are disorganized, your business will be disorganized. If you are greedy, your employees will be greedy, giving you less and always asking for more.” – Michael Gerber

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GREENWASHING PRACTICES: LEGAL CHALLENGES AND ECONOMIC IMPLICATIONS IN THE CONTEXT OF EUROPEAN INTEGRATION

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Abstract: Corporate communication that inflates or misrepresents an organization's environmental responsibility is known as "greenwashing." The study analyzes this phenomena from a legal-economic perspective, assessing Moldova's changing legal system and how well it complies with EU sustainability and consumer protection regulations. This paper aims to explore the phenomenon from a legal perspective, focusing on the Republic of Moldova's current regulatory framework and its alignment with European Union standards. The study seeks to identify the gaps and challenges in addressing greenwashing within the context of the country's progressive integration into the EU single market.

The research is based on a comparative legal analysis, examining relevant Moldovan legislation, EU directives, and case law concerning unfair commercial practices and consumer protection. Additionally, the study reviews international best practices, including regulatory approaches from the United States and selected EU member states, to provide a broader understanding of enforcement mechanisms.

The findings indicate that while Moldova has made significant steps toward harmonizing its consumer protection and advertising legislation with EU requirements, enforcement mechanisms remain underdeveloped. The absence of specific provisions targeting environmental claims creates a legal vacuum that may enable companies to engage in deceptive marketing without facing significant consequences. Moreover, limited consumer awareness and insufficient monitoring capacity further weaken the effectiveness of existing laws.

The paper concludes by proposing legal and policy recommendations, including the introduction of explicit legal definitions of greenwashing, enhanced sanctions for misleading environmental claims, and improved inter-agency cooperation. These measures aim to strengthen the legal framework, foster consumer trust, and encourage genuine corporate sustainability initiatives, ultimately contributing to the country's competitiveness in the knowledge economy.

Keywords: greenwashing, consumer protection, EU integration, unfair commercial practices, environmental claims, legal regulation

JEL Classification: K32, K33, M14, Q56

1 INTRODUCTION

The concept of *greenwashing* has become one of the most debated issues in contemporary legal and economic discourse. It refers to marketing practices that create a false or exaggerated impression of a company's environmental responsibility or the ecological benefits of its products (McKinsey & Company, 2023). At its core, greenwashing undermines the integrity of sustainability as both a policy objective and a market value by misleading consumers and distorting competition. Its growing prevalence reflects the tension between the global rise in consumer demand for sustainable goods and the commercial incentives to exploit this demand without undertaking genuine environmental commitments.

Globally, consumer behavior has shifted significantly over the last decade. Surveys consistently demonstrate that consumers—particularly younger generations—prefer environmentally responsible products and are willing to pay a premium for them. However, this willingness is contingent upon trust. Misleading eco-claims erode that trust, thereby creating a paradoxical effect: while genuine sustainability initiatives should be rewarded, the proliferation of

deceptive practices generates skepticism that undermines the entire sustainability market. This dynamic illustrates why greenwashing is not merely an ethical or reputational issue, but also a regulatory, economic, and legal challenge.

In the European Union, legal frameworks addressing unfair commercial practices have increasingly evolved to account for the dangers posed by greenwashing. Directives such as the Unfair Commercial Practices Directive (2005/29/EC), the Misleading and Comparative Advertising Directive (2006/114/EC), and the recently adopted Empowering Consumers for the Green Transition Directive (2024/825) establish clear standards prohibiting vague or unsubstantiated environmental claims. These frameworks reflect the EU's broader Green Deal agenda, which seeks to combine consumer protection with the transition to a low-carbon economy. They also highlight the growing importance of aligning consumer law with climate and environmental policy objectives.

By contrast, the Republic of Moldova, as a candidate country pursuing alignment with the EU acquis, has not yet developed explicit provisions on greenwashing. While Moldova has transposed elements of the EU's consumer protection acquis into national law—particularly through the Consumer Protection Law (2003) and the Advertising Law (2022)—these instruments remain general in nature and do not directly regulate environmental claims (Republic of Moldova, 2003; Republic of Moldova, 2022). This legal lacuna not only exposes consumers to misleading information but also risks creating an uneven playing field for businesses that invest in authentic sustainability. Moreover, it raises questions about Moldova's preparedness to integrate into the EU's single market, where increasingly rigorous standards on environmental marketing are being enforced.

In this context, this article aims to examine the legal problems related to greenwashing in Moldova and evaluate their wider economic consequences. It critically analyzes the alignment of Moldova's consumer and advertising regulations with EU directives and worldwide standards, notably the U.S. Federal Trade Commission's Green Guides (Federal Trade Commission, 2012). It also looks at how loopholes in regulation hurt consumer trust, competitiveness in the market, and Moldova's efforts to join the European Union. This study employs a qualitative and comparative legal technique, integrating the analysis of legislation and directives with case law and regulatory practices from other countries. In doing so, it shows both what the laws are supposed to mean and how they are really enforced.

This study makes two contributions. First, it shows exactly where Moldovan laws do not follow EU standards and worldwide best practices. This makes it clear what needs to be changed. Second, it puts greenwashing in the context of both protecting consumers and being a structural problem for Moldova's economic competitiveness, trust in institutions, and progress toward sustainable development in the European knowledge economy.

2. LEGAL FRAMEWORK OF GREENWASHING IN REPUBLIC OF MOLDOVA

The Republic of Moldova has slowly brought its consumer protection and advertising laws in line with the European Union's *acquis communautaire*. However, there are still some big gaps, especially when it comes to claims about the environment. The country has set up a general legislative framework to protect consumers from misleading tactics, but it has not put in place any specific rules to stop greenwashing. This part looks at the main parts of the current laws, points out their flaws, and puts them in the context of the EU's process of approximation.

2.1 Consumer Protection Law

The cornerstone of Moldova's consumer law is the *Law on Consumer Protection* (No. 105-XV of 2003, as amended), which transposes Directive 2005/29/EC on unfair business-to-consumer practices. The law prohibits both misleading and aggressive commercial practices, defining unfair practices as those that contain false information or omit material facts likely to mislead the average consumer. This reflects the general structure of the EU Unfair Commercial Practices Directive,

which operates on a principle-based approach. However, the Moldovan law does not include explicit provisions relating to environmental or sustainability claims. Consequently, while unsubstantiated “eco-friendly” or “climate neutral” assertions could in theory fall within the broad category of misleading practices, their regulation depends on the willingness and capacity of enforcement bodies to interpret them as such. This reliance on generic clauses creates interpretative uncertainty and weakens deterrence.

2.2 Law on Advertising

In 2022, Moldova adopted the *Law on Advertising* (No. 62 of 17 March 2022) to modernize its regulatory landscape and harmonize with EU Directive 2006/114/EC on misleading and comparative advertising. The legislation sets out principles of accuracy and transparency, prohibits false or unverifiable statements, and requires the clear identification of the advertiser. It also incorporates the EU’s blacklist approach, whereby certain advertising practices are categorically prohibited. Despite these advances, the law does not define “greenwashing” nor does it introduce eco-specific provisions. Its focus remains on the formal and technical aspects of advertising regulation—such as outdoor advertising permits and placement rules—rather than on the substantive veracity of environmental claims. As a result, the law does not provide adequate safeguards against the proliferation of misleading sustainability marketing.

2.3 Competition Law

Elements of unfair commercial conduct also fall under the scope of the *Law on Protection of Competition* (No. 183/2012). This law prohibits misleading advertising and other practices that distort fair competition, including marketing strategies that create confusion about product origin, qualities, or characteristics. In theory, it could be invoked against misleading green claims where they affect market competition. However, enforcement in this area is the responsibility of the Competition Council rather than consumer protection authorities, and to date there have been no reported cases in Moldova where environmental claims have been challenged under competition law. This reflects a broader tendency for greenwashing to remain overlooked by existing enforcement mechanisms.

2.4 Enforcement Gaps and Institutional Limitations

While Moldova has taken notable steps to harmonize its consumer and advertising framework with EU directives, enforcement remains underdeveloped. Consumer protection authorities and advertising regulators lack specialized guidelines and technical expertise to assess the accuracy of environmental claims. There are no dedicated monitoring mechanisms, and the absence of clear definitions complicates regulatory action. As has been observed in national legal commentary, “the absence of specific provisions targeting environmental claims creates a legal vacuum that may enable companies to engage in deceptive marketing without facing significant consequences” (Republic of Moldova, 2022).

In practical terms, this means that although Moldova’s laws formally prohibit misleading commercial practices, enforcement against greenwashing remains largely reactive, case-specific, and dependent on consumer complaints. The lack of proactive supervision or standardized verification processes allows companies to continue using vague environmental slogans with minimal risk of sanction. This gap not only undermines consumer protection but also creates distortions in market competition, favoring firms that rely on deceptive marketing over those investing in genuine sustainability.

2.5 Implications for EU Integration

Moldova’s current legal framework illustrates the challenges faced by candidate countries in aligning domestic legislation with the EU acquis. While significant progress has been made in transposing directives on consumer and advertising law, the lack of eco-specific provisions signals an incomplete harmonization. Given the EU’s recent adoption of the Empowering Consumers for the Green Transition Directive (2024/825), which explicitly regulates environmental claims,

Moldova's legislative framework will require further reform to avoid regulatory divergence. The absence of such alignment could hinder Moldova's integration into the single market, particularly in sectors where environmental marketing plays a central role.

3. COMPARATIVE ANALYSIS WITH EU AND INTERNATIONAL PRACTICES

The regulatory shortcomings in Moldova become particularly evident when assessed against developments within the European Union and other leading jurisdictions. While Moldovan legislation prohibits misleading practices in general terms, EU law and international practice are increasingly characterized by targeted, eco-specific instruments designed to address greenwashing with precision and enforceability.

3.1 Developments within the European Union

The EU has long considered misleading environmental claims as falling under the scope of the *Unfair Commercial Practices Directive* (UCPD, 2005/29/EC). The Directive prohibits deceptive commercial practices, including those involving omissions of material information, and has been interpreted by both the European Court of Justice and national authorities to cover vague or unsubstantiated sustainability claims. In practice, member states have used the UCPD to sanction firms for generic descriptors such as “eco-friendly” or “environmentally safe” when these lacked substantiation.

But recent EU legislative efforts have gone beyond this basic framework. The Empowering Consumers for the Green Transition Directive (Directive (EU) 2024/825) was passed in February 2024 to make it clear that greenwashing is not allowed. This Directive says that you can not use "generic environmental claims," like "green," "sustainable," or "climate friendly," unless you can back them up with strong and verifiable evidence (Morgan Lewis, 2024; Mason Hayes & Curran, 2025). It also limits claims of carbon neutrality unless they are based on clear and traceable data on emissions. By 2026, Member States must turn these measures into national law, which sets a clear deadline for reform.

At the same time, the EU was thinking about passing a Green Claims Directive that would have made it necessary for a third party to check environmental claims. The Commission said in the middle of 2025 that it would not go through with this proposal (Latham & Watkins, 2025), but it stressed that the decision did not weaken the bigger picture. The Green Transition Directive is still in effect, and putting it into action will be a big step forward in protecting consumers from misleading marketing about sustainability.

3.2 United States Federal Trade Commission

The Federal Trade Commission's (FTC) Green Guides (FTC, 2012) are the main way that the United States deals with greenwashing. They are the main way to evaluate claims about environmental marketing. The Green Guides are not legally binding rules, but they do set out clear standards that are meant to stop businesses from making false or misleading environmental claims. The FTC says that businesses should not make broad, unqualified claims like "eco-friendly" or "sustainable" unless they can back them up with reliable and verifiable proof. In addition, claims about the environment, like those about recyclability, biodegradability, or renewable content, must be based on scientifically sound methods and tests (FTC, 2012).

Section 5 of the Federal Trade Commission Act makes it illegal for businesses to do "unfair or deceptive acts or practices" in commerce. The Green Guides are not legally binding, but they do help people understand how to use Section 5 in marketing for the environment (Delmas & Burbano, 2011). The FTC has used these rules in several cases against companies that lied about how their products helped the environment. This made the Green Guides an important reference for compliance in U.S. consumer protection law.

Recent changes to the Green Guides have made them more relevant to new sustainability claims, such as carbon offsetting, climate neutrality, and environmental, social, and governance (ESG) marketing statements (Federal Trade Commission, 2023). This is because the market is

changing. Because of this, the FTC's framework is now known around the world and has had an effect on regulators in places like the European Union and the United Kingdom, which have used similar methods to stop greenwashing by being open, using evidence-based substantiation, and using standardized definitions (Testa et al., 2018). So, the FTC's advice serves as a de facto global standard for ethical environmental communication and consumer protection.

3.3 National Approaches within and beyond the EU

Several EU member states have adopted domestic measures that go beyond EU minimum standards. France's *Climate and Resilience Law* (2021) criminalizes greenwashing and establishes severe penalties, including fines up to €300,000 and custodial sentences for individuals (Gowling WLG, 2023). French authorities have also banned unqualified “carbon neutral” claims in advertising, underscoring their commitment to ensuring that environmental assertions are accurate and verifiable.

The United Kingdom, through the Competition and Markets Authority, has developed a *Green Claims Code*. While non-binding, this code establishes principles of accuracy, transparency, and substantiation. Legislation coming into effect in 2025 further empowers the CMA to levy fines against misleading sustainability claims, marking a shift from voluntary guidance to enforceable obligations.

In China, regulators rely on general advertising and anti-unfair competition laws to target false environmental claims. Enforcement actions have included penalties for companies overstating eco-benefits, signaling a global recognition of greenwashing as a competition and consumer protection issue.

3.4 Implications for Moldova

This comparative analysis highlights Moldova's relative lag in regulating environmental claims. Whereas the EU and other advanced jurisdictions are adopting explicit prohibitions, requiring substantiation, and even criminalizing deceptive environmental marketing, Moldova relies solely on general provisions prohibiting misleading advertising. Such reliance leaves enforcement reactive, complaint-driven, and inconsistent.

A practical illustration underscores the divergence: under the EU Green Transition Directive, a claim such as “Our product is biodegradable” would be unlawful unless supported by robust evidence (Mason Hayes & Curran, 2025). In Moldova, however, the same claim could be marketed without consequence unless consumer authorities chose to interpret it as misleading under the general prohibition. This asymmetry not only risks consumer deception but also disadvantages Moldovan firms seeking to compete in EU markets where higher standards apply.

4. ECONOMIC AND MARKET IMPLICATIONS

The economic impact of greenwashing is multifaceted, affecting consumer trust, competitive dynamics, and investment behavior. Evidence suggests that credible sustainability claims contribute positively to sales performance. For example, McKinsey (2023) reports that consumer-packaged goods with environmental, social, and governance (ESG)-related labels experienced a 28% growth in sales over five years, compared with only 20% for products without such claims. This differential illustrates that consumers are not only receptive to sustainability narratives but are also willing to reward companies that credibly integrate environmental considerations into their value propositions.

4.1 Consumer Trust and Market Confidence

Greenwashing undermines the very trust upon which sustainable markets depend. When consumers are exposed to misleading environmental claims, skepticism extends beyond individual products and can erode confidence in sustainability labels more broadly. McKinsey (2023) warns that greenwashing poses substantial reputational risks to businesses by diminishing consumer willingness to pay for genuinely sustainable goods. A survey cited by the Federal Trade Commission found that 88% of young consumers express distrust toward unqualified green claims,

signaling that trust deficits are particularly pronounced among younger, environmentally conscious demographics. In the Moldovan context—where consumer awareness of environmental issues is still developing—greenwashing may not only diminish trust but also hinder the very emergence of a culture of sustainability.

4.2 Distortion of Competition and Innovation Disincentives

Unchecked greenwashing distorts competition by granting unfair advantages to companies that rely on marketing strategies rather than substantive environmental performance. Firms that make unsubstantiated sustainability claims may secure market share without incurring the costs of genuine environmental innovation, thereby penalizing competitors that invest in cleaner technologies or eco-friendly processes. This misallocation of resources reduces incentives to innovate, slows the diffusion of green technologies, and undermines market efficiency. In Moldova, where the transition toward a knowledge-based and sustainable economy is integral to EU integration, such distortions pose a systemic risk to competitiveness.

4.3 Financial and Investment Implications

From the perspective of financial markets, the consequences of greenwashing are complex. A report by the European Securities and Markets Authority (ESMA, 2021) found that allegations of greenwashing surged in Europe between 2020 and 2021, particularly in the financial and energy sectors. However, the same study observed no systematic evidence of immediate effects on stock returns or firm valuations, suggesting that markets may not initially penalize companies accused of greenwashing. Nevertheless, ESMA cautioned that repeated scandals generate significant costs in terms of legal expenses, reputational damage, and regulatory penalties.

For emerging economies such as Moldova, where capital markets are less mature, the primary risks are not short-term stock volatility but rather reputational and regulatory credibility. Foreign investors may interpret weak enforcement against deceptive environmental claims as an indicator of broader governance deficiencies. In this sense, greenwashing may reduce Moldova’s attractiveness as an investment destination, particularly in sectors where environmental compliance is a key consideration for international partners.

4.4 Implications for Moldova’s EU Integration

The economic implications of greenwashing are amplified by Moldova’s strategic objective of European integration. As the EU introduces increasingly stringent rules on environmental claims, Moldovan firms that operate under a permissive domestic regime risk facing barriers when accessing the single market. A lack of harmonization may also create reputational risks for Moldova as a jurisdiction perceived to tolerate deceptive practices. Conversely, the adoption of robust anti-greenwashing regulations could enhance Moldova’s competitiveness, reinforce consumer trust, and improve the country’s attractiveness for sustainable investment.

5. POLICY RECOMMENDATIONS

To address the regulatory and enforcement deficiencies identified in the preceding analysis, Moldova should adopt a comprehensive package of policy measures. These interventions would strengthen consumer protection, ensure market transparency, and accelerate legislative alignment with the European Union. Six key recommendations can be identified:

Introduction of an explicit legal definition of greenwashing

Moldova’s *Consumer Protection Law* and *Advertising Law* should be amended to incorporate a precise definition of *greenwashing* or *misleading environmental claims*. Establishing a clear statutory definition would reduce interpretative ambiguity, ensure consistency in enforcement, and subject sustainability-related marketing to the same evidentiary standards as other commercial claims (Morgan Lewis, 2024).

Prohibition of generic or unqualified environmental claims

Legislation should explicitly prohibit the use of broad descriptors such as “green,” “natural,” or “carbon neutral” unless substantiated by verifiable evidence. The EU’s *Empowering Consumers*

for the Green Transition Directive provides a useful model in this respect, ensuring that only claims supported by transparent data and third-party verification are permissible (Mason Hayes & Curran, 2025). This reform would discourage superficial branding strategies and reward companies engaging in genuine sustainability practices.

Enhancement of enforcement powers and sanctions

The deterrent effect of current sanctions in Moldova remains weak, as fines are modest and rarely applied. To improve compliance, penalties should be increased, with provisions for administrative and, where appropriate, criminal liability. Public disclosure of offenders could also serve as a reputational deterrent. Comparative experience demonstrates that stronger enforcement frameworks are effective in reducing the prevalence of deceptive sustainability claims (Gowling WLG, 2023).

Strengthening of inter-agency coordination

Greenwashing oversight requires cooperation across institutional boundaries. Moldova should establish joint investigative mechanisms and information-sharing protocols between the Consumer Protection Agency, the Competition Council, and environmental regulators. Such coordination would prevent regulatory fragmentation, facilitate more efficient enforcement, and ensure that environmental claims are scrutinized from both a consumer protection and competition law perspective (Mason Hayes & Curran, 2025).

Promotion of consumer and business awareness

Along with changes to the law, there need to be educational and informational campaigns aimed at both businesses and consumers. Businesses should learn about compliance requirements through guidelines, training, and consultations. Consumers should also be able to critically evaluate environmental claims. Efforts to raise eco-literacy, such as outreach through schools, civil society groups, and media campaigns, would make consumers more aware and make regulations work better.

Harmonization with EU sustainability standards

As a candidate country for the EU, Moldova needs to get ready for and follow new EU rules, such as requiring proof of environmental claims and using EU-recognized ecolabels. Proactive harmonization would not only make sure that Moldovan exporters are legally compatible, but it would also help them compete in the single market. Moldova can lower future compliance costs, improve access to markets, and show its commitment to long-term economic integration by making its own rules more like those of the EU.

Conclusion

Greenwashing is a problem that affects the law, the economy, and the health of consumers. The current rules in Moldova do not have any specific ways to deal with false environmental marketing. Our research shows that Moldova has changed its consumer laws to be more like those in the EU, but it has not yet made rules about green claims. This gap could confuse customers and make the market less efficient at a time when sustainability is very important for staying competitive. On the other hand, the EU and other places are moving toward strict rules against greenwashing, such as banning unproven "eco" labels and giving regulators the power to enforce truth in advertising (Morgan Lewis, 2024; Mason Hayes & Curran, 2025).

If greenwashing goes unchecked, it can hurt the economy by making people less trusting and making competition less fair, which will cost society in the long run (McKinsey & Company, 2023; ESMA, 2021). Moldova should make it clear that false environmental claims are against the law, step up enforcement and penalties, and make its laws more in line with EU rules on sustainability marketing to deal with these problems. These actions will protect consumers, make things fair for honest businesses, and help Moldova's ongoing integration into the European single market.

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THE IMPORTANCE OF KNOWING BUSINESS LEGISLATION FOR ENTREPRENEURS

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Abstract: In today's dynamic economic environment, understanding business legislation is a fundamental aspect of entrepreneurial success. Legal awareness ensures compliance with regulations, mitigates risks, and protects the interests of both the business and its stakeholders. Entrepreneurs must navigate complex areas such as contracts, corporate governance, taxation, labor law, and consumer protection. Moreover, staying informed about legislative changes helps businesses adapt to new requirements, maintain competitiveness, and avoid potential penalties or disputes. This topic is particularly relevant as regulatory frameworks continue to evolve, requiring a proactive approach to legal education. Legal awareness is not merely a technical requirement but a strategic asset for business owners. By understanding their rights and obligations under the law, entrepreneurs can enhance their decision-making capabilities, foster transparent operations, and build a foundation for long-term success.

The primary aim of this article is to emphasize the importance of legal knowledge for entrepreneurs and demonstrate how it can be effectively applied to everyday business operations.

Specific objectives include:

Highlighting the critical areas of business law that impact entrepreneurial activities.

Explaining the role of legal awareness in risk management and dispute resolution.

Encouraging entrepreneurs to integrate legal compliance into their strategic planning processes.

Demonstrating how understanding legislation supports sustainable and ethical business growth.

This article is based on a qualitative analysis of relevant legal frameworks, practical case studies, and a comparative review of global best practices in business law compliance. Additionally, input from legal experts and examples of common challenges faced by entrepreneurs were used to provide actionable insights. These methods ensure a comprehensive approach to the subject and underline its practical implications.

Keywords: Business legislation, legal compliance, risk management, corporate governance, entrepreneurship, sustainable growth, legal awareness.

JEL Classification: K2, K22.

Introduction. Business law is a discipline, important through the field of study, which refers to business. Seen as a distinct branch in the private law system, business law is made up of all the legal rules governing business. Business means an income-generating economic activity. Business law, as a legal branch and field of study, constitutes a set of norms and legal institutions governing commercial activities.

The usefulness of studying business law for potential entrepreneurs is for them to find the optimal way in building their own successful careers. Thus, the entrepreneur becomes responsible for the choice he made and will use the legal norms in organizing a business.

Let us also mention in the article that Business Law is a fundamental discipline studied in all faculties that train specialists in various branches of the national economy.

The content of the study material in the field of Business Law is intended to provide students with legal knowledge in the field of entrepreneurial activity, documents and acts of trade, of the interaction between the subjects of the entrepreneurial activity on one hand and between them and the state bodies on the other.

The field of Business Law includes many general aspects related to the legal regulation of entrepreneurial activity in the Republic of Moldova, subjects of entrepreneurial activity, establishment, organization and functioning of legal entities for profit, reorganization and

liquidation of for-profit legal entities, insolvency, analysis of different types of companies, cooperatives and state and municipal enterprises, ending with the analysis of commercial contracts relevant to the business field.

Business law, as a university study discipline, takes into account the set of general rules of private law and special rules of private and public law applicable to entrepreneurs, natural and legal persons authorized in their business activity, respectively of production, provision of services, execution of works or acts of trade (Cristea, 2012).

The business has a solid normative basis, consisting of a multitude of acts that refer to various areas of the national economy. The term *business* is frequently replaced by other terms or phrases such as entrepreneurial activity, business, commercial activity, entrepreneurship activity, economic activity, etc. Businesses, in the legislation of the Republic of Moldova, are regulated as *entrepreneurship* (entrepreneurial activity).

Business law is that branch of private law that regulates patrimonial and personal social relations in the field of trade, relationships that are usually born between people who have the quality of trader and who are in the position of legal equality (Roșca and Baieș, 2011).

In the specialized doctrine, business law has different names, including that of commercial law. In the Republic of Moldova there is no trade code or business code, the business field is regulated by a wide range of special laws, including the civil code of the Republic of Moldova.

In our view, commercial law cannot be equated as meaning with business law, the first having a narrower sphere of regulation in relation to business law. Business law regulates the relations related to the production of goods, the provision of services, the execution of works, as well as the marketing of goods, while commercial law regulates only trade relations. Therefore, we can identify a gender-species correlation, business law being the gender and commercial law the specie.

The object of business law is the relationships that arise in connection with the activity of a for-profit entrepreneur between individuals and legal persons who have the quality of an entrepreneur.

Therefore, from the category of social relations, which fall under the regulatory incidence of the norms of the business law, are the following:

relationships that arise in connection with the acquisition, maintenance and cessation of entrepreneurial quality (registration of entrepreneurs, reorganization and liquidation of legal entities, cessation of the activity of individual entrepreneurs, etc.);

the relationships that appear in the activity of the entrepreneur and the production of profit (conclusion and execution of commercial contracts, execution of works, provision of services etc.);

relationships that arise between public authorities and persons who have the quality of entrepreneur (determination and collection of taxes and duties, control of activity by state bodies, etc.) (Grău-Panțureac, 2022).

Given the fact that in the Republic of Moldova, there is no trade code or business code, we find the basic regulations for the business field in the Civil Code of the Republic of Moldova. The Civil Code is considered to be the basic organic law for regulating private relations, including for regulating entrepreneurial relations. The Civil Code contains regulations on the topics of civil legal relations, which are individuals and legal entities that practice entrepreneurial activity, establishes the right of the individual to carry out entrepreneurial activity and the ways under which he can do it, regulates the legal status of for-profit legal persons, stipulates regulations related to goods and property rights, essential in carrying out entrepreneurial activity. An indisputable importance is the commercial contracts, which provide the economic circuit, contracts regulated by the Civil Code of the Republic of Moldova (Civil Code of the Republic of Moldova, 2002).

In addition to the Civil Code of the Republic of Moldova, there are a series of special laws that regulate different segments of entrepreneurial activity.

Both natural persons and legal persons have the right to carry out entrepreneurial activity if they meet all the requirements provided by the legislation in force. Topics of entrepreneurial activity can be people, either individually or grouped in various organizational-legal forms, who carry out an entrepreneurial activity, ie they have acquired, by registration or otherwise established by law, the quality of entrepreneurs.

Given that business law also incorporates public law rules, legal persons of public law who register, authorize, license, and supervise have the status of subjects and legal persons of public law, control the persons who carry out entrepreneurial activity, holding in these reports a dominant position (Rădulescu and Duță 2014).

The topics of entrepreneurial activity are contractors, entrepreneurs, economic agents, businessmen, etc. In the legislation of the Republic of Moldova, the term *entrepreneur* is used to designate all persons who carry out entrepreneurial activity.

In the sense the Law on Entrepreneurship and Enterprises of the Republic of Moldova an entrepreneur can be (Law of the Republic of Moldova on Entrepreneurship and Enterprises, art. 2, 1992):

any citizen of the Republic of Moldova who is not restricted in rights, in the manner established by this Law and other legislative acts;

any foreign or stateless citizen, under the legislation in force, a group of citizens or stateless persons (a group of partners) of which the collective entrepreneur is constituted;

any legal or natural person following its main purposes and with the law.

The state and local public administration authorities are special entrepreneurs. The duties of an entrepreneur to state-owned enterprises (municipal) are performed by the chief enterprise manager based on the contract concluded with him. The heads and specialists from public administration authorities do not have the right to practice entrepreneurship, whose attribution is the decision on issues related to the development of entrepreneurship or control over such activity.

One of the first decisions that the entrepreneur must make when starting a business is regarding the choice of its legal organizational form. As there is no good and bad legal form, the field of activity chosen, and the available resources will be taken into account in making the right decision, as well as the expectations of the business entrepreneur.

The potential businessman needs to know in what form he can organize his business most favorably, so it is important to know what are the forms of business organization on the territory of the Republic of Moldova.

An important factor of the entrepreneurial environment, which regulates and influences the development of the enterprise activity is the legal one. That is why the entrepreneur must also know the legal aspects of the business.

Implementing a Business Law Clinic at the Academy of Economic Studies of Moldova (ASEM) represents a significant step in applying the theoretical knowledge acquired by final-year students in the Business Law discipline. By providing consultancy to young entrepreneurs within ASEM, students develop the practical skills necessary in the legal field and contribute to supporting emerging business initiatives. This direct interaction with the real business environment facilitates the transition from theory to practice and strengthens the professional competencies of future legal professionals.

Moreover, students have the opportunity to participate in study visits to various state institutions such as the Parliament, Government, Ministries, and Commercial Banks, where they can later undertake internships and even secure employment

Business law is not limited to national legislation. In the Republic of Moldova, the process of alignment with European Union law plays a key role, especially after the signing of the Association Agreement between the Republic of Moldova and the EU in 2014. This requires

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harmonization of legislation on commercial companies, competition, consumer protection, and contract law with EU directives and regulations (Association Agreement RM–EU, 2014).

Another essential aspect is the impact of digital transformation on the business environment and business law. The Law on Trusted Services and Electronic Documents No. 124 of 18 May 2023 establishes the legal framework for electronic signatures and documents, crucial for modern business activities (Law on Trusted Services and Electronic Documents, 2023). This legislation facilitates registration, transmission, and storage of commercial documents.

A central domain of business law is the regulation of fair competition and consumer protection. The Competition Law No. 183 of 11 July 2012 provides the framework to prevent and sanction anti-competitive practices and abuse of dominant position (Competition Law, 2012). Complementary legislation for consumer protection (Law No. 105 of 13 March 2003) ensures balance between the interests of businesses and consumer rights.

From a comparative perspective, Anglo-Saxon literature often distinguishes between commercial law and business law. In foreign doctrine, business law covers not only classical commercial matters but also labor law, data protection, and corporate governance. In this sense, Business Law in the Republic of Moldova aligns more with the broader interpretation, covering all legal relations of the entrepreneur.

The introduction of Business Law Clinics at the Academy of Economic Studies of Moldova (ASEM) allows students to apply theoretical knowledge and develop practical skills while supporting emerging businesses. Study visits and internships in state institutions (Parliament, Government, Ministries, Commercial Banks) provide further professional training and experience.

Conclusion. Therefore, business law is an indispensable sector in training a successful entrepreneur, in the formation of skills that would allow the appreciation and argumentation of phenomena and situations in the business field. Business Law Institutions aim for future entrepreneurs to learn the fundamental legal notions of setting up and developing a business, learning the legal language and mastering the principles of law that govern the business environment. The entrepreneurial potential will acquire the necessary skills to use the legislation applicable to the business sector. As a fundamental field, business law is meant to provide the entrepreneur with the necessary knowledge to penetrate the essence of legal norms in the field of entrepreneurial activity.

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LEGAL ASPECTS REGARDING THE HARMONIZATION OF THE LEGISLATION OF THE REPUBLIC OF MOLDOVA WITH THE SINGLE SUPERVISORY MECHANISM OF THE EUROPEAN UNION

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Abstract: The current study investigates the legal aspects of transposing the European Single Supervisory Mechanism (SSM) into the national banking legislation of the Republic of Moldova, aiming to determine the compatibility of the domestic regulatory framework with the principles of the European Banking Union. The purpose of the research is to highlight the normative, institutional, and doctrinal challenges faced by Moldova in adapting its banking legislation to European standards, particularly in the context of financial stability, prudential supervision, and the integration process with the European Union.

The subject of the study focuses on the correlation between Moldovan laws, such as Law no. 548/1995 on the National Bank of Moldova and Law no. 202/2017 on banking activity and European Union instruments, including Regulation (EU) No 1024/2013 establishing the SSM and the ECB's supervisory manuals. The methodology is based on comparative legal analysis, critical interpretation of doctrine, and examination of the convergence criteria applied in European integration. Special emphasis is placed on Moldovan doctrinal contributions (Armeanic Alexandru, Cojocaru Vladlen, Gribincea Lilia) as well as Romanian and European scholarship addressing the structural evolution of banking supervision.

The results show that Moldova has taken significant steps in harmonizing its legislative framework with European banking acquis, particularly by aligning prudential supervision and risk management standards. However, important gaps remain in terms of institutional independence, operational capacity of the National Bank, and integration of EU - level governance mechanisms. The findings suggest that a gradual transposition, supported by legislative adjustments and enhanced supervisory capacity, is the most feasible path forward.

In conclusion, the research contributes to the doctrinal debate by identifying both opportunities and challenges for Moldova in approximating to the SSM. This strengthens the academic understanding of the convergence between national banking law and European supervisory mechanisms, while offering concrete directions for future harmonization.

Keywords: Banking law, Single Supervisory Mechanism, European Banking Union, financial stability, National Bank of Moldova.

JEL Classification: K15, E5.

INTRODUCTION

Over the past two decades, the evolution of European banking law has been profoundly shaped by the consolidation of the European Banking Union (EBU), a cornerstone of the European Union's (EU) financial architecture. Established as a response to the 2008-2009 financial crisis, the EBU aims to ensure financial stability, restore confidence in banking institutions, and prevent systemic risk. Within this framework, the Single Supervisory Mechanism (SSM) represents the first pillar of the EBU, ensuring integrated supervision of credit institutions across the euro area under the coordination of the European Central Bank (ECB) and national competent authorities.

Although the Republic of Moldova is not a member of the EU, it is engaged in an extensive process of legislative and institutional approximation with the EU acquis, as part of its Association Agreement with the European Union (2014) and its roadmap for deep economic integration. In the banking sector, this process entails not merely the formal transposition of EU norms but also the substantive adaptation of the national regulatory framework to the principles and governance

mechanisms promoted at the European level (Cojocaru, *Drept bancar comparat*, p. 114; Cușnir, *Drept bancar și valutar*, p. 76).

The scientific relevance of this study stems from the ongoing modernization of the regulatory framework governing the National Bank of Moldova (NBM) and credit institutions, in line with the standards of the European Banking Union. Specifically, the research analyses the correlation between Law No. 548/1995 on the National Bank of Moldova and Law No. 202/2017 on Banking Activity, and the provisions of Regulation (EU) No. 1024/2013 establishing the SSM.

According to Article 5 of Law No. 548/1995, the NBM's mission is to ensure price stability and maintain the stability and viability of the financial system by exercising prudential supervision over licensed banks. Article 41 further empowers the NBM to issue binding regulations on risk management, capital adequacy, and corporate governance in the banking sector. (Legea cu privire la BNM, 1995, art.41) These provisions correspond to Article 4(1) of Regulation (EU) No. 1024/2013, which assigns the ECB exclusive supervisory competences over significant institutions and coordinating roles for less significant ones. (Regulation (EU) No. 1024/2013, art., 4 (1))

In turn, Law No. 202/2017 on Banking Activity introduces a gradual transposition of CRD IV/CRR principles, setting capital requirements (Articles 39-46), internal governance and risk control standards (Articles 62-70), and the sanctioning framework (Articles 111-118). (Legea privind activitatea băncilor, 2017, art. Art 62-70; 111-118) These alignments illustrate Moldova's convergence toward European banking standards, yet gaps persist regarding supervisory independence, bank resolution mechanisms, and the direct applicability of EU regulations.

The purpose of the research is to provide a doctrinal and practical analysis of the legal framework for the transposition of the SSM in Moldova, assessing the compatibility of national norms with European banking governance principles. The main objectives are:

- to examine the national legislative framework and its level of compliance with the EU banking acquis;
- to identify points of convergence and divergence between Moldovan and EU legislation;
- to formulate doctrinal recommendations for strengthening national supervisory and resilience mechanisms.

Methodologically, the research applies a comparative legal analysis, systemic interpretation of norms, and doctrinal-normative evaluation, complemented by secondary sources such as reports of the National Bank of Moldova, ECB documents, and relevant academic literature (Gribincea, L., *Reglementarea supravegherii bancare în Republica Moldova*, RDF, no. 2/2020, p. 58; Zlati, R., *Bazele supravegherii bancare în UE*, p. 167).

Hence, this study aims to provide an in-depth academic perspective on Moldova's legislative and institutional harmonization with the European Banking Union, as a key element of its efforts to strengthen the stability and sustainability of the national financial system.

General Considerations on the European Normative Framework and Its Applicability in Associated States

The process of European integration of the Republic of Moldova implies not only economic and political convergence but also a profound legislative harmonization, including in the banking sector. Under the EU-Moldova Association Agreement, the chapter on Financial Services and Prudential Supervision requires the alignment of national legislation with the European standards established by the European Banking Union.

A central element of this framework is the Single Supervisory Mechanism (SSM), established by Regulation (EU) No. 1024/2013 of the Council, which grants the European Central Bank (ECB) exclusive competence in the prudential supervision of credit institutions (Regulation (EU) No. 1024/2013, Articles 4-6).

In legal literature, the SSM is regarded as the cornerstone of the European Banking Union, designed to consolidate financial stability and reduce systemic risk (Zlati, R., *Bazele supravegherii*

bancare în Uniunea Europeană, 2020, p. 115). According to Mihai Buruiană, the SSM represents not merely a technical supervisory tool but also “an institutional architecture aimed at integrating supervisory culture and market discipline at the European level” (Buruiană, M., *Drept bancar european*, 2021, p. 92).

For the Republic of Moldova, direct participation in the SSM is not currently possible in the absence of EU membership. Nevertheless, the transposition of SSM principles and standards into national legislation represents a strategic stage in the progressive approximation to the European normative framework.

Law No. 548-XIII of 21 July 1995 on the National Bank of Moldova (NBM), republished in 2015 and subsequently amended, constitutes the foundation of prudential regulation and supervision in the Republic of Moldova.

Article 5 establishes that the NBM is the supervisory authority of the banking sector, with the responsibility to ensure the stability and security of the financial system. This provision is fully consistent with the SSM principles, which require supervision to be independent, proportionate, and risk-preventive. (Legea cu privire la Banca Națională a Moldovei, 1995, art.5)

Article 41 of the same Law provides that the NBM “carries out continuous supervision of banks’ activities, assessing compliance with prudential requirements and the risks associated with their operations.” (Legea cu privire la Banca Națională a Moldovei, 1995, art. 41)

This corresponds to the European model, in which the ECB conducts risk-based supervision, focusing on systemically important institutions (European Central Bank, *SSM Supervisory Manual*, 2022).

According to Valeriu Cușnir, “the evolution of the NBM’s legal framework reflects a clear transition from administrative control to a risk-based and governance-oriented supervision model” (Cușnir, V., *Drept bancar și valutar*, 2021, p. 137).

In this respect, the NBM has progressively adopted SSM standards, particularly regarding the Supervisory Review and Evaluation Process (SREP), transparency of reporting, and interinstitutional cooperation.

Additionally, Article 44 of Law No. 548 provides for the exchange of information with foreign supervisory authorities “under international treaties to which the Republic of Moldova is a party,” a key element for compatibility with cross-border cooperation mechanisms established by the SSM. (Legea cu privire la Banca Națională a Moldovei, 1995, art.44)

Transposition of SSM Principles into Law No. 202/2017 on the Activity of Banks

Law No. 202/2017 on the Activity of Banks represents a decisive step in aligning Moldova’s legal framework with EU standards. Inspired by Directive 2013/36/EU (CRD IV) and Regulation (EU) No. 575/2013 (CRR), the law reflects the core principles of the SSM, particularly regarding capital requirements, internal governance, and risk management.

Article 21 regulates initial capital and own funds, establishing minimum thresholds similar to those under the CRR, while Articles 27-35 introduce governance requirements, including the board’s obligation to ensure clear risk management, internal control, and audit policies. (Legea privind activitatea băncilor, 2017, art.21, 27-35)

According to Article 38, banks are required to perform periodic self-assessments of risks, a principle equivalent to the Internal Capital Adequacy Assessment Process (ICAAP) under the SSM. (Legea privind activitatea băncilor, 2017, art.38)

Moreover, Article 69 establishes early intervention measures, similar to those provided by Directive 2014/59/EU (BRRD) on bank recovery and resolution. (Legea privind activitatea băncilor, 2017, art.69)

As noted by Vladlen Cojocaru, “Law No. 202/2017 not only transposes CRD IV and CRR provisions but also creates systemic compatibility with the SSM architecture, granting the NBM

prerogatives comparable to those of the ECB” (Cojocaru, V., *Drept bancar comparat*, 2022, p. 245).

Thus, the Moldovan regulatory framework has become functionally aligned with European standards, enabling prudential supervision equivalence, even in the absence of formal participation in the European Banking Union.

The Harmonization of the Republic of Moldova’s Banking Legislation with the Single Supervisory Mechanism of the European Union

The process of harmonizing the banking legislation of the Republic of Moldova with the European Union’s standards represents a strategic objective of the country’s financial and economic integration. This process derives from the Association Agreement between the Republic of Moldova and the European Union, signed on 27 June 2014, which establishes the obligation to gradually approximate the national legal framework to the EU *acquis* in the field of financial services.

The Moldovan banking system is currently governed by a complex legislative framework, the core of which is formed by Law No. 548/1995 on the National Bank of Moldova (NBM) and Law No. 202/2017 on the Activity of Banks. These two acts are the main pillars of the national financial system and the key instruments for aligning the domestic supervisory regime with the standards of the Single Supervisory Mechanism (SSM) within the European Union.

The harmonization process aims to achieve a threefold objective:

Strengthening the institutional autonomy of the National Bank of Moldova in accordance with the model of the European Central Bank (ECB);

Implementing prudential banking standards and Basel III criteria regarding capital adequacy, liquidity, and internal governance;

Ensuring the convergence of supervisory mechanisms with those of the ECB and the European Banking Authority (EBA).

As noted by Moldovan doctrine, harmonization is not merely a technical exercise of legal transposition, but rather a conceptual transformation of the legal framework governing banking supervision (Cușnir, V., *Drept bancar și valutar*, Chișinău, 2021, p. 73). In this context, the operational autonomy, decision-making independence, and public accountability of the NBM must be regarded as core correlates of institutional convergence with the ECB (Țicu, *Elemente metodologice în cercetarea dreptului bancar european*, 2021, p. 114).

Law No. 548/1995 establishes the National Bank of Moldova as an autonomous public authority, acting as the central bank of the state, in full accordance with the principles enshrined in the Statute of the European System of Central Banks (ESCB). Article 4 (1) provides that “the NBM is a public legal entity, autonomous and independent in the exercise of its powers,” while paragraph (2) states that “the NBM shall neither seek nor take instructions from other public authorities or legal entities.” (Legea cu privire la Banca Națională a Moldovei, 1995, art.4)

This provision embodies the principle of institutional independence, as recognized under Article 130 of the Treaty on the Functioning of the European Union (TFEU). Moreover, Article 5 of Law No. 548 defines the NBM’s main functions, including the formulation of monetary policy, banking supervision and regulation, management of foreign reserves, and ensuring price stability. (Legea cu privire la Banca Națională a Moldovei, 1995, art.5)

Comparatively, the European Central Bank (ECB) performs similar functions, though under a more detailed and standardized legal framework established by Regulation (EU) No. 1024/2013, which created the Single Supervisory Mechanism (SSM). Within the EU framework, banking supervision is divided between the ECB (for significant institutions) and national competent authorities (for less significant ones), forming a shared supervision system.

For the Republic of Moldova, Article 26 of Law No. 548 grants the NBM supervisory and control powers over banks. (Legea cu privire la Banca Națională a Moldovei, 1995, art.26)

However, the exercise of these powers has been significantly modernized since 2016, through the implementation of the NBM Banking Supervision Manual, aligned with the ECB’s methodology. According to the NBM’s 2023 Annual Report, the supervisory procedures for assessing solvency and risk management have been standardized following the Supervisory Review and Evaluation Process (SREP) used by the ECB (Banca Națională a Moldovei, *Reportul Annual 2023*, p. 47).

Another element of convergence is found in Article 51 of Law No. 548, which provides for transparency and public reporting, reflecting the principle of public accountability under Article 15 of the ECB Statute. This strengthens the institutional governance of the NBM and aligns it with European central banking standards. (Legea cu privire la Banca Națională a Moldovei, 1995, art.51)

Law No. 202/2017 largely transposes the provisions of Directive 2013/36/EU (CRD IV) and Regulation (EU) No. 575/2013 (CRR), which define prudential requirements for credit institutions.

() Article 27 of the Moldovan law states that banks must have “adequate internal governance mechanisms ensuring sound and prudent management.” (Legea privind activitatea băncilor, 2017, art.27)

Articles 60-75 establish detailed provisions on capital adequacy, liquidity, and risk management, closely reflecting the Basel III framework adopted in the EU. (Legea privind activitatea băncilor, 2017, art.60-75) These provisions are consistent with the standards set by the ECB and the EBA for both macroprudential and microprudential supervision.

A key innovation is found in Article 83, which regulates bank recovery and resolution procedures, in line with Directive 2014/59/EU (BRRD). () Through this mechanism, Moldovan legislation introduces a modern framework for early intervention, granting the NBM expanded powers in managing distressed banks-similar to those of resolution authorities within the SSM.

Institutionally, a major development has been the establishment of the National Committee for Financial Stability, as provided by Article 93 of Law No. 202/2017. (Legea privind activitatea băncilor, 2017, art.93 This body functions analogously to the European Systemic Risk Board (ESRB), ensuring the coordination of macroprudential policies and enhancing the resilience of the financial system.

Hence, through Law No. 202/2017, the Republic of Moldova has achieved an advanced level of technical and legal harmonization with EU directives, particularly in the fields of:

- (a) capital adequacy,
- (b) internal governance,
- (c) risk management, and
- (d) crisis prevention and resolution.

Overall, the Republic of Moldova’s banking legislation demonstrates a high degree of structural compatibility with European banking law, though achieving functional harmonization requires further institutional strengthening and deeper international cooperation.

The process of integrating the Republic of Moldova into the European banking supervision architecture represents one of the most complex and strategic reforms within the country’s financial sector over the past decade. The efforts toward legislative, institutional, and procedural harmonization are driven by the necessity to strengthen financial stability, mitigate systemic risks, and ensure compliance with European standards of banking governance and prudential oversight.

In Moldovan legal doctrine, Vladlen Cojocaru observes that “*the legislative alignment of the Republic of Moldova to the standards of the European Banking Union represents an institutional and doctrinal maturation process, consolidating the principles of responsibility, transparency, and risk-based supervision*” (Cojocaru, V., *Drept bancar comparat*, 2022, p. 193]. Similarly, Valeriu Cușnir underlines that “*the efficiency of banking supervision depends largely on the professionalization of supervisory authorities and the quality of secondary regulations issued by the National Bank of Moldova*” (Cușnir, V., *Banking and Monetary Law*, 2021, p. 256).

In conclusion, the legislative reforms introduced through Law No. 548/1995 and Law No. 202/2017, complemented by the secondary prudential regulations of the NBM, have established a functional framework compatible with the principles of the Single Supervisory Mechanism. Nevertheless, achieving full compatibility requires strengthening the institutional independence of the NBM, deepening international cooperation, and developing an integrated macroprudential supervision framework, in line with the standards set by the ECB and the European Banking Authority.

CONCLUSIONS AND RECOMMENDATIONS

The harmonization of the Republic of Moldova’s legislation with the Single Supervisory Mechanism (SSM) of the European Banking Union marks a profound and multi-dimensional legal evolution that goes beyond the technical boundaries of banking regulation. This analysis has demonstrated that legislative reforms, modern prudential regulation, and institutional independence of the National Bank of Moldova (NBM) are the key pillars of this transformation.

Firstly, Law No. 548/1995 on the National Bank of Moldova has been gradually updated to ensure institutional and functional convergence with the supervisory standards of the European Central Bank (ECB). Articles 5, 25, and 41 define the NBM’s supervisory mandate, operational autonomy, and international cooperation, reflecting the essential principles of the SSM framework.

Secondly, Law No. 202/2017 on the Activity of Banks effectively transposes the provisions of Directive 2013/36/EU (CRD IV) and Regulation (EU) No. 575/2013 (CRR), establishing modern rules on capital requirements, corporate governance, risk management, and early intervention measures. This law provides the legal foundation for Moldova’s transition to a risk-based supervisory model consistent with EU practice.

Thirdly, Law No. 232/2016 on Bank Recovery and Resolution complements this framework by introducing tools for crisis management and financial resilience, aligned with Directive 2014/59/EU (BRRD).

Although Moldova is not yet a member of the European Banking Union, its normative and institutional standards are already substantially aligned with those of the ECB and the European Banking Authority (EBA).

Doctrinal and Institutional Recommendations

Establish a Cooperation Memorandum between the NBM and the ECB to facilitate information exchange and technical assistance in banking supervision.

Strengthen the secondary normative framework concerning internal governance and risk evaluation (ICAAP/ILAAP), in line with EBA Guidelines and the ECB Supervisory Manual.

Expand the competences of the National Committee for Financial Stability to include macroprudential supervision of financial conglomerates and Basel III compliance monitoring.

Develop a national recovery and resolution mechanism interoperable with the EU’s Single Resolution Board (SRB).

Through continuous reform, institutional modernization, and doctrinal alignment, the Republic of Moldova has established a solid foundation for integration into the European system of banking supervision, positioning itself as a model of legal and prudential convergence within the Eastern Partnership region.

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DIGITALIZATION OF BANKING OPERATIONS IN THE PROCESS OF ACCESSION OF THE REPUBLIC OF MOLDOVA TO THE EUROPEAN UNION

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Abstract. The digitalization of the banking system in the Republic of Moldova is making remarkable progress, with citizens having at their fingertips innovative solutions that save them from queues at the counters. In this way, banking operations can be carried out entirely electronically, directly from their phone or computer, wherever they are. The most important achievement is the MIA Instant Payments operation that allows money transfers in seconds, safely and cost-effectively, including Moldova's acceptance into the Single Euro Payments Area (SEPA), which will facilitate euro transactions with European countries at the same advantageous conditions as local transfers.

In this scientific article, we reported that the main role in the digitalization of banking operations in the process of the Republic of Moldova's accession to the European Union is played by the National Bank of Moldova (BNM). The National Bank promotes innovation and supports the modernization of the financial sector by adopting new technologies, aligned with European standards.

In conclusion, we believe that the most important benefit of the digitalization of banking operations is the reduction of tax evasion. Numerous studies and analyses indicate a very high correlation between the share of electronic payments (by bank card, internet/mobile banking) in the economy and the reduction of the gray economy. Thus, the banking community in the Republic of Moldova can contribute with know-how in the implementation of digital services and cybersecurity, including by developing applications dedicated to e-government interactions and by promoting public-private partnerships in the field of digitalization.

Keywords: banking operations, banking contracts, digitalization, electronic payment system, electronic signature, bank card.

JEL Classification: G 21, G28, O52

Introduction

Digitalization is an irreversible process with a major impact on banking activity. The bank is one of the most important financial institutions in the economy, and its digitalized operations directly influence other entities, so that the services and products of the banking industry are always in the public's attention.

Global digital transformation is increasingly present, with the need to conform the banking sector to the general global framework of digitalization. Digitalization in banking refers to a technological transformation of banking products and services, in order to provide customers with experiences tailored to their expectations, through faster, more efficient and accessible services.

The paper aims to analyze the level of banking digitalization in the Republic of Moldova, based on the current product offer, the analysis of the banking processes and procedures used, from

a technological point of view, the identification of the regulatory legislative framework, challenges and opportunities.

The purpose of this article is to explore how digitalization is influencing banking operations, highlighting the significant changes and associated challenges. It aims to assess the benefits of implementing digitalization within financial institutions, identify potential risks and challenges, and highlight future prospects for this technological evolution.

The key objectives of the strategy are ambitious and focused on the sustainable development of Moldova: developing a digital society, in which electronic services are accessible to all citizens; strengthening the banking sector and increasing the competitiveness of the Republic of Moldova on the global market by creating an innovative and resilient economy; making public institutions more efficient through the widespread use of technologies. The government must be transparent, and administrative work must be paperless; ensuring a safe and inclusive digital environment, where personal data is protected and cybersecurity is solid.

The topicality of the research.

The research was conducted based on articles and works of experts in the field of innovations and development of banking technologies, annual banking reports, analysis of the offer of banking products and specialized articles in the technological field, to identify possible challenges and trends.

The topicality of this topic is explained by the fact that in recent years, in the banking activity of the Republic of Moldova, a great interest has been shown by banking services regarding innovative aspects of transaction digitization. In developed countries, banking operations with the help of various digitized systems have become widespread.

The consolidation that is taking place in the financial system and the ability of banks to implement Artificial Intelligence and digitization will inevitably lead to their transformation. Banking regulators will rely primarily on market discipline, instead of traditional examinations of banks, to determine the health of the banking system.

The results obtained.

New digital financial technologies and instruments allow the transformation of processes, procedures and strategies within banking institutions. In this context, good legal regulation of activities related to the development and implementation of financial technologies is necessary. In the Republic of Moldova, in addition to Law No. 202 of 06.10.2017, on the activity of banks, laws, directives and regulations have been adopted in this regard, including: Law No. 114 of 18.05.2012 on payment services and electronic money, Regulation on strict customer authentication and open, common and secure communication standard between payment service providers No. 12 of 11.01.2024 and Regulation on minimum requirements for information and communication systems of banks, approved by the National Bank of Moldova No. 47 of March 14, 2018. Also, in the process of harmonizing legislation and aligning it with European standards, we mention the European directives and regulations valid in the Republic of Moldova on this subject: Regulation 2022/2554, Directive 2022/2556, Regulation 2023/1114, Regulation 2022/858, Directive 2022/2555 (transposed into Law No. 48 of 16.03.2023 on cybersecurity).

Description of the research method used.

In order to investigate the role of digitalization of banking operations in the context of the Republic of Moldova's accession to the European Union, it is crucial to establish a solid and well-founded research methodology. Here are some key elements that were included in the research methodology: a detailed review of the specialized literature on digitalization in business and its impact on organizational performance was conducted. This provided a solid understanding of the current concepts, theories and practices in the field. Relevant data on financial performance, operational efficiency and customer feedback were collected and analyzed to assess the impact of digitalization on the enterprise. The risks and benefits associated with digitalization within

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enterprises were carefully analyzed, identifying the areas where the greatest advantages can be achieved and considering the necessary measures to minimize potential risks.

This research involved the analysis of scientific articles to identify trends, specific technologies and relevant conclusions from the existing literature; the analysis of documents, such as: press releases of the National Bank of Moldova; offers of banking products and services in the Republic of Moldova. Other research methods used include: the documentary framework method, the study over time and evolution, as well as the analysis of official documents, research reports, press articles and other relevant sources of information to identify the opinions and perspectives of experts in the financial and banking field in order to create a much clearer picture of the analyzed process.

The basic content of the research.

Digitalization has become a central element in the development and growth strategies of businesses around the world. It represents the transition from traditional analog processes to digital ones, using technologies such as cloud computing, data analytics, artificial intelligence and the Internet of Things to transform the way organizations operate and interact with customers, employees and business partners.

Within the activity of a business, digitalization plays a crucial role in making operational processes more efficient. By adopting digital solutions, businesses can automate and optimize workflows, reduce errors and the time required to complete tasks, and thus improve employee efficiency and productivity.

An important aspect of digitalization in business is the streamlining of operational processes. By adopting digital solutions, companies can automate repetitive processes, improve workflows, and reduce the costs associated with manual management of data and information. This not only leads to increased operational efficiency, but can also free up human resources to focus on higher value-added activities.

Digitalization also plays a crucial role in improving customer and business partner relationships. Through online platforms, social media, and other digital channels, companies can communicate more effectively with customers, provide personalized services, and better manage feedback and relationships with them. This can help increase customer satisfaction and strengthen brand loyalty. However, it is important to recognize that digitalization does not come without challenges. Therefore, it is essential that any digitalization strategy is well planned and implemented, taking into consideration both the benefits and the risks involved.

Moreover, digitalization can open up new opportunities for innovation and growth for the enterprise. By analyzing data and using artificial intelligence, organizations can identify market trends, anticipate customer needs, and make better-informed decisions. It can also facilitate the diversification of products and services offered and increase the enterprise's competitiveness in the market.

In recent years, technology has expanded rapidly, and biometrics has developed a series of security filters for the user. Biometric authentication is based on the recognition of biological or physiological properties of the user. Because the attributes used cannot be forged, biometric authentication is classified as the most secure method of digital security (Tokarev, 2021, p.186). Most often, biometric authentication is used in the digital payments industry, and the most well-known methods of authorizing payments are: facial recognition, fingerprint recognition, speaker voice recognition, and iris recognition.

The banking industry has undergone a massive transformation with the advancement of digitalization. From the first automatic teller machines (ATMs) to today's sophisticated online platforms, the evolution is remarkable and visible. In the 1960s, the first electronic terminals appeared, paving the way for computerized banking services. The first automated teller machine (ATM) was installed by Barclays Bank in London, United Kingdom, on June 27, 1967. It was the

world's first functional ATM. The machine was known as the “Barclays Cash Machine” and was located in the bank's branch in Enfield, London (Lebedeva et al., 2024, p.118).

The first efforts to develop the banking system in the Republic of Moldova were recorded in 1992 when the Republic of Moldova became a member of the International Monetary Fund and the International Bank for Reconstruction and Development, which contributed to the beginning of the establishment of a banking regulation and supervision system based on international standards (4).

The digitalization process brings new opportunities not only for private banks, but also for central banks. Thus, in order to prevent illegal operations and money laundering schemes, the National Bank of Moldova has implemented an intelligent program that monitors financial transactions and supervises the transparency of the activities of bank shareholders. The new information system, the implementation cost of which amounts to 1.8 million dollars, is a first not only for the region, but also for a central bank (National Bank of Moldova, 2023).

We emphasize that the National Bank of Moldova promotes innovation and supports the modernization of the financial sector by adopting new technologies, aligned with European standards. The digitalization of financial services is a priority of the central bank, and to explain this transformation, the National Bank continues the series of explanatory materials, in the context of the European integration of the Republic of Moldova (National Bank of Moldova, 2024).

Digitalization in the financial sector means that we tend to keep up with technological progress, with care for time, safety and citizens' access to financial services that make their lives easier. By modernizing payment systems and aligning them with European standards, we are building a financial infrastructure that brings Moldova closer to the European Union, and we are talking here about reduced commissions, minimal waiting time and increased protection of personal data through advanced security systems.

Thus, the National Bank of Moldova, as the central bank of the Republic of Moldova, promotes the alignment of the regulatory framework and its activities with EU legislation and best practices and actively participates in internal legislative, institutional and functional changes aimed at contributing to the achievement of the economic criterion for EU accession, thus ensuring an increasing rapprochement of the Republic of Moldova with the EU. The Governor of the National Bank is a member of the National Commission for European Integration (National Bank of Moldova, 2025). Also, the representative of the National Bank is part of the Negotiation Team for the accession of the Republic of Moldova to the European Union (established by Government Decision no. 180/2024 on the Coordination Mechanism for the accession process of the Republic of Moldova to the European Union and the organization and functioning of the negotiation team within this process (Government of the R.M., 2024)), which is responsible for leading the negotiations for the accession of the Republic of Moldova to the European Union.

The digitalization of the banking sector is accelerated by the transformations in market demand and supply, depending on customer expectations and needs, non-bank competition, as well as the needs to increase banking resilience and profitability (Grecu, 2022, p.276).

Since the signing of the Association Agreement with the European Union, as well as throughout the entire process of preparation for the accession of the Republic of Moldova to the EU, our state remains actively involved in the process of aligning national legislation with the EU acquis covering the areas of competence and activities of the National Bank in the digitalization process, such as:

a) the EU acquis on banking activity is transposed into: Law R.M. No. 202/2017 on the activity of banks (Parliament of R.M., 2017) (in force since 2018) and secondary legislation, which transpose the international Basel III requirements. Following the positive assessment by the European Banking Authority (EBA) of the confidentiality regime applied in the Republic of Moldova, the EBA recognized in 2018 the equivalence of our confidentiality regime with EU

norms and included the NBM in the list of supervisory authorities in non-EU member states, whose confidentiality regimes can be considered equivalent to those applied in European Union countries;

b) the EU acquis on payment services is transposed into Law R.M. No. 114/2012 on payment services and electronic money (Parliament of R.M., 2012) and secondary legislation;

c) the EU acquis on insurance activity is transposed into Law R.M. No. 92/2022 on insurance or reinsurance activity and Law R.M. No. 106/2022 on compulsory motor third party liability insurance for damage caused by vehicles;

d) the EU acquis on preventing and combating money laundering and terrorist financing is transposed into Law R.M. No. 308/2017 on preventing and combating money laundering and terrorist financing (Parliament of R.M., 2017) and Law R.M. No. 75/2020 on the procedure for establishing violations in the field of preventing money laundering and terrorist financing and the manner of applying sanctions (Parliament of R.M., 2020) and secondary legislation.

Trends and strategic guidelines

The economy of the Republic of Moldova must seriously undergo a massive structural adjustment, relying primarily on domestic material and human resources, with sustainable priorities and an emphasis on the transition to a green economy and the digitalization of the country, areas that offer numerous opportunities, but also challenges. For this reason, structural reforms, legislative measures and banking regulations need to provide conditions for promoting and encouraging investments related to digitalization.

In turn, central banks can support the promotion of productive activity and entrepreneurship through specific policies and instruments, especially in areas related to climate change, the green economy and digital transformation. As a result, the National Bank of Moldova must act from a leadership position in the financial markets and, in this regard, we believe that it can initiate partnerships with Fintech companies, with producers of advanced technologies, which, however, should know the specifics of a central bank. Also, the local specifics, the strategy and policies of the local central bank should be taken into account.

A key example of how digitalization has had a significant impact is the use of cryptocurrencies, such as Bitcoin, which emerged as an alternative to traditional currencies. They offer a decentralized and anonymous form of value transfer that has captured the attention of investors and individuals who want to avoid banking intermediaries. However, this innovation has raised significant regulatory and security questions (Munachi et al., 2024, p.460).

In the context of the increasingly frequent use of virtual currency schemes (Bitcoin, Litecoin, Ethereum, and others) both on the international market and on the payment services market in the Republic of Moldova, the National Bank of Moldova provides some clarifications regarding the associated risks.

Virtual currency is a digital representation of value and is not issued or guaranteed by a central bank or a public authority. It is not necessarily attached to a national currency, but is used by individuals or legal entities as an alternative to cash. It can be transferred, stored or traded electronically. The use of virtual currencies is not regulated in the Republic of Moldova. They do not represent a form of electronic currency within the meaning of Law No. 114 of 18.05.2012 on payment services and electronic currency, and the activity regarding their issuance and trading is not subject to supervision by the authorized body. For these reasons, users of virtual currencies are exposed to a series of risks.

In this context, the National Bank of Moldova warns users of payment services that virtual currencies and related exchange methods are not subject to regulation on the territory of the Republic of Moldova. Accordingly, users' funds are not protected (National Bank of Moldova, 2023).

Digitizing banking can generate additional benefits for national economies. A very important benefit of digitalizing payments is the reduction of tax evasion. There is a direct correlation

between the share of electronic payments in the economy and the reduction of the shadow economy.

Along with the benefits, digitalization can also bring some challenges. In the banking sector, through which a large volume of personal data passes, the biggest problem is its protection against criminals. In the context of the introduction of artificial intelligence-based technologies, all of this data will be processed and analyzed automatically, without human intervention. Thus, banks must ensure strict data protection measures to protect customer information and comply with relevant regulations (Mariț, 2025, p.204). Failure to comply with them can lead to breaches, reputational damage and legal consequences. Among other challenges, we also mention the high implementation costs, the high cost of errors, job losses, the lack of human connection (Bejan, 2024, p.205).

At the same time, it should be emphasized that a growing inclination and dependence of banks towards digitalization and new technologies have increased the risk of cyber attacks. It thus becomes an objective necessity to make investments in cybersecurity, through new technologies, through professional training and increasing the skills of the staff involved, as well as by ensuring acceptable resilience, with regard to the risks generated by a possible cyber attack.

In the same context, new banking regulations regarding risk management, reporting and improving corporate governance can support measures to mitigate these risks. We also mention the fact that a quantification of cyber risks is quite difficult and partially valid. Therefore, it is necessary to achieve sustainable resilience at the level of each institution in order to be able to “navigate” with greater skill through the period of a possible cyber attack.

Today's realities show that cyber risk is one of the main sources that generate operational risks in financial institutions. The National Bank of Moldova must impose preventive measures on the banking system to strengthen risk management activities, improve internal procedures, as well as raise the skills of the employed human resources to a higher level. Banks must be resilient enough to navigate safely, protecting stakeholders and maintaining critical functions, during the period of cyber attacks that sometimes generate interruptions in activity.

A defining example of how digitalization has had a significant impact is the use of cryptocurrencies, such as Bitcoin, which emerged as an alternative to traditional currencies. They offer a decentralized and anonymous form of value transfer that has captured the attention of investors and people looking to avoid banking intermediaries. However, this innovation has raised significant questions about regulation and security.

An important role in this regard is played by cyber risk insurance (which covers a multitude of risks that threaten the assets of companies, governments or individuals, losses generally including financial or non-financial assets, identities, disclosure of sensitive information and interruption of activities/business and, last but not least, payment of fines) (Ayadi et al., 2025, p.97). This has become a safe practice to cover residual risk, because as defenses increase, financial crime seeks out the weaknesses of society and chooses the easiest path to try to destroy our way of life.

We tend to mention that digital transformation in the banking sector has the potential to revolutionize the way we do banking. It has already begun to transform the way banks interact with their customers, offering them a more personalized and convenient banking experience. With mobile banking apps, digital wallets, and AI-powered chatbots, banks can offer customers a wider range of services, 24/7 access to their accounts, and faster transaction times (Zamfir & Hohlov, 2024, p.350). In addition, digital transformation also has the potential to generate new revenue streams for banks by creating new financial products and services. For example, robo-advisory services powered by AI can provide customers with personalized investment advice, while blockchain-based payments can reduce costs and increase security.

Digitization of banking can generate benefits adjacent to national economies. A very important benefit of digitization of payments is the reduction of tax evasion. There is a direct correlation between the share of electronic payments in the economy and the reduction of the grey economy. However, it should be noted that in this race towards digitization, not all consumers have the same accessibility. Some groups, especially in rural or low-income areas, may be excluded from the advantages of digital banking services. Thus, it is essential to continue efforts to ensure that the entire society benefits from this digital revolution.

Conclusions and recommendations.

Finally, we tend to mention that digital transformation in the banking sector has the potential to revolutionize the way we do banking. It has already begun to transform the way banks interact with their customers, offering them a more personalized and convenient banking experience. With mobile banking apps, digital wallets, and AI-powered chatbots, banks can offer customers a wider range of services, 24/7 access to their accounts, and faster transaction times. In addition, digital transformation also has the potential to generate new revenue streams for banks by creating new financial products and services. For example, robo-advisory services powered by AI can provide customers with personalized investment advice, while blockchain-based payments can reduce costs and increase security.

The banking system in the Republic of Moldova has experienced a visible evolution in the field of financial technologies in recent years. A robust digitalized banking system requires good legislative regulation, the adoption of laws related to new technologies and cyber security would allow a more harmonious and secure development of the new digitalized banking system. Banks in the Republic of Moldova have demonstrated that they are able to modernize and keep up with FinTechs and non-banks, however, continuous development is necessary to face new challenges.

The banking system in the Republic of Moldova has embarked on a broad process of automating institutions in recent years, which has allowed them to optimize operational processes, provide modern customer services and grow in the market. As part of the digitalization process of banking activities, the ability to find and implement digital solutions has led to in-depth research of customers and their needs, as well as the efficient promotion of products and services. As a result, financial institutions are increasingly interested in investing in technologies and digitalization.

We can conclude that digitalization is redefining the way banks conduct their operations, bringing significant benefits to efficiency, security, and personalization of the customer experience. On the other hand, without a sufficiently strong security system, banks may face the risk of losing customer data, being attacked by cyberattacks or facing serious financial fraud.

Therefore, banks must invest heavily in modern security solutions, such as data encryption, multi-layer authentication and artificial intelligence applications in transaction monitoring. In order for the digital banking transformation to be more effective, it is necessary to issue specific regulations on bank data security, ensuring network security standards and risk management processes.

The Republic of Moldova has made digitalization a policy priority. The country is currently preparing the Digital Transformation Strategy 2023-2030, which will highlight digital literacy and digital business skills to improve the competitiveness of the private sector. Digitalization has already brought significant benefits to Moldova, where Information Technology in Banking has been one of the most dynamic sectors in recent years.

Digital transformation in the banking sector in the Republic of Moldova is not a choice, but a necessity in the modern world. Yes, the path to digitalization presents obstacles, especially in IT security and managing customer preferences. But understanding these challenges can equip banks to deal with them effectively. By adopting new technologies and balancing the needs for both

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digital and physical banking experiences, banks can not only survive, but also thrive in the digital age.

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CONSUMER PROTECTION AGAINST UNFAIR CONTRACT TERMS: A COMPARATIVE ANALYSIS BETWEEN MOLDOVAN LAW, ARMENIAN LAW AND EUROPEAN LAW

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Abstract: The paper examines consumer protection against unfair terms in standard-form (adhesion) contracts through a comparative analysis of Moldovan law, Armenian law, and European Union (EU) law. It takes as a benchmark the EU test of a “significant imbalance contrary to good faith,” the transparency requirements, and the sanction that renders unfair terms non-binding, and maps these against national preventive and remedial mechanisms. The methodology combines doctrinal and legislative analysis (special consumer statutes, civil code provisions, and sector-specific regulations—financial services, telecommunications, and digital content/data) with selected case law and institutional enforcement practice. The findings indicate notable convergence with the EU *acquis*, alongside gaps concerning black/grey lists of clauses, courts’ *ex officio* control, the effectiveness of injunctive actions, and the treatment of common subscription-economy terms (unilateral price changes, automatic renewal, unjustified limitations of liability, and pre-formulated arbitration clauses). Building on this, the article advances targeted policy recommendations: strengthening the material and procedural framework for unfair-terms control; explicitly codifying indicative lists; issuing trader compliance checklists; broadening standing for consumer associations; and improving enforcement, sanctions, and ADR/ODR interfaces. The study’s contribution is applied and practice-oriented, outlining a feasible roadmap for alignment and good practice for authorities, courts, businesses, and consumer assistance centres, with positive effects on legal certainty and market trust in both domestic and cross-border transactions.

Keywords: Unfair contract terms; Consumer protection; Adhesion contracts; Republic of Moldova; Armenia; EU law; Contract transparency;

JEL Classification: K12, D18, K23, K33, K41

1 Introduction

Unfair terms represent one of the most important institutions of consumer protection law, as they ensure contractual balance and good faith in the relationship between the trader and the consumer. Today, the concept goes beyond the classical notion of adhesion contracts and applies to all consumer contracts—namely, any contracts concluded between a trader and a consumer where the terms have not been individually negotiated.

This approach derives from Article 3(1) of Council Directive 93/13/EEC of 5 April 1993 on unfair terms in consumer contracts, which provides that “a contractual term which has not been individually negotiated shall be regarded as unfair if, contrary to the requirement of good faith, it causes a significant imbalance in the parties’ rights and obligations arising under the contract, to the detriment of the consumer.” (Council Directive 93/13/EEC of 5 April 1993)

Accordingly, the decisive criterion for identifying an unfair term is not the form of the contract but the absence of individual negotiation and the existence of a significant imbalance. Within this logic, the protection applies to any consumer contract, whether standardised, electronic, verbal, or physically signed.

The purpose of this study is to analyse, from a comparative perspective, how the law of the Republic of Moldova, the law of the Republic of Armenia, and European Union law regulate and

apply the principles governing unfair contract terms, identifying points of convergence, existing gaps, and possible directions for harmonisation. The comparative analysis aims to provide a practical perspective on how these three legal systems ensure consumer protection in the contemporary context of the digital economy and standardised contracts.

The methodology adopted relies on a comparative, doctrinal, and normative approach. The study combines the analysis of doctrinal literature, statutory instruments (civil codes, consumer protection laws, and sector-specific regulations), and the relevant case law of the Court of Justice of the European Union (CJEU)—notably the cases *Océano Grupo Editorial*, *Mostaza Claro*, *Banco Español de Crédito*, *Kásler*, and *Gutiérrez Naranjo*—as well as the judicial practice of courts in Moldova and Armenia.

Furthermore, the research includes an assessment of national and European institutional mechanisms concerning the enforcement of sanctions and the control of unfair terms. The paper is thus applied and forward-looking in nature, aiming to contribute to the harmonisation of national legislation with the EU *acquis* and to the strengthening of effective consumer protection mechanisms across jurisdictions.

2 The legal framework of protection against unfair contract terms

The legal regime governing unfair contract terms in the Republic of Moldova is founded on the provisions of the Civil Code of the Republic of Moldova, republished under Law No. 133 of 15 November 2018, which modernised the law of obligations and contracts by repealing the former Law No. 256/2011. The civil reform sought to align national legislation with the European principles of consumer protection enshrined in Council Directive 93/13/EEC of 5 April 1993 on unfair terms in consumer contracts.

In domestic law, the control of unfair terms is based on a coherent set of general principles: good faith, contractual balance, and the protection of public economic order. Articles 992 and 993 of the Civil Code impose on the parties the duty to act in good faith and to preserve contractual equilibrium, while Article 1107(2) provides that any ambiguous clause shall be interpreted in favour of the consumer. Additionally, Articles 330–338 regulate the nullity of juridical acts, providing the substantive basis for declaring unfair terms void as provisions contrary to law and public order.

Thus, good faith, in the sense of the Moldovan Civil Code, is no longer merely a moral standard but a binding legal norm with objective effects on the validity of contractual terms. It obliges the trader to draft contractual provisions that are fair, transparent, and proportionate. Moldovan legal scholarship has emphasised that good faith performs a social corrective function, designed to remedy structural imbalances between the trader and the consumer and to prevent the abuse of economic power.

In addition to civil provisions, the Law No. 105/2003 on Consumer Protection expressly prohibits unfair terms in contracts concluded between consumers and traders (Articles 5 and 16 letter a)). The statute extends protection universally to all consumer contracts, regardless of their form or medium—whether written, electronic, or verbal.

Under Moldovan law, the sanction for unfair terms is absolute nullity (*nulitatea absolută*), producing *ex tunc* effects. This sanction derives from the principle of public economic order and serves both a remedial and a preventive function. Consequently, the unfair term is deprived of legal effect from the moment of its inclusion in the contract, and the court is obliged to declare such nullity *ex officio*. This solution, affirmed in both doctrine and case law, corresponds to the model established by the CJEU, which requires national courts to exercise an active role in ensuring the effective protection of consumers.

In the Republic of Armenia, consumer protection against unfair contract terms is regulated by the Civil Code of Armenia and the Law on the Protection of Consumer Rights, adopted in 2001 and subsequently amended until 2023. Although the Civil Code does not expressly define “unfair

terms,” Articles 728–734 regulate consumer contracts and stipulate that any clause imposed unilaterally, which contravenes the principles of good faith or restricts a party’s rights, may be declared null and void. Specifically, Article 729(2) provides that any contractual condition depriving the consumer of the right to terminate the contract is void *ipso iure*. The civil framework thereby implicitly recognises the principle of protection against significant contractual imbalance and imposes an obligation of fairness in consumer relations.

The Armenian Law on the Protection of Consumer Rights (Chapter VII, Articles 16–21) complements this framework by explicitly prohibiting clauses that limit the rights granted by law to the consumer, exempt the seller or service provider from liability for non-performance, or impose disproportionate or unfair obligations. These provisions establish a standard of contractual fairness and reinforce the principle that consumer protection prevails over the formal freedom of contract.

Nevertheless, the Armenian legal framework remains incomplete compared with EU standards. The absence of an explicit definition of a “significant imbalance contrary to good faith” and the lack of indicative black and grey lists of prohibited clauses—similar to those included in the Annex to Directive 93/13/EEC—lead to inconsistent application of the protection principle. The control of unfair terms is exercised almost exclusively by the courts and only at the initiative of the consumer, with no *ex officio* competence, while the applicable sanction is usually relative nullity (voidability) with *ex nunc* effects, which limits the restoration of the *status quo ante* and prevents full restitution of the performances executed.

At the European Union level, the fundamental legal framework is established by Council Directive 93/13/EEC of 5 April 1993, which defines an unfair term as any contractual provision that, *contrary to the requirement of good faith, causes a significant imbalance in the parties’ rights and obligations to the detriment of the consumer*.

The Directive rests on three essential normative pillars: The “significant imbalance contrary to good faith” test, Transparency requirements, and The sanction of non-binding effect (lack of enforceability) of unfair terms.

Article 6(1) provides that such terms shall not be binding on the consumer and that the contract shall remain valid if it can continue without them. Furthermore, Article 5 requires that all contractual terms be drafted in plain, intelligible language, thus reinforcing both formal and substantive transparency. (Council Directive 93/13/EEC of 5 April 1993 on unfair terms in consumer contracts, Official Journal of the European Communities L 95, 21 April 1993, pp. 29–34)

This framework was subsequently strengthened by Directive (EU) 2020/1828 on representative actions for the protection of the collective interests of consumers, adopted on 25 November 2020, which introduced the possibility for qualified entities and consumer organisations to bring injunctive and redress actions on behalf of consumers, thereby consolidating the preventive and collective dimension of consumer protection.

Accordingly, EU law outlines a comprehensive and balanced model, where the control of unfair terms constitutes an essential component of legal consumer protection and an expression of the principle of effectiveness of EU law.

3 Judicial control and institutional enforcement mechanisms

Consumer protection against unfair contract terms represents one of the most important dimensions of European economic public order. It is grounded in the positive obligation of both the State and the courts to guarantee contractual balance and good faith in consumer relations—not only through substantive norms but also through effective and accessible procedural mechanisms.

The Court of Justice of the European Union (CJEU) has developed a substantial body of case law interpreting Directive 93/13/EEC, thereby transforming the control of unfair terms into a

matter of European public policy. In *Océano Grupo Editorial SA v. Rocío Murciano Quintero and others* (Joined Cases C-240/98 to C-244/98), the Court established the duty of the national court to examine ex officio the unfairness of contractual terms, emphasising that consumer protection cannot depend solely on the initiative of the consumer. In *Mostaza Claro v. Centro Móvil Milenium SL* (C-168/05), the Court confirmed that consumer protection prevails over the principle of procedural availability, requiring courts to intervene even where the consumer does not expressly invoke the unfairness of a term.

Subsequently, in *Banco Español de Crédito SA v. Calderón Camino* (C-618/10), the Court clarified that the national court is obliged to disapply an unfair term ipso iure, without awaiting a formal request from the consumer. The landmark case *Kásler and Káslerné Rábai v. OTP Jelzálogbank Zrt* (C-26/13) refined the requirement of substantive transparency, holding that terms are only binding where the consumer is able to understand their economic and legal implications. In *Gutiérrez Naranjo and others v. Cajasur Banco SAU* (C-154/15), the Court enshrined the principle of restitutio in integrum, according to which the declaration of nullity of an unfair term entails the full restitution of all amounts paid under it, with ex tunc effect. Finally, *Invitel Távközlési Zrt v. Nemzeti Fogyasztóvédelmi Hatóság* (C-472/10) recognised the erga omnes effect of judgments declaring a clause unfair, thereby extending protection to all consumers affected by identical terms.

Taken together, these decisions configure a model in which the control of unfair terms constitutes an active judicial instrument—an essential element of effective judicial protection as guaranteed by Article 47 of the Charter of Fundamental Rights of the European Union.

In the Republic of Moldova, the legal regime of unfair terms is expressly defined in Article 1076 of the Civil Code, which introduces the concept of protective nullity (*nulitate de protecție*). Pursuant to paragraphs (1)–(3), “an unfair term is struck by absolute nullity, and where the party that did not propose the unfair term is a consumer, the court shall invoke nullity ex officio.” (Civil Code of the Republic of Moldova (republished pursuant to Law No. 133 of 15 November 2018), published in the Official Gazette of the Republic of Moldova No. 66–75 of 15 March 2019)

Thus, nullity serves a functional purpose: to protect the consumer and restore contractual balance without affecting the overall validity of the contract. Paragraph (4) confirms that the remainder of the contract remains valid if it can reasonably continue without the unfair clause, while paragraph (5) grants the trader a right of recourse against the supplier who imposed the use of the unfair term in business-to-business transactions.

This regulation transforms the control of unfair terms into a positive obligation of the courts and an instrument for safeguarding public economic order. However, its practical effectiveness depends on coordination with the administrative mechanisms established under Law No. 105/2003 on Consumer Protection. According to Article 37 of that law, the State Inspectorate for the Supervision of Non-Food Products and Consumer Protection and, for the financial sector, the National Financial Market Commission are empowered to monitor compliance with the provisions of Articles 1069–1072, 1075–1079, and 1081 of the Civil Code concerning consumer contracts. These authorities may detect unfair terms either upon a consumer’s complaint or ex officio and may request the trader to provide copies of contracts subject to verification (Article 37(1)–(3)).

Under paragraph (4), when unfair terms are confirmed, the authority issues a statement of findings and brings an action before the courts seeking a judicial declaration of nullity. Although these bodies do not possess adjudicatory powers, they enjoy active legal standing to initiate proceedings in the interest of consumers.

Moreover, Article 37(5) provides that where a court finds certain contractual terms to be unfair and used on a large scale, the judgment may produce erga omnes effects—ordering the removal of such clauses from all similar contracts and prohibiting their future inclusion (Law of the Republic of Moldova No. 105 of 13 March 2003 on Consumer Protection, published in the

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Official Gazette of the Republic of Moldova No. 126–131/505 of 11 July 2003). This solution brings Moldovan law in line with the European model developed by the CJEU in *Invitel* (C-472/10), where judgments declaring a term unfair extend protection to all consumers affected by identical contractual provisions.

Furthermore, paragraphs (6) and (7) introduce the possibility of collective and sectoral actions, allowing consumer associations to bring claims either against individual traders or against groups of traders within the same economic sector who use or recommend identical or similar clauses. This mechanism strengthens preventive control and provides a systemic enforcement tool, complementing individual judicial review.

Therefore, the Republic of Moldova currently operates a mixed system of control over unfair terms, combining:

- Active judicial control under Article 1076 of the Civil Code, with the court’s *ex officio* duty to declare absolute nullity;

- Administrative and procedural control under Article 37 of Law No. 105/2003, through detection, notification, and judicial referral by competent authorities; and

- Collective and sectoral mechanisms allowing extended *erga omnes* effects and class-type interventions.

This dual structure aligns Moldovan law with European standards of consumer protection, ensuring a balanced interaction between judicial, administrative, and collective instruments.

In contrast, in the Republic of Armenia, the application of protection against unfair terms relies primarily on judicial mechanisms, with no distinct administrative control system comparable to that of Moldova. The Civil Code of Armenia grants courts exclusive jurisdiction to examine the validity and effects of contracts, including the power to declare clauses void where they contravene good faith or fairness. Consequently, protection is reactive and individual, triggered only at the initiative of the aggrieved consumer

The material grounds for judicial intervention are found in Articles 444 and 729(2) of the Civil Code, which provide that unilaterally imposed terms that unjustifiably restrict the rights of the adhering party or limit the trader’s liability may be declared null. However, the Code does not impose a duty on courts to review unfairness *ex officio*, and the resulting nullity produces effects *ex nunc*, without full restitution of executed performances.

In practice, judicial control is exercised under Article 13 (protection of civil rights) and Article 14 (prohibition of abuse of rights), which authorise courts to restore contractual balance and eliminate the consequences of bad-faith conduct. These provisions provide a general framework but lack specific procedural norms governing *ex officio* review or the collective effects of judgments, which limits their practical efficiency (Civil Code of the Republic of Armenia, adopted on 5 May 1998, published in the Official Gazette of the Republic of Armenia, as amended and supplemented (latest consolidated version by the 2023 Law).

From an institutional standpoint, the Competition Protection Commission, regulated under Articles 27 and 37 of the Law on the Protection of Economic Competition, plays a complementary but non-jurisdictional role. According to Article 27(1), the Commission is an autonomous body subordinated to the Government, tasked with ensuring free competition, preventing anti-competitive practices, and safeguarding consumer interests. Under Article 37, it may issue recommendations and warnings, and initiate administrative proceedings against economic operators violating competition rules. However, the Commission lacks competence to bring actions before courts for the annulment of unfair contractual terms and cannot issue binding civil enforcement decisions (Law of the Republic of Armenia on the Protection of Consumer Rights, adopted on 26 November 2001, published in the Official Gazette of the Republic of Armenia, as amended and supplemented (consolidated version 2023)).

Hence, its role is primarily consultative and supervisory, limited to identifying unfair or anti-competitive practices. The power to declare terms null and void lies solely with the ordinary courts under the Civil Code. The absence of institutional cooperation between courts and the Commission, together with the lack of collective redress mechanisms, means that the effectiveness of consumer protection largely depends on individual initiative.

Therefore, the Armenian system of enforcement of protection against unfair terms remains predominantly judicial, fragmented, and formalistic, based on *ex post* and passive control by the courts. The absence of *ex officio* review, an administrative authority with standing, and collective instruments reduces both the deterrent and preventive capacity of the legal framework.

4 Comparative analysis, challenges and directions for harmonisation

The comparative analysis of the legal regimes of the Republic of Moldova, the Republic of Armenia, and the European Union reveals differing degrees of normative and institutional maturity in the protection of consumers against unfair contract terms. While the EU framework is comprehensive, coherent, and supported by a consolidated body of case law from the Court of Justice of the European Union, the Moldovan system demonstrates a progressive convergence toward EU standards, whereas the Armenian framework remains predominantly judicial, formalistic, and limited in procedural efficiency.

From a substantive perspective, all three systems are grounded in the principles of good faith and contractual balance. Yet they diverge in their sanctioning regimes:

In Moldovan law, an unfair term is subject to absolute nullity (*nulitate absolută*) with *ex tunc* effect, and the court is expressly obliged to declare such nullity *ex officio*.

In Armenian law, the sanction takes the form of relative nullity (voidability) producing *ex nunc* effects, and judicial examination depends exclusively on the consumer's initiative.

Under EU law, Article 6(1) of Directive 93/13/EEC provides that unfair terms are non-binding on the consumer, and the principle of *restitutio in integrum*, confirmed in *Gutiérrez Naranjo* (C-154/15), ensures the full retroactive restitution of amounts unduly paid.

From a procedural standpoint, the Republic of Moldova aligns closely with the European model by combining active judicial control with preventive administrative enforcement. Courts have a legal duty to review unfair terms *ex officio*, while the State Inspectorate for the Supervision of Non-Food Products and Consumer Protection (ISSPNPC) and the National Financial Market Commission (NFMC) are empowered to identify and refer unfair terms to court. This dual mechanism enables both individual and collective actions, and judgments may produce *erga omnes* effects, as established in *Invitel* (C-472/10).

By contrast, the Armenian procedural framework remains confined to judicial intervention by ordinary courts, with no *ex officio* competence and no collective redress. Its legislation provides only general grounds for declaring nullity, without proactive procedures. The Competition Protection Commission, though competent in monitoring market conduct under the Law on the Protection of Economic Competition, has merely an advisory and supervisory role, lacking standing before courts and the power to issue binding decisions. As a result, enforcement remains reactive, dependent on the individual consumer's initiative.

Comparatively, the European Union provides a comprehensive and balanced model, where substantive protection is complemented by clear procedural safeguards. Through the dynamic interpretation of the CJEU—from *Océano Grupo Editorial* (C-240/98–C-244/98) and *Mostaza Claro* (C-168/05) to *Banco Español de Crédito* (C-618/10)—the principle of *ex officio* control and the priority of consumer protection over procedural autonomy have become central. Directive (EU) 2020/1828 further strengthens this model by introducing representative actions that allow consumer organisations to seek both injunctive relief and collective redress, thereby extending protection to the systemic level.

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Regarding enforcement effectiveness, the Republic of Moldova is in a stage of consolidation. Although its legal framework is largely harmonised with EU standards, judicial practice remains fragmented: courts seldom invoke nullity ex officio, and cooperation with administrative authorities is still developing. In Armenia, the absence of complementary procedural tools and of collective standing for consumer associations maintains protection at a declarative rather than deterrent level. Within the EU, by contrast, enforcement is supported by an established judicial culture of proactive control and by the integration of consumer protection into the broader concept of economic public order.

Overall, the comparison reveals three regulatory models:

The European model – integrated and proactive, balancing judicial, administrative, and collective control.

The Moldovan model – mixed and convergent, substantially aligned with EU standards but requiring stronger practical implementation.

The Armenian model – formal and judicial, focused on individual protection and lacking systemic preventive mechanisms.

To ensure functional harmonisation, several legislative and institutional reform directions are required. First, it is necessary to introduce “black” and “grey” lists of unfair terms, similar to those contained in the Annex to Directive 93/13/EEC, in order to provide predictability and uniformity in judicial practice. Second, the ex officio control over unfair terms must be extended and cooperation strengthened between courts, authorities and consumer associations. Third, it is advisable to establish a specialised administrative mechanism with the competence to notify and initiate collective actions, in cooperation with competition and market protection authorities. Finally, strengthening the digital framework of protection, through the development of automated analysis tools for standard-form contracts and digital platforms, would allow for an effective and preventive application of consumer protection rules.

In **conclusion**, the protection of consumers against unfair contract terms represents an area of legislative and institutional convergence between the Republic of Moldova, the Republic of Armenia, and the European Union. While EU law sets an advanced standard of contractual balance and transparency, Moldova has achieved substantial alignment, and Armenia must transition from a reactive to a proactive model. Strengthening judicial ex officio review, institutionalising collective redress, and enhancing cooperation between national authorities and consumer organisations will enable the creation of an efficient, equitable, and EU-compatible system—one capable of guaranteeing genuine respect for good faith and contractual fairness in all consumer relations.

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SECTION X

CONTEMPORARY LIBRARIES: CHALLENGES, TRANSFORMATIONS AND PREMISES FOR DEVELOPMENT IN THE NEW SOCIO-ECONOMIC CONTEXT

RECONFIGURING THE ROLE OF ACADEMIC LIBRARIES IN SUPPORTING THE SCIENTIFIC PUBLISHING ECOSYSTEM: A CASE STUDY OF THE REPUBLIC OF MOLDOVA

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Abstract: With all the big changes going on in the world of scientific publishing right now, academic libraries are becoming more and more important in supporting editorial processes and spreading knowledge. This article looks at the Republic of Moldova through real research done in projects called “Trends in the Development of the Scientific Publishing System in the Republic of Moldova through the Lens of Science Policies” and “The Phenomenon of Predatory Pseudoscientific Publishing in the Academic Community of the Republic of Moldova”. These studies included surveys of scientists (539 people answered) and journal editors (57 people answered), as well as checks of how well bibliographic references and citations met the rules. The results show that there are still problems with making sure that citations are accurate and follow international standards. There is also a growing need for support from universities to improve academic integrity and make their work more visible around the world.

Survey results show how important libraries are becoming. While only a few researchers said librarians were their main source of info on dodgy publications, more than half said they'd check with librarians to see if a journal was legit. Editors also said they were slowly getting used to international standards for citations, and said these were important for indexing and being more visible around the world.

Actions such as updating journal profiles in bibliometric databases and rigorously applying international editorial standards are viewed as priorities.

The conclusions highlight the convergence between the educational role of libraries and editorial efforts toward professionalization, suggesting that academic libraries can play a decisive role in consolidating a sustainable and competitive publishing ecosystem, both regionally and internationally.

Keywords: Academic libraries, scientific publishing, citation standards, predatory journals, international visibility

JEL Classification: E24, I23, J80

1 Introduction

Over the past two decades, the field of scientific publishing has undergone significant transformations driven by digitization, the globalization of research efforts, and the proliferation of open access models. In this dynamic environment, academic libraries have evolved beyond their traditional role as providers of information resources to assume more complex functions, including supporting editorial processes, promoting the visibility of publications, and strengthening academic integrity (Tzanova, 2020; Qu and Huang, 2022).

The open science model has created significant opportunities for the democratization of knowledge; however, it has also introduced challenges related to financial sustainability and the maintenance of editorial standards (Redkina, 2022; Lo, 2025). In this context, libraries have become active participants in this new ecosystem by investing in digital infrastructure, developing publishing services, and establishing support mechanisms for peer review (Schlosser, 2018; Duffy, 2024).

But there are two other things that are making things more complicated. First, there are more and more publishers who are only interested in making money, and secondly, there's the pressure

to publish quickly. These two things have made it hard to know whether the research in new academic areas is any good (Shen and Björk, 2015; Frandsen *et al.*, 2022). Libraries, working with the scientific community, need to develop tools and policies to stop these bad practices and make the academic system stronger (Hansson and Johannesson, 2013; Hosier and Cantwell-Jurkovic, 2025).

In the Republic of Moldova, these global changes are happening in a country that is not strong, with limited money and technology, not much internet, and rules that keep changing. Even though there has been a lot of progress in the rules and classification of publications, there are still a lot of challenges. It is hard for journals to be well-known around the world for a number of reasons. These include limited access to international databases, different universities and research organisations not always supporting the development of journals, and difficulties in keeping the same editors for a long time (Cuciureanu and Vrabie, 2022; Cojocaru *et al.*, 2022; Cuciureanu, 2024; Turcan, 2025).

This research looks at how academic libraries in the Republic of Moldova are changing the way they support the scientific publishing ecosystem. It does this by looking at the problems and possibilities that come up when moving to open models, the pressures of internationalisation, and the need to strengthen academic integrity.

2 Literature review

New research shows that changing what academic libraries do goes hand in hand with the major changes that scientific communication has seen in the last 20 years. The way knowledge circulates and is validated is changing because digitisation is speeding up, open access is being adopted everywhere, and new ways of checking information are emerging. (Tzanova, 2020; Lo, 2025). This issue extends beyond merely augmenting technical infrastructures; it involves institutional repositioning. Libraries are no longer simply providers of collections; rather, they are evolving into co-producers of scientific communication. These institutions assume a dual role, encompassing editorial functions – Including methodological support and publishing services – and normative functions, such as education related to ethics, quality, and transparency (Tzanova, 2020; Hansson and Johannesson, 2013). Simultaneously, the global publishing landscape, once dominated by subscription models, is transitioning toward hybrid models in which processing fees, algorithms, and attention metrics create new dependencies and redistribute costs among authors, institutions, and commercial publishers (Lo, 2025).

From a conceptual perspective, the transition to Open Science encompasses more than just open access to articles. It includes various practices such as data and code sharing and open evaluation, which require libraries to possess integrated advisory, training, and standardization capabilities (Qu and Huang, 2022). These capabilities serve as interfaces between the circuits of scientific production and discovery, linking infrastructures, public policies, and evaluation mechanisms (Qu and Huang, 2022). Furthermore, Redkina (2022) emphasizes that the effectiveness of an open science ecosystem depends on coherence among platforms, metadata, persistent identifiers, and institutional policies. Therefore, library support must be both technological and organizational, aiming to achieve interoperability and long-term sustainability.

At the operational level, the literature describes a pragmatic repositioning, evident in the enhancement of the academic environment's publishing capacity and the development of library publishing services as alternatives to, or supplements for, commercial channels (Schlosser, 2018). The author demonstrates how initiatives centered around the Library Publishing Coalition have produced organizational models, tools, and best practices that lower barriers to entry for institutional journals and university publishing series. Duffy (2024) notes a similar trend in Ireland, where library-managed publishing services are facilitating the transformation of scientific communication through inter-institutional collaboration, standardization, and the professionalization of the editorial process. In this context, the library becomes a provider of

infrastructure – such as platforms, metadata, and archiving – and a guarantor of quality through procedures, guidelines, and editorial training. Perceptions of librarians confirm this transition to hybrid roles, where publishing and evaluation skills are added to traditional ones (Hansson and Johannesson, 2013).

Alongside these opportunities, recent research also highlights systemic risks that require intervention from libraries, institutions, and policymakers. Shen and Björk (2015) documented a steady increase in articles published in outlets with questionable editorial practices, a phenomenon driven by performance pressures and fee-based models. One empirically tested solution is to adjust promotion criteria to discourage publication in questionable journals, with libraries acting as policy brokers and compliance advisors for the academic community (Frandsen *et al.*, 2022). Additionally, the integration of artificial intelligence into editorial workflows introduces new challenges. Hosier and Cantwell-Jurkovic (2025) demonstrate that artificial intelligence (AI) is already being utilized for technical checks and language support; however, they emphasize the necessity of an ethical framework and human oversight. At a macro level, Lo (2025) discusses a “new economic paradigm” emerging from the combination of AI and open access, which has mixed effects on the sustainability and fairness of access.

The diversification of knowledge production also places additional demands on libraries. A study by Kaier *et al.* (2019) in Austria shows that researchers are increasingly focusing on non-traditional outputs such as datasets, replications, and software. This trend necessitates the expansion of institutional archiving and support infrastructures. Similarly, Scotti *et al.* (2025) emphasize that American libraries' involvement in Open Science requires the development of policies, infrastructures, and training programs. These examples could serve as points of comparison for countries such as the Republic of Moldova.

Reporting on these trends in the context of the Republic of Moldova reveals several vulnerabilities and gaps. Local empirical studies indicate that exposure to predatory publications is higher in environments characterized by pressure to publish quickly, a lack of culture surrounding channel evaluation, and financial constraints, which often push authors toward risky choices (Cojocaru *et al.*, 2022). Regarding visibility and procedural compliance, there is a discrepancy between the existing scientific publishing policies and the reality of indexing in international databases. This discrepancy reflects the absence of a coherent framework for the professionalization of journals and the management of editorial resources (Turcan, 2025b). Collectively, these findings paint an uncomfortable picture: the editorial infrastructure remains fragmented; human resources for editing and reviewing are limited; and working procedures often rely on informal practices. These areas can be addressed by libraries in partnership with publishers through the development of clear routines, workflows, and quality assurance mechanisms (Schlosser, 2018; Duffy, 2024).

Overall, studies suggest that the reconfiguration of academic libraries – from providers of collections to co-architects of the publishing ecosystem – is not only a response to global transformations but also a prerequisite for the sustainable professionalization of institutional channels, particularly in resource-limited systems. This is especially evident in contexts with more pronounced constraints, where the involvement of libraries can yield significant benefits through the development of academic publishing services, systematic publishing education programs, and the consistent application of integrity policies.

3 Methods and Materials

The study employed a mixed-methods approach, combining content analysis with quantitative, questionnaire-based tools.

In the first stage, two documentary analyses were conducted on national scientific journals. The first study, carried out in February 2025, examined 71 journals (42 accredited and 29 additional ones identified using the National Bibliometric Instrument) to assess the clarity of

citation rules, the use of unique identifiers, and alignment with international standards (ISO 690:2022). The second study, conducted between March 26 and 28, 2025, compared the stated instructions with editorial practices. It analyzed 57 accredited scientific journals to evaluate the consistency between official requirements and actual reference formatting.

The quantitative component consisted of two surveys conducted between January and March 2025. The first survey, sent to a sample of 539 researchers, academics, and doctoral students, examined their experiences with the editorial process, their perceptions of the quality of national journals, and their awareness of pseudoscientific publishing. The second questionnaire, completed by 57 editors, focused on the challenges associated with editorial activities, the level of professionalization, and the relationships with authors and institutions.

Combining these methods enabled us to capture both editorial practices and their perception by the scientific community and publishers. This approach provides a more nuanced understanding of the academic context in the Republic of Moldova.

4 Findings and Discussion

The results of the survey conducted among the scientific community (n = 539; 524 valid responses to this question) indicate that information about predatory journals and conferences primarily circulates through informal channels, such as professional networks, colleagues, or media sources. This predominance of non-institutional communication suggests that the phenomenon is perceived more as a topic of discussion among researchers than as a component of structured training programs.

Conversely, the data highlight the marginal role of librarians in this process. Only 8.21% of respondents identified libraries as a source of relevant recommendations (Figure 1), indicating a significant discrepancy between these institutions' professional capacity to provide educational and editorial support and the extent to which this support is recognized or utilized by the academic community. Libraries already have the expertise to evaluate sources and identify publications with questionable editorial practices. These results highlight the importance of redefining their role to include ethical and informed research beyond traditional boundaries.

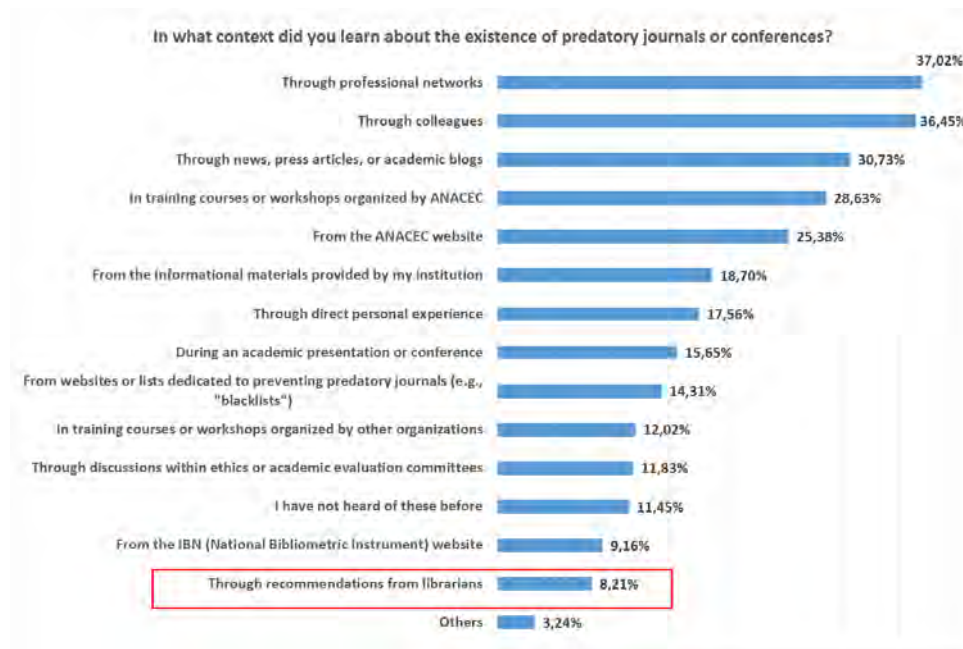


Figure 1. Information sources about predatory journals and conferences

Source: Own elaboration based on the results of a survey (n = 524)

It is interesting that only a few respondents (9.16%) mentioned IBN, while a medium number (25.38%) said the website of the National Agency for Quality Assurance in Education and Research (ANACEC) was a good source of information. This suggests that the current institutional mechanisms are not being used to their full potential in preventing the phenomenon under analysis. Academic libraries can help with this by acting as a bridge between the rules and the people who use them. It is important to provide clear information and make publication evaluation tools easier to access. This will help to create a stronger culture of quality within the local scientific community.

The results show that more and more people are aware of this, but this awareness is spread out and relies too much on people's personal experiences and informal networks. Making academic libraries more important could help change this process into a lasting way of teaching people and protecting them against bad publishing practices.

The survey results show that most respondents like to check the credibility of a journal or conference by looking at national and international databases (56.18%; n = 582) and lists of suspicious publications (48.41%; n = 243). Many participants also cited sources such as the Internet, particularly warnings from authors who have previously been affected (43.43%; n = 218). Additionally, a significant proportion of respondents report participating in training courses and workshops organized by ANACEC (39.84%; n = 200). These findings suggest an increased reliance on external institutional sources, which are perceived as stable reference points in the publishing landscape.

The survey results indicate that, when determining whether a journal or conference is predatory, researchers primarily rely on well-established external sources (Figure 2). The most frequently cited sources are national and international databases (average rating 3.55), blacklists of suspicious publications (average rating 3.43), and online information, including warnings from other authors (average rating 3.34). In contrast, internal institutional structures and collegial support are referenced less frequently.

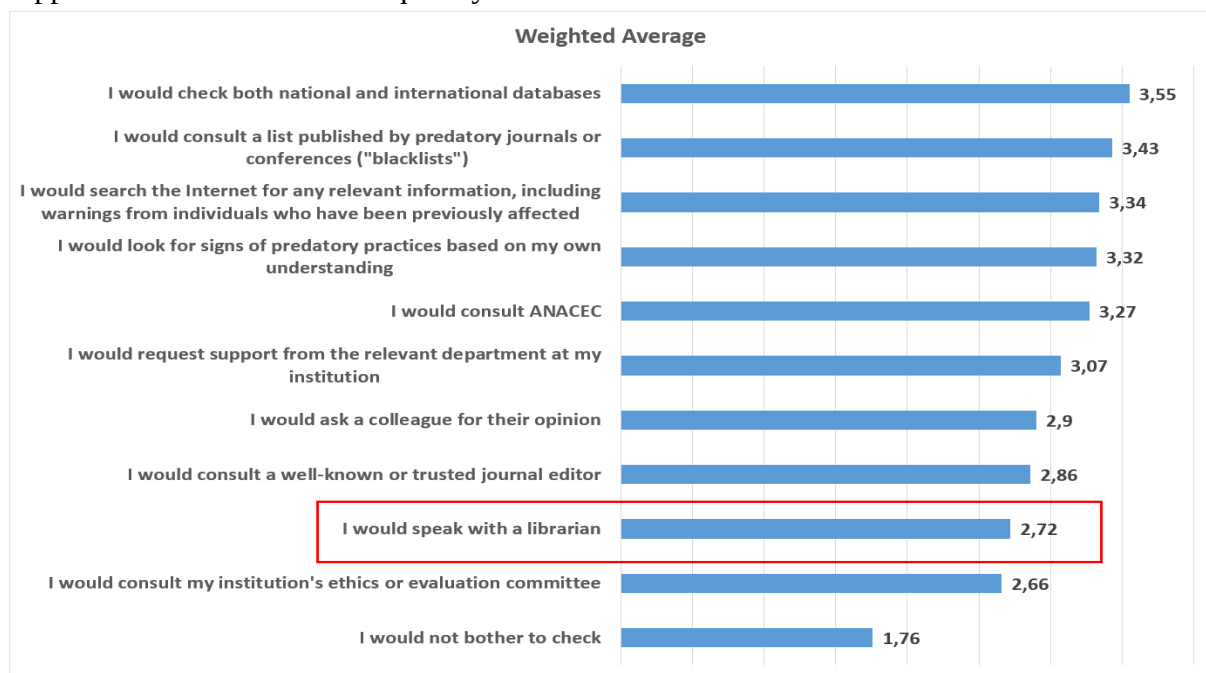


Figure 2. Strategies for identifying predatory publications

Source: Own elaboration based on the survey results (on a scale from 1 to 4, where 1 = strongly disagree; 4 = strongly agree) (n = 502)

In this equation, librarians occupy an intermediate position (mean = 2.72), suggesting that seeking their expertise is neither a common practice nor a marginal one. However, their contribution is only modestly recognized, with just 15.54% (n = 78) of respondents explicitly mentioning this option as a way to verify the predatory nature of a publication. A detailed analysis of the response would talk to a librarian reveals that more than half of the participants either agree or strongly agree with this option. Data from Figure 3 completes the picture, indicating that although few firmly affirm this practice, 36.25% (n = 182) say they would consult a librarian, and 17.3% (n = 89) do not rule out this option. At the same time, almost 30% of respondents disagree or strongly disagree, confirming that libraries are still not widely perceived as sources of specialized support in evaluating publications.

These results present an ambivalent picture. On one hand, there is a foundation of trust in librarians' expertise; on the other, this resource remains underutilized. Enhancing their visibility in editorial policies and strengthening their educational role could transform libraries from mere resource providers into active partners in promoting scientific integrity.

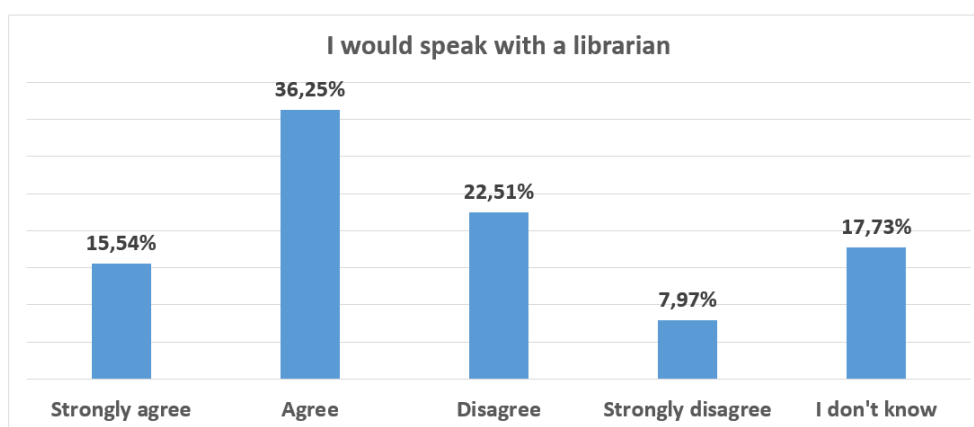


Figure 3. Respondents' perceptions of the role of librarians in identifying predatory publications

Source: Own elaboration based on the survey results (n = 502)

The observed discrepancy suggests that the potential of libraries remains only partially utilized. Although librarians possess the necessary expertise to help the academic community identify predatory publishing channels, their role is often perceived as less important than that of external sources. These findings reinforce the idea that librarians need to increase their visibility to be recognized as active partners in promoting a responsible publishing culture by providing training, best practice guides, and advisory services tailored to researchers' needs. In the Republic of Moldova, pseudo-scientific publications continue to pose a problem, and libraries could support research integrity processes and strengthen trust in publishing practices by becoming more actively involved.

To complement the survey of the scientific community, a second questionnaire was sent to journal editors, 57 of whom responded, to identify strategies for increasing international visibility (Mincină and Țurcan, 2025). Figure 4 shows that publishers emphasize indexing in the National Bibliometric Instrument (IBN), mentioned by 51 respondents; promoting ORCID identifiers for authors (49 responses); and implementing DOIs for articles (47 responses). All of these measures require knowledge of and adherence to international standards – an area in which librarians are well positioned to provide methodological assistance and specialized technical support.

The consistent application of international citation standards, as referenced by 45 publishers, highlights the necessity for bibliographic expertise. In this area, librarians have demonstrated

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proficiency and can facilitate the alignment of author guidelines with established standards, such as SM ISO 690. In contrast, fewer respondents reported indexing in major international databases (41 responses) or maintaining active profiles on bibliometric platforms like Google Scholar or ResearchGate (34 responses). These discrepancies suggest that the integration of digital tools and the monitoring of scientific impact are not yet fully established. Consequently, academic libraries can play an active role by providing support in the indexing process, data management, and enhancing international visibility.

Consequently, the findings suggest that publishers recognize the importance of global standards and infrastructures; however, fully implementing these remains a significant challenge. Librarians are uniquely positioned to help translate these intentions into sustainable practices through various means, including counseling, training, and direct involvement in editorial and academic visibility processes.

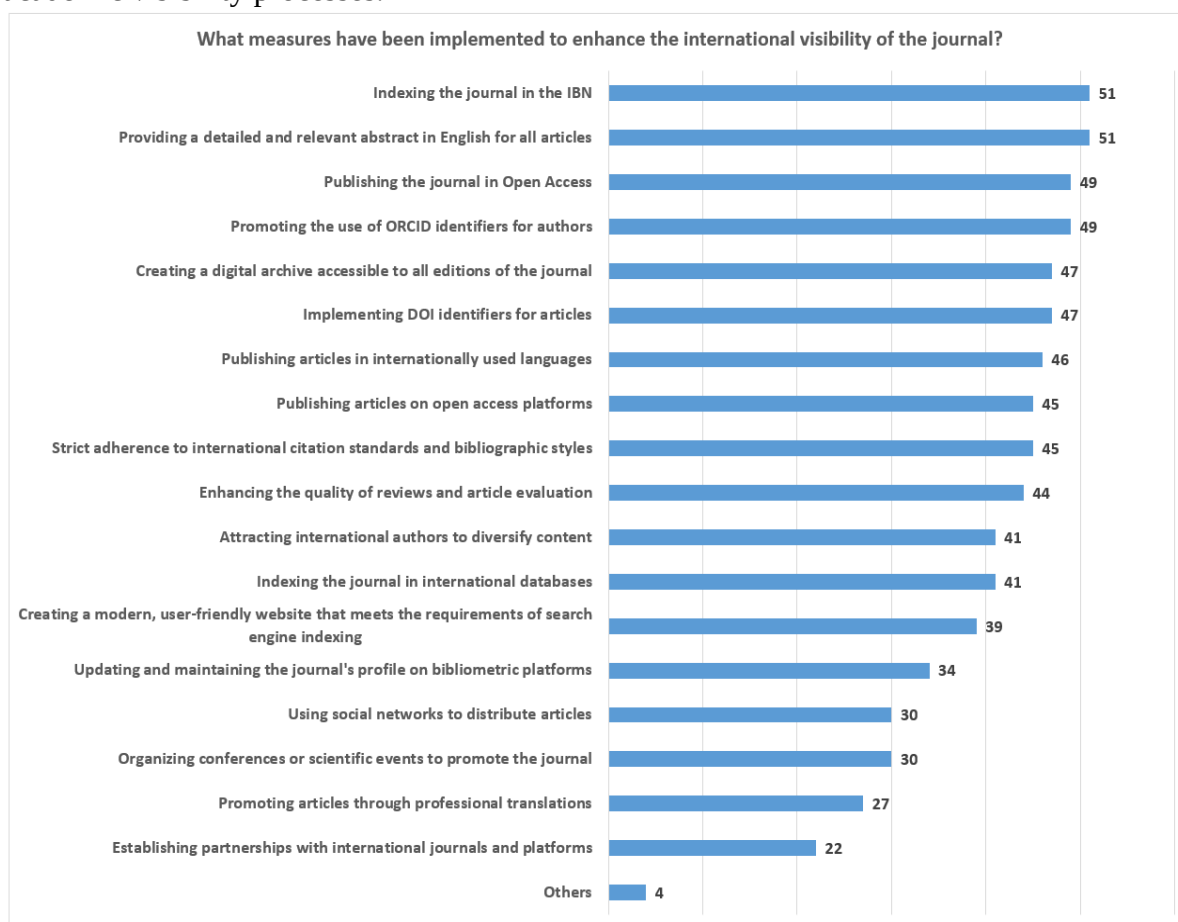


Figure. 4. Measures adopted by publishers to enhance the international visibility of journals
Source: Own elaboration based on the survey results (n = 56)

The survey results also demonstrate that the majority of international requirements are perceived as accessible and useful for enhancing the journal's prestige. The most highly regarded measures were the introduction of persistent ORCID identifiers for authors (45 responses) and the assignment of a DOI to each article (43 responses), followed by the assignment of a DOI to the journal itself (37 responses). These findings support the commitment to global best practices for identifying and validating scientific output. However, requirements related to the completeness and accuracy of bibliographic references (31 responses) and ensuring digital archiving (31 responses) are considered beneficial but present practical challenges for some publishers. Four respondents described these as a “major challenge”.

Within the category of “difficult to implement but necessary” aspects, the most frequently mentioned option is the use of Open Journal Systems (OJS) platforms, cited by 24 respondents. This choice highlights the lack of sufficient technical and infrastructural resources.

The results of this study provide a relatively clear picture, indicating that publishers are generally receptive to the adoption of international standards. However, challenges arise when these standards require the use of digital resources, technical expertise, and a deep understanding of bibliographic norms. Librarians can address these challenges in several practical ways, including training publishers and authors in the use of ORCID and DOI integration, offering methodological support to verify the accuracy of references, providing technical assistance for adopting OJS platforms, and developing guidelines or workshops to professionalize publishing activities.

Consequently, university libraries can play a pivotal role in the process of international journal indexing, thereby reducing the gap between global standards and locally available resources.

Another aspect examined in the survey was the presence of explicit provisions concerning editorial policies. The majority of editors (53 out of 57 respondents) confirmed the existence of regulations related to citation styles and the accurate preparation of bibliographies in the journals they manage. This finding suggests that, at a declarative level, citation standardization is considered a crucial element of the editorial process and a prerequisite for attaining international visibility. However, content analyses and compliance assessments reported in previous studies reveal frequent discrepancies between the stated rules and their actual implementation in published articles.

This lack of uniformity presents an opportunity for librarians' expertise to become truly relevant. Given their familiarity with citation standards such as APA, Harvard, and ISO 690, librarians can play a pivotal role in aligning author guidelines with international norms. They can also verify and ensure consistency in the application of these standards throughout the editing and publishing process.

The findings reaffirm the importance of adhering to bibliographic standards in shaping editorial policies and highlight the promising role that academic libraries can play in the professionalization of editorial processes and in enhancing the quality of scientific publications in the Republic of Moldova.

The analyses reveal a common trend: persistent difficulties in standardizing citation practices in domestic journals. An evaluation of 57 accredited journals shows a clear imbalance – only 21 (36.8%) explicitly reference an international citation style or recognized standard, while the remaining 63.2% provide no clear guidance in this regard (Țurcan and Minciună, 2025a). The practical application of these rules presents several challenges. First, only 20 journals consistently adhere to the citation rules they declare. Second, 25 journals apply these rules only partially, and in 12 cases, there is no genuine compliance.

These findings are supported by the analysis of a larger sample of 71 journals, of which only 24 provide a clear reference to an established citation style (Țurcan and Minciună, 2025b). It has been demonstrated that alternative citation formats are frequently used in ways that are both ambiguous and inconsistent. This has been shown to cause editorial inconsistencies, thereby reducing the likelihood of publications being included in international databases.

Furthermore, a case study in the field of educational sciences highlights a concrete consequence of this lack of standardization, revealing that only 10.02% of the 369 references analyzed fully complied with the formal requirements (Țurcan, 2025a). This low accuracy rate indicates that, in the absence of clear standards and a coherent editorial verification mechanism, errors are not only frequent but also nearly unavoidable. The impact is significant; the visibility, reputation, and potential inclusion of journals in international databases are all adversely affected.

Consequently, the three investigations are complementary and converge on the same conclusion: the lack of standardization and rigorous editorial oversight constitutes one of the most significant vulnerabilities in the domestic publishing system. In this context, university libraries could intervene effectively in two ways. First, they could train authors and editors in the proper use of citation standards. Second, they could develop monitoring and correction tools. These measures would substantially reduce the number of errors and significantly enhance the scientific community's confidence in national publications.

5 Conclusions

The study indicates that academic libraries in the Republic of Moldova are undergoing a transition, gradually shifting from their traditional role as providers of information resources to active partners in the publishing ecosystem. Survey data suggest that, despite possessing the necessary skills to support the identification of predatory publications and the application of international standards, librarians utilize this potential only to a limited extent. A considerable number of researchers continue to view libraries as significant sources of editorial support, highlighting the need for a strategic repositioning of the services offered.

A comprehensive qualitative analysis of the compliance and accuracy of bibliographic references has revealed significant deficiencies in standardization. Only a third of journals follow international rules for citations, and a study in education sciences found that less than 10% of references are completely accurate. These findings show that it is very important to involve libraries as methodological contributors, as they can support verification and training processes.

But publishers have said that international standards and using identifiers that never change are important. But they have also seen the problems that come with putting this into practice, mostly because they don't have the right digital systems or the technical skills they need. At this point, librarians can help by offering technical support, training programmes and ongoing guidance.

All of these findings suggest that it is no longer a good idea to think about changing the role of libraries. It is now necessary to change the role of libraries. If the editorial and advisory teams get bigger, the way the articles are put together can become more professional. This can stop problems that happen when people are too quick to publish things that are not good enough. It can also make research more visible to people in other countries.

Academic libraries have the potential to become real bastions of academic integrity. But for this change to work, the company has to recognise their expertise and make sure they're involved in decision-making and editorial processes.

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DECEPTIVE PRACTICES IN SCIENTIFIC PUBLISHING IN THE REPUBLIC OF MOLDOVA

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Abstract: The article examines the phenomenon of deceptive practices in the publication of scientific results in the Republic of Moldova, with particular emphasis on predatory publishing. Such practices constitute dissemination methods driven by the pursuit of rapid financial gain, undermining research integrity and eroding trust in science. Evidence indicates a significant prevalence of these practices across all scientific fields among researchers in the Republic of Moldova. One such practice is the phenomenon of so-called “ghost conferences”, exemplified by the case of InterConf. The authors also identify domestic manifestations of such practices, including publication in journals that accept manuscripts without peer review, or conferences that publish papers and issue certificates without actual participation. In addition to predatory publishing, the article highlights other deceptive practices: (1) dubious patents, particularly those acquired in the United Kingdom, which fail to meet invention criteria and mislead the scholarly community; and (2) pseudo-scientific rankings, such as the AD Scientific Index or Moldova H-index, which rely on opaque methodologies and promote paid services to artificially inflate visibility. These phenomena appear to stem not only from deliberate attempts at fraud, but also from a deficient research culture, institutional pressures to publish, and the absence of a robust system for regulation and education in research ethics. The authors advocate for the recognition and eradication of such practices through coherent policies and systemic interventions.

Keywords: Predatory publishing, scientific integrity, deceptive practices, research evaluation, pseudo-scientific rankings.

JEL Classification: I23, I28, O39

1. Introduction

Deceptive practices in the publication of scientific results aim to secure rapid financial gain by exploiting weaknesses in the academic system, including the pervasive “publish or perish” pressure and the absence of a robust culture of scientific integrity.

Commonly referred to as predatory publications, such journals and conferences are on the rise globally, posing serious risks to public trust in science and research integrity, generating significant waste of research resources, and becoming embedded within research culture (IAP, 2022), thereby severely undermining the quality and credibility of scientific knowledge. Researchers from low- and middle-income countries are regarded as being most affected by this phenomenon (Callaghan and Nicholson, 2020).

Against this backdrop, and building on our previous studies, we set out to identify and analyse the principal forms of deceptive publishing practices involving researchers from the Republic of Moldova.

2. Material and methods

Deceptive practices were established through an analysis of the publication output of Moldovan researchers in relation to criteria identified in the scholarly literature or synthesised by the authors. In determining pseudo-scientific predatory publications, we applied the criteria developed within the project *The Phenomenon of Publishing in Pseudo-Scientific Predatory Outlets in the Academic Community of the Republic of Moldova* (Cuciureanu, 2024). The study also drew on the results of an online survey dedicated to the phenomenon of predatory publishing, conducted between 31 January and 7 March 2025 within the same project, which gathered responses from 539 researchers in the Republic of Moldova. The identification and synthesis of the main forms of deceptive practices were further informed by our earlier research and by findings from scientific studies published abroad.

3. Results and discussions

3.1. Publishing with predatory publishers

This constitutes the principal form of deceptive practices in the publication of scientific results involving researchers from the Republic of Moldova. It refers to the dissemination of scientific outputs through platforms that mimic the standards of legitimate academic publications, yet in reality fail to adhere to the ethical and professional norms of scholarly communication. Hallmarks of predatory journals and conferences include the absence of rigorous peer review (with the rapid acceptance of manuscripts), unjustified publication fees (payment is made for acceptance rather than for the provision of editorial services), misleading journal or conference titles (which may imitate the names of prestigious outlets or adopt pompous titles), false or obscure indexation (claims of inclusion in Scopus or Web of Science without actual indexing), lack of sustainable archiving (articles may disappear from the platform without warning), the “organisation” of mass-scale conferences (purportedly taking place in major world cities), among others.

Publishing in foreign predatory journals and conferences by Moldovan researchers is widespread and relatively well documented through our empirical studies.

More than half of the research projects funded under the 2020–2023 State Programme — the main policy instrument for science in the Republic of Moldova during that period — included publications of a predatory nature. The phenomenon spans most scientific fields and institutions, albeit to varying degrees. The majority of such outputs authored by Moldovan researchers appear in pseudo-scientific publications operating within the Eastern European region, often edited by individuals or entities from Ukraine. These outlets typically charge low publication fees, yet display clear predatory characteristics (Cuciureanu, 2025b). Notably, members of the Academy of Sciences of Moldova were listed as authors of predatory publications in 14 of these projects. Furthermore, numerous publications failing to meet scholarly standards were identified, even in cases where no publication fee could be confirmed, including those appearing in journals and conferences organised by unrecognised entities in their respective jurisdictions (e.g., from Crimea or the eastern districts of the Republic of Moldova).

One of the most prominent pseudo-scientific publishers for the Republic of Moldova, particularly during the pandemic, was *InterConf*, which offered participation in conferences ostensibly held in cities across various continents, alongside publication in proceedings volumes for a fee of €10 or €20 — without any actual conference taking place. In 2021 alone, these proceedings contained 363 papers authored by 413 researchers from the Republic of Moldova, including two rectors, three academicians, one head of a public authority in the research sector, 43 *doctor habilitat* and 142 *doctor* degree holders, 79 doctoral candidates, 38 full professors, and 99 associate professors (Cojocaru *et al.*, 2022). Most of these publications were in the fields of medicine, law, and educational sciences.

Equally alarming is the situation regarding the awarding of scientific and academic titles, as well as the right to supervise doctoral studies, based on works published in pseudo-scientific outlets. An analysis of 254 attestation files submitted to ANACEC between August 2024 and

February 2025 revealed 147 papers published in predatory outlets, distributed as follows: 22 papers in predatory publications across 10 files for confirmation of the *doctor habilitat* title; 41 papers across 111 files for confirmation of the *doctor* title; 26 papers across 41 files for confirmation of the academic titles of full professor and associate professor; and 58 such papers in files requesting approval to supervise doctoral research. The *InterConf* series accounted for 13 of these papers, representing a decrease compared to the two-month monitoring period in 2022, although new publishing alternatives resembling *InterConf* were identified, such as conferences from the *World of Conference* and *Way Science* series.

Overall, a trend was observed towards meeting the minimum performance indicators — particularly the number of publications in international or foreign outlets — by relying on articles published in predatory conference proceedings and journals within a relatively short time frame. This “dangerous phenomenon” has been documented in the scholarly literature, whereby individuals more concerned with meeting research performance metrics exhibited a higher likelihood of publishing in obscure journals (Conlogue *et al.*, 2022). The consequences are severe: through publication in predatory outlets, researchers can obtain — or have already obtained — titles, accreditations, certifications, and promotions that would otherwise be unattainable, all made possible by the ease of article acceptance offered by predatory publishing practices (Beall, 2017; Shrestha, 2020).

Publishing in Journals and Conferences in the Republic of Moldova with Deceptive Practices. Our previous analyses have shown that both scientific journals and scientific conferences in the Republic of Moldova exhibit characteristics associated with deceptive practices.

The failure to comply with publication standards in journals, including the peer review of articles, leads to a situation in which almost any submitted manuscript can be published. This finding applies particularly to journals in the field of law, as demonstrated by an experiment conducted in 2016–2017, which showed that these journals agreed to publish an article that had already been published in another journal and was available in Open Access (Moldoveanu and Cuciureanu, 2020).

An experiment involving 16 scientific conferences, to which a manuscript was submitted by a fictitious author containing text plagiarised from other works and a fabricated universal indicator for research evaluation — the Timmy Index — likewise revealed the absence of academic rigour in the publication of proceedings. Of the conferences targeted, 14 accepted the manuscript, 12 published it in their proceedings, and nine issued certificates of participation in events that no one had actually attended (Cuciureanu, 2025a).

In another study, manuscripts were submitted to 19 conferences in the Republic of Moldova containing the following sentence in the methodology section: “*Our hypothesis is that this paper will not be peer reviewed.*” The research identified deficiencies in meeting the criteria for organising and conducting scientific conferences, such as the absence of manuscript review (with the impression that some proceedings could include papers of any content), the acceptance of materials without presentation (thus undermining the very purpose of holding scientific events), discrepancies between reported organisational details and reality, the existence of an excessive number of scientific events in certain fields, and the tendency to formalise events for administrative purposes (Cuciureanu *et al.*, 2024).

The manner in which articles are published in journals, and particularly the organisation of conferences and the publication of their proceedings, reflects the low level of scientific culture in academic publishing and the lack of awareness regarding the necessity of validating research results through expert review. This fosters the development of a publishing culture in which the act of publishing becomes an end in itself rather than a means of disseminating research results. At the same time, this cannot be characterised as classical predatory publishing, as no evidence was found of publishers in the Republic of Moldova whose primary objective is financial profit.

Rather, such behaviour appears to be motivated by the need to publish in order to fulfil reporting requirements for projects, obtain academic titles, or advance in one’s career.

The perception that predatory journals and conferences are absent in the Republic of Moldova also appears to be shared by most local researchers. Only around 17% of respondents to a 2025 survey believed that there are predatory journals and conferences in the country, with the majority holding a different opinion (Figure 1).

At the same time, 57% of respondents considered that predatory practices are becoming a problem for researchers in the Republic of Moldova, while 24.7% believed they already represent a serious problem.

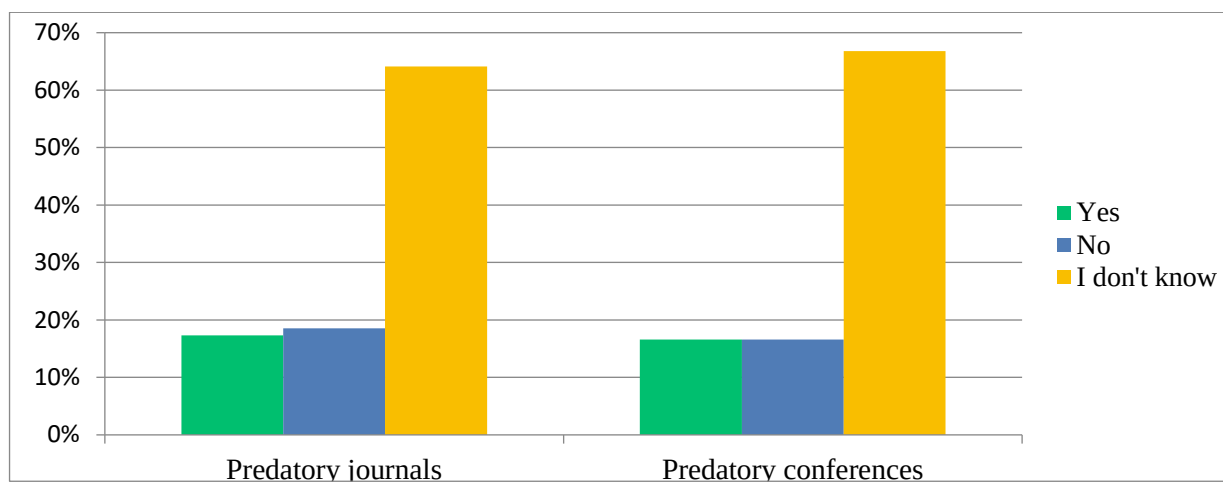


Figure 1. Researchers' opinions on the existence of predatory journals and conferences in the Republic of Moldova (n=502)

Source: elaborated by the authors based on the results of the survey conducted

3.2. Dubious Patents

The United States Patent and Trademark Office accepts patent applications that employ *prophetic examples*—imaginary experiments intended to illustrate how an invention would function, even though they have not actually been conducted. Researchers, investors, or evaluators reading such patents are not always aware that some of the described results are hypothetical, as these are often drafted in a detailed and persuasive manner, making them difficult to distinguish from real data (Freilich and Ouellette, 2019). Such situations can generate confusion (e.g., citation as a source of actual results, investment funding, etc.), thereby undermining trust in both the scientific literature and the patent system.

A deceptive practice in this context is the sale of “patents” to researchers from less developed countries. For instance, at the United Kingdom Intellectual Property Office, thousands of design registration applications are filed by companies whose primary aim is to profit from selling them. Unlike patents, these applications are not examined for novelty or individual character. These “patents” are not, in fact, patents, and are much easier and cheaper to obtain. In some countries, such as India and Pakistan, universities reward patents with points for promotion and even financial bonuses, thus incentivising such fraudulent schemes (Richardson *et al.*, 2025). The impact is the erosion of trust in intellectual property systems and the tarnishing of the reputation of universities and research in the countries involved.

This practice has begun to emerge in the Republic of Moldova. At the beginning of 2024, the acquisition of such a “patent” by a researcher from the Technical University of Moldova was widely publicised. The very headline—“A Moldovan researcher has developed a drone for smart agriculture. The vehicle has been patented in the UK”—is misleading in several respects. The article further claimed that this was “an internationally recognised invention patent registered in

the United Kingdom” for “a drone that monitors crops and sprays pesticides”, developed “in collaboration with two universities in India” (Diez, 2024). In reality, examination of the official document issued by the UK Intellectual Property Office reveals that it was a “Certificate of Registration of a United Kingdom Design”, certifying that the industrial design “Agricultural Drone for Crop Monitoring and Pesticide Spraying” had been registered under the names of eight individuals (seven from India and one from the Republic of Moldova). Thus, the registration protected the design or model rather than the rights to an invention.

Notwithstanding the above, this registration appears to have succeeded in misleading decision-makers involved in assessing research impact. As a result, in 2024, the researcher’s institution awarded her the Second Degree Prize and Second Degree Diploma in the category “Research and Innovation Laureate of the Year” (the most cited researcher in the Republic of Moldova received only the Third Degree Prize). In the same year, the researcher was named a laureate at the Champions of Change Gala, with the nomination citing, among other reasons, the fact that she had “obtained an invention patent registered in the United Kingdom”, which “promises to bring a significant change to Moldovan agriculture through the integration of advanced technologies.”

3.3. Pseudo-scientific Rankings

Pseudo-scientific (predatory-type) rankings of academic institutions or researchers lack scholarly rigour and are often characterised by questionable methodologies (unreliable data, vague methodological descriptions), absence of transparency, inclusion fees, and a focus on profit at the expense of quality. Such rankings may emphasise indicators that are easily manipulated or that fail to reflect genuine academic excellence. Predatory rankings may be associated with obscure or bad-faith publishers and websites.

One example of a predatory ranking is the AD Scientific Index, which charges fees for the inclusion of researchers and institutions in its rankings, yet employs a non-transparent methodology based exclusively on Google Scholar and undisclosed parameters. This creates the potential for manipulation of public perception and research funding policies, particularly in countries with fragile scientific cultures (RetractionWatch, 2021). Uncritical promotion of such rankings risks diverting resources and shifting the focus away from genuine research quality.

In the Republic of Moldova, several researchers promoted in 2021 one of the AD Scientific Index rankings in which they were listed—World Scientist and University Rankings 2022. Even minimal scrutiny of the ranking’s website reveals that it is a commercial enterprise seeking to monetise vanity, lack of discernment, and the desire for recognition. The underlying scheme is straightforward: academic entrepreneurs extracted publicly available data from Google Scholar profiles and compiled national lists of the “top” researchers. They then heavily promoted these rankings via social media, employing various marketing strategies. The implicit message is that anyone can appear in the ranking (without any publications indexed in major international databases) provided they have a Google Scholar profile and pay a fee of only €20.

In 2025, the so-called National H-index Ranking of Moldova began to be publicised. For instance, the Facebook page of the “Centre for Educational Research” published the ranking for the second quarter of 2025, followed by a news item on the website of the Academy of Sciences of Moldova, which claimed that it “contributes to improving the quality of scientific research, increasing the global visibility of Moldovan science, and engaging international partners in promoting and implementing joint projects”. There are, however, multiple indicators that this ranking (*H-index*, 2025) should be regarded as dubious, including:

Anonymous authorship – The website states that it is produced by “a group of scientists from the United States, the United Kingdom, Ukraine, the Netherlands, and Turkey”, but provides no names, organisations, or contact details, a hallmark of predatory publishing practices.

Exaggerated self-praise – The ranking claims to be “the only ranking in the world that evaluates scientific productivity based on a unified H-index metric from open sources and databases” and to provide “the most objective comparative analysis of data”, among other grandiose assertions.

A simplistic, irrelevant, and academically unvalidated methodology – The indicator used for organisational ranking is calculated as the arithmetic mean of the H-index from Scopus, the H-index from Web of Science, and one-half of the H-index from Google Scholar. While the first two components arguably reflect research quality (as journal inclusion in these databases follows evaluation), the third component lacks any quality filter, since Google Scholar indexes predatory publications as well as works involving plagiarism or other scientific misconduct. Moreover, this consolidated H-index is used only for organisations, not for individual researchers. For researcher rankings, no proprietary methodology is applied—data are simply extracted from Scopus, Web of Science, and Google Scholar. This is essentially an automated aggregation of publicly available affiliation data from the three sources for individuals linked to Moldovan institutions.

Content errors in the ranking itself – On the first page of the second-quarter 2025 ranking of the “top three leaders of scientific potential”, the first-placed organisation has not existed as a separate institution since 2022, and the third-placed institution has had no research functions since 2018. The list also includes universities that no longer exist. Such inaccuracies indicate that the data were harvested automatically from the three sources and do not reflect current realities (e.g., the State University of Tiraspol appears above the institution that absorbed it—“I. Creangă” State Pedagogical University of Chişinău—because the researchers concerned are now affiliated elsewhere). The researcher rankings also contain numerous errors; for example, the third-ranked individual in the “Top 1000 Moldovan Scientists in the Google Scholar Database 2025”, Alexa Wolberg, is listed as affiliated with the Technical University of Moldova, although no official source supports this claim.

Other errors on the website – For instance, it claims that the ranking aims at “solving the problem of the ‘diminishing’ state aspect in the context of the globalisation of society in the field of scientific research”, or that it evaluates the scientific activities of “business initiatives”.

Rankings exhibiting such characteristics are frequently developed with underlying commercial motives, for instance, to secure the inclusion or promotion of organisations and researchers in return for financial remuneration. In the case of the ranking under examination, no explicit information regarding the collection of fees was identified on its official website. Nevertheless, the platform invites organisations to register as ranking partners and encourages researchers to create personal profiles, requiring the submission of individual data.

Simultaneously, a promotional campaign has been initiated for the “Scientific Publications” platform, which operates its own website. This site underscores the purported significance of the H-index and markets services designed to increase it. These services are offered on a paid basis: fees for H-index enhancement are negotiated individually, while publication in a Scopus- or Web of Science-indexed journal is advertised at a starting price of USD 800. The company *Scientific Publications* actively promotes the H-index Ranking, for example, through its LinkedIn page and via its Bulgarian website.

A salient observation is that the set of countries for which the H-index Ranking is produced appears to overlap with those where *Scientific Publications* maintains country-specific websites—predominantly post-Soviet and post-socialist states, where international recognition of scientific output is often a priority, yet where susceptibility to certain forms of manipulation may be comparatively high. These patterns support the hypothesis that the two promotional initiatives are strategically coordinated, and that the ranking functions as a marketing instrument to attract researchers from the Republic of Moldova to purchase paid publication and H-index enhancement services offered by the company.

4. Conclusions

The analysis of deceptive practices in the publication of scientific results in the Republic of Moldova reveals a range of dysfunctions that severely undermine the integrity, quality, and credibility of research. The phenomenon of predatory publishing is both widespread and often tacitly tolerated, fuelled by the formal pressure to publish, the absence of effective mechanisms for assessing research quality, and weaknesses in the academic culture with regard to publication ethics.

Researchers in the Republic of Moldova frequently resort to predatory journals and conferences, reflecting both a lack of institutional discernment and the insufficiency of regulations governing the validation of scientific performance. The presence of pseudo-scientific publications within projects funded from public resources highlights the need to reform evaluation criteria and funding policies.

Deceptive practices also extend to other areas related to research, such as the registration of patents lacking genuine technological value or the promotion of pseudo-scientific rankings, which distort perceptions of academic performance and may serve as tools for institutional manipulation.

In this context, combating predatory publishing and other forms of falsification of scientific performance must become a sustained and systemic concern for the research and education authorities in the Republic of Moldova, in order to safeguard the integrity of the system and foster a genuine academic culture.

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LIBRARIES AS SPACES FOR DIGITAL HYGIENE: THEIR ROLE IN SHAPING CRITICAL THINKING AND MEDIA LITERACY

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Abstract: The article looks at how libraries can help people learn to think critically and be more aware of what they see on the internet, as society becomes more digital. The study looks at how libraries are communicating with people online and identifies new ways to get the public more interested in media. The research uses a variety of methods. These include looking at academic literature to study the theoretical foundations of digital hygiene and media literacy. The research also includes analysing content to examine programmes, activities and resources implemented by libraries. The research uses sociological surveys to assess the perception of libraries as spaces of digital security. The research also uses comparative and case study methods to investigate successful international and Ukrainian experiences.

The results show that libraries are changing. They used to be places where people went to find books and other materials. Now, they are becoming places where people can talk to each other, learn, and work together on projects. They teach people how to use digital technology and help them to use information safely. The article suggests a way of classifying new models of library communication, including interactive-educational, partnership-network, club-discussion, digital-interactive, and creative-participatory models. The study highlights the practical significance of Ukrainian libraries' experience in implementing media education programs, organizing trainings and workshops, and building partnerships with civil society organizations. The conclusions emphasize that libraries play a key role in the development of citizens' information culture, contribute to countering disinformation, and support the formation of a conscious and responsible information user in the digital environment.

Keywords: library, digital hygiene, media literacy, critical thinking, digital security, information culture, communication, digital transformation, fact-checking, media education

JEL Classification: D83; I21; L86; Z18

1 Introduction

In the modern information society, media literacy is a key competence that ensures the ability to critically evaluate information flows, identify fakes, manipulation, and propaganda, as well as to consciously consume and create media content. In the context of hybrid threats, information oversaturation, and the rapid development of digital technologies, the need for skills in navigating the information space becomes particularly pressing.

Libraries, as traditional centers of knowledge and enlightenment, today play a new and extremely important role: they are becoming platforms for informal education in media literacy. The concept of the Library as a Laboratory of the Future (Library Futures Lab) reflects this evolution, emphasizing the role of libraries as platforms for experimentation, learning, and civic

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engagement (Horchynska, 2025). Through educational events, training sessions, and interactive activities for children, adolescents, youth, and older adults, libraries promote the development of critical thinking, fact-checking skills, the ability to recognize sources of disinformation, and resistance to informational pressure.

The purpose of this study is to analyze models of interaction between libraries and users in the context of digital socialization and the enhancement of media literacy among the population. The paper particularly focuses on practices related to organizing information security training, conducting media literacy lessons for schoolchildren and adolescents, and establishing partnership programs with non-governmental and educational institutions.

Special attention is devoted to libraries as institutions that ensure inclusive access to knowledge and contribute to the formation of responsible and informed information consumers, opening broad opportunities for reflection and analysis of modern library activities. Contemporary libraries are no longer limited to storing and lending books - they are transforming into centers of communication, learning, co-creation, and digital security.

A librarian today is not merely someone who “knows where each book is,” but an information navigator, a facilitator of learning processes, and a mentor of digital ethics (Novopskov, 2020). Libraries can do many different things to help people learn about information, culture and digital skills. These could include training for different age groups on how to understand media, and workshops where people can learn how to check if news stories are real, as well as clubs for critical reading of social media publications. These formats encourage people to think carefully about how they use information.

Libraries can also put on workshops on digital security. Visitors can learn how to protect their personal data and understand the idea of a “digital footprint”. Another good idea is to start fact-checking platforms in libraries together with local organisations. This would make the libraries more useful places for the community.

Object of the study: libraries as social and educational institutions in the context of digital transformation.

Subject of the study: functions and practices of libraries related to the formation of digital hygiene, critical thinking, and media literacy among users.

Research methods: analysis of scholarly literature - to study the theoretical foundations of digital hygiene, media literacy, and the role of libraries; content analysis - to examine programs, events, and resources offered by libraries; sociological surveys - to collect data on users' perceptions of libraries as spaces of digital security; comparative analysis - to study the experience of libraries in various countries in the field of digital education; and the case study method - for an in-depth examination of successful library practices.

2 Digital Hygiene and Media Literacy

Digital hygiene is not merely about careful handling of passwords or antivirus software. It represents a culture of responsible, conscious, and safe use of information resources - a subdomain that concerns the secure and healthy use of digital tools, though it does not encompass all aspects of content analysis.

Media literacy, on the other hand, is a broader concept, as it includes skills of orientation within the entire informational and media landscape (social networks, news, advertising, blogs, etc.). In other words, someone who knows about the media is likely to follow the rules of digital hygiene, but not everyone who follows the rules of digital ethics is necessarily someone who knows about the media.

Let's explain what digital hygiene and media literacy mean. Digital hygiene is all about using digital technologies safely, healthily and in a balanced way. It includes: “protection of personal data and passwords; cybersecurity (antivirus protection, system updates); control of time spent

online; avoidance of digital overload; maintenance of psychological and physical well-being in the digital environment” (10 Rules of Digital Hygiene, 2023).

Media literacy means being able to understand, analyse, check and create media content. It includes: “the ability to distinguish facts from fakes; competence in working with information sources; understanding of manipulation, propaganda, and advertising; development of critical thinking regarding media messages” (Melnychuk, 2023), (Fig. 1).

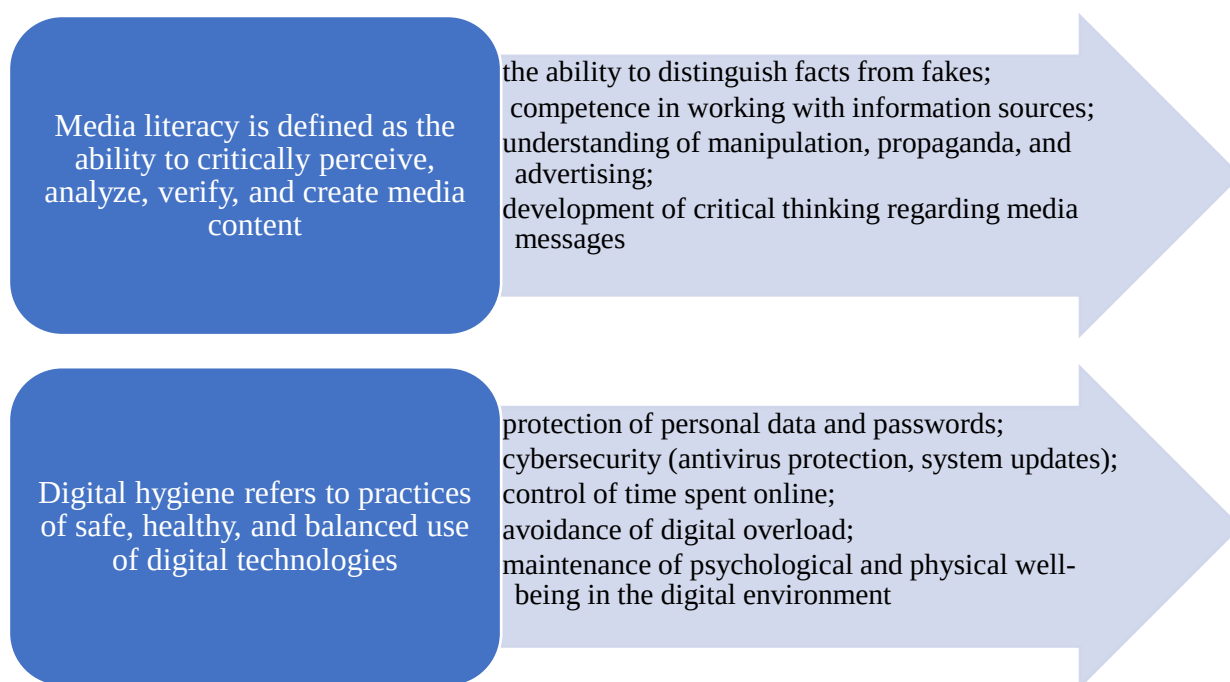


Figure 1. The conceptual content of Media Literacy and Digital Hygiene

Source: based on Demir *et al.* (Melnychuk, 2023)

Valentyna Horchynska gives a good example of how the library can be a laboratory of the future (Horchynska, 2025a). It is a joint project between the National Library of the Netherlands (de Koninklijke Bibliotheek) and researchers from the Faculty of Industrial Design at Delft University of Technology and the Faculty of Electrical Engineering, Mathematics and Computer Science (EEMCS). The plan is to help libraries think again about what it means to look after books and other materials.

The project includes the creation of modern areas within libraries, where visitors can experiment with new technologies, participate in creative projects and communities, and gain access to resources for self-development. The main goal is to promote innovation, collaboration, and lifelong learning.

Key areas of implementation include:

Makerspaces and FabLabs: equipped environments for creativity and prototyping, where visitors can work with 3D printers, laser cutters, and other tools;

Digital art and VR/AR exhibitions: interactive displays and projects that use virtual and augmented reality to engage audiences and present new forms of art;

Foresight discussions and workshops: events aimed at discussing future trends, technological changes, and their social implications;

Testing of digital solutions: piloting new technologies and services, such as artificial intelligence, the Internet of Things, and others, to assess their effectiveness and impact.

Ukrainian libraries are taking their first steps along this path - makerspaces, educational laboratories, and digital hubs are beginning to emerge. The further development of this model may become not only a response to the challenges of modernity but also the foundation for a new vision of the cultural, educational, and social mission of libraries in Ukraine.

Valentyna Horchynska cites a noteworthy fact: there are more than 5,000 digital education hubs operating in Ukraine, most of them based in libraries (Horchynska, 2025b, 2025c). The introduction of innovative formats - from makerspaces to digital archives - demonstrates the growing role of libraries as essential elements of the educational, cultural, and technological infrastructure.

When examining global, European, and Ukrainian strategies for fostering critical thinking and civic values in the digital society, Nadiia Khymytsia and Olha Morushko emphasize the priority of such approaches for institutions in the United States, Europe, and Ukraine (Khymytsia, 2025). They note that in the U.S., the focus is placed on digital literacy and the integration of digital citizenship into education; in Europe - on transparency and source verification; and in Ukraine - on the implementation of national strategies for media literacy and reading.

Let us trace the activities of Ukrainian libraries in the field of media literacy through practical examples. For instance, the Urban Library in Lviv regularly holds events on media literacy for young people, combining lectures, film screenings, and discussions. The project “Library. Media. Literacy” (which is being run together with IREX) includes classes for teenagers, where participants learn to analyse sources through games.

Libraries in Vinnytsia are also actively promoting media literacy to different groups of people. At the Vinnytsia Regional Universal Scientific Library named after Valentyn Otamanskyi, there was a training session called “Media Literacy: Recognizing Fakes and Manipulations” was held. Participants explored the concepts of fake news, propaganda, disinformation, and “paid journalism”, while learning to distinguish between true and false information.

To do this, they used interactive exercises from the Fit in Fakten project. These included the puzzle “If You Know It – You Notice It”, the game “Information Labyrinth”, and the tasks “Draw Your Sign” and “Foolish but Not in the Media”. These methods helped school students to understand how to spot false information and think for themselves (Vinnytsia Regional Universal Scientific Library, 2024a).

A separate example worth highlighting is the training session “Media Literacy” held as part of the Fit in Fakten project for senior citizens. Participants learnt both theory and practical ways of finding information, which helped them to find what they were looking for. During the sessions, they looked at the differences between facts and opinions, learned to spot manipulation and propaganda, and took part in interactive games and exercises. We looked especially at situations involving older adults most frequently encounter informational risks, making the training as applied and beneficial as possible (Vinnytsia Regional Universal Scientific Library, 2024b).

Also, people taking part in the training worked with modern tools to check information. They tested the Fake Calculator, interactive games on the NotaYenota and Filtr platforms, and familiarized themselves with digital tools such as BotChecker and FakeBoom Bot.

These practical sessions helped people to think more critically and spot manipulative content. This means that the people taking part gained useful experience that will help them deal with information better in the future and know how to spot false information in their everyday lives.

Overall, libraries are capable of engaging various age groups in the topic of digital hygiene: Children – through interactive fairy tales, games, and creative workshops on topics such as “How Not to Get Lost on the Internet”; Teenagers: they are active participants who create content themselves, such as blogs, podcasts and videos; Older adults: they can access individual consultations, group lessons and digital support clubs.

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Making such a change takes a lot of effort and comes with several challenges. The main issues include limited resources, insufficient digital competence among staff, and low public awareness of the opportunities and potential of libraries. These things can make it harder to modernise and reduce the success of new plans.

At the same time, there are lots of opportunities for development. Libraries can get grant funding, work with media organisations, schools and research centres, and set up educational platforms and digital hubs on their premises. These initiatives can enhance the role of libraries in the social and educational life of local communities.

3 The Library as a Space for Digital Awareness

A library today is not merely a “place of silence”, but a space of enlightenment amid the information storm. This is where a new type of literacy, information literacy, is being created. You can't be a fully-fledged citizen of the modern world without it. In a time where it's easy to mislead people, we need to make sure that libraries become places where people can learn to understand, analyse and think critically, as well as just how to read.

There arises a need to study new models of library communication with audiences under conditions of digital interaction and changing forms of socialization.

Table 7. Activities of Ukrainian Libraries in the Field of Media Literacy

Library Name	Forms of Media Literacy Activities	Acquired Skills
National Library of Ukraine for Children	Section “Information Culture of Users”; online publications and resources on media literacy	Orientation in information flow, critical thinking, protection against manipulation
Lviv Regional Library for Youth named after Roman Ivanychuk	Project “Fake or Fact?”; interactive fact-checking trainings; work with fake news in mass media and social networks; use of fact-checking tools (StopFake, MediaWise); analysis of visual content (photo and video manipulation); youth quizzes, QR quests, infographics	Ability to verify information accuracy; identification of fakes and manipulation; critical thinking in media consumption; fact-checking and visual analysis skills
Kherson Regional Library for Youth named after Borys Lavreniov	Educational course “Media Literacy – Protection of Consciousness” for school students (grades 8–11); discussions on types of manipulation; analysis of media texts and language influence; creation of critical content (posters, storytelling)	Development of critical thinking; analysis and evaluation of media texts; recognition of linguistic manipulation; creative application of media literacy principles
Scientific Library of the National University of Kyiv-Mohyla Academy	Information-educational project “Media Literacy Lab”; workshops on digital security; seminars on media manipulation detection; sessions on creating information campaigns; mini-courses for teachers and students; use of online tools (Google Workspace, Canva, fact-checking tests)	Digital literacy and security; creation of media content and communication campaigns; recognition of media manipulation; use of online fact-checking tools
Central City Library named after Lesya Ukrainka (Solomianskyi District, Kyiv)	MediaMind Club: discussions on blogger ethics and influencers; analysis of disinformation on TikTok and Instagram; workshops on visual literacy (images, memes); debates on the role of media and social networks in society	Conscious social media consumption; analysis of visual messages and media influence; ethical content creation; argumentation in public discussions
Public Library named after Lesya Ukrainka (Kyiv)	Project “Fit in Fakten”; media literacy corner with games, quizzes, materials	Learning through gamified methods; development of analytical thinking

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Youth Library (Oleksandriia)	Section “Media Guide for Everyone”; information materials about safe internet use	Recognition of fake information; safe internet practices
Khmelnitskyi City Centralized Library System	School of Media Literacy; training sessions and practical workshops	Recognition of propaganda and information noise; development of critical thinking
Mykolaiv Regional Children's Library	Participation in the Fit in Fakten project; use of games and quizzes	Awareness of disinformation risks; development of fact-checking skills
Poltava Regional Youth Library named after Oles Honchar	XR exhibition “The Real Causes of War” within the anti-propaganda marathon	Understanding propaganda mechanisms; ability to debunk fakes
Kherson Regional Library for Children named after Dniprova Chaika	Media lesson “Cyberbullying: Aggression on the Internet”	Awareness of online communication risks; safe interaction skills
Public Library of Voronovysia Settlement Council	Event “Media Literacy – The Key to Victory”; collaboration with the Diia.Osvita platform	Source verification, cyber hygiene, recognition of reliable information
Regional Universal Scientific Library named after Dmytro Chyzhevskiy (Kropyvnytskyi)	Campaign “How to Protect Personal Data?”; promotion of educational video series	Personal data protection; critical thinking; cyber hygiene awareness
Uzhhorod Public Library	Sessions with students on information security and manipulation	Recognition of manipulation; development of information culture
Sumy Public Library	Media literacy classes; project “Behind the Scenes of Reality” (AR technologies)	Fake identification; information analysis; use of AR in education
Vinnitsia Regional Universal Scientific Library named after Valentyn Otamanskyi	Course “Recognizing Fakes and Manipulations in the Media” for senior adults	Fact-checking; countering fakes; propaganda detection
Volyn Regional Library for Youth	Camp “Soft Skills School”; lectures and the game “The Country of Legends”	Information verification; understanding of propaganda mechanisms
Lviv Regional Children's Library	Project “The Fifth Element” for displaced children	Critical thinking; information literacy; psychological adaptation
Ternopil Regional Library for Youth	Interactive lesson “Fundamentals of Media Literacy”; Fit in Fakten educational games	Critical information perception; resistance to manipulation
Academy of Ukrainian Press (Library of Mass Communication and Media Literacy)	Publication of manuals for librarians on media literacy	Teaching methodologies; interactive educational approaches

Source: own work

The table 1 summarizes the experience of Ukrainian public libraries in implementing media education initiatives. It presents examples of various formats of work – from creating dedicated online sections to organizing interactive classes, trainings, and nationwide projects.

Libraries employ a variety of activity formats:

Informational and educational (sections, publications, campaigns, exhibitions);

Training-based (courses, schools, workshops);

Interactive and gamified (board, online, and AR games);

Partnership projects with international organizations (Fit in Fakten, Behind the Scenes of Reality, UNICEF, Goethe-Institut, IREX).

The main aim of all these projects is to help different groups of people, like children, teenagers, students and older people, to understand information and media better. This means that

digital technologies have made it possible for new ways for people to interact with information to emerge. These new ways focus on more than just the transmission of information. They also focus on people working together and on developing critical thinking.

In today's digital age, libraries are changing. They are moving away from just storing books and becoming places where people can connect, learn, and work together.

Let's look at these new ways that libraries are talking to their users in the digital age and how social life is changing (Fig. 2).

1. Interactive-Educational Model

- Essence: The library acts not only as an intermediary of information but as a trainer in media and digital literacy.
- Forms: Trainings, online courses, quizzes, quests, workshops.
- Purpose: To form an active, critically thinking user.

2. Partnership-Network Model

- Essence: The library functions as a communication hub that unites educational, cultural, and media communities.
- Forms: Joint projects with universities, journalists, and non-governmental organizations; content exchange and collaborations.
- Purpose: To create an open knowledge ecosystem.

3. Club-Discussion Model

- Essence: A transition from lecture-based to dialogical communication; the library becomes a platform for discussing social and media-related topics.
- Forms: Media literacy clubs, debates, discussions on blogger ethics, analytical meetings.
- Purpose: Development of critical thinking, communication culture, and media ethics.

4. Digital-Interactive Model (Online Communication)

- Essence: Interaction with users in the digital environment—social networks, online platforms, multimedia services.
- Forms: Live streams, virtual exhibitions, online consultations, interactive resources.
- Purpose: Expansion of the audience, personalization of information services, and flexible learning formats.

5. Creative-Participatory Model

- Essence: The user not only consumes information but also becomes its co-creator together with the library.
- Forms: Creation of user-generated content (posters, storytelling, podcasts), media projects, cultural flash mobs.
- Purpose: Development of creative initiative and co-creation of content as a form of modern literacy.

Figure 2. Models of Library Communication within the context of digital interaction and evolving forms of socialization

Source: own work

4 Conclusions

The modern library is becoming a space where people can communicate through different types of media. It is a place where people can find information, learn and enjoy different types of culture. The new ways of communicating online, such as interactive, educational partnerships, club-style discussions, digital interactions and creative participation, show a clear move away from the old way of sharing information, where information was sent from one person to many, to a new way of sharing information where people are working together to create meaning in digital culture.

Libraries are changing what they do. They used to be places where people went to find books and other materials. Now, they are places where people can learn for their whole lives. They also help people learn to use computers and the Internet. Libraries are very important in helping people to think in a critical way, understand the media, and stay safe online. These are all very important skills for living in a modern society where we have so much information at our fingertips.

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MODERN LIBRARIES AS KNOWLEDGE INFRASTRUCTURE IN THE DIGITAL ECONOMY: NEW FUNCTIONS IN THE CONTEXT OF SMART SPECIALISATION AND REGIONAL DEVELOPMENT

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Abstract: In the context of accelerated digitalization and the transition to a knowledge-based economy, modern libraries are undergoing a profound transformation of their institutional roles and functions. From traditional book repositories, they are evolving into multifunctional centers of digital inclusion, lifelong learning, and local innovation support. This transformation is particularly relevant within the framework of Smart Specialization Strategies (S3), which aims to leverage regional potential through Entrepreneurial Discovery Processes (EDP) and targeted innovation. The paper explores the role of public libraries in the Republic of Moldova as essential components of regional innovation ecosystems, especially in small towns and rural areas where access to technology and education is limited. Using qualitative analysis and European policy frameworks (RIS3, DESI, DigComp 2.0), the authors identify how libraries act as strategic nodes providing access to open data, training resources, collaborative spaces, and digital services. In facing challenges such as digital divides, institutional underfunding, and competition from commercial digital platforms, libraries are adapting by developing new functions aligned with regional development agendas. These include supporting S3/RIS3 strategies, participating in national innovation programs, promoting digital inclusion, and facilitating grassroots entrepreneurship. The paper concludes with recommendations for integrating libraries into national and regional strategies for sustainable development and digital transformation.

Keywords: smart specialization, public libraries, digital inclusion, regional development, ecosystem innovations, knowledge economy, digital transformation, RIS3, open data, entrepreneurship.

JEL Classification: O38, R58, I28, L86, O15

Introduction

With rapid technological progress and the digitalization of the economy, the importance of knowledge as a key productive resource is growing. Contemporary challenges such as regional differentiation, the digital divide, and declining social cohesion have heightened the need for resilient institutions capable of serving as development infrastructure in the digital economy. Libraries—traditionally perceived as information repositories and cultural spaces—have begun to transform in recent decades into active hubs of digital interaction, education, innovation, and inclusion. Their potential as hubs in regional innovation ecosystems is increasingly recognized in the context of Smart Specialization Strategies (S3), developed by the European Union to stimulate growth based on identified regional advantages.

In the Republic of Moldova, where a significant portion of the population lives in rural and small urban areas, libraries are becoming virtually the only institutions providing access to digital services, educational resources, and collaboration platforms. However, libraries remain on the

fringes of strategic planning for innovation and digitalization. A lack of sustainable funding, institutional recognition, and strategic partnerships hinders their ability to realize their full potential in the knowledge economy.

This article aims to rethink the role of libraries in the context of digital transformation and smart specialization. The study aims to analyze how libraries can be integrated into regional and national sustainable development strategies, what functions they already perform as knowledge infrastructure, and what institutional changes are needed to enhance their contribution to digital transformation. The study draws on European policy frameworks (RIS3, DESI, DigComp 2.0), as well as empirical examples and approaches presented in the current academic literature.

1. Theoretical and methodological foundations: libraries in the digital economy and smart specialization strategies

The transition to a digital economy is accompanied by profound structural changes that affect not only the production and technology sectors, but also cultural, educational, and institutional spheres. One of the key concepts in this context is the knowledge economy, where information, skills, and innovation become the primary drivers of growth. Under these conditions, the understanding of development infrastructure is also changing: the emphasis is shifting from traditional industrial and logistical infrastructure to intellectual and digital ones. It is in this context that libraries, as institutions with a high degree of public trust, are acquiring new strategic significance as components of the "soft" knowledge infrastructure and inclusive digitalization. The concept of "knowledge infrastructure" implies a set of institutions, platforms, and processes that ensure the creation, accumulation, dissemination, and practical application of knowledge. According to (Houghton and Sheehan, 2006), the most important challenge of the knowledge economy is not so much the accumulation of information as its integration into socio-economic practice, which requires accessible channels for knowledge transfer and adaptation. Modern libraries, especially in resource-limited regions, serve precisely this function, reducing barriers to digital and educational resources.

When considering libraries as an element of innovation infrastructure, it is necessary to consider the European policy context. According to the RIS3 Strategic Directions Guide (Foray et al., 2012), effective regional innovation policy requires an ecosystem that includes not only businesses and universities but also so-called intermediary institutions capable of facilitating horizontal links between actors. Public libraries, as open and geographically distributed institutions, are uniquely positioned to act as such intermediaries, particularly in environments with low levels of digital maturity.

Modern libraries provide access to data, digital services, educational platforms, and spaces for communication and sociocultural interaction. This is especially relevant in regions lacking technology parks, innovation hubs, or universities. As shown by (Buyannemekh, Gasco-Hernandez and Gil-Garcia, 2024) argues that libraries can "develop citizens who, as smart citizens, possess the digital skills, autonomy, and creativity to actively participate in the development of smart cities." This demonstrates that libraries play a role not only in digital inclusion but also as platforms for developing citizens who actively participate in the process of digital and educational transformation and the entrepreneurial discovery process (EDP), which underlies the S3 concept.

Furthermore, in line with the DigComp 2.0 framework (Vuorikari et al., 2016), libraries actively promote the development of digital competencies, particularly among socially vulnerable groups: the elderly, the unemployed, and youth from rural areas. Libraries are becoming local access points for the skills of the future - from basic digital literacy to cybersecurity, information retrieval, and data analysis- as well as spaces for discussion, engagement, and co-design of smart initiatives, as well as innovation spaces where users interact, experiment, and create new solutions (Buyannemekh et al., 2024). Such competencies are necessary not only for participation in the digital society but also for adapting to new forms of employment, education, and entrepreneurship.

This underscores the need to rethink the role of libraries in the context of smart specialization and open innovation strategies aimed at inclusive and sustainable growth.

However, despite growing interest in library transformation, they are still rarely considered as strategic partners in regional innovation strategies. As highlighted in the report of the European Network of Living Labs (ENoLL, 2020), the sustainability of civic innovation is often threatened by a lack of institutional, political, and financial support from governments, particularly with regard to intermediary organizations, which may include libraries (ENoLL, 2020, p. 88). Thus, there is a need for a theoretical and methodological rethinking of the role of libraries: from supporting reading and access to information to active participation in the digital transformation of regions and the formation of a knowledge economy. Such a rethinking should take into account both the macro level (EU policies and national digitalization strategies) and the meso - and micro-levels – local communities, partnerships with municipalities, universities, technology centers, and businesses. Libraries, especially in contexts with limited institutional options, can act as catalysts for inclusive and sustainable growth, drawing on their unique social capital and citizen trust. Below, we examine how these library functions can be transformed through smart specialization (S3) and entrepreneurial open discovery (EDP) strategies.

2. Libraries in the Republic of Moldova: Potential, Barriers and Institutional Context of Digital Transformation

In the Republic of Moldova, public libraries traditionally serve as cultural and educational centers, particularly in small towns and rural areas. Given weak regional infrastructure and limited access to quality educational resources and digital services, libraries are often the only institutions providing information and digital mediation between the state and the public. However, from a public policy and strategic planning perspective, their potential as knowledge and innovation infrastructure remains underestimated.

As of 2024, Moldova had over 1,200 public libraries, the vast majority of which are located in rural areas, and 1,318 academic libraries (university, school, vocational schools, etc.). Although digitalization and staff training projects have been implemented in a number of libraries in recent years with the support of international donors (USAID, IREX, EIFL, etc.), the level of technical equipment, the sustainability of digital services, and the institutional integration of libraries into regional strategies remain extremely uneven. This confirms the European Commission's observation of the high degree of digital inequality in the Eastern Partnership countries, particularly in the context of DESI (A. Babin, T. Colesnicova, S. Tutunaru, 2023), where Moldova performs poorly in terms of digital infrastructure and skills.

Libraries in Moldova are increasingly becoming venues for the provision of basic digital services: internet access, assistance with electronic document processing, use of digital educational platforms, and training. However, a lack of systematic funding limits opportunities for equipment modernization, software updates, and staff professional development. Many libraries still use outdated technology, significantly reducing the quality of services provided.

Another significant problem is the institutional positioning of libraries. They remain part of the Ministry of Culture's system and are generally not included in economic and innovative development strategies developed by other ministries (Economy, Education, and Information Society). This leads to fragmentation of efforts, a lack of coordination between different levels of government, and a loss of libraries' potential as entry points into the digital economy. As ENoLL (2020) notes, libraries can be effective links in open innovation ecosystems, but this requires institutional recognition of their role in development processes, particularly within the framework of the smart specialization strategy (S3).

It's worth noting that the Innovate Moldova and Smart Moldova 2030 programs do not consider libraries as direct beneficiaries, despite their potential role in disseminating innovation and supporting local small businesses. This is particularly paradoxical, given that libraries possess a

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well-developed network, human resources, and the trust of local communities—qualities not always found in innovation centers or business incubators.

At the same time, examples of successful library initiatives aligned with European approaches to digital inclusion and sustainable development are accumulating at the micro level. For example, some libraries have become digital literacy platforms for senior citizens, young people, and the unemployed. In a number of localities, libraries have initiated projects to teach basic entrepreneurial skills, work with government digital services, and use open data for local research. These practices align with the goals of the DigComp 2.0 strategy, which advocates the development of digital competencies for all citizens, regardless of age, education level, or place of residence (Vuorikari et al., 2016).

Despite this, most such initiatives remain isolated and dependent on external funding. The lack of mechanisms for institutionalizing successful practices and scaling innovative solutions is a serious barrier. Furthermore, libraries face staffing challenges: low salaries and limited opportunities for professional development lead to persistent staff turnover, and young professionals are reluctant to prioritize library careers. This hinders the development of sustainable capacity to implement complex digital and educational programs.

Particularly noteworthy is the insufficient involvement of libraries in entrepreneurial open discovery processes (EDP), which underpin the S3 strategy. As emphasized in the European Commission's RIS3 guidance (Foray et al., 2012), local knowledge and the participation of a wide range of stakeholders are key to successful specialization. Libraries could act as platforms for horizontal connections between citizens, small businesses, government agencies, and educational institutions. However, in practice, this potential remains unrealized due to the lack of appropriate mechanisms, including regulatory and financial ones.

Thus, the situation in Moldova demonstrates a sharp contradiction: on the one hand, libraries possess unique potential as actors in digital transformation, while on the other, they are institutionally and resource-marginalized. Overcoming this gap requires a rethinking of digital transformation policies, decentralization of innovation, and recognition of libraries as infrastructure capable of ensuring inclusive, territorially balanced development. Below is a table with more precise data for the regions of the Republic of Moldova for 2023, based on official statistics on public libraries:

Table 1: Statistics on public libraries

Region	Number of libraries	Number of books and magazines (thousand copies)	Number of books and magazines per 100 residents	Comments
Chisinau	38	5,950	138	Leader in the number of libraries and collections
Center	250	1,200	185	High availability of books per capita
North	330	1 100	160	Sustainable Rural Library Network
South	310	800	90	Lagging behind in terms of provision and number of funds
Gagauzia	60	200	95	Low book stock and funding
Transnistria	20	50	30	Minimum number of libraries and collections

Source: National Bureau of Statistics

Brief analysis: Chisinau is the most developed region across all key public library indicators. The center and north have a wide library network with adequate resources. The south, Gagauzia,

and Transnistria require significant attention and support, particularly in terms of collections and infrastructure.

3. New Functions of Libraries in the Digital Economy: A Model for Integration into Regional Innovation Ecosystems

The transformation of libraries in the context of the digital economy and the smart specialization strategy presupposes a shift from the traditional model of user service to active participation in building inclusive, sustainable, and innovation-driven communities. This involves not only the introduction of new digital technologies but also a shift in the library's mission—from a passive information intermediary to an active participant in socioeconomic transformation at the regional level.

In the context of digital transformation, libraries are taking on new functions that extend beyond the traditional framework of education and cultural leisure. According to the analysis by (Ballart and de-la-Fuente-Valentín, 2022), libraries in smart cities are becoming platforms that foster innovation, social inclusion, and civic participation. This approach can be extended to small towns and rural areas, where libraries play an even more significant role as hubs for access to digital infrastructure and services. In a region lacking universities, business incubators, or technology parks, a library can become the sole hub of the digital and educational ecosystem.

New library functions can be roughly grouped into four interrelated areas:

1. *Digital inclusion and literacy*: libraries are becoming key access points to the internet, digital government and banking services, and online learning platforms. Through training and individual support, librarians help citizens master basic and advanced digital skills in accordance with the DigComp 2.0 framework (Vuorikari et al., 2016). Particular attention is paid to vulnerable groups - the elderly, the unemployed, and youth from rural areas.

2. *Support for non-formal and continuous education*: libraries provide access to online educational resources, MOOC platforms, and conduct educational events in partnership with local schools and NGOs. They act as a bridge between the formal education system and the labor market, helping citizens adapt to the changing demands of the digital economy.

3. *Civic engagement and local development*: libraries can act as "living labs" where territorial development issues are discussed, local initiatives are implemented, and collaborative planning takes place. This is consistent with the concept of entrepreneurial open discovery (EDP), within which libraries can moderate interactions between government agencies, citizens, entrepreneurs, and NGOs (Foray et al., 2012; ENoLL, 2020).

4. *Support for entrepreneurship and innovation*: libraries can provide budding entrepreneurs with access to market information, legal and administrative procedures, open data platforms, and online services. Some libraries in EU countries are already implementing "local business incubation" or micro-consulting programs for local SMEs, particularly in rural areas (Camarero et al., 2021).

Integrating libraries into regional innovation ecosystems requires the development of a new model of institutional collaboration. This model should be based on the principles of cross-sector partnership and political support, entailing library participation in regional strategic processes - from setting S3 priorities to assessing program impact. As part of the Smart Specialization strategy, libraries can perform analytical and communications functions: accumulating local knowledge, garnering community feedback, and helping identify promising niches and areas for regional development. Implementing this approach requires:

- Institutional recognition of libraries as elements of innovative infrastructure in regulatory documents and strategic plans for regional development;

- Systematic financing of digital transformation projects for libraries, including equipment modernization, personnel development, and the creation of digital services;

- Formation of partnerships with universities, technology parks, local authorities, NGOs and SMEs;

- Development of metrics for assessing the impact of library activities within the framework of regional strategies: digital literacy, entrepreneurial activity, involvement in decision-making.

It's significant that libraries in a number of EU countries are already implementing such functions. In Estonia, Latvia, and Finland, libraries are integrated into regional innovation platforms, serving as hackathon organizers, open data coordinators, and participants in digital territorial mapping. The table below shows how libraries in the Baltic countries are integrated into the innovation ecosystem.

Table 2. Integration of Estonian Libraries into the National Innovation System

Direction	Concrete actions and projects	Results and significance
1. Digital infrastructure and services	• Implementation of a unified MIRKO platform and URRAM database • Integration with the national electronic ID system • Online access and delivery of books throughout the country	• Equal access to resources is ensured regardless of place of residence • Improved convenience and efficiency of library services
2. Supporting research and open science	• Training of researchers in data management through DataCite Estonia • Participation in international open science projects	• Estonia's scientific reputation has been enhanced • Conditions for transparent and reproducible science have been created
3. Continuous learning and digital literacy	• Libraries as knowledge centers and access points to scientific and professional information • Programs for the development of digital skills and information literacy	• Support for education at all levels • Increasing digital inclusion and citizens' readiness for the digital economy

Source: developed by the authors based on analysis of materials.

These examples can be adapted to the Moldovan context, provided they receive appropriate support from state and municipal authorities. Therefore, redefining the role of libraries in the digital economy requires going beyond cultural policy and integrating libraries into a comprehensive system of regional development. This is only possible with political will, cross-sector dialogue, and institutional mechanisms that enable libraries to act as active, rather than auxiliary, elements of digital transformation.

Conclusion and recommendations

The digital transformation of society and the economy requires a rethinking of the role of traditional institutions such as libraries. As this study demonstrates, in the context of the transition to a knowledge economy, libraries can and should play the role of infrastructural hubs for innovation ecosystems, particularly in regions with low levels of digitalization and limited access to educational and technological resources. Their institutional capital, social trust, geographical distribution, and focus on public needs create unique preconditions for fulfilling new functions—from digital inclusion to supporting entrepreneurship and implementing the Smart Specialization Strategy (S3).

The Republic of Moldova's example reveals both the library system's significant potential and the systemic barriers limiting its realization: policy fragmentation, institutional marginalization, a lack of sustainable funding, and a shortage of digital skills among staff.

Furthermore, libraries already de facto perform numerous strategic functions, but without adequate institutional recognition and support.

An analysis of European practices and recommendations of the European Commission (Foray et al., 2012; Vuorikari et al., 2016; ENoLL, 2020) allows us to identify key recommendations for the formation of an effective model for integrating libraries into regional strategies for digital and innovative development:

1. Institutionalization of the role of libraries as part of the regional innovation infrastructure through inclusion in strategic documents (S3, RIS3, Smart Moldova 2030, etc.) with clearly defined functions, KPIs and impact assessment mechanisms.

2. Financial sustainability: development of long-term financing programs for the digital transformation of libraries, including equipment modernization, creation of digital services, and support for human resources.

3. Cross-sector partnerships: creating sustainable collaboration platforms between libraries, universities, NGOs, local authorities and businesses, including library participation in entrepreneurial open discovery processes (EDP) within S3.

4. Competency development: systematic improvement of library staff qualifications in the field of digital technologies, project management, inclusion, and entrepreneurial literacy.

5. Monitoring and evaluation: implementation of systems for collecting data and monitoring the effectiveness of new library functions (digital literacy, public engagement, level of service use, entrepreneurial activity, etc.).

6. Transfer of successful practices: adaptation of digital library models and innovation hubs implemented in the EU (Finland, the Netherlands, Estonia) to Moldovan conditions through pilot projects and regional competence centers.

In the context of growing polarization of regional development and the threat of digital inequality, libraries can become not just social institutions, but key platforms for territorial coordination, sustainability, and inclusive growth. This requires policymakers, researchers, and libraries themselves to be prepared for transformation, open to innovation, and strategic thinking. Only then will libraries realize their full potential as knowledge infrastructure in the economy of the future.

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DIGITAL INFRASTRUCTURE AND INTERNATIONAL VISIBILITY OF MOLDOVAN SCIENTIFIC JOURNALS

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Abstract: This study evaluates the online accessibility and international visibility of scientific journals from the Republic of Moldova by analyzing the technical and functional features of their websites. In an era where a journal's digital presence is fundamental to its reach and impact, many smaller academic communities risk marginalization. Applying a structured evaluation framework, this research assesses key website characteristics – Including domain architecture, publishing platforms, metadata implementation, and archive currency – against international best practices. The findings reveal a concerted effort towards internationalization, evidenced by the presence of an English-language version on 80% of the sites. However, this intent is counteracted by significant technical deficiencies. A reliance on subdomains or pages within institutional websites limits autonomy and professional perception, while the low adoption of specialized platforms like Open Journal Systems (OJS) hinders efficient editorial management and metadata standardization. Critically, fewer than half of the journals provide individual, persistent URLs and comprehensive metadata for their articles, severely compromising discoverability by major databases and search engines. Furthermore, over one-third of journals exhibit irregularly updated archives, posing a direct threat to their credibility and indexing eligibility. The study concludes that strategic modernization of the technical and editorial infrastructure is urgently required for Moldovan journals to enhance their global visibility, establish credibility, and increase their scientific impact. The findings offer a model for similar small research ecosystems aiming to navigate the complexities of digital scholarly communication and achieve greater integration into the global academic conversation.

Keywords: Moldovan scientific journals, journal website, journal visibility, journal accessibility, website technical features

JEL Classification: I23, D83, O33

1 Introduction

In the contemporary landscape of scholarly communication, a high-quality scientific journal is inseparably linked to a robust and functional website. This digital presence has evolved from a simple informational tool into the primary platform for the dissemination, discovery, and validation of research (Björk, 2007; Ware and Mabe, 2015). The role of a journal's website is therefore critical in enhancing both national and international visibility, serving as the central gateway to its content and a fundamental prerequisite for indexing and academic recognition.

A well-structured and technically optimized website is paramount for increasing a journal's discoverability. It ensures rapid, permanent, and barrier-free access to published research, which is essential for global readership. Furthermore, integration with major academic search engines like Google Scholar, OpenAIRE, and BASE – often facilitated by protocols like OAI-PMH (Open Archives Initiative Protocol for Metadata Harvesting) – significantly amplifies a journal's reach by enabling the automatic aggregation of its content (Van de Sompel *et al.*, 2004; Visser and Weideman, 2011). To be effective, this technical infrastructure must align with international standards. The consistent implementation of persistent identifiers (DOI), standardized metadata schemas (Dublin Core, JATS XML), and clear open access policies is no longer optional but a mandatory condition for inclusion in prestigious international databases such as Scopus, Web of Science (WoS), and the Directory of Open Access Journals (DOAJ) (OASPA *et al.*, 2018; Prancute, 2021).

Beyond technical specifications, the credibility and appeal of a journal are heavily influenced by its digital presentation. A modern, visually cohesive website that embodies strong branding and offers a positive user experience inspires trust among potential authors and readers (Fogg, 2003). This credibility is further reinforced by the transparent publication of editorial policies, peer-review procedures, and ethical guidelines, which are hallmarks of reputable journals (OASPA *et al.*, 2018). Collectively, these elements work to foster international collaboration by attracting a diverse cohort of authors, reviewers, and readers. When combined with the provision of open access content, particularly with English-language metadata, a journal significantly increases its potential for global citation and impact (Piwowar *et al.*, 2018).

Despite the established importance of these digital criteria, their systematic implementation and effectiveness can vary significantly, particularly in smaller or developing research ecosystems. This study therefore aims to evaluate the accessibility and international visibility of scientific journals from the Republic of Moldova by conducting a systematic analysis of the technical, functional, and informational characteristics of their websites. The findings will provide a critical assessment of their readiness to compete in the global scholarly arena.

Objectives of the Study:

To identify the platforms and technical solutions used to host Moldovan journals.

To evaluate the technical and functional features of Moldovan journals' websites.

To assess the level of international visibility of Moldovan journals.

To develop recommendations for enhancing web infrastructure and increasing the international impact of Moldovan journals.

2 Background

The scholarly publishing landscape of the past two decades has been fundamentally reshaped by rapid technological innovation, an exponential growth in scientific output, and escalating concerns regarding research integrity (Gasparyan *et al.*, 2016). In this competitive environment, inclusion in prestigious international databases – such as WoS, Scopus, and DOAJ – has become a critical marker of a journal's legitimacy and reach. This inclusion is contingent upon strict adherence to established criteria encompassing scientific quality, publishing ethics, and technical standards (Turcan, 2025).

Editorially, databases mandate the publication of original and relevant research, a transparent and rigorous peer-review process, a consistent publication schedule, and demonstrable geographic diversity among editorial boards and authorship (Prancute, 2021). Furthermore, compliance with ethical frameworks, such as the guidelines established by the Committee on Publication Ethics (COPE), is now a foundational requirement (OASPA *et al.*, 2018).

Parallel to these editorial policies, the adoption of robust technical infrastructure is non-negotiable for discoverability and long-term preservation. The implementation of persistent digital identifiers – such as the International Standard Serial Number (ISSN) for the journal, Digital

Object Identifiers (DOIs) for individual articles, and ORCID iDs for author disambiguation – forms the core of a modern journal's identity and interoperability system (Cujba, 2019). These are complemented by the need for secure digital archiving solutions (e.g., CLOCKSS, LOCKSS) to ensure the permanent accessibility of content, a key factor in maintaining the scholarly record (Rieger, 2008).

Underpinning this technical ecosystem are metadata standards that ensure consistency and machine-actionability. Crossref, as a central DOI registration agency, facilitates unique identification, reciprocal citation linking, and the exchange of standardized metadata. This metadata often aligns with schemas like Dublin Core, which promotes interoperability across diverse platforms and indexing services (Jackson *et al.*, 2008; Maron, 2018). The seamless integration of these editorial and technical best practices is, therefore, essential for ensuring a journal's quality, visibility, and long-term academic impact, enabling it to compete internationally and attract high-quality submissions from a global research community.

3 Methodology of Research

The analysis of journal websites was conducted between February and March 2025 and updated in July-August 2025, based on publicly available information from the official journal pages. The primary source for the list of scientific journals was the Register of Scientific Journals approved by the National Agency for Quality Assurance in Education and Research (ANACEC). Journal URLs were identified both through the National Bibliometric Instrument (<https://ibn.idsi.md/>) – and through direct online searches.

3.1 Sample Analyzed

This study focused exclusively on journals evaluated by ANACEC, which at the time of the research held one of the following categories: A+, A, B+, B, or C, according to ANACEC's classification.

The sample of journals analyzed was drawn from the National Register of Scientific Journals approved by ANACEC on February 23, 2024. According to this register, 56 journals held categories A, B+, B, or C. A new version of the National Register was approved on July 4, 2025, containing 51 journals in categories A+, A, B+, and C. Compared with the previous version, six journals were removed, and one journal was added. The union of these two lists resulted in 57 journals. Of these 57 journals, two no longer had active websites at the time of evaluation (*Moldovan Medical Journal*; *Buletinul AȘM. Științele vieții*). Consequently, the analysis was based on 55 active journal websites.

3.2 Analysis Criteria

The analysis was carried out by identifying criteria related to both technical infrastructure and the factors that enhance and maintain the visibility and accessibility of Moldovan scientific journals:

- Web domain
- Web site Platform / CMS used
- Separate pages for articles
- Timelines of issues
- English version of the website
- Presence of DOIs for articles
- Presence of ORCID identifier for authors
- Indexing policy

4 Results and Discussions

4.1 Web Domain and its Strategic Importance

The web domain is important for a scientific journal not only from a technical perspective but also from editorial and strategic standpoints, due to its impact on international visibility. First, it supports the journal's academic identity and brand: having a dedicated domain (e.g., journal.md)

conveys professionalism and institutional stability. Second, search engines and major databases (WoS, Scopus, DOAJ) recognize and manage publications with clear, easily identifiable domains more consistently. Third, a professional URL is perceived as significantly more credible than a subpage hosted within the founder's website structure. Finally, owning the domain provides direct control over the journal's information architecture, content, and archives, facilitating maintenance and migration without loss of visibility.

Types of Domains and Their Impact

There are several ways for a scientific journal to establish its online presence, and the choice of domain type directly impacts the publication's visibility, credibility, and long-term stability.

The most recommended solution is to use a dedicated second-level domain, such as journal.md. This option offers independence and full control over the website, facilitates promotion and address memorability, enhances trust in the journal, and is better regarded by international indexing databases. Additionally, migrating the platform to another server or content management system can usually be done without losing links or indexing. In international practice, established journals typically own their own domains – this is considered the standard reference model.

An intermediate option is to use a third-level domain, such as a dedicated subdomain like journal.founder.md. This approach is particularly appealing due to its low cost – often provided by universities or other founding institutions – and can ensure continuity as long as the institution's main domain remains stable. However, branding suffers because the journal's name is not clearly distinguished, and changes in the institutional website structure can result in broken links. Furthermore, complete dependence on the institution's domain implies a lack of autonomy and diminishes the journal's appeal to indexing services.

The least effective option is creating a simple, dedicated page on the founder's website, such as founder.md/journal. While this approach incurs no additional cost and may serve as a temporary solution in the early stages, it has significant drawbacks. Indexing is challenging because search engines typically assign lower visibility to internal pages. Additionally, control over the page's structure and design is limited, and any changes to the institution's site organization can result in broken links. Furthermore, this setup conveys a lack of professionalism and greatly diminishes the likelihood that the journal will be perceived as an independent and credible publication.

The analysis of Moldovan journals websites reveals that out of 55 journals, 36 (approximately 66%) use subdomains (e.g., journal.founder.md); 15 (27%) have internal pages on the founder's website (e.g., founder.md/journal); and only 4 (7.3%) have their own domains (e.g., journal.md). This distribution indicates limited web autonomy and weak branding for the majority of publications (see Figure 1).

Thus, most of the scientific journals examined are hosted online via third-level domains, whereas dedicated websites with their own second-level domains are rare, constituting only a small fraction of the total – even among journals in higher categories. The high prevalence of journals using subdomains or simple pages on the founder's website underscores their limited web visibility and autonomy.

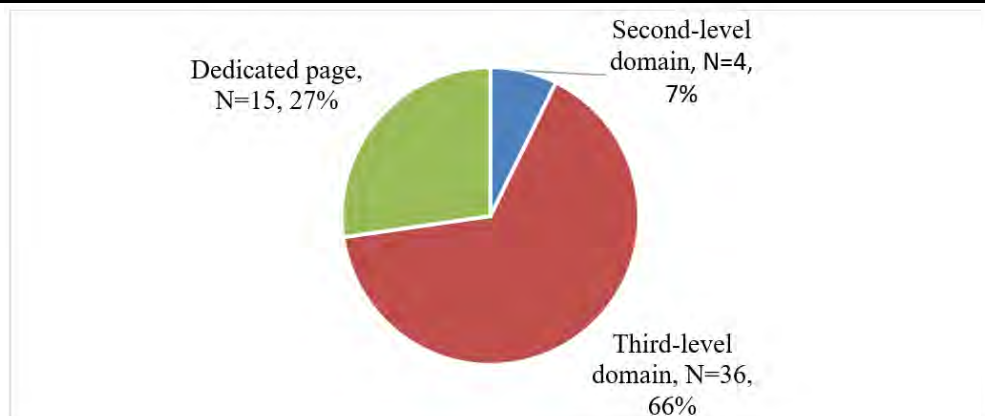


Figure 1. Domains of Moldovan Journals' web sites

Source: authors own study

4.2 Website Platform / Content Management System (CMS)

Examining the web platforms on which scientific journal websites are built – such as Joomla, Drupal, WordPress, and Open Journal Systems (OJS) – is important for several reasons related to both publication quality and the journal's visibility and security. Depending on the platform, editorial functionality and publishing workflows can vary significantly. For example, a platform like OJS includes dedicated modules for managing the entire process – from article submission and peer review to editing, publishing, and indexing. In contrast, general-purpose CMS like Joomla, Drupal, and WordPress may require additional extensions to support academic functionalities. Therefore, using a platform optimized for journals reduces editorial workload and minimizes the risk of human error.

The analysis of platforms shows that 26 journals – nearly half – are hosted on the WordPress CMS. One-fifth (20%), or 11 journals, use the OJS platform. Another six journals (11%) are hosted on the Drupal CMS. One journal is hosted on Joomla, while the remaining 11 journals (20%) operate on custom-built platforms. Notably, most of these custom platforms represent institutional websites, with only one or a few pages dedicated to the journal itself (see Figure 2).

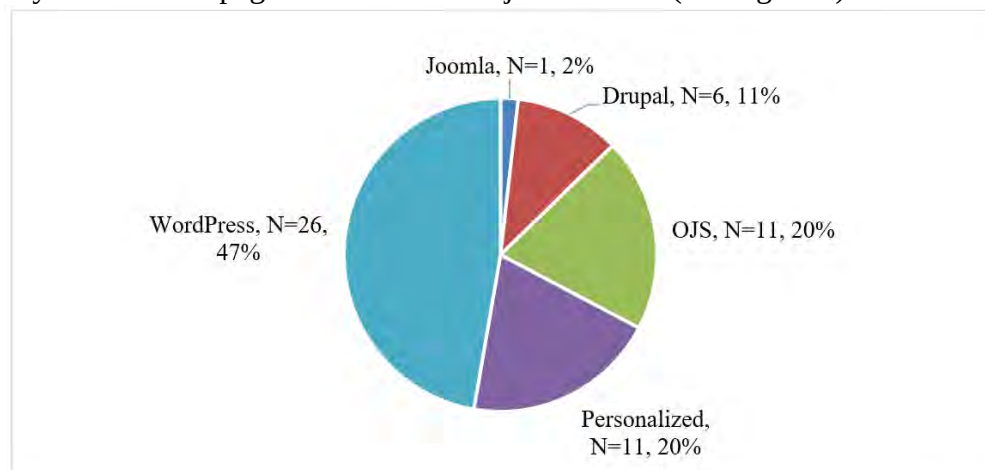


Figure 2. Platform / CMS that host Moldovan Journals

Source: authors own study

Although WordPress is the most widely used platform, it is not specifically designed to manage academic editorial processes, which may limit its functionality and integration with international indexing standards. The relatively low proportion of journals using the OJS platform – specifically dedicated to scientific publishing – indicates untapped potential for optimizing editorial workflows and enhancing international visibility. Additionally, relying on institutional

websites with limited pages for the journal can negatively impact both accessibility and the publication's unique identity.

4.3 Separate Pages for Articles

Creating separate pages for each article remains an essential practice in contemporary academic publishing.

First, individual article pages are essential for international visibility and indexing. Academic databases require each article to have a unique and stable URL (permalink). If articles are available only as PDFs within a general list, automatic indexing becomes significantly more difficult – or even impossible.

Second, a dedicated page allows for the presentation of the article's metadata, enhancing accessibility and optimizing it for search engines that index academic content. Another important aspect is that a separate page facilitates DOI integration, with each article obtaining a permalink, such as <https://doi.org/...>, ensuring stable links for citation and bibliographic referencing.

Equally important is adherence to good editorial practices – having a separate page for each article is considered a minimum international standard in academic publishing. Modern editorial management platforms, such as OJS, are designed so that every article automatically has its own dedicated page.

Therefore, it is highly important that each article has a separate page on the journal's website. This ensures international visibility, proper indexing, easy access, and transparency. The absence of dedicated pages drastically reduces a journal's chances of being indexed in scientific databases and diminishes the impact of the published research.

The study of journal websites reveals a suboptimal situation in this regard. Of the 55 sites analyzed, fewer than half (27, or 49%) have dedicated pages for articles (see Figure 3).

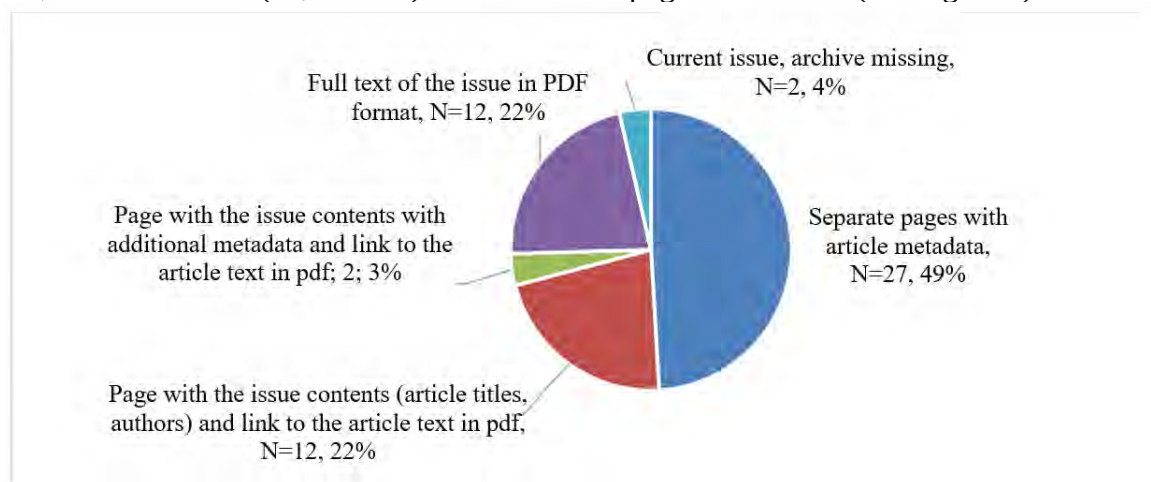


Figure 3. Dedicated pages for articles

Source: authors own study

Among the 28 journals without dedicated article pages, 12 list the table of contents with direct links to PDFs; 2 include minimal metadata in the table of contents (such as DOI, abstract, or keywords) but still link only to the PDF; 12 publish the entire issue as a single PDF; and 2 do not provide any online archive at all.

Essentially, the absence of dedicated article pages hinders automatic indexing by platforms such as Google Scholar, Crossref, DOAJ, and Scopus. As a result, individual articles become difficult to locate, which diminishes the journal's visibility, citability, and scientific impact. Journals that publish only complete PDF issues or lack an online archive, significantly undermine their prospects for international recognition.

It can be stated that the situation is inadequate – fewer than half of the journals meet the international standard of providing separate pages for each article. The others rely on incomplete

or unprofessional solutions, such as links to PDFs, full issues in PDF format, or lack of archives, which severely limit visibility and indexing potential. An urgent modernization of the journals' web infrastructure is necessary through the implementation of compliant editorial platforms (e.g., OJS) that enable metadata display and individual access to each article.

4.4 Timelines of Issues (Most Recent Issue on the Website)

Timely publication of journal issues is a fundamental criterion for any reputable scientific journal and directly impacts its credibility and visibility. Adhering to the publication schedule demonstrates that the journal maintains a stable editorial workflow and has a responsible team.

Conversely, delayed publication undermines the trust of the academic community and may be perceived as editorial negligence or poor organization, potentially discouraging authors from submitting their work. Moreover, databases such as Scopus, WoS, and DOAJ monitor publication timeliness; if issues are not released according to the declared schedule, the journal risks rejection or removal from indexing.

Data extracted from journal websites reveal a concerning situation (see Figure 4). Of the 55 journals examined, only 31 (56%) had published current issues as of July 30 (the date of the last verification), indicating that more than one-third of the journals failed to adhere to their announced publication schedules. Eleven journals were behind by one issue, four by two issues, another four by three issues, and one journal each was delayed by four, five, and six issues, respectively. This situation seriously undermines the credibility of these journals. Additionally, two journals do not publish issues or archives on their websites at all, indicating a lack of transparency and making it impossible to verify their editorial activity.

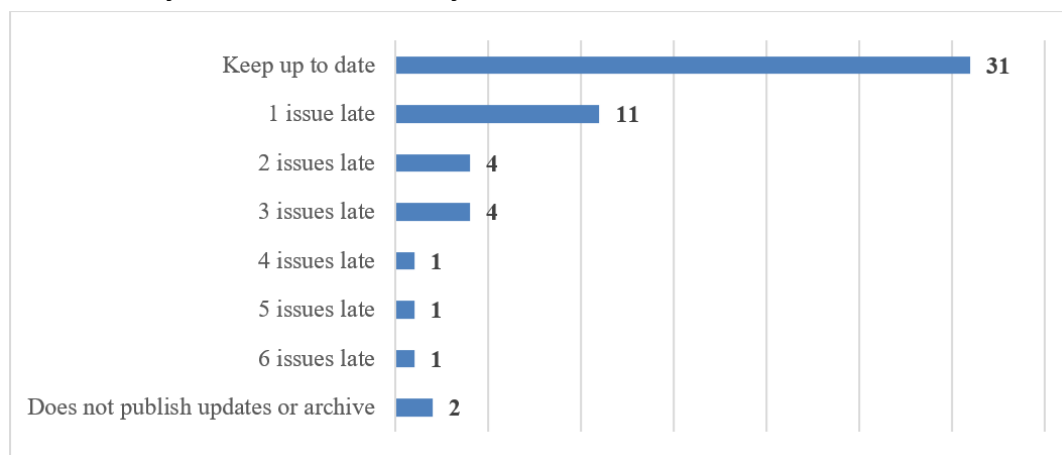


Figure 4. Timelines of issues

Source: authors own study

To sum up, publishing issues on time is crucial for a journal's credibility, attracting and retaining authors, achieving international indexing, and enhancing the scientific impact of its articles. A journal that fails to maintain timely publication seriously jeopardizes its chances of recognition and academic visibility.

4.5 English Version of Journals' websites

The presence of an English version on a journal's website is not merely optional but an almost mandatory requirement for achieving international visibility and recognition. It is essential that the website includes an English version, at least for key sections such as the journal title, purpose and objectives, instructions for authors, editorial policy, editorial board, and article metadata. This ensures broader international visibility, facilitates indexing in major databases, attracts foreign authors, and enhances the journal's prestige.

An analysis of 55 journal websites reveals that 44 (80%) offer an English version or pages in English (see Figure 5). This indicates a high level of international compliance and openness,

global visibility, and alignment with the standards of international databases. Conversely, the remaining 11 journals (20%) maintain their websites exclusively in Romanian, which limits international access, reduces visibility, and may pose a significant obstacle to the indexing process. These journals risk being perceived as exclusively local, even if they publish valuable articles.

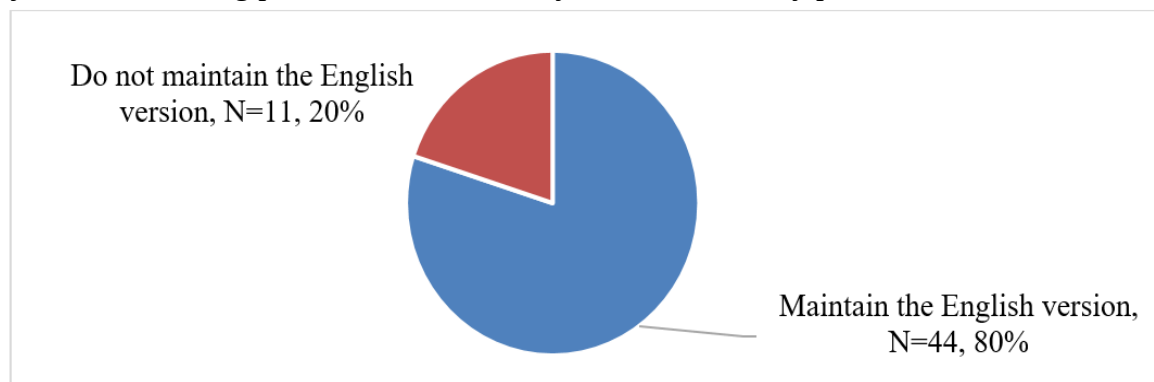


Figure 5. Maintenance of the English version of Journals' websites

Source: authors own study

Overall, the situation is positive. The vast majority of journals already have an English version, bringing them closer to international standards of transparency and accessibility. However, the 20% of journals that publish only in Romanian are at a disadvantage and urgently need to develop an English version to increase their chances of indexing, visibility, and internationalization.

4.6 Presence of DOIs for Articles

The DOI is an essential international standard in modern scientific publishing, providing each article with a unique and permanent identifier. Unlike regular hyperlinks, which can change or expire, a DOI remains stable regardless of platform or domain changes, ensuring continuous access to the article. The use of DOIs enhances the international visibility and accessibility of publications, as they are recognized and indexed by major databases such as Scopus, Web of Science, Crossref, and Google Scholar.

At the same time, DOIs facilitate the accurate citation of scholarly works, reducing ambiguity. Today, an increasing number of international journals explicitly require the inclusion of DOIs in bibliographies. Moreover, the DOI system enables the interconnection of articles with other digital resources – for example, authors' ORCID identifiers, research projects, or databases – thereby strengthening the global network of scientific information.

Therefore, assigning DOIs enhances credibility and demonstrates compliance with international editorial standards. Without DOIs, articles become more difficult to discover and are cited less frequently, which diminishes their academic impact and limits the journal's visibility and its chances of inclusion in international databases.

An analysis of the 53 journal websites that maintain online archives show that all journals (100%) assign DOIs to their published articles, whether these appear on separate web pages, as individual PDF files, or within a complete issue PDF (see Figure 6). Of these, 51 journals (approximately 96%) are Crossref members and register their identifiers through this organization, ensuring integration with essential infrastructures such as CrossMark, ORCID, and OpenCitations. The remaining two journals (approximately 4%) use DOIs assigned via Zenodo, a solution that guarantees the persistence of identifiers but offers less control over editorial metadata at the journal level.

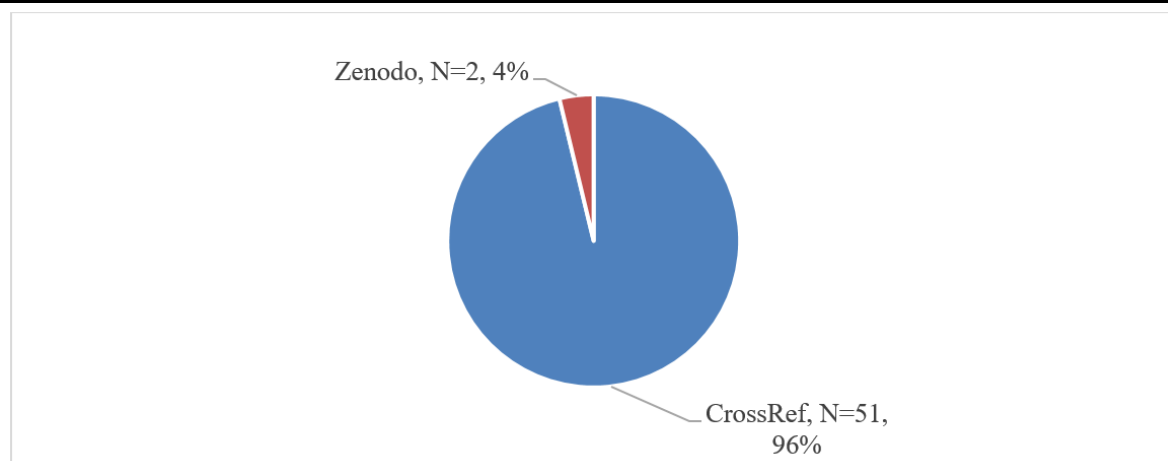


Figure 6. Assigning DOIs to articles

Source: authors own study

The situation demonstrates a high level of editorial maturity and strong preparedness for international indexing (Scopus, Web of Science, DOAJ), while also identifying several areas that require attention. It is essential for all journals to ensure consistent DOI resolution, so that each DOI directs users to the article's landing page rather than directly to the PDF file. Additionally, metadata must be complete, including titles and abstracts in English, clear licensing information, standardized affiliations, funding details, and comprehensive bibliographic references.

The recommendations emphasize strengthening the use of Crossref wherever possible, standardizing DOI display in the canonical format (<https://doi.org/...>), depositing references in Crossref, and making them open (open references) to enhance visibility. Overall, the outlook is positive, demonstrating strong alignment with international best practices while allowing room for optimizations that could further increase the visibility and impact of published articles.

4.7 Presence of Authors' ORCID Identifiers in Articles

ORCID plays a crucial role in scientific publishing by providing each author with a unique and permanent identifier. This eliminates name ambiguities and ensures the accurate attribution of academic contributions. Because many researchers may share identical or similar names, or may change or vary their names over time, ORCID guarantees precise identification.

As an internationally recognized standard integrated into the publishing workflows of major publishers and databases – including Elsevier, Springer, IEEE, Crossref, Scopus, and Web of Science – ORCID enhances the visibility and impact of research. Articles linked to an author's ORCID ID automatically appear in their profile and can be more easily discovered by the academic community.

In addition, integration with editorial platforms (e.g., OJS) and indexing systems reduces the risk of errors in editorial processing and metadata management, thereby enhancing transparency and publication ethics by ensuring accurate recognition of each author's contributions. ORCID also holds increasing practical value in research evaluation and funding, as many funding agencies and evaluation bodies now require that articles, reports, and projects be linked to an ORCID identifier to monitor productivity and impact. Consequently, ORCID has become an indispensable tool in modern scholarly publishing and an increasingly common prerequisite for article acceptance in prestigious journals and databases.

An analysis of journal websites and published articles reveals inconsistent application of international standards for author identification through ORCID (see Figure 7). Of the total journals examined, 34 (approximately 62%) display authors' ORCID identifiers in their articles, indicating openness to international best practices and a commitment to enhancing the visibility and accurate recognition of scientific contributions.

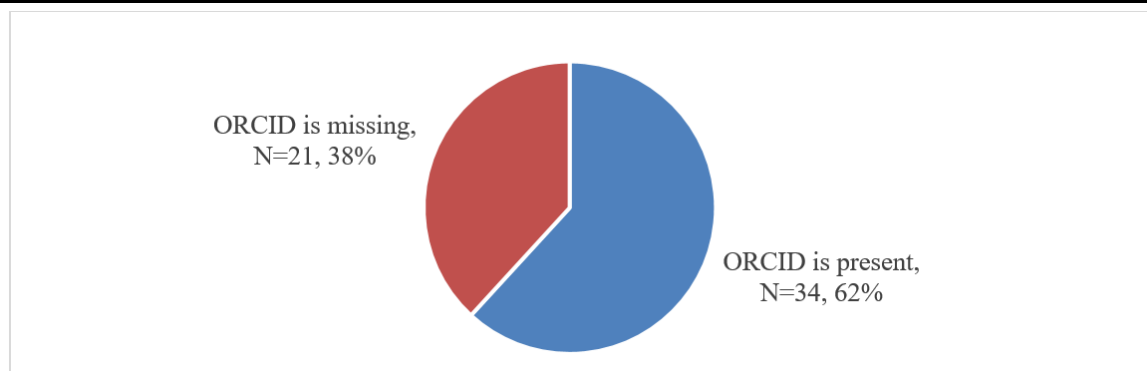


Figure 7. Including authors' ORCID in articles

Source: authors own study

However, 21 journals (approximately 38%) do not adhere to this standard, which limits interoperability with international databases, reduces transparency in the editorial process, and may negatively impact both the visibility of authors and the indexing potential of journals. This discrepancy indicates that, despite significant progress in the adoption of ORCID in the Republic of Moldova, standardized measures and robust editorial policies are necessary to ensure the mandatory implementation of this identifier in all scientific publications.

4.8 Indexing Policy of Journals' Websites

Indexing is also very important objectives for a scientific journal, as it determines the publication's visibility, credibility, and international impact.

First, indexing in prestigious databases such as Scopus, Web of Science, DOAJ, EBSCO etc. ensures increased visibility; articles become easier to be discovered by researchers, academics, students, and practitioners worldwide. This enhances the likelihood of citation and, consequently, strengthens the prestige of both the journal and its authors.

Second, indexing confers recognition and legitimacy. Acceptance into an international database involves a rigorous evaluation process that certifies compliance with editorial, ethical, and technical standards. As a result, the journal gains the trust of the academic community and becomes more attractive to authors.

Indexing also enhances interoperability by integrating articles into global academic networks. These articles can be linked to authors' ORCID profiles, institutional repositories, and funder databases, facilitating the monitoring of scientific performance and the reporting of research outcomes.

Last but not least, indexing supports the sustainable development of the journal: a visible and recognized publication attracts high-quality authors, competent reviewers, and international collaborations, thereby strengthening its long-term position in the academic community.

Analysis of journal websites reveals inconsistent practices concerning the transparency of indexing (see Figure 8). Of the 55 journals examined, 37 (approximately 67%) mention their indexing policies or the databases in which the journal is included, indicating a commitment to visibility and providing accurate information to authors and readers. In contrast, 18 journals (approximately 33%) do not display such information, which may undermine trust in the publication and reduce its appeal to potential authors. The absence of indexing details makes it more difficult to assess the journal's prestige and impact.

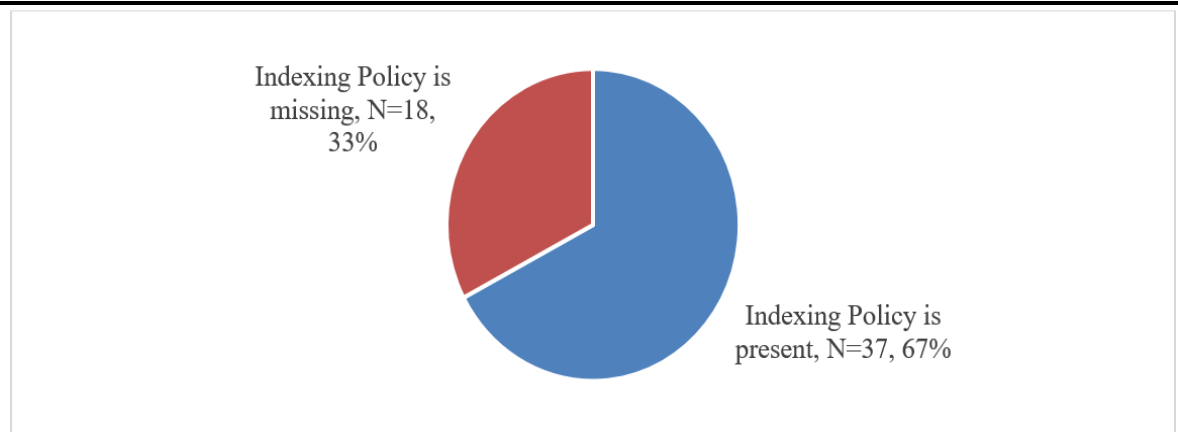


Figure 8. Presence of Indexing Policy on website

Source: authors own study

The situation underscores the need for editorial standardization: all journals should present indexing data clearly and transparently, in accordance with established international standards of academic communication.

5 Conclusions

Based on the data collected in the study referring to the technical characteristics and visibility of journal websites, we identified several structural issues that negatively impact visibility, professionalism, and the likelihood of international indexing. The primary vulnerability concerns the web domain. Although international standards recommend that journals use their own second-level domain (e.g., revista.md), the reality is that two-thirds of journals (66%) use third-level domains (e.g., revista.fondator.md), and over a quarter (27%) only have dedicated pages on the founding institution's website. Only 7% of journals have their own domains, meaning the vast majority face challenges related to branding, web independence, and indexing. This situation diminishes the international visibility of journals and makes them more susceptible to institutional or technical changes.

Regarding the platforms and CMSs used, nearly half of the journals are built on WordPress, a general-purpose platform that is not optimized for academic publishing. Only 20% of journals use OJS, the dedicated and internationally preferred solution for scientific journals, which offers editorial management, peer review, and automated indexing functionalities. The remaining journals rely on institutional platforms or custom solutions, resulting in fragmented practices and, in many cases, a lack of academic functionality. This indicates a heterogeneous technical infrastructure and highlights an untapped potential for modern digitization.

Another critical vulnerability lies in the pages dedicated to individual articles. Only 49% of journals provide separate pages for each article, which is an international standard and a fundamental requirement for indexing in databases such as Google Scholar, Crossref, DOAJ, and Scopus. The remaining journals publish articles solely as full PDFs or lack an accessible archive altogether, significantly limiting the visibility of the articles, diminishing the research impact, and undermining the journal's potential for international recognition. This represents one of the most significant structural deficiencies in the technical infrastructure of journals.

Significant problems also arise regarding the timeliness of issue publication. Only 56% of journals release their scheduled issues on time; the remainder are one or more issues behind schedule, and some do not publish their archives at all. This lack of punctuality directly undermines the journal's credibility, diminishes authors' trust, and reduces the likelihood of indexing in international databases, where adherence to the editorial calendar is a mandatory criterion.

In terms of access language, the situation is relatively better: 80% of journals have an English version or pages in English, which gives them international visibility and alignment with global

standards. However, 20% of journals maintain their sites only in Romanian, which places them at a disadvantage, reducing accessibility for the global audience and constituting a serious obstacle in the indexing process.

On the one hand, the use of DOIs for articles demonstrates a high level of editorial maturity: all journals analyzed assign digital identifiers, ensuring their visibility, accessibility, and international recognition. However, issues persist regarding the consistency of DOI display and resolution, as well as the completeness of metadata. In some cases, identifiers link directly to the PDF file rather than the article landing page, and metadata are not always presented in a uniform format, which diminishes interoperability with international databases.

In contrast to the widespread adoption of DOIs, the implementation of ORCID identifiers for authors remains inadequate. Only about two-thirds of journals display ORCID identifiers in their articles, reflecting a trend toward international best practices but leaving a significant portion of journals that do not use this standard. This lack of uniformity limits researchers' visibility, increases the risk of author misidentification, and reduces the attractiveness of journals for international indexing and academic collaboration.

The overall situation concerning identifiers and international standards reveals both significant progress and several shortcomings that need to be addressed.

Another issue is related to indexing policy. Only a fraction of journals clearly mentions on their websites the databases and platforms in which they are included, which conveys transparency and credibility. However, a third of journals do not provide any information about indexing at all, which affects the trust of authors and reduces the potential to attract quality papers. The lack of a standardized presentation of indexing denotes a weakness in academic communication and affects international visibility.

In conclusion, the technical characteristics and accessibility of the websites of journals in the Republic of Moldova reflect a level of partial compliance with international standards. The main problems identified are the lack of their own second-level domains, the insufficient use of platforms dedicated to academic publishing (such as OJS), the absence of separate pages for articles, frequent delays in publishing issues and the lack of an English version for some journals. These deficiencies directly affect the visibility, credibility and internationalization of journals, reducing their chances of indexing and recognition in the global scientific environment. Modernizing the digital infrastructure and aligning with international best practices is an essential priority for strengthening the position of these journals in the international academic landscape.

6 Recommendations

Regarding the web domain, it is recommended that each journal obtain its own second-level domain (for example, *journal.md* or *journal.eu*), as this ensures institutional independence and professional visibility. Hidden pages within the founder's website or complex subdomains should be avoided, since they diminish credibility and hinder indexing. Any migration to a new, independent domain must be carefully planned using permanent redirects (HTTP 301) to preserve existing indexing and external links.

In terms of the platform or CMS, the preferred solution is to use Open Journal Systems as the standard platform for scientific journals, given its built-in support for peer review, metadata, and DOI management. If general-purpose CMS platforms such as WordPress or Drupal are used, they should be supplemented with specialized modules for handling articles, metadata, and digital identifiers. It is equally important to ensure site security, perform regular updates, and maintain periodic data backups.

Concerning individual article pages, each published article should have its own dedicated webpage containing complete metadata, including title, authors (with ORCID IDs), institutional affiliation, abstract, keywords, and DOI. The page should include a link to the full-text PDF, but the PDF must not replace the article's web page itself. Accessibility for automatic indexing by

services such as Google Scholar, Crossref, and DOAJ should be regularly verified to ensure discoverability.

With respect to the timeliness of publication, journals must publish issues on schedule, according to their declared frequency. An updated online archive providing access to all past issues should be maintained at all times. In cases of delay, the journal should provide a transparent official notice on its website, explaining the situation.

A fundamental step for internationalization is the development of a comprehensive English version of the journal's website. This must extend beyond a simple homepage translation to include all key sections: the journal's aims and scope, detailed author guidelines, editorial policies, the composition of the editorial board, and crucially, the complete metadata (title, abstract, keywords) for every article. To be effective, this translation must be professionally executed to ensure conceptual accuracy and uphold the journal's credibility. Furthermore, this English version should be strategically promoted as the primary gateway for engaging international authors and readers.

Regarding identifiers, DOIs should always be displayed in their canonical format (<https://doi.org/...>) to ensure consistency and international recognition. ORCID identifiers should be integrated into the editorial workflow through the publishing platform (such as OJS), which minimizes errors, enhances transparency, and strengthens the link between authors and their scholarly contributions.

Finally, a key element of a journal's credibility is the transparent communication of its indexing status. Journals should proactively publish a clear and accurate list of all international databases and platforms that index their content. This information should be presented in a standardized, dedicated section on the website, avoiding ambiguous or scattered mentions. A consistent and verifiable presentation allows the academic community to reliably evaluate the journal's visibility and standing, which is a critical factor for authors when deciding where to submit their work.

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„HOME AT CHISINAU” CAMP: STRENGTHENING NATIONAL CULTURAL IDENTITY AND EUROPEAN VALUES AMONG DIASPORA CHILDREN THROUGH DIGITAL ENGAGEMENT VIA LIBRARIES

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Abstract: In the context of increasing migration, preserving cultural identity among diaspora children of the Republic of Moldova becomes an opportunity for connection and continuity. This study presents the outcomes of the first edition of the online educational camp „Acasă la Chișinău” (e.g., „Home at Chisinau”), initiated during July 14th–25th 2025 by the „B.P. Hasdeu” Municipal Library (ML) in Chisinau, and supported by the Chisinau City Hall. The program was designed to reconnect 26 children aged 6–12 from the diaspora from France, Germany, Italy, Romania, Spain, and the UK. The program applied a child-centered, interdisciplinary methodology, combining live Zoom sessions, with educational videos, creative workshops, linguistic exercises, and virtual tours. Activities were developed collaboratively by librarians, writers, museum specialists, artists, and craftspeople, assisted by a team of librarians. It included 44 activities, such as meetings with cultural representatives, language and local cultural heritage lessons, puppet theatre and gastronomy workshops, as well as interactive games. The educational content was placed on a dedicated online platform, that focused on children’s language skills and actively involved parents and/or grandparents in the learning process. Results indicated a strong positive impact on participants, including improved Romanian language skills, increased awareness of local cultural heritage, and practical experience of European values such as inclusion and mutual respect. The program also enhanced community engagement and digital outreach, reaching over 3,000 page visits and receiving media coverage.

Keywords: diaspora, European values, intercultural education, heritage, online camp, public library, Chisinau
JEL Classification: I21, I25, Z10, Z18

Introduction

In the current context of migration and globalization, preserving cultural identity is becoming a challenge for children in the diaspora (Allakhverdov, 2024). Community traditions and values, as well as language, are at risk of fading away in the face of new cultural realities (Weir, 2019). Aware of this phenomenon and the imperative need to keep alive the connection between the new generations of citizens of the Republic of Moldova and their spiritual heritage, the ML launched the first edition of the online camp „Home at Chisinau” in July 2025 - an innovative educational program designed as a connection between the diaspora and local values, but also as a framework for promoting European principles.

This initiative aimed to reconnect children from the diaspora with the Romanian language, culture, folk traditions, and history of the city of Chișinău, while promoting tolerance, inclusion, freedom of expression, and active participation - fundamental values of the European Union. The camp activities were designed as interactive experiences: Romanian language and history lessons, creative workshops with folk artists, meetings with writers, knowledge and digital exploration games, online cultural tours, and intercultural dialogue sessions. In line with the objectives of the

National Program “Diaspora” 2024–2028, which emphasizes strengthening ties with Moldovan citizens abroad, preserving cultural identity, and facilitating knowledge transfer between generations (Government of the Republic of Moldova, 2023), the „Acasă la Chișinău” online educational camp illustrates a concrete example of how such policy priorities can be operationalized at the local level.

The project leveraged the library's resources, from the expertise of librarians to its collections and digital platforms, and integrated valuable collaborations with local cultural partners: artists, educators, historians, and promoters of national heritage. Using a modern methodology adapted to the age and reality of children abroad, the camp created a dynamic, accessible, and inclusive virtual space where active participation, free expression, and appreciation of diversity were encouraged.

At the same time, the „Home at Chisinau” program reflected the library's commitment to contributing to the strengthening of European cohesion through intercultural education, intergenerational dialogue, and the formation of a responsible civic consciousness inspired by the principles of the European Union. Through the activities carried out, children learned to value both their cultural heritage and the spirit of unity in diversity that characterizes Europe.

Methodology: forms and methods of activity

The program was built on an interdisciplinary and inclusive approach, centered on the child and oriented towards intercultural dialogue, capitalizing on both national cultural heritage and the principles of contemporary European pedagogy. The „Home at Chisinau” camp was designed by a multidisciplinary team from the ML, involving librarians, writers, museum curators, visual artists, folk artists, historians, and specialists in non-formal education, who collaborated to create an interactive, accessible, and attractive program for children from the diaspora. The online camp „Home at Chisinau” was held with the support and active involvement of institutional and cultural partners who contributed to the quality and attractiveness of the program. The Chisinau City Hall, through Deputy Mayor Angela Cutasevici, supported the promotion of the initiative, and the General Directorate for Culture and Cultural Heritage facilitated access to valuable resources about the city's heritage. The ML, together with the teams from the Program Development Department, the Evaluation and Monitoring Department, the Memory of Chișinău Department, the Information Technology Department, and the Communication Department, coordinated all activities, mobilizing teams of librarians and specialists to create interactive materials.

The activities were structured into 10 live sessions on the Zoom platform, each lasting 2 hours. These sessions combined various modern educational methods: visual presentations, interactive exercises, linguistic and creative games, thematic challenges, storytelling, and intercultural dialogues. In addition to the live sessions, participants had access to educational videos made especially for the camp, virtual tours of museums and iconic places in Chișinău, craft workshops, introductory lessons on traditional clothing, national symbols, the history of the Romanian language, and holiday traditions.

The innovative element was the integration of social media as platforms for dissemination and engagement: posts, video collages, participants' impressions, and moments from the activities were published regularly, accompanied by messages promoting European values and cultural identity. The local media also covered the project, amplifying its visibility and impact in the community. Participants were selected based on a public call launched through the communication channels of the library and its partners in the diaspora. In the end, the camp brought together 26 children aged between 6 and 12 from France, Germany, Italy, the United Kingdom, Spain, and Romania – a diversity that fostered intercultural exchange and a sense of belonging to common European values.

The camp provided each child with a safe and stimulating environment for expression, exploration, and learning, emphasizing active participation, open dialogue, and encouraging curiosity about their own cultural roots. At the same time, the methodology fostered the

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development of social and cultural skills, critical thinking, and sensitivity to diversity – essential qualities for the Europeans citizens.

Experience: from knowledge to experimentation

The online camp „Home at Chisinau” was a complex and interactive experience, offering participants 44 structured activities designed to stimulate both cultural knowledge and personal development in children. The activities were diverse and balanced, including: 13 meetings with personalities from Chisinau's cultural life, 10 creative workshops, 11 interactive games, 4 anagram sessions, and 6 lessons on linguistic inclusion.

The children actively participated, often accompanied by their parents or grandparents, in activities that combined learning with play and communication with creativity. Among the most appreciated were the Romanian language lessons, accompanied by pronunciation exercises, designed to facilitate reconnection with the mother tongue in a friendly and motivating way. The craft workshops, led by folk artist Olesea Enache, introduced participants to the world of traditional symbols and the art of sewing, stimulating curiosity and manual dexterity.

A special moment was the puppet theatre performance based on the legend of Chişinău, presented by the actors of the „Guguţa” Municipal Theater, guided by the director of the institution, Gabriela Lungu – an activity that combined artistic value with the transmission of local memory in a form accessible to children. Other activities included exploring the urban and ecological heritage of Chişinău through virtual tours and online visits to museums, provided by library colleagues and museographer Alexandra Vasiliev from the Chişinău Electric Transport Museum. An unforgettable visit to the Zoo, organized live by director Roman Creţu, as well as traditional gastronomy workshops with journalist Traian Stoianov, who invited children to discover the tastes of Bessarabian childhood, ensured the children's curiosity, by preparing the salad called „Chişinau salad”.

Meetings with writers Iulian Filip, Claudia Partole, Maria Pilchin, Victoria Fonari, and others provided an opportunity for authentic dialogue about literature, reading, and identity, and through the „Memory of Chişinău” section, children had access to thematic virtual tours and video materials that promoted the culture and history of Chişinău. All activities were delivered through a combination of methods – live Zoom sessions, videos, interactive games, hands-on activities, that were tailored to both the language level and interests of the participants. This adaptability allowed each child to feel included, encouraged, and connected to a common cultural universe, despite the geographical distance. The experience was intense, emotional, and enthusiastic, strengthening the bonds between children in the diaspora and the cultural and linguistic values of the Republic of Moldova.

Impact and results

The online camp „Home at Chisinau” had a significant impact on both direct participants and the wider community, demonstrating the value of such educational and cultural initiatives in the context of the diaspora. One of the most important effects was the strengthening of the children's cultural identity through the rediscovery of Chişinău's heritage, familiarization with national symbols, and practicing the Romanian language in authentic and attractive contexts. The children learned not only through formal lessons, but also through games, stories, dialogue, and creative engagement, regaining a sense of belonging to the culture and values of Moldova.

The camp promoted, in a natural and applied way, fundamental European values such as inclusion, diversity, and mutual respect. The activities were designed to cultivate empathy, collaboration, and openness towards others, reflecting the spirit of modern education based on active participation and respect for multiple identities.

Another important result was the creation of a safe, empathetic virtual space tailored to the emotional and educational needs of children in the diaspora. The camp format provided stability, rhythm, and opportunities for interaction, contributing to the development of self-confidence and

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a sense of inclusion. Similarly, the visibility of the program was amplified through consistent media coverage and online platforms. The camp was promoted through articles and announcements on news portals and television stations such as Diez, Realitatea TV, Știri.md and News.yam.md, Vocea Basarabiei, IPN, which helped draw attention both within the country and among the diaspora.

The active involvement of the community was essential. Parents and grandparents appreciated the camp program not only for its rich content and professional delivery, but also for its relevance to the needs of children raised outside the Republic of Moldova. The feedback received highlighted satisfaction with the quality of the activities and the positive emotional impact on participants. Feedback from parents:

„We would like to thank the organizers of the „Home at Chisinau”Camp for giving our children the opportunity to participate in interactive, creative, and very interesting activities! The children were extremely satisfied!!! At the end of August, when we come home, we will gladly visit the ML! Have a wonderful summer!!! With respect, the Roșcovanu family”.

„Dear Ms. Maria, we thank you from the bottom of our hearts for the professionalism, empathy, and patience with which you guided the children through this wonderful experience, Home at Chisinau. You have managed to create a special bond with the little ones and convey information with warmth and passion. Elina was delighted and has great admiration for you. We are grateful for everything and hope to see you again soon! With appreciation, The Sirbu Family from Germany.”

The camp also enjoyed high visibility in the public sphere. The camp's official website recorded over 3,000 visits, and the activities were constantly covered in the national media and on social networks. This coverage contributed to the recognition of the initiative as an example of good practice in promoting cultural and European values through the library.

Conclusions

The online camp „Home at Chisinau” has convincingly demonstrated that cultural education and the promotion of European values can be effectively achieved through digital means, combined with pedagogical creativity and inter-institutional collaboration. The program succeeded in bringing together children from the diaspora and Chișinău in an empathetic, accessible, and valuable learning space, where heritage, language, and cultural identity were transmitted through modern and interactive methods.

This project has become an example of good practice in terms of involving the diaspora in short-term educational and cultural processes, contributing to the strengthening of the national and European identity of the younger generation. Participants were encouraged to reflect on common European values, freely express their thoughts, and connect emotionally with Moldovan culture.

Through this initiative, the ML reaffirms its status as a strategic cultural actor, a facilitator of community cohesion, and an active promoter of intercultural dialogue. The „Home at Chisinau” camp demonstrated that the library can become a link between communities, generations, and cultures, thus strengthening its mission in a democratic and inclusive society.

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TRAINING PROGRAMS FOR THE DEVELOPMENT OF INFORMATION LITERACY AT THE SCIENTIFIC LIBRARY OF THE TECHNICAL UNIVERSITY OF MOLDOVA

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Abstract: In the current context of rapid technological development and widespread digital access, fostering a strong culture of information literacy is imperative for the academic and professional success of students and researchers. The Scientific Library of UTM plays a key role in this by offering training programs to develop information-seeking and resource management skills. Information literacy involves more than just the ability to locate information; it also encompasses the capacity to critically evaluate, interpret and use resources effectively for educational and research purposes.

This article analyses the training programs implemented by the Scientific Library of UTM, highlighting their importance in the contemporary educational and scientific environment, which is characterised by complex information flows and the need to efficiently use digital resources. Furthermore, it describes how these programs contribute to developing essential skills for success in research and higher education, and their impact on improving academic performance and enhancing collaborative capacities in a digital environment.

Keywords: Information literacy, scientific library, information skills, user training, educational programs.

JEL Classification: I23, I25, O33

1 Introduction

Academic libraries are important places where people can go to study and do research. Their role is more than just running and providing library services. They also play an active part in the educational process, especially in the digital age, where technology is changing teaching and learning in higher education around the world (Bennett, 2015). For many years, academic libraries have had a very important job: to support learning and teaching. But how these libraries do this is always changing. This is because of new technology, changes in the economy and society, and changes in the institutions that run these libraries (Corrall and Jolly, 2019).

Libraries are well known for helping people learn, but there is still a lot of discussion about what librarians actually do. This is because of traditional ideas about what a librarian does, but there are also new academic realities that mean librarians need to develop teaching skills and digital skills, as well as knowledge of information literacy. As a result, academic libraries are starting to see themselves as partners in education, helping to improve teaching and learning.

In recent years, academic libraries have also started to focus more on research and scholarly activity. This is because of developments in digital infrastructures, data management and open science. This means that librarians can support research by using new methods and coming up with new ideas. At the same time, improvements in information literacy, how you design learning materials, learning with your peers and open educational resources have led to new library practices. These new practices make it easier for people to get the support they need for their studies. Academic libraries continue to play a vital role in higher education by offering traditional information services as well as new and innovative ways to help students learn and do research (Corrall and Jolly, 2019).

A central element of this transformation is information literacy, which is defined as the ability to recognise the need for information and develop the necessary skills to locate, evaluate and use information resources effectively (Cunningham and Lanning, 2002). The American Library Association says that information literacy is “the ability to recognise the need for information and to develop the skills necessary to locate, evaluate, and use information resources effectively” (American Library Association, 2001). In practice, Doyle defines an information-literate person as someone who can accurately identify the need for information, formulate relevant questions, locate appropriate sources, develop effective search strategies, critically evaluate the obtained information, and coherently integrate it into their thinking and problem-solving processes (Doyle, 1994).

In the contemporary educational environment, the ability to navigate, evaluate and utilise a plethora of information resources in libraries is paramount. This aptitude, often termed “information literacy”, is a critical skill that empowers students and researchers to competently traverse the vast expanse of knowledge. This encompasses not only the identification of pertinent information but also the application of higher-order cognitive abilities such as analysis, synthesis, evaluation and knowledge creation (Allen, 2008). These skills are imperative for academic success, lifelong learning and responsible participation in an information society (Liu, 2025).

2 Training programs on Information Literacy

The Scientific Library of the Technical University of Moldova has developed a wide range of programmes and activities. These are designed to help students and researchers learn how to find information. These programs are structured so that they meet the specific needs of different academic levels, ranging from first-year students to doctoral candidates and faculty members engaged in research. The way it is organised means that there are different educational activities, which are designed to suit the level of preparation and what each user needs:

- First-year students,
- Second- and third-year students,
- Master's level students,
- Doctoral students,
- Teaching and research staff.

Program for first-year students

At the beginning of their academic journey, the library organises a program called “Discover the library and its information resources”. This program is designed to familiarise students with the library's services and resources, as well as methods of identifying, selecting and using

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information. The program aims to help students integrate into the academic environment quickly and develop essential information-searching and management skills.

Through interactive and practical sessions, participants will:

- become familiar with the library's structure, services, book collections and available electronic resources;
- learn how to use the electronic catalogue, the electronic teaching library and the TUM institutional digital repository;
- acquire skills in identifying and selecting relevant online resources for their fields of study;
- apply academic documentation methods through examples and case studies.

This program enables students to develop the fundamental competencies necessary for building advanced information literacy skills.

Table 1 illustrates the evolution of the program “Discover the library and its information resources”, which was delivered by the library between 2022 and 2024 to students at the start of the academic year. The data highlight a steady and significant increase in the main indicators. For example, the number of activities nearly tripled, increasing from 63 in 2022 to 182 in 2024. Similarly, the number of academic hours more than doubled from 63.5 in 2022 to 189 in 2024, indicating an expansion in both content and program duration. The number of participants also increased steadily, rising from 1.685 in 2022 to 3.145 in 2024, demonstrating growing student interest and the tangible impact of these activities.

Table 1. Evolution of the program “Discover the library and its information resources”, 2022–2024

Year	Activity	Academic hour	Participants
2022	63	63,5	1 685
2023	96	88	2 270
2024	182	189	3 145

Source: own work

This evolution demonstrates that the program is becoming increasingly effective in integrating students into the academic environment by offering support in using information resources and developing documentation skills. While information literacy classes are not part of the university curriculum, the steady increase in activity and participation highlights the importance and necessity of these sessions for the student community.

Program for second- and third-year students

Following the introductory stage, second- and third-year students follow an advanced program designed to develop skills in searching for, using and managing scientific information. This course aims to teach users how to use the scientific databases subscribed to by the TUM Scientific Library (Springer, Research4Life, ASTM, Compass Complete, IOP Publishing, etc.) and develop the competencies required to access, use and efficiently manage the available electronic resources. For students in this category, the emphasis is placed on:

- developing skills in formulating precise and complex search queries (Boolean operators, advanced filters, keywords);
- selecting and filtering relevant results for seminar papers, projects, or essays;
- organizing and integrating selected information into academic projects and research papers;
- applying criteria for the critical evaluation of sources;
- strengthening academic writing skills in accordance with citation standards and information ethics;
- using software tools (e.g., Zotero) for the efficient management of resources.

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Thus, the program for second- and third-year students consolidates the foundation acquired during the first year and ensures the transition to a higher level of informational autonomy, preparing students for the advanced stages of their studies.

The program „Supporting TUM Graduates”

Every year in February and March, the TUM Scientific Library runs the program „Supporting TUM Graduates”, which aims to assist students with preparing their bachelor's and master's theses. Designed as a series of informational and educational activities, the program provides graduates with specialised support in the form of access to resources, training sessions and personalised consultancy. Participants benefit from:

training sessions on the effective use of information resources – specialized and multidisciplinary international databases, TUM’s electronic library, digital repositories, and electronic catalogues;

developing competencies in identifying, selecting, and evaluating information, in accordance with academic ethics standards;

training in the correct application of citation styles and the preparation of standardized bibliographic references;

counselling on plagiarism prevention and adherence to academic integrity norms.

In addition to practical training activities, the program includes thematic and informational exhibitions showcasing newly acquired books, as well as presentations of methodological and bibliographic publications developed by the library, such as standards, guides for preparing bibliographic references, bibliographies, bio-bibliographies, and recommended reading lists.

With the support of the deans of all university faculties and in close coordination with teaching staff, the library organises information literacy lessons. Additionally, lessons, interventions and presentations are conducted as part of course sessions for specific subjects, such as Scientific Research Methodology, Experimental Techniques, and Academic Writing, at the request of professors.

The InfoDoctorandus program

This program offers a wide range of information, training and consultancy activities for doctoral students, providing the necessary support throughout the entire research process. The program addresses the essential needs of early-career researchers by facilitating access to relevant information, developing documentation skills and ensuring adherence to ethical and academic standards.

The program's core objectives are as follows:

- facilitating the information-gathering and documentation process for doctoral students in order to produce high-quality research work;
- developing skills in identifying, selecting, evaluating, and efficiently using information within the context of planned research;
- fostering the ability to present bibliographic references used in scientific works according to international standards;
- preventing plagiarism and promoting ethical research behaviour;
- informing doctoral students about normative and procedural frameworks, including the requirements of the National Council for Accreditation and Attestation (CNAA), as well as other regulations related to the presentation of scientific work.
- Within the program, doctoral students receive information and practical training on:
 - using available information resources to identify relevant literature (electronic catalogues, institutional digital repositories, international scientific databases, etc.);
 - accessing publications that are unavailable in the library collections or have restricted access;
 - compiling thematic bibliographies relevant to their research topics;

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- correctly formatting bibliographic references and citations according to academic standards;
 - using ZOTERO software for efficient source management and organization of bibliographic references;
 - obtaining personalized consultations tailored to the individual needs of each doctoral student.
- The program is designed in a flexible and interactive manner, including:
- specialized training sessions conducted by librarians and experts in scientific information;
 - interactive information sessions to familiarize students with resources and research tools;
 - practical exercises allowing doctoral students to practice using databases, bibliographic tools, and reference management software;
 - individual consultations and personalized support to address specific challenges encountered during the research process.

3 Open Science for Researchers Program

This initiative is dedicated to supporting the academic community in strengthening the visibility of, and increasing the impact of, scientific outcomes. Designed as a framework for training, consultancy and practical support, it provides researchers with the necessary tools and competencies for integration into the international open science landscape.

The program includes individual consultation sessions aimed at addressing the specific needs of each researcher, as well as practical, interactive workshops. Topics covered include:

Creating and developing professional profiles on international platforms (Google Scholar, ResearchGate, Scopus Author ID, Web of Science ResearcherID, etc.), which facilitate visibility and scientific collaborations;

Integrating and updating publications within academic profiles, ensuring an accurate and comprehensive representation of research outcomes;

ORCiD links unique researcher identifiers. This helps to make it clear who the authors are in the international research environment;

Managing citations and monitoring the impact of science correctly by using databases and tools that measure scientific activity;

Using bibliometric responsibly and accurately. It is also important to emphasise understanding of their limitations and to avoid misinterpretations when evaluating scientific performance.

This program helps researchers get the advanced information and digital skills needed in the era of open science. At the same time, the programme encourages openness and honesty in research, which helps to share scientific results around the world and makes the institution more well-known for its academic work.

To make it easy for people to find out about training programmes, courses and activities, the TUM Scientific Library shares information about them on its website. Students and researchers can find out more about each programme and use an online form to book a course or a personalised consultation. Training activities are carried out based on what the users want and need. This can be done in person, online, or a mix of both. This makes sure that there is as much flexibility as possible and that it can be used in different academic situations.

The Scientific Library's website provides users with access to a range of guides and educational resources that are designed to support the development of information and digital literacy skills. These include guides on creating and managing professional profiles on Google Scholar and ORCiD, using the Zotero reference management tool, and critically evaluating information and applying various citation styles. Furthermore, there are materials available to assist with the documentation and composition of academic papers.

Users' information literacy is further enriched and made more engaging through the integration of innovative elements designed to meet current learning, research and socialisation needs.

These include microlearning (short, gamified lessons) accessible via the library platform; interactive digital guides on proper citation, source management and using Zotero reference software; information literacy quizzes (e.g. identifying fake news vs. real news and credible sources); mentoring programs – advanced users support beginners.

The central idea is to transition from a passive information model to one of active and creative participation, in which users are encouraged to think critically and collaborate in the creation of knowledge.

4 Conclusions

The training programs conducted by the Scientific Library of the Technical University of Moldova have demonstrated a significant impact on the development of information literacy among students and researchers. Participants in these programs have developed essential competencies in identifying, selecting, evaluating, and using information resources, both in academic activities and research. Through interactive sessions, practical training, and personalized consultancy, users have acquired advanced skills in information management, the use of scientific databases and digital tools, as well as in applying ethical and academic standards in academic writing.

The benefits of these programs are evident in the increased information autonomy of students and researchers, the improvement of the quality of academic and scientific work, and the strengthened capacity to collaborate effectively in a digitalized environment. Additionally, the programs have contributed to the development of digital competencies and academic visibility skills, which are essential in the context of open research and scientific performance evaluation.

However, the implementation of these programs has also encountered challenges, such as adapting to the diverse needs of users, limitations in digital infrastructure, and the need for better monitoring of their impact on academic performance. These aspects provide opportunities for the continuous adjustment and improvement of the programs.

The Scientific Library of the Technical University of Moldova aims to consolidate and expand its training programs to meet the increasingly diverse requirements of students and researchers. The future will see development in a number of different areas. Firstly, the aim is to add more areas to the site by adding modules dedicated to scientific publishing, identifying dishonest journals, and research data management, in order to respond more effectively to the needs of users across different academic sectors.

Secondly, we will focus on new teaching methods, such as interactive platforms, webinars, video tutorials, and digital resources that can be accessed remotely. This will make the programmes more flexible and available to all participants.

We will also be able to see how well the programme is working by looking at things like how much the people taking part have learned, how often they use the digital tools, how good their school work is, and how happy they are. These indicators will allow us to keep track of the impact of the programme and make changes to make the most of it.

Furthermore, a key part of the development strategy is to work more closely with academic institutions and international libraries. This will help us to share good practices, access educational resources and take part in international training projects. This will help make sure that training programs meet global standards and make the library's activities more visible and well-known in the world.

The Scientific Library has a clear plan to make sure its training programmes stay relevant. It also wants to use these programmes to help TUM students and researchers improve their

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information, digital and research skills. This will show how important the library is to modern education and research.

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ENHANCING QUALITY AND VISIBILITY OF SCIENTIFIC PUBLICATIONS: BEST PRACTICES AND RECOMMENDATIONS IN THE CONTEXT OF NATIONAL REGULATIONS AND INTERNATIONAL STANDARDS

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Abstract: In the world of academic publishing and organising conferences, there is a growing demand for publishers and organisers to follow the rules set out by their own country while also meeting international standards for sharing academic research. The move to digital publishing has created new opportunities for local publishers to be more visible and to have a bigger impact. But many local publishers find it hard to understand the complicated system of indexing databases, permanent identifiers and interoperability protocols. This is a big problem for new research groups who want to create publications that are reliable, easy to find, and can be used in other studies. Digital Object Identifiers (DOIs) are becoming more and more important for deciding how well a publication does, but there is a lack of clear guidance on how to use them. The aim of this research is to find and organise the best ways to edit scientific publications so that they meet national and international standards. This will help to improve the quality, visibility and impact of these publications. The study looks at the rules in the Republic of Moldova for evaluating scientific journals and events, and international recommendations for making sure that online content is easy to find. The research identifies the most important requirements for editors: using peer-review processes, adopting modern publishing platforms (OJS), ensuring persistent identifiers (ISSN, DOI), following metadata and interoperability standards (OAI-PMH, OpenAIRE), and providing content in different formats (PDF, HTML, XML, JATS). The study shows how important DOI is for helping researchers to cite each other's work, tracking how much it is used, and how it fits into the global research system.

Keywords: best practices, online visibility, scientific impact, DOI, national regulations, international standards

JEL Classification: I23, O33, L82, C81

1. Introduction

The scholarly publishing landscape has undergone profound transformation in recent decades, driven by technological advances, changing research practices, and evolving expectations regarding access and discoverability. Academic publications worldwide face a dual challenge: meeting increasingly stringent national regulatory requirements while simultaneously adhering to rapidly developing international standards and best practices (Meadows, 2015). This tension is particularly acute for publications in regions with developing research infrastructures, where limited resources must be strategically deployed to maximize quality, visibility, and impact.

The proliferation of digital platforms and formats has created unprecedented opportunities for disseminating scholarly content, but has also introduced complex technical requirements that many publications struggle to implement effectively. As Brase and Farquhar (2011) note, “In the digital age, the traditional methods of ensuring persistence and provenance of scholarly materials have been disrupted, requiring new technical solutions and organizational practices.” This disruption requires a structured approach to enhancing publication quality that addresses both technical and organizational dimensions.

This paper examines the critical role of persistent identifiers - particularly Digital Object Identifiers (DOIs) and ORCID IDs - in establishing a foundation for publication quality and visibility. We present a comprehensive framework for implementation that guides stakeholders

through progressive levels of enhancement, from basic regulatory compliance to advanced international best practices. The framework is designed to be adaptable to various resource constraints while providing clear pathways for improvement.

The research addresses four key questions:

What are the essential components of publication quality that enhance visibility and impact?

How can persistent identifiers be effectively implemented within existing publication workflows?

What technical infrastructure best supports enhanced metadata quality and interoperability?

What implementation strategies maximize benefits while acknowledging resource constraints?

By addressing these questions, this paper provides practical guidance for journal editors, conference organizers, librarians, and researchers seeking to enhance the quality, visibility, and impact of their publications in an increasingly competitive global scholarly ecosystem.

2. Theoretical Framework: the Publication Quality Pyramid

The enhancement of publication quality, visibility, and impact can be presented as a hierarchical structure with three interdependent levels. This “Publication Quality Pyramid” provides a framework for understanding the progressive implementation of quality enhancements in scholarly publishing (Figure 1).

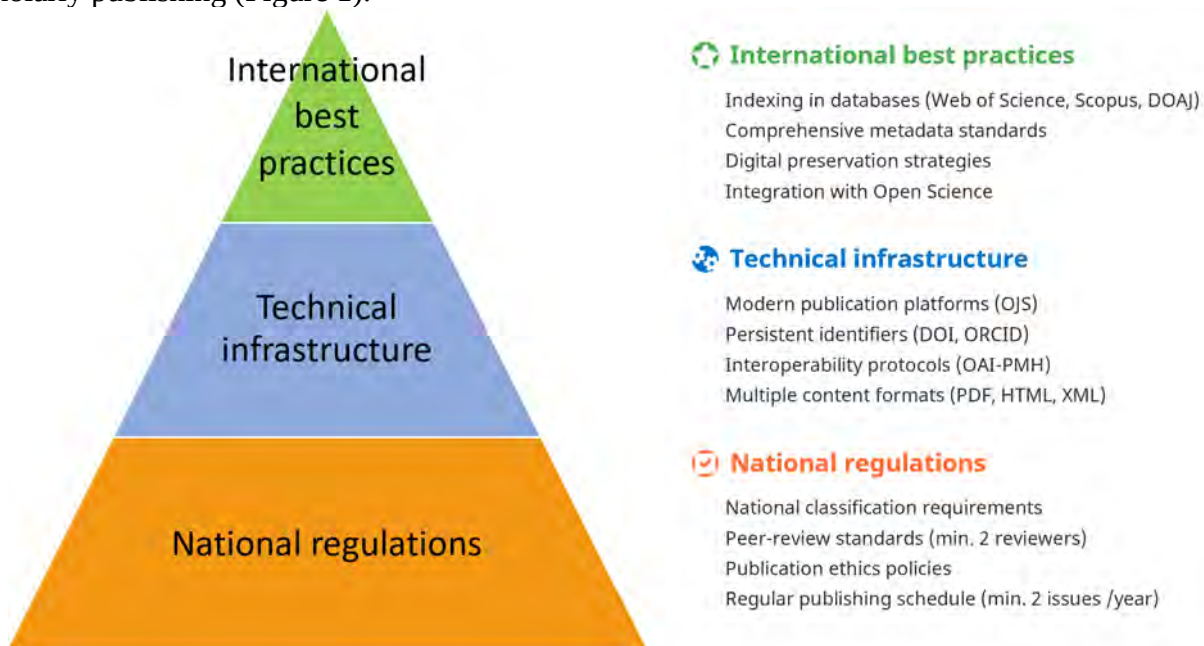


Figure 1. Publication quality pyramid

Source: developed by the author

The base of the pyramid represents fundamental compliance with national and institutional regulations governing scholarly publications. These typically include:

Registration requirements (ISSN/eISSN)

Peer review standards (minimum number of reviewers, documentation of review process)

Publication ethics policies and declarations

Regular publication schedules

Editorial board composition requirements

As Stojanovski et al. (2015) observe, regulatory compliance establishes the minimum threshold for credibility in scholarly publishing but is insufficient alone to ensure visibility or impact. Nevertheless, this foundation is essential, as non-compliance can result in exclusion from national recognition systems and undermine subsequent quality enhancement efforts.

The middle tier of the pyramid encompasses the technical systems and standards that enable effective digital dissemination and discovery. Key components include:

- Publishing platforms (e.g., Open Journal Systems)
- Persistent identifiers (DOI, ORCID)
- Interoperability protocols (OAI-PMH)
- Multiple content formats (PDF, HTML, XML)
- Secure hosting with HTTPS implementation

This technical infrastructure layer serves as the bridge between basic compliance and international best practices. As Cyzyk and Choudhury (2008) note, “The selection and implementation of appropriate publishing platforms fundamentally shapes a publication's capacity for metadata management, interoperability, and long-term sustainability.” The technical choices made at this level have profound implications for a publication's potential visibility and impact.

The highest tier represents the adoption of advanced international standards and practices that maximize visibility, interoperability, and impact. These include:

- Comprehensive metadata implementation
- Indexing in major international databases (Web of Science, Scopus, DOAJ)
- Digital preservation strategies
- Open science integration (data availability statements, open peer review options)
- Advanced article-level metrics

Tennant et al. (2019) argue that publications reaching this level “participate fully in the global scholarly communication ecosystem, benefiting from network effects that amplify visibility and impact.” While achieving this summit requires significant investment of resources and expertise, it represents the ultimate goal for publications seeking international recognition and influence.

The Publication Quality Pyramid provides a conceptual framework for understanding the progressive enhancement of scholarly publications. Each level builds upon the previous one, creating a structured pathway for improvement that acknowledges both regulatory requirements and international standards.

3. The Critical Role of Persistent Identifiers

Persistent identifiers serve as the connective tissue of the modern scholarly communication ecosystem, providing stable, unique references to digital objects regardless of changes in their location or ownership. This section examines the specific contributions of two key identifier systems - DOIs and ORCID IDs - to publication quality, visibility, and impact.

3.1 Digital Object Identifiers (DOIs)

DOIs have emerged as the global standard for identifying and locating scholarly content online. As defined by the International DOI Foundation, a DOI is “a digital identifier of an object, rather than an identifier of a digital object” (IDF, 2019), emphasizing its role in providing persistent identification regardless of format changes or platform migrations. The implementation of DOIs delivers multiple benefits to scholarly publications:

persistent access - DOIs ensure that content remains accessible even when URLs change or publishers migrate platforms. This persistence is critical for maintaining citation integrity over time. Boudry and Chartron (2017) found that articles with DOIs had significantly lower rates of reference rot (link decay) compared to those without, with 96.7% of DOI links remaining functional after five years versus only 62.3% of standard URLs.

citation tracking - DOIs enable accurate tracking of citations across platforms and databases. Klein and Van de Sompel (2022) demonstrated that publications implementing DOIs experienced an average 27% increase in captured citations compared to pre-implementation periods, primarily due to improved reference matching across systems.

metadata exchange - the DOI system facilitates rich metadata sharing between systems and databases. When registering DOIs through organizations like Crossref, publishers must provide

standardized metadata that becomes available through APIs, enhancing discoverability. The metadata associated with DOIs represents one of the largest standardized bibliographic databases in existence, powering countless discovery services and metrics systems, according to (Hendricks et al., 2020).

database integration - major indexes and databases increasingly require DOIs for inclusion. Journals without DOIs face significant barriers to inclusion in services like Web of Science and Scopus, limiting their visibility and impact potential.

global ecosystem participation - DOIs integrate publications into the worldwide research network, enabling participation in services like Crossref Cited-by, reference linking, and similarity checking tools.

The implementation of DOIs represents a pivotal investment for publications seeking to enhance their quality and visibility. While requiring some technical infrastructure and ongoing management, the benefits substantially outweigh the costs, particularly when accessed through sponsoring organizations that reduce financial barriers for smaller publications.

3.2 ORCID Identifiers

While DOIs identify content objects, ORCID IDs provide persistent identification for researchers, addressing the critical challenge of author disambiguation in scholarly communication. ORCID (Open Researcher and Contributor ID) offers a registry of unique researcher identifiers that connect individuals to their research outputs, affiliations, and professional activities.

For publications, implementing ORCID integration delivers several key benefits:

author disambiguation - ORCID resolves the persistent problem of author name variants, transliterations, and homonyms. Haak et al. (2012) found that large bibliographic databases contained an average of 2.5 name variants per researcher, leading to fragmented citation profiles and attribution errors.

automated metadata population - when integrated with submission systems, ORCID enables automatic retrieval of standardized author information, reducing manual data entry and associated errors. Thomas et al. (2015) documented a 64% reduction in author metadata correction requirements following ORCID implementation.

enhanced author profiles - ORCID integration allows researchers to build comprehensive profiles that aggregate all their scholarly contributions, increasing the visibility of publications they have authored.

reduced administrative burden - for both authors and publishers, ORCID streamlines identity verification and metadata management processes, particularly in large multi-author collaborations.

The implementation of ORCID in publication workflows represents a relatively low-cost enhancement with significant benefits for metadata quality and author satisfaction. ORCID adoption creates a virtuous cycle where improved metadata leads to better discovery, which incentivizes further metadata improvements, according to (Meadows, 2016).

3.3 Implementation Strategies for Persistent Identifiers

Effective implementation of persistent identifiers requires both technical infrastructure and organizational processes. For publications with limited resources, we recommend a phased approach:

DOI implementation - begin with retroactive DOI assignment for the current year's content, then expand to the complete back catalog as resources permit. Prioritize integration of DOIs in reference lists to strengthen the citation network.

ORCID integration - initially request ORCID IDs from authors during submission, then progress to API integration with the submission system for automated verification and metadata retrieval.

Metadata enhancement - leverage the structured metadata requirements of DOI registration to improve overall metadata quality, particularly for abstracts, references, and funding information.

Reference linking - implement Crossref Cited-by service to display incoming citations and enhance the visibility of citing articles.

This phased approach allows publications to realize incremental benefits while building toward comprehensive implementation of persistent identifier systems.

Building on the analysis, persistent identifiers like DOIs and ORCID IDs are crucial for enhancing publication visibility and impact. DOIs provide stable links, improve citation tracking, and enable database integration, while ORCID IDs resolve author disambiguation issues and streamline metadata management. Implementing these identifiers gradually - starting with DOIs for recent content and ORCIDs during submission - will strengthen metadata, discoverability, and integration into the global scholarly ecosystem.

4. Technical Infrastructure for Publication Enhancement

The selection and implementation of appropriate technical infrastructure fundamentally shapes a publication's capacity for quality enhancement. This section examines key infrastructure components with particular emphasis on publishing platforms and metadata standards.

4.1 Publishing Platforms

Modern publishing platforms provide integrated environments for managing the entire publication workflow, from submission through peer review to publication and dissemination. For publications with limited resources, open-source platforms offer sophisticated functionality without prohibitive licensing costs.

Open Journal Systems (OJS) developed by the Public Knowledge Project, OJS has emerged as the leading open-source platform for journal publishing, currently supporting over 10,000 journals worldwide (PKP, 2023). OJS provides:

- complete editorial workflow management
- built-in DOI and ORCID integration
- OAI-PMH compliance for metadata harvesting
- multiple language interfaces
- customizable templates and themes

OJS was specifically designed to improve both the scholarly and public quality of journal publishing through a number of innovations, from making journal policies more transparent to improving indexing. Its widespread adoption has created a large community of users and developers, ensuring ongoing support and enhancement.

For conference organizers, Open Conference Systems (OCS), provides similar functionality tailored to the specific requirements of conference proceedings, including abstract submission, review management, and program scheduling. Integration between OJS and OCS facilitates the transition of conference papers to journal special issues, enhancing content dissemination.

When selecting a publishing platform, stakeholders should evaluate a series of factors, such as compliance with metadata standards and export formats, integration capabilities with persistent identifier systems, customization options to meet specific workflow requirements, active development community and update frequency and hosting requirements and technical expertise needed. Other examples of publishing platforms, both open-source and proprietary include Scholastica, ARPHA, Janeway etc. For publications transitioning from legacy systems, migration planning should include careful mapping of existing metadata to new system structures to prevent information loss or corruption.

4.2 Metadata Standards and Interoperability

Metadata - structured information about publications and their content - forms the foundation for discoverability in digital environments. Adherence to established metadata standards enhances interoperability between systems and improves visibility in search engines and databases.

Core Metadata Standards include:

Dublin Core, which provides a basic element set for describing digital resources, serving as a common denominator for interoperability.

JATS (Journal Article Tag Suite) is an XML standard for marking up journal articles, enabling machine readability and format conversion.

Crossref metadata schema is required for DOI registration and ensures comprehensive bibliographic information.

Schema.org enhances discoverability through major search engines by providing structured data markup.

The main interoperability protocols used in scholarly publishing are nowadays:

OAI-PMH (Open Archives Initiative Protocol for Metadata Harvesting) enables automatic harvesting of metadata by aggregators and databases.

REST APIs allow programmatic access to publication metadata for reuse in other systems.

OpenURL facilitates context-sensitive linking to resources across platforms.

The value of metadata increases exponentially when it can be exchanged between systems and combined with other metadata. Publications should therefore prioritize not only the creation of rich metadata but also its exposure through standardized protocols that enable harvesting and aggregation.

4.3 Implementation Recommendations

Based on the analysis of technical infrastructure requirements, we recommend the following implementation approach:

Assess current needs and future goals to select an appropriate publishing platform, with preference for systems that support metadata standards and persistent identifiers.

Define core metadata elements required for various use cases (discovery, citation, evaluation) and establish workflows for consistent metadata creation and validation.

Configure OAI-PMH endpoints and other interoperability mechanisms to expose metadata to relevant aggregators and search services.

Implement DOI registration workflows and ORCID collection processes within the selected platform.

Develop comprehensive training materials for editorial staff to ensure consistent application of metadata standards and identifier systems.

For publications with limited technical expertise, collaboration with library systems departments or national library services can provide valuable support during implementation and ongoing maintenance.

5. Practical Implementation Guidelines

Moldova's national regulations for scientific publications, reflected in the 2025 ANACEC documents (ANACEC, 2025), demonstrate a strategic integration of international standards into the local research ecosystem. The evaluation regulation for scientific journals explicitly incorporates persistent identifiers as essential elements for publication quality and visibility, requiring DOI implementation for articles as a mandatory requirement for B+ category journals and requesting ORCID identifiers for authors and scientific committee members. The classification of journals into categories A+, A, B+, B, and C reflects a gradual approach that encourages publications to evolve from basic compliance to international excellence. For scientific events, the regulation similarly requires the use of DOI for articles in conference proceedings and ORCID for authors and scientific committee members. The implementation of modern platforms such as Open Journal Systems (OJS) is explicitly mentioned as a requirement for higher category journals, while indexing in international databases becomes a fundamental evaluation criterion. These regulations demonstrate that Moldova has adopted a comprehensive approach to align with global standards, transforming persistent identifiers and modern technical infrastructure from mere recommendations into normative requirements, thus

creating a framework that facilitates the integration of Moldovan research into the international scientific circuit.

This section provides specific, actionable recommendations for different stakeholder groups seeking to enhance publication quality, visibility, and impact.

5.1 Guidelines for Journal Editors

Journal editors serve as primary decision-makers in publication quality enhancement initiatives. The following recommendations provide a structured approach to implementation:

Foundational actions include the following steps:

- register with a DOI registration agency (preferably Crossref) through direct membership or a sponsoring organization;
- implement DOIs for all new articles and develop a plan for retroactive assignment;
- establish comprehensive publication ethics policies aligned with COPE guidelines;
- ensure consistent publication schedules with clearly communicated deadlines.
- Technical infrastructure development refers to:
 - migrate to a standards-compliant publishing platform (e.g., OJS) if not already using one;
 - implement HTTPS security for the publication website;
 - require ORCID IDs for corresponding authors, with a plan to extend to all authors;
 - develop standardized templates for article components (abstracts, references, etc.).
- Advanced enhancements that bring added value include:
 - provide content in multiple formats (PDF, HTML, XML) to enhance accessibility and reuse;
 - implement reference linking through Crossref Cited-by service;
 - develop a digital preservation strategy through services like CLOCKSS or Portico;
 - create machine-readable license information for all content.
- Metadata optimization refers to several important steps, such as:
 - ensure abstracts and keywords are available in English even for non-English content;
 - implement structured abstracts where disciplinarily appropriate;
 - include funding information and grant identifiers in standard formats;
 - validate references against the Crossref database during copyediting.

All these enhancements should be implemented progressively. Journal development is not achieved in a single bound but through continuous incremental improvements guided by international standards and best practices.

5.2 Guidelines for Conference Organizers

Conference organizers face unique challenges in quality enhancement due to the time-limited nature of events and diverse submission types. The following recommendations address these specific needs. González-Albo and Bordons (2011) emphasize that “conference proceedings represent a vital component of the scholarly record in many disciplines, yet often receive less attention regarding metadata quality and persistence than journal articles.” Implementing these recommendations helps ensure that conference contributions receive appropriate visibility and recognition.

Foundational actions refer to the following:

- establish rigorous peer review processes with clear evaluation criteria;
- develop detailed submission guidelines that facilitate metadata collection;
- create persistent landing pages for conference proceedings that remain accessible long-term;

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- implement DOIs for all proceedings papers through Crossref membership or sponsorship.
- Technical infrastructure development covers the following:
- implement a conference management system (e.g., Open Conference Systems);
- create structured metadata for all presentations, including those without full papers;
- collect ORCID IDs from all presenters during submission;
- establish standardized formats for proceedings papers with required metadata elements.
- Advanced enhancements that bring added value refer to the following:
- archive proceedings in institutional or disciplinary repositories with proper metadata;
- develop post-conference publication pathways for selected papers in partner journals;
- implement conference series identifiers for recurring events;
- create machine-readable program information using scholarly event description standards.
- Sustainability planning includes the next steps:
- establish clear ownership and maintenance responsibility for proceedings;
- develop succession plans for web resources and identifiers if organizing committees change;
- create documentation of technical processes for future conference iterations;
- establish permanent archives independent of conference websites.

5.3 Guidelines for Librarians and Repository Managers

Academic libraries have evolved from being mere service providers to becoming active partners in the scholarly communication process. Librarians and repository managers play crucial roles in supporting publication quality enhancement through infrastructure, training, and services.

Support services cover aspects, such as:

- provide DOI registration services through institutional Crossref membership;
- offer metadata consultation and validation services for local publications;
- support OJS/OCS installation and configuration for institutional publications;
- develop training programs on persistent identifiers and metadata best practices.
- Infrastructure provision refers to the following activities:
- maintain institutional repositories that comply with metadata standards and support persistent identifiers;
- implement ORCID institutional integration to facilitate researcher ID adoption;
- provide preservation services for local publications through distributed preservation networks;
- support XML creation and validation for publications transitioning to full-text markup.

Advocacy and education are critical components of library activities and cover:

- promote the value of persistent identifiers to institutional stakeholders;
- develop educational materials on publication standards and best practices;
- monitor compliance with funder and national requirements for institutional publications;
- facilitate communities of practice among editors of local publications.
- Assessment and improvement are indispensable to cover the whole development cycle:
- conduct metadata quality audits for institutional publications;

- track citation and usage metrics for publications using institutional infrastructure;
- identify indexing opportunities for qualifying publications;
- benchmark local publications against international standards and recommend enhancements.

5.4 Guidelines for Researchers and Authors

Researchers are not merely passive users of the scholarly communication system; they are active agents whose decisions and practices can directly shape and enhance its overall quality, through their submission practices and venue selection. The following practices can drive quality improvements.

By creating and maintaining ORCID profiles with complete publication histories, by including ORCID IDs in all submissions and peer review activities, by registering for other relevant identifiers (e.g., ResearcherID, Scopus Author ID) and validating institutional affiliations using organizational identifiers (ROR IDs), researchers and authors can significantly enable **identifier adoption**.

Metadata enhancement can be achieved by providing structured abstracts when supported by the publication, by including all required metadata elements during submission (keywords, classifications), by supplying complete and accurate reference lists in the required format and by providing funding information in standard formats with grant identifiers.

Quality advocacy is implemented through consistent steps that prioritize submission to publications that implement persistent identifiers and metadata standards, that serve on editorial boards that are committed to publication quality enhancement, that recommend quality improvements when reviewing for publications and support regional and institutional publications that implement international standards.

Digital research identity management is another critical step, that can be implemented by authors to increase quality and visibility of publications, by creating consistent name formats across publications and platforms, by linking identifiers across platforms (ORCID to Scopus, Web of Science, etc.), by claiming publications in relevant profile systems and by monitoring and correcting metadata errors in published works.

6. Conclusion and recommendations

This paper has presented a comprehensive framework for enhancing publication quality, visibility, and impact through the implementation of persistent identifiers, metadata standards, and supporting technical infrastructure. The Publication Quality Pyramid provides a conceptual model for understanding the progressive enhancement of scholarly publications from basic regulatory compliance through technical infrastructure development to international best practices.

Our analysis demonstrates that persistent identifiers - particularly DOIs and ORCID IDs - serve as critical connective elements in the scholarly communication ecosystem, enabling accurate citation tracking, enhancing discoverability and facilitating participation in global scholarly services. The implementation of appropriate technical infrastructure, especially standards-compliant publishing platforms like OJS, provides the necessary foundation for metadata optimization and identifier integration.

The transformation of scholarly publishing continues to accelerate, with increasing emphasis on machine-readable content, automated discovery, and networked information. Publications that implement the recommendations outlined in this paper will be well-positioned to participate fully in this evolving ecosystem, enhancing their visibility and impact while maintaining compliance with both national and international standards.

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PROMOTING READING IN LIBRARIES FROM THE PERSPECTIVE OF NEW EDUCATION

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Abstract: The article looks at how libraries can get people interested in reading outside of school hours and help them develop the skills they need to get on with day-to-day life. It does this by looking at the ideas suggested by modern education plans. The focus is on trans-literacy and on combining reading skills with media, digital and critical literacies, which makes the library an alternative educational space with both formative and civic impact.

Reading promotion is all about values education, which keeps our culture going, helps us remember our literary history and makes us think about who we are. At the same time, it encourages diversity and a democratic spirit. In the same way, global citizenship education encourages an open attitude towards other cultures and the ability to understand the world through intercultural and critical reading practices. The library also does a lot to promote education for sustainable development, by getting people to debate things like migration, cultural identity and child protection, which helps to cultivate empathy and social reflection. Extracurricular reading also helps with peace education, by encouraging reciprocity and a culture of non-violence, as well as media education, where information literacy is seen as a meta-competence that covers access, analysis and responsible content creation. Libraries are great at encouraging equality and inclusion, helping people understand different cultures and making it easier for everyone to access information. Libraries have a really important role to play in the digital age. They offer people the chance to learn how to use digital tools and get to grips with artificial intelligence. And they do this in really exciting ways, like through interactive learning, using tools that let people work together and digital portfolios. Plus, they encourage people to create their own cool projects, which is great. Also, reading helps you think about health and well-being, education, financial literacy and business education. It uses stories and literature to get you thinking in new ways and to come up with new ideas.

Keywords: digital literacy, functional literacy, media literacy, transliteracy, critical thinking, multiculturalism.

JEL Classification: I21, I23, I25, Z18

1 Introduction

There are more and more library and information science experts saying that libraries are more than just places where you store books. This means that the library is seen as an educational laboratory of the future and a “learning centre” (Lankes, 2012). In this way of thinking, reading is important for helping to develop people into informed, thoughtful, and empathetic global citizens.

Public libraries have always been all about encouraging people to read. But nowadays, there are new challenges and opportunities, because of globalisation, digitalisation, and social and cultural changes. Public libraries are like dynamic educational institutions, bringing together cultural heritage and modern society.

In this context, the idea of “new education” gives libraries a useful way of thinking about how to change their strategies for promoting reading. Changes in education have also had an impact on librarianship, especially when it comes to scholastic methods giving way to more open ways of learning (Manguel, 2022).

In today’s educational discussions, there’s a growing focus on the idea that young people’s learning needs a balanced mix of science and humanities (Wilson, 2019). It’s really important that the library world takes this on board and starts using new information technologies.

The following proposal is hereby submitted for consideration: that public libraries consider the ways in which they might integrate new educational elements into their activities. This objective could be realised through the integration of a transversal infusion within library services, as opposed to the introduction of artificial components. Instead, the emphasis should be placed on a reinterpretation and contextualisation of reading.

2 Education of values

Public libraries play a very important role in sharing classical, humanistic and cultural values. They are always at the forefront of sharing knowledge (King, 2022).

Their collections include well-known books and modern fictional and non-fictional stories. These collections encourage readers to think about how our society has changed over time and the new ideas that have appeared.

One way the library could get involved in education for values is by organising events like reading clubs on ethical themes, thematic exhibitions on the great classics, and comparative interpretation workshops.

For example, a library might organise a public debate on the relationship between written and unwritten laws. They could use Sophocles' "Antigone" as a starting point for this. This approach connects classical literature to modern moral problems, encouraging participants to explore legal literature more deeply.

The library might also invite lawyers to come to the event to offer their advice.

Consequently, reading can be regarded not merely as a form of aesthetic consumption, but rather as a civic and identity exercise that evokes "values and value networks" (Santerres-Sarkany, 2000).

3 Education for the cultivation of global citizenship

The presence of authors from a variety of geographical locations serves to transform the library into a space conducive to intercultural dialogue. By selecting collections and organising multicultural events, public libraries contribute to the formation of a global consciousness.

The organisation of comparative reading workshops between authors from a range of countries, including but not limited to Australia, Japan and China, in conjunction with the hosting of thematic exhibitions dedicated to African or Latin American literature, has been identified as a catalyst for the enhancement of understanding of otherness and the cultivation of tolerance for ambiguity.

Libraries have the capacity to promote interactive media projects, including digital representations of cultural values and visual collages inspired by global literary texts. It is through the implementation of these activities that reading becomes a tool for the cultivation of global citizenship.

In this context, diversity and otherness are perceived as resources rather than obstacles. The recommended reading corpus is indicative of ideological maneuvering within a "field of literary democracy" (Santerres-Sarkany, 2000).

4 Education for sustainable development

The present study commences with Ion Stoica's proposition that "development is nothing more than a synergetic model, based on information, that visionary strategies can integrate" (Stoica, 2010). The researcher identifies in the field of library economics the existence of "an acute need to serve contemporaneity from a development perspective" (Stoica, 2001) and its "imbalances" (Stoica, 2010).

The concept of world political consciousness is defined as the moment when the connection between events becomes clear, and we can understand the political or social community that exists, which Aristotle and the Greeks called the polis (Kearney, 2020).

Literature often contains ideas about people moving from one place to another, and public libraries can use these texts to help people think about what is happening now and what has happened in the past all over the world.

Reading clubs that focus on the books of migrants, people who have been forced to leave their homes, and those who have been sent to live in camps (for example, Ovidiu, Paul Celan, Svetlana Alexievici) can be places where we can understand and think about human crises.

Libraries can organise creative writing workshops and public readings on the topic of identity in the context of globalisation or media projects. These projects allow users to compare how migration is represented in literary texts, memoirs and contemporary press from different eras.

These practices have been shown to encourage reading and also change it into a tool for building a community and its culture, in line with ideas of sustainable development and life within a community horizon (Husserl, 1997).

5 Education for Peace

It has been observed that libraries polarize a multitude of intellectual interests (Petrescu, 2006). It is the responsibility of these institutions to promote a culture of peace and dialogue through reading.

For instance, the organisation of public readings of works such as Tolstoy’s “War and Peace”, Remarque’s “All Quiet on the Western Front”, or contemporary Ukrainian poetry, has been demonstrated to engender profound reflection on the absurdity of war and the imperative for reconciliation.

Research could look at how soldiers’ literary diaries or discussions about the role of literature in peacebuilding could be included in reading promotion programmes.

This makes the library a place where people can come together and show that they care about each other.

6 Media and Information education

These days, we’re seeing a new media-culture popping up everywhere you look (Santerres-Sarkany, 2000).

In a “telematic” society, where there’s loads of information flowing around (Enache, 2008), public libraries have to take on the job of teaching their users how to use media and information skills.

When we think about “homo videns” (Sartori, 2008), making literary or infographic podcasts about characters, and comparing literary texts with their film adaptations, can help people improve their media literacy and reduce the number of people who can’t read well.

The idea of digital reading is becoming more and more important in academic discussions (Stoica, 2013). Digital activities (like podcasts, literary blogs and interactive games) change reading into a multimodal experience. This means that the reader has the role of both receiver and creator of content, as well as promoter of ideas and good practices.

As Nelly Țurcan says, it is very important to study how people read in the digital environment (Țurcan, 2020). This environment is becoming more and more important.

7 Education for equity and inclusion

As Horvat says, public libraries can make the most of their social function by taking advantage of the diversity of authors, titles, and themes to encourage social inclusion (Horvat, 1996).

Some examples of this kind of programme include feminist reading programmes (Virginia Woolf, Simone de Beauvoir), workshops on gender bias (as exemplified by Henrik Ibsen’s “Nora”), and collaborative projects on unity in diversity in books on philosophy, sociology, jurisprudence, and so forth.

These programmes have the capacity to raise awareness of gender, ethnicity, and social status differences in the community.

In this sense, as Gottschall asserts, “people can be made to think differently about sex, race, class, gender, violence, ethnicity, and just about anything else based on a single story” (Gottschall, 2019).

Consequently, reading becomes an exercise in recognition and respect for otherness, with the library serving as the space where all users feel represented and included within the sphere of “social literacy” (Lankes, 2011).

This concept involves marginalized groups, including socioeconomically disadvantaged communities, girls, and children with special needs (Chanchal, 2022). Consequently, a community synergy of individuals is produced.

8 Education for digital skills and AI

The user of library services is posited as an “informational being” (Stoica, 2013).

As early as the turn of the millennium, Alexe Rău proposed a “cybernetic” model of library management, predicated on the premise of “optimal adaptability and therefore of a harmonious evolution” (Rău, 2000).

Public libraries, in their capacity as centres of extracurricular and lifelong learning, already integrate digital skills and AI in promoting reading practices. Projects involving the use of interactive applications, the creation of digital portfolios, the generation of visual content with the help of AI or the organisation of podcasts transform reading into an experience connected to new technologies and paradigms of virtual knowledge.

Through these activities, the library responds to the demands of digital natives and contributes to the formation of citizens capable of using technology in a responsible and creative way is now a necessity, because of the existence of virtual settlements (Perpelea, 2015), which are definitely changing the social picture.

9 Education for health and wellness

Husserl made a diagnosis: European countries are in bad shape, and Europe as a whole is in a crisis (Husserl, 1997).

It is clear that books about art show many different images of illness, life's big questions and how people can deal with hard times. For this, we need a collection of important books. These include personal development books, philosophical essays, anthropological studies, biological texts, and psychoanalytic and psychological studies.

It is suggested that public libraries can organise discussions to encourage people to think about their physical and mental health.

Reflective writing workshops and therapeutic reading groups are tools for promoting emotional balance and well-being through reading, a form of “bibliotherapy” (Gherghel, 2018), which can come before the process of a subsequent “psychotherapy” (Cordoş, 2004).

The book's visual appeal is enhanced by its healing powers, which make it a great source of comfort and emotional support.

10 Financial and Entrepreneurial education

As Santerres-Sarkony point out, the idea of a market economy and the economy of needs can also be applied to library users (Santerres-Sarkony, 2000).

Public libraries can make good use of literary resources to help people learn about finance and become more entrepreneurial, arising from temporary needs (Toffler, 1973), which are defined by contemporary demands.

The extensive bibliography in the economic field that is available in libraries should be utilised in this context.

Thematic exhibitions on the subject of thrift or enterprise, in conjunction with reflection workshops on the relationship between financial resources and autonomy, metamorphose reading into a medium for economic learning and training as “education for competition” (Stoica, 2009).

Furthermore, libraries have the capacity to organise interdisciplinary projects, such as “literary business plans” inspired by works, with the potential to stimulate creativity and critical thinking.

The organisation of such debates may be undertaken with the participation of economists, managers and other relevant parties. The organisation of contests and book battles on this theme is a possibility.

Conclusions

The public library has evolved into a pivotal institution that transcends its traditional role in preserving written memory.

Instead, it has emerged as a crucial agent in the cultivation of responsible, creative, and empathetic citizens.

In this capacity, the library functions as an instrumental catalyst in nurturing the “competent citizen” (Lau, 2010).

The infusion of new educational elements into reading promotion activities enables libraries to evolve into cultural institutions and centres for shaping the democratic and sustainable future of the community.

As stated by Țurcan N., “in an efficient and innovative library, training will never stop” (Țurcan, 2023).

This policy will be applicable to all individuals associated with the company, including its users, staff, partners, and even its founders, if deemed necessary.

The promotion of reading in public libraries, from the perspective of new educational approaches, necessitates the transcendence of a conventional methodology and the transformation of the library into a laboratory of learning, dialogue and critical reflection.

The integration of education for values, global citizenship, sustainable development, peace, media, equality, digital and AI skills, health, financial and entrepreneurial education offers a complex perspective on the role of the library in contemporary society.

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ASPECTS OF ARTIFICIAL INTELLIGENCE IN THE PROTECTION OF INTELLECTUAL PROPERTY OBJECTS

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Abstract: The article addresses aspects regarding the benefits and risks of using Artificial Intelligence (AI) in the field of Intellectual Property (IP), highlighting both the opportunities and the challenges it generates. It highlights the importance of protecting intellectual creations in the digital age, in which innovation and economic competitiveness are conditioned by the existence of effective legal mechanisms. In this context, the main concepts are defined: types of artificial intelligence (narrow, general, generative), the main areas of intellectual property (patents, trademarks, copyrights, industrial designs) and categories of objects influenced by intelligent technologies (software, automatically generated works, AI-assisted inventions).

The application of AI in the protection of IP objects is reflected in high-performance tools for detecting plagiarism and counterfeiting, algorithms for monitoring online markets, data analysis on work registration certificates, patents, trademarks, as well as digital document management platforms. On the one hand, artificial intelligence brings significant benefits, such as increased efficiency, reduced costs, increased accuracy and rapid access to information; on the other hand, it also involves immense risks, including the lack of a uniform legislative framework, ethical dilemmas related to artificial creativity, the proliferation of deepfakes and vulnerabilities regarding data security. This tool offers major opportunities for technological and economic progress, but also involves complex challenges, which require legal, ethical and security solutions adapted to new realities, solvable through international cooperation and by training specialists capable of managing the impact of the convergence between AI and Intellectual Property.

Keywords: intellectual property, intellectual property objects, artificial intelligence, copyright protection, legislative framework.

JEL Classification: K24; O34; O38

1 Introduction

The exponential development of artificial intelligence technologies has generated profound transformations across multiple fields, including that of intellectual property. Machine learning algorithms, neural networks, and data-driven systems are no longer merely support tools but active participants in the processes of creation and innovation. These technologies not only redefine the boundaries of human knowledge but also the ways in which such creations can be protected under the law. In this context, the importance of intellectual property goes beyond the legal world, becoming an ethical and strategic issue that is also important for the economy. This idea is supported by Maskus and Reichman (2004) in their analysis of protecting intellectual property in the globalised world (Maskus & Reichman, 2004).

This article looks at how artificial intelligence and intellectual property overlap, and highlights laws, rules and practices that protect new creations. It does this by checking official and academic sources. The article's aim is to encourage scientists to talk to each other and help

institutions decide how to protect copyright, offering a balanced view of the role of intellectual property in modern research.

Specialized literature and practical examples clearly show that the legal framework needs to be adapted to the new realities brought about by Artificial Intelligence. The current rules on intellectual property often don't work well. This is because intelligent technologies are changing so quickly. This creates complicated issues around ownership and use. These issues lead to legal disputes and intense debates in our countries, in Europe, and around the world. This raises important questions about how advances in artificial intelligence affect scientific research and the challenges and opportunities that come with protecting new ideas created using AI.

Intellectual property management is a key part of scientific activity. It helps to encourage creativity and new ideas, and it supports the continued growth of society. At present, innovation originating from the academic environment plays a major role in the evolution of human knowledge, while copyright protection remains indispensable for ensuring continuous progress in research (Popovici, 2024). Artificial intelligence, due to its ambiguous role, has attracted significant attention among international communities dealing with IP-related matters. On one hand, artificial intelligence opens new horizons for innovation and creativity, offering powerful tools for the development of next-generation products and services; on the other hand, it significantly alters the structure of the creative sector, affecting the economic incentives of humans to create original works.

The World Intellectual Property Organization (WIPO) draws similar conclusions in its recent study on the economic perspectives of the interaction between artificial intelligence and intellectual property, clearly indicating the dual effect of artificial intelligence mentioned above (Cuntz, Fink, Stamm, 2024). However, at the core of discussions among WIPO experts and jurists lies the fundamental question: *Who owns the output generated by AI?*

According to current European and national legislation on copyright and related rights, protection is granted only to works created by humans. Thus, scientific creations, music, paintings, and other texts generated by artificial intelligence remain in a legal gray area. Consequently, further questions arise, such as: if no human author is involved, can such works be protected by copyright? Or, if a person provides input data to the AI, does that person become the author of the output? These questions are not merely theoretical - they have real implications for IP right holders, developers, and users of AI systems (*Legal Aspects*, August 18, 2025).

The provision that copyright must belong exclusively to natural persons is reiterated in the *Strategy on Artificial Intelligence* (2023), issued by the Court of Justice of the European Union (CJEU). This document explicitly excludes machine-generated content from copyright protection. Moreover, the EU Intellectual Property Office (EUIPO) recently (2025) published its strategic plan *The Development of Generative Artificial Intelligence from a Copyright Perspective*, which encourages IP right holders to view artificial intelligence as an opportunity (EUIPO, 2025). It proposes the implementation of direct licensing contracts through which IP right holders could control how their works are used, receive fair compensation, and benefit from transparency throughout the entire process. At the same time, developers would enjoy a clear legal framework, reduced litigation risks, improved data quality, and greater scaling potential.

This legal and ethical dimension directly intersects with economic realities, since technological progress and creativity cannot be separated from the fundamental role that innovation plays in the development of society. To understand the complexity of the relationship between Artificial Intelligence and Intellectual Property, we identified the key concepts from informational, technological, legal, and economic perspectives. In this regard, presenting the conceptual framework of advanced technological tools constitutes a necessary premise for elucidating the intersection between artificial intelligence and the system for protecting intellectual creations.

2 Definition of Key Concepts

Intellectual Property (IP) represents the set of exclusive rights granted to creators and innovators over intellectual products resulting from human creative activity. It reflects a balance between the interests of creators/innovators and the public's right to access knowledge and culture. As a fundamental concept, IP is a legal field encompassing all norms that regulate the protection of creations of the human mind, whether they are scientific, artistic, literary, technical, or commercial in nature.

The notion of exclusive right grants the holder the authority to decide how their creation is used (reproduction, distribution, communication, sale, licensing, etc.), while the balance of interests principle ensures that the IP system protects authors and inventors, but also includes certain limitations and exceptions (e.g., citation, educational use, compulsory licenses).

According to the *World Intellectual Property Organization (WIPO, 2022)*, the main concepts of IP include:

Copyright and related rights – protect literary, scientific, and artistic works (books, music, films, software, databases, academic papers).

Industrial property:

Patents – protect new and industrially applicable technical solutions.

Trademarks – distinctive signs (logos, names, slogans, sounds) that differentiate products or services.

Industrial designs and models – protect the aesthetic appearance of products.

Geographical indications and designations of origin – link a product to a region (e.g., wines, cheeses).

Trade secrets – confidential information with economic value.

Modern notions:

Software and Artificial Intelligence – fall under copyright or patent law, with ongoing debates regarding AI-generated content.

Intangible assets – know-how, data, algorithms, brands, reputation.

Licensing and technology transfer – mechanisms through which IP becomes an economic resource.

Open access and open source – alternative rights management models promoting free access to knowledge and collaborative innovation.

In essence, today IP is no longer limited to the protection of traditional creations - it also serves as a strategic instrument for innovation, economic competitiveness, and cultural development, adapted to new technological realities such as digitalization, AI, blockchain, and big data.

Artificial Intelligence (AI) is an interdisciplinary field of computer science aimed at developing systems capable of performing tasks that require human intelligence, such as learning, reasoning, pattern recognition, or natural language processing. According to Russell and Norvig (2021), Artificial Intelligence can be defined as „the study of intelligent agents capable of perceiving their environment and acting to maximize their chances of success.”

In the specialized literature, Artificial Intelligence is classified into several categories:

Artificial Narrow Intelligence (ANI) - systems designed for specific tasks, such as facial recognition, automatic translation, or virtual assistants (Kaplan & Haenlein, 2019).

Artificial General Intelligence (AGI) - a hypothetical form of AI with the ability to learn and perform any intellectual activity that a human can (Bostrom, 2014).

Generative Artificial Intelligence (GenAI) - a modern subset of AI based on advanced neural networks, capable of creating original content (texts, images, music), such as GPT or DALL·E models (Floridi & Chiriatti, 2020).

Thus, Artificial Intelligence is not merely a technological tool but also a catalyst for societal, economic, and legal transformations, including within the field of Intellectual Property. Consequently, the emergence of works and inventions generated partially or entirely by autonomous systems intensifies the debate over ownership rights, the boundaries of legal recognition, and the methods of preventing infringements. Therefore, protecting IP objects in the digital era is essential for maintaining the balance between open access to knowledge and the fair reward of creators and innovators. In a world where AI increasingly influences content creation, it is crucial to remain vigilant and to develop as informed and responsible consumers of information.

Intellectual Property Objects Influenced by Artificial Intelligence

With the rapid development of Artificial Intelligence, new challenges arise for the legal framework of Intellectual Property, as technology generates or assists in the creation of intellectual works. Among these are:

Software - considered both a copyright-protected object and, in some jurisdictions, a patentable invention. AI algorithms and models raise questions regarding ownership rights (Samuelson, 2016).

Automatically generated creative works - texts, music, or visual art produced by generative systems. The central issue lies in identifying the author: is it the programmer, the user, or the system itself? (Gervais, 2019).

AI-assisted inventions - Artificial Intelligence contributes to the innovation process by identifying molecules in medicine, optimizing materials, or developing technical solutions. The current legal debate concerns whether AI should be recognized as an inventor or whether this status should remain exclusive to natural persons.

Thus, the impact of Artificial Intelligence on Intellectual Property is profound and multidimensional, requiring a reevaluation of traditional concepts such as author, inventor, and rights holder.

3 Applications of Artificial Intelligence in Intellectual Property Protection

Artificial Intelligence is fundamentally transforming the way Intellectual Property (IP) is protected and leveraged, offering advanced tools for preventing infringements and streamlining legal and administrative processes. One of the most prominent applications is the use of AI systems for detecting plagiarism and counterfeiting. Models based on natural language processing, convolutional neural networks, and signal analysis algorithms can identify textual, visual, and audio similarities, even when these are partially disguised through paraphrasing, graphic alterations, or sound distortions. Such solutions support academic institutions, publishers, and rights holders in defending the integrity of creative works.

At the same time, real-time monitoring algorithms for markets and online platforms play a major role in detecting counterfeit products and abusive use of trademarks. Automated analysis of listings, commercial descriptions, and product images enables the rapid identification of irregularities, significantly reducing response time compared to traditional methods.

Another field of application is the analysis of patent and trademark data through machine learning. Automatic classification of patent documents, identification of emerging technologies, and assessment of similarity between trademarks are made possible by state-of-the-art machine learning algorithms and neural networks. These technologies facilitate the work of Intellectual Property offices as well as strategic innovation and technology transfer processes.

Moreover, intelligent platforms for IP document management and archiving integrate OCR (Optical Character Recognition), multimodal recognition, and semantic tools to ensure the rapid and secure retrieval of information, as well as compliance with international standards (WIPO ST.96; ISO 15489). Integrating OCR into IP protection means that intelligent document management and archiving systems (for patents, trademarks, designs, and publications) use OCR for:

Digitizing historical archives (printed patents, technical descriptions, journals);
Semantic search within documents that would otherwise exist only as images;
Recognizing drawings or technical figures (in combination with computer vision);
Workflow automation - extracting metadata, indexing by keywords, identifying claims or brand names.

International examples: WIPO & EPO

WIPO PATENTSCOPE – many historical patents were published only on paper or as scanned images. Through OCR integration, these documents have become fully searchable, allowing users to directly search for technical terms in descriptions and claims.

EPO (European Patent Office) has applied OCR to millions of pages from collections prior to 1978, when patents existed only as facsimile scans. As a result, researchers can perform semantic analysis and text mining on historical patents, tracing technological evolution over time.

National example: AGEPI (Republic of Moldova)

The Official Bulletin of Industrial Property includes patents, trademarks, and industrial designs. In older editions (1990s – early 2000s), documents were published only as images.

OCR integration allows for:

Automatic extraction of data about inventors, patent titles, and technical descriptions;

Indexing of documents within digital catalogs of technical and scientific libraries;

Enabling researchers to search for specific terms directly within patent documents.

Thus, OCR technology emerges as a key element in the process of transforming Intellectual Property collections into a modern, accessible, and interconnected digital heritage. By automating workflows and ensuring a higher level of data security, these systems optimize operational efficiency and guarantee the long-term preservation of documents. In this context, OCR plays a decisive role in converting traditional IP archives into dynamic digital resources that are easily usable for research, innovation, and legal protection. The integration of Artificial Intelligence-based solutions further enhances this transformation by strengthening rights protection mechanisms and reinforcing the infrastructure necessary to foster innovation and economic competitiveness.

4 Benefits of Using Artificial Intelligence in the Protection of Intellectual Property

The integration of Artificial Intelligence (AI) into the field of Intellectual Property (IP) protection offers multiple strategic and operational advantages:

Efficiency and reduction of processing time for Intellectual Property applications represent one of the most evident benefits. Traditional processes - particularly those related to patent examination—involve the analysis of vast volumes of technical and legal documents, requiring significant human resources and extended durations. By integrating machine learning algorithms, Intellectual Property offices can automate patent classification, identification of international classification codes (IPC/CPC), and correlation with relevant scientific literature. This automation does not completely replace the work of examiners but allows them to focus on complex aspects, considerably reducing case resolution time and contributing to greater procedural transparency (WIPO, 2019).

Increased accuracy in detecting Intellectual Property infringements is also a major benefit. Algorithms based on natural language processing (NLP) and image recognition enable the identification of plagiarism, counterfeiting, or similarities between trademarks and products - even when these are disguised through paraphrasing, graphical alterations, or distortions. Audio-video analysis systems, including deepfake detection technologies, provide additional support in ensuring the authenticity of digital creations (EUIPO, 2022). Thus, Artificial Intelligence significantly enhances institutions' ability to respond promptly and precisely to potential abuses, reducing the risk of financial or reputational loss for rights holders.

Cost optimization in monitoring and litigation represents another significant advantage. Traditionally, identifying and documenting IP infringement cases required laborious investigations and substantial financial resources. Through the automated monitoring of online platforms, marketplaces, and databases, Artificial Intelligence reduces manual effort and enables rapid selection of cases with a high likelihood of infringement. This leads to lower investigation-related costs, fewer unnecessary lawsuits, and increased legal efficiency (OECD & EUIPO, 2021).

Rapid and integrated access to international databases. IP offices and users can simultaneously query sources such as WIPO PATENTSCOPE, EPO Espacenet, USPTO, or commercial databases using semantic searches, machine translation, and metadata extraction algorithms. Consequently, the process of identifying technological prior art or trademark conflicts becomes much faster and more reliable (EPO, 2022). This cross-border interconnectivity plays a decisive role in the context of market globalization and the growing volume of digital creations.

The use of Artificial Intelligence in the protection of Intellectual Property thus provides a wide range of benefits - from administrative efficiency and increased precision in detecting infringements to cost optimization and easier access to international resources. These advantages strengthen not only legal protection systems but also the infrastructure necessary to foster innovation, competitiveness, and international cooperation.

5 Challenges and Risks of Using Artificial Intelligence in the Protection of Intellectual Property

The development of Artificial Intelligence (AI) technologies brings undeniable benefits to the protection of Intellectual Property (IP) objects. However, the integration of these technologies also entails a series of challenges and risks that affect the legislative, ethical, technological, and social environments alike.

A first major difficulty lies in the *lack of a uniform legislative framework* regarding Artificial Intelligence and Intellectual Property. Currently, international regulations differ significantly in terms of recognizing AI-generated creations, determining ownership rights, or assigning legal responsibility for infringements committed through autonomous systems. This lack of harmonization creates legal uncertainty and complicates the enforcement of IP rights, especially in cross-border cases (WIPO, 2020).

Another challenge concerns the *ethical issues* surrounding the relationship between human and artificial creativity. The emergence of works generated partially or entirely by Artificial Intelligence raises fundamental questions: Can AI be considered an “author” or “inventor”? What role does human contribution play in an automated creative process? In the absence of clear answers, there is a risk of undermining the value of human creativity, which may lead to cultural and economic imbalances (Floridi, L., Cowls, J., 2021).

A particularly pressing technological risk is the *proliferation of deepfakes and advanced forgeries*. Generative algorithms, such as Generative Adversarial Networks (GANs), enable the creation of highly realistic visual or audio content that is difficult to distinguish from authentic material. In this context, copyrights, trademarks, and even personal identity can be manipulated or misappropriated, complicating the work of protection institutions and law enforcement agencies (Chesney, R., Citron, D., 2019).

Equally important are the *risks associated with data security and confidentiality* in AI systems. IP protection infrastructures rely on large datasets, including legal documents, patents, and sensitive commercial information. Cyber vulnerabilities can allow unauthorized access to such data, with serious consequences for economic competitiveness and national security. At the same time, data collection and processing raise concerns about compliance with privacy regulations, such as the European *General Data Protection Regulation (GDPR)* (Veale, M., Borgesius, F. Z., 2021).

Although AI opens significant opportunities in the IP field, the associated risks - lack of uniform regulation, ethical dilemmas, proliferation of digital forgeries, and data security vulnerabilities - require a *cautious and balanced approach*. We can only deal with these challenges and turn them into opportunities for improving how we protect intellectual property if we work together internationally and develop the right rules and technology.

6 Conclusions

When we look at the problems and risks of using artificial intelligence in the area of Intellectual Property, we see a complicated situation where new technology, laws and ethics all meet. Although artificial intelligence has the potential to greatly benefit the processes of creating, detecting and protecting innovations, it also raises many questions regarding authenticity, property rights and information security.

There is a lack of coordinated legislation at an international level. This makes things more uncertain when it comes to copyright and the establishment of legal liability. The idea of *artificial creativity* means that the traditional notion of human originality needs to be rethought. In today's digital world, protecting intellectual property is crucial to maintaining its value and integrity.

Innovation is very important for economic and social progress. Protecting ideas and creations legally is also important. This encourages investment, helps technology to be shared, and makes countries and organisations stronger.

It is very important to update and adapt the laws about intellectual property to the new realities created by the development of artificial intelligence. This is so that we can make the most of this technology in a sustainable way.

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PERSONAL LIBRARIES AND AI-ASSISTED READING: OPPORTUNITIES, RISKS, AND RESEARCH DIRECTIONS

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Abstract: The article investigates how artificial intelligence (AI) can be integrated into the study, organization, and reinterpretation of personal book collections. The aim is to explore how AI transforms personal libraries from static archives into dynamic, self-reflexive systems capable of generating meaning, predicting reading needs, and personalizing intellectual experiences. The research uses a qualitative case study based on the author’s own library, focusing on a corpus of over thirty titles related to Homer. Through algorithmic analysis and structuring, the initial accumulation of books was transformed into a coherent reading itinerary, guided by thematic, chronological, and interpretative connections. The methodology combines bibliographic mapping, AI-assisted data structuring, and hermeneutic interpretation. Findings reveal that AI tools can optimize reading time, enhance comparative comprehension, and support cognitive retention, turning the library into an intellectual laboratory. However, the study also identifies risks: algorithmic uniformity, the loss of material engagement with the book, and reduced reader autonomy. The article proposes hybrid models where AI complements rather than replaces human discernment, envisioning reading as a co-creative process between human and machine. Thus, personal libraries become predictive and affective archives that reflect both cultural memory and cognitive identity.

Keywords: Personal libraries, artificial intelligence, AI-assisted reading, algorithms, cognitive mapping, reader autonomy, cultural memory.

JEL Classification: D83, L86, O33, Z11, Z18

1 Introduction

The personal library can be viewed as a material embodiment of the educational endeavor centered on the competence of “learning to learn” (lifelong learning). Evoking the idea that listening to a lecture “is in many respects like reading a book”, Mortimer J. Adler and Charles Van Doren develop the analogy between a teacher present in the classroom and a book as an absent teacher – one that nevertheless encourages independent inquiry: “If you ask a living teacher a question, he will probably answer you.

If you do not understand something he says, you can save yourself the trouble of thinking by asking him what he means. But if you ask a question of a book, you must answer it yourself. In this respect, a book is like nature or the world: if you question it, it will only answer you to the extent that you think and reason for yourself” (Adler and Doren, 2014).

Within this perspective, the personal library becomes not merely a repository of books, but a space of continuous learning – an adaptive environment shaped by changing intellectual and professional needs that extend beyond formal education.

Reading, understood as a form of intellectual labor that requires discipline, specific skills, and sustained attention, also becomes a form of solitary inquiry and self-dialogue. It acquires the

value of meditation or introspection, a dialogue with oneself or with the text of the book, helping one to preserve integrity, strengthen mental resilience, and reaffirm one's value orientation in a turbulent world. It is not necessarily about building an ivory tower of comfort from books, but rather about maintaining an individual culture or art of solitary reading, in which active focus and analytical assimilation of ideas become the main instruments of intellectual development. This, in turn, does not isolate us from the world, but rather makes our relationship with it more conscious, deliberate, wise, active, and responsible.

In 2019, a group of twelve artificial intelligence experts convened to analyze, within a scenario-based workshop, the results of an extensive Delphi study dedicated to the future of artificial intelligence.

The meeting aimed to address three fundamental questions: which AI-based applications would be desirable in a decade's time; what technological and social crossroads could determine the direction of AI development – toward progress or risk; and, finally, how national policies and European regulations could contribute to making an optimistic future for Europe by 2030 more likely. From this discussion emerged a complex yet coherent picture of the aspirations related to AI use.

Among the most notable outcomes of the reflection were ideas such as the development of personalized medicine capable of revolutionizing diagnosis and treatment through precision and anticipation; the emergence of intelligent tutors that accelerate learning processes by adapting to each learner's rhythm and style; and the design of digital assistants able to take over repetitive tasks – from routine shopping to the automatic completion of tax returns.

At the same time, the experts emphasized the importance of “intelligent support for individual work organization (for example, prioritizing tasks) and for scheduling. Such a system should also include sufficient leisure, rest, and quality time” (Ramge, 2020).

The encounter between personal libraries and artificial intelligence tools opens a promising field of research, situated at the intersection of bibliology, information science, and reading studies. The personal library today expands its functionalities and takes shape as a dynamic archive that can be reconfigured through algorithms for organizing, classifying, and contextualizing readings.

This reconceptualization implies not only a change in perspective on the material object of the book, but also a shift in the hermeneutic paradigm: reading becomes simultaneously an individual and a technologically assisted act, in which the interaction between human and algorithm produces new forms of textual (informational) comprehension.

We may assume that artificial intelligence can assist the reader in two fundamental directions. The first concerns the structure of the collection: through automatic indexing, metadata generation, identification of thematic connections, and the elaboration of personalized recommendations (reading itineraries, conceptual maps, interpretive patterns, etc.), the personal library becomes a self-reflexive system capable of suggesting alternative reading paths.

The second direction concerns the reading process itself: digital tools allow the optimization of reading time, the stimulation of memory and retention capacity, and the intensification of interpretations and comparative connections. Algorithms can signal correspondences, recurring themes, stylistic evolutions, or intertextual dialogues (in the case, for example, of literary texts), but the responsibility for critical judgment and value selection remains with the reader.

2 Rethinking the Personal Library in the Age of AI-Assisted Reading

AI-assisted reading thus acquires an interdisciplinary dimension, as it can integrate linguistic, thematic, and quantitative analyses applicable to the corpus of a personal library. The advantages of this model are many: rapid access to information, personalization of reading paths, increased cognitive comfort, and the possibility of extending the volume of assimilated knowledge. However, risks must also be assessed.

Among these are the danger of interpretive uniformity (by reducing hermeneutic diversity to a few algorithmic patterns), the diminishing of direct contact with the materiality of the book (an essential dimension of the reading experience), and the risk of excessive dependence on technological tools, which can erode the reader's critical autonomy.

Nick Bostrom proposes a well-known typology: AI as “oracles, genies, sovereigns, and tools” (Bostrom, 2016). In the context of the personal library, while AI may serve as a useful tool (a classifier, a recommender), it can also become a “sovereign” monopolizing access to knowledge. If the reader relies exclusively on the algorithm, the personal library ceases to be a space of intellectual freedom and becomes a territory governed by opaque logics. Hence the paradox: the more “intelligent” the personal library becomes, the greater the risk of diminishing the reader's autonomy.

Consequently, a relevant research direction in this field lies in developing hybrid models for organizing personal libraries, in which artificial intelligence does not substitute but rather complements the reader's discernment. AI-assisted reading should be understood as a process of intellectual co-creation rather than a simple externalization of memory – a process in which the algorithm and the human subject collaborate in generating meaning and expanding the horizon of knowledge.

Kissinger, Schmidt, and Mundie warn that AI is transforming not only science but also global relations: “the development of AI systems is capable of radically transforming our perception of reality and truth; the very process of cognition; and the biological evolution of humankind” (Kissinger et al., 2025). A predictive, AI-assisted library could anticipate the reader's needs, with the algorithm suggesting volumes from the collection based on biographical contexts (age, career, social events).

Likewise, AI can detect in an individual's readings patterns of preference, thematic obsessions, and cognitive gaps. As a result, a “textual portrait” of the library owner – a kind of intellectual radiography – can be created, which in turn becomes a valuable research source.

Bibliographic sources in the field of AI suggest several research directions regarding the relationship between the collection of a personal library and AI tools: the affective mapping of reading, the transformation of the reader's intellectual portrait under the influence of AI, and the algorithmic anticipation of reading and research trajectories.

3 Case Study

In the current context, marked by the rapid development of AI, a new paradigm is taking shape: the library is no longer merely a collection, but a dynamic network of sources that can be reconfigured through digital tools into genuine maps of reading. A striking example is the way in which a list of titles dedicated to Homer from our own library was transformed, with the help of AI, into a coherent itinerary of research and reading.

The corpus (the list of books from the personal library) that we have offered to the AI algorithm for qualitative and quantitative reading analysis included over thirty titles: major monographs, multiple translations of the “Iliad” and the “Odyssey” in Russian, Romanian, and German, thematic studies (on the myth of Helen, the topography of Ulysses, the relationship between Homer and Hesiod), as well as editions of the “Homeric Hymns” and the parodic poem “The Battle of Frogs and Mice”. Such diversity risked becoming overwhelming: instead of a guiding thread, the reader faced an almost chaotic list. The intervention of AI radically changed this situation.

First, the algorithm proposed a phased structuring. Instead of starting directly with the epics, it recommended a preliminary stage of historical and archaeological context, followed by monographs on Homer's life and era. Only then did it proceed to the “Iliad” and “Odyssey”, beginning with a “canonical” translator and later comparing multiple versions.

In parallel, auxiliary texts – the hymns, apocrypha, and scholarly commentaries – were distributed across later stages to strengthen analysis. This sequencing produced a clear epistemic effect: from the chaos of accumulation emerged a reading map in which each volume had its place and function.

A second level involved the qualitative analysis of connections. AI suggested correlations between studies on the Trojan War and translations of the epics, between research on Ulysses’ journeys and literary commentaries.

Thus, the library began to take shape not as a list but as a network of meanings, in which the reader could trace themes such as historical memory, the image of the journey, and the structure of myth. Highlighting these internal links stimulated a comparative reading, richer than mere linear progression.

A third level was the quantitative dimension. The algorithm estimated the time required to read the corpus – about thirteen months at a rate of two to three hours of daily reading – dividing the plan into two- to three-month phases. This temporal concretization transformed the project into a realistic program, with measurable goals and a sustained rhythm. The personal library thus became a pedagogical laboratory, where reading was not only a pleasure but also an exercise in intellectual discipline.

This case study shows how AI can enhance the value of a personal library. From a simple corpus of disparate titles, digital tools can construct a coherent reading strategy: logical sequencing, thematic connections, temporal quantification, geographical extension. The risk of interpretive uniformity and the illusion of exhaustiveness remain, yet the reader’s critical responsibility is not diminished but, on the contrary, reinforced. The choice of path belongs to the human being, while AI provides maps, compasses, and instruments of orientation.

In conclusion, the personal experience of reading Homer through one’s own library, reconfigured with the support of AI, exemplifies how technologies can reshape our relationship with books.

The personal library becomes an augmented space – a living archive, a matrix of knowledge, a laboratory of reflection. In this sense, the case study dedicated to books by and about Homer (and his fictional universes) is not merely an individual experience, but also an argument for reconsidering the role of AI in managing private cultural heritage for purposes of self-education, professionalization, and lifelong learning.

4 Conclusions

The integration of artificial intelligence into the management of personal libraries and the construction of reading plans opens an interdisciplinary field of research at the intersection of bibliography, reading studies, and information science.

The AI-assisted personal library occupies a frontier zone between memory and prediction, between the owner’s identity and a network of interconnected meanings. On one hand, it promises numerous advantages related to the qualitative and quantitative organization of reading. On the other, it raises profound dilemmas concerning the autonomy of the reader, algorithmic control, and the very nature of knowledge itself.

In this context, the philosophical reflection on the limits of artificial intelligence becomes essential. As the researcher Yvonne Hofstetter observes, “it certainly seems that intelligent machines, in the long run, will only be able to imitate human emotions, creativity, and instinct. What will remain, in the long term, as a distinguishing feature for us are precisely those Kantian qualities of conscience, sense of responsibility, and the capacity for moral action.

These are precisely the cause and purpose of the human being as the ‘crown of creation’. In the long run, it is hard to see why machines – no matter how intelligent and human-like they may appear – should ever be anything other than created objects, nothing more than a new repertoire

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of instruments: perfected and more advanced, indeed, but still a set of tools that serve humanity and remain under human control. One simply needs to make that clear” (Hofstetter, 2014).

This perspective reinforces the idea that, even within algorithmic environments, personal libraries retain their anthropocentric core: they remain extensions of human consciousness and moral agency rather than its substitutes. Artificial intelligence can enhance the organization and accessibility of knowledge, but the ethical and existential dimensions of reading continue to belong to the human domain.

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EXTRACURRICULAR ACTIVITIES FOR DEVELOPING PROFESSIONAL SKILLS IN A LINGUISTIC AND INTERCULTURAL CONTEXT

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Abstract: In an increasingly globalized educational context, extracurricular activities are becoming essential tools for developing students' professional skills. They contribute not only to enriching theoretical knowledge, but also to developing the practical skills needed in a dynamic professional environment. By participating in panel discussions, round tables, workshops, debate clubs, international competitions, exchange programs, etc., students improve their language skills, critical thinking, and adaptability. The linguistic dimension of these activities promotes the improvement of communication skills in various languages, providing students with opportunities to interact with colleagues and professionals from different cultures. At the same time, the intercultural component allows them to develop tolerance, flexibility, and understanding of diversity, which are essential skills in fields such as international business, diplomacy, or global management. The study analyses the impact of extracurricular activities on students' professional training, highlighting their benefits in terms of developing leadership, collaboration and decision-making skills. At the same time, examples of good practices in ASEM that promote multilingual and intercultural education through various extracurricular initiatives are presented. In conclusion, the integration of extracurricular activities into the educational process contributes significantly to the development of professional skills, preparing students for the challenges of a globalized and intercultural work environment.

Keywords: extracurricular activities; non-formal education; professional competences; globalization; multilingualism; interculturality.

JEL Classification: I23, I25, Z18

1 Introduction

In the current context of globalization and internationalization of educational processes, universities are called upon to rethink their objectives and methods of professional training. The focus is gradually shifting from the transmission of theoretical knowledge to the development of transversal skills, which are essential for effective integration into an increasingly globalized labor market. In this sense, extracurricular activities become valuable complementary tools, facilitating the integration of students into culturally and linguistically diverse environments.

This research explores three main areas of analysis: the theoretical and methodological foundations of extracurricular activities, their role in the development of professional skills, and the integration of linguistic and intercultural dimensions into non-formal education. Furthermore, extracurricular activities are investigated from the perspective of their formative value, being considered a catalyst for experiential learning and the development of essential skills such as communication, leadership, collaboration, and adaptability.

The used methodology is based on a qualitative approach, which includes documentary analysis, direct observation, and a case study, with the ASEM as the place of application, an institution actively engaged in promoting extracurricular programs with an international focus.

It is worth noting that the article makes both a theoretical and practical contribution to the evaluation of non-formal and complementary education, providing a useful framework for reflection for teachers, decision-makers, and students in the process of training for integration into a globalized professional environment.

2 Extracurricular Activities (EA) in the Context of Global Education: Theoretical and Methodological Framework

Globalization has forced a profound rethinking of how universities prepare future professionals. In an educational context characterized by increased mobility, accelerated digitization, and frequent intercultural interactions, the focus is shifting from the accumulation of theoretical knowledge to the development of transversal skills essential for adaptability and employability in the globalized labor market. In this sense, extracurricular activities take on strategic importance, providing authentic contexts for experiential learning and contributing to the development of a competitive professional profile. As complementary educational tools, they facilitate the integration of linguistic and intercultural dimensions into student training, responding to the demands of an increasingly internationalized academic and professional environment.

This study aims to investigate the impact of extracurricular activities on the development of students' professional skills, with a particular focus on the integration of multilingual and intercultural dimensions into the non-formal educational process.

The main objective is to analyze how active involvement in such initiatives contributes to the formation of an adaptable, competitive, and internationally oriented professional profile.

To achieve this objective, a qualitative research methodology was adopted, focused on investigating student experiences and the institutional framework provided by the ASEM.

The methodological approach includes:

documentary analysis of the conceptual framework and relevant educational materials;

direct observation of extracurricular activities (workshops, round tables, panel discussions, debates, flash mobs, etc.);

conducting an institutional case study focused on identifying good practices developed through collaboration between the Scientific Library, the Department of Modern Languages, and other ASEM structures.

The theoretical basis of the research is based on the definition and analysis of key concepts essential for understanding the issues addressed.

From an educational and cultural perspective, the process of globalization may be considered as complex and multidimensional, involving integration and interdependence between states, economies, cultures and educational systems on a global scale (Crețu, 2022, p. 24).

In this context, interculturality and extracurricular activities can be defined as forms of non-formal or informal learning, which have been shown to make a significant contribution to the personal, social and professional development of pupils and students (Bocoș & Jucan, 2008, p. 17).

EA are defined as non-formal initiatives, carried out outside the standard curriculum, which make a valuable contribution to the development of transversal skills.

In the same vein, we also mention the term non-formal education, which is an organized learning process, carried out outside the formal system, which aims to develop skills through voluntary, interactive, and practical activities (Murgu, 2016, p. 98).

Professional skills can be defined as the integrated set of knowledge, abilities, and attitudes that enable the effective performance of an activity in a specific field (Manolescu, 2011, p. 23).

The theoretical analysis showed that, in the context of globalization and the accelerated internationalization of education, it is imperative to develop intercultural and transversal skills that cannot be formed solely through the formal curriculum.

3 Extracurricular activities at ASEM – a Tool for Developing Professional Skills

In an academic environment focused on internationalization and adaptation to labor market requirements, the ASEM has built an institutional culture in which EA are actively integrated into the student training process. Within the extended educational process, EA's are valued as strategic tools for personal and professional development.

Extracurricular activities carried out within the ASEM framework have been shown to contribute significantly to the development of students' professional skills, valuing the skills acquired outside the formal curriculum (Manolescu, 2011). Research has demonstrated that these competencies encompass both technical and specialised dimensions, which are unique to a specific professional domain, and essential transversal skills, including communication, leadership, critical thinking, adaptability, and managing cultural diversity (Vasilescu, 2021). The collaboration between SL ASEM, faculties and the Department of Modern Languages has resulted in extracurricular activities that offer students concrete opportunities for linguistic, intercultural and professional development. These activities serve to strengthen students' preparation for the globalised context of the labour market. For example, work ethic, resilience, and autonomy in the learning process.

It is important to note that extracurricular activities are forms of non-formal and informal learning that take place outside the compulsory academic curriculum and play an essential role in students' personal and professional development. In this sense, "extracurricular activities have a multi-directional educational function: formative, cultural, and motivational" (Mihăilă, 2022). They provide authentic contexts for complementary training, supporting the learning process through experience and stimulating the transversal skills required in contemporary society. Therefore, "extracurricular activities offer varied contexts for experiential learning" (Bocoş & Jucan, 2008).

Extracurricular activities can be classified into several categories, depending on their nature and objectives:

Academic and scientific activities, such as conferences, debates, thematic workshops, and interdisciplinary projects;

Socio-cultural activities, which include participation in student clubs, theater groups, festivals, and various artistic events;

Civic and volunteer activities, carried out through involvement in non-governmental organizations, community campaigns, social and environmental projects;

International mobility programs, such as Erasmus+, internships, academic exchanges, and international training courses.

Specialized studies show that extracurricular activities serve multiple functions, contributing significantly to strengthening the educational, social, and professional dimensions of the higher education process. They are recognized as forms of non-formal and informal learning that support personal and professional development in a framework complementary to formal education. It is worth noting that "non-formal education plays an essential complementary role in professional training" (Murgu, 2016).

In the extended educational process, EA can be associated with the following major functions:

the educational function, aimed at deepening and diversifying knowledge;

the formative function, which supports the acquisition of transversal skills, attitudes, and competences;

the socializing function, which facilitates integration into the academic community and the development of interpersonal relationships;

the recreational function, which contributes to psycho-emotional balance and stress reduction;

the cultural function, through the promotion of local, national, and universal values;

the professional function, associated with preparation for entry into the labor market;

the motivational function, which stimulates active involvement, perseverance, and individual aspirations (Mihăilă, 2022, p. 124).

Within ASEM, extracurricular activities are notable for their thematic and functional diversity, being structured in such a way as to support the comprehensive development of students. These include:

Conferences, round tables, and debates, designed to stimulate critical thinking, argumentative expression, and analytical spirit;

International programs and academic partnerships, such as Erasmus+ and participation in European university networks, which facilitate multicultural collaboration and professional development in an international context;

Internships and volunteer activities in multicultural environments, which offer concrete opportunities to apply knowledge and engage in direct intercultural contact;

Thematic clubs and centers that promote intercultural dialogue, diversity, and language skills development;

Workshops, conferences, and symposiums on economic, social, or environmental topics that encourage initiative, civic responsibility, and strategic thinking;

Literary and artistic events, commemorative events, and awareness campaigns, aimed at cultivating humanistic values and civic awareness;

Creative and interactive activities, such as competitions and flash mobs, which capitalize on students' active involvement, expressiveness, and innovative spirit.

SL ASEM plays a central role in organizing EA, acting as a hub for active learning. By collaborating with ASEM' faculties and departments, especially with DLM, it contributes to stimulating intercultural dialogue and promoting awareness of universal values, thus strengthening a dynamic and inclusive academic community.

The active involvement of students in extracurricular activities contributes to shaping a balanced and complex professional profile, providing relevant contexts for practical learning and personal reflection. By participating in such initiatives, students develop essential skills such as project management, teamwork, effective communication, and decision-making. In addition, interaction with intercultural environments fosters empathy, cognitive flexibility, and openness to diversity.

These experiences contribute to increased self-confidence and employability, as well as sustainable personal development. In this sense, "extracurricular initiatives offer students opportunities to apply theoretical knowledge in real-life contexts" (Simion, 2019).

It is important to note that the active participation of ASEM students in extracurricular activities has a significant impact on the development of key skills necessary for employability in the current labor market context. Thus, these activities contribute to the formation of the following essential skills:

Leadership and initiative, strengthened through involvement in project coordination and implementation;

Planning, decision-making, and problem-solving, developed through participation in applied workshops, simulations, team management, and event organization, as well as through taking on responsibilities;

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Critical thinking and contextual analysis skills, stimulated through thematic debates and collective reflection on global challenges;

Personal autonomy and self-directed learning, cultivated through voluntary involvement in various initiatives and through individual reflection processes;

Multilingual communication and effective collaboration, developed through clubs, workshops, academic mobility programs, and international interactions;

Intercultural adaptability, strengthened through participation in international projects, collaboration in multicultural teams, and exposure to a variety of perspectives;

Negotiation and time management skills, acquired through extracurricular experiences involving setting priorities, efficient allocation of time resources, coordination of tasks and deadlines, as well as adjusting objectives according to context, available resources, and the dynamics of the teams involved.

To strengthen professional skills and create an active academic community, ASEM, through the SL ASEM and in collaboration with faculties and departments, carries out a series of extracurricular activities considered relevant examples of good practice. As D. Rusu (2023, p. 105) points out, "the integration of extracurricular activities into university life requires collaboration between the library, faculties, and departments, providing students with real contexts for applying their knowledge."

In this context, the following particularly significant events can be highlighted:

The National Campaign "Let's Read Aloud Together", which promotes reading through collective activities;

"NEXT Generation" Reading Club a space dedicated to literary exploration and personal development;

Mihai Eminescu's birthday (January 15), celebrating the values of national literature;

National Reading Day (February 14), with initiatives aimed at encouraging reading;

International Francophonie Day (March 20), focused on promoting linguistic and cultural diversity;

Europe Day (May 9), highlighting European cohesion;

European Day of Languages (September 26), dedicated to celebrating multilingualism;

International Students' Day (November 17), recognizing the active involvement of young people;

International Human Rights Day (December 10), with the aim of raising awareness of universal values.

It should be noted that these initiatives contribute to creating a dynamic educational environment that stimulates the development of essential skills and promotes intercultural dialogue. Faced with the increasingly complex challenges of the labor market, ASEM values extracurricular activities as key tools for developing students' transversal and technical skills.

Transversal skills are increasingly valued by employers in the current labor market context. As Vasilescu (2021) points out, "transversal skills are becoming essential in an education anchored in globalized realities."

To support the development of these skills, the SL ASEM, in collaboration with faculties and departments, organizes a wide range of extracurricular activities focused on developing essential skills such as communication, teamwork, critical thinking, time management, adaptability, leadership, and negotiation.

Among the most successful initiatives dedicated to the development of transversal skills within ASEM are:

Literary Club "Reading means living", now in its seventh edition this academic year;

National Campaign "Reading Aloud" – 2024 edition, inspired by the journalism of Mihai Eminescu;

Cultural activities organized to celebrate Europe Day, International Francophonie Day, National Reading Day, and other similar events.

Technical skills, also known as "hard skills," represent specific knowledge and abilities that are indispensable in the exercise of specialized professions. Extracurricular activities complement theoretical training, facilitating the improvement of these skills, connecting students to innovations in the field, and increasing employment opportunities in a competitive professional environment.

Within ASEM, the following EAs are relevant examples of good practices for the development of technical skills:

Campaign to combat human trafficking;

International Student Day;

Human Rights Day;

Panel discussions on legal, social, and other topics;

"NEXT Generation" club and reading workshops.

Extracurricular activities have been shown to contribute to the development of transversal and specialised skills. These activities offer students professional training opportunities and access to innovations, as well as the chance to diversify their educational portfolio.

4. The multilingual and intercultural dimension of extracurricular activities

Extracurricular activities have a significant formative role, preparing students adaptable and competitive in the global labor market. Their multilingual and intercultural dimension develops essential skills for communication and collaboration in international contexts, through activities carried out in French, English and German and through active learning experiences, direct interaction and critical reflection on one's own culture (Huber & Reynolds, 2014).

The reflective dimension plays a fundamental role in developing intercultural competence because it allows students to analyze their own cultural perspectives and develop their capacity for experiential learning. According to UNESCO (2013, p. 6), "intercultural competence is the ability to communicate effectively and appropriately with people from other cultures, involving a set of specific knowledge, attitudes, and skills."

Participation in multilingual clubs, international workshops, or thematic campaigns stimulates introspection, thus facilitating the development of a mature intercultural awareness based on empathy and continuous learning.

The development of intercultural and multilingual skills within ASEM is also supported by relevant international educational partnerships, facilitated by the AUF-Moldova National Office. As part of the project "Development of Sciences in French in the Republic of Moldova" (Développement des sciences en français en République de Moldavie).

The international internships carried out at ASEM by Safae Omrani and Justin Datcu, supported by AUF-Moldova, highlight the institution's commitment to promoting multilingual and intercultural competences. The objective is realised through a variety of means, including events, clubs, training programmes and international partnerships. These provide students with active and reflective learning contexts. In essence, ASEM's extracurricular activities are congruent with European strategies concerning the internationalisation of higher education and the cultivation of intercultural and linguistic competencies.

In this regard, it is important to emphasize that intercultural education must be promoted through institutional policies and international collaborations (Byram & Wagner, 2018).

Activities such as Erasmus+ programs, language clubs, participation in international student networks, or multilingual cultural events concretely reflect these objectives, providing real opportunities to apply European principles.

5 Conclusions

The study *Extracurricular Activities for Development Professional Skills in a Multilingual and Intercultural Approach* highlighted the essential role of extracurricular activities in higher education, in the context of globalization and the need to develop adaptable, transversal, and intercultural professional skills.

The analysis of the theoretical framework, correlated with ASEM's institutional experience and with examples of good practices, highlights the significant role of extracurricular activities in the development of students' linguistic and personal skills, contributing to the configuration of a professional profile oriented towards innovation, collaboration and intercultural dialogue.

Extracurricular activities can be regarded as a complementary educational framework that facilitates the development of skills in demand on the labour market. The integration of multilingual and intercultural dimensions in these activities has a significant formative value, preparing students for multicultural contexts and professions with an international outlook.

Teachers and librarians play an important role in coordinating these initiatives, transforming them into authentic and reflective educational experiences, aimed at developing personal and professional skills.

The ASEM Scientific Library and the Department of Modern Languages are establishing themselves as central actors in promoting European values, multilingual reading, intercultural dialogue and active learning.

Nevertheless, the integration of multilingual and intercultural dimensions in extracurricular activities continues to pose challenges. The key challenges identified pertain to the students' limited confidence in foreign language proficiency, the inconsistent level of engagement influenced by faculty profiles and year of study, and the absence of an institutional framework dedicated to the facilitation of intercultural initiatives.

In light of these circumstances, it becomes essential for institutions of higher education to incorporate extracurricular activities within their institutional development strategies and student training plans. Concurrently, there is a necessity to enhance the training of teaching staff in the domain of intercultural education, whilst also extending collaborative relationships with European institutions.

The promotion of intercultural dialogue has been demonstrated to contribute to the development of multilingual skills, the strengthening of students' personal and professional skills, and the preparation of students to function effectively in diverse international contexts. International cooperation, and learning in multilingual contexts, extracurricular activities carried out within ASEM contribute significantly to the formation of a professional profile characterized by openness, empathy, and adaptability. At the same time, these valuable initiatives build bridges between cultures, fields, and generations, strengthening a dynamic, inclusive academic community focused on excellence in education.

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RELATIONSHIP MARKETING AS A TOOL FOR THE MODERNIZATION OF LIBRARY SERVICES

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Abstract: The development of libraries is closely linked to the profound transformations of the digital society and the need to adapt quickly to the dynamics of the information market. Digitization, rising prices of information resources and increased competition from the online environment are both major challenges and opportunities for libraries. At the same time, the situation is complicated by factors such as insufficient state financial support, the ageing of human resources, the slow process of renewing collections and the increased costs of traditional and electronic resources. All these difficulties contribute to the migration of users to the Internet, where access to information is faster and more convenient, although they do not always guarantee its quality. In this context, libraries in the Republic of Moldova, especially university ones, use modern marketing, management and information technology tools to maintain their relevance and meet the needs of the academic community. Relationship marketing is becoming a key tool, able to support user loyalty, attract new audiences, strengthen institutional image and create innovative information products and services. In addition, by using fundraising strategies and engaging in projects, libraries can obtain additional resources for development and modernization. Thus, Relationship marketing is shaping up as a strategic platform for the development of university libraries, through which sustainable and beneficial relationships with users and institutional partners can be built. The application of this concept allows the modernization of library services and their active integration in the educational and scientific system, contributing to the creation of a synergistic framework for the dissemination and valorization of quality information.

Keywords: Relationship marketing, university libraries, library services, digitization, information resources.

JEL Classification: M31, D83, I23

1 Introduction

The development of libraries in the 21st century is strongly influenced by the transformations of the digital society, the rapid changes in the information market, and the growing competition generated by the online environment. Digitization, diversification of information products and services, as well as the rising costs of traditional and electronic resources, represent both challenges and opportunities for libraries. At the same time, weak financial support, the aging of human resources, and the slow pace of collection renewal exacerbate the difficulties of information institutions, leading users to migrate to the Internet, where access is easier but often at the expense of information quality.

To meet these challenges, libraries in the Republic of Moldova, especially university libraries, rely on modern tools of marketing, management, and information technology. In this

context, relationship marketing emerges as a strategic tool capable of supporting user loyalty, attracting new audience segments, strengthening institutional image, and creating innovative information products and services. At the same time, by using fundraising techniques and participating in project-based activities, libraries obtain additional resources for development and modernization.

University libraries are distinguished by the need to build durable and complex relationships with various segments of the academic community – from students, master’s and doctoral candidates, to teaching staff, departments, faculties, and rectorates. At the same time, they collaborate with external partners, authorities, and various categories of contact audiences, relationships that are important for strengthening their institutional role. However, the specific nature of these interactions is constantly changing, requiring adaptation of collaboration strategies and a solid theoretical and practical basis for managing transformations. The ability of libraries to integrate these changes determines their long-term success and contributes to their dynamic development.

Relationship marketing stands out as an important conceptual and operational framework for the development and strengthening of university libraries. Through it, information institutions can build and maintain long-term relationships based on trust, cooperation, and mutual benefits. In an educational and scientific context marked by rapid changes, applying the principles of relationship marketing is both a strategic option and a necessity to respond to the new demands of the academic and informational environment.

The concept of *relationship marketing* was introduced into the literature in the 1980s by L. Berry, who emphasized its role in “attracting customers, maintaining and strengthening relationships with them” (Berry, 1983). Later, Philip Kotler developed this approach, defining relationship marketing as “the practice of building long-term, mutually beneficial relationships with key market partners: consumers, suppliers, distributors, with the goal of establishing privileged and lasting ties” (Kotler and Keller, 2012). In a broader sense, the concept represents a continuous process of creating, maintaining, and expanding valuable relationships with users and institutional partners on multiple levels: economic, institutional, and social (Baron, 2010; Baron, Conway and Warnaby, 2010; Gummesson, 2002; Harris and Ogbonna, 2008; Sheth, 2002; Валько, 2013; Кошурникова, 2013). Local authors regard relationship marketing as a modern approach to management, developing as an element of organizational development strategy (Remeşovschi, 2024; Райлян, 2016). Integrating this concept into library practice contributes to the reconfiguration and modernization of services, orienting them toward the real and dynamic needs of users (Хвостова, Штратникова and Уржумова, 2020).

Relationship marketing promotes the transformation of libraries into active players in the educational and scientific system, strengthening their role in generating, disseminating, and capitalizing on quality information. By creating a synergistic framework based on collaboration and interdependence between libraries and the communities they serve, new opportunities for innovation, sustainability, and institutional development are opened. Relationship marketing emerges as the foundation on which university libraries can build durable, harmonious, and efficient interactions with all segments of the academic community. By applying it, libraries respond to users’ immediate needs and create a real framework in which quality information products and services are generated and enhanced through cooperation and mutual involvement.

This perspective is particularly relevant for university libraries, which, by their nature, must cultivate lasting relationships within the academic community and with external partners. Thus, relationship marketing becomes both a relationship management tool and a catalyst for the modernization and adaptation of library services to current realities.

2 The Evolution of Relationship Marketing in University Libraries

User loyalty is one of the fundamental objectives of relationship marketing in university libraries. Building and maintaining this loyalty is not limited to offering quality information services; it also involves cultivating the emotional dimension of the relationship between the library and its community. Users become attached to the library not only because of the resources and services provided but also due to the atmosphere of trust, openness, and cooperation. These are built gradually through constant and personalized dialogue. Developing close partnerships is rooted in this emotional component, which gives consistency and authenticity to institutional relationships, making it possible to transform formal interactions into lasting and beneficial collaborations.

Extending across all areas of library activity, the emotional component of relationship marketing becomes an indispensable element of successful development. It strengthens the library's position within the academic environment, ensures visibility and relevance in relation to external partners, and contributes to the modernization and adaptation of the institution to the current demands of the information society.

The evolution of relationship marketing in university libraries in the Republic of Moldova can be analyzed dynamically, by outlining three representative stages:

Pre-digital stage (until 2000) – characterized by the library's traditional role as an information provider. Activity was centered on operational efficiency, where the main criteria were the speed of service delivery and the completeness of resources made available. The relationship with users was mainly formal, unilateral, and oriented toward meeting punctual information requests.

Initial transformation stage (2001-2020) – marks the beginning of marketing tools being applied in libraries. In this period, the first studies on the needs and preferences of different categories of users were conducted. At the same time, more consistent partnerships began to develop with the university's internal structures: departments, faculties, publishing houses, and other subdivisions, consolidating the library's role in the academic process.

Contemporary stage (2021 – present) – defined by a strategic orientation toward the user, with clear segmentation (students, teaching staff, doctoral candidates) and the adaptation of services to the needs of each group. The necessity of building lasting, trust-based relationships with users is increasingly recognized. The library becomes an active player in institutional projects, editorial activities, and the promotion of scientific research results. At the same time, libraries are increasingly involved in university PR actions, contributing to the visibility and prestige of the academic institution (*Table 1*).

Table 1. The Stages of the Evolution of Relationship Marketing in University Libraries in the Republic of Moldova

Stage	Period	Main characteristics	Development directions
Pre-digital	Until 2000	Library perceived as information provider; unilateral relationship with the user	Speed of services; completeness of information
Initial transformation	2001–2020	First applications of marketing tools; research on users' needs	Strengthening partnerships with departments, university publishing houses, subdivisions
Contemporary	2021 – present	User segmentation; personalized services	Building lasting relationships; involvement in projects, editorial activities, and university PR

Source: own work

The study of the application of relationship marketing elements at the Scientific Library of the Academy of Economic Studies of Moldova (ASEM) was based on a combination of methods:

analysis of secondary information, direct observation, and empirical research. Recognized as the most important university institution with an economic profile in the country, the library was among the first to initiate a modernization process through the integration of relationship marketing, starting in the 2000s.

The awareness that the user is the central element of the library service system spurred the need for a deeper understanding of their requirements and expectations. One of the landmark studies was conducted in 2004 and aimed at evaluating students' satisfaction with the services of the Multimedia Center, involving a sample of over 450 respondents. The results highlighted both strengths and areas needing improvement, thus guiding the library toward diversifying and enhancing its multimedia services.

Subsequently, surveys and periodic consultations with various user segments – students, teaching staff, researchers – became an integrated practice in library management. Through these efforts, the ASEM Scientific Library managed to adjust its services to the real needs of the academic community and build trust-based relationships, founded on dialogue and collaboration, thereby consolidating its role as an active partner in the educational and research process.

The results of opinion research provided the foundation for the development and implementation of marketing strategies oriented toward the sustainable development of the ASEM Scientific Library. These strategies included diversifying the service portfolio, introducing new facilities, and adapting the offer to users' needs. At the same time, the library began providing paid services to external users, which became both an additional source of resources and proof of the institution's flexibility in relation to the dynamics of the information environment.

3 Relationship Marketing Strategies

One of the basic objectives of library management is the creation and maintenance of a loyal audience that continues to use library services even after graduation, including on a paid basis. This loyalty-building process is developed gradually, starting from the moment students are admitted to the university. Introductory courses in Information Culture, thematic competitions, and other educational activities contribute to the gradual integration of students into the library's information system. Information about student groups is managed through specialized databases, which allows for personalized communication and the adaptation of services to users' real needs.

Maintaining constant contact with the public is ensured through a variety of communication tools: e-mail, social networks, and other direct marketing methods. In parallel, public relations activities and the organization of joint cultural events dedicated to significant moments and dates strengthen the emotional bond between the library and the academic community. This affective dimension becomes a key factor in user loyalty and in consolidating the library's image as an indispensable partner of the educational and cultural process.

Serving advanced user categories – master's students, doctoral candidates, and teaching staff – is based on the application of an individualized model of response to information needs. In this framework, user information is ensured through selective dissemination mechanisms that correlate the resources provided with the ongoing research topics. The ASEM Scientific Library provides these segments with both traditional and electronic resources, adapting services to the particularities and specialization level of each group. Segmentation and individualization strategies thus represent fundamental components of relationship marketing, as they contribute to creating strong and long-lasting relationships between the institution and the academic community.

The transformations recorded in university libraries over the past decade, including at the ASEM Scientific Library, are also reflected in the expansion of partnership relations, both within the university and at the national and international levels. Partnerships developed with various academic structures, professional organizations, and cultural institutions demonstrate the library's capacity to adapt to a dynamic context and to respond to the multiple expectations of the community.

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According to the principles of relationship marketing, strengthening and diversifying partnerships ensure the efficient and sustainable functioning of the organization, contributing to the increase of its visibility and prestige. In the case of the ASEM Scientific Library, these processes have generated a favorable image in the academic environment and in the broader social and informational space, confirming its role as an important actor in the educational and research infrastructure of the Republic of Moldova (*Table 2*).

Table 2. Relationship Marketing Strategies

User segments	Strategies applied	Results
Master’s students	Segmentation based on research topics; provision of traditional and electronic resources; selective dissemination of information	Quick access to specialized resources; increased user satisfaction; development of library loyalty
Doctoral candidates	Individualized approach to information needs; personalized research assistance; promotion of advanced scientific resources	Effective support for scientific activity; strengthening of trust-based relationships with the library; increased use of electronic resources
Teaching staff	Information through selective dissemination; resources adapted to teaching and research areas; collaboration in projects and partnerships	Support in teaching and research; involvement in collection development; increased visibility and prestige of the library

Source: own work

Thus, this table demonstrates that relationship marketing strategies (segmentation + individualization) allow services to be adapted to each user category. The results translate into satisfaction, loyalty, and the strengthening of the ASEM Scientific Library’s image as an important partner in education and research. Internal and external partnerships multiply the effects of these strategies, increasing institutional recognition.

4 Directions of Partnership of the Library

The ASEM Scientific Library has developed, in the external environment, a solid network of professional collaborations that contribute to strengthening its image and visibility at the national and international levels. Among its institutional partners are: the Association of Librarians of the Republic of Moldova, the Association of Librarians of Romania, the EIFL International Consortium, the REM National Consortium, as well as prestigious organizations such as the World Bank and the European Commission. A particularly important aspect is the partnership agreements for the exchange of publications and documentary resources. At present, the ASEM Scientific Library has concluded 25 international partnerships, which include collaborations with libraries from Norway, Germany, France, the United States of America, Lithuania, Bulgaria, Ukraine, as well as with 18 libraries in Romania. These cooperation relationships facilitate access to diversified and up-to-date information and contribute to the development of a professional climate based on the exchange of good practices, experiences, and successful models. In this way, the library manages to diversify its information offer and strengthen its role as an active actor in the international knowledge circuit.

Within the internal environment of the university, collaborative relationships have also been developed and strengthened with the following subdivisions (*Table 3*).

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**Table 3. Directions of Partnership of the ASEM Scientific Library
with University Subdivisions**

No.	Partner subdivision	Functions and new roles of the library in the partnership
1	ASEM Publishing House	Promotes articles published in the university's scientific journals on Open Access platforms. Compiles bibliographic collections and biobibliographies. Contributes to the visibility and impact of university research by integrating it into international databases. Prepares bibliographic references and assigns UDC classifications to articles published in institutional journals.
2	Research-Development-Innovation Department	Provides support in writing and capitalizing on research results (conferences, reports, studies). Is an active partner in scientific and innovation projects. Supports monitoring of scientific productivity through bibliometric tools. Organizes exhibitions during scientific events. Checks doctoral theses and institutional publications (monographs, conference proceedings, and journals such as <i>Economica</i> , <i>Eastern European Journal of European Studies</i> , and <i>Economy and Sociology</i>) in anti-plagiarism systems.
3	Faculties and departments	Prepares support files for the accreditation process of study programs. Provides information resources adapted to courses and curricula.
4	Department of Quality Management, Curriculum Development and Studies	Contributes to the design and updating of curricula by identifying relevant information resources. Participates in the evaluation of the quality of educational resources and their integration into teaching-learning processes. Actively participates in the university's Quality Management System by developing and implementing internal procedures, monitoring performance indicators, and contributing to self-evaluation reports.
5	Doctoral School	Provides doctoral training in information management and scientific publishing. Ensures access to academic databases and resources for thesis writing. Supports dissemination of scientific results through Open Access. Prepares bibliographies and assigns UDC classifications to doctoral theses.
6	School of Continuing Education	Supports lifelong learning by providing resources and digital tools. Develops joint training programs for librarians.
7	National College of Commerce	Integrates library resources into vocational training. Organizes extracurricular and cultural activities for students and teaching staff.
8	IT Department	Collaborates on collection digitization and the implementation of modern technologies in services. Develops the institutional repository IREK. Integrates e-learning tools and digital platforms for fast access to resources (Moodle).
9	Republican Technical-Scientific Library	Strategic partner for the exchange of publications and resources. Collaborates in the field of bibliometrics and access to electronic databases.
10	Marketing, Partnerships, and Career Service	Collaborates in organizing cultural and scientific events. Supports career guidance activities through information resources and training. Participates in strengthening the university's public image through joint PR actions.

Source: own work

Thus, it can be stated that the ASEM Scientific Library actively applies the principles of relationship marketing in its interaction with various categories of users. The library's activity is undergoing a profound transformation, becoming more complex, more intellectualized, and more diversified, in accordance with the demands of the academic environment and the information society. The library demonstrates an increased ability to adapt to rapid changes in the external environment, which allows it to develop sustainable partnerships and initiate various forms of collaboration.

By strengthening relationships with user segments and focusing on quality information services, the library succeeds in creating a climate of trust and loyalty. At the same time, by

cultivating a positive institutional image and diversifying partnership activities, the library strengthens its role as an important element in the academic system. This approach reflects the transition from the traditional model of information provision to a relational and collaborative one, centered on interaction, co-creation, and added value for users.

5 Difficulties and Development Perspectives of Relationship Marketing in Library Activity

However, the implementation of relationship marketing in libraries is not without difficulties. Among the main problems identified are:

Limited resources – both financial and material, which restrict the library’s ability to invest in modern technologies, professional training, and the development of innovative services.

Aging staff structure – which affects institutional dynamics and reduces the readiness to quickly integrate new digital and relational approaches.

Insufficient professional competencies – the lack of advanced knowledge in fields such as marketing, communication, data management, or the use of advanced digital tools may limit the efficiency of user-oriented activities.

Weak collaboration with university top management – which leads to the underestimation of the library’s strategic role and difficulties in integrating it into major decision-making processes.

These challenges highlight the need for an integrated institutional vision in which the library is recognized as a strategic partner of the university, and relationship marketing is supported through resources, training, and appropriate managerial policies.

Despite current difficulties, the ASEM Scientific Library has clear prospects for strengthening and expanding relationship marketing. Priority directions include:

Adopting an integrated system of interaction with users, through which all communication, service, and partnership activities are coordinated based on a unified strategic vision.

Continuous training and professional development of staff to improve digital, communication, and marketing skills necessary for engaging with modern users.

Investments in the library’s digital infrastructure, oriented toward electronic service platforms, resource management systems, and solutions for analyzing service usage data.

Conducting periodic marketing research to collect direct user feedback, understand the evolution of their needs, and adapt the service offer in real time.

Integrating relationship marketing into the library’s strategic documents by explicitly including it in institutional development plans, thereby granting it the status of a priority management tool.

By applying these directions, the ASEM Scientific Library can strengthen its role in the academic system, becoming an active player in supporting the educational process and scientific research, as well as a model of good practice within the university library network.

6 Conclusions

Relationship marketing, as a modern approach to library management, emerges as the foundation for ensuring the effective presence of libraries on the information market. In this context, the service delivery process is no longer unilateral, but involves active interaction between librarian and user, which introduces an important emotional component and contributes to audience loyalty.

The ASEM Scientific Library demonstrates a consistent and diversified application of relationship marketing, through the conduct of marketing studies, the strengthening of internal and external partnerships, and active involvement in international projects. The institution’s top management adopts mechanisms for adapting to transformations in the academic and information environment, supporting the gradual transition to a relational development model.

Nevertheless, there are significant difficulties that slow down the full implementation of this approach. Among them are limited resources, an aging staff structure, and insufficient professional skills to meet the increasingly dynamic demands of users and the challenges of the digital environment.

Under these conditions, relationship marketing remains a strategic tool capable of supporting the modernization and adaptation of university libraries to the new realities of the digital age, through user orientation, sustainable partnerships, and quality information services.

The future use of relationship marketing in the ASEM Scientific Library must rely on several strategic directions: consolidating a systemic approach in user relations, continuous training and motivation of staff, modernization of digital infrastructure, conducting marketing research, as well as integrating the principles of relationship marketing into the institution's strategic documents and development plans.

Strengthening partnerships and consolidating relationships with users and external collaborators will contribute to increasing the visibility and positive image of the ASEM Scientific Library, to building a community of loyal users, and to fortifying its position in the information market of the Republic of Moldova.

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ARTIFICIAL INTELLIGENCE IN UNIVERSITY LIBRARIES: TECHNICAL, ETHICAL AND EPISTEMOLOGICAL CHALLENGES IN THE CONTEXT OF MOLDOVA

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Abstract: Using artificial intelligence (AI) in university libraries creates new opportunities, but also brings many challenges that must be carefully looked at. This article looks at the technical, ethical and knowledge-related parts of this process, showing both the new possibilities of AI and its limits. When we talk about integrating smart technologies, we need to consider the hardware and software that supports them, how they can work together, and the quality of the information they use.

The article talks about the risks of bias caused by algorithms, how personal data is protected and how information is chosen. These problems need clear rules to make sure users can trust the system. The text looks at how people know things and the challenges they face. AI is changing the way we understand knowledge and information, which means we need to improve our skills in finding and understanding information, and we also need to keep on learning. Librarians help people to use digital tools in the right way. Through hands-on workshops, online tutorials, and training sessions, libraries can support users in understanding the working principles of algorithms and maintaining their intellectual autonomy. The conclusions say that AI should not be seen as a replacement for human judgment. Instead, it should be seen as a useful tool for research and education. But this must be done in a way that follows strong ethical rules and is supported by the right institutions. So, university libraries can turn these problems into chances to make their role in the knowledge society stronger.

Keywords: Artificial Intelligence, university libraries, technical challenges of AI, epistemological implications of AI, digital transformation in libraries.

JEL Classification: D83, L86, O33, Z11, Z18

1 Introduction

Digital transformations are no longer just a trend; they have become an essential part of how university libraries are changing, and they are changing the way we access information and organise collections. New technologies have opened up ways to explore different resources, made cataloguing processes much quicker, and made it easier to manage documentary funds. In this context, artificial intelligence (AI) is a promising area of modernisation. It offers tools such as personalised recommendations, intelligent search and automated data processing.

The Republic of Moldova has been interested in information technology since the 1990s. It created a ministry for information technology and telecommunications and has been developing digital infrastructure ever since. The internet was introduced to schools, and electronic services for citizens and institutions were set up. This was the start of the digitisation of administration and education. This way of thinking has become stronger over time. This has happened because of

policies and important documents like the White Paper on Data Governance (White Book, 2024), the Digital Transformation Strategy 2023-2030 (Strategia de Transformare Digitală, 2023), and the Government's Activity Programme for the period 2021–2025 (Programul de activitate al Guvernului, 2025), which contains sections dedicated to digital transformation and harnessing emerging technologies, including artificial intelligence. As stated in the Digital Transformation Strategy 2023–2030, "The digital transformation of the Republic of Moldova is a national priority, aimed at modernizing public services, strengthening digital skills and stimulating innovation."

At the moment, there are only a few discussions about using AI in university libraries in Moldova. This means that we have the chance to explore and understand better how smart technologies can be used. We are just starting to look at the technology, the skills librarians need, and how to use AI. This makes a good time to talk about technical, ethical and knowledge issues.

This article looks at these challenges in a joined-up way. We'll be talking about a bunch of topics, like technical issues with infrastructure, systems, and databases, as well as ethical dilemmas around data protection, responsibility for automated decisions, and the risks of information bias. We'll also be chatting about how AI affects the validation and use of knowledge, the role of the librarian as an information mediator, and the development of users' digital skills.

The article hopes to show what the local situation is now and how AI could be used in Moldovan university libraries in the future in a responsible and efficient way. This would help staff who specialise in this area and the people who work in universities.

2 Technical challenges

The introduction of AI in university libraries is difficult, even more so in the Republic of Moldova, where the digitisation process is still in its early stages. Although we have made notable progress in recent years, such as developing electronic catalogues and making it easier to access information, using AI will create new demands. This requires not only adequate infrastructure and compatibility of existing systems, but also long-term strategic planning, capable of ensuring efficient data management and optimal operation of intelligent platforms.

A first aspect of the technical challenges relates to **the hardware and software infrastructure**. AI algorithms need high-performance servers, generous storage space, and stable networks to be able to process data in real time. Currently, existing facilities mainly support the management of digital resources and electronic catalogs, but are not yet adapted for the complex requirements of machine learning. However, this already created foundation provides a solid starting point for gradual upgrades and incremental adaptations.

Equally important is **the integration of databases and ensuring interoperability**. For AI to work effectively, information needs to be well-structured and standardized. Existing digitized resources can be seen as a promising foundation, but the unification of metadata and the interconnection of systems would pave the way for more precise recommendations, automatic classifications and much more efficient searches. This would improve both the user experience and the way collections are managed.

Another aspect of the technical challenges is **the human resource**. Librarians in the Republic of Moldova already have solid experience in the use of digital technologies, such as database management, the implementation of electronic cataloguing and the provision of online information services. However, their direct contact with artificial intelligence tools is lacking, and specialized training in this field is not yet available. At the same time, there is also a lack of specialists dedicated to AI in libraries, as in Moldova there are only two master's programs that include artificial intelligence courses, but they address the subject at a general level and are not oriented exclusively towards practical applications in libraries or information sciences (Cojocaru, 2021). This situation highlights the need for dedicated training programmes and closer collaboration between academia, IT and the library system.

Last but not least, the issue of **financial resources** is to be taken into account. Implementing AI involves significant costs for software, equipment, and staff training, and institutions' budgets are often limited. However, opportunities for international collaboration or access to external funding programmes can support this transition. Phased planning, making the best use of existing resources, could reduce financial pressure and ensure sustainable development.

In addition to investments and training, **the maintenance and constant updating of the systems** will be indispensable. Algorithms need to be regularly recalibrated and data constantly updated to maintain the accuracy and relevance of the results. The experience already gained in the administration of digital platforms could be gradually extended to the management of more complex systems, but this also requires the proper training of specialists in charge of the maintenance and operation of AI platforms.

Overcoming technical challenges is not only a necessity, but also an opportunity to build a solid foundation for smart university libraries. In our opinion, this stage paves the way for the responsible integration of artificial intelligence, influencing how ethical and epistemological challenges will be addressed.

3 Ethical challenges

The adoption of artificial intelligence in university libraries brings not only opportunities but also significant ethical responsibilities. In the Republic of Moldova, the local context offers the chance to outline correct standards and practices from the beginning, so that the implementation of smart technologies is perceived as safe, transparent and beneficial for the entire academic community. Reflecting on the moral and social aspects of AI thus becomes an integral part of the modernization process, strengthening user trust and the reputation of institutions.

Data privacy remains one of the most sensitive aspects. Digital platforms inevitably collect information about how users search for and use resources, and the integration of AI amplifies this trend through a more detailed analysis of these behaviors. In this context, students and researchers might feel that their academic intimacy is exposed. Therefore, transparency and the existence of clear protection policies are not only technical requirements, but guarantees of trust in the relationship between the library and its community (Shang et al., 2025).

Another challenge is related to algorithmic bias and lack of transparency. If recommendation or search systems do not make their selection criteria visible, there is a risk that international resources, written in widely circulated languages or published in high-impact journals, will always be put in the foreground, while local works remain in the shadows. In this way, local research becomes less visible, and students or professors' risk being deprived of perspectives relevant to the regional context. Moreover, the lack of clarity of the algorithms makes it difficult to verify the correctness of the displayed results. An ethical approach would imply that the user can understand and even adjust these criteria, choosing, for example, to give priority to publications in Romanian or to authors in the region.

Information security is equally important. Any smart system can become the target of cyberattacks or unauthorized access. Such incidents not only jeopardize the library's technical or administrative data, but can also compromise the trust of users, who may be afraid to leave their personal data registered. For this reason, libraries will need to strengthen their security policies and implement prevention mechanisms, including constant monitoring of networks and regular software updates, to protect both institutional and user data.

Another essential element is related to the professional responsibility of librarians. Even if decisions are made by algorithms, the ultimate responsibility must remain with the specialists. Algorithms can make mistakes or generate biased results, and without human oversight the risk of passing on erroneous information would be much higher. That's why librarians have the role of constantly monitoring the functioning of systems, intervening when errors occur, and ensuring that automatically generated recommendations comply with ethical principles and values of education.

So, it's really important to keep training staff so they can understand and use new technologies in the right way.

In general, ethical problems should be seen not just as dangers, but also as opportunities to create strong rules for the future. They give Moldovan libraries the chance to create a culture of transparency, responsibility and respect for users. If we start with these standards in mind, we can make sure that the introduction of artificial intelligence into university services is safer and more balanced. This will be good for everyone in the academic community.

4 Epistemological challenges

AI in university libraries brings technical and ethical challenges. It also changes how users access knowledge and interpret it. We are talking here about challenges to how we know things, i.e., how AI influences the process of creating, validating and using information. These aspects are very important because they affect the quality of learning and research, and help students, researchers and librarians to think critically and use information skills.

The first challenge is to understand how knowledge is produced and checked. AI algorithms can quickly analyse large amounts of data and generate automated recommendations or summaries, but the way they choose and prioritise sources affects how relevant and credible the information seems to users. So, if people can't access all the information online, or if they can only access some of it, smart systems can show more or less of certain sources, languages or types of publications. This means that people still have to check, complete and explain the information. Thus, librarians and researchers remain key actors in ensuring the quality and diversity of knowledge (Shang et al., 2025).

Another epistemological challenge lies in the **over-reliance on automatic recommendations**. Students and researchers may end up relying too heavily on the suggestions provided by AI, which can diminish their ability to critically evaluate information or choose the most appropriate sources. Even if the level of information literacy is solid, it is important that users are trained on how algorithms work, the criteria for selecting sources and the limitations of intelligent systems. In addition, constantly comparing digital information with traditional materials and independently verifying sources helps develop critical thinking and ensures that AI remains a support for research, not a substitute for human judgment.

The limitations of AI in assessing the quality of information are obvious. Although artificial intelligence systems can quickly identify popular or frequently cited sources, they are not able to assess the real quality of information. AI cannot assess whether the methodology used in a study is correct, whether the data is properly interpreted, or whether the paper makes a valuable contribution to the field. For this reason, human intervention remains indispensable: libraries must offer bibliographic guides, tutorials and training sessions that help users understand how to check sources, critically analyze information and compare data obtained from various resources. In this way, AI works as an effective support tool, without replacing people's ability to evaluate and judge.

The impact on information education is significant, as the use of AI changes the way students and researchers search, select, and interpret information. The introduction of these technologies does not only mean having faster access to resources, but also developing critical thinking, digital literacy and the ability to formulate pertinent questions to correctly assess the results generated by algorithms. For example, a recommendation system may suggest articles or books based on previous preferences, but students must learn to identify whether these suggestions are truly relevant or whether they ignore important sources. Activities such as hands-on workshops, online tutorials, or how-to materials allow users to understand the principles of algorithms, how information is filtered, and the limits of automated recommendations. Thus, information education becomes an active process: students not only receive information, but learn to verify it, compare it with other sources and interpret it critically, strengthening their independent research skills.

The socio-cultural and professional impact is directly felt in the relationship between the librarian and the user. If in the past the librarian mainly offered support in finding a book or in orienting through catalogs, with the integration of AI his role becomes more complex: he becomes an epistemological mediator. This means that it not only facilitates access to information, but also helps users understand why an algorithm recommends certain resources, how search criteria can be adjusted, and what risks exist in passively accepting results. At the same time, librarians must be able to monitor and correct the functioning of systems so that recommendations remain relevant and balanced. This new responsibility involves continuous training and the development of skills that combine technical, ethical and pedagogical knowledge.

Institutional policies and good practices these become indispensable. Libraries must establish clear rules on data privacy, transparency of algorithms, and applicable regulations. Human oversight and adherence to an ethical framework are essential to prevent errors and reduce the risk of information bias. In addition, by promoting critical thinking, facilitating access to verified sources and developing responsible digital skills, libraries support users to understand and evaluate the recommendations of intelligent systems. Thus, the academic community is protected against information manipulation and a healthy balance between technology and human values is maintained.

Epistemological challenges can be managed so that AI becomes a valuable support for critical thinking and informed access to knowledge, complementing users' judgment and discernment.

5 Conclusions

For AI to become a valuable and responsible tool in Moldovan university libraries, a gradual and well-planned approach is essential. First of all, the modernization of the digital infrastructure is a fundamental step. This requires high-performance equipment, servers capable of handling large volumes of data, stable networks and adequate storage capacities, so that AI systems work efficiently and without interruptions. Pilot deployment of AI modules can be a useful first test to assess performance and identify necessary adjustments before scale-up.

Database integration and standardization is another crucial element. Well-structured and interoperable data enables intelligent systems to generate accurate recommendations and optimize searches, thus supporting users in identifying relevant resources. At the same time, the development of clear policies and good ethical practices becomes indispensable. Libraries must ensure data privacy, transparency of algorithms and accountability of staff by transparently communicating with users how they operate and the purpose of collecting information.

The continuous training of librarians is another essential pillar. Staff must be trained not only in the use of digital platforms, but also in overseeing algorithms, identifying biases, and adjusting automated recommendations, ensuring a balance between technology and human discernment. At the same time, training users – students and researchers – in terms of how algorithms work, verifying sources and critically evaluating information contributes to transforming AI into a real support, not a substitute for independent thinking.

On the other hand, the piloting and progressive evaluation of AI systems helps to identify problems, adjust processes and optimize the performance of algorithms. Creating a framework for continuous monitoring and updating is equally important, in order to maintain the accuracy of recommendations, prevent errors and biases, and protect institutional and personal data. Finally, promoting an organizational culture open to innovation facilitates the acceptance of smart technologies, turning the implementation of AI into an opportunity to improve services and strengthen access to knowledge.

By combining these strategies – adequate infrastructure, interoperable databases, clear policies, training and digital literacy – Moldovan university libraries can integrate AI responsibly

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and efficiently, supporting both the academic community and the development of information services.

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DEVELOPING THE DIGITAL SKILLS OF LIBRARY PROFESSIONALS IN THE AGE OF ARTIFICIAL INTELLIGENCE

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Abstract: At this stage in the development of society, artificial intelligence becomes a tool as familiar as a calculator or search system. The library sector is not an exception: in recent years, there has been a lot of discussion on the prospects and practices of introducing AI technologies into the activities of libraries. These changes pose new requirements for the professional training of specialists, especially with regard to the formation and development of digital competences.

The modern librarian is not only a custodian and organizer of information resources, but also a mediator between the user, information technology and the digital environment. In this context, knowledge of data handling skills, understanding of algorithms for searching and processing information, as well as the ability to use digital platforms and intelligent services become key elements of professional competence.

The article is an author's understanding of current problems of digital skills of university librarians and an analysis of their possibilities for development under various forms of professional education with the use of new information technologies. The development of complex competencies related to the use of various online services, analytical tools and artificial intelligence tools comes to the fore.

Special attention is given to the integration of librarians into the digital space of higher education. In the context of digitalization, universities are actively implementing electronic resources, distance learning platforms and intellectual assistants, librarians have the opportunity not only to accompany users in the process of searching for information, but also to act as mentors in mastering digital practices.

The results of the study show that the development of digital skills of specialists is effectively achieved through a complex of forms of professional development: online courses, webinars, modular training programs and project activities. This approach allows individual educational trajectories to be taken into account, supports motivation for self-learning and forms a sustainable culture of digital professionalism.

The development of digital competences of library professionals in the age of artificial intelligence is an essential condition for the successful transformation of libraries. It ensures their digital competitiveness and strengthens the role of librarians as mediators between information, technology and society.

Keywords: artificial intelligence, library, academic librarian, digital transformation, artificial intelligence tools, digital skills, digital competencies, library and information education, professional development, professional training of librarians.

JEL Classification: D83; I23; L86.

1 Introduction

Today, we live in a world where artificial intelligence (AI) is becoming as common a tool as a PC or search engine. The widespread use of artificial intelligence and digital technologies is

radically changing and influencing the development of our society. It allows us to improve management efficiency, optimize production processes, create a favorable environment for innovative entrepreneurship, and strengthen information security. Even areas that have traditionally been considered the domain of human influence are increasingly encountering the possibility of artificial intelligence implementation. Librarianship is no exception, and the introduction of AI into this field is now increasingly being discussed by both foreign and domestic experts and researchers.

The implementation of digital technologies is redefining the forms and methods of library and information services, as well as the ways in which librarians and users communicate with each other. In this context, the development of digital information and resource management systems is of great importance. Intelligent search applications speed up the process of finding relevant information and delivering it to users.

Integrating these technologies in libraries automates activities and processes, optimizes information flows to meet the complex requirements of the modern user.

At the same time, the digital transformation creates significant challenges for libraries that require adapting their products and services to new technologies. It redefines the role and functions of the library in the institution's information infrastructure. A major challenge in this changing information environment concerns the development of digital competencies of information science professionals.

The present study analyzes the use of artificial intelligence in the work of libraries and its impact on the training and development of their digital competencies. The topic under discussion is relevant from the perspective of adapting the work of libraries to international trends of implementing innovative tools based on artificial intelligence. Subject experts, researchers as well as practitioners recognize the strong influence of digitization of information services. The acceleration of digital transformations in society requires libraries to pay particular attention to the training and development of the digital skills of their staff. At present digitization is becoming a prerequisite for maintaining library competitiveness in the information environment. The aim of our research is to identify effective approaches and methods for professional development of librarians in the era of digital transformation.

2 Artificial intelligence and its impact on the library

Artificial intelligence is a separate field of computer science. Experts argue that the use of algorithms allows computers to process large amounts of data and information and develop systems that analyze and manage them like humans. We note that artificial intelligence has developed rapidly in the 21st century, which experts explain by the following reasons:

The emergence of powerful computers that can process and analyze huge amounts of data with greater speed and efficiency;

The volume of data from social networks and other environments allows artificial intelligence to learn;

New technologies and approaches support the development of artificial intelligence;

Machine learning and neural networks are becoming increasingly accessible and provide opportunities to create smarter systems (Yandex.Praktikum, 2025).

Today, new technologies are used in all areas of activity, including education and research. In this context, the library as an integral part of the educational and research process also actively participates in the digital transformation of activity. Artificial intelligence is becoming one of the important tools in the development of modern libraries, allowing them to remain competitive. Table 1 presents examples of practical application of artificial intelligence in modernized libraries.

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**Table 1. Practical application of artificial intelligence
in the context of library activities**

Library functions	Processes
Automation of operations	Cataloging and classification of materials, inventory management, processing user requests, etc.
Personalization of services	AI-based systems perform: analyze user behavior and preferences to provide personalized recommendations for books, scientific articles, and other resources.
Interactive customer service	creation of chatbots and virtual assistants to support users: communicating with users, answering their questions, helping them navigate library resources, other services.
Analytics and forecasting	collecting and analyzing data on library usage patterns, which helps predict future trends, improve resource planning, and offer more effective services.

Source: authors based on Tukhtaev (2023)

Therefore, the use of neural networks in libraries can automate cataloging and indexing processes, which significantly speeds up the processing of new arrivals, quickly updates the catalog, and offers users relevant literature. An example is the use of machine learning algorithms to recognize and systematize electronic documents.

An important area is the introduction of intelligent search engines capable of interpreting complex user queries and generating relevant results. With the help of AI systems, libraries are creating intelligent search mechanisms that analyze user queries and return more precise results. More libraries are introducing chatbots and virtual assistants that advise readers online. Personalizing recommendations with artificial intelligence makes the library's interaction with users more individualized and convenient, while improving the quality of service. Simple algorithms analyze the history of book loans and help recommend literature that is of interest to specific readers.

In academic libraries, artificial intelligence is integrated into digital libraries, becoming an important element of the educational environment, facilitating access to necessary materials for students and researchers. It helps create virtual assistants for readers, speeds up information processing, and expands the range of electronic services.

Intelligent search and analysis of large data sets allow for the identification of trends in resource usage and the optimization of collections.

Special mention deserves national library projects related to AI for digitization and preservation.

Development and enhancement of digital skills is complemented by artificial intelligence tools. They come to the aid of librarians, but they still need to be studied in order to achieve the desired effect.

Table 2. Best AI tools for productivity

#	Tool name	Area of productivity enhancement
1	ChatGPT	AI chatbots
2	Gemini (formerly Bard)	AI Chatbots
3	Microsoft Copilot AI	AI Chatbots
4	Nedetctabil.ai	AI content creation
5	Grammarly	AI content creation

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6	Copy.ai	AI content creation
7	DALL-E 3	AI content creation
8	Notion AI	AI task management
9	Clickup	AI task management
10	Otter.ai	AI task management

Source: Perry (2025)

Thus, artificial intelligence is already being implemented in librarianship and offers important opportunities to improve the work of libraries and meet the needs of users.

However, the implementation of artificial intelligence in libraries is associated with a number of problems and challenges. Here are some of them (Tukhtaev, 2023):

Security and privacy issues. AI can compromise data privacy, which is traditionally an important value for libraries, especially in today's digital age.

Legal issues. Liability for errors made by AI-based systems or for violations of data processing and storage rules.

Staffing requirements. Library staff must have the appropriate skills and knowledge. Training staff to work with new technologies may require additional resources.

Budget constraints. For small libraries with limited budgets, AI implementation is expensive.

Bias and prejudice. If AI is trained on biased data, it can reproduce and reinforce existing prejudices and inequalities.

Accessibility issues. For some users who lack the necessary technological skills or have limited access to technology, the implementation of AI may create barriers for others, especially those.

Ethical aspects of AI application. Ethical regulation is essential in this era of mass digitalization and the implementation of AI technology (Bryson, 2018) (Heinrichs, 2022).

Artificial intelligence assists library staff in their practical activities – reading and distributing books, attending events, conducting library tours, answering reader questions, selecting literature, processing and classifying texts, compiling news feeds, and voice search.

The disappearance of the librarian profession. It is important to recognise and overcome the problems and challenges associated with the introduction of AI. Addressing challenges requires a comprehensive approach that includes training, strategic planning, continuous learning and adherence to ethical and legal standards. The introduction of artificial intelligence in libraries should be carefully planned and monitored regularly to ensure the security, confidentiality, fairness and accessibility of services for all users.

3 Developing the digital skills of librarians in the AI context

The use of technology is transforming modern libraries into centers that process, structure, and disseminate knowledge. Libraries are now facing technological transformations that are unprecedented in speed and scale in the form of generative artificial intelligence. Understanding and mastering the tools that emerge daily, particularly in the field of information technology, is a challenging task due to the fast pace of technological development. This means that librarians must develop the digital skills of library professionals so that they can use technology effectively and remain a key link between knowledge and society. Here are just a few areas that require digital skills:

Creating digital content in various formats: text, images, video, databases, etc., which involves using applications and tools for scanning, recognizing, and editing documents.

Digital content management – designing and developing tools for promoting and managing resources, etc.

Information and knowledge management specialist Dr. D. Savich believes that the professional training of library specialists requires the development of the following competencies:

- digital literacy, or technical knowledge;
- working with information and cognitive overload;
- flexibility and adaptability;
- continuous microlearning and personal development;
- emotional intelligence and social skills;
- cultural diversity;
- transdisciplinary approach;
- mobile workforce and remote work;
- understanding the generation gap;
- high-level digital ethics (CILIP: The Library and Information Association, 2021).

Thus, the digital competencies necessary to ensure the functioning of libraries in the context of digital transformation are now closely intertwined with the development of general cultural, creative, and communicative components in library education, as well as the strengthening of the humanities training of library specialists who serve users. Successful mastery of digital skills and abilities, as well as teaching users how to use them, makes librarians conduits of open science and open access to information, which contributes to the unhindered dissemination of knowledge in society and the formation of well-rounded individuals.

Electronic libraries, databases, digital archives – all of this requires the ability to quickly find, structure, and provide information to users. Working with metadata, search skills, and the ability to evaluate the reliability of sources are important components of the competence of a modern librarian.

In the library sector, a digital educational environment is gradually being formed as part of the professional development of library specialists in cultural universities through the market for distance learning services that provide high-quality additional education is not sufficient, as noted by researchers due to limited human, technological, and technical resources (Tikunova, 2019).

The first thing to note is that these are additional professional education programs and advanced training courses that are designed to give practical mastery of digital services. Online courses and webinars are becoming more and more important, as they allow librarians to study at a time that is convenient for them and master new technologies at their own pace. Librarians have the chance to access the best global educational practices thanks to massive online courses, which are becoming a promising direction.

Formal continuing training programmes, professional development courses and internships have been shown to facilitate the exchange of experience and the enhancement of librarians' digital competencies.

4 Conclusions

The integration of artificial intelligence within the library constitutes a substantial milestone in its digital global transformation. The integration of artificial intelligence within the domain of librarianship has been shown to engender novel opportunities, thereby fostering enhanced interaction between libraries and the community whilst ensuring the preservation of libraries' preeminent status in the realm of information.

The utilisation of AI tools within bibliographic services has seen a marked increase, encompassing activities such as metadata extraction, bibliographic record creation, information retrieval, information evaluation and dissemination, and reference services.

Advancements in information technology have had a considerable impact on the expansion of forms and methods in the domain of continuing vocational education. Virtual and augmented reality, artificial intelligence tools offer the possibility of interaction with the use of databases and other digital information resources. At the same time, these tools support personalization of learning and teaching.

The librarian who develops skills in using digital information resources becomes a competent guide and intermediary between the user, technologies and digital information resources. The fundamental elements of the professionalization of librarians in this framework are skills related to data management, understanding algorithms for searching and processing information, as well as the use of digital platforms and intelligent services.

Libraries in the Republic of Moldova could introduce the following objectives in their future agenda of activities:

Integration of artificial intelligence tools in libraries and their consolidation for service diversification, resource optimization and improvement of user experience.

Permanent adaptation to technological innovations to maintain the relevance of the library in the current information system.

The development of librarians' digital competencies should become a strategic priority and be reflected in all policy, regulatory and planning documents.

Continuing professional development should include current topics such as data and metadata management, online security, critical evaluation of information sources and the introduction of new services based on the use of digital products.

Promote the new roles and functions of the librarian as a mediator between users and modern information technologies and as a creator of digital content.

Therefore, the acceleration of digital transformations in society requires the modernization of librarians' professional training. Professional development and specialized education need to prepare quality professionals capable of effectively integrating content from traditional formats into the digital environment and providing services that fully meet the requirements of the modern user.

An integral part of the future of libraries is the introduction of artificial intelligence. In the near future, we will see more interesting and innovative applications of AI in the library sector, which will significantly expand the possibilities for librarianship and increase the competitiveness of libraries in the digital sphere.

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MULTIMEDIA SERVICES IN UNIVERSITY LIBRARIES: INTERNATIONAL BEST PRACTICES AND ANALYSIS OF ASEM USERS' EXPERIENCES

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Abstract: The rapid transformations driven by digitalization and the expansion of the online environment have fundamentally changed the way university libraries design and deliver their services. Over the past two decades, professional organizations such as the International Federation of Library Associations and Institutions (IFLA) and the American Library Association 165 (ALA) have outlined strategic directions for adapting libraries to the demands of the digital era, emphasizing open access, information literacy, and the development of modern multimedia infrastructures. In this context, libraries are no longer merely spaces for storing information but have evolved into digital hubs that facilitate access to electronic resources, online training, and research support. This article examines these international trends in relation to the local context of the Scientific Library of the Academy of Economic Studies of Moldova (ASEM), with a particular focus on the Multimedia Center. The evaluation of its services was conducted through a survey addressed to the academic community, aiming to identify users' needs and expectations, frequency of multimedia infrastructure usage, satisfaction with access to electronic resources, and interest in digital guides and tutorials. The survey results highlight an increasing preference for online services and remotely accessible digital resources, confirming global trends toward the virtualization of information services. Respondents request a diversification of electronic resources, more advanced multimedia infrastructure, and interactive guidance and training tools, such as video tutorials or digital guides. The findings indicate that the shift from traditional face-to-face service models to hybrid or fully online models is positively perceived and better aligns with the current requirements of academic environments. The article concludes that integrating user feedback with international best practices forms the foundation for the continuous modernization of library services. Embracing digital technologies and strengthening multimedia services enhance library visibility and relevance, reinforcing its role as an active partner in education and research. The Scientific Library of ASEM is thus positioned as an academic support and innovation center, capable of meeting the challenges of the digital era and fostering an academic culture grounded in open access, flexibility, and inclusivity.

Keywords: university libraries international trends, multimedia services, information users, needs assessment, library modernization.

JEL Classification: I23, I28, L86

1 Introduction

Today, the education system is undergoing profound changes at a global level. The integration of the information technologies into education has become a major priority, offering modern solutions through the emergence of new concepts, the improvement of traditional methods, and the expansion of multimedia communication. Libraries, an essential part of the educational process, have quickly realized the strategic role of this information and communication

environment. Through the work of librarians and IT specialists – who identify, select, organize, and evaluate online resources – virtual libraries are being built: valuable collections that facilitate user access to information, programs, and digital communities.

Students need services that support their intellectual, emotional, linguistic, social, and educational development, and university libraries can play an important role by providing contexts for learning, socializing, and engaging with science and culture.

European and national policies increasingly favor digitization and multimedia services, forcing decision-makers and library managers to analyze how they can offer full or partial electronic services. The central challenge for libraries is to integrate new digital formats into traditional service structures, along with staff training and the adoption of modern resource management models.

2 Literature review

Issues related to the modernization of library services and the study of user needs are extensively discussed in the specialized literature of the last decade. The National Bibliometric Tool records over 20 publications that appeared between 2015 and 2025, analyzing the trends, challenges, and innovations that mark the evolution of university libraries. An important segment of these contributions are studies dedicated to the modernisation of library services, carried out by authors such as A. Repanovici, N. Cheradi, B. G. Adăscăliței Macari and R. Sobieski-Camerzan. These works examine the transformations generated by digital technologies, the implementation of innovative services, and the development of strategies aimed at optimizing the functioning of libraries (Repanovici, 2025; Cheradi, 2023; Adăscăliței Macari, 2024; Sobieski-Camerzan, 2020; Malaniuc and Sandu, 2024).

Another significant area of research focuses on analyzing user needs, assessing satisfaction, and adapting services to the actual requirements of the public. Authors N. Cheradi, S. Ghinculov, E. Railean, A. Drăgănel, and I. Nicuță have developed relevant studies in this regard, contributing to the understanding of users' information behavior and expectations (Cheradi and Nicuță, 2021; Ghinculov et al., 2015; Drăgănel, 2025; Nicuță and Cheradi, 2022).

Within the ASEM Scientific Library, studying information needs is an ongoing activity, with several studies conducted between 2015 and 2025. Among these, two studies dedicated to information services for doctoral students (2015; 2021) stand out, as well as the research “Assessment of the information needs of users in the ASEM Scientific Library” (2021), which provided valuable insights for the development and adjustment of the institution's services.

3 Assessment of user needs and expectations

The Scientific Library of the Academy of Economic Studies of Moldova (ASEM) has responded to these challenges by developing the Multimedia Center, which is an information structure equipped with modern equipment. This center explicitly responds to the trend of making high-quality goods and services of general interest available to all, and the Republic of Moldova's Digital Transformation Strategy for 2023-2030 (Digital Transformation Strategy..., 2023) promotes access to such services. The information technology-based services and activities provided by university libraries help students develop a positive attitude towards education, in line with the goal of building an e-Europe, and contribute to their development as human beings capable of playing an active role in society.

The Multimedia Center aims to support various categories of users: students, master's students, teachers, and researchers by offering services that facilitate access to knowledge and provide access to information resources relevant to the study process and research activities. In recent years, the Multimedia Center has undergone an extensive reconfiguration process, along with the transfer to a new space. The service team has rethought the way it organises and carries out its activities, adapting to the new conditions in order to ensure the continuity and quality of the services offered to users.

In this context, there was a need to conduct research on identifying users' needs, expectations, preferences, and satisfaction in order to tailor services, resources, and activities to the real needs of the academic community. Such research allows for a more efficient use of resources, increases user satisfaction, and strengthens the library's role as a center for learning and innovation. Understanding information needs facilitates the development of personalized services and contributes to the formation of a lasting relationship between the library and its community (Țurcan, 2021).

Based on this, between March 1 and 31, 2025, research was conducted to assess the needs and expectations of users regarding the services of the ASEM Scientific Library's Multimedia Center. The purpose of this study was to analyze how users of the Multimedia Center perceive the services offered, the degree of use, the level of satisfaction, expectations, difficulties encountered, and suggestions for improvement. The results of this analysis provide valuable information for adapting services to user requirements and for the strategic planning of the Center's infrastructure and services, contributing to their increased efficiency and relevance.

Research objectives:

1. Determining the profile of Multimedia Center users (user category, frequency of visits, etc.).
2. Identifying the main purposes of using the Multimedia Center.
3. Assessing user satisfaction (technical infrastructure, service quality, resource accessibility, etc.).
4. Analyzing the difficulties encountered by users.
5. Formulating recommendations for improving and diversifying the services offered.

4 Methodology

The research tool used was an online GoogleDocs questionnaire survey. The research sample consisted of 56 respondents, representing the main categories of users of the Multimedia Center: undergraduate students, master's students, teaching staff, and doctoral students. This diverse distribution allows for the evaluation of services according to the specific needs of each category, highlighting the differences and similarities in how the Center is used.

The sample represents approximately 10% of the most active users of the Multimedia Center, can be considered representative, and allows for the collection of relevant data, while ensuring the reliability and validity of the interpretations resulting from the questionnaire.

5 Results and interpretations

Respondent profile. Of the 56 respondents, the vast majority are students – 36, master's students – 9, teachers – 9, doctoral students – 2. This diversity highlights the role of the Multimedia Center as a space open to all categories of users, its ability to respond to a variety of needs, and emphasizes the importance of adapting services to each user segment.

Frequency of use. The analysis of frequency of use revealed three main categories: users who visit the center several times a week (24); once a week (11); once a month (8). Six respondents use the center daily, most of whom are students, suggesting that the Multimedia Center's services are integrated into their academic routine. The segment of occasional users (less than once a month – 7 respondents) indicates the existence of untapped potential for promoting services and attracting them to more frequent use.

Purposes of use. Respondents indicated that the main reasons for using the Multimedia Center include individual study (45), access to electronic resources and scientific databases (34), copying, printing, and scanning services (32), as well as documentation activities for research. This demonstrates that the center is not only a physical space, but also an essential support infrastructure for the educational and scientific process, integrating digital resources with traditional study activities.

Evaluation of services. The evaluation of service quality showed high average scores: the quality of equipment and resources obtained an average score of 4.66, with a maximum of 5 points (Figure 1), while the atmosphere and comfort of the space achieved a score close to the maximum – 4.95.

Most participants (40) stated that the Multimedia Center is “Very useful” for academic activities. This is confirmed by the fact that there were no responses of “Not at all useful” or “Neutral”. These results indicate that overall user satisfaction is high and that the physical environment contributes significantly to their positive experience.

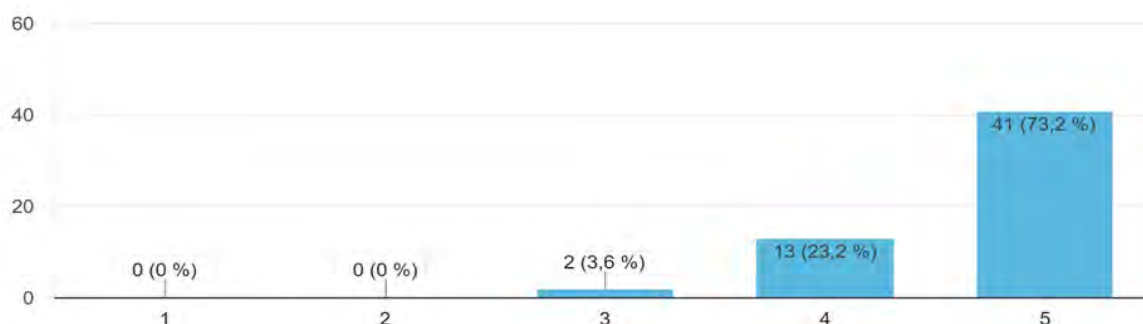


Figure 1. Degree of user satisfaction with the quality of equipment and resources

Source: own work

Use of electronic resources. The study revealed the most popular resources: in first place was the library's electronic catalog, with 45 respondents having used it. In second and third place in terms of popularity were the IREK Institutional Repository (26 respondents) and EBSCO databases (21 respondents), while the National Bibliometric Tool is used by 15 respondents. Web of Science is used by 13 respondents, Scopus by 9, and DOAJ is used by only 2 respondents. One respondent also mentioned that they did not use any databases.

Difficulties encountered. Most respondents (52) mentioned that they did not encounter any difficulties in using CM. However, in response to the question “*What are the main difficulties you encounter in using the library's electronic resources?*” (Figure 2), users specified the following: lack of skills in using databases (17), difficulties in identifying relevant sources (11), linguistic difficulties in accessing international electronic resources (8). These issues highlight the need to implement training programs, practical guides, and personalized support to improve users' information and digital skills.

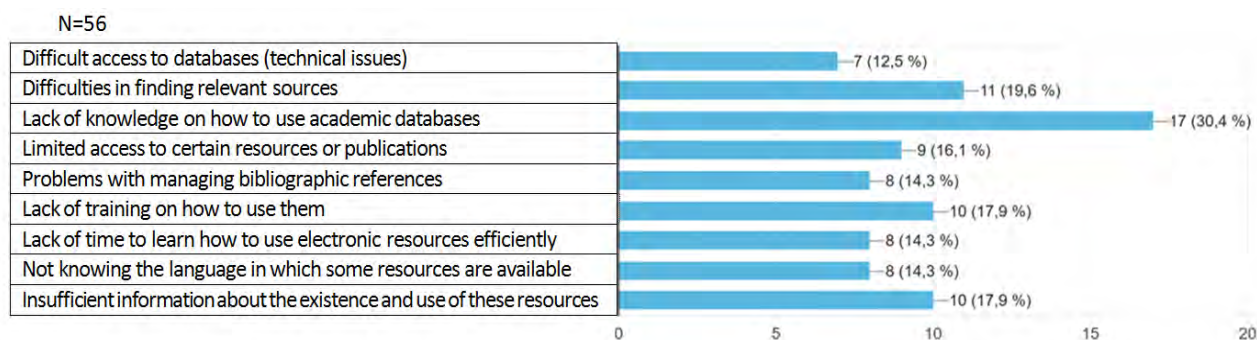


Figure 2. Difficulties encountered in using the library’s electronic resources

Source: own work

Expectations and suggestions for development. Respondents proposed several measures to improve services, providing answers to the semi-closed question “*What additional resources or services do you think the Multimedia Center should offer to facilitate access to information?*”. Thus, 42 respondents suggested equipping the center with modern equipment; organizing training sessions and webinars on the use of databases (25), and 19 respondents considered it useful to equip the Center with headphones and other multimedia accessories for individual activities. Nine respondents requested the creation of online guides and tutorials; although this option was mentioned less frequently, it indicates interest in independent training and learning tools (Figure 3).

The results obtained outline a predominant need to modernize the technical infrastructure and develop digital skills through training activities. Multimedia Center users express a priority interest in improving equipment and diversifying training methods, confirming the current trend toward digitizing the educational process and creating an interactive and effective learning environment.

N=56

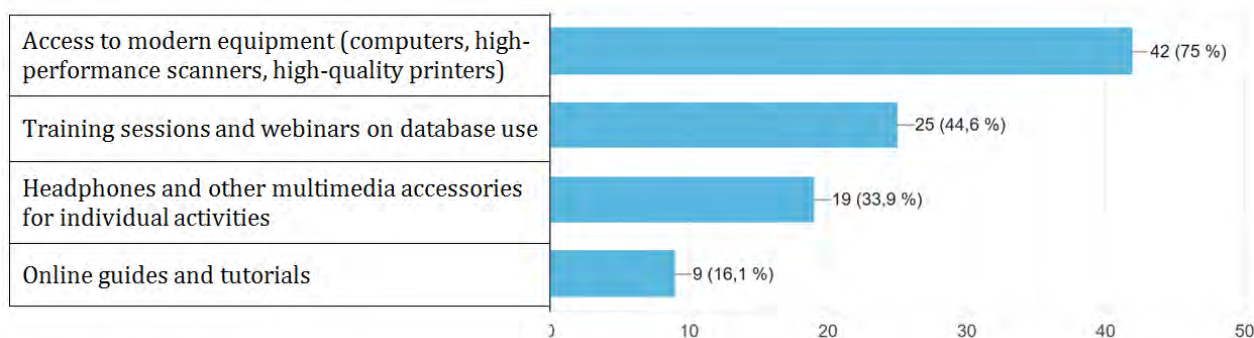


Figure 3. Users' suggestions regarding additional resources or services that the Multimedia Center should provide

Source: own work

Analysis of suggestions for improving the Multimedia Center's services, provided in the open question, revealed the following:

- most of the responses collected focused on the need to modernize equipment and upgrade to high-performance technology;
- proposals were made to organize training sessions and webinars on how to use databases;
- some respondents said they were satisfied with the existing services, and some suggested more active interaction with students.

In conclusion, the main areas for development identified are updating the infrastructure and expanding training and communication activities, and the responses to this question support the findings highlighted in other questions.

6 Conclusions

The results of the questionnaire confirm the importance of the Multimedia Center as a multipurpose space, essential for the learning and research process. Users appreciate the comfort and usefulness of the services, but highlight the need to modernize the infrastructure and provide training in the use of electronic resources. These findings are in line with global trends in the development of university libraries as hubs for digital learning and integrated research.

The Multimedia Center of the ASEM Scientific Library is viewed positively by all categories of users and plays a strategic role in supporting academic and research activities. However, in

order to maintain the relevance and efficiency of services, technological modernization, the development of training programs, and the active promotion of electronic resources are required.

Recommendations

1. Modernization of technical infrastructure: replacement of computers and multimedia equipment, software updates.

2. Organization of user training activities: workshops, webinars, and video guides for information and digital literacy.

3. Active promotion of electronic resources: information campaigns on international databases and the IREK – ASEM Institutional Repository.

4. Development of educational resources: online guides, video tutorials, and multilingual materials.

5. Adaptation of space and extension of operating hours: areas dedicated to individual and collaborative work.

6. Regular monitoring and evaluation: annual questionnaires to adjust services to user needs.

As digital content becomes increasingly important, the balance between printed materials, multimedia resources, and online access is constantly changing. This transition also influences the way library spaces are organized, as users demand more and more powerful computers and equipment dedicated to accessing digital resources.

In this context, librarians are consolidating their role as specialists in selecting, organising and mediating access to multimedia resources. A major responsibility is to structure the abundant information available online and develop high-quality library services that are accessible both locally and remotely.

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SECTION XI

ECONOMIC RESILIENCE ROMANIA – MOLDOVA: PRESENT, PERSPECTIVES, AND DIRECTIONS FOR ACTION

RESILIENCE AND STRATEGIC ADAPTATION OF MONETARY POLICY IN THE INCIDENCE OF EXTERNAL SHOCKS (LITERATURE REVIEW)

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Abstract: This paper represents a literature review, and examines the strategic adaptation of monetary policy under the influence of external shocks in small open economies, as well as its capacity to support economic and financial resilience, depending on the type of shock and other influencing factors. The article is structured as a theoretical synthesis composed of a review of the literature and policy practices' evidence. The main focus of the study consists of exploring available monetary policy tools' capacity to tackle the external shocks affecting key transmission channels.

Special attention is given to the operational and institutional constraints alongside policy trade-offs associated with the effective conduct of monetary policy in current external conjunctures, marked by high uncertainty, interdependence, and mixed geopolitical trends. While the topic is intensely discussed by academia and policymakers, literature offers a relatively limited comprehensive approach and a conceptual insight into these challenges, in particular with direct relevance for small open economies, characterised by specific structural features such as limited capital mobility, partial exchange rate flexibility, and often opaque transmission mechanisms; this study is an attempt to contribute to that particular (sub) field of study.

The conclusions are multifold; first, there is no universal framework capable of fully absorbing external shocks in such contexts, but there are limits of monetary policy which can be tried to be overcome. Rather, a flexible and adaptive policy mix appears to have positive contribution to achieving its objectives - one grounded in rigorous macroeconomic understanding of the current situation, supported by institutional credibility, and coordinated closely with the general economic growth strategy of the state.

Keywords: *External shocks; Small open economies; Monetary policy transmission; Macroeconomic resilience; Policy coordination; Imported inflation.*

JEL Classification: E52; E58; F41; F44; H12; O23.

Introduction

The topic of adaptation of monetary policy in addressing the external shocks is becoming increasingly relevant in the contemporary context. In recent years there have been witnessed modifications in economic alliances' trends, emerging monetary unions and geopolitical blocks and fragmentation, however, globalisation continues to produce its multiple effects on economic

and financial relations alongside with transformative advancement of digitalisation and technologisation (Aldasoro *et al.* 2024, Bullok, 2018). Thus, the relevance is supported not only by the increasingly interconnected world, dynamic technological progress, extensions of the central bank's mandates with modern international policy agendas, but also in the context of the recent shocks that economies have recently experienced - the sanitary crisis generated by the Covid-19 pandemic and the geopolitical events, which have reflected in prices of raw materials, directly and indirectly affecting the prices composing the consumer's basket.

Developing small open economies are exposed to external sector events that plausibly aggravate historically existing macroeconomic imbalances and pose additional risks to the financial stability, subsequently producing direct, indirect and, sometimes, costly effects on both the economic and social environment in a country. If not managed effectively, macroeconomic instability, frequently rise social and political problems, affecting other dimensions essential to the quality of life of the population, such as trust, competitiveness, safety, migration, environmental quality, food security and others, which in turn continue to reinforce and deepen existing unstable economic situation.

The vulnerability of small open developing countries is also enhanced by their widespread reliance on international trade and foreign capital inflows that transmit shocks via a number of channels. Given the circumstances of the global economic volatility that has been characterized by extensive fragmentation, volatility in the financial, energy, and trade markets, and recession risk, it is imperative that these nations respond differently so that they become more resilient and sustainably develop.

Even though historically monetary policies operate under presumption of long-run neutral and medium-term demand stabilisation, the recent global events and trends re-bring in their focus supply-side considerations (Babura *et al.* 2024,), and reopen professional and academic discussions regarding its influence on long-term rates and household consumption decisions (Kovanda, 2025). This approach was a challenge for central banks during the two recent major crises, the global sanitary crisis and the so-called energy crisis, because the instruments of modern central banks are not adapted to the associated shocks, especially given that the last two decades have been marked by relatively modest inflation.

The main purpose of this study is to explore, trace and synthesise the development of the theoretical-conceptual framework that shaped the modern approaches of monetary policy in mitigating the impact of external shocks on price stability and economic growth applicable in contemporary emerging market economies.

The main goal is intended to be achieved by applying the research methodology, consisting of review and analysis of literature. The argumentative body of the article's narrative is expressed predominantly dialectically - synthesis, and progressively - analysis.

The role of the central bank and monetary policy in assuring resilience in face of external shocks

Any discussions about macroeconomic management of shocks, inevitable will resume to its two main pillars: monetary policy and fiscal policy. After the recent so-called sanitary crisis and energy crises macroeconomists question the leadership of one or another. Unquestionable remains the ability of the two in dealing with macroeconomic stabilisation. The trends of recent years call for closer coordination of those policies (Drabi, 2014), which currently meets a range of practical implementational challenges in different types of settings, be it monetary unions, federations, advanced or economies in developing phase.

History shows that forceful monetary policy responses efficiently contributed to restoring stability in advanced economies (BIS, 2024). Brunnermeier (2023, p.6) names central banks as "directors" of modern economies, emphasising monetary dominance, based on the independence of central banks, with which they are invested by law. Moreover, in his analysis, which apparently

refers to central banks in developed countries, the author supports the idea of central banks setting policies that actually extend their historical role, including setting policies that can stimulate the economy, focus on achieving social objectives, promote financial inclusion and the transition to resilience and sustainability.

Monetary policy theoretical framework alongside the economic thought, as well as its interpretation, progressed through numerous theoretical cycles since their foundation, with each school of thought and current contributing with distinct perspectives on monetary phenomena shaped by their historical and geographical contexts. Contemporary monetary policy frameworks were formed selectively from various theoretical and operational traditions to address the specific challenges of external shocks.

Macroeconomics is a relatively a “young science” (Pișchina, 2012) and given the progress in research, it is natural that there are different and even contradictory opinions, each formed on the basis of assumptions or input data. Monetary theory in the field of economics includes a plurality of ideological perspectives contrary to a single approach. At the same time, the respective competences and subsequently the instruments applied are determined by the regime, strategy and objective of monetary policy. Historically, various schools and currents of thought prioritised different factors and mechanisms defining the price level, respectively, consistently promoting different, individual policy interventions, for each of the distinct challenges that economies faced at certain periods in certain geographical spaces (Scepanti and Zagmani, 2005, p.8).

The prism through which the evolution of economic thought itself should or can be viewed and analysed is a separate research topic, but it is certain that it is in a continuous and multidimensional movement and should be viewed according to the relative importance to the theoretical basis of contemporary central banks.

Keynesian theory, born in an advanced economy, in a specific economic context, applicable to an advanced economy, emphasises the role of active economic policies in managing business cycles and mitigating external shocks. Keynes (1936) argued that in periods of recession, insufficient demand can be stimulated by expansionary monetary policies, by lowering interest rates to encourage investment and consumption.

Irving Fisher, the influential American economist, argued that inflation can be avoided or controlled by monitoring and adjusting the money supply by monetary authorities. Monetarists, starting with Friedman (1968), argue that monetary policy should aim to stabilise the money supply, arguing that inflation is always and everywhere a monetary phenomenon. Both Fisher and Friedman approached the problem of inflation and monetary policy from different perspectives, both made significant contributions in the development of economic thought and in influencing contemporary economic policies. According to Friedman (1968, p.14), first of all, the monetary authority should base its decisions on factors it can control, such as exchange rates, price levels, or monetary aggregates, instead of relying on variables it cannot control.

Additionally, monetarists advocate for steady policy implementation arguing that the monetary authority should avoid abrupt changes in policy direction, and even moderate inflation or deflation is preferable to erratic fluctuations potentially leading to instability (Friedman, 1968). This idea, transposed to external shocks, suggests measured rather than aggressive responses to external shocks. Following this approach, monetary policymakers today would meet the issue of uncertainty related to knowing the duration of the shock and its effects, moreover, macroeconomic shocks typically exhibit two phases of effects (Bloom, 2009, p.624), the severity, direction and length in time of which is typically challenging to predict.

Evolving in distinct directions conceptually and chronologically, Post-Keynesianism and New Keynesianism, represent two different economic schools of thought that stem from the ideas of John Maynard Keynes. Post-Keynesianism, which began to develop in the 1950s and 1960s, focuses on economic uncertainty, financial instability, and supports government intervention,

sceptically viewing the concept of self-correcting markets. While the New Keynesian Economics, popularised in the 1970s and 1980s, try to combine Keynesianism with aspects of neoclassical economics, such as rational expectations and mathematical modelling, focusing on price and wage rigidities, and the role of monetary policy in stabilising the economy.

The Post-Keynesian school adds the importance of financial institutions. Post-Keynesians comes with idea that the markets are not always self-correcting and to ensure economic stabilisation and employment goals, there is a need of state action, including in form of monetary and fiscal policies (Arestis, 2010). Post-Keynesianism bring doubts in the idea of the neutrality of money, and underline the central bank's central role of managing the supply of credit and stabilising the financial system.

The first macroeconomic models appeared in 1950s and were based on Keynesian theory, since then central banks employ extensively to analyse, test, model and forecast shocks to the economy. The New Keynesian approach combines Keynesian elements with microeconomics. It involves using the principles and theories of microeconomics to explain and build models of the larger economy, or macroeconomics. These models attempt to integrate individual behavior, market frictions and rigidities, and expectations into the analysis of macroeconomic phenomena, providing a deeper and more nuanced understanding of the economy. Based on Clarida, Gali, and Gertler (1999), it can be argued that monetary policy should respond to shocks by adjusting interest rates according to deviations of inflation from target and the output gap, suggesting that central banks can use interest rate policy to cushion the effects of external shocks on the economy. The authors conclude (Clarida *et al.*, p.78) that a better understanding of the macroeconomics and the determinants of inflation is important and place the persistence of inflation among the important considerations in its relationship with the adaptability of the labour force and economic growth. At the same time, the authors indicate that their research was based on closed economies and in a broader perspective external factor should be taken into account. This study also has another limitation in terms of its relevance for developing small and open economies, because they usually face a higher, persistent level of inflation, and other characteristics that determine that the monetary frameworks in these countries are not primarily focused on the analysis through the prism of business cycles, the real marginal cost, including labour, or even the economic growth/product versus inflation ratio, given that the monetary policy regime will be ignored.

Finding the balance between the rule-based and discretionary approach to monetary policy is one of permanent debates among economic policymakers and scholars. This debate was significantly influenced by the work of Kydland and Prescott (1977), who supported the rules-based, stressing that discretionary policy can lead to suboptimal outcomes due to time inconsistency problems.

New Classical Economics, represented by figures such as Robert Lucas (1976), bring in focus the rational expectations and the idea that monetary policy influences nominal variables, but not the real ones, in the long run. Lucas criticised traditional macroeconomic models for giving way too little weight to the role of rational expectations in economic agents' decisions. This school argues that predictable, rule-based monetary policies are preferable, because discretionary policies can be counterproductive due to their effects on economic agents' expectations.

The evolution of theoretical frameworks supporting modern monetary policy is by far non-exhaustive, that also wasn't the aim of this study. For example, during this same period, the Austrian School of economics advocated for spontaneous market mechanisms while avoiding government economic intervention. Austrian economists contended that central bank manipulation of money supply creates artificial business cycles and distorts markets. However, narrowing the focus to the structural characteristics of emerging market economies that matter for responding to external shocks, it is reasonable to stop here, as New Keynesian models have become widely adopted by mainstream central banks around the globe.

Monetary policy adaptation and associated structural challenges

Prominent contemporary economists, characterise the current situation as one where the main role in the economy belongs to the central bank (Brunnermeier, 2023 p.6)), facing conflicts with fiscal and financial stability policies; the author stresses that the "intellectual framework" of central banks in developed countries adopted after the 2008 financial crisis is still in force, but there are already signs that it will undergo changes, which can potentially lead to the unanchoring of inflation, that can have consequences on both aggregate demand and supply. Developed countries, showing relative stability, in the last three decades have been facing deflationary threats, this has led to the adaptation of monetary policy frameworks, including its instruments, such as, for example, the introduction of unconventional instruments, the data-based approach to avoid tightening monetary policy at the expense of lost economic growth. But major external shocks, which came with disruptions to supply chains, have shown that government policies, including fiscal policy, affect both market developments and central bank independence.

Recent developments in structural monetary policy tools provide additional perspectives on shock management. Guo (2022) examines how the People's Bank of China employs structural monetary policy instruments to address sectoral shocks and support specific economic segments, demonstrating that targeted tools can complement traditional monetary policy in managing heterogeneous external impacts on different sectors of the economy.

Referring to the focus on resilience and sustainability, as the theory and practice of monetary policy continued to develop, political and economic discourses and analyses to describe the objective of central banks or governments to moderate economic growth and prevent inflation, without triggering a recession gained more place. The idea of this, called "soft landing", is closely linked to macroeconomic theories and the practice of business cycle management, which evolved significantly in the 20th century. Thus, contemporary monetary policies, were refined through the work of economists of more than one school, including Monetarist School, as well as through the contributions of the Keynesian School, which emphasised the role of government in moderating business cycles. A "soft landing" is seen as an optimal goal in business cycle management, representing a balanced transition from overheating, while ensuring financial stability and maintaining low unemployment. Monetary policy plays a key role in trying to achieve a "soft landing" by adjusting the money supply and borrowing costs to influence consumer spending and business investment. Global financial crises, pandemics, sudden changes in commodity prices or geopolitical conflicts complicate the central bank's mandate in achieving soft landing objectives, but the risks of this landing remain to be balanced, given the aim to maintain stable growth of demand and labour productivity.

The complementary objectives of maintaining macrofinancial stability, climate agendas, gender balance, digitalisation in a way or another complement today's central bank mandate, with each central bank deciding on its own approach to policy priorities and tools. However, the main objective of price stability remains central, alongside with primary macroeconomic stabilisation.

The Republic of Moldova showcases an example of the structural fragilities typical of small, open countries that conduct inflation-targeting policies. A high dependence on energy causes important exposure to external price shocks, while weather events frequently harm agricultural activity, reflecting in food prices and destabilising growth. Persistent trade imbalances indicate stronger import demands vis-à-vis limited export potential. Although financial sector is enough capitalised to withstand financial frictions, stress of sectoral rapid credit growth and surging immovable property prices amidst supply constraints point towards possible property market overheating. Currency stability demands maintaining enough foreign exchange reserves for cushioning emerging risks. Fiscal sustainability in a large proportion dependent on the externality of foreign assistance that limits revenue generation and create fiscal space constraints. Institutional reforms have gone far, while central bank operational credibility is further required in terms of the

expectation channel. Although EU accession path adds some clarity, geopolitical and economic uncertainty still makes policy forecasting difficult. These type of structural issues pose policymakers into situation to solve policy trade-offs between inflation restraint and growth goals, amidst the containment of external shocks when policy space face multiple operational and institutional constraints.

Cuhal (2012, p.85) explores details regarding the prioritising of a certain type of objective by the central bank in a small open economy; this would depend on the level of significance that the monetary authority attributes to the factors, with regard to external factors, the central bank chooses in which direction to focus its forces, either on the interest rate, to open the financial market to foreign flows, or on domestic credit to direct domestic demand and the volume of exports. The differences in approaches addressing the most recent crises which generated external shocks to domestic economies, were observed, when during the Covid-19 pandemic, different central banks acted differently and at different points in time to respond to the associated shocks (Cociug and Ialaia, 2023).

Adaptation of policy starts with a clear image on the current situation. Clearly understanding the effects of external shocks on macroeconomic conditions are a complex topic, involving the analysis of how economic, non-economic, or global policy and non-policy changes influence monetary policy decisions at the national level. The complexity is conditioned by many factors, such as the limits of traditional or existing frameworks to analyse the macroeconomic condition, the necessity to apply microeconomic view, where it could become more difficult to disentangle and link a particular event with the outcome in the macroeconomic landscape, this is clearly seen for example in an attempt to define a exchange rate volatility pass-through to inflation.

Monetary policy researchers and monetary policymakers re-brought the issues of limited capacity of current analytical frameworks recently under discussion due to the nature of recent major shocks which monetary policy cannot ignore. Banbura *et al.* (2024) argue that due to the supply-side nature of external shocks on prices, current models should include more of those supply side factors into analysis models by going beyond analysing traditional shocks on oil prices, by including gas prices and supply chain bottlenecks. The complexity in analysis is aggravated for a developing economy due to historical operational and institutional constraints of monetary policy which are different in their nature. Studies (Ghosh *et al.*, 2012, Selvarajan *et al.*, 2020, Antohi *et al.* 2003) directly or indirectly mention that emerging market and developing economies tend to be less financially integrated by having limited capital mobility, financial markets' immaturity (wide current account deficits, lower integration in global financial markets (translated into less access to finance but also less of contagion risks linked to financial crisis), weaker governance, conflict of policy objectives, more opaque monetary policy transmission due to dollarisation and role of exchange rates in expectations, as well as typically higher informal economy rates than more advanced economies.

These country characteristics reinforce a standalone problem associated with data availability and quality. Emerging market economies from the operational point of view lack of granular data, long time series and even the lack of certain type of data that make it challenging to analyse and have a clear event-effect diagnosis.

Those structural aspects, represent challenges of the time and necessitate a detailed approaches that address the problems an all levels.

Conclusions

An efficient monetary system is essential for maximising the use of capital and labour resources, thus generating real economic growth and prosperity (Pișchina, 2012, p.207). In context of this study, an efficient functioning of the monetary system presupposes the ability of the central bank to maintain resilience by acting flexibly, timely and appropriately in times of economic fluctuations, provoked by both by internal and external factors. For the developing small open

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economies, which, due to their deeper economic and financial dependence the international markets, are often more exposed to global economic events, and where the effects of such events are prone to manifest greater negative influence, this ability is vital.

The evolution of economic thought and the theoretical underpinnings supporting the monetary policy framework within macroeconomic policies have predominantly been shaped adapted to the geographical and temporal contexts prevailing at the time the respective methodologies were developed. The recent significant external shocks have underscored that no singular theoretical framework is capable of adequately gauging all complexities, particularly those arising from the non-monetary sector and supply-side shocks. Effective shock management would more appropriately hinge upon flexibility, coupled with a credible framework, rather than dependence on a specific doctrine. The emergence of unconventional tools, the integration of macroprudential policy with monetary policy, as well as structural monetary policy instruments, as evidenced in economies such as China, implies that targeted interventions may serve to augment traditional instruments when shocks disproportionately impact certain sectors. From this analysis, it can be concluded that the theoretical frameworks in economics, ranging from classical monetary theory to Post-Keynesian and Monetarist Schools, provide diverse perspectives and considerations for economic stabilisation. The contemporary and continually evolving new-Keynesian approach, along with its subsequent refinements, has become a prevalent "lens" through which to examine the macroeconomic conditions and to model shocks within a monetary policy framework. This underscores the necessity for timely identification of the nature of uncertainty shocks and the meticulous design and calibration of the appropriate policy mix, contingent upon the formally assigned mandates of the authorities regarding price and financial stability.

Contemporary central banks operate under multiple objectives and goals complementing the main goal of price stability. Therefore, a proactive monetary policy with well-calibrated models is expected to create a good base for counteracting inflationary effects, stabilising the economy and be aligned with the general economic growth strategy of the state. In addition, a stable and predictable economic environment accompanied by effective monetary policy supports economic growth. For the developing small open economies, the aspects are critical to ensuring resilience and capable of adapting and taking advantage of global opportunities, with no or limited negative impact of external events. The study reveals the necessity for a complex action, from the one side continuation of capital market's development, from the other, increasing the quality and quantity of relevant data, that help better understand macroeconomic interlinkages and improve informing timely policy decisions.

It is clear that in real life and modern conditions, achieving the main objective of price stability with optimal costs to the economy by itself a challenging objective. This challenge is additionally compounded by the country's historical specificities as well as by the current world developments in geoeconomics, geopolitics, and technology. The uncertainty around the evolution of those processes serves a source for potential new shocks. Therefore, this task, nowadays requires a comprehensive multi-disciplinary approach, capable of highly calibrated policy responses to anticipate and respond effectively to rapid changes in the global economic conjuncture.

Particular structural features of the economies, as well as limits and constraints of existing monetary policy frameworks in which emerging market economies operate, pose certain constraints that limit its stabilisation capacity. Further research questions and practical challenges would lie not in pursuing optimal policies that assume away these constraints, but in developing resilient strategies that perform adequately across various shock scenarios defined by the uncertain global environment.

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MONETARY POLICY TRANSMISSION IN THE REAL SECTOR: CHANNELS, RESPONSES AND MACROECONOMIC IMPLICATIONS

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Abstract: The theoretical paper examines how monetary policy influences the real sector of the economy, focusing on the transmission channels through which policy actions affect the economic processes and decisions. The analysis aims at examining the mechanism of transmission of different channels, observe the empirical evidence and emphasise the limits and conditions for reinforcement and amplification of the effect of the analysed channels. The paper also looks at the economy of the Republic of Moldova, exemplifying a small open developing economy with internal structural and relatively high external vulnerabilities. This analysis completes the overview of the channels' functioning, and allows for tracing the validity and applicability of theoretical regularities and highlight asymmetries in the transmission processes characteristic for countries belonging to different territorial regions and different level of development. The analysis particularly addresses monetary policy implementation in the period marked by occurrence of major external shocks.

Another objective of the study is to explore the capacity of available monetary policy tools in contribution to external shocks management through key transmission channels such as exchange rate fluctuations, imported inflation, shifts in global demand, financial conditions, and foreign monetary stances, in the same time attempting to observe tendencies regarding the policy impact on real output. All of these channels affect the formulation and effectiveness of monetary framework and contribute to its potency for influencing growth, with some being more relevant for modern monetary policy in open economies with inflation targeting regime, which constitute the majority on the global level. In this context this paper observes and outlines the underlying patterns, which enable for better understanding how monetary policy influences economic growth through different channels. Although, since recent times, the topic has been widely discussed in academic and policy circles, the existing literature provides limited comprehensive approaches and conceptual clarity on these challenges, differences and particularly in the context of small open development economies, which are marked by series of particular structural characteristics, and often weak and opaque transmission mechanisms. This study seeks to advance understanding in this specific area. The paper employs a theoretical synthesis approach, systematically reviewing recent empirical evidence on transmission channels and applying this framework to Moldova's institutional context. The analysis underlines the importance of the topic for further research and contributes to a deeper understanding of how monetary policy transmits into real economic outcomes, and reinforces the necessity of building optimal policy frameworks to time- and country-specific conditions.

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Keywords: *Monetary policy resilience; real sector dynamics; macroeconomic stability; external shock absorption; transmission mechanisms; economic adjustment; policy responsiveness; resilient growth.*
JEL Classification: E32; E52; E44; E61; O11; F41.

Introduction

Understanding how central bank decisions are transmitted to the real economy is a fundamental prerequisite for any policymaking process and coherent response to external shocks. In a small open developing economy like the Republic of Moldova, where various types of external shocks - trade, financial, energy or geopolitical - exert a decisive influence on macroeconomic dynamics, the simple mechanical adjustment of the interest rate or other monetary policy instruments proves insufficient. The monetary authority must have a deep understanding not only about the appropriate direction of its intervention, restrictive or accommodative, but also which channels would work in the most optimal way, with what intensity and over what period of time the intervention will be transmitted to the entire real and financial economy. Only in this way can monetary policy be adapted in a credible and efficient way to the specific nature of the external shock, avoiding both inaction that prolongs imbalances and overcorrection that amplifies volatility and generates excessive social and economic costs.

The stated goals of monetary policy, such as price stability, macrofinancial stability, and anchoring inflation expectations, are macroeconomic outcome variables that cannot be directly controlled by the central bank. Instead, the monetary authority influences a set of intermediate variables - the monetary policy interest rate, liquidity in the banking system, lending conditions, the exchange rate, the prices of financial and real estate assets, and the expectations of economic agents. This complex set forms what the economic literature calls the monetary policy transmission mechanism. Bernanke and Gertler (1995) demonstrate that the credit channel enhances the effects of monetary policy on the real economy by amplifying interest rate changes through borrower's balance sheets and bank lending. The implication is that models or policy frameworks that neglect this mechanism may underestimate monetary policy's overall impact, potentially compromising the central bank's ability to calibrate appropriate responses.

Analysis of the transmission channels, responses and macroeconomic implications of the monetary policy for the real sector

Recent literature delves deeper into the topic and reinforces the idea that the transmission of monetary policy to the real sector can take place through multiple channels, and is characterised by heterogeneity, sometimes also by twofold effects and non-linearity (for example in case of large shadow banking sector), implying that not all channels operate with the same strength or speed, and the magnitude of the effects depends on the financial structure, the structural characteristics of the economy and the macroeconomic context. Thus, recent research brings to the discussions the four most important channels of monetary policy transmission, viewed through the effort/effect relationship in the use of monetary policy instruments (Table 1). This study will examine some additional channels, sometimes classified as sub-channels of the four traditional ones, and provide more complete perspectives of their functioning, especially comparing developed economies to small open developing economies.

The first classic channel is the *interest rate channel*. Typically, in inflation targeting regimes of the economies with a relatively mature financial sector this channel is considered to be the most responsive and strong channel, as changes in the central bank's policy rate quickly transmit to interest rates on loans and savings, directly influencing the demand for money, through the influence on financing cost of investment and consumption. In a normal tightening scenario, the increase in the policy rate leads to the respective adjustments in consumer and business spending decisions, resulting in a reduction in the volume of loans, and to a decrease in the money creation capacity of banks. Empirical evidence shows that central banks rely on this channel the most, being

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accessible, and quite effective in the short term. For instance, an increase in the Bank of England's reference rate in the period of 2023-2024 reduced household consumption and business investment, reflecting intertemporal substitution mechanisms and effects on cash flows (Burr and Willems, 2024).

Another important for the monetary policy channel, is the *credit channel*. Its main mechanism affects the *bank lending (bank-lending sub-channel)*, the importance of which increases when the share of bank financing in the total volume of financing is higher than non-bank financing, for example in bank-based financial systems. Therefore, the effects of this channel are best observed through the responsiveness of the credit supply to the changes in monetary policy. A restrictive policy is expected to materialise in reduced volumes of deposits, bank reserves, constrains in bank lending and decrease in the investment of firms dependent on bank financing. The credit channel can be viewed as an amplifier of the traditional interest rate channel.

Recent evidence comes from the observations for the South African Reserve Bank, where a monetary tightening reduced both bank deposits and the volume of bank loans, and changed the structure of lending towards the non-bank financing system, producing sizeable effects on the real estate market. However, the efficiency of this channel differs depending on the monetary policy stance and the business cycle phase (Choi *et al.*, 2023), as well as on the structure of the economy and the depth of the financial sector. In countries with developed financial sector, besides the effects through bank lending, this channel affects the financial position of the borrowers, affecting the value of balance-sheet assets and producing effects on external finance premium, which further discourages investment and spending. These effects on the economic agent's balance-sheets gave the name to the *balance-sheet channel*, which can be seen as a sub-channel of the credit channel, or a standalone asset-price channel. Thus, in an economy with predominantly small firms, which do not have sufficient collateral assets, these are more sensitive to the credit channel than those with predominantly large bankable firms. In the same time, the effects are stronger in unfavourable economic periods or in countries with low financial market development.

The *asset-price and wealth channel* materialise through the changes to the values of assets and *balance-sheets* of the borrowing firms as a response of the change of monetary policy stance. It works through the effects on the net wealth of households and firms, which influences their access to credit, borrowing capacity or decision about financing (source of financing), once the financing becomes more expensive due to the change in collateral or financial assets price and/or the necessity to borrow external funds (Mermelas and Tagkalakis, 2024).

For the open economies and import-dependent economies, the *exchange rate channel* plays a significant role, because changes in the interest rate influence the exchange rate, affecting the competitiveness of exports, the cost of imports and thus real output (Zahid *et al.*, 2021). This transmission is of increased relevance for developing economies with emerging markets or outward-oriented economies, and often conditions inflation-targeters to employ foreign exchange policy to achieve price stability goals - a largely debated topic in the field of policy-oriented research, because in inflation targeting regimes, foreign exchange interventions aimed at price stabilisation, are considered to blur policy signals leading to policy inconsistency, undermine inflation targeting credibility, and generate excess liquidity or quasi-fiscal costs.

The Table 1 below summarises the evidence about the effects, limits and amplifying factors over the functioning of the four traditional monetary policy transmission channels.

Table 1. Traditional transmission channel functioning

Transmission channel	Effect on the economy	Limits of the channel	Amplifying factors or factors limiting the effects

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<i>Interest rate channel</i>	Interest rate changes influence financial conditions, affecting consumption and investment (Lane, 2022)	Incomplete and slow transmission effect- not all rates adjust quickly (and the impact on the economy may be delayed (Byrne and Foster, 2023)	-The interconnection between the banking system and the money market -Sensitivity of consumption or investment to interest rates
<i>Credit channel (Bank lending channel)</i>	Monetary policy affects the supply of credit: when the rate increases, banks restrict lending, investments and consumption being determined by bank loans decrease	If there are alternatives to traditional banks (non-bank credit institutions), the effect can be mitigated- credit can be redirected to non-banks (Cucic and Gorea, 2024)	- The economy is composed of small firms with little collateral (Choi et al., 2023) - Banks are dependent on deposits; - There are no alternative financing markets or financial intermediation is weak (Pirozhkova and Vieg, 2024)
<i>Asset-price, Wealth (Balance-sheet channel)</i>	Changes in interest rates affect asset prices (stocks, bonds, real estate), the wealth of firms and households, available collateral, which influences consumption, investment and lending	The effects are often diffuse, with a lag, and may depend on the level of interconnectedness of financial markets. In addition, asset valuations can be cyclical, with high volatility risk	- The structure of the economy includes a significant share of financial/real estate assets; (Lane, 2022) - When firms and households are exposed to price volatility - The loan is secured by collateral
<i>Exchange rate channel</i>	Monetary policy changes interest rates, which influence the exchange rate by affecting import/export prices, external competitiveness, exports/imports, external demand, having impact on production	If exports/imports are low or balanced, the channel may have a weak effect. External volatility, foreign exchange reserves, capital controls may disrupt the effect (Lane, 2022)	- The degree of openness of the economy with a high share of exports/imports; - The exchange rate reacts to monetary policy shocks; - When there are no severe macroprudential constraints

Source: developed and constructed by the authors based on cited sources

The transmission channels described above, considered classic, can form related channels. Thus, the specialised literature identifies a channel derived from the credit channel, namely *shadow banking / non- bank financial mediation channel*, which manifests itself in the fact that non-bank financial institutions can take over part of the credit demand, cushioning the negative effects of the banking restriction, financing investment and consumption even if banks restrict lending. In this case, the effect of the credit channel is attenuated, and the efficiency of monetary policy is more modest. The Denmark’s Nationalbank study “Nonbank Lending and the Transmission of Monetary Policy” (2024) shows how non-banks increase the supply of credit after a monetary contraction, compensating for the decline in bank credit. (Cucic and Gorea, 2024). However, if non-bank financial institutions have a different regulatory regime, do not have easy access to funding, or have liquidity constraints, the channel may be weak or volatile, highlighting structural changes that change the traditional mode of transmission (Cafiso and Rivolta, 2024).

As in case with other transmission channels, its effects depend on its magnitude, in this case, measured by the volume of lending originating outside the banking system. But its effects can be viewed from two sides - from one perspective, in a normal inflation targeting regime, it may hinder proper transmission and blur the right economic diagnostic by the economic policy-setters; from other point of view, it maintains the supply of credit during tightening periods which may be considered excessive. The efficiency of this channel increases if non-bank financing markets are subject to a flexible regulatory/supervisory regime.

Recent research by the ECB (2024) shows that transmission occurs not only through policy instruments, but also through global financial conditions that condition inflation expectations (Lane, 2024). The s.c. *macrofinancial channel* works through expectations of participants to the economic and financial relations which makes them to act based on their anticipation about the future level of rates or value of assets. The channel acts in tandem with the relatively new monetary policy instrument, forward guidance, employed by advanced economies and economies with developed financial markets. If monetary policy influences aggregate financial conditions (interest rates, asset prices, credit, liquidity, exchange rate volatility), the way central banks communicate ("forward guidance", scenarios) affects the expectations of firms and consumers, which alters spending, investment and savings decisions, and can condition a faster or amplified transmission of monetary policy to the real sector. This channel is particularly influential, serving as a key rationale for adopting inflation targeting regimes and occupying a central role in the monetary policy analysis and forecasting frameworks of central banks within those countries.

Its effectiveness, however, depends on several institutional and financial preconditions. The inflation expectations channel operates efficiently when the central bank is credible and transparent, financial markets are well-functioning with a diversity of institutions, and macroprudential constraints are not unduly severe. These conditions are most fully met in advanced economies and those with deep financial markets, where economic agents are responsive to policy signals and adjust their expectations and financial decisions accordingly.

An emerging conclusion from the recent literature analysed above, is that financial development, bank characteristics, economic structure and firm vulnerabilities (debt, dependence on bank credit, liquidity) strongly influence the efficiency of monetary transmission. Countries with underdeveloped banking markets or firms with fragile balance sheets have weaker and more uneven transmission (Oyadeyi, 2024). The analysis and recent studies reaffirm that the effects may vary depending on the macroeconomic regime, the cyclical state of the economy (boom vs. recession), and the mix of instruments (conventional vs. unconventional monetary policy) (Choi et al., 2023).

Monetary policy transmission in the Republic of Moldova

The specialised economic literature pays extensive attention to the analysis of the transmission mechanism in advanced economies (Choi et al., 2023, p.2), yet the specifics of small open economies with underdeveloped financial markets remain insufficiently explored. A developing, young market economy in Eastern Europe, Moldova, exemplifies the complex policy dilemmas that these economies face. The particularities and monetary policy challenges faced by Moldova reflect the complexity of the trade-offs imposed by a range of structural vulnerabilities and exposure to external shocks. Specifically, the National Bank of Moldova (NBM), guided primarily by a forward-looking inflation targeting framework, is continuously adjusting to balance responses to domestic risks and inflationary pressures that cannot be immediately controlled. The energy crisis triggered by Russian gas supply disruptions, coupled with ongoing geopolitical instability, climate-induced challenges clearly exemplify such pressures. Even though an economic recovery is anticipated in the coming years, Moldova's GDP growth stagnated, highlighting the constraints inherent in an economic structure largely based on consumption and investment. At the

same time, net exports remain consistently negative, influenced by agricultural uncertainties and disruptions to established routes, especially with the neighbourhood.

The formal adoption of the euro as the official reference currency in January 2025 signals a deeper structural integration with the EU financial markets, this relationship simultaneously promises a contribution to stability, but also an exposure to various market spillover effects of the European market. However, the currency stability is currently supported by relatively robust foreign exchange reserves and international macrofinancial funding. Moldova's current negative net international investment position (– USD 6 billion) and high gross external debt of USD 10.5 billion, representing 57.4 % of GDP (NBM, 2025), highlight the fundamental fragility of an economic model based on external financing.

While external macrofinancial assistance constantly provides a solid buffer, it cannot provide complete insulation against all external shocks, leaving monetary policy to play the role of primary economic stabiliser in an environment of heightened uncertainty (EU Commission, 2024). After a period of relative stability, price pressures re-emerged in late 2024, with annual inflation accelerating from 3.28% in May 2024 to 9.75% by January 2025 (Figure 1) (NBM, 2025) - well above the NBM's target range. The NBM's medium-term inflation target (as measured by year-over-year CPI growth) is 5%, with a variation corridor of ± 1.5 p.p. The inflation spike was fuelled by overlapping crises, implicitly by stagflation (GDP contraction of -5%) and the increase in natural gas prices. The concomitant spike of real estate lending contributed to the property price inflation, suggesting the need for closer macroprudential surveillance on the stability side. This resurgence highlights the challenges of maintaining price stability in an economy highly sensitive to imported inflation, exchange rate fluctuations, and supply-side shocks.

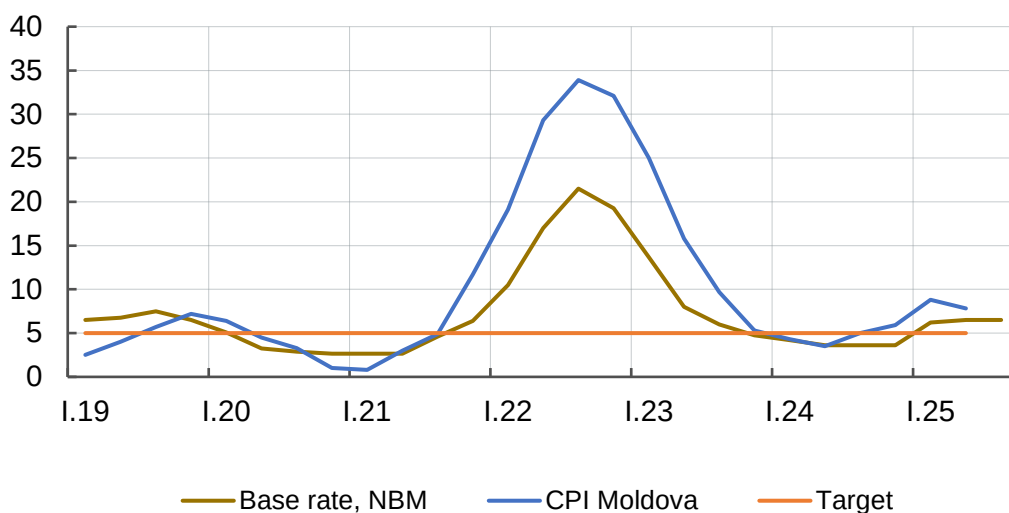


Figure 1. Dynamics of the consumer price index (year-on-year, %), the base rate (%) and the inflation target (%), 2019-2025

Source: constructed by the authors based on NBM data

Monetary transmission is often weakened by elevated currency substitution and excess liquidity in the banking system, both characteristic for Moldova, yet this time external shocks, originating outside of the financial system were at the core of the reasons therefor. Such periods, highlight another particularity of such economies, which is also one of the main dilemmas in macroeconomic management therein - the complex interplay between inflation targeting and exchange rate management. According to its strategy, the NBM intervenes on the foreign exchange

market only if necessary to support the effects of the open market operations to the extent required to achieve the targeted price stability, without influencing the fundamental trends of the Moldovan Leu exchange rate.

For the Republic of Moldova, empirical studies dedicated to assessing the effectiveness of monetary policy transmission are practically absent, at least studies that are extensive and relevant to the nature of contemporary shocks. This fact generates substantial uncertainty on economic policy decisions, but also on the capacity of central bank instruments to optimally stabilise the economy in the face of external disturbances. This lack becomes particularly problematic in a context in which the NBM has been operating under the inflation targeting regime since 2010 (*full transition in 2012*), a regime that requires a precise understanding of the magnitude and persistence of the effects of changes in the monetary policy interest rate.

Transmission analysis therefore becomes the necessary precondition for calibrating the response to an external shock. Consider a negative external supply shock, such as a sudden increase in imported energy prices, a phenomenon experienced by the Republic of Moldova in 2021-2022 when the price of natural gas increased approximately fivefold in a few months. Such a shock, of non-monetary origin, tends to simultaneously affect inflation, pushing it up through increased production costs and second-order effects in supply chains, and economic growth, slowing it down by eroding purchasing power and increasing business uncertainty.

The absence of a rigorous characterisation of the transmission mechanism in the Republic of Moldova generates fundamental uncertainty regarding: (i) the intensity and time horizon of the effects of monetary policy on inflation and output, (ii) the dominant channels through which monetary impulses are propagated, (iii) the existence and extent of transmission bottlenecks caused by the structural peculiarities of the economy, (iv) the complementary role of foreign exchange interventions in the context of a managed floating exchange rate regime. This uncertainty compromises the optimal calibration of the central bank's response to external shocks, increasing the risk of adopting suboptimal economic policy decisions and policy instruments' mix - either through insufficient reactions that prolong imbalances, or through excessive adjustments that amplify macroeconomic volatility and have a counterstimulating effect on growth.

As was seen during the 2021-2022 inflation surge, the NBM acted primarily through the interest rate channel, which is conventionally regarded as the most effective short-term instrument for mitigating sharp inflation driven by sudden increases in imported energy prices. In the absence of a robust understanding of the actual transmission mechanism, particularly regarding how policy rate adjustments propagate through the banking sector to lending rates (as illustrated in Figure 2, which reveals a notably weak and delayed pass-through from the policy rate to commercial bank interest rates), the central bank faces the risk of adopting suboptimal policy responses. Visual inspection of the data indicates that commercial lending rates adjust incompletely and with substantial lags following policy rate changes, suggesting structural impediments in the interest rate transmission channel that warrant further empirical investigation. An excessively aggressive tightening of monetary policy, accentuates the recessionary component of the shock while failing to achieve effective control over the inflationary component, thereby amplifying macroeconomic volatility rather than stabilising the economy.

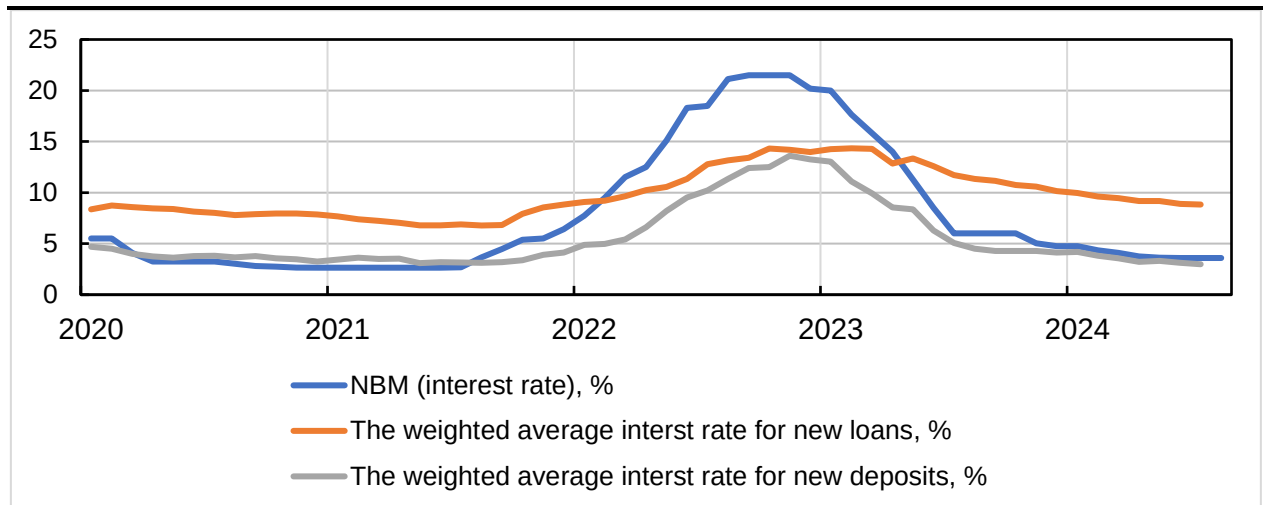


Figure 2. Interest rate channel transmission in the Republic of Moldova, 2020-2024, percentage

Source: constructed by the author based on NBM data

The asymmetry arises because a relevant part of the inflation generated by an energy shock is imported and therefore poorly sensitive to domestic demand, which is the only component that monetary policy can influence in the short term through traditional channels. The analysis of policy transmission provides critical information on the extent to which current inflation is controllable through standard monetary policy channels and to what extent it reflects exogenous factors over which central bank instruments have limited influence.

Conclusions

This theoretical synthesis of the monetary policy transmission mechanism for a particular economy with all its specific characteristics is not a purely theoretical exercise, reserved for abstract macroeconomic modelling or academic debates. It represents a comprehensive indispensable intellectual infrastructure for any responsible monetary policy decision in an open economy, subject to recurrent external shocks. In the absence of detailed knowledge of the transmission channels - how strongly and how quickly the change in the interest rate propagates to the exchange rate, to credit conditions, to consumption and investment; who actually bears the burden of the adjustment; how much of the observed inflation is domestic and controllable, and how much is imported and exogenous; what is the effective resilience of the banking sector to financial shocks - monetary policy risks either becoming excessively pro-cyclical and destabilising, amplifying economic fluctuations instead of mitigating them, or unduly delaying the reaction and losing control over inflationary expectations, allowing them to become unanchored and increasing the future costs of disinflation.

For the Republic of Moldova, this problem is particularly acute. The Moldovan economy is simultaneously exposed to trade shocks through its dependence on relatively geographically concentrated export markets, to financial shocks through its vulnerability to fluctuations in capital flows, to commodity price shocks through its almost total dependence on energy imports, and to geopolitical shocks through the proximity of regional conflicts.

In the absence of a rigorous understanding of the transmission mechanism adapted to these specificities, the central bank operates under conditions of extreme uncertainty, being forced to calibrate monetary policy based on intuitions gained through accumulated experience, contrary to a rigorous substantiation. This situation increases the probability of economic policy errors and diminishes the effectiveness of the instruments available for macroeconomic stabilisation. Therefore, transmission analysis is not just a step towards adapting monetary policy to external

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shocks, but the minimum condition for this adaptation to be efficient, legitimate and sustainable in the medium term, protecting both price stability and financial stability and the well-being of the population.

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