DIGITAL TRANSFORMATION AND EMPLOYMENT DISRUPTION. A QUALITATIVE ANALYSIS OF THE CHALLENGES AND LIMITS OF ARTIFICIAL INTELLIGENCE ON THE FUTURE OF WORK

VALENTINA VASILE
Institute of National Economy,
Romanian Academy,
Bucharest, Romania,
valentinavasile2009@gmail.com
ORCID ID: ORCID ID 0000-0002-2368-1377

RAZVAN VASILE
National Institute of Economic Research "Costin C. Kiritescu",
Romanian Academy,
Bucharest, Romania,
vasile.razvan89@gmail.com
ORCID ID: 0000-0002-0269-2886

ELENA BUNDUCHI
"George Emil Palade" University of Medicine, Pharmacy, Science,
and Technology of Târgu Mureș,
Institute of National Economy- Romanian Academy, Romania
elena.bunduchi@umfst.ro
ORCID ID: 0000-0002-6036-9091

Abstract: The digital transition has become a common topic of debate for specialists, its impact on the way of life of individuals being increasingly complex and controversial. The current stage of the expansion of AI applications in various fields of activity and workplaces has caused debates regarding the replacement / elimination of humans in production and service processes. The current study aims to present a critical analysis of the effects of digital transformation on employment disruption and the role of the workforce in the conditions of increasing digital intensity of companies. Starting from an analysis of the specialized literature, and from discussions on the externalities produced by the digital transformation on the labor market, a comparison is made between the stage of automation/robotization on work and the current stage of the growth of AI applications. Through a combined qualitative analysis, the differences between doing digital and being digital are presented. The results show us significant differences between the two stages, but also the limits of employment disruption. Artificial intelligence will substantially change the working model, but it will not exclude man, it redefines his role and responsibilities in the sustainable development of the digital society.

Keywords: digital transformation, employment disruption, artificial intelligence, the future of work.

JEL classification: O31; J21; J81

Introduction

The digital transition is a process that started since the second half of the last century, being facilitated by the rapid modernization of computers and their association with industrial production - from design and processing, to marketing and management at the company level. Digitization and digitization are processes that have facilitated the development of databases and stimulated complex analyzes based on previous experiences. From replacing humans in performing repetitive tasks, to activities such as intelligent personal assistants, the purpose of AI was to complement and augment human abilities.

The digital transition changed the content of almost all jobs, eliminated some and, at the same time, created new jobs. Human interaction has been adjusted by transferring some communication activities into the virtual space, through the development of decision support systems and smart search systems, in order to ease human work and save time.

The purpose of this work is to identify the effects of digital transformation on employment disruption and the role of the workforce in the conditions of increasing digital intensity of companies. Finally, we have presented some major trends that will redefine the future model of work, the main issue in debate remaining, to what extent generative AI will replace human work and to what extent the association between the results of robotics development and generative AI products / services will replace processes managerial / decision-making at company level.

Literature review

It is obvious that the digital transition determined the increase in labor productivity, stimulated investments in computer-aided technologies, which replaced repetitive work, but also created negative externalities on the labor market, by increasing the skills mismatch between labor demand and supply. At the same time, the increase in the digital intensity of the companies has generated a diversification of jobs in the field of IT specialists, but also augmented the transversal skills of the jobs, precisely to allow the creation of labor relations at the company level in a hybrid system.

The range of externalities produced by the digital transformation on the labor market is increasing, both in the form of costs and benefits. The most obvious effects are on employment, from the diversification of the demand for skills, new professional specializations and new jobs, to the increase in the complexity of work tasks and the complementarity between human work and the assistance of tasks and decisions by AI. Currently, there is no complete inventory of the externalities generated by digital transformation, neither at the level of companies nor at the level of households, the dynamics of the development of digital technologies and the expansion of applications in the generative area of AI, permanently adding other externalities.

Artificial intelligence, like robotics decades ago, will affect jobs and change various industries, char in significant proportions. If automation has replaced jobs and activities that people considered tedious and monotonous, AI applications rather accompany and help to achieve faster and more efficient work tasks, including in operational managerial decisions and for complex analyzes and syntheses. Moreover, their association, respectively robotics that incorporates AI

accelerates productivity in workplaces with manual tasks, repetitive or / and based on past experience.

The specialized literature indicates a sub-thematic diversity of researches associated with "digital transition" and "employment disruption", just as each key term, separately, also associates other specific aspects. A bibliometric analysis, only from the WoS database, shows us that the published works that included the two keywords as a theme have grown significantly in recent years (for example just for "digital transition" from a total of 33788 papers published up to December 15, 2023 in WoS, 2/3 has the publishing year in and after 2020), and this because the COVID-19 crisis has accelerated the digital transition, on both aspects essential: a) at the level of expansion and application of digital communication facilities, the development of some activities in a hybrid system and the optimization of operational decisions and b) the continuation of the reform in the digital field, with the expansion of the facilities for the creation, administration and use of databases of data, but also the necessary transition from "doing digital" to "being digital" (Neeley & Leonardi 2022; Giacosa et al, 2022, Sen, 2023, Vasile 2024).

Moreover, it is appreciated that the main benefit of the pandemic in the field of digital transition was for small companies (EIB, 2022, OECD, 2020, Eurofound, 2021)), which, in order to survive, were forced to discover the value of flexibility in carrying out the activity through digitization, with significant benefits in the field of visibility (being present in the virtual environment has expanded the possibilities of promoting the business), market expansion through online commerce and reorganization of processes within the company (outsourcing of some services and cost savings, time saving, efficiency in running some activities of coordination, testing, evaluation, operative analysis for feed-back for adjustment/problem solving).

Method and database

Starting from an analysis of the specialized literature, and from discussions on the externalities, a comparison is made between the stage of automation/robotization on work and the current stage of the generative AI development (AI applications). Through a combined qualitative analysis, the differences between doing digital and being digital were presented. We combined the statistical analysis of the main indicators that provide information on digital intensity and skills mismatch at the company level with the analysis of the countries' performance in AI development in the last years.

Research results and comments

A comparison between the effects of robotization and AI on employment, in terms of level and structure of employees, shows us significant differences between the two stages, but also the limits of employment disruption. Robotization significantly replaced jobs with difficult physical activities, in dangerous conditions, which required long attention/concentration, stress, etc., jobs with repetitive activities, etc., but it also created jobs of supervision, monitoring, control. The (re)employed staff assumed an upgrade of knowledge, acquisition of new skills. Moreover, service activities have been developed for production or service companies by outsourcing some

activities (serviced-based business). Although at the level of some industries, robotization also determined staff reductions, other activities were created and the demand for qualified personnel increased. We can appreciate that robotization has redefined the structure of employment and highlighted the need for continuous staff training, for new skills and in new areas of specialization. Digitization has changed the demand for transversal skills (digital competencies) and specialized personnel in professions specific to the ITC sector. At the company level, the digital intensity has increased, measured both by the purchase of IT equipment and digital programs, but also by the investment in the human resources employed, respectively their training to be able to use digital equipment and technologies.

The digitalization forced by the pandemic has determined a significant increase in staff with basic digital skills and above.

The data provided by Eurostat allow us only a brief picture for the year 2021 of the structure of the personnel on digital skills 2.0. category (the methodology was recently change and a comparison with pre-pandemic situation is not possible. A comparative analysis between EU countries.

A comparative analysis between EU countries indicates significant differences between countries in the case of digital skills above basic, but also the persistence of a significant share of staff with low and narrow ODS (Figure 1). It is obvious that the dynamics of digital transformation will significantly change this structure in the future and, in particular, with the expansion of the use of AI at the level of companies and by public authorities.
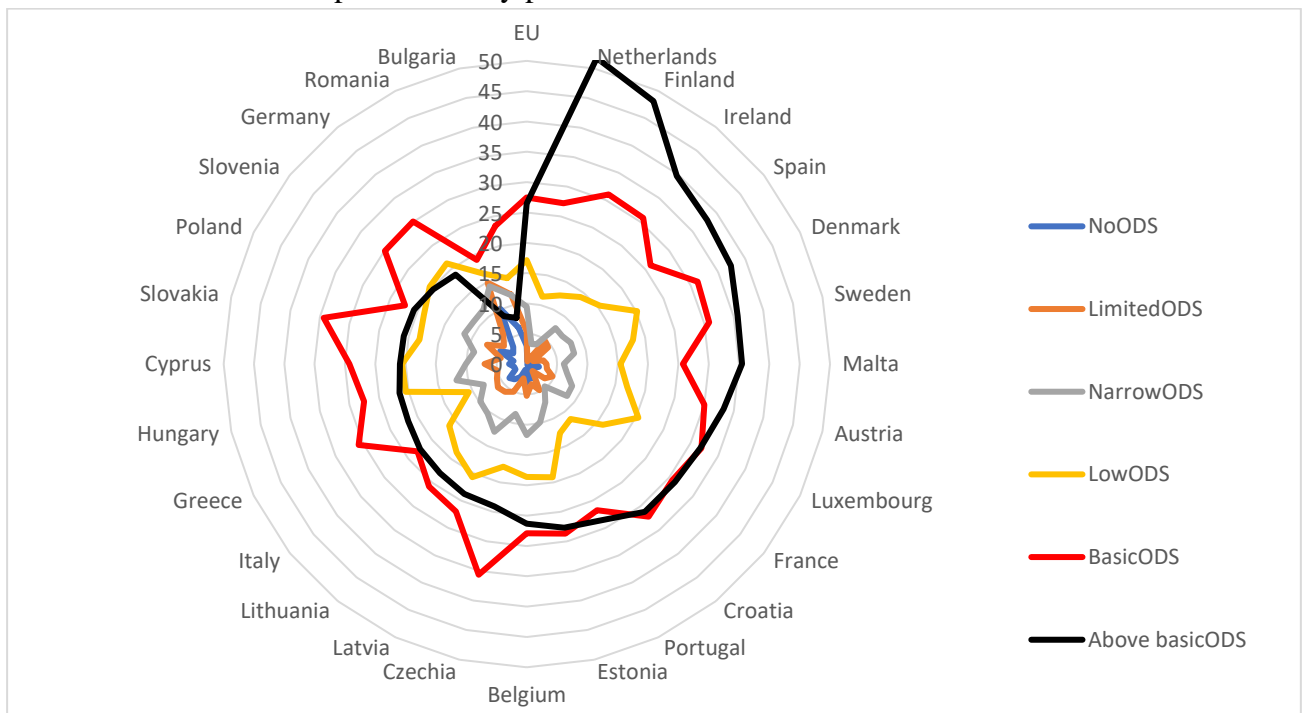
**Figure 1 Share of individuals with overall digital skills (ODS),
by UE member state in 2021**
Source: Eurostat, (2023)

Artificial intelligence will substantially change the working model, but it will not exclude man, it will redefine his role and responsibilities in the sustainable development of the digital society. Generative AI would complement, rather than substitute, human labor, simply because of the actual limits of tasks able to be performed, which excludes creative innovation. The rapidity of association of some information present in the defined database, which meets a given synthesis-analysis objective, cannot be considered as innovation, or creation of novelty. It won't create anything truly innovative or original like the human can. In addition, the tendency to generate erroneous information significantly adjusts the overall efficiency.

It is noted, on the one hand, that generative AI applications (e.g. ChatGPT) can contribute to increasing work productivity for the information search and synthesis stage, but, on the other hand, the results must then be checked and validated by humans, to avoid information association errors, which, in some cases, can lead to a higher total processing time than the initial one and even reduce the chances of human innovation in the database analysis process, due to the concern to identify and remove mistakes. Therefore, it can generate inappropriate answers and could lower the innovation dynamics.

It is an emerging technology, but with limited applicability in many sensitive areas such as the banking system, health services, in education, in scientific research. The most important limitation is the lack of versatility in the interpretation of information, often ending up giving wrong answers or not being able to answer simple questions, from the basic education area.

So, could be useful tools that can help us with many day-to-day tasks, but, a) It has a tendency to hallucinate, b) does not ensure good protection of personal information, c) limits the ability to develop some skills extremely useful for individuals, respectively searching for information, writing and communicating, summarizing, translating content for different audiences, or structuring information, d) by generating standardized information, in a predefined format for interpersonal communication excludes the aspects that actually define human nature, respectively, empathy, to convey nuances, innovative thinking, fun, personalized relationship-building. The individuals of the future will be less creative and more "standardized" on past behaviors.

AI Watch Index 2021shows us also in this case significant gaps between countries (Righi et al, 2021). At EU27 level, France and Germany have over 1000 AI players, but the highest AI player intensity is registered in Estonia and Malta, with a ratio of 1.57 and, respectively, 1.02 AI players per billion euro of GDP. The last place is held by Slovakia, for both indicators. It should be mentioned that the gaps between countries are significant in all AI thematic areas. Germany, France, Spain and Belgium had the best performances in 2021. (Figure 2)
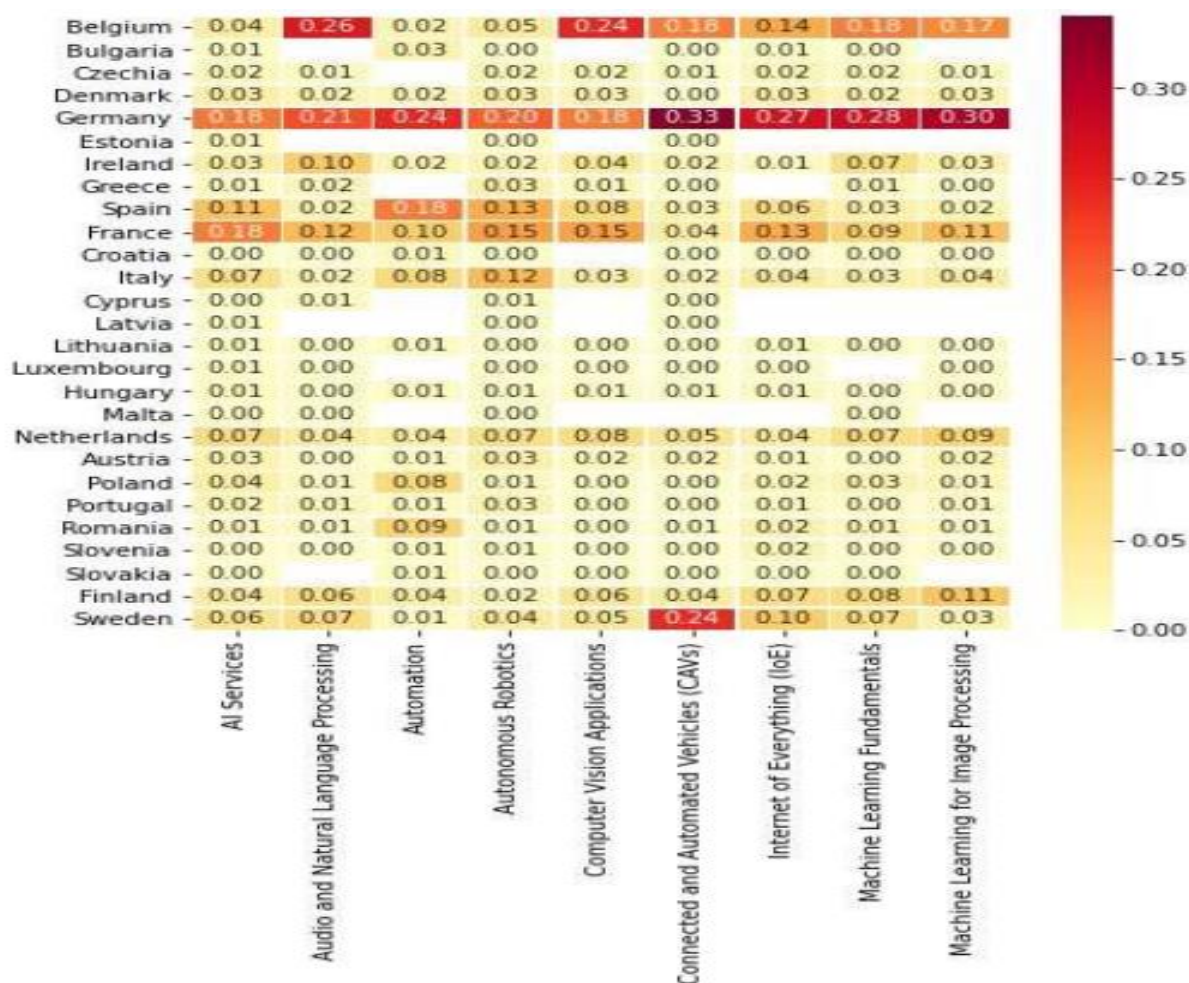
	AI Services	Audio and Natural Language Processing	Automation	Autonomous Robotics	Computer Vision Applications	Connected and Automated Vehicles (CAVs)	Internet of Everything (IoE)	Machine Learning Fundamentals	Machine Learning for Image Processing
Belgium	0.04	0.26	0.02	0.05	0.24	0.18	0.14	0.18	0.17
Bulgaria	0.01		0.03	0.00		0.00	0.01	0.00	
Czechia	0.02	0.01		0.02	0.02	0.01	0.02	0.02	0.01
Denmark	0.03	0.02	0.02	0.03	0.03	0.00	0.03	0.02	0.03
Germany	0.18	0.21	0.24	0.20	0.18	0.33	0.27	0.28	0.30
Estonia	0.01			0.00		0.00			
Ireland	0.03	0.10	0.02	0.02	0.04	0.02	0.01	0.07	0.03
Greece	0.01	0.02		0.03	0.01	0.00		0.01	0.00
Spain	0.11	0.02	0.18	0.13	0.08	0.03	0.06	0.03	0.02
France	0.18	0.12	0.10	0.15	0.15	0.04	0.13	0.09	0.11
Croatia	0.00	0.00	0.01	0.00		0.00	0.00	0.00	0.00
Italy	0.07	0.02	0.08	0.12	0.03	0.02	0.04	0.03	0.04
Cyprus	0.00	0.01		0.01		0.00			
Latvia	0.01			0.00		0.00			
Lithuania	0.01	0.00	0.01	0.00	0.00	0.00	0.01	0.00	0.00
Luxembourg	0.01	0.00		0.00	0.00	0.00	0.00		0.00
Hungary	0.01	0.00	0.01	0.01	0.01	0.01	0.01	0.00	0.00
Malta	0.00	0.00		0.00				0.00	
Netherlands	0.07	0.04	0.04	0.07	0.08	0.05	0.04	0.07	0.09
Austria	0.03	0.00	0.01	0.03	0.02	0.02	0.01	0.00	0.02
Poland	0.04	0.01	0.08	0.01	0.00	0.00	0.02	0.03	0.01
Portugal	0.02	0.01	0.01	0.03	0.00	0.00	0.01	0.00	0.01
Romania	0.01	0.01	0.09	0.01	0.00	0.01	0.02	0.01	0.01
Slovenia	0.00	0.00	0.01	0.01	0.00	0.00	0.02	0.00	0.00
Slovakia	0.00		0.01	0.00	0.00	0.00	0.00	0.00	
Finland	0.04	0.06	0.04	0.02	0.06	0.04	0.07	0.08	0.11
Sweden	0.06	0.07	0.01	0.04	0.05	0.24	0.10	0.07	0.03

Figure 2 The share of AI activities on thematic area, EU countries, 2009-2020
Source: Righi et al, 2021

The impact of AI expansion on the labor supply is and will be significant, which implies a redefinition of initial and continuing education, respectively of the educational supply. Employability in the future will increasingly depend on the package of AI skills acquired by candidates, which will affect both individual employment opportunities and the human capital needed to support the innovation of the industry, but also of all human activities, from personal services in education and societal services.

Brief conclusions

The digital transition as a process, although it started decades ago, experienced a significant development during and after the pandemic crisis: a) during the pandemic, the process of quasi-completion of digitization at company level, in households and in communication between individuals and stakeholders was accentuated, including public authorities; b) continued the development of industry 4.0, with an accelerated transition to industry 5.0, with a diversification of generative AI products.

The directions of change that will continue to modify the world of work will consider at least the following aspects:

a) the transition from digital optimization (modernization of existing technologies with digital facilities) to digital transformation (technological change, through new technologies in fields of sciences, which incorporate digital components accompanying the entire production chain). From the work perspective, the activities that assume human-AI complementarity will multiply, and, gradually, human responsibility - coordination and control - will adjust the robotic systems, verify and analyze the results of the activities/tasks performed by generative AI. Digital technology will assist human activity (smart assistant), ensuring time savings in search activities, database and information processing. Human intervention will focus on verifying and interpreting the results provided through the use of AI, the human will remain responsible for innovation and creativity, for the generation of new knowledge.

b) skills mismatch will remain the main problem on the labor market, because the dynamics of the business environment overtakes the development of new skills and knowledge acquired by the new generations of graduates from the initial education system. Learning to learn and being innovative are and remain the basic requirements for the education system.

c) training at the workplace associated with permanent professional development have already become common requirements for employees, in order to remain performing at the workplace. But also the responsibility of the companies will increase, especially on the component of adapting new technologies to the specifics of the company, to the customization of digital applications.

d) the classic model of employment has already been strongly shaken by the pandemic restrictions and the reform will continue, in all its aspects, from the facilitation of work in a hybrid system to the regulation of the right to disconnect, from the rigid measurement of labor productivity to the evaluation of the efficiency of the employee's activity , with a balance between its economic productivity and its social productivity.

Robotization and AI have essentially made work easier and increased economic efficiency, but the threats from the inappropriate use of generative AI should not be ignored, from at least the following aspects:

a) technology facilitates human activities, but it must not generate constraints on responsible human decision-making

b) innovation is a human attribute, with complex aspects associated with the process of generating ideas, products, etc. Generative AI can make associations of ideas, based on information and past data, in new forms, but it does not represent innovation, but a development of algorithms for selection, synthesis and quantitative analysis. Even if the improvement of products associated with generative AI will lead to the reduction of the generation of erroneous information, this risk does not disappear and, therefore, the qualitative analysis of the human is the one that will, in the end, validate the results.

c) the digital transition undoubtedly leads to an increase in economic efficiency, but security and human health must come first, which implies responsibility in assigning decision-making freedom to robots with AI.

d) the dynamics of changing the universe of professions will continue, so the current work model is only a transitory phase in a long process of adaptation/combination of production factors for the application of technologies in order to achieve the object of the companies' activity.

e) the management of household activities and the relationship between individuals and market actors (including the public authority) will be easier, but there is a risk to the security of personal information, which requires a new regulatory framework to allow the observance of moral principles related to personal life.

References:

EIB. (2022). The 2021/2022 digitalisation in Europe report: The pandemic has made the digital transformation an integral part of European society, European Investment Bank, 2022-214-EN, **https://www.eib.org/en/press/all/2022-214-the-2021-2022-digitalisation-in-europe-report-the-pandemic-has-made-the-digital-transformation-an-integral-part-of-european-society**

Eurofound. (2021). The digital age: Implications of automation, digitisation and platforms for work and employment, Challenges and prospects in the EU series, Publications Office of the European Union, Luxembourg

Eurostat. (2023). Enterprises that provided training to develop/upgrade ICT skills of their personnel by size class of enterprise [ISOC_SKE_ITTS__custom_7223438] accessed on 30 July, 2023.

Giacosa, E., Culasso, F., Crocco, E. (2022). Customer agility in the modern automotive sector: how lead management shapes agile digital companies, Technological Forecasting and Social Change, Volume 175, 2022, 121362, **https://doi.org/10.1016/j.techfore.2021.121362**.

OECD. (2020). Digital Transformation in the Age of COVID-19: Building Resilience and Bridging Divides, Digital Economy Outlook 2020 Supplement, OECD, Paris, **www.oecd.org/digital/digital-economy-outlook-covid.pdf**

Neeley T., Leonardi, P. (2022). Developing a Digital Mindset, Harward Business Review, 100(5-6), 50-55, **https://www.hbs.edu/ris/Publication%20Files/Developing%20a%20Digital%20Mindset_81f3f69d-e28d-483e-8d1e-ce0ee159c0bb.pdf**

Righi, R., Pineda Leon, C., Cardona, M., Soler Garrido, J., Papazoglou, M., Samoili, S. and Vazquez-Prada Baillet, M., AI Watch Index 2021, Lopez Cobo, M. and De Prato, G. editor(s), EUR 31039 EN, Publications Office of the European Union, Luxembourg, 2022, ISBN 978-92-76-53602-4, doi:10.2760/921564, JRC128744.

Sen, V. (2023). Doing Digital, Business Expert Press, **https://learning.oreilly.com/library/view/doing-digital/9781637424100/**

Vasile, R., 2024- Digital transformation. Challenges and limits for the new normal? – Chapter 3 in the volume The Economic and Social Impact of the COVID-19 Pandemic. Romania in a European Context, Vasile, V., Bunduchi, E., 2024 (Editors)-, book series: Contributions to Economics (CE), Springer Cham, eBook ISBN 978-3-031-47780-5, Hardcover ISBN 978-3-031-47779-9, https://link.springer.com/book/9783031477799