BIBLIOMETRIC ANALYSIS OF TRENDS IN INTELLECTUAL CAPITAL MEASUREMENT

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Abstract. *From an accounting perspective, information on intellectual capital must be presented in both financial and non-financial statements. In order to make the most balanced and realistic forecast for the future, it is necessary to assess trends in the measurement of intellectual capital up to 2025. Bibliometric analysis shows that the main trends since 1994 have been related to company performance, knowledge, innovation, corporate social responsibility, and human capital, while in recent years, studies have addressed intellectual capital together with the concepts of management, intangibles, big data, and disclosure. The digitization and use of artificial intelligence as an integral part of companies' activities requires updated regulations on reporting, and alignment with sustainability standards requires greater accuracy and transparency of information. In recent years, international regulatory institutions have made considerable efforts to standardize rules, but clear standards for measuring intellectual capital do not currently exist. Although the pace of technological development is rapid and it is difficult to predict the next 10 years, we have found that the main future trends are related to indicators, sustainability, reporting, competitive advantages, and financial performance, as well as modern multidimensional models for intellectual capital assessment..*

Keywords: *intellectual capital (IC), artificial intelligence (AI), digital economy. trends, measurement.*

JEL Classifications: M41

1. Introduction

Currently, entities are seeking innovative solutions to retain valuable intellectual capital whose activity and contribution contribute to both present and future benefits. Investors want to be as informed as possible and to assess as accurately as possible the activities of the companies in which they wish to invest. They therefore pay close attention to financial data, but also to non-financial data in the case of listed companies, in order to obtain as realistic a picture as possible. Moreover, banks, customers, current students, and future professionals have access to a wealth of information about policies and financial data via the Internet. It is well established that tangible assets are not the main drivers of profit. Human capital, through knowledge and skills, structural capital represented by the processes and databases used to carry out the activity, but also relational capital due to the establishment of healthy relationships with customers and suppliers are defining elements for the final result of the exercise, but also for future strategies and evolution. In this context, there is a tendency to include intellectual capital in non-financial reporting. In recent years, the Council of the European Union has developed a series of projects and directives, for example in Directive (EU) 2016/943 of

the European Parliament and of the Council of 8 June 2016, which specifies the importance of intellectual capital in relation to legal performance and market competitiveness. Other institutions that have taken steps in 2022 to include IC in technology companies are the European Financial Reporting Advisory Group (EFRAG) and the Institute of Chartered Accountants of Scotland (ICAS), and with regard to Romanian legislation, this requires companies with more than 500 employees to prepare and publish annual ESG reports, which also include information on intellectual capital policies. This provision is based on Ministry of Public Finance Orders No. 1938/2014, No. 3456/2018, and No. 85/2024.
With regard to financial reporting, methodological rules for the valuation of intellectual capital have not yet been established, although in the context of digital skills and the use of artificial intelligence by employees, clear regulations on the valuation of intangible assets by the competent institutions are needed. In order to understand the evolution of the concept and the need to measure intellectual capital, we have carried out a bibliometric analysis that will help us identify the most important aspects from 1994 to 2025.

2. Basic content.
With access to the internet, it is much easier to follow the evolution of the main problems that specialists in the field are seeking solutions for. The same is true in the field of accounting. The exchange of information, the confrontation of ideas, and the comparison of different working systems are much easier through digitization and the online environment (Rossi et al., 2018). This is beneficial both for doctoral students and for accounting practitioners who have learned to understand and signal the need to measure and highlight intellectual capital. The larger the company, the greater the need to report IC (Sharma & Dharni, 2017). This phenomenon can be explained by the diverse situations faced by management and the search for the best solutions to overcome them. In addition, there are many more working relationships: with customers, suppliers, banks, and between employees. A previous bibliometric analysis highlighted that between 2000 and 2020, countries such as Italy, Australia, and the United States produced the most scientific papers addressing emerging topics related to intellectual capital (Bamel et al., 2022). Another study presented the topic of intellectual capital reporting as a strategy, but also as a means of collaboration between the collaborating parties of an organization (Paoloni et al., 2023), which could contribute to the uniform distribution of information to them, resulting in increased reputation and sales due to customer attraction and retention. Other authors recognise that there is an important new industry, that of knowledge, pointing out that in practice few current techniques for measuring IC are known (Kannan & Aulbur, 2004).
The bibliometric analysis is based on the study of 655 papers resulting from entering the term "trends in intellectual capital" into the Web of Science search engine. We found that the first publication in this database was in 1994. A graphical representation of the number of publications per year is shown in Figure 1.

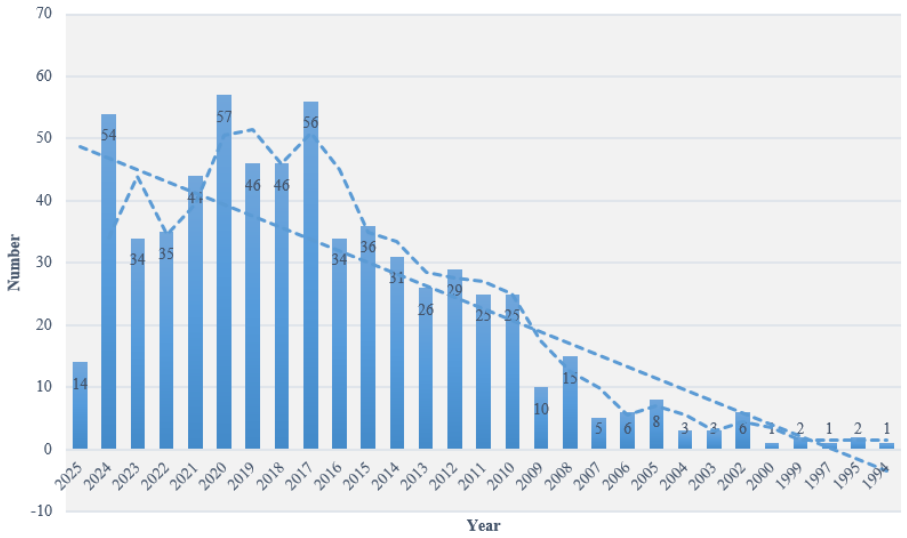

Figure 1. Annual scientific production

Source: processing authors using the Biblioshiny program

We note that 2017, 2020, and 2024 are the most productive years in terms of the number of papers produced, with a steady increase from 2009 to 2017. This increase can be explained by the fact that since 2017, many companies have started to integrate digital technology more into their activities, and in 2020, with the onset of COVID-19, the role of intellectual capital in finding the best strategies to overcome crisis situations but also for keeping companies running in general. 2024 is the year when artificial intelligence and intellectual capital were the focus of many scientific events, with more and more people looking for ways to report on them and use them together without them messing with each other.

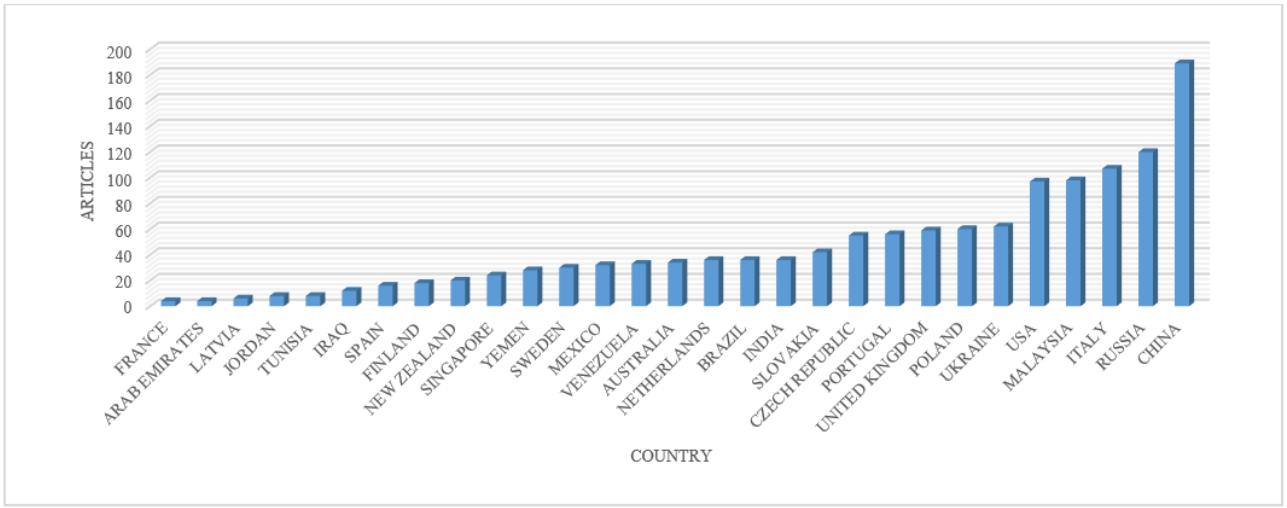

Figure 2. Countries' production over time

Source: processing authors using the Biblioshiny program

Figure 2 shows that among the countries with the highest interest in the term analyzed are: China with 189 articles, Russia with 120, Italy with 107, Ukraine with 62, and Portugal with 56. China is one of the countries with numerous developed brands and technologies, with investments in innovation. On the other hand, from a historical and political point of view, Russia has gone through important stages in terms of its economy, and in the context of the war with Ukraine and the measures taken by the EU regarding economic relations and currency circulation, it has directed major investments into research and development, brands, and local know-how. Italy is an important partner of EFRAG in

terms of intangibles, and academic research is reaching a high level of interest in this field.

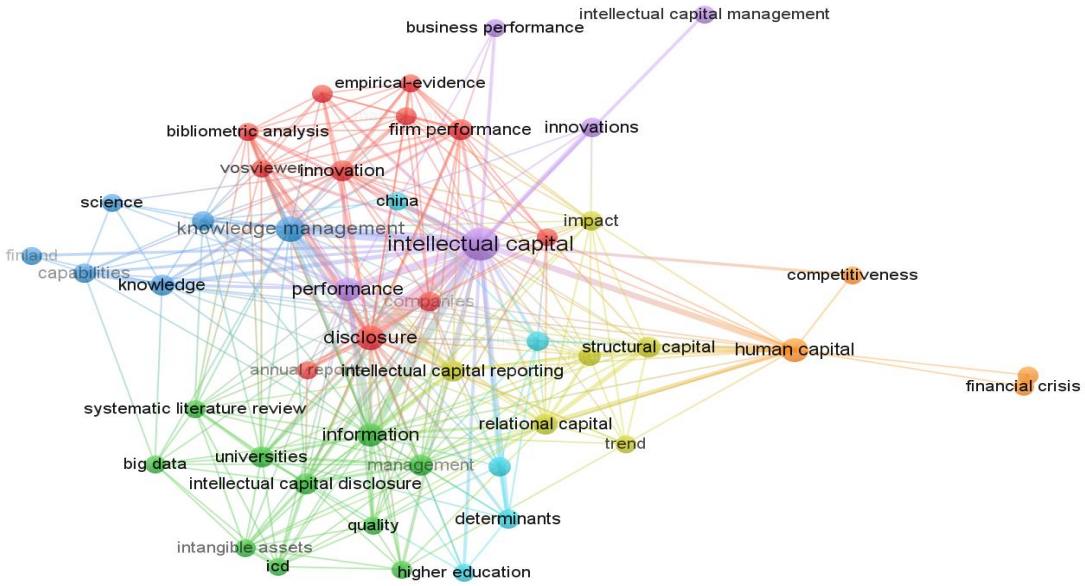

Figure 3. Thematic map for „trends in intellectual capital"

Source: processing authors using the VOSviewer program

For the term trends in intellectual capital, the thematic map in Figure 3 was obtained, with 240 words divided into 7 clusters, the largest being intellectual capital with 11 words, information with 10 words, followed by knowledge management with 6 words, and structural capital with 6 words.
Therefore, disclosing information about intellectual capital is an important benchmark for the company's future strategies, for assessing its role in achieving performance, for a better understanding of the importance of allocating resources to innovation, and for effective management.

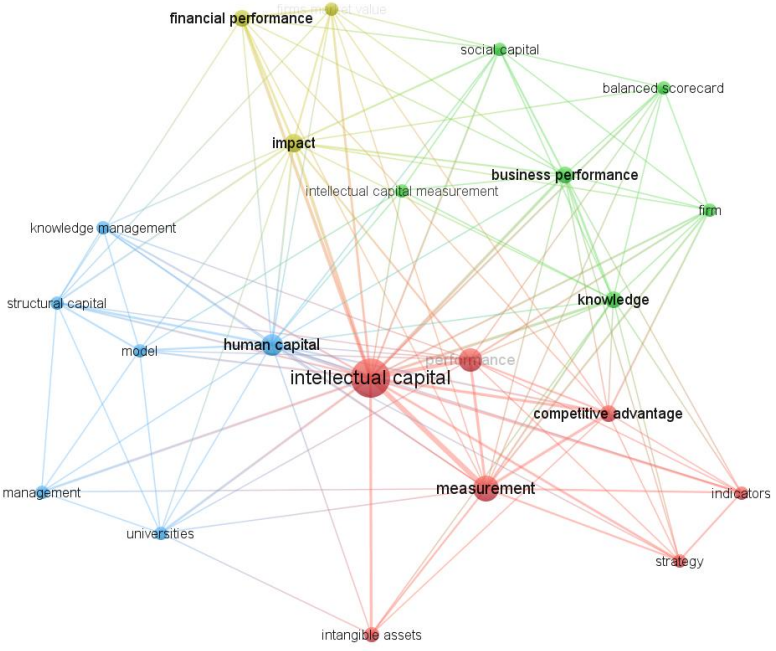

Figure 3. Thematic map for „ intellectual capital measurment"

Source: processing authors using the VOSviewer program

To compare terms and see if different keywords come up, we made the same type of thematic map using the term "intellectual capital measurement," Figure 4, which gave us a total of 192 words

divided into 4 big clusters: intellectual capital, business performance, human capital, and financial performance. We noticed common terms: intellectual capital, measurement, impact, human capital, competitive advantage, firm, model, strategy. The purpose of the comparison was to verify whether the papers resulting from the two keywords addressed both the trends and the issues of intellectual capital measurement. Traditional methods of measuring IC, Market Capitalization Methods, focus on comparing either the market value with the book value of tangible assets, and the remaining difference is considered to be IC; or on determining the monetary value of IC by assessing individual values, but these methods often encounter subjectivity. At present, there is a desire to transition to hybrid models that will combine quantitative information with non-financial information. Furthermore, the aim is to highlight the connections between IC performance and the achievement of long-term benefits. From another point of view, we note that the mandatory sustainability reports reflect an awareness that human, relational, and structural capital can also be measured by non-financial indicators, which, although based on figures and calculations, also include narrative descriptions. This increases the understanding of the importance of allocating more resources to its development by determining employee retention rates, training and professional development expenses, and the level of process technology.

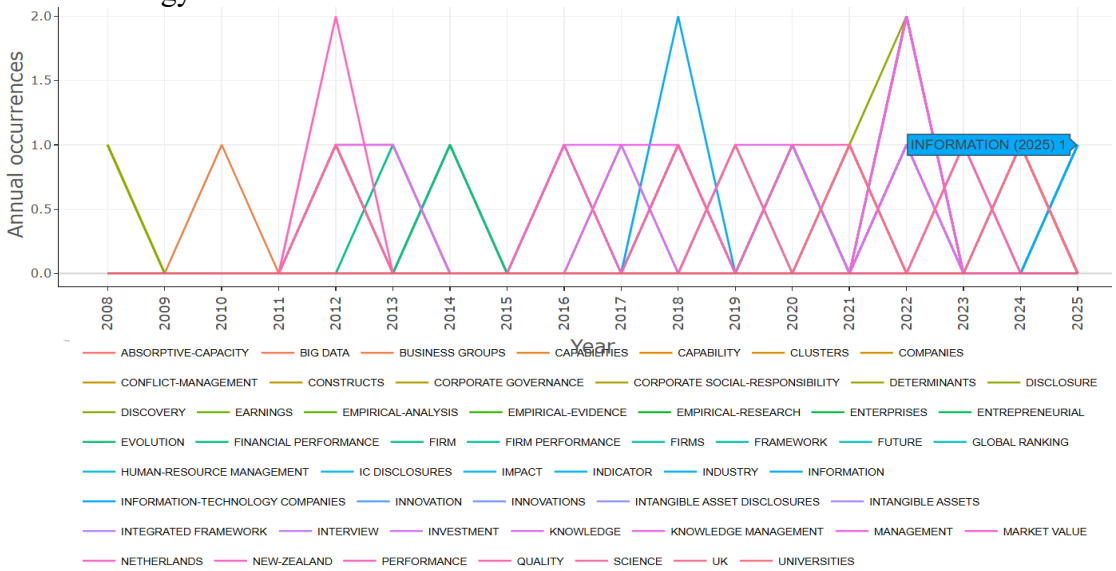

Figure 4. Words' Frequency over Time

Source: processing authors using the Biblioshiny program

Since 2008, we have analyzed the most frequently used keywords to identify the main issues that have been analyzed over time in relation to our research. Thus, we found that in 2008 the most frequently analyzed term was disclosure, in 2010 business groups, in 2012 performance, in 2013 knowledge, in 2014 firm performance, in 2017 management, in 2018 information, in 2019 sciences, in 2022 market value, in 2024 universities, and in 2025 information. We therefore conclude that practitioners and researchers in the field have identified close connections between intellectual capital, performance, and information. We believe that future trends will include key terms such as digitization, artificial intelligence, software, intangible asset valuation, sustainability, standards, IAS, and IFRS GRASP. Intangible assets are an integral part of business, especially in the context of the new digital economy (Butnaru, 2024). Intellectual capital cannot be measured without establishing specific indicators and methods that allow for comparability between different companies in different fields of activity. Artificial intelligence can create opportunities to analyze large amounts of data and values, but the final reasoning must be the product of intellectual capital. In principle, it should be borne in mind that all information made available through artificial intelligence must be designed for the human ability to understand and filter both financial and non-financial information.

3. Conclusions.

Intellectual capital is a rediscovered resource for the entire economy. Bibliometric analysis has shown that interest in measuring its contribution to company performance has been around for several decades, but according to the analysis, the number of papers addressing this topic is constantly growing. Reporting, information, performance, knowledge, and innovation are just a few of the terms that are analyzed together with intellectual capital, so it cannot be treated separately by practitioners. It is a valuable intangible asset that should not be viewed as an expense, but as a source of value creation. According to data from countries such as China, Russia, and Italy, most of the work on this topic comes from these countries. Access to information and digitization must standardize the level of appreciation of future economic benefits, and international bodies must develop clear standards and norms for measuring and reporting intellectual capital as soon as possible so that companies' situations are transparent, real, and comparable. We want a sustainable economy and integrated reporting based on quality information, but this is only possible after implementing practices that are adapted to current business needs and visions. Allocating more smart resources to figure out the value benefits of intangibles and reporting them will create competitive advantages for both investors and other stakeholders.

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