

Bucharest University of Economic Studies

The Faculty of Theoretical and Applied Economics

**Economic convergence
in European Union**

(ECEU)

**Transforming the Future of Work:
Navigating the Intersection
of Digital Transformation and Human Capital**

21st edition

Bucharest
22nd of May 2024

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Examining the challenges and opportunities of AI integration in the Romanian education system: a case study perspective

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Abstract. *As the world transitions into the era of Education 4.0, characterized by rapid technological advancements, countries like Romania are compelled to navigate through challenges while embracing opportunities to adapt their education systems accordingly. This paper delves into an examination of the challenges and opportunities arising from the integration of Artificial Intelligence (AI) in the Romanian education system, employing a case study perspective. Drawing upon theoretical insights and actions proposed by Romanian authorities, this research scrutinizes the measures taken to align with the evolving educational landscape. By juxtaposing these actions with European Union regulations, the study evaluates the degree of implementation and assesses Romania's readiness to meet the demands of the global educational paradigm shift. Through this analysis, the paper aims to shed light on the positioning of the Romanian education system within the framework of Education 4.0, contributing to the existing literature on educational transformations. Furthermore, it endeavours to elucidate arguments both in favour of and against the alignment of Romania with emerging educational trends, thereby offering valuable insights for policymakers, educators, and stakeholders involved in shaping the future of Romanian education.*

Keywords: Artificial Intelligence, Education 4.0, Romanian education system, digitalization, digital education, case study.

JEL Classification: C45, C49, I21, I22, I25, I28.

Introduction

In recent years, artificial intelligence (AI) integration in various sectors has attracted worldwide attention because of its potential to transform processes, increase efficiency, and increase results. One area that could benefit from the integration of AI is education. The Romanian education system, like many other countries in the world, faces many challenges ranging from outdated education methods to resource limitations. In this context, the combination of AI technology can address these challenges and reveal new educational development opportunities.

The aim of this research paper is to critically evaluate the challenges and opportunities associated with the integration of artificial intelligence into Romania's educational system. The adoption of a case study perspective allows for detailed analysis of specific examples of the implementation or proposal within the Romanian educational landscape. This study seeks to offer constructive understanding of the broad implications caused by the integration of artificial intelligence in education in Romania and elsewhere, by analysing both the successes and the obstacles encountered in these cases.

Challenges in the Romanian Education System

The Romanian education system grapples with several persistent challenges that hinder its ability to deliver high-quality and equitable education to all students. One of the primary challenges is the outdated nature of pedagogical methods and curriculum frameworks, which often fail to align with the evolving needs of the digital age (Botnariuc et al., 2020).

Additionally, resource constraints, including inadequate funding and infrastructure, pose significant obstacles to enhancing educational outcomes (Buşu et al., 2021). Moreover, there exists a digital divide among students, with disparities in access to technology and digital literacy skills exacerbating educational inequalities (Hosszu & Rughiniş, 2020).

Opportunities Presented by AI Integration

Despite these challenges, the integration of AI into the Romanian education system presents promising opportunities for innovation and improvement. AI technologies have the potential to personalize learning experiences, catering to the diverse needs and learning styles of individual students (Gligorea et al., 2023).

Furthermore, AI-powered tools can facilitate data-driven decision-making processes for educators and policymakers, enabling more effective resource allocation and curriculum design (Greene, 2023). Additionally, AI-based educational platforms offer scalable solutions for expanding access to quality education, particularly in remote or underserved areas (Țițan et al., 2020).

Case Studies in AI Integration

To explore the practical implications of AI integration in the Romanian education system, this paper will examine several case studies where AI technologies have already been

implemented or proposed. These case studies will take account of various aspects of education, including teaching methodologies, student assessment, administrative processes, and educational outreach initiatives. By analysing these practical examples, we can achieve a deeper understanding of the opportunities, challenges, and best practices associated with AI integration in education.

In conclusion, the integration of AI into the Romanian education system signifies a complex and multidimensional effort with the potential to reshape teaching and learning practices, enhance educational outcomes, and address longstanding challenges. Through the exploration of case studies and critical analysis, this research paper aims to contribute to a deeper understanding of the implications of AI integration for education in Romania and deliver beneficial comprehensions for stakeholders participating in shaping the future of education.

Literature review

Artificial Intelligence (AI) has emerged as a transformative force in education, offering the potential to revolutionise teaching and learning processes. This potential is not without its challenges, as the integration of AI in educational settings has been the subject of extensive research after the pandemic. However, few researchers have addressed the problem of challenges and opportunities raised by the integration of AI in the Romanian education system.

Recently, the impact of COVID-19 has accelerated the adoption of AI-driven educational systems, as shown in the statistical analysis by Pantelimon et al. (2021). The bibliometric study by Ivanova et al. (2024) emphasises this evolution, revealing an increase in scientific production focused on AI's role in education. Their study also highlights key research areas such as AI techniques and technologies like ChatGPT, which are being applied in various educational sceneries, representing a proof of the growing interest and potential impact of AI in upgrading educational practices.

The approach introduced by Grosseck et al. (2024) emphasises the importance of digital assessment tools, as recognised by Romanian higher education teachers. Their active use of digital technologies for evaluation, coupled with a need for professional development, indicates a growing acknowledgement of AI's role in education.

Moreover, the readiness of educators to integrate AI into their teaching practices is a critical factor in the successful adoption of AI in education. The research of Luckin et al. (2022) has made a significant contribution to this field by introducing a 7-step ethical AI Readiness Framework designed to empower educators with the necessary skills to make informed decisions about AI tools and their implementation. This framework bridges the gap between theoretical AI concepts and practical application in educational settings, highlighting the need for AI readiness training tailored to the specific needs of the education sector. Their study concludes that while AI has the potential to significantly improve educational practices, its adoption is contingent on the ability to comprehend and apply AI in a contextually relevant way, ensuring ethical and effective use.

The study by Ivanov et al. (2024) has shed more light on the perceived strengths and benefits of generative AI (GenAI) tools to significantly influence attitudes, subjective norms, and perceived behavioural control among lecturers and students in higher education. These factors, in turn, positively affect their intention to use GenAI, leading to actual adoption.

Furthermore, the impact of Smart Personal Assistant (SPA) technology on problem-solving skills in educational settings is explored by Winkler et al. (2021). Their findings indicate that students who used SPA technology for learning presented a significant improvement in problem-solving competences compared to those who used traditional methods. The study employed a mixed-method approach, including field quasi-experiments and focus group discussions, to assess the effectiveness of SPAs in enhancing students' problem-solving abilities. The conclusion highlights that SPA technology not only aids in skill development but also changes the learning process by promoting interactive behaviour and providing individualized support.

Other studies, such as those by Ivanova et al. (2024) and Grosseck et al. (2024), focus on improving learning environments and pedagogy through AI technologies. The potential of AI in improving the learning environment within Higher Education Institutions (HEIs) is further discussed by Bucea-Manea-oniș et al. (2022). Their study, based on a survey of Romanian and Serbian teachers, examines their knowledge and perceptions of AI. However, as Pisica et al. (2023) and Adams et al. (2023) highlight, ethical considerations and challenges are also prevalent in the discourse on AI in education.

In addition to these concerns, AI literacy and teacher education have emerged as critical areas of focus. Studies by Sperling et al. (2024) and Celik (2023) underline the importance of AI literacy and the need for efficient integration of AI-based instruments into education. For example, the scoping review by Sperling et al. (2024) on AI literacy in teacher education reveals that while AI literacy is a rapidly increasing research area, it remains largely unexplored within the context of teacher education.

Furthermore, the role of international collaboration in improving AI literacy cannot be overstated. Research by Korte et al. (2024) and Awidi (2024) demonstrate the effectiveness of online workshops in improving the AI literacy. Likewise, Verma et al. (2023) introduce an AI-enabled tool designed to enhance student engagement in online learning, offering a novel approach to fostering student commitment.

On another note, Habib et al. (2024) investigate the impact of generative AI on student creativity, promoting a balanced approach that supports creative thinking without overshadowing human creativity. Similarly, Nahar (2024) presents a study on the impact of AI-based innovation on the Sustainable Development Goals (SDGs), revealing that the effects vary by country due to differences in socioeconomic conditions.

Finally, studies by Ouyang and Jiao (2021) and Markauskaite et al. (2022) analyse the evolving paradigms in AI in education and the need for capabilities such as self-regulated learning and creativity for successful cooperation with AI. Although AI presents a transformative potential for education, it is imperative to navigate the ethical landscape

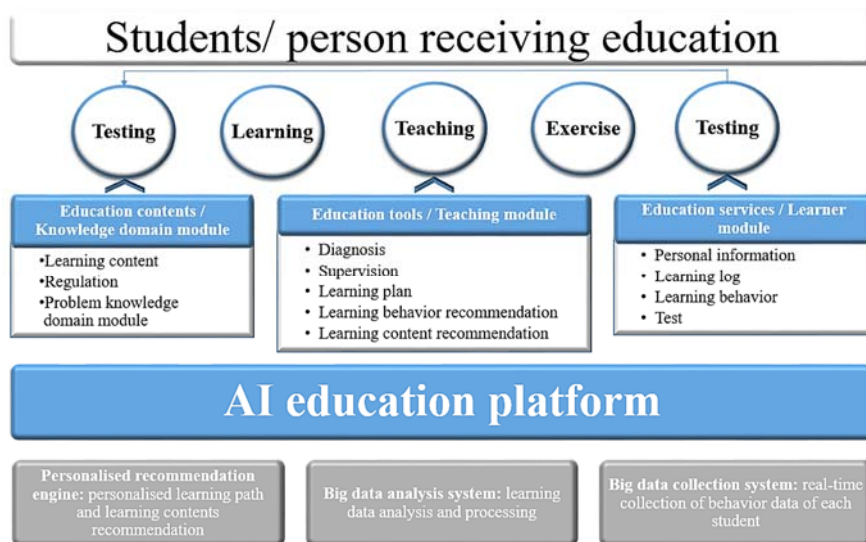
with caution. Integration of AI in education must be guided by solid policy guidance and a deep understanding of the long-term implications on the development of learners.

As education experiences a digital transformation, the major conclusions provided by the literature review process have enabled the categorisation of personalization types generated by AI tools into distinct segments, creating a picture of the process followed by AI algorithms to adapt content delivery, pace, and style to match the learning preferences and abilities of each student.

Therefore, Figure 1 serves as a valuable reference for educators, policymakers, and researchers, synthesising the findings from the literature review process and highlighting the diverse applications of AI in remodelling the future of education. This categorisation illustrates how AI algorithms can dynamically adjust the information provided in a particular rhythm and using a specific style in order to meet an infinite number of different learning preferences and abilities of individual students.

As shown in Figure 1, through the integration of data analytics and machine learning techniques, AI empowers educators to implement highly tailored and personalized learning strategies. The aim of these strategies is to optimize student commitment, comprehension, and retention rates by aligning educational content with the unique needs and interests of learners. By offering an extensive outline of the various approaches to learning process personalization facilitated by AI, Figure 1 enables informed decision-making and strategic planning in the search of improved educational results.

Figure 1. *Categories of Learning Process Personalization Enabled by Artificial Intelligence*



Source: Authors' contribution.

Given these points, the literature review presents a fascinating picture of AI's increasing influence on education. From bibliometric analyses to empirical studies, the evidence points toward an imminent paradigm shift into the AI-augmented educational landscape.

Methodology

This study aims to focus on a comparative analysis of the response of both the European Union and Romania to the urgent need to be accurately informed about the risks and opportunities caused by AI use within the education system. The study consists of two main approaches. The first section delves into the directives proposed by the European Union regarding the integration of AI within educational contexts. The following section offers a comprehensive analysis of the Romanian strategic blueprint pertaining to AI for the timeframe from 2024 to 2027.

The choice of the theoretical framework of this paper is based on the recognition that effective action in terms of AI implementation in the education sector necessitates a comprehensive understanding of the focal areas and sectors that warrant greater attention. By using this approach, a holistic perspective of the emerging imperatives within the labour market can be achieved, as articulated by leading experts in the field of education within both the EU and Romania.

This paper begins by analysing the final report of the Commission Expert Group on Artificial Intelligence and Data in Education and Training. This analysis is crucial for our country's alignment with the directives set forth by the Union. Second, the paper proceeds to provide an overview of Romania's adherence to EU regulations, and outlines strategies for AI integration within the education system according to local authorities. The next sections of the paper present the findings and their interpretation.

Findings

European Union regulations regarding AI

In the face of rapid technological advancements and increasing global data volumes, the European Union (EU) stands at a crossroads. The documents presented by the European Commission on February 19, 2020, highlight the urgency of fostering digital sovereignty. The EU's ambitious targets and proposed legislative measures aim to catalyse the development and dissemination of technologies, infrastructures, and skills essential for Europe's digital autonomy (European Commission, 2020).

The European Commission has identified a significant investment gap in digital infrastructure and networks, estimated at €65 billion annually. Thus, addressing this gap is crucial for achieving the EU's connectivity objectives by 2025, which include providing ultra-fast broadband to all citizens, even in peripheral and rural areas. This effort necessitates mobilizing private and public investments through initiatives like the Digital Europe Programme and the Connecting Europe Facility (European Commission, 2020).

In addition, the exponential growth of data production, controlled by a handful of large technology companies, presents both challenges and opportunities. Hence, the European Strategy for data aims to overcome market fragmentation, establish a single European data market, and ensure compliance with European standards of privacy and fair competition. Moreover, the strategy emphasises the importance of building federated cloud

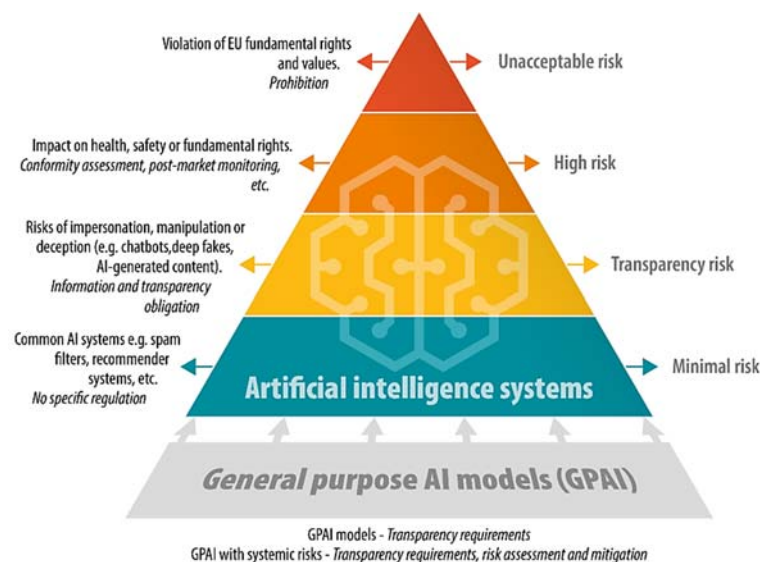
infrastructures and European data spaces across strategic sectors, thereby unlocking the potential economic value of non-personal data (European Commission, 2020).

Because the journey of AI technology from theoretical research to practical application is complex, the EU aims to make this transition seamless by building an ecosystem where excellence thrives. For this reason, collaborative efforts with stakeholders, such as the European Partnership on AI, Data, and Robotics, are essential to create a roadmap that supports foundational and application-oriented research, talent nurturing, and the commercialization of AI technologies. AI must be a force for good in society, and this requires a robust policy framework that fosters trust in AI systems. The EU's approach is to develop ethical guidelines and assessment tools, like the Ethics Guidelines for Trustworthy Artificial Intelligence and the Assessment List for Trustworthy AI (ALTAI), to ensure that AI respects fundamental rights and operates within ethical boundaries (European Commission, 2021).

Next, the European Union's enactment of the Artificial Intelligence Act represents a pioneering step in the regulation of AI technologies. This legislation, being the first binding horizontal regulation on AI globally, establishes a comprehensive framework for AI systems' use and supply within the EU. It adopts a risk-based approach, categorizing AI systems into different levels of risk and tailoring requirements and obligations accordingly (European Parliament, 2024).

The Act identifies certain AI practices as 'unacceptable' and prohibits them due to the risks they pose to safety and fundamental rights. For example, AI systems employing subliminal techniques or exploiting vulnerable groups are banned. Conversely, 'high-risk' AI systems, which could significantly impact individuals' health, safety, or rights, are permitted but must meet stringent requirements to access the EU market (Figure 2).

Figure 2. Categories of AI systems based on the risk approach of EU AI Act



Source: European Commission.

AI systems with limited risk, such as those lacking transparency, are subject to specific information and transparency obligations. Meanwhile, AI systems that present only minimal risk to individuals are exempt from additional legal obligations, promoting innovation while ensuring user safety (Figure 2). The EU's AI Act is part of a broader international effort to govern AI, with various countries and organizations, like the USA and OECD, developing their own AI governance policies. This global legislative movement highlights the importance of establishing ethical and safe AI practices that line up with societal values and principles.

The beginning of the Digital Decade foreshadows a transformative era for the European Union, with the education sector at the forefront of this change. Consequently, the EU's commitment to digital transformation is not only a technological upgrade but a strategic move to enhance the well-being and quality of life of all Europeans.

Additionally, the 2030 Digital Decade Report emphasises the necessity of integrating digital technologies into education to ensure that the workforce keeps pace with evolving skills demands (European Union, 2023).

Despite the EU's efforts, the current state of digital education reveals a significant gap between ambitions and reality. The report indicates that only 59% of the population would possess basic digital skills by 2030 without further action. This shortfall stresses the urgent need for Member States to prioritize investment in digital education and skills, adapting to the rapidly evolving digital landscape (European Union, 2023).

To sum up, the digital transformation of education promises to unlock unprecedented capabilities. By embracing digital technologies, educational institutions can nurture innovative learning environments, facilitate access to a wealth of knowledge, and prepare students for a digital future. The 2030 Digital Decade Report highlights the importance of high-quality, inclusive, and accessible digital education and training to develop the digital skills of European citizens.

However, the path to digital transformation is loaded with challenges. The digital divide, particularly among older people, those with less formal education, or residents of rural areas, poses a significant barrier to inclusive digital education. Therefore, the report calls for targeted policy interventions and significant investment to bridge this divide and ensure that no one is left behind in the digital era (European Union, 2023).

Romania's strategy for AI integration

The rapid advancement of artificial intelligence (AI) technologies presents both opportunities and challenges for societies worldwide. With the purpose of addressing both the challenges and the opportunities, the National Strategy for Artificial Intelligence (2024-2027) of Romania aims to harness the potential of AI for economic growth and social welfare while addressing ethical concerns and aligning with European Union (EU) standards (MCID, 2024).

Interestingly, it should be noted that Romania is among the first three cluster of countries to adopt a national AI strategy since the emergence of this new technology even before the COVID-19 pandemic, as the data from Table 1 reveal. First of all, the first three countries that have adopted a national AI strategy since 2017 are Canada, China, and Finland. Then, in 2018 another seven countries published their national AI strategy: Australia, France, Germany, Sweden, India, Mauritius, and Mexico.

Next, data from Table 1 indicates that the greatest adoption of a national AI strategy was in 2019, when Romania was among the 28 states that followed the path to an AI landscape (Argentina, Austria, Bangladesh, Botswana, Chile, Colombia, Cyprus, Czech Republic, Denmark, Egypt, Estonia, Japan, Kenya, Lithuania, Luxembourg, Malta, Netherlands, Portugal, Qatar, **Romania**, Russia, Sierra Leone, Singapore, United Arab Emirates, United States of America, and Uruguay).

Table 1. Annual Publication of AI National Strategies by Country

Year	Country
2017	Canada, China, Finland
2018	Australia, France, Germany, India, Mauritius, Mexico, Sweden
2019	Argentina, Austria, Bangladesh, Botswana, Chile, Colombia, Cyprus, Czech Republic, Denmark, Egypt, Estonia, Japan, Kenya, Lithuania, Luxembourg, Malta, Netherlands, Portugal, Qatar, Romania , Russia, Sierra Leone, Singapore, United Arab Emirates, United States of America, Uruguay
2020	Algeria, Bulgaria, Croatia, Greece, Hungary, Indonesia, Latvia, Norway, Poland, Saudi Arabia, Serbia, South Korea, Spain, Switzerland
2021	Brazil, Ireland, Peru, Philippines, Slovenia, Tunisia, Turkey, Ukraine, United Kingdom, Vietnam
2022	Italy, Thailand

Source: Maslej et al., 2023.

Figure 3. Romania's priority domains of analysis regarding AI



Source: Authors' contribution.

Romania's strategy for AI outlines objectives to support education, research, development, and innovation in AI, fostering a resilient infrastructure and data sets for AI applications (Figure 3). Also, the adoption of AI promises to improve the quality of life and social welfare in Romania. For example, AI applications in healthcare, transportation, and public services can enhance efficiency and accessibility, contributing to a more sustainable and resilient society.

Besides, ethical considerations and the protection of human rights are central to the responsible development and deployment of AI. The strategy emphasizes the importance of transparency, security, and accountability in AI systems, ensuring they respect fundamental freedoms and democratic values (MCID, 2024).

Consequently, the National Strategy for Artificial Intelligence reflects Romania's commitment to leveraging AI for societal benefits while addressing the challenges posed by these technologies. As AI continues to evolve, it is imperative for Romania to remain proactive in its approach, safeguarding that AI serves as a tool for development and prosperity without compromising ethical standards or human rights.

Human Resources Training, Digital Skills, and AI Competencies

The training and development of human resources' digital expertise stand as central foundations in the adoption and progression of artificial intelligence (AI) within a given society. The relationship between education and AI permits examination from two distinct vantage points: the utilisation of AI methodologies in education to enhance the pedagogical process and the imperative for education in the AI domain to raise the general populace's cognitive proficiency regarding AI and cultivate specific competencies for AI technologies.

Regarding human resource development in Romania, an overabundance of affirmative attributes can be distinguished, creating the foundation for successful development in this domain, juxtaposed with a range of limitations necessitating increased scrutiny, particularly from decision-making entities.

With regards to the positive aspects, Romania benefits from national funding, support, and education recovery plans, which provide essential resources and guidance for human resource development. Additionally, the high number of ICT graduates and the gender balance in this field reflect a promising trend, indicating a strong pool of talent and a commitment to diversity (Table 2).

However, despite these strengths, there are significant challenges that need to be addressed. For instance, the underfunding of education is a critical issue, leading to adverse effects on participation rates and learning outcomes. Furthermore, the limited number of specialized academic programs in the field of artificial intelligence highlights a gap in education that needs to be filled to meet the demands of the modern workforce (European Commission, 2023a,b).

Moreover, the low level of digital literacy among the population poses a barrier to effective human resource development, hindering individuals from fully harnessing the potential of digital technologies (Table 2).

As Figure 4 illustrates, merely 28% of individuals show rudimentary digital competencies, a figure significantly inferior to the EU average of 54% and the ambitious EU target of 80%. This substantial gap persists notably among women, with only 26% demonstrating basic digital skills, contrasting starkly with the EU level of 52%. Additionally, a mere 9% of the population possesses digital skills exceeding the basic level, marking a considerable shortfall compared to the EU average of 26% (Table 2).

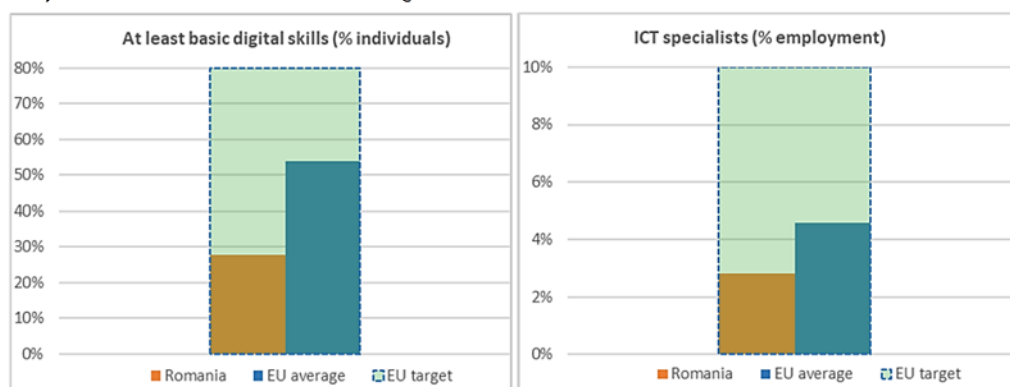
Table 2. Romania's progress towards EU 2030 target in terms of digital skills

	Romania			EU	EU
	DESI 2021	DESI 2022	DESI 2023	DESI 2023	2030 target
1a1 Internet use	76%	82%	84%	89%	
% individuals	2020	2021	2022	2022	
1a2 At least basic digital skills	NA	28%	28%	54%	80%
% individuals		2021	2021	2021	
1a3 Above basic digital skills	NA	9%	9%	26%	
% individuals		2021	2021	2021	
1a4 At least basic digital content creation skills	NA	41%	41%	66%	
% individuals		2021	2021	2021	
1a5 Enterprises providing ICT training	6%	6%	9%	22%	
% enterprises	2020	2020	2022	2022	
1b1 ICT specialists	2.4%	2.6%	2.8%	4.6%	20 million
% individuals in employment aged 15-74	2020	2021	2022	2022	~10%
1b2 ICT graduates	6.3%	6.7%	6.9%	4.2%	
% graduates	2019	2020	2021	2021	

Source: European Commission, 2023c.

The country displays a modest proportion of ICT specialists, comprising only 2.8% of total employment, a figure notably lower than the EU average of 4.6% (Figure 4). Conversely, Romania demonstrates a commendable share of ICT graduates, accounting for 6.9% of the total, positioning it among the frontrunners in the EU (Table 2).

Figure 4. Individuals possessing basic digital skills (left) and number of ICT specialists (right) – a comparative analysis between Romania and EU average in 2023



Source: European Commission, 2023c.

However, this disparity is largely attributed to the tenacious challenge of retaining talent within Romania's borders. Additionally, the scarcity of enterprises providing ICT training exacerbates this issue, limiting access to essential skills development opportunities.

Amidst the COVID-19 pandemic situation, the ongoing CRED initiative has initiated support measures for educators through tailored training modules aimed at enhancing digital competencies. As of April 2023, a total of 56,615 teachers have participated in these modules, constituting 48% of all primary and secondary education instructors.

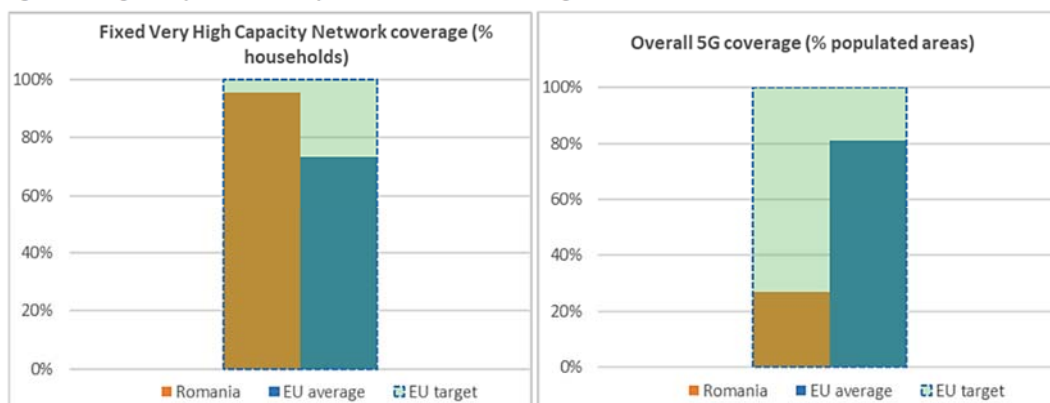
Additionally, an extensive ongoing training initiative titled "Digital educational resources: creation, use, and evaluation" has been implemented, with approximately 3,900 teachers having completed the program to date, resulting in the availability of around 8,700 open educational resources. Over the past year, the training portal has recorded over 2.4 million page views, accumulating a total of more than 90 million views since its inception (European Commission, 2023c).

Another best practice example is the PROF project. Through collaborative efforts involving four universities and eleven Teachers Resources Centres, the PROF project has been established to provide career mentoring interventions for teachers, integrating a significant digital education component. This includes mentoring and digital skills training programs, resulting in 2,846 teacher-mentors being trained by December 2022. The project aims to provide continuous training for 25,000 teachers by the end of December 2023, leveraging the e-Prof IT platform and offering training programs tailored for school managers and educators (European Commission, 2023c).

Digital Infrastructure and Data Management

Accessibility to infrastructure and data represents essential prerequisites for the development and utilization of artificial intelligence solutions, and data management may involve either facilities for uniform data processing or the provision of data from the public sector to artificial intelligence solution developers. When examining Romania's accessibility to infrastructure and data management, a comparative analysis reveals a mixed profile.

Figure 5. Digital infrastructure of Romania and EU average in 2023



Source: European Commission, 2023c.

On one hand, Romania deals with a notable deficit of available datasets at the EU level, presenting a substantial obstacle to comprehensive data utilization and analysis. This scarcity limits the breadth and depth of data-driven initiatives and impedes the development of robust artificial intelligence solutions (Figure 5).

Conversely, Figure 5 demonstrates that Romania boasts admirable access to broadband internet infrastructure, positioning itself favourably for digital connectivity and access to online resources and services. This infrastructure facilitates widespread internet access, enabling individuals and organizations to harness digital technologies more effectively.

For instance, Romania excels in digital infrastructure, meeting a crucial prerequisite for successful digital transformation and significantly contributing to the EU's digital connectivity objectives. Particularly noteworthy is Romania's outstanding performance in fixed connectivity, placing it among the leaders in the EU and continuously advancing. Currently, 96% of households in Romania have access to gigabit network coverage, surpassing the EU average of 73% (Figure 5).

Romania also leads all Member States in fiber-to-the-premises (FTTP) coverage, with an impressive 96% compared to the EU average of 56%. Furthermore, uptake of high-speed internet subscriptions has seen positive growth, with 81% of individuals subscribing to connections of at least 100 Mbps, outpacing the EU average of 55%. Additionally, 23% of individuals in Romania have adopted connections of at least 1Gbps, exceeding the EU average of 14%. Although prices have increased across various subscription tiers, they remain approximately half of the EU average. However, significant rural-urban disparities persist in certain regions of Romania, where rural areas continue to lag behind the EU average in terms of very high-capacity network (VHCN) coverage.

Furthermore, Romania demonstrates proactive efforts with policies promoting open data at the national level. Such initiatives underline a commitment to transparency and collaboration, cultivating an environment favourable to innovation and the development of artificial intelligence solutions. For example, the RO-NET Initiative stands out as best practice in terms of public digital infrastructure commitment and expansion. With a budget of EUR 85 million and co-financed by the European Regional Development Fund (ERDF), the RO-NET project has successfully deployed nearly 5,000 kilometres of fibre optic infrastructure to cover 695 rural localities in Romania. This extensive network expansion has provided these areas with the potential for internet speeds of up to 10 Gbps, along with the installation of six radio towers in the Danube Delta region. These localities encompass more than 30% of the previously underserved regions identified at the project's outset. With the deployment of dark fibre completed, other telecommunications operators are now tasked with delivering last-mile connections to end-users, with approximately 60 operators currently active in this endeavor. The project's long-term impact is anticipated to benefit approximately 120,000 households by providing them with access to high-speed internet connectivity (MCID, 2024).

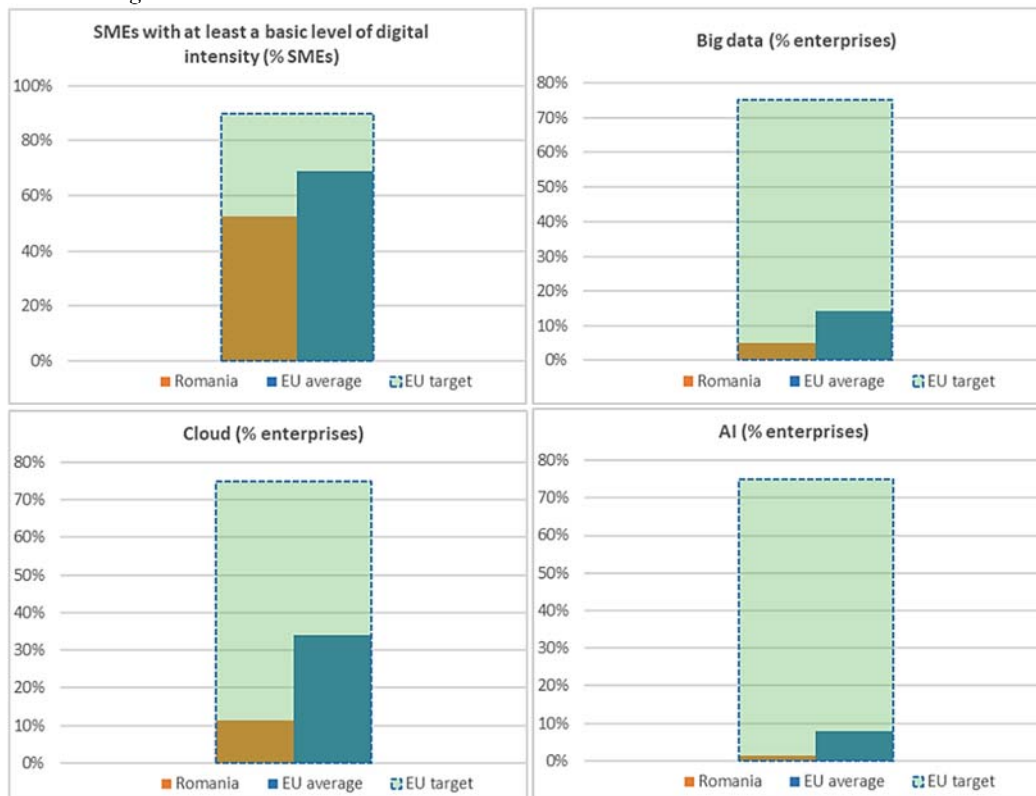
Unleashed Potential: Digitalisation of Businesses in Romania

In terms of digitalisation of businesses, Romania unveils a controversial profile. On one hand, the nation boasts a rich heritage in mathematics and computer science, providing a solid foundation for technological advancement. However, this potential is slowed down by significant underfunding of research, development, and innovation (R&D) from both public and private sources.

Despite this challenge, Romania demonstrates promising indicators in the field of artificial intelligence (AI), with a substantial number of researchers and a balanced gender representation. Additionally, the introduction of a scientific visa for foreign researchers enhances the country's research ecosystem, nurturing collaboration and knowledge exchange.

Furthermore, Romania stands out for its prolific output of AI publications, demonstrating the nation's intellectual contributions to the global AI landscape. Nevertheless, the low number of innovative enterprises constrains the full realization of Romania's digitalization potential, compounded by a limited uptake of AI technologies among companies and talent migration.

Figure 6. Digitalisation of businesses: a comparative analysis between Romania and EU average in 2023



Source: European Commission, 2023c.

Despite these obstacles, the emergence of AI start-ups signals a promising trajectory for innovation in the country. However, challenges persist, including a deficit in patents and a reliance on external funding for innovation initiatives. Although Romania holds considerable untapped potential in its journey towards digitalizing businesses and contributing to the EU's overarching objectives in this domain, the country's performance in adopting advanced digital technologies remains notably deficient (Figure 6).

Currently, the adoption rates for key technologies such as AI, cloud services, and big data stand at a mere 1%, 11%, and 5% respectively, lagging significantly behind the EU averages of 8%, 34%, and 14%. It is worth noting that the Digital Decade initiative aims for 75% of businesses to embrace advanced technologies (Figure 6).

While Romania fares better in terms of the percentage of small and medium-sized enterprises (SMEs) with a basic level of digital intensity, with 53% compared to the EU average of 69%, this still falls short of the 2030 EU target of 90% (Figure 6).

Although there has been progress observed over the past year in terms of enterprises engaging in online sales and e-commerce turnover, Romania continues to trail below the EU average across all these metrics, albeit displaying early signs of convergence (Figure 5).

Despite its low adoption rates for key technologies, Romania introduces the groundbreaking ION initiative, marking a significant milestone as the government's inaugural AI-based advisor launched in early 2023. Designed to revolutionize governance, ION's primary function is to analyse public sentiment and provide valuable insights to the cabinet members.

Additionally, it serves as a catalyst for promoting awareness about the transformative power and advantages of cutting-edge digital technologies. This innovative approach accentuates Romania's commitment to promoting AI for informed decision-making and nurturing digital progress.

Technological Transfer, Partnerships, and Digital Innovation Centres

A comprehensive examination of innovation partnerships in Romania reveals a complex landscape characterized by diverse collaborative actions. According to MCID Report (2024), 30.2% of innovative enterprises in the country have engaged in cooperation agreements for innovation. However, a closer inspection unveils contrasting trends in the nature and scope of these collaborations.

Predominantly, the highest proportion of partnerships gravitates towards agreements with clients or buyers within the private sector, which emphasises the prevalent focus on market-driven innovation initiatives, highlighting the commercial orientation of many Romanian enterprises. In stark contrast, a mere 5.1% of all agreements involve collaborations with universities, higher education institutions, public administration, or public research entities (MCID, 2024).

Moreover, an analysis of external partnerships further accentuates the comparative landscape. While 5.8% of innovation agreements entail collaboration with external partners outside Romania, the extent and depth of these international engagements remain relatively modest. This suggests an opportunity for Romanian enterprises to enhance their global footprint and leverage international expertise and resources to drive innovation.

In the context of business innovation, the data reveals a sobering reality. Out of a total of 28,776 enterprises operating in the industrial and service sectors with over 9 employees, only 14.6% are actively engaged in innovation activities. This statistic highlights the imperative for concerted efforts to foster a culture of innovation and R&D within the Romanian business ecosystem.

Funding of the AI Domain

Over the past two decades, Romania has maintained a consistent allocation of approximately 0.5% of its Gross Domestic Product (GDP) to Research and Development (R&D). However, this percentage pales in comparison to the European average of around 2% of GDP, signalling potential negative implications for the country's research and innovation outcomes. The persistent disparity in R&D investment may intensify existing gaps in research and innovation performance within the European context (MCID, 2024).

Furthermore, Romania faces challenges in tapping into significant funding opportunities from European sources. Despite the presence of research entities, particularly within universities, participating in various projects, Romania's engagement in European-level AI research projects remains limited. Between 2009 and 2018, Romania failed to attract the targeted 2% share of the total available funds, highlighting a missed opportunity to leverage European funding for innovation and R&D initiatives (MCID, 2024).

The allocation of only 73 million euros for R&D programs within the National Recovery and Resilience Plan (PNRR) further stresses the constrained investment landscape in Romania. This relatively modest allocation raises questions about the country's commitment to fostering innovation and technological advancement. Moreover, Romania lags behind in terms of venture capital investment, as reported by the Organization for Economic Cooperation and Development (OECD). The scarcity of venture capital funding poses a significant barrier to the growth of innovative start-ups and emerging technologies in the country.

The lack of investment in emerging technologies emerges as a notable weakness for Romania, as evidenced by its ranking of 52 out of 134 countries in the 2023 Network Readiness Index (Table 3).

Table 3. Romania's Network Readiness Index 2023

	Rank (Out of 134)	Score
Network Readiness Index	52	52.41
Pillar/sub-pillar	Rank	Score
A. Technology pillar	57	42.76
1st sub-pillar: Access	48	70.12
2nd sub-pillar: Content	50	28.72
3rd sub-pillar: Future Technologies	78	29.45
B. People pillar	66	43.57
1st sub-pillar: Individuals	70	46.54
2nd sub-pillar: Businesses	52	48.95
3rd sub-pillar: Governments	78	35.22
C. Governance pillar	52	63.55
1st sub-pillar: Trust	51	55.41
2nd sub-pillar: Regulation	45	72.56
3rd sub-pillar: Inclusion	63	62.67
D. Impact pillar	42	59.75
1st sub-pillar: Economy	33	38.83
2nd sub-pillar: Quality of Life	41	74.98
3rd sub-pillar: SDG Contribution	63	65.43

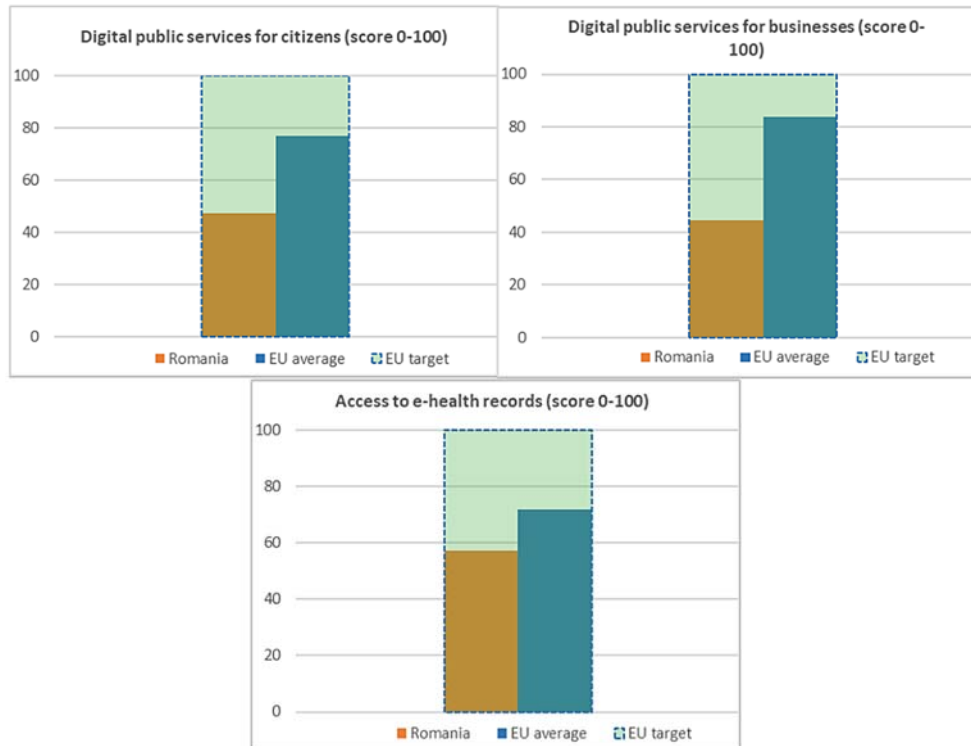
Source: Dutta & Lanvin, 2023.

The same report ranks Romania on the 57th position in term of technology, while the sub pillar “future technologies” ranks our country on the 78th place (Table 3). This highlights the urgent need for increased investment and policy support to bolster Romania's competitiveness in the digital era.

Additionally, the dearth of private investments combined with limited public support for innovation and R&D projects in the București-Ilfov region, despite its relatively higher development status, is a concerning trend. The lack of robust investment mechanisms and support frameworks hampers the region's potential to drive innovation-led growth and development.

Adoption of AI Solutions in Governance, Public Sector, Companies, and Society

The adoption of AI across Romanian society faces significant challenges due to the relatively low percentage of individuals possessing basic digital competencies, since data reveals that less than one-third (31%) of individuals aged 16 to 74 have at least basic digital skills, compared to the EU average of 56%. Moreover, only 35% demonstrate basic software skills, falling below the EU average of 58%.

Figure 7. Digitalisation of Romanian public services compared to EU average in 2023

Source: European Commission, 2023c.

In terms of digital public service adoption, Romania ranks lowest among EU member states. Romania's performance in this realm, however, still requires enhancement. Merely 24% of online users utilize e-Government services, contrasting with the EU mean of 74%. Romania attains a rating of 48 for digital public services aimed at citizens, juxtaposed with the EU norm of 77.

Likewise, the evaluation for digital public services targeting businesses stands at 45, lagging behind the EU average of 84 but gradually approaching it (Figure 7). These relatively modest ratings persist consistently across the various facets of the eGovernment Benchmark analysis (e.g., user assistance, mobile compatibility, service delivery transparency, interface design, data privacy, and prefilled documentation).

Several ongoing initiatives are gaining momentum and demonstrating the advantages of e-government services in terms of streamlining processes and reducing administrative burdens. 'Ghiseul.ro' stands out as a nationwide payment platform and online application, developed by the ADR in collaboration with the Romanian Electronic Payments Association. This platform enables citizens to access and settle various fees, taxes, fines, and other payments online, with around 400 payment types available. To date, approximately 1.8 million individuals and businesses have utilized this platform. In the first quarter of 2023, 75 public institutions began using the platform for receiving payments,

with 250,000 new users registering during this period, indicating a growing success of the platform (European Commission, 2023c).

Furthermore, the limited adoption of AI technologies by Romanian companies is a notable concern. According to Eurostat, a mere 6% of companies with at least 10 employees, excluding the financial sector, utilize artificial intelligence. While this figure is close to the European average of 7%, it falls significantly below Ireland's adoption rate of 23%.

Discussion

While this research paper provides valuable insights into the digital transformation and AI adoption in Romanian education, it is important to acknowledge its limitations. Firstly, the scope of the paper may not fully capture the complexity and nuances of the digital education landscape in Romania. The research may have focused on certain aspects of AI adoption while neglecting others, leading to potential gaps in understanding. Additionally, the findings and conclusions drawn in this paper are based on existing literature and analysis, which may be subject to bias or incomplete information.

Moreover, the paper may not have explored the perspectives of all relevant stakeholders, such as students, parents, and teachers, which could provide additional insights into the challenges and opportunities of AI adoption in Romanian education. Additionally, the dynamic nature of technology and education means that the conclusions drawn in this paper may become outdated over time as new developments emerge. Therefore, while this research paper offers valuable contributions to the understanding of digital education in Romania, it is essential to recognize its limitations and encourage further research to address these gaps and continue advancing knowledge in this field.

Conclusion

As the technology advance and global data volume increase, the European Union (EU) is at a crossroads. The documents submitted by the European Commission on 19 February 2020 highlight the urgency of promoting digital sovereignty. The EU's ambitious objectives and proposed legislative measures are designed to ease the development and dissemination of essential technologies, infrastructures and skills for the digital autonomy of Europe (European Commission, 2020).

Furthermore, the expansion of artificial intelligence (AI) necessitates adequate investment in research and innovation, as well as a coordinated EU-wide approach to facilitate AI adoption. The EU must also establish a regulatory framework that addresses security, accountability, and the protection of fundamental rights. The proposed Regulation on AI systems and the integration of AI into machinery highlight the need for a legal framework that balances technological progress with ethical considerations.

Moreover, the digital transformation is integral to the EU's response to the economic crisis induced by the Covid-19 pandemic (European Commission, 2020). To close the gap with global competitors and achieve the objectives outlined in the EU's 2030 Digital Compass,

a transformative improvement in quality and a significant increase in investment are imperative. Italy's national recovery and resilience plan, aligned with the EU's vision, present a unique opportunity to address past delays and enhance the digitalization rate. The EU must accelerate the implementation of its digital education plan, prioritize investments in training and digital upskilling, and foster a culture of data sharing. By doing so, Europe can secure its digital sovereignty and strategic autonomy in a rapidly evolving global landscape.

In conclusion, the EU's coordinated approach to AI reflects a deep understanding of the transformative power of technology and a commitment to harnessing this power responsibly. The digital transformation of the education sector is not just an individual or national concern but a collective European endeavour.

Regarding Romania, while the country demonstrates commendable progress in fostering innovation partnerships, there exist notable disparities and areas for improvement. A balanced approach leveraging both private and public sector collaboration, as well as international partnerships, is essential to drive Romania towards a more vibrant and competitive innovation landscape. However, addressing multifaceted challenges, such as inadequate R&D investment and limited access to funding, requires intensive efforts from policymakers, businesses, and other stakeholders to nurture a more conducive environment for innovation and technological advancement in the country.

Overall, Romania faces challenges in embracing digital transformation and AI adoption, spanning from inadequate digital skills among individuals to low engagement with digital public services and limited integration of digital technologies in business operations. However, these challenges also present opportunities for growth and development, particularly in the education sector. By harnessing the power of AI, Romanian educational institutions can revolutionize learning environments, personalize education experiences, and equip students with essential digital skills for the future job market. Moreover, investing in digital education and upskilling initiatives can bridge the digital divide and ensure that no one is left behind in the digital era. Thus, while the road ahead may be challenging, the adoption of AI in the education sector holds immense potential to push Romania towards a more prosperous and technologically advanced future.

Further research should consider several key areas to advance the digital transformation and AI adoption agenda in Romanian education. Firstly, analysing the impact of AI adoption on student engagement and academic performance can provide valuable insights. Next, understanding the digital skills gap among different demographic groups is crucial for targeted interventions. Also, long-term impact assessments are necessary to monitor societal and economic outcomes over time. Collectively, these research directions will drive forward Romania's digital education agenda, creating a more inclusive and resilient education system for the future.

Statements

This paper was co-financed by The Bucharest University of Economic Studies during the PhD program.

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AI ethical consequences in business and society

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Abstract. *The paper aims to explore ethical consequences because of wide-spread adoption of artificial intelligence (AI) in business in society. The pace of development in the recent period has been very significant, creating a new wave of disruption. This is particularly pertinent given the lack of AI regulation and limited understanding of its side-effects on the long run. Some of the changes are already visible, while the others are merely imagined, nevertheless requiring examination and handling. Embracing technology advancements for their benefits and opportunities, we should not overlook their wider implications in business and in our society in general.*

Keywords: artificial intelligence, ethics, social response, marketing.

JEL Classification: A13, M31.

Introduction

It is not the first time in human history when technological breakthrough creates ethical dilemmas. It will probably take some time to accommodate social and economic changes with regulations and business practice.

Until recently, those implications concerned mostly engineers and data scientists. However, recent technological advancements made it possible to integrate AI in many industries and raised questions about their impact in business and society. This happens because now humans delegate their decisions to another type of technology that can learn and improve autonomously and we found in a situation where we have something that we can compare ourselves with (Belk, 2019: p.11).

Unlike other previous technologies, AI has the potential to be more comprehensive due to their ability to act as a substitute for humans in decision-making process (Cabiddu et al., 2022: p.685). This similarity with humans makes it more important. Even though AI is only at the beginning, it is still difficult to predict its future, but the expectations are that it will support managers to make better decisions (Di Vaio et al., 2020: p.284). This opinion is not shared by all researchers. Some authors concluded that perspectives about AI impact are contradictory – some think AI is a useful, superior technology, others consider it dangerous or even an existential threat (Du and Xie, 2020: p.1).

In our paper, we will analyze current literature review on the topic and we will present some of the most important consequences in business and society from a marketing perspective.

Literature review

The ethical issues associated with the widespread adoption of AI include moral dilemmas to which society has not yet found a satisfactory answer. AI concept is not new and has evolved for more than a half of century. However, it has done so in a relative scientific obscurity, without significant practical successes until the last decade (Haenlein and Kaplan, 2019: p.1). Only recently, due to developments in machine learning (Ma and Sun, 2020: p.482), and in generative capabilities it started to be adopted at company level, and especially in marketing (Kshetri, 2023: p.71). Moreover, AI has the ability to learn and improve itself by incrementally extending its knowledge (Kumar et al., 2021: p.5) so that it starts to surpass humans in areas where it has been undisputed so far (Belk, 2019: p.11).

It is expected that this will trigger a social response from consumers reflected in the metaphor of “uncanny valley”, a metaphor to reflect the situation where certain objects exhibit behavior that exceeds social expectations at that time and is applicable to artificial entities with anthropomorphic form (robots) that, upon displaying human attributes, can provoke technological animism, that is, the attribution of exclusively human characteristics (spirit, consciousness, etc.) to objects (Coeckelbergh, 2022: p.2056). In this context, consumer reactions turn out to be distrustful, cautious, or uncomfortable (Gerlich, 2023: p.2). Initially, the acceptance of artificial entities with human attributes is expected to increase in the initial phase and then decrease when they sporadically exhibit certain

behaviors that consumers will interpret as bizarre or strange (because they will not initially be at the same level as human beings), but gradually these reactions will diminish as the emotional capacity of the artificial entities improves (Feng et al. 2024: pp.3-4). Therefore, the question of trust is directly related to consumer perception on how key ethical concerns are addressed (Du and Xie, 2020: p.2). It is yet difficult to assess whether AI will generate a positive or negative impact in society (Stahl et al., 2023: p.1), and trust in AI will depend largely on the how the risks and benefits will be handled from the ethical perspective (Du and Xie, 2020: pp.7-8).

One way to address the concern would be to create a compelling regulation on how to use AI. This approach would fall into a defensive reaction, according to Farzaneh and Boyer (2021: pp.161-163), but it would not be easy to accomplish and, taking into consideration the current pace of innovation, would probably be partially obsolete before even been adopted. Another approach would be the offensive reaction, described by Farzaneh and Boyer (2021: pp.164-166) as a gradual adoption of AI, in three successive phases: (i) learn to work with AI, (ii) accommodate AI in their lives and (iii) mastering AI and using it to create new type of relations between humans. Other researchers are also skeptical that regulation could make a difference and propose a common approach on mutual accepted ethical requirements in training and testing AI (Haenlein and Kaplan, 2019: pp.6-8).

In order to define AI ethics, Ashok et al. (2022: pp.2-3) started with defining digital ethics. They considered that digital ethics consists of hard ethics (regulations and compliance) and soft ethics (over and above regulations). The authors identified several ethical domains, such as: technoethics and computer ethics (related to technology use), information ethics (information use), roboethics and machine ethics (moral design and relation with humans), and AI ethics, that relates to transparency, responsibility, auditability, predictability and even morality of machines (Ashok et al., 2022: p.3). Other researchers identified other ethical domains, such as: biases, privacy, cybersecurity or unemployment (Du and Xie, 2020: p.1) or concerns regarding algorithmic discrimination, as an implicit result of the self-learning process on historical datasets that have absorbed the biases of society at that time; concerns regarding the malicious use of AI and the temptation of certain states or organizations to utilize it to reinforce means of misinformation and social control; and concerns regarding the emergence and negative manifestation of a potential AI superintelligence, surpassing human intelligence by far and potentially acting against the interests of humanity (Goel, 2022: p.267).

Research problem and methodology

Rapid integration of AI in company's processes and their products raises crucial questions about the balance between effective targeting and potential for manipulation or invasion of privacy. Moreover, use of AI could lead to disparities in consumer experiences and outcomes, potentially exacerbating issues of fairness and discrimination. Little is known so far about the consumer reaction to objective ethical implications such as those posed by AI. The implications are "objective" in the sense that they are not intentional but are based on data and algorithms. However, if better understood they could be handled by design and

transparency and thus being mitigate it. In order to explore ethical implications of AI we used an integrative review. We collected information regarding our topic of interest and selected relevant information from a marketing perspective. We have identified relevant databases (Web of Science and Science Direct) and we have search using various combinations of keywords, such as: “AI consequence”, “AI ethics”, “bias”, “anthropomorphism”, “social response”, “virtual influencers”, “hallucination”. We have selected the papers in English and French with information that could be used to create a review of ethical concerns. After we analyzed the information, we extracted the relevant ideas for each of the selected ethical concerns highlighted in our review.

Review of ethical concerns

The topics below are not intended to be exhaustive. We acknowledge that other ethical concerns may become important and relevant in the future as a result of technological advancements or practical outcomes (similar to those that followed Cambridge Analytica case). Nevertheless, they present a series of challenges that business managers and regulators should take into consideration when embracing, using and regulating AI.

Algorithmic Bias

One of the most frequently mentioned ethical questions relates to algorithmic bias, which defines a situation when AI behaves differently in relation with customers based on historical data it has been trained on (Huang and Rust, 2021: pp.46-47). Biases can involve cultural (values), social (professional, generational, orientation), personal (age, gender) or commercial criteria (Abrardi et al., 2021: pp.4-13). Some researchers believe that algorithmic bias is inevitable due to training data, therefore the focus should be to mitigate its effects (van Giffen Herhausen and Fahse, 2022: p.98), while other researchers consider that biases are a fluid phenomenon and AI should sync with current social values with updated trainings on large set of data (Anantrasirichai and Bull, 2021). From this perspective, AI should be designed from the outset to incorporate a certain set of values necessary for human society at that time, such as transparency, fairness, equity, responsibility, confidentiality, autonomy, trust, dignity, sustainability, or solidarity (Kazim and Koshiyama, 2021: p.8).

Privacy

AI can collect numerous confidential data about consumers, sometimes without their awareness or consent, for example through services offered for free in exchange for the possibility of collecting such data (Du and Xie, 2020: p.8). At the same time, intelligent objects within IoT systems can record, store, and process any and all data collected from the individuals they interact with (Wirtz et al., 2018: p.3), and protecting this confidential data, such as identification, location, monitoring, or profiling data, poses challenging management issues (Hoyer et al., 2020). Recent progress in generative AI, which collects numerous potentially confidential information from users, requires the establishment of rules and special mechanisms to ensure the confidentiality of this information (Bubeck et

al., 2023: p.91). An example of the negative processing of confidential data is the case of Cambridge Analytica, where confidential data of millions of users of the Facebook platform were used for social and political influence purposes (Kietzmann et al., 2018: p.263). Additional challenges regarding data confidentiality assurance and strengthening the level of protection of collected data have arisen with the widespread adoption of generative AI applications, where end consumers frequently use personal data (Kshetri, 2023).

An experiment run by Japanese researchers found out that AI could read the human brain and reconstruct visual images seen by a subject (Koide-Majima et al., 2024: pp.355-361) which opens a Pandora box regarding the possibility to have access to most intimate parts of humans: their thoughts.

Explainable AI

The study of how AI reaches certain decisions is called "Explainable AI" (XAI) (Rai, 2020: pp.137-138), and it can contribute to increasing trust in AI through constant efforts to communicate traceability, explainability, and limitations of AI (Stahl et al., 2023: p.16). Even though the details of the algorithms are well known, the AI mechanism often remains a kind of black box, because it is not completely clear how the AI behaves and arrives at certain decisions (Grewal et al., 2021). However, manufacturers of self-learning algorithms, being in fierce competition, currently act protectionist and do not provide any transparency regarding the design of these algorithms (Keegan et al., 2022: pp.40-45). A good practice would be to inform people they are dealing with an algorithmic agent (Kobis and Mossink, 2021: p.3).

Pricing Discrimination

This outcome may be generated by dynamic pricing, which could be used by some companies as a tool for maximizing profits through constant and immediate adjustment of prices based on seasonality, time of day, marketing experiments (Calvano, 2020: p.3267), demand level, stock levels, competitors' offers, and any other relevant factors (Abrate et al., 2022: p.191).

The use of dynamic pricing is perceived negatively by consumers, especially in cases where the price changes for a user when AI identifies a large number of repeated searches for a specific product (Keller et al., 2022: p.285). Appearance of specialized AI models with focus on dynamic pricing could pave the way for new services on the market, through which companies specialized in these algorithms could charge a commission, both from the seller and the buyer, for the optimal matching of supply and demand (Stöcker, 2017).

Jobs

The role of employees will gradually change as a consequence of AI integration, from solving problems to identifying problems to be solved (Verganti et al., 2020: p.225). However, as the integration spreads throughout the company, employees will need to learn to work with AI, and managers will need to start collaborating with AI as if it were another team member (Huang et al., 2019: p.16). Adoption of AI will imply processes automation

and it could affect less skilled jobs, which can easily be replaced (Abrardi et al., 2021: pp.4-6), but also specialists in marketing, customer relations or sales (Kopalle et al., 2021: p.4). In the future, certain managerial roles could effectively be fulfilled by algorithms, and it could lead to the existence of hyper-productive corporations, operating entirely without employees (Ferras-Hernandez, 2018: p.2).

Antropomorphism

As AI becomes more competent, it challenges the way humans regards themselves and how they related with intelligent machines.

Antropomorphism defines the tendency to associate human-like characteristics to artificial entities, either physical, emotional, or rational (Pelău et al., 2021) which possesses capacity to show intentions, motivations and other traits specific to humans (Mariani et al., 2023: p.9). However, the level achieved by artificial entities in creating objects similar to those made by humans poses a problem of social acceptance (Ragot et al., 2020: p.2) and may provoke a negative reaction among some consumers who perceive this progress as a threat (Millet et al., 2023: p.2). The negative reaction does not necessarily manifest when artificial entities achieve modest success but rather triggers it suddenly when the results produced by artificial entities reach a nearly perfect level of humanization (Scorici et al., 2022: pp.2-3). In other gradually constructed contexts, such as anthropomorphic profiles on social media (AI influencers), a high level of physical and behavioral similarity with humans would generate a rather positive reaction from their followers, positively influencing the level of acceptance of recommendations transmitted through these profiles (Feng et al., 2024: pp.4-5).

Coeckelbergh (2022: pp.2051-2052) divided anthropomorphic reactions into "naive instrumentalism" (expressing a dualistic-exclusive perspective from the standpoint of humans, where artificial entities are seen as mere objects, regardless of their mode of appearance and capacity for expression) and "unconditional post-humanism" (expressing an inclusive-evolutionary perspective, where artificial entities can be assimilated to persons who complement and enrich the human world).

The variety of forms of manifestation of artificial entities may have a significant influence on the perception of consumers with whom they interact (Roy and Naidoo, 2021: pp.11-12), but some researchers believe that a high level of anthropomorphism exhibited by artificial entities could negatively influence the consumer experience, being perceived rather as deceptive and dishonest (Rizomyliotis et al., 2022: p.336). The anthropomorphic reaction, also referred to as "algorithmic aversion," is less pronounced in objective domains but more acute in subjective domains, including creativity, where evaluation criteria are much vaguer (Chu and Liu, 2023: p.1). Other researchers have concluded that the anthropomorphic manifestation of artificial entities does not inherently influence either the level of acceptance or the level of trust in AI, which are instead more influenced by empathy and the quality of interaction (Pelău et al., 2021: p.2). Thus, anthropomorphism is extended to artificial entities as individuals lacking social interactions tend to associate human characteristics with non-human beings or objects to compensate for this social gap (Feng et al., 2024: pp.3-4).

Pseudo-creativity

Although the advances in generative AI within the creative field are impressive and allow reaching the level where synthetic digital objects, created by AI, can no longer be distinguished from authentic objects created by a human, it is observed that the exclusive use of Generative Adversarial Networks (GAN), without human involvement, cannot facilitate creativity, being limited to the purpose for which they were trained - incrementally imitating human art (Elgammal et al., 2017: p.2). Algorithmic creativity would generate content because of the divergence from precedents (i.e., previous works), whereas human creativity would generate content as a result of the need to express a specific purpose (Coffin, 2022: p.614). The process of human creativity would thus be impossible to replicate by AI, which would lack certain essential attributes of human-like creativity, such as intrinsic motivation, choice, or intentionality (Runco, 2023: pp.93-94). Therefore, creativity generated by AI would not be more than a new form of plagiarism (Kobis and Mossink, 2021: p.3). The widespread introduction of generative AI programs into the creative process could potentially lead to a plateau in the form of artistic standardization (Brook, 2020: p.1).

Hallucination.

Another phenomenon associated with content generation through generative AI is the development of arguments based on speculative but false reasoning, which seemingly appear authentic and produce a type of AI hallucination (Grant and Metz, 2023). Although, like humans, artificial entities based on generative models can make mistakes, the "hallucination" effect of pre-trained generative transformers (GPT) is even more striking because sometimes information is generated without any connection with reality, being presented as if they were certainties (Chui et al., 2023).

Deepfakes

Generative AI technology has opened up the possibility of training GAN models to create new synthetic content, in the very realistic form of simulated people through the "deep-fake" technique, which involves training a model on hundreds of dimensions, such as characteristics and facial expressions (Campbell et al., 2021: p.1). Deep-fakes generate altered content in the sense that certain elements (such as the face of a person) are overlaid in a different context than the real one, accurately simulates the natural movements of the body and can relatively easily mislead the human eye (Anantrasrichai and Bull, 2021: p.601). Deep-fakes could be used for fraud in the digital environment or for manipulating public opinion (Zhang et al., 2022: pp.56-57).

Post-authenticity

Advertising content created through generative AI achieves elements with a very high degree of non-authentic realism, representing a manufactured version of reality and can be considered a form of consumer manipulation (Campbell et al., 2021: pp.4-6). A high-impact example are AI influencers, who appear in anthropomorphized forms and have amassed audiences of millions of followers, but lack authenticity (Feng et al., 2024: p.2). Thus, para-social relationships can develop between simulated profiles and consumers as

a substitute for social relationships in the physical environment, yet these relationships end up being favorably perceived by digital environment users (Zhang et al., 2023: pp.4-6). Although no differences have been observed at this time from consumers in following AI influencer profiles over human ones, they still exhibit caution towards AI influencer communication, which they consider to be less trustworthy (Sands et al., 2022: p.1). In the future, it is expected that AI influencers may be able to act completely autonomously, where their behavior will be a combination of tasks planned by the creator and interaction with the audience, which can lead to a variety of styles, from very approachable to very robotic, according to the specifics of each audience (Thomas and Fowler, 2021: p.27). Gradually, authenticity is expected to diminish in the case of AI influencers (Łaszkiewicz and Kalinska-Kula, 2023: p.2488), and as the world continues to evolve towards virtual and artificial digital environments, the notion of authenticity is likely to become increasingly vague, with its influence on consumer perception being supplanted by elements such as attractiveness, beauty, humor, sensuality, authority, or exclusivity (Gerlich, 2023: pp.5-8).

Conclusions

The research contributes to a better understanding of the risks faced by society and business landscape when incorporating AI. Some of the ethical implications we have identified are difficult to be observed and to be measured. Some reactions could vary from person to person. However, we believe that a debate about ethics could be productive both for marketing practitioners and for engineers who are developing AI algorithms.

In many other papers we have consulted on the AI adoption in marketing we have noticed limited interest on ethical consequences. This could be explained from several perspectives: (a) ethical issues appear because of lack of regulation and therefore they should be handled by regulatory institutions; (b) ethical issues are temporary, due to transition to a new AI-digital economy that would require massive upskill and conversion of employees and cultural change of customers; (c) ethical issues are less relevant than benefits obtained following successful AI adoption and they could be handled afterwards; (d) ethical issues encountered today may soon become obsolete as culture and values will change under influence of the new digital society; (e) ethical issues are merely imagined, as they are not visible in measurement and appear only incidentally. We consider that ignoring AI ethical implications is not a good option in the long run. The process of identifying and acknowledging the type of issues that must be taken into consideration in relation with AI is a significant concern for companies and society as a whole and it should be constantly assessed with each step ahead.

Study/Research limitations

The ethical implications that have been identified are subject to change in direct correlation with technological progress of AI. Since this is a rapid changing environment in current period, it can generate unforeseen ethical implications in the near future. The perspective of the author is rooted in the marketing area, therefore it could miss some other relevant

ethical consequences from technical, sociological, psychological or other areas. Future research should focus more on the intersection of these perspectives from different areas. Another gap identified by this paper is the lack of practical research done so far regarding consumer perception through experiments that focus on ethical consequences.

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Digital shift to education 4.0: a bibliometric analysis

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Abstract. *The primary objective of this research paper is to exhibit bibliometric figures on articles about the digital evolution from education 3.0 to education 4.0, disclosed in the journals listed in the Scopus and Web of Science databases between 2020 and April 2024. The data compiled from 41534 articles within the study's purview underwent bibliometric scrutiny across six classifications: article and citation count, paramount articles in citations, prevalent keywords, influential nations, preeminent institutions, and foremost journals. This research effort is designed to provide a comprehensive overview and to provide bibliometric network visualisations to elucidate the landscape of pertinent research. Advanced bibliometric techniques, particularly the use of the VOSviewer, were used to generate intricate network maps and conduct in-depth evaluations of the bibliometric data. Bibliometric analysis showed that there are several key trends in the digital evolution of education. Patterns in the adoption and dissemination of specific keywords were observed, shedding light on prevalent themes and areas of focus within the discourse on Education 4.0. Prominent keywords that recurrently appear in the literature were identified, reflecting the core concepts and concerns driving scholarly inquiry in this field. Furthermore, significant insights into the geographic distribution of research efforts were revealed, highlighting the leading nations contributing to the discourse on Education 4.0. Additionally, the most influential academic institutions and journals were identified, underscoring their role in shaping and disseminating knowledge in this domain. By presenting these bibliometric findings, a deeper understanding of the evolving landscape of digital education is facilitated, providing valuable information for researchers, policymakers, and educators alike. The originality of this paper lies in its comprehensive bibliometric approach, providing a nuanced understanding of the digital shift in education and offering fresh insights for future research.*

Keywords: Education 4.0, digital education, technology-based education, online education, e-learning, bibliometric analysis, VOSviewer.

JEL Classification: C88, I21, O14.

1. Introduction

The recent pandemic crisis has created the perfect conditions for the landscape of education to be significantly influenced by the sudden shift to online learning and daily integration of digital technologies into educational settings, leading to the arrival of what is generally referred to as Education 4.0. This transformation reflects a departure from conventional educational practices towards more technology-driven and interactive learning environments (Selwyn, 2016). Education 4.0 is closely intertwined with the broader concept of the fourth industrial revolution, characterized by the integration of digital technologies into various aspects of society (Schwab, 2017). As such, it represents a paradigm shift in educational philosophy and pedagogical approaches, emphasizing the use of technology to personalize and optimize learning experiences (Hodges et al., 2020).

Within the European Union (EU), initiatives such as the Digital Education Action Plan (European Commission, 2018) and the Artificial Intelligence Act (European Parliament, 2024) emphasise the importance of harnessing digital technologies to enhance education and training across member states. Similarly, at the national level, countries like Romania have prioritized the integration of digital tools and resources in educational settings to improve learning outcomes and foster digital literacy among students (Ministry of Education, 2023a,b).

The transition from Education 3.0 to Education 4.0 is underpinned by theories of constructivism and social constructivism, which emphasize the active construction of knowledge through social interaction and collaboration (Vygotsky, 1978; Piaget, 1973). However, Education 4.0 goes beyond these theories by leveraging emerging technologies such as artificial intelligence, augmented reality, and big data analytics to create immersive and personalized learning experiences (González-Pérez & Ramírez-Montoya, 2022).

Critical to the discourse on Education 4.0 are questions surrounding equity of access, digital literacy, and the ethical use of both digital and AI-based technologies in education. Scholars have highlighted the need for inclusive approaches that address the digital divide and ensure equitable access to educational resources for all learners (Noja et al., 2022).

Furthermore, concerns regarding data privacy, security, and algorithmic bias have prompted calls for robust regulatory frameworks to govern the use of technology in educational settings (Adams et al., 2023). On this basis, the present study aims to conduct a comprehensive bibliometric analysis of the academic literature on the digital evolution of the education paradigm, from Education 3.0 to Education 4.0. The research examines articles in databases such as Scopus and Web of Science, aiming to identify key trends, influential authors, and emerging research themes in Education 4.0.

Additionally, by employing advanced bibliometric techniques such as VOSviewer, this research intends to visualise the bibliometric networks underpinning the discourse on Education 4.0, offering insights for researchers, policymakers, and educators alike.

Through this endeavour, this study seeks to contribute to the ongoing dialogue surrounding the digital transformation of education and provide a basis for future research efforts in this dynamic and evolving field.

2. Research questions

This research paper intends to address the subsequent six research questions.

RQ1. What are the global digital education research trends and subject classifications in terms of publication productivity?

By answering to this question, researchers will be able to investigate more easily the development trends and status quo of digital education research.

RQ2. Which authors and countries have intensively contributed to digital education research?

The resolution of this inquiry will enable scholars to identify global partnerships and potential allies in research on digital education.

RQ3. Which are the pivotal cited papers that contribute significantly to the realm of Education 4.0?

The answer to this question will empower researchers to select suitable journal venues for disseminating studies on digital education research.

RQ4. What are the trending research subjects and emerging topics discussed in Education 4.0?

By revealing the answer to this inquiry, scholars would have a clearer image of novel research domains, having the opportunity to conduct further investigations upon identifying research gaps, and potential subjects in Education 4.0 discovered by this paper.

RQ5. Which topics in Education 4.0 research have emerged after the COVID-19 pandemic?

The resolution of this query will aid scholars in directing their attention toward subjects that can provide guidance for academics, teachers and school managers in integrating digital technologies with education during the COVID-19 pandemic.

RQ6. What novel subjects emerged in Education 4.0 research over the years?

The response to this question would assist researchers in identifying substantial developments that have occurred over the past five year, but also innovative areas of exploration that have emerged in Education 4.0 research.

3. Data collection and methods

3.1. Data collection

To thoroughly encompass the worldwide investigation of digital pedagogy, the SCOPUS and Web of Science repositories were employed to accumulate abundant scholarly and epistemic literature (Boyack et al., 2005). The data was extracted on March 31, 2024. The query used was: “Education 4.0” OR “Digital education” OR “Online education” OR “Technology-based education” OR “Smart education” OR “E-learning” OR “Digital learning” OR “Digital teaching”.

3.2. Method

Bibliometric, within the domain of information and library sciences, pertains to the quantitative analysis of bibliographic data by constructing a comprehensive panorama of noteworthy advancements within a specific research domain, journal, or geographical region (Hood and Wilson, 2001; Mas-Tur et al., 2020). Moreover, bibliometric facilitates the discernment of authorial figures who exhibit notable activity within the field, thus paving the way for potential future collaborations. To enhance the comprehension of findings, the amassed data undergoes graphical scrutiny via tools such as VOSviewer, thereby enabling a visual representation and analysis of the bibliometric landscape.

Graphical exploration and interpretation prove invaluable, as they can assist researchers in gaining a deeper understanding of the content explored thus far in Education 4.0 and related domains. It also aids in pinpointing and charting the principal trends in this realm. VOSviewer is a software application that utilizes the bibliometric data extracted from diverse databases such as WoS, Scopus, PubMed etc., but also generates graphical representations that envision and visualise the results employing various methodologies, including co-citation analysis, bibliographic coupling, co-authorship and co-occurrence of keywords (Mas-Tur et al., 2020). Firstly, co-citation refers to instances where two articles receive citations from the same third-party article. Secondly, bibliographic coupling quantifies the highly valuable outcome by identifying all articles that cite the articles under examination more frequently. Thirdly, co-authorship denotes the quantity of publications involving a set of variables such as countries, authors' affiliations, and their interrelationships. Next, the co-occurrence of keywords signifies the most frequent and prevalent keywords utilized by the articles under scrutiny.

Data was extracted on March 31, 2024, and included comprehensive details about the documents (full records, cited references) from both WoS and Scopus databases. The search used the following query: “Education 4.0” OR “digital education” OR “technology-based education” OR “online education” OR “smart education” OR “e-learning” OR “digital learning” OR “digital teaching”. Also, the search was refined for the period between 2020 and 2024. After data cleaning, a total of 41534 valid papers were obtained.

4. Results

4.1. Assessment of publication contributions

The trend of publication each year helps to understand the progress, establishment of literature and maturity of the subject. As data from Table 1 demonstrate, between 2020 and 2024, a total of 41534 articles were published. Most publications were published in 2022 (38.65%), followed by 2020 (21.3%), 2021 (20.58%), and 2023 (19.45%). Until April 2024, a large number of publications were also published. The trend in publication is slowing down rather than increasing.

Table 1. *Publication count over the last five years*

Publication years	Record count	% of 41534
2024	6464	15.56%
2023	8077	19.45%
2022	16052	38.65%
2021	8549	20.58%
2020	8856	21.32%

Source: Author's own contribution.

4.2. Analysis of categories

Next, the analysis of categories shows the growth of research on this topic in various fields and reflects the topics studied in Education 4.0. Table 2 shows the top 10 themes that attract researchers in this area. The distribution of categories indicates that digital education has been strongly studied in educational and educational research (41%), followed by interdisciplinary applications in computer science (10.65%) and methods in computer science theory (9.5%). Other fields that attracted researchers in this field are: education scientific disciplines, computer science information systems, engineering electrical electronic, computer science artificial intelligence, computer science software engineering, telecommunications, and engineering multidisciplinary.

Table 2. *Top 10 web of science categories*

Categories	Record count	% of 41534
Education Educational Research	17032	41.01%
Computer Science Interdisciplinary Applications	4422	10.65%
Computer Science Theory Methods	3945	9.50%
Education Scientific Disciplines	3746	9.02%
Computer Science Information Systems	3687	8.88%
Engineering Electrical Electronic	2711	6.53%
Computer Science Artificial Intelligence	2311	5.56%
Computer Science Software Engineering	1300	3.13%
Telecommunications	1242	2.99%
Engineering Multidisciplinary	1138	2.74%

Source: Author's own contribution.

4.3. Analysis of countries

The geographic distribution of articles can be achieved through the examination of the spread of countries publishing in this field. As Table 3 illustrates, the USA has the highest productivity of scientific papers on the topic of Education 4.0 over the period from 2020-2024 and produced 4853 articles (11.68%) in total, followed by China, which published 4769 articles (11.48%).

Table 3. *Top 10 Countries count of publication*

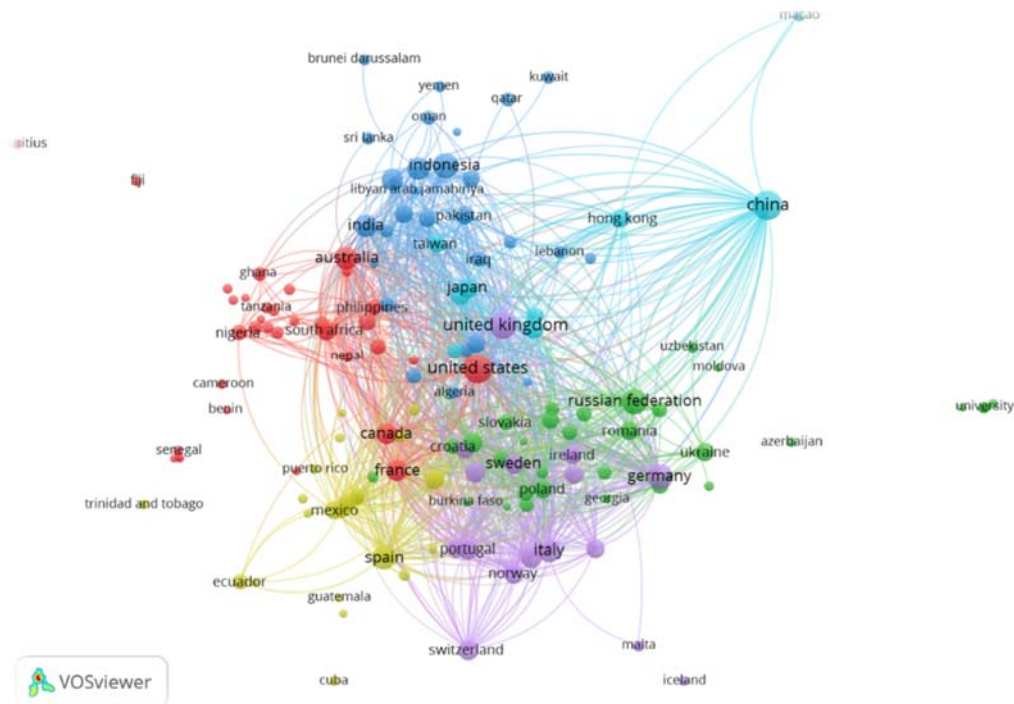
Countries/ Regions	Record count	%	Citations	Total Link Strength
USA	4853	11.68%	73252	3265
China	4769	11.48%	41551	2000
United Kingdom	2942	7.08%	50794	3387
Germany	2274	5.48%	22747	1953
Indonesia	2240	5.39%	11078	476
Russian Federation	2209	5.32%	8213	572
Spain	1850	4.45%	22721	1571
Australia	1432	3.45%	24545	1591
Canada	994	2.39%	12821	1168
Saudi Arabia	976	2.35%	14456	935

Source: Author's own contribution.

The top 10 countries published 24539 of the total 41534 articles, which are around 59% on the topic of digital education. This implies that around 41% of research is published in other countries. As shown in Figure 1, the USA and China have published a maximum number of articles in the field and have acquired the highest citations as well.

As data from Table 3 reveals, the top 10 countries published 24539 of the total 41534 articles, which represent 59% on the topic of Education 4.0. Hence, around 41% of the research is published in other regions. Also, Table 3 demonstrates that the USA and China have published the biggest number of studies in the field and the two countries almost share the first position since China has less than 90 documents behind the USA.

Similarly, the USA also has the biggest number of citations (73252), while the second position is occupied by the United Kingdom (50794), the country from the third position in terms of published articles in this area of knowledge. Additionally, the countries that scored the highest number of collaborations with the United States of America are Germany, China, the United Kingdom, Canada, India, and Switzerland (Figure 1).

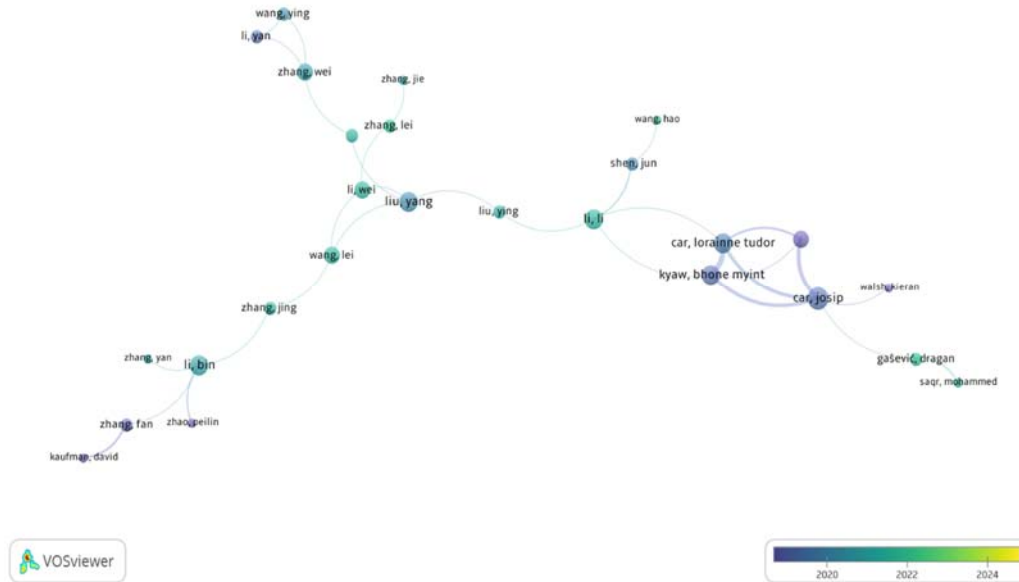
Figure 1. Co-authorship of countries based on number of documents

Source: Author's own contribution.

Next, China has also been deploying intensive collaboration with the USA, but also with the United Kingdom, Australia, Malaysia, Pakistan, South Korea, and the Russian Federation (Figure 1). Moreover, both China and the USA have also collaborated with each other and with the United Kingdom. In terms of citations, Australia is in the fourth position with 24545 citations, followed closely by Germany (22747) and Spain (22721).

4.4. Analysis of author collaboration network and author co-citation network

The author's collaboration analysis reflects the research potential of this theme and assesses progress in the realm of Education 4.0. When analysing 41534 articles, 123172 different authors contributed to this field. The minimum number of articles contributed by each author was set at 10, and 123 authors met the criteria for collaboration between them. Table 4 shows the ten most productive authors and their affiliations between 2020 and 2024. According to the number of publications, Josip Car (22 papers and 18 link strength) and Wei Zhang (22 papers and 3 link strength) dominated.

Figure 2. Top author collaborations in this field

Source: Author's own contribution.

According to Table 4, other authors with an exceptional publication record are Wei Li (20 articles), Li Li (19 articles), Jing Zhang (16 articles), and Lei Zhang (16 articles).

Table 4. Top 10 most prolific authors in the field of Education 4.0 between 2020-2024

Rank	Author (Name, surname)	Current affiliation	TP	TC	TC/TP	Total link strength
1	Josip Car	Nanyang Technological University, Singapore	22	919	41.7	18
2	Wei Zhang	The University of Western Australia, Australia	22	113	5.14	3
3	Wei Li	University of Helsinki, Finland	20	73	3.65	3
4	Li Li	South China University of Technology, China	19	146	7.68	5
5	Jing Zhang	California State University, USA	16	170	10.62	2
6	Lei Zhang	University of Regina, Canada	16	141	8.81	2
7	Lorraine Tudor Car	Nanyang Technological University, Singapore	15	1115	74.33	17
8	Dragan Gašević	Monash University, Australia	15	404	26.93	3
9	Yan Li	ESSEC Business School, France	15	27	12.87	2
10	Bin Li	University of Science and Technology of China, China	14	298	21.29	5

Note: TP=Total publications, TC=Total citations, TC/TP=the average number of citations per paper

Source: Author's own contribution.

Next, the list of top ten authors based on the citations received for their research and their highly cited references are shown in Table 5. Lorraine Tudor Car tops the list with 1115 citations for 15 research articles published by the author with an average 74.33 citations per publication followed by Nabyl Zary (996 citations for 12 articles and average of 83 citations).

Table 5. Top 10 cited authors and their highly-cited articles on Education 4.0, 2020-2024

Rank	Author	TP	TC	TC/TP	Highly-cited reference (No. of citations)	Altmetrics
1	Lorraine Tudor Car	15	1115	74.33	Virtual Reality in Medical Students' Education: Scoping Review (33) The role of eLearning in health management and leadership capacity building in health system: A systematic review (27)	Tweeters: 4 Social media mentions: 60 Citations Dimensions: 48 Readers on Mendeley: 127
2	Nabyl Zary	12	996	83	Virtual Reality for Health Professions Education: Systematic Review and Meta-Analysis by the Digital Health Education Collaboration (324)	Tweeters: 87 Social media mentions: 73 Citations Dimensions: 411
3	Josip Car	22	919	41.7	Digital health training programs for medical students: Scoping review (24)	Tweeters: 16 Social media mentions: 8 Citations Dimensions: 39 Readers on Mendeley: 125
4	Bhone Myint Kyaw	13	635	48.85	A Digitally Competent Health Workforce: Scoping Review of Educational Frameworks (60)	Tweeters: 9 Social media mentions: 28 Citations Dimensions: 74 Readers on Mendeley: 296
5	Yan Zhang	11	564	51.27	Digital Twin Networks: A Survey (303)	Tweeters: 2 Social media mentions: 5 Citations Dimensions: 16 Readers on Mendeley: 326
6	Fan Zhang	10	519	51.9	The multi-dimensional actions control approach for obstacle avoidance based on reinforcement learning (2)	Tweeters: 0 Social media mentions: 0 Citations Dimensions: 14 Readers on Mendeley: 6
7	Peilin Zhao	12	429	35.75	Online learning: A comprehensive survey (207)	Tweeters: 0 Social media mentions: 5 Citations Dimensions: 169 Readers on Mendeley: 989
8	Dragan Gašević	15	404	26.93	Vision, challenges, roles and research issues of Artificial Intelligence in Education (307)	Tweeters: 5 Social media mentions: 15 Citations Dimensions: 260
9	Mohammed Saqr	13	311	23.92	Students matter the most in learning analytics: The effects of internal and instructional conditions in predicting academic success (52)	Tweeters: 2 Social media mentions: 113 Citations Dimensions: 23 Readers on Mendeley: 251
10	Bin Li	14	298	21.29	Design of the Online Learning System for College Physical Education Teaching Based on the BP Neural Network (4)	Tweeters: 0 Social media mentions: 0 Citations Dimensions: 11

Note: TP=Total publications, TC=Total citations, TC/TP=the average number of citations per paper

Source: Author's own contribution.

4.5. Analysis of co-citation journals

In order to identify journals in this field, it is important to analyse the number of articles and citations. Table 6 shows the top ten most productive journals by total publications for the period of 2020-2024. Sustainability is the most productive magazine of 2020-2024, with 464 publications on Education 4.0. The magazine has a very high H-index of 169 and impact factor of 3.9, and mainly publishes on sustainability issues such as education, the SDG targets and other social sciences. It should be noted that the Journal of Education and

Information Technology has published 366 articles in Education 4.0, with an H-index of 76 and an impact factor of 5.5. Afterwards, the Journal of Education Sciences has published 249 papers, having the H-index 53 and the impact factor 3.0, followed by the Interactive Learning Environments (H-index 68 and the influence factor 5.4), which once again determines the importance and relevance of the subject across various disciplines.

Table 6. Top 10 most productive journals (total publication and average citation per paper) in Education 4.0, between 2020-2024

Rank	Journal (Total publication)	TP	H-index	IF	Subject
1	Sustainability	464	169	3.9	Education and awareness of sustainability
2	Education and Information Technology	366	76	5.5	Education, E-learning
3	Education Sciences	249	53	3.0	Education
4	Interactive Learning Environments	214	68	5.4	Education, E-learning
5	Frontiers in Psychology	209	184	3.8	Psychology
6	BMC Medical Education	193	97	3.9	Education
7	International Journal of Emerging Technologies in Learning	189	46	2.7	Education, E-learning
8	Lecture Notes in Computer Science	188	470	1.27	Computer Science
9	Electronic Journal of E-learning	170	38	2.3	Education, E-learning
10	Frontiers in Education	164	40	2.3	Education

Note: TP=Total publications, IF=a 5-year impact factor, H-index, NI=no information

Source: Author's own contribution.

4.6. Analysis of cited references

The top 10 most cited references during the period of 2020–2024 were analysed as shown in Table 7. The most cited report (1279 citations) was published in 2020 by the journal of Human Behavior and Emerging Technologies and has been cited 1279 times during this period of analysis. This journal published in 2020 the article COVID-19 and online teaching in higher education: A case study of Peking University, whose single author Bao W. riched the highest amount of citations.

The article from the second position also has a very big amount of citations (1222) and has been published in the Journal of Applied Learning and Teaching in 2020. The research conducted by Crawford et al. (2020) is entitled COVID-19: 20 countries' higher education intra-period digital pedagogy responses and presents a comparative analysis of twenty countries to their response to the pandemic crisis in terms of pedagogical dimensions.

Table 7. Top 10 cited references in Education 4.0 between 2020 and 2024

Rank	Title	Author	Year	Source	Citations
1	COVID-19 and online teaching in higher education: A case study of Peking University	Bao, W.	2020	Human Behavior and Emerging Technologies	1279
2	COVID-19: 20 countries' higher education intra-period digital pedagogy responses	Crawford, J., Butler-Henderson, K., Rudolph, J., ...	2020	Journal of Applied Learning and Teaching	1222

Rank	Title	Author	Year	Source	Citations
		Magni, P.A., Lam, S.			
3	A systematic review of immersive virtual reality applications for higher education: Design elements, lessons learned, and research agenda	Radianti, J., Majchrzak, T.A., Fromm, J., Wohlgenannt, I.	2020	Computers and Education	1144
4	A Literature Review on Impact of COVID-19 Pandemic on Teaching and Learning	Pokhrel, S., Chhetri, R.	2021	Higher Education for the Future	1057
5	Online teaching-learning in higher education during lockdown period of COVID-19 pandemic	Mishra, L., Gupta, T., Shree, A.	2020	International Journal of Educational Research Open	966
6	The future of digital health with federated learning	Rieke, N., Hancox, J., Li, W., ... Baust, M., Cardoso, M.J.	2020	NPJ Digital Medicine	893
7	Learning loss due to school closures during the COVID-19 pandemic	Engzell, P., Frey, A., Verhagen, M.D.	2021	Proceedings of the National Academy of Sciences of the United States of America	674
8	Advantages, limitations and recommendations for online learning during covid-19 pandemic era	Mukhtar, K., Javed, K., Arooj, M., Sethi, A.	2020	Pakistan Journal of Medical Sciences	665
9	Adapting to online teaching during COVID-19 school closure: teacher education and teacher competence effects among early career teachers in Germany	König, J., Jäger-Biela, D.J., Glutsch, N.	2020	European Journal of teacher Education	632
10	Deep reinforcement learning for online computation offloading in wireless powered mobile-edge computing networks	Huang, L., Bi, S., Zhang, Y.-J.A.	2020	IEEE Transactions on Mobile Computing	622

Source: Author's own contribution.

From the data shown in Table 7, it is evident that most of the top 10 cited references in Education 4.0 (six out of ten articles) are related to the COVID-19 pandemic, which is another sign that the pandemic forced the traditional education to transform the traditional paradigm of pedagogical landscape to Education 4.0.

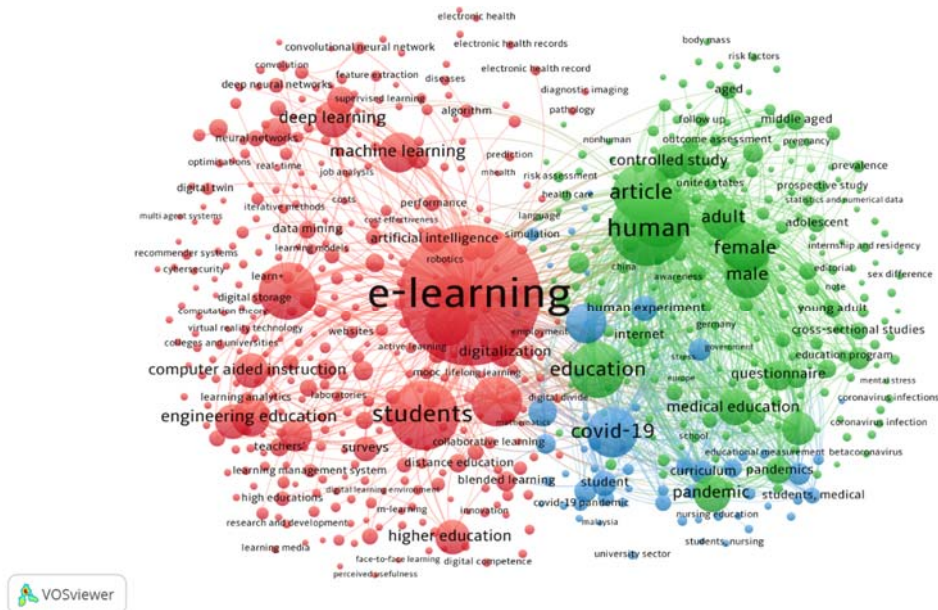
5. Trending research subjects and emerging topics

5.1. Trending research subjects

The analysis of keyword occurrence signifies the domain space and essential content of a particular topic/subject. Figure 3 illustrates all keyword co-occurrence networks and explains the diverse and mixed domains of digital literacy research. This map was plotted using the following criteria-type of analysis: co-occurrence; unit of analysis: all keyword and counting method: full counting. The minimum number of occurrences was set to 100

for a keyword in the paper so that we will have a focus on the prominent keywords only. The map categorised the keywords in three different clusters.

Figure 3. Network map of a keyword co-occurrence in Education 4.0 research based on article weights



Source: Author's own contribution.

Out of 57698 keywords, 113 keywords were extracted and the frequency and link strength of the top 20 keywords are shown in Table 8. “E-learning” is the hottest topic in the field with the highest frequency of 21491 and a 154656 link strength, followed by “human” (6946 occurrences), and students (6219 occurrences), also shown in Figure 4 through density visualisation.

It is very interesting to emphasise that new emerging keywords are gaining popularity, such as “learning systems” (4674 occurrences), “machine learning” (2329 occurrences), “computer aided instruction” (1828 occurrences), “learning algorithms” (1305 occurrences), and “artificial intelligence” (1179 occurrences) (Table 8).

Also, it should be noted that since 2021 other emerging keywords are: “data mining” (566), “deep neural networks” (417), “convolutional neural networks” (364), and “digital twin” (347).

Table 8. Top 20 most cited keywords

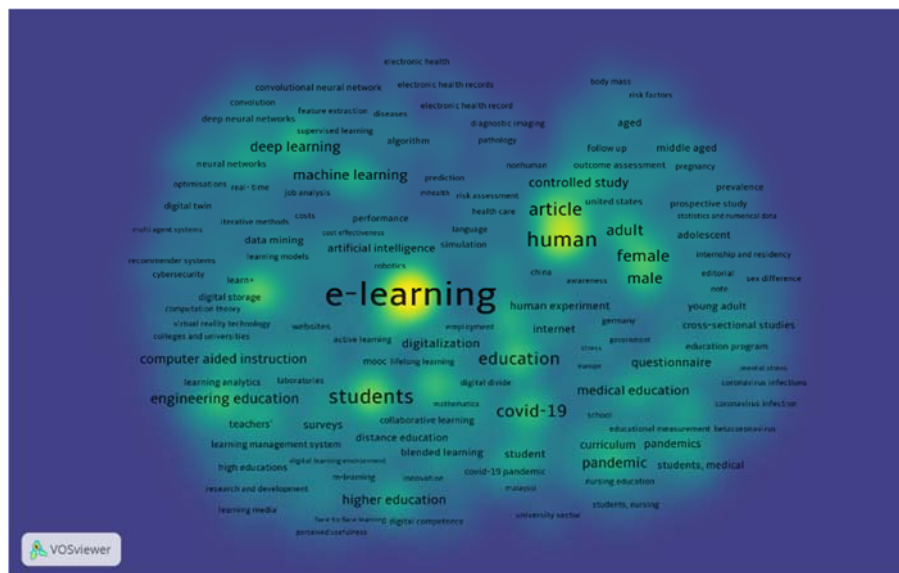
Rank	Keyword	Occurrences	Total link strength	Average publication year
1	E-learning	21491	154656	2020
2	Human	6946	107944	2020
3	Students	6219	47859	2020
4	Learning systems	4674	33102	2021

Rank	Keyword	Occurrences	Total link strength	Average publication year
5	Education	4311	52624	2020
6	Covid-19	3706	40660	2021
7	Machine learning	2329	17500	2022
8	Engineering education	2276	14838	2021
9	Pandemic	2138	35433	2021
10	Deep learning	2114	15439	2021
11	Higher education	1906	9505	2021
12	Computer aided instruction	1828	13412	2020
13	Curricula	1648	11879	2020
14	Learning algorithms	1305	9606	2021
15	Artificial intelligence	1179	9242	2021
16	Reinforcement learning	633	3832	2021
17	Data mining	566	4376	2020
18	Deep neural networks	417	3112	2021
19	Convolutional neural networks	364	3147	2022
20	Digital twin	347	2191	2022

Source: Author’s own contribution.

Consequently, the emergence of new keywords related to the field of education represent a clear evidence that Education 4.0 englobes new fields (data mining, artificial intelligence, deep neural networks, machine learning) for which both learners and teachers must be equipped in terms of competences.

Figure 4. Visualization map of keyword co-occurrence in Education 4.0 research based on article-weights density



Source: Author’s own contribution.

5.2. Emerging topics

The keywords that were recently used (2020–2024) were further analysed and the highest frequency keywords used recently are shown in Table 9. The keyword “digital technologies” has gained attention due to the pandemic which forced educational institutions worldwide to shift from traditional learning to online learning environments.

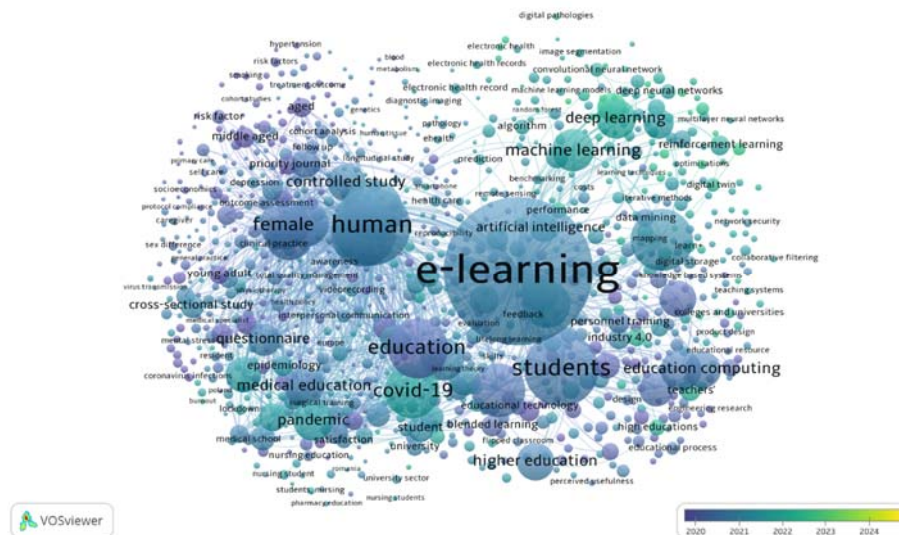
Table 9. Top 10 cited emerging keywords

Rank	Keyword	Occurrences	Total link strength
1	Digital technologies	569	3177
2	Educational technology	515	3857
3	Internet of things	473	3366
4	Gamification	368	2177
5	Data handling	312	2368
6	Neural networks	297	2197
7	Learning models	263	2044
8	Convolution	261	2317
9	Transfer learning	214	1625
10	Recommender systems	212	1477

Source: Author’s own contribution.

Keywords like “educational technology”, “internet of things”, and “gamification” also attracted the interest of the researchers, as shown in Figure 5.

Figure 5. Overlay visualization based on keywords and average publication year

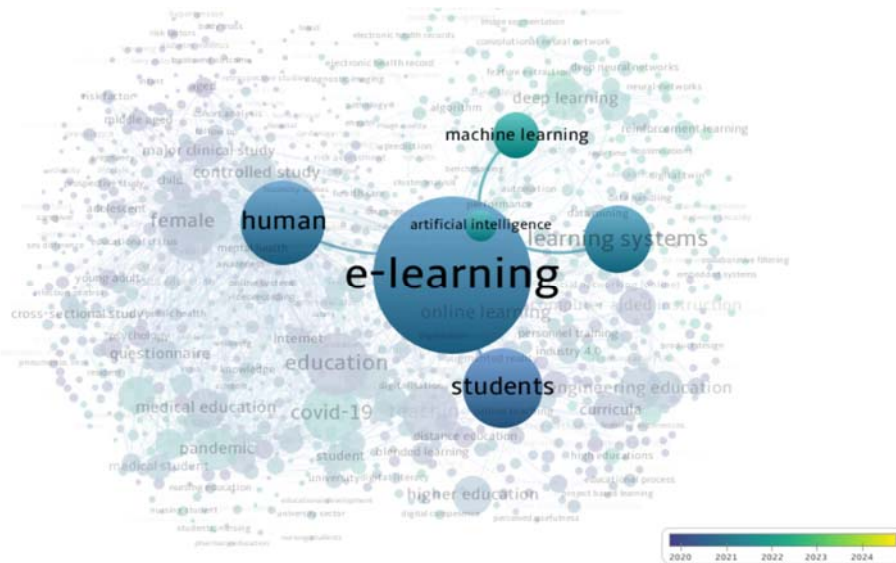


Source: Author’s own contribution.

The health crisis led to the study of health-related terms and equipment, and again gained the attention of academics in health literacy. Normally, COVID-19 has recently been included in educational 4.0-related keywords, and has also been included among the 20

most frequently mentioned keywords. Another keyword that gained vast attention from researchers worldwide is “artificial intelligence”, which is why a further analysis of its links with other keywords was employed, as shown in Figure 6.

Figure 6. Overlay visualization of artificial intelligence and other keywords



Source: Author’s own contribution.

Figure 6 demonstrates that the topic of “artificial intelligence” has been studied with “learning systems”, “e-learning”, “machine learning”, “human”, “students”, and “deep learning”.

5.3. Keywords thematic evolution

This study further analyses the thematic progression in the field of Education 4.0 from 2020, 2021, 2022 and 2023 based on titles/keywords. This section will be useful to identify the different threads of scholarship in the resources to highlight the shifts in trends, topics and theoretical perspectives in the Education 4.0 domain over the years. If in the year 2020 the main keywords related to “e-learning” were “mobile learning”, “collaborative learning”, “blended learning”, and “collaborative learning”, in 2021 there was a shift to “online learning” as primary keyword, linked to “virtual reality”, “artificial intelligence”, “machine learning”, “digital education”, “digitalization”, and “neural networks”.

Next, in 2022 the primary keyword was “virtual reality”, related to other keywords such as “simulation”, “augmented reality”, “digital education”, and “digitalization”. These keywords are very relevant for the post-pandemic era when all educators and students should have already embraced Education 3.0 and adapt to the new Education 4.0. The year 2023 marked the shift to “machine learning” as primary keyword, closely related to “artificial intelligence”, “reinforcement learning”, “deep learning”, “digital twin”, and

“natural language processing”. With the rise of AI chatbots utilisation for all kinds of administrative tasks, their insertion into the educational tasks deployed by students has also proven to be a strong concern for both teachers and researchers.

6. Discussion

As expected, the findings demonstrate that there has been a steadily increasing number of publications in Education 4.0 until the end of the pandemic in 2022. Afterwards, results indicate a downward trend in Education 4.0 interest, since the number of publications has dropped by half in 2023. On one hand, the loss in scholars’ interest for this field of knowledge is strongly influenced by the post-pandemic era when learning classes are still held in traditional classrooms. On the other hand, most students and teachers are now digitally equipped in terms of competencies, which means that digitalisation should be incorporated through an interdisciplinary approach in order to benefit from beneficial outcomes generated by the shift to online settings.

Regarding the first research question, the main research has been conducted in the fields of education and computer science, both strongly related to the realm of Education 4.0. Next, the answer to the second research paper shows that the USA and China are the most prolific countries in terms of number of publications in Education 4.0. Not only that these countries have collaborated, but they have also conducted intensive collaborations with Canada, Australia, and the United Kingdom. It is noteworthy to mention that the new-coming countries in Education 4.0 research are Germany and Saudi Arabia. Therefore, it is not a surprise that some of the most prolific authors in Education 4.0 are from the top publishing countries (USA, China, Canada, and Australia).

Furthermore, the most cited papers on Education 4.0 count over 300 citations per paper and investigate online learning, virtual reality, and digital twin networks. These papers were published by researchers who have also conducted collaborations with each other and have built a strong personal brand on social media where they promote and disseminate their papers. Consequently, this answers the third question of this research.

Regarding the fourth research question, one interesting aspect that emerged from the analysis is the occurrence of new keywords related to Education 4.0 such as “computer-aided instruction”, “learning systems”, “learning algorithms”, and “artificial intelligence”. Other emerging topics discussed in Education 4.0 are “data mining”, “deep neural networks”, “convolutional neural networks”, and “digital twin”.

Additionally, findings reveal that new topics have emerged in Education 4.0 over the last five years, such as the Internet of Things, data handling, transfer learning, and learning models. The topic of Artificial Intelligence has gained a lot of popularity since 2022 and has been studied with other keywords like “machine learning”, “e-learning”, “learning systems”, and “deep learning”. Not surprisingly, even if the end of the pandemic has also

marked a decrease in scientific interest in Education 4.0 in general, scholars' attention has recently shifted to the subject of artificial intelligence. This answers the last two research questions.

Finally, the originality of this research paper resides in the identification of the keywords thematic evolution and of new emerging trends in Education 4.0 in the post-pandemic era, when digital technology use is rarely compulsory. For this reason, policymakers could approach the most advanced universities and institutions in terms of Education 4.0 research for specific guidance and best practices examples to achieve a smoother integration of digital technologies into educational environments.

7. Conclusion

The study is the first bibliometric analysis of Education 4.0 topics in 2020-2024. This study provides a dynamic picture of digital education during this period. The study revealed the main research countries, networks and authors in this field. The United States is at the top of the list, and China follows the ladder. The study also demonstrated that highly productive journals in this field come from education and computer science. The study also highlighted authors actively publishing in this field and may help emerging researchers to review and collaborate on their literature.

Afterwards, the paper analysed the most cited authors, references and articles published during this period, as well as the most prolific high quality journals that published on this topic. While analysing the keywords, the utilisation of VOSviewer software permitted to identify the most used keywords and emerging keywords. After the pandemic, other keywords popped up such as "learning systems", "machine learning", "artificial intelligence", "deep learning", and "reinforcement learning", that suggest the dynamics of the topic of Education 4.0 in the emerging situations.

The thematic evolution helped to understand the development of new domains, fields and topics, which have been investigated with Education 4.0 topic. One limitation of this paper could be the short period of analysis which future studies can further extend. Since there has been observed a decrease in the number of publications on this subject, it should be very interesting to examine the horizon that the current educational settings will be unveiling.

Furthermore, future research may also look at research streams that are still untapped, such as publication status, including digital skills, AI capabilities, and AI literacy in various narrow areas of application (medicine, industry, arts, governance, etc.).

Statements

This paper was co-financed by The Bucharest University of Economic Studies during the PhD program.

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Performance management paradigms in educational organizations

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Abstract. *In the current context of globalization and technological integration, performance management in educational organizations becomes fundamental to ensure the quality of education and to meet the requirements of the beneficiaries. This paper explores epistemological contents and specific paradigms of performance management, emphasizing the need for continuous quality improvement in the relationship with the beneficiaries of educational services. It argues that performance, a managerial concept quantifiable through efficiency and effectiveness, represents a subjective reality, interpretable and oriented towards achieving the organization's objectives.*

The epistemological approach to performance management includes principles and standards that facilitate the alignment of human resources, organizational culture, and communication system to enhance organizational performance. Performance evaluation tools, such as management based on profit centers, management by objectives, and balanced scorecard, are discussed in the context of their adaptation to the specifics of the pre-university education system.

The study emphasizes the importance of communication and the need to improve the information system in school organizations, to enhance efficiency and effectiveness, as well as to increase the quality of educational services. The paper proposes an integrated approach to the paradigm of performance management, complementary to that of quality management, to meet the contemporary challenges in education.

Keywords: performance, efficiency, effectiveness, quality, communication, information system.

JEL Classification: I21, I25, M12.

1. Definitions and Dimensions of Managerial Performance

Performance, in a managerial context, can be measured using criteria of efficiency and effectiveness. The concept of performance is complex and can be interpreted in various ways, which complicates the establishment of a universal definition. Performance applies at different levels: individual, personal, departmental, and organizational, a reflection also found in definitions from the Merriam-Webster dictionary.

Various definitions of performance include:

1. The successful completion of an action or task.
2. The fulfillment of a requirement or promise.
3. The ability to operate efficiently, whether in the case of a person or a mechanism.
4. The appropriate response to various external stimuli.

Fundamental theories of performance, developed by experts such as Lebas J.M., Wholey S.J., and Folan P., approach performance from different perspectives:

- Lebas J.M. views performance as a forward-looking indicator, focused on achieving specific objectives. (Lebas, 1995: pp.23-35)
- Wholey S.J. argues that performance is a subjective social construct that exists in people's perception and is influenced by factors such as the economy and efficiency (Wholey, 1996: pp. 146-147).
- Folan P. emphasizes the need to evaluate performance within the specific context of each organization, measuring it relative to its objectives and relevant characteristics. (Folan, 2005: pp. 663-680)

Thus, performance is perceived as an interpretive and subjective concept that can only be quantified in the context of an organization's defined objectives.

1.1. Conceptual Clarifications Regarding Performance

Performance constitutes an essential standard for the employees of any organization, reflecting both the results achieved and the degree to which established objectives are met. In management, performance is inseparable from the notions of efficiency and effectiveness: efficiency is measured by the ratio of results to efforts expended, while effectiveness evaluates the extent to which an organization meets the expectations of its direct or indirect beneficiaries (Figure 1).

According to economist Verboncu I., performance represents a pillar of management, essential for the competitiveness, efficiency, and effectiveness of the organization. Without considering the competitive context, one cannot discuss an organization with real performance (Verboncu, 2005: pp. 135),

Callot P., in his work "La performance? Soyez tranquille: je la surveille de près," argues that performance is manifested through the organization's objectives and how it utilizes available resources. Efficiency involves optimal use of resources, while effectiveness focuses on the ability to generate desired effects. Therefore, the discussion about performance cannot be separated from these two fundamental concepts: efficiency and effectiveness. (Callot, 1994, pp. 61-70)

Figure 1. *Theoretical Considerations Regarding Performance*

Brălișteanu G.

- "Performance is a state of competitiveness achieved through a level of effectiveness and efficiency that ensures a lasting presence over time." (Brălișteanu, 2013: pp. 427)

Callot P.

- "Performance is a measure of the organization's success as perceived by the public." (Callot, 1994, pp. 61-70)

Devine P.

- "Performance is quantified by the degree of success in achieving declared objectives." (Devine, 1979: pp. 300)

Noye D.

- "Performance consists in achieving the proposed goals, in accordance with the organization's objectives." (Noye, 2002, pp. 6)

Niculescu M.

- "Performance is a state of competitiveness of the organization, achieved through a level of effectiveness and productivity that ensures a durable presence in the market." (Niculescu, 1999: pp. 256)

Verboncu I.

- "Performance is a remarkable result obtained in the field of management, economics, commerce, etc., which imparts characteristics of competitiveness, efficiency, and effectiveness to the organization and its procedural and structural components." (Verboncu, 2005: pp. 135)

Source: Adapted from the cited sources.

According to a series of specialized works, including contributions from Verboncu I., Niculescu M., and others, performance is seen as a necessity for the development of any organization in a competitive environment. Success in this regard is possible only when all departments and committees collaborate effectively to optimize results with minimal effort.

Effectiveness refers to the ability of an action to fulfill a well-defined purpose. The purpose is essentially a strategic anticipation of the outcomes the organization aims to achieve, and effectiveness measures how well the organization succeeds in meeting these expectations. It is essential that the goals are realistic and clearly defined to allow for an objective evaluation of effectiveness. Eliminating activities that do not directly contribute to achieving these goals can reduce time and associated costs, thus improving organizational effectiveness.

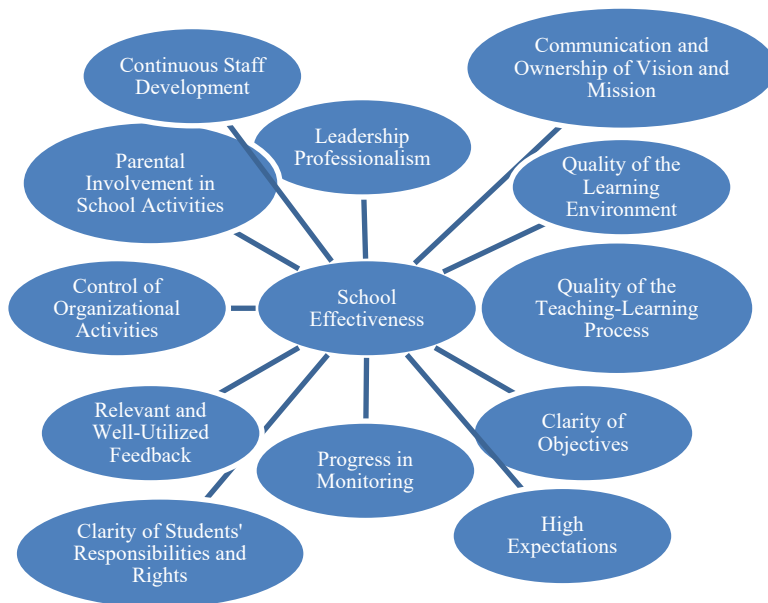
Efficiency, assessed by comparing the effects achieved with the efforts expended, is an indicator of resource economy. An organization is considered efficient if it manages to maximize results with minimal resource consumption. This involves not just cost reduction but also improvement of outputs. Efficiency is therefore a balance between reduced costs and maximized results, essential for the long-term sustainability of any organization.

1.2. Efficiency and Effectiveness in Educational Management

With Romania's integration into European structures, the efficiency of the educational system has become a major topic of interest, directly reflecting in the competencies and adaptability of the population in a globalized economy. Efficiency in education is crucial to ensure a high level of training for generations, which in turn directly influences the

standard of living and can reduce the unemployment rate. A modern and efficient educational system is important to balance social differences and to offer equal opportunities in access to education.

Figure 2. *Factors Influencing School Effectiveness*



Source: Adapted from Gherguț, 2007: pp. 152-153.

To evaluate educational efficiency, we propose several perspectives:

- **From the perspective of designed objectives**, the number and quality of achieved objectives are measured.
- **From the perspective of system operation**, the contribution of resources to the educational process and its outcomes (e.g., the number of graduates) are analyzed.
- **From the relational perspective**, the impact of interpersonal relationships on the quality of educational life is assessed.
- **From the institutional perspective**, the effectiveness of the organizational structure in fulfilling educational functions is measured.
- **From the statistical perspective**, data about the pass rate and labor market insertion of graduates are used.

Defining the concept of school effectiveness is considered difficult, as it involves relating to well-defined criteria, depending on the specifics of each school unit. The focus is on student outcomes and the value added by the educational institution.

Measuring effectiveness involves establishing standardized parameters, among which are the consistency and constancy of the school's influence on the results obtained (Figure 2).

We believe that the effectiveness of a school organization is based on the clarity and acceptance of a common vision related to the institution's performance. It is essential that

it is able to mobilize and align all school staff to this vision, to communicate effectively, and to efficiently structure time to meet established objectives.

2. Epistemological Foundations of Performance Management

Performance management is crucial for improving efficiency both at the individual and organizational levels. It represents an evolutionary process through which individual abilities and organizational conditions are constantly perfected. Performance management integrates various elements such as setting objectives, evaluating performance, a differentiated remuneration system, and career management, all contributing to the increase in organizational performance.

2.1. Principles of Performance Management

Performance management harmoniously combines all components of an organization, from human resources and organizational culture to the communication system. This system:

- **Clarifies the general objectives of the organization** and translates them into individual ones;
- **Is a continuous and dynamic process**, where performance increases over time;
- **Is based on collaboration**, avoiding excessive control and punitive actions;
- **Favors the self-management of individual performance** and encourages an open managerial style, facilitating communication across different hierarchical levels;
- **Requires constant feedback**, allowing employees to use their experiences and accumulated knowledge to improve organizational objectives;
- **Evaluates the performance of the organization** by comparing results to predetermined objectives;
- **Is uniformly applied to all employees** and does not directly correlate financial rewards with performance achieved.

The outlined principles contribute to optimal organizational performance, adapted to the public sector in Romania, conditioned by adherence to a clear framework of objectives, standards, and necessary competencies. Effective communication and a clear agreement between manager and employee regarding organizational expectations are extremely important for the success of this system.

2.2. Performance Standards

Performance standards represent specific objectives that must be met for an activity to be considered properly executed. These standards are defined through quality indicators that measure various aspects of performance, such as quantity, quality, costs, time, resource use, and how activities are conducted.

The process of measuring quality involves assessing the current performance level of the organization against established standards. This evaluation identifies discrepancies between expected and actual performance, thereby providing opportunities for continuous improvement of internal processes. Improvements are subsequently integrated into the organization's procedures to optimize performance.

In Romania's pre-university education system, performance standards are classified into two main categories: authorization standards and accreditation or periodic evaluation standards. Authorization standards are used when creating a new educational unit, a new specialization, or a new level of education. Accreditation standards are applied to authorized educational institutions that have at least two graduating classes and seek external evaluations to obtain official accreditation. These standards are established and regulated by the Romanian Agency for Quality Assurance in Pre-University Education, the competent authority for evaluating educational units in Romania.

The Romanian Agency for Quality Assurance in Pre-University Education evaluates the performance of school organizations in Romania using a set of well-defined quality indicators that cover various aspects of institutional functioning and management. These indicators are essential for ensuring a high standard of education and include:

1. **Projective documents:** the existence, structure, and content of development and managerial plans are examined, which are essential for the strategic direction of the school.
2. **Internal organization:** the organization and functioning of the educational unit are verified to ensure that daily operations are efficient.
3. **Communication and information:** the efficiency of internal and external communication systems and how information is managed are evaluated.
4. **Health and safety:** all necessary measures are taken to protect the health and safety of participants in the educational process.
5. **Guidance and counseling services:** the availability and effectiveness of counseling and guidance services for students are verified.
6. **School infrastructure:** the characteristics, facilities, and use of school, administrative, and auxiliary spaces are examined.
7. **Accessibility:** access to school spaces and equipment is evaluated.
8. **Personnel management:** the management of human resources in the school, including teaching, non-teaching, and auxiliary staff, is analyzed.
9. **Educational offerings:** how the school's educational offerings are defined and promoted is observed.
10. **Curriculum and planning:** the design of the curriculum and the effectiveness of planning educational activities are evaluated.

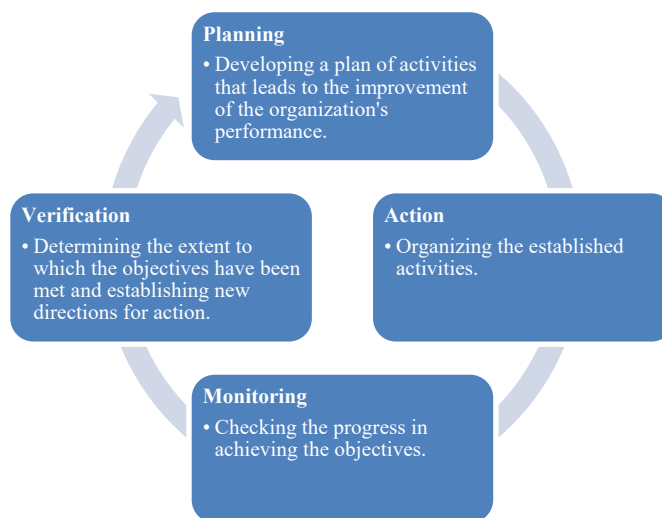
These indicators are complemented by monitoring educational outcomes, the educational trajectory of graduates, budget management, conducting self-assessments, continuous professional development of staff, and optimizing access to educational resources. All these criteria contribute to creating an educational environment that fosters efficient learning and personal development of students.

2.3. Performance Management Cycle

Organizational performance stems from the effective implementation of established strategies and objectives, the organization's commitment to continuous staff training, and a reward system that recognizes and values employee performance. It is important that the elements of the performance management system are integrated, and that the results obtained serve as a basis for formulating further developmental objectives for the organization.

The performance management process involves using a set of specific tools and activities that support the achievement of organizational objectives. These include strategic planning, setting organizational goals, priorities, and values, as well as identifying and applying the most effective performance measures. Also important are the continuous evaluation of personal development plans and the implementation of a remuneration system that reflects differences in employee performance.

Figure 3. *The Performance Management Cycle*



Source: Adapted from Deming, 1991: pp. 23-32.

Since 2015, the Romanian Agency for Quality Assurance in Pre-University Education (ARACIP) has implemented the performance management cycle (Figure 3) as a support tool for pre-university education units to facilitate the measurement of performance of the activities carried out.

3. Methods of Performance Evaluation in Pre-University Education

The literature emphasizes the importance of using effective performance evaluation tools to achieve organizational objectives and identify actual performance. In the context of pre-university education, several specific methods are recommended:

1. **Profit Center Management:** This complex model involves the decentralization of financial and managerial control at the level of each unit, allowing a direct correlation between the results achieved and the rewards granted. It is used to save resources and improve individual and organizational performance (Verboncu, 2014: pp. 173-177).
2. **Management by Objectives:** This method focuses on setting clear and measurable objectives, facilitating strategic planning and performance monitoring. It contributes to employee motivation and increases organizational efficiency (Conger, Kanungo, 1988: pp. 471-482).

3. **Job Description Management:** Provides a clear basis for performance evaluation by precisely defining roles and responsibilities, essential for proper human resources management and optimization of organizational processes (Verboncu, 2022: pp 23).
4. **Management by Exception:** Focuses management on identifying and addressing deviations from established norms, optimizing managers' time and resource use by focusing on exceptions (Verboncu, 2014: pp. 37-43).
5. **Dashboard Management:** A monitoring tool that synthesizes essential information about organizational performance, facilitating effective communication and informed decision-making (Verboncu, 2014: pp. 210-213).
6. **Balanced Scorecard:** This tool extends performance evaluation beyond traditional financial measures, incorporating strategic perspectives for a holistic view of performance (Figge, 2002: pp.269–284).
7. **Benchmarking:** Compares the organization's performance with that of other similar institutions to identify best practices and opportunities for improvement (Grigorescu, 2010: pp. 356-358).
8. **Common Assessment Framework (CAF):** Used in public administration, CAF facilitates self-assessment and continuous improvement of organizational performance by aligning with quality standards (Provan, 1999: pp. 18-22).

These methods not only support the continuous improvement of educational quality but also ensure the alignment of educational processes with the strategic objectives of educational institutions set by the Ministry of Education, contributing to the development of an organizational culture focused on performance and results.

4. The Role of Information in Performance Management

Effective communication and a complex information system are essential in school organizations to increase efficiency and effectiveness, as well as to improve the quality of educational services. In their daily activities, educational managers often face the challenge of managing a vast amount of information, and often lack the necessary information to make decisions. The importance of information is directly proportional to the level of managerial responsibility, which turns management into a process of strategic use of information carried out in three fundamental stages: collection, decision-making, and action implementation (Daft, 2014: pp. 4-12).

Modern information systems, which include the totality of data and information along with circuits, flows, and processing procedures, contribute to setting and achieving organizational objectives. In the digital era, information technologies facilitate a rapid and efficient flow of information, essential for reducing decision-making time and for implementing educational actions (Hallinger, 2010: pp. 95-110).

To enhance organizational performance, the information system must perform three primary functions:

- **Documentation Function**, which ensures employees' access to updated information for carrying out organizational activities.

- **Operational Function**, which enables employee mobilization towards achieving the organization's objectives.
- **Decisional Function**, which provides decision-makers with the necessary information to make informed choices.

The characteristics of information, such as realism, complexity, clarity, conciseness, reliability, timeliness, dynamism, and adaptability, have a major impact on the effectiveness of the educational system and directly influence the quality of decisions made (Anderson, 2011: pp. 324-333).

By improving communication and information systems, schools in Romania can manage educational resources more effectively and improve the quality of services offered, thus meeting the current needs of society and preparing to face future challenges.

Conclusions

The literature in the field of performance management offers valuable benchmarks for evaluating organizational performance and presents methods designed to improve the performance of an organization. It also highlights the role of communication in enhancing organizational performance.

Methods developed for the private sector, such as management by objectives, job description and benchmarking, are also applied in the pre-university education system. However, direct observations show that the application of these methods is not always in accordance with established procedures. For example, although there are nationally developed staff evaluation forms, they often do not reflect the specifics of each school.

Regarding the adoption of management by objectives, it is observed that although school leadership develops short-term strategic documents, the salary system does not support performance-based differential rewarding. Additionally, although benchmarking is recommended by the Ministry of Education, the necessary information for conducting this analysis is often difficult to access in local or national reports.

Effective communication in schools is essential for motivating teachers, especially in contexts where material rewards are not always possible. Moreover, communication systems must support the efficiency and effectiveness of work, considering that teaching staff who are part of committees at the educational unit level are not always relieved of other duties to focus on these roles.

To measure the effectiveness of employees' work, to meet the expectations of beneficiaries, and to optimally use available resources, it is necessary to implement specific quality management methods. These paradigms must complement and enhance existing practices in performance management, thus contributing to the continuous improvement of the quality of educational services.

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Considerations on implementing ESG reporting in the Romanian public sector. The role of the Romanian Court of Accounts in ESG audit

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Abstract. *Increasing awareness of issues related to climate change, social inequities and corporate governance have led to the need for companies to present non-financial elements in their annual reports. Although, currently, the ESG concept is used by private sector entities, a number of regulatory bodies have focused on the possibility of introducing this type of non-financial reporting also within public entities. This article aims to analyze the possibilities regarding ESG reporting within the public sector in Romania, as well as the role of the Romanian Court of Accounts in terms of carrying out ESG audits, but also the implications of these audits on the performance of the audited entities. Also, the paper aims to analyze the possibility of developing an audit standard in this field, given the concern at the level of the international external public audit community (INTOSAI) regarding this aspect.*

Keywords: ESG, Romanian Court of Accounts, external public audit, INTOSAI, sustainable development.

JEL Classification: H83, H61, M48.

1. Introduction

At about the same time with the evolution of environmental, social and governance issues, there has been an awareness to develop tools regarding the needs of companies, which reflect the way their activities have an impact on the environment, the way in which they influence their own employees and society, but also how they implement the highest standards of governance.

It is obvious that the activity of all economic operators in the market has an impact on the environment, on their own employees and at the level of society, through the products or services they offer, all these things are practically reflected in their image. Thus, the description of information regarding the impact of their activities on the environment and on society has become an increasingly important aspect for the investors, from the perspective of decisions with financial impact.

The awareness of the need to implement these non-financial reporting tools has its origins in ancient times and has evolved in various forms to date, from CSR to ESG and then to the SDGs. In order to better understand the three concepts, which are closely interconnected, they will be presented separately in the paper, focusing on ESG reporting as a regulated part of non-financial reporting in the private sector around the world. At the same time, the possibility of introducing ESG reporting in the public sector as well, as part of government accountability and transparency to stakeholders, is analyzed.

2. Literature review

Initially, the responsibility of companies was summed up in the concept of corporate social responsibility (CSR). According to some authors (Chaffee, E. C., 2017, pp. 351-352), the origins of the social component in terms of corporate activity can be found in the old Roman laws, which can be seen in the form of asylums, hospitals, orphanages, etc. Later, according to the same authors, this form of social responsibility extended to the level of English legislation in the Middle Ages within academic, religious and municipal institutions, then developing under the auspices of the English Crown, which saw corporations as an instrument of social development. The concept has evolved to the present, with social responsibility being today practically a self-imposed obligation by corporations to society in general.

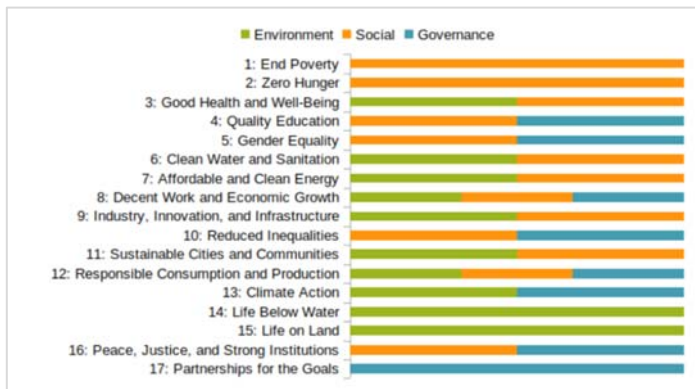
Later, in 2004, the United Nations jointly developed a report with the Swiss government on the ways in which environmental, social and corporate governance issues could be integrated into the management of companies' assets. By preparing this report, the United Nations has aimed to contribute to a better integration of these factors from the perspective of investors' decisions. Within this report, the term ESG (Environment, Social, Governance) was introduced for the first time, through which a broader definition of materiality (threshold) was brought into discussion than that which is commonly used, in meaning that it had a longer time horizon, over 10 years. Basically, the central idea was that the inclusion of non-financial reporting (social, environmental and corporate

governance aspects) would positively influence investors' decisions, which would implicitly lead to the stability and predictability of markets (Global Compact, 2004, pp. 1-2).

In 2015, during the General Assembly of the United Nations, several countries joined the 2030 Agenda, which includes 17 sustainable development goals that the states of the world want to achieve by 2030. These development goals sustainable are based on the "leave no one behind" principle, which practically aims to eradicate poverty (United Nations System, 2017, p.11).

Figure 1 below shows the connection between the two concepts, respectively between ESG reporting and sustainable development objectives (SDGs):

Figure 1. *The connection between ESG reporting and the SDGs*



Source: R. Raghavendran, *ESG Investing #2: Frameworks and Strategies*, (2020).

As can be seen in Figure 1 above, there is a close connection between the SDGs and ESG reporting. Practically, the three components of ESG reporting are found in different proportions within the 17 sustainable development goals established by the 2030 Agenda. Some of the 17 sustainable development goals contain only one component of the 3 (environment, social or governance), these being SDG 1 and SDG 2 (both containing only the social component), SDG 14 and SDG 15 (containing only the environmental component and SDG 17 (only the governance component).

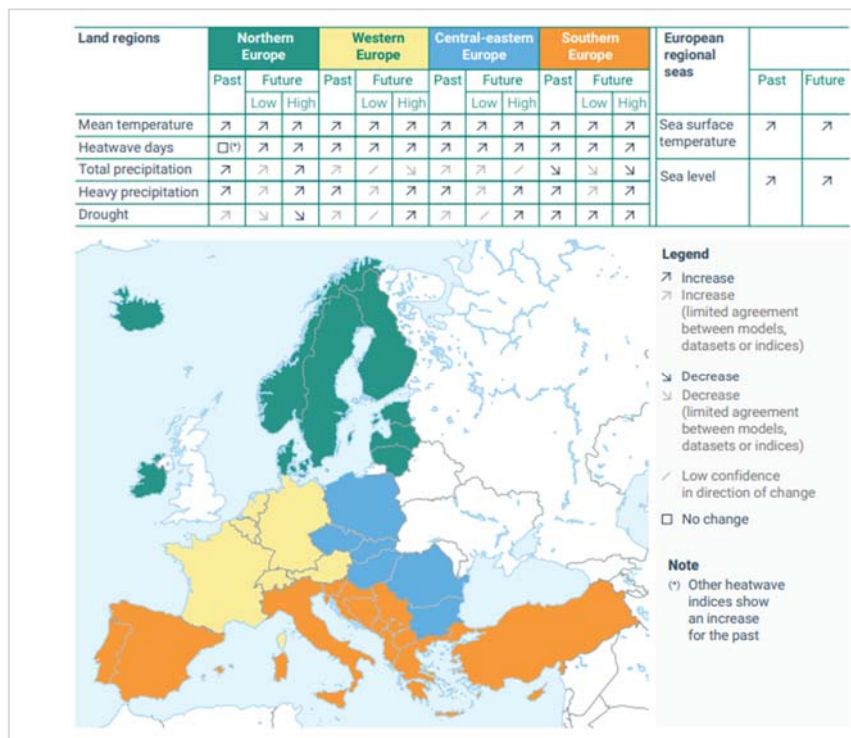
3. Problem statement

Recently, a report by the European Environment Agency mentions the serious problems that Europe will face by the year 2100 (European Environment Agency, 2024). Thus, the report mentions the fact that environmental problems will affect the entire economy of the European Union, whose losses will be, according to experts' estimates, around 1 trillion euros by the year 2100. The same report specifies the fact that from 1980 until 2022 Europe has lost around 650 billion euros due to problems caused by climate change and extreme events.

The European Environment Agency in the same report found that the evolution of climate change at the European level has the same trend, with small exceptions related to the precipitation area in southern Europe (which were low and will remain in the same trend in the future).

The Agency's conclusions on European climate change findings and estimates are summarized in Figure 2 below:

Figure 2. *The evolution of climate change in various areas of Europe. Projections for the future*



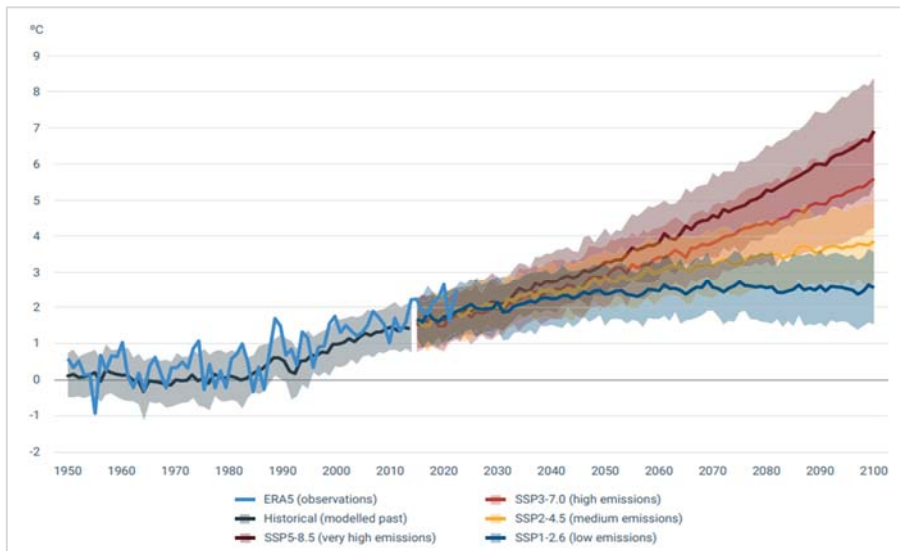
Source: European Environment Agency, *European climate risk assessment*, (2024)

The data presented by the European Environment Agency refer to the period between 1952-2021 and those estimated until the end of the century, respectively for the period 2081-2100. Thus, as can be seen, in the case of the northern area of Europe, both in terms of average temperature, abundant precipitation and total precipitation, the estimated data remain unchanged compared to the past period, with the exception of the drought data, whose level it is expected to decrease in the future. As far as Western Europe is concerned, the evolution of the indicators remains the same as in the past, with the exception of total precipitation, which is expected to decrease in the future. As for the southern part of the European territory, it can be observed that the total precipitation keeps the same decreasing trend for the future as well. Regarding the level and temperature of the seas in the European region, the data show us that the increasing trend is maintained both in terms of the level of the seas and in terms of the temperature recorded on their surface.

All the data presented in Figure 2 show us that in Europe, the climate tends to maintain an increasing trend in terms of the average temperature recorded throughout its territory, and this is also true for the hot days recorded, but also in terms of the level of precipitation abundant.

The report continues with the projection of three scenarios regarding the evolution of temperature at European level, these being presented in Figure 3 below:

Figure 3. *Temperature evolution on the surface of Europe. Projections for the future*



Source: European Environment Agency, *European climate risk assessment*, (2024).

Figure 3 above presents the main conclusions of the report regarding the extent of climate change that will have a direct impact on the European continent. Thus, a model made on a historical basis is presented starting from the available data from 1950 until 2010 (referred to the pre-industrial period), followed by the estimation based on three scenarios, namely the existence of high carbon emissions (the most pessimistic scenario), then followed by a more moderate scenario (the existence of medium-level carbon emissions) and finally the optimistic scenario (i.e. low carbon emissions). Thus, the two scenarios evaluated are SSP1-2.6 (low warming) and SSP3-7.0 (high warming), where it can be seen that the higher the carbon emissions, the greater the chance of a sudden increase of temperature, according to the most pessimistic scenario (SSP3-7.0).

The report explicitly describes the main risks to which the European continent is exposed from the perspective of the increase in global temperature, divided into 36 categories, starting from food, health, infrastructure, economy and finance.

Starting from the findings of this report, but also from the numerous studies carried out at the international level regarding the impact of climate change on the international economy, there is a need to develop an instrument with a role in preventing and reducing the impact of actions on the environment. The first step has already been achieved, by introducing non-financial reporting at the level of private sector entities, namely ESG reporting, which allows private companies to describe how their activity has implications for the environment (E) and from a social point of view (S). Also, private companies must report many aspects related to the activity of those charged with governance (G). All these aspects proved to be of great interest from the perspective of investors.

As far as the public sector is concerned, until now there is no non-financial reporting (ESG) obligation, other than the awareness of the important role that national authorities have in terms of implementing the sustainable development objectives established by the 2030 Agenda and to which they have adhered almost all countries of the world.

4. Research methodology

The research methodology used in the development of this article is based on fundamental research and empirical research. The fundamental research was carried out by reviewing the specialized literature on the ESG concept and, subsequently, its specification at the national level. The empirical research is based on a series of questions regarding the introduction of ESG reporting in relation to public entities in Romania and its implications on the performance of the Romanian public sector.

5. Findings

At the level of the international external public audit community INTOSAI (International Organization of Supreme Audit Institutions) there are concerns about ESG reporting in the public sector. These concerns started from the need to implement the sustainable development objectives established within the 2030 Agenda by the states of the world. The particularly important role of supreme audit institutions in terms of implementing sustainable development objectives is emphasized in UN Resolution A/69/228 "Promoting and fostering the efficiency, accountability, effectiveness and transparency of public administration by strengthening supreme audit institutions", where it is mentioned that supreme audit institutions have an indispensable role in the effective and transparent implementation of the 2030 Agenda (A/RES/69/228, 2014, pp. 2-3).

Within the working groups of INTOSAI there are numerous initiatives leading to the approach of ESG reporting by supreme audit institutions. Thus, within the Strategic Plan for the period 2023-2025 of the INTOSAI Working Group on environmental audit there are two main hubs, respectively the hub on Climate and Biodiversity and the hub on the Green Economy (INTOSAI WGEA Projects for 2023-2025). Within the first hub, Climate and Biodiversity, there is an initiative called Climate scanner led by SAI Brazil whose aim is to develop a tool for rapid assessment of government actions in 3 directions: governance, public policies and financing (Climate Scanner, 2024). Through 3 projects that are developed within the second hub, the Green Economy, the Working Group addresses a series of issues of interest from the perspective of environmental aspects but also from a financial perspective, the focus being on increasing the degree of awareness regarding to the economic impact that environmental problems can have on the economic sector and, implicitly, on the public sector, by affecting public budgets.

Through these initiatives, INTOSAI has shown its intention in terms of outlining the particularly important role that supreme audit institutions can have in relation to the implementation of the sustainable development objectives established in 2030 Agenda.

Starting from this initiative, we can state that at the level of the international external public audit community, the first steps have already been taken regarding the possibility of introducing ESG reporting audits, by developing tools capable of analyzing government actions from an E (environment) perspective.

Also, at the INTOSAI level, within the Working Group on Sustainable Development Goals and Key Indicators on Sustainable Development, there have been numerous initiatives regarding the exchange of best practices regarding the development of tools for measuring economic and social progress from the perspective of achieving the goals of sustainable development established at the national level by each state, as a result of the implementation of the 2030 Agenda. This group is considering the development of a guide on ESG auditing in the public sector (Working Group on SDGs and Key Sustainable Development Indicators, 2024)

The need to develop the ESG audit derives mainly from the fact that the achievement of some sustainable development objectives established by the 2030 Agenda has still remained unknown. Taking into account the fact that the issue of the ESG audit is closely related to the audit related to the governmental responsibility regarding the implementation of the sustainable development objectives, an approach to the audit based on the information reported by each entity within the public sector regarding the environmental, social and governance aspects (ESG) would represent a solution in terms of including the level of implementation of the previously mentioned objectives, this approach being a novelty for supreme audit institutions, being yet another opportunity for them to demonstrate the relevance of specific external public audit activities, as stated in the international auditing standard INTOSAI P-12 The value and benefits of supreme audit institutions. Making a difference in citizens' lives (INTOSAI P-12, 2019, p.10).

On the other hand, in order for the supreme audit institutions to be able to carry out ESG audits, it is necessary to introduce provisions in the national legislation regarding the need for entities in the sector to report on the measures they undertake with regard to the implementation of government programs that result in reducing the impact on the environment, social inclusion, as well as the need for reports on how to comply with corporate governance principles.

From the considerations expressed above, we can state that carrying out ESG audits in public sector represents a challenge for the supreme audit institutions, due to the fact that this concept is a new one for the public sector, implicitly for the auditors. Also, with regard to external public audit standards in the public sector, at this time INTOSAI has not developed yet a standard to regulate the manner in which supreme audit institutions must perform ESG audits, based on non-financial reporting.

At the same time, ESG reporting represents a problem also for public entities, due to the fact that this concept is not sufficiently known, but also because at the moment there are no regulations in this regard that establish the way to carry out this type of reporting and who is administratively responsible for this.

Figure 4. Ways to carry out ESG audits in the public sector by supreme audit institutions



Source: author.

In practice, at this moment, as presented in Figure 4 above, ESG audits that can be carried out by supreme audit institutions at the level of the public sector may consider an analysis of the measures established by public policies developed by national governments, which aim to stimulate public sector entities to implement non-financial (ESG) reporting in the activities they carry out.

Also, supreme audit institutions can consider the evaluation of information and data from the level of audited entities, respectively whether they comply with ESG principles.

At the European level, the regulation of aspects related to ESG reporting was achieved through two Directives (Directive 2022/2464 and Directive 2014/95) and two Regulations (Regulation 2019/2088, respectively Regulation 2020/852).

Although non-financial reporting at the European level has been introduced, as can be seen in the normative acts issued by the European Parliament and mentioned above, in Romania there is no very clear regulatory framework regarding the reporting obligation ESG. Thus, the Romanian Ministry of Public Finance transposed the normative acts approved at the European level by means of two orders issued in 2016 and 2018 respectively, which amend and complete a series of accounting regulations at the national level in Romania.

By Order no. 1938/2016 regarding the amendment and completion of some accounting regulations, the Romanian Ministry of Public Finance introduced for the first time the obligation (starting from 2017) for public interest entities that at the balance sheet date exceed an average number of 500 employees during the financial year to include in the administrators' report "a non-financial statement containing, to the extent necessary for the understanding of the development, performance and position of the entity and the impact of its activity, information on at least the environmental, social and personnel aspects (...)" (Order no. 1938/2016).

Also, starting in 2019, by Order no. 3456/2018 regarding the amendment and completion of some accounting regulations, the Romanian Ministry of Public Finance extended this obligation to all "entities that, at the balance sheet date, exceed the criterion of having an average number of 500 employees during the financial year", being removed from the text of the law article the expression "of public interest" (Order 3456/2018).

Practically, if before the legal provisions regarding the obligation of non-financial reporting were applicable only to entities of public interest that exceed an average number of 500

employees (in the sense in which they are defined by Law no. 162/2017 on the statutory audit of annual financial statements and of the consolidated annual financial statements and amendments to some normative acts, respectively the companies whose securities are admitted to trading on a regulated market, credit institutions, insurance, insurance-reinsurance and reinsurance companies, non-banking financial institutions and other such), this obligation was extended, starting in 2019, to all entities that exceed the mentioned indicator.

Regarding the non-financial reporting method (ESG), in November 2023 the Romanian Sustainability Code was developed and approved. It was approved by Government Decision no. 1.117/2023 regarding the approval of the Methodology for sustainability reporting - the Romanian Sustainability Code. This methodology provides guidance on the way of non-financial reporting for entities that have the obligation, according to the legal provisions in force, to report on these aspects. Moreover, this methodology can also be applied by entities that do not have the obligation to carry out this type of reporting, but can do it voluntarily, in order to support investors or other entities that make financial or commercial decisions based on the practices of sustainability of the reporting entities (Government Decision no. 1.117/2023).

The use of this Code is free both for those who have the obligation to make non-financial reports, and also for the entities that do not have this legal obligation, but wish to do so voluntarily. The way of reporting and the indications for making these types of reports can be found within a platform managed by the Romanian Department for Sustainable Development within the General Secretariat of the Romanian Government. Within this platform, there is the possibility of creating an account for the reporting entities, as well as a section where the reports published by these entities can be consulted.

Also, the reports prepared by the reporting entities receive a special mark, which officially confirms the creation and publication of a sustainability report, a mark that can be used, according to the legal provisions, as a mean of promotion for the entities for which this is important in carrying out their activity.

The sustainability code also contains a series of criteria that serve to classify reporting areas, as well as performance indicators based on which reporting entities prepare their non-financial reports.

Although the obligation of non-financial reporting in Romania was introduced starting in 2017, according to the two aforementioned normative acts, only after 6 years their application rules were developed, respectively the adoption of Government Decision 1.117/2023.

In support of non-financial reporting, several guides have been developed in Romania. One of these guides was developed by the Romanian Stock Exchange as early as 2022, together with the European Bank for Reconstruction and Development (EBRD), through which a series of concepts regarding ESG reporting, reporting principles, climate change reporting was explained, ESG reporting by stages, as well as a number of disclosure recommendations. The guide is intended for local issuers, as support for them in their efforts to better align with investors' expectations (Bucharest Stock Exchange, European Bank for Development and Reconstruction, 2022, p.4).

As can be seen, the current regulatory framework in Romania regarding ESG reporting refers only to the private sector. As far as the public sector is concerned, there is no precise legal framework.

However, many public sector entities voluntarily make a series of descriptions regarding the impact of their activities on the environment, on their employees or citizens, as well as on governance issues, in their annual activity reports.

Regarding the legislation in Romania, although the concept of ESG reporting has not been introduced in the private sector, there are still a series of guidelines on fields that introduce a series of social and environmental aspects. Thus, through the Romanian National Strategy on Public Procurement, approved by Government Decision no. 554/2023, the importance of the use by contracting authorities/entities of social and environmental criteria in the award documentation was emphasized. Moreover, the Romanian National Agency for Public Procurement has already developed a series of ecological criteria to be used by contracting authorities/entities within the award documentation related to public procurement procedures in Romania (National Agency for Public Procurement, 2023).

At the same time, at the national level, as part of the implementation of the 2030 Agenda, the Romanian National Strategy for the Sustainable Development was adopted by Government Decision no. 877/2018 regarding the adoption of the National Strategy for the sustainable development of Romania 2030. This strategy contains a series of elements that must be reported by Romania as the stage of implementation of the sustainable development objectives established through the 2030 Agenda, these elements also referring to social aspects, environmental and governance.

At the same time, in terms of governance, as part of the way that entities operate in the Romanian public sector, there is the internal managerial control system, regulated through Order 600/2018 on the approval of the Code of internal managerial control of public entities, through which the management of the public entities is obliged to implement an internal managerial control system, so that it represents an effective management tool in the public sector. The internal managerial control code at the level of public entities regulates a number of issues regarding ethics, competence and performance within the entity, goal setting and risk management, which can be reported by public sector entities as part of potential ESG reporting in this sector.

Although there is a context whereby, at the level of the public sector, there are a number of regulations regarding environmental, social and governance aspects, but these are not reported by public sector entities separately, as is the case with private actors. Thus, it is necessary to amend the national legislation in order to introduce clear regulations regarding the manner in which public sector entities must carry out non-financial reporting (ESG), as well as indicating the persons responsible for this.

The main advantage of introducing ESG reporting in the public sector in Romania is practically an increase in the transparency of the activities of public entities, from the perspective of actions that have an impact on the environment (reduction of carbon emissions, waste recycling, use of alternative energy sources, etc.), of those that affect or have a positive impact on the lives of the citizens they serve (health, social inclusion, social

protection, etc.), as well as from the point of view of management activities, the implementation of ethical aspects and anti-corruption policies, such as and the implementation of an effective internal managerial control system at the level of these entities.

At this moment, the legal mandate of the Romanian Court of Accounts allows three types of audit to be carried out: financial audit, compliance audit and performance audit, as provided for in Law no. 94/1992 on the organization and operation of the Court of Accounts, republished.

Within the legal mandate conferred by law, currently the Romanian Court of Accounts may carry out ESG audits, without completing their legal mandate. In summary, the methods of carrying out ESG audits by the Romanian Court of Accounts is presented in the Table 1 below:

Table 1. Ways of carrying out ESG audits by the Romanian Court of Accounts

Types of audit	Environment (E)	Social (S)	Governance (G)
Compliance audit*			Evaluation of the internal managerial control system
Performance audit	<ul style="list-style-type: none"> ✓ The National Strategy regarding climate change ✓ The National Integrated Plan in the field of Energy and Climate Change (PNIESC) ✓ Romania's long-term strategy for reducing greenhouse gas emissions (LTS) ✓ National strategy for sustainable development: <ul style="list-style-type: none"> ▪ SDG6: Clean water and sanitation ▪ SDG7: Clean and affordable energy ▪ SDG14: Aquatic life ▪ SDG15: Earth life ✓ Evaluation of the degree of use of ecological criteria in the award documentation related to public procurement processes by contracting authorities/entities 	<ul style="list-style-type: none"> ✓ National strategy for sustainable development: <ul style="list-style-type: none"> ▪ SDG1- No poverty ▪ SDG2- Zero hunger ▪ SDG3- Health and well-being ▪ SDG4: Quality education ▪ SDG5: Gender equality ▪ SDG8: Decent work and economic growth ▪ ODD9: Industry, innovation and infrastructure ▪ ODG10: Reduced inequalities ▪ ODG11: Sustainable cities and communities ▪ ODD13: Action in the field of climate change 	<ul style="list-style-type: none"> ✓ National strategy for sustainable development: <ul style="list-style-type: none"> ▪ SDG12: Responsible consumption and production ▪ SDG16: Peace, justice and efficient institutions ▪ ODG17: Partnerships for the achievement of objectives ✓ Adherence to the National Anticorruption Strategy

* In most cases, compliance audits can be carried out by the Romanian Court of Accounts in the context of legislative changes in the sense of clearly regulating the manner of carrying out ESG reporting by public sector entities. **Source:** author.

Also, with regard to the specific external public audit activity, starting from the 20 criteria established by the Romanian Sustainability Code, specific audit criteria can be established, based on which the external public auditors can carry out walk-through tests that come in support of the checks they carry out on those public sector entities that voluntarily choose to carry out non-financial reporting.

From the analysis of the data presented in Table 1 above, the following conclusions can be drawn:

- At this moment, the Romanian Court of Accounts cannot carry out compliance audits in the ESG area, due to the fact that there is no regulatory framework that clearly regulates the method of ESG reporting for entities in the public sector, nor the persons responsible for this, therefore no audit criteria can be established on the basis of which external public auditors can carry out compliance audit missions. However, the Romanian Court of Accounts evaluates only one component within ESG, the one related

to governance, through the evaluation of the internal managerial control system at the level of entities within the public sector, on the occasion of compliance audit missions and financial audit missions;

- The Romanian Court of Accounts may carry out performance audit missions on national strategies that implement international and European legislation, in order to assess the degree of fulfillment the objectives established by these strategies, but this can only be carried out on separate components within ESG.

The introduction of ESG reporting for public sector entities in Romania would bring numerous advantages. Practically, this would implicitly lead to an increase in the degree of transparency regarding government policies from the perspective of protecting the environment, the impact they have on the lives of citizens and the activity of the management of these entities. Also, this would also allow an increase of confidence for foreign investors, who thus have the guarantee that in Romania government policies promote sustainable economic development.

In order to carry out ESG audits in the public sector by the Romanian Court of Accounts, as mentioned before, it is necessary to amend the national legislation, on the one hand, and on the other hand to develop audit standards for carrying out these types of audits. Also, within the audit missions, audit criteria, methods of carrying out walk-through tests, the risk-based approach, the identification of the stakeholders for this type of audit, the possibility of calling on the services of experts in various fields, as well as establishing the documents that will be requested from the audited entities.

At the same time, due to the fact that non-financial reporting is a new concept, an adequate professional training of external public auditors must be ensured, as well as the provision of adequate resources to carry out these audits.

Also, as part of the principles established through the INTOSAI international audit standards level 1, which establish the general framework for carrying out audit missions for the three main types of audit (financial audit, compliance audit and performance audit), it is necessary that, after the completion of the ESG audit missions and the reporting of the results, the evolution of the way of implementation of the recommendations issued by the Romanian Court of Accounts by the audited entities is carried out through the follow-up missions. Thus, the Romanian Court of Accounts can monitor the level of implementation of the recommendations, but also the degree of involvement of the auditees' management in this regard.

Although at first sight ESG reporting within the public sector would seem to be necessary for audited entities, this may also be valid for the Romanian Court of Accounts, as part of the Romanian public system, especially from the perspective of the international audit standard INTOSAI P-12 which states that the supreme audit institutions must be a model for other public sector institutions. This non-financial reporting (ESG) may be done on a voluntary basis at present, through its annual activity reports.

As part of the implementation of ESG principles, the Romanian Court of Accounts has already taken a series of measures in this regard, by increasing the degree of digitization at the level of the institution (in an attempt to eliminate documents in physical format, which

require a lot of paper consumption), by adherence to the principles of the National Anticorruption Strategy, but also from a social perspective, through its numerous external public audit activities carried out in various areas, all with an impact on the lives of citizens.

Conclusions

The possibility of introducing ESG reporting in the Romanian public sector can represent a way of materializing both the New Public Management (NPM) phenomenon by adopting some management practices from the private sector within the public sector (Hood, C., 1991, p.3-19) but also the phenomenon of New Public Governance (NPG), the latest stage of development of public administration, which, according to management specialists, is characterized by a series of tools that require the existence of networks at the level of state institutions and civil society, with the ultimate goal of continuing promote initiatives aimed at solving society's problems (McQuaid R., 2010, 127-148).

The importance of introducing non-financial reporting (ESG) at the level of the public sector in Romania may have as consequences an increase in the level of trust of the main stakeholders in the activity of state institutions, given the fact that they will have to report on the main measures regarding the reduction the impact on the environment (E), measures with a direct positive impact on citizens (S), but also management activities from the perspective of good governance practices (G).

At the same time, the introduction of this new type of reporting would allow the development of a new type of audit carried out by the Romanian Court of Accounts, in as supreme audit institution of Romania, a fact that would bring benefits both for public sector entities that, practically, will benefit from the quality expertise of the professionals within the Romanian Court of Accounts, but also for the Romanian Court of Accounts itself, by widening the scope of specific activities and acquiring practical experience, and also as a result of participating in international events organized by INTOSAI on this issue.

In conclusion, non-financial reporting, although at the beginning in Romania, may have many advantages that will be seen over time, by ensuring a sustainable economic growth, friendly to the environment and with a positive impact from a social point of view.

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The role of Artificial Intelligence in creating sustainable solutions in the business environment: bibliometric analysis

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Abstract. *Artificial Intelligence (AI) has emerged as an innovative technology with considerable potential to revolutionize industries and societies globally. This article examines artificial intelligence in the field of management, highlighting the potential that Artificial Intelligence holds to support sustainability in the business environment through various applications. The study conducts a bibliometric analysis of the specialized literature from scientific publications related to Artificial Intelligence and sustainable solutions, identifying key areas where Artificial Intelligence makes significant contributions to promoting sustainability in business management.*

Keywords: artificial intelligence, sustainable solutions, business management, bibliometric analysis.

JEL Classification: M15, O15.

Introduction

Technology has always been a crucial factor in the progress of societies and business environments. Research on technology has often focused on its impact on communities and the economy. Throughout history, we see continuous transformation in the technological field. Events such as the Industrial Revolution, the development of the Internet and recent advances in technologies such as artificial intelligence, cloud computing and Blockchain have brought significant challenges and economic and social changes.

One of the latest technological challenges and innovations is artificial intelligence (AI), which is redefining the concepts of business productivity. From automation and machine learning to language processing and augmented reality, AI has already begun to change the way companies do business. The purposes of using AI vary depending on the context, from replicating or augmenting human intelligence to automating repetitive tasks and providing personalized predictions or recommendations.

The extensive use of Artificial Intelligence in various fields suggests unlimited potential to improve efficiency, decision making and drive innovation in the business environment. However, by incorporating AI into their business strategies, companies can maximize efficiency and minimize their environmental impact, contributing to a more sustainable and responsible business environment.

1. Review of specialized literature

Artificial Intelligence (AI) can identify relevant patterns in large volumes of data, providing humans with actionable data. This potential of data can be maximized and the information extracted can be used in proactive analysis and evaluations, thus supporting the coordination of an enterprise's operations. In developed countries, AI enables the development of smart energy grids. Rajendra Akerkar believes that the analysis of large volumes of data requires significant investments in their collection and storage (Akerkar R. 2019, p. 23). Therefore, implementing AI, while promising in many ways, can also be a costly challenge.

In today's context, responding to climate change and sustainability issues is becoming increasingly important for a business's competitive advantage. The potential applications of AI in the field of sustainability are significant; however, we must consider that processing massive data sets involves considerable energy consumption, and building the necessary infrastructure may require natural resources. Thus, it is important to assess the extent to which the adoption of AI actually contributes to the progress of sustainability without undermining it at the same time.

It notes that cooperation between humans and machines may eventually lead to the automation of some tasks, allowing humans to engage in other, more creative pursuits. For example, implementing AI in business can reduce time spent on administrative routines and help increase customer satisfaction by providing them with personalized recommendations and efficiently managing interactions with them.

The implications of AI can affect both a company's internal environment (eg improving operational efficiency) and its relationships with customers, other companies and society as a whole. While AI can be a valuable resource, we must also be aware of the threats it can pose, such as job losses and exacerbating social and economic inequalities. However, Peter Dauvergne believes that AI-based innovation will also generate new employment opportunities and areas of expertise (Dauvergne P., 2022, p. 700).

AI applications are present in a variety of fields, from marketing and customer relations to medicine and materials science. For example, AI can be used for precise customer segmentation and early detection of medical conditions such as cancer (Paschen U., 2020, p. 149). AI can also be used in demand forecasting, giving businesses a more accurate and personalized approach to inventory management and production planning (Kopka A., Grashof N., 2022).

Rohit Nishant, Mike Kennedy, Jacqueline Corbett believe that AI technologies can be applied in areas such as environmental monitoring, risk management and optimization of production and logistics operations. While there are concerns about the environmental impact of using AI, AI technologies also have the potential to enhance sustainability by optimizing processes. However, we also need to be aware of the ethical and social aspects of implementing AI, ensuring that the technology is used responsibly and fairly.

2. Exposure of the problem

This article examines artificial intelligence in the management sphere, highlighting the potential that AI holds to support sustainability in the business environment through various applications. This topic highlights the importance of integrating artificial intelligence into business management and highlights how AI can help promote sustainability in this environment. Through various applications such as data analysis, data-driven decision making, and operational optimization, AI can help companies become more efficient and environmentally responsible. Integrating AI into management can open up new opportunities to improve processes and reduce negative environmental impact, helping to build a more sustainable business environment in the long term.

3. Research methods

One of the most used research methodologies to examine a broad topic and analyze its evolution over the years (2016-2024) is by using a bibliometric analysis. A bibliometric analysis was performed using Web of Science (WoS) publications from 2016-2024.

The scanning of the entire universe of existing literature in the field on WoS was achieved through two fundamental notions "Artificial Intelligence" and "sustainability in the business environment". The bibliometric analysis was performed using the software tool VOSviewer version 1.6.15, which is "a freely available computer program developed for the construction and visualization of bibliometric maps. VOSviewer is increasingly used (either alone or in conjunction with other tools) by business and management researchers

to conduct systematic reviews. Once exported to VOSviewer, the results provided by WoS (containing Full Record and Cited References) became data sources for the creation/generation of new maps: The text data was used to build networks of co-occurrence links between terms, over time which bibliographic data were used to build networks of keyword co-occurrences and citations (of sources and documents). The study conducts a bibliometric analysis of the specialized literature from scientific publications related to AI and sustainable solutions, identifying key areas where AI makes significant contributions to promoting sustainability in business management.

4. Finding

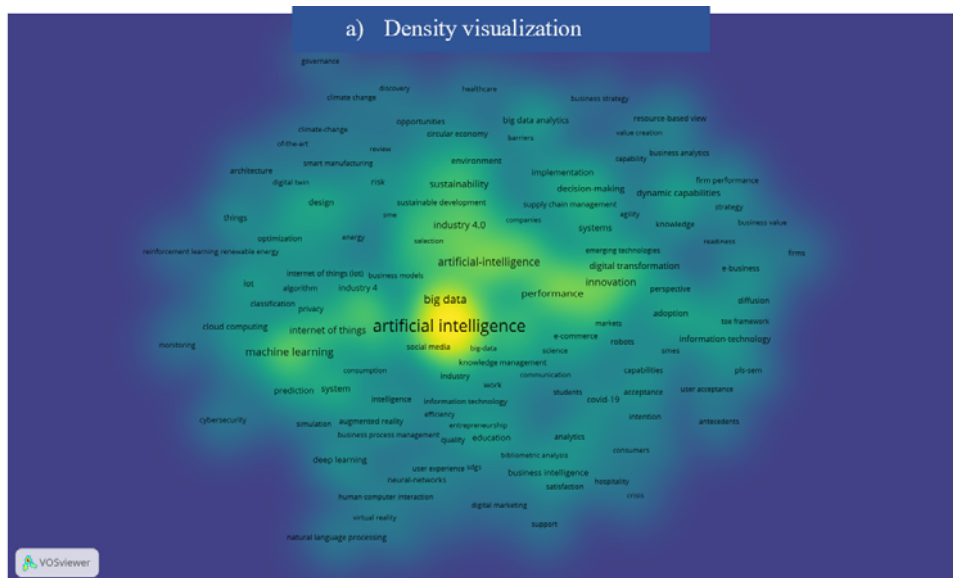
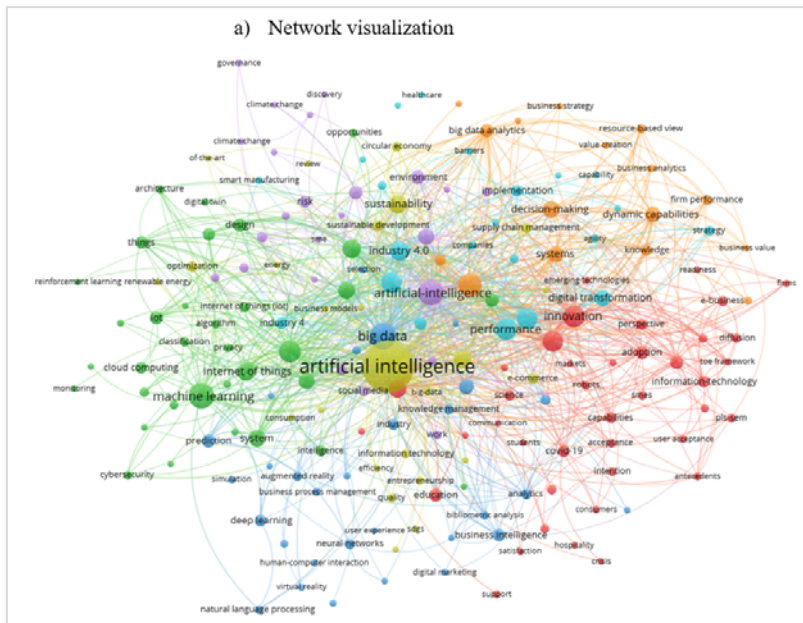
The Web of Science (WoS) search for “Artificial Intelligence” and “sustainability in business” returned a total of 812 results/publications. Imported from WoS into VOSviewer, these data served as inputs allowing the construction of bibliometric maps to support further analysis; all figures and tables in this section were generated accordingly (using WoS data and the VOSviewer tool).

Regarding the whole analyzed time interval (2016–2024), the "term co-occurrence map based on text data" (Figure 1) generated 191 elements — grouped into seven clusters, developing 4207 links and a power total links of 7878. Among the most relevant items within each group (along with their total link strengths) are:

- Cluster 1 (40 items): acceptance, adoption, antecedents, behavior, capabilities, communication, consumers, covid-19, crisis, determinants, diffusion, e-business, education, emerging technologies, fintech, firms, hospitaly, impact, information - technology, innovation, intention, leadership, markets, model, networks, perspectives, pls-sem, readiness, robots, satisfaction, science, service, smes, students, support, technology acceptance, technology adoption, toe framework, trust, user acceptance;
- Cluster 2 (34 items): algorithm, anomaly detection, architecture, blockchain, challenges, classification, cloud computing, cybersecurity, data mining, digital twin, ethics, internet of things, machine learning, neural-networking, opportunities;
- Cluster 3 (30 items): analytics, bankruptcy prediction, bibliometric analysis, big data, business intelligence, chatbot, digital marketing, evolution, information, knowledge management, prediction;
- Cluster 4 (25 items): artificial intelligence, big-data, business, business environment, business models, circular economy, consumption, e-commerce, efficiency, entrepreneurship, optimization, renewable energy, robotics, sustainability, sustainable development, technological innovation;
- Cluster 5 (24 items): adaptation, artificial-intelligence, automation, climate change, decisions, digitalization, discovery, environment, future, governance, risk management, social media, transformation work;
- Cluster 6 (22 items): agility, barriers, business model, capability, collaboration, digital transformation, digitization, framework, organization, performance, smart manufacturing, software, strategy;

- Cluster 7 (16 items): big data analytics, business analytics, business strategy, competitive advantage, decision-making, knowledge, management, strategies, supply chain, sustainable supply chain, value creation.

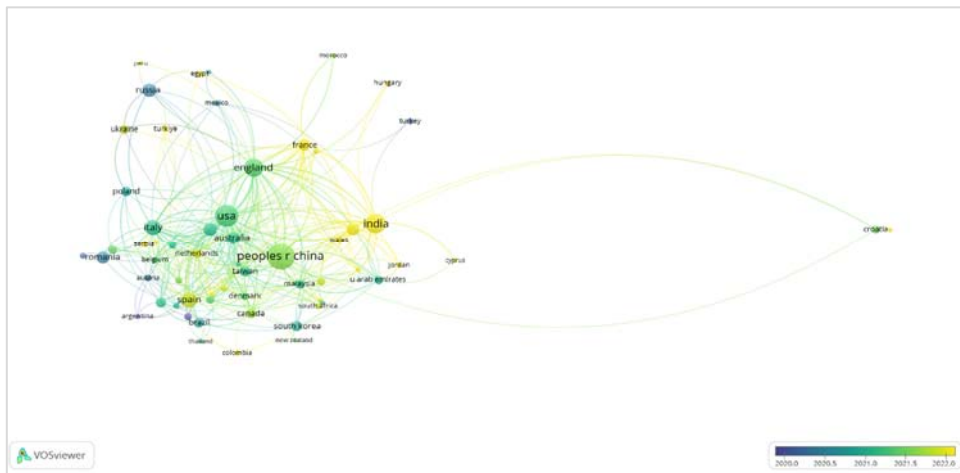
Figure 1. Term co-occurrence map based on text data (2016–2024)



Source: developed by the author.

Regarding the geographical distribution of literary works, according to figure 2, it can be seen that a large part of the publications are produced in China, ranking 1st.

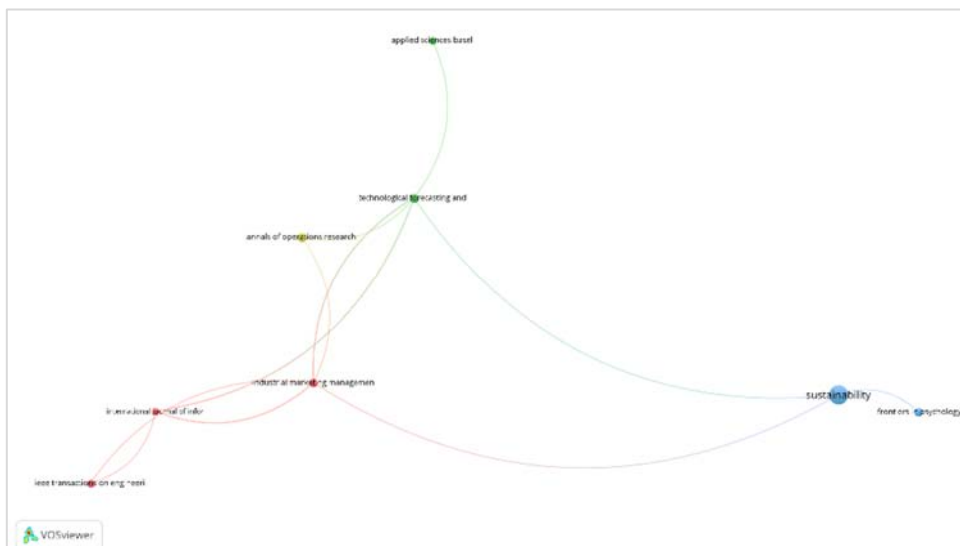
Figure 2. Production of articles by country



Source: developed by the author.

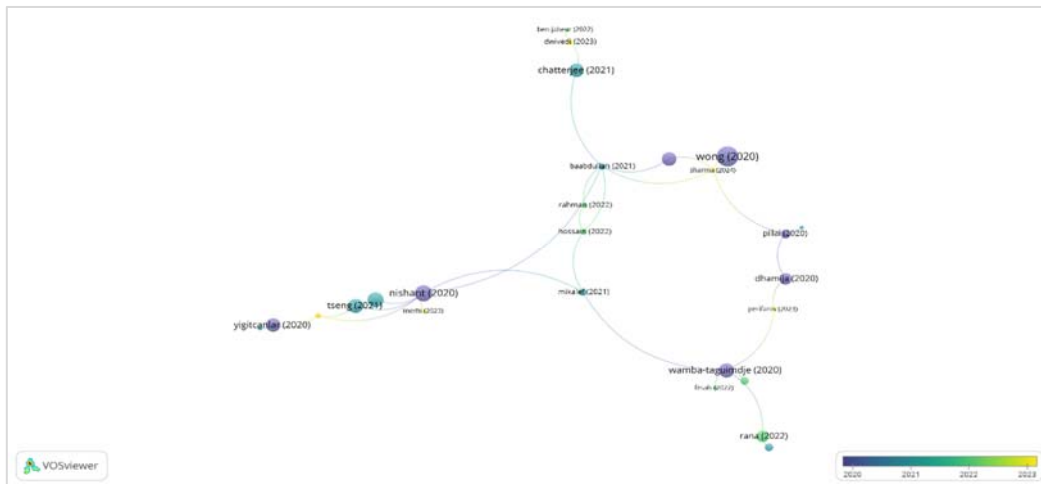
The most relevant citation sources from the entire analyzed period are presented in figure 3.

Figure 3. Most relevant citation sources (2016–2024)



Source: developed by the author.

As for the most relevant citation documents between 2016 and 2024, they are highlighted in figure 4.

Figure 4. Most relevant citing documents (2016-2024)

Source: developed by the author.

Recently, the relationship between artificial intelligence and sustainability in the context of business has attracted the attention of researchers from various scientific fields and with various methods of approach. This interest has generated significant contributions, stemming from both theoretical developments and empirical investigations. However, the increasing complexity of these interactions continuously brings new challenges, including in identifying unexplored areas and unanswered questions, but at the same time offers new perspectives for addressing them. These perspectives come, in particular, from scientific fields and theories such as complexity theory, paradox theory, co-evolutionary economics or sustainability science, and require the exploration and conceptualization of new solutions based on practical advances at the business level. Therefore, it becomes evident and necessary to adopt a complex and contingent business-level approach capable of capturing the big picture and facilitating large-scale synergies from both a diachronic and a synchronic perspective. This approach involves bringing together different streams of research from diverse fields and connecting the dots to develop new synapses, and the main objective is to propose a conceptual framework to serve as a guide for this type of approach.

5. Conclusions and predictions

In our analysis, we categorized the keywords and used them to extract 812 relevant articles and reviews which gave us the following results: there is a growing academic interest in the use of AI (Artificial Intelligence) to promote sustainability in business management. This can contribute to the promotion of sustainability in the business environment in various ways.

AI can identify and implement solutions to optimize a company's operational processes, reducing resource consumption and generating energy and material savings. Through automation and optimization, AI can help increase efficiency in the use of resources and reduce waste.

It can analyze massive volumes of data to identify patterns, trends and opportunities to support business decisions towards sustainability. By providing accurate insights and predictions, AI can help companies adopt more environmentally responsible strategies.

It can also optimize supply chains, helping to reduce resource consumption, emissions and waste throughout the production and distribution network. Through data analysis and optimization of transport routes and inventory management, AI can contribute to increasing the sustainability of the business environment.

AI can be used to develop and improve products and services that are more environmentally friendly. Through advanced simulation and modeling, AI can contribute to the design of more sustainable materials, more efficient manufacturing processes, and products with reduced environmental impact.

By integrating AI into their business strategies, companies can maximize their efficiency and minimize their environmental impact, thus helping to promote sustainability in the business environment.

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Empowering entrepreneurship: the crucial nexus of institutional arrangements and sustainable development

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Abstract. *This paper presents a holistic examination of the interaction between the institutional framework and entrepreneurship to achieve the objective of sustainable development. This paper aims to explore the relationship between institutional arrangements, entrepreneurship, and sustainable development, with a particular focus on the member states of the European Union. The research is conducted in response to the global imperative for sustainable development, analyzing the inclusive-extractive institutional dichotomy as a starting point in understanding the complexity of the interaction between entrepreneurship and the promotion of sustainable development. The analysis is based on established theories of institutional economics, essential to capture the manner in which inclusive and extractive institutional arrangements shape the incentives or constraints within which entrepreneurial initiatives unfold. Entrepreneurship plays a crucial role in stimulating sustainable development by encouraging innovation, and the institutional framework is decisive for entrepreneurial behavior. Institutional arrangements that encourage business development, through stability, predictability, and promotion of competition, support sustainable development. The study aims to highlight the negative consequences of an institutional framework affected by corruption and bureaucratic obstacles, which hinder innovation and limit the potential for sustainable development. Furthermore, the study emphasizes the nuanced dimensions of sustainable entrepreneurship, highlighting the emergence of socially and environmentally responsible business models, as well as the institutional framework that favors them. In conclusion, this paper addresses the relationship between institutional arrangements and entrepreneurship in achieving sustainable development, and it aims at contributing to the progress of theory and practice in the field of entrepreneurship and sustainability, thus facilitating the transition to more efficient and prosperous societies.*

Keywords: institutional arrangements, entrepreneurship, sustainable development, innovation.

JEL Classification: O17-L26-Q56.

Introduction

Sustainable development represents a crucial concept in the contemporary discourse, highlighting the interconnectedness of economic progress, social equity, and environmental conservation. At the core of this approach is the recognition of entrepreneurship as a catalyst for economic growth, promoting social inclusion and environmental protection. Achieving these transformations relies not only on individual initiative but also on institutional frameworks capable of shaping the entrepreneurial ecosystem. This paper explores the interaction between entrepreneurship and institutional arrangements, a connection with profound implications for the trajectory of sustainable development, with a particular focus on the member states of the European Union.

The path to achieving sustainable development reflects the aspiration to harmonize economic prosperity with social inclusion and environmental protection, requiring a balance among the conditioning factors. Among these, institutional arrangements governing economic activities are of paramount importance, as they influence individual behavior and society. Institutions encompass rules and norms, thereby structuring human interactions. Highlighting the importance of institutional quality, Acemoglu and Robinson (2012) identify two typologies: inclusive institutions and extractive institutions. The former are characterized by respect for property rights, open competition, governmental transparency, and equitable resource distribution, while the latter are marked by endemic corruption, lack of transparency, excessive regulations, and privileges granted to a narrow elite. Inclusive institutions provide an environment where entrepreneurship can thrive and innovate, whereas extractive institutions exacerbate socio-economic inequalities, discouraging or obstructing entrepreneurship and innovation. Sustainable development requires inclusive institutions that ensure a creative and dynamic business environment, which is responsive to signals from citizen participation in market processes and encouraging their involvement in economic and political processes.

Entrepreneurship serves as a catalyst for economic dynamism and innovation, and it is essential for achieving sustainable development goals. Entrepreneurs, driven by a spirit of creativity and resilience, play a key role in fostering creativity, taking risks, and identifying opportunities, thus meeting societal needs. The entrepreneurial spirit is shaped by the institutional environment in which it operates, significantly influencing the success or failure of businesses. The entrepreneurial climate is affected by government policies, access to resources and capital, culture, norms, etc., necessitating a favorable environment for innovation and development to occur. Inclusive institutional arrangements provide a conducive environment for entrepreneurs to develop their potential, leading to positive societal changes. A hostile or corrupt environment generates instability and uncertainty, stifling entrepreneurial initiatives and hindering sustainable development.

Additionally, the business landscape has been transformed by the emergence of sustainable entrepreneurship, with the concept of sustainable development gaining prominence. Entrepreneurs are integrating social and environmental considerations into business models, aiming to create value for the society as well. These practices are guided by commitments to ethical practices, environmental stewardship, and social responsibility, marking a new development paradigm that transcends traditional profit-maximization

objectives. The institutional framework in which these entrepreneurs operate is crucial, as it must provide support and encourage sustainable practices. These institutional climates include policies and regulations that support innovation, sustainable technologies, and promote transparency and accountability towards the environment and future generations.

Literature Review

Institutional theory offers perspectives on defining institutions, represented by both formal and informal rules, which have the capacity to shape the context in which entrepreneurial activity occurs. Institutions serve as "rules of the game" exerting a profound influence on entrepreneurship, with formal institutions establishing the legal and regulatory framework for entrepreneurial activities, and informal ones influencing the societal framework (North, 1990, 1991, 2003, 2005).

The significance of institutions in the entrepreneurial realm has microeconomic determinants, such as the influence of transaction costs on the firm (Coase, 1937; Williamson, 2005, 2010), as well as macroeconomic ones (Acemoglu and Robinson, 2005; Acemoglu, 2010; Acemoglu and Robinson, 2012; Boettke and Coyne, 2003, 2009; Boettke et al., 2008; Boettke and Fink, 2011). Formal institutions play a role in providing stability, clarity, and predictability, which are essential characteristics for stimulating innovation and attracting investments, with their effectiveness depending on adaptability and applicability to changing circumstances. Conversely, informal institutions, such as social norms and cultural values, can influence entrepreneurial behavior, playing a crucial role in facilitating cooperation and the exchange of knowledge and resources within entrepreneurial ecosystems, as well as in reducing transaction costs (Marinescu, 2013).

The interaction between formal and informal institutions is complex and creates a dynamic landscape where adaptation and innovation are necessary for the entrepreneurial environment. Furthermore, the relationship between institutions is dynamic within the entrepreneurial environment, and it is influenced over time by technological changes, market disruptions, or shifts in societal values. The emergence of tensions between formal and informal institutions can have implications for economic development and innovation. This represents a complex interaction that can influence the direction and pace of societal progress (North, 1990). These tensions can also be stimulated by the different adaptation and adoption rates of formal versus informal institutions (Williamson, 2000). Institutional complementarity emphasizes the importance of coherence and alignment among different institutional pillars, requiring synergies based on the mutual reinforcement of institutions, thus improving the overall functioning of the entrepreneurial environment (Elert et al., 2019). The role of institutions is crucial in the field of entrepreneurship, particularly in stimulating innovation and creativity, with the capacity to shape the contemporary global dynamic landscape. The success and efficiency of entrepreneurship do not depend solely on innovation and ingenuity, but the influence of institutions on entrepreneurial activity is vital (Baumol, 1990, 2002; Baumol et al., 2009).

The changes extend beyond merely acknowledging environmental alterations, regardless of the controversies surrounding their causes, and involve adjustments in the institutional

sphere, particularly regarding formal institutional arrangements. These adjustments include the emergence of the Green Act in the US, legislative changes adopted by states to reduce carbon emissions, and initiatives aligning with the UN Sustainable Development Goals (United Nations, 2024). Additionally, the European Green Deal and the emphasis on Environmental, Social, and Governance (ESG) criteria represent significant shifts in policy and regulatory frameworks aimed at addressing climate change and promoting sustainable development.

The paradigm shift in entrepreneurship focuses on sustainable development goals, with innovation serving as a catalyst (Urbano et al., 2019). Moreover, changes in entrepreneurship entail challenges as well as potential opportunities, emerging as a consequence of institutional adjustments to meet the new aims created by sustainable development objectives. Current business success is no longer confined to financial profitability; instead, it includes a triple bottom line framework comprising three key areas: economic, environmental, and social. This framework captures the interconnection of these dimensions, promoting a balanced approach advocating for the long-term sustainability of business practices. Thus, firms' resilience will increase, and risks can be mitigated by adopting this triple framework (Ukko et al., 2018).

The social dimension plays a crucial role in promoting entrepreneurship focused on sustainable development. The specialized literature has identified the necessity of social recognition as a driver to stimulate innovation and has emphasized the impact of human capital in promoting sustainability-focused practices. Additionally, transforming inefficient systems relies on the collaborative advantages of social entrepreneurship and the adaptation and improvement of existing institutions to foster sustainable development (Estrin et al., 2013). The economic dimension is linked to sustainable initiatives, offering multiple benefits: reducing operational costs through efficient resource use, market innovation through the development of eco-friendly products and services, increasing productivity by adopting sustainable practices, and creating jobs in fields such as renewable energy, recycling, or green transition towards a circular economy. Innovation is stimulated within an inclusive institutional framework, and entrepreneurship in a system focused on efficiency and responsible resource management generates economic value (Lioutas and Charatsari, 2018).

The environmental dimension is highlighted through green entrepreneurship, making an essential contribution to supporting sustainable development by promoting eco-friendly practices, reducing pollution, and conserving resources. Economic resilience and competitiveness are boosted by green investments, and entrepreneurs pursuing sustainability principles and use of innovative technologies that contribute to environmental conservation (Nikolaou et al., 2011).

Sustainable entrepreneurship represents a transformation in the business world, shifting from an emphasis on financial success to prioritizing sustainable development goals. This approach encompasses entrepreneurial activities guided by sustainability principles (Drucker, 2014; Matos and Hall, 2007). Cohen and Winn (2007) characterize market imperfections as factors that exacerbate environmental pollution, presenting entrepreneurial opportunities to establish sustainable business models. York and Venkataraman

(2010) describe entrepreneurship as a solution to environmental degradation, emphasizing the importance of entrepreneurial efforts to improve regulations and drive corporate social responsibility initiatives. Additionally, Shepherd and Patzel (2011) reveal the capacity of entrepreneurship to manage environmental and social challenges, supporting sustainable development goals.

The relationship between institutions, entrepreneurship, and sustainable development has been analyzed in the context of less developed countries, describing the concept of the "growth penalty" (Omri et al., 2017). In these countries, the growth penalty associated with entrepreneurship suggests that a marginal increase in the entrepreneurship rate leads to higher economic growth rates. However, the number of entrepreneurs in these countries is low, requiring the promotion of entrepreneurship and the creation of incentives to foster a conducive environment for sustainability. Survival entrepreneurs emerge in underdeveloped countries, creating little added value and having a diminished impact on economic growth. The solution to counteract this type of entrepreneurship is to encourage innovation, as supported by Schumpeterian theory (Baumol, 1996). In developed countries, innovation-driven entrepreneurship is stimulated, thereby creating jobs and pursuing sustainability principles. Policy reforms to reduce bureaucratic obstacles and promote entrepreneurial education have encouraged innovation and provided new solutions to existing challenges (Silvestre, 2015).

Reforming institutions aims to reduce bureaucracy and is essential for unlocking the full potential of entrepreneurs. Streamlining administrative processes, grounding policies favorable to innovation, protecting intellectual property, digitizing, and simplifying business procedures can encourage entrepreneurship. Adapting institutional arrangements to the needs of entrepreneurs can stimulate sustainable development, creating an efficient and innovative entrepreneurial climate (Omri et al., 2017).

To achieve sustainable development goals, entrepreneurship and innovation are indispensable globally. "Opportunity entrepreneurship," focused on developing environmentally friendly products and services, can help mitigate environmental degradation, driving the transition to a sustainable economy (Omri et al., 2017).

The European Union (EU) is strongly committed to achieving all the Sustainable Development Goals and actively cooperates with developing countries. The EU implements policies focused on strengthening institutions and promoting human rights, with a particular emphasis on Sustainable Development Goal 16 (SDG16), which aims to promote peaceful and inclusive societies through strong institutions. This goal extends the Millennium Development Goals, emphasizing the interconnectedness of peace, security, and development. However, the adoption of SDG16 has been marked by controversies, as some states are concerned about potential interference between development and security (Kezie-Nwoha and Lalbahadur, 2017). An innovative aspect of SDG16 is its emphasis on eradicating violence in all its forms, recognizing the direct link between violence, poor governance, and state fragility (Adams, 2017). Corrupt institutions are also addressed as obstacles to sustainable development. The EU's strategy is based on resilience, democracy, and human rights. Combating corruption and strengthening good governance are pursued by the EU, with anti-corruption measures implemented, and candidate states are required

to demonstrate substantial progress in transparency, the rule of law, and democratic values. The EU's actions towards SDG16 are significant, actively contributing to the building of inclusive and strong institutions, and the dedication to achieving this goal represents a beacon of hope for a more prosperous and sustainable world (Zamfir, 2022).

In light of the EU's sustained efforts to promote sustainable development, it is essential to analyze the connections between institutional arrangements, entrepreneurship, and achieving sustainable development goals. Based on the milestones highlighted in the specialized literature, the following can be formulated as research questions:

- How do institutional arrangements influence the quality of entrepreneurship?
- Do implementing and achieving sustainable development goals require formal institutional arrangements to create opportunities or constraints in the entrepreneurial sphere?
- If achieving sustainable development goals is influenced by the quality of entrepreneurship and the institutional arrangements, then what is the appropriate structure of incentives and constraints that favor it?

Methodology

A qualitative analysis approach will be used, employing empirical and statistical data, particularly data on SDG16 collected over the past 22 years for EU member states. By selecting the top three and bottom three ranked states regarding SDG16, significant variations will be tracked, highlighting specific challenges and opportunities for each country. Additionally, using data from the Global Entrepreneurship Monitor (GEM), the influence of entrepreneurial quality on progress towards sustainable development will be analyzed, providing examples of best practices. GEM offers valuable insights for evaluating entrepreneurial indicators, which significantly contribute to policy formulation by shaping perspectives on cultural and social values that influence sustainable development strategies (Aylett and Coduras, 2016). Thus, this paper aims to provide a comprehensive analysis of how institutional arrangements and entrepreneurship interact in the context of sustainable development in EU member states.

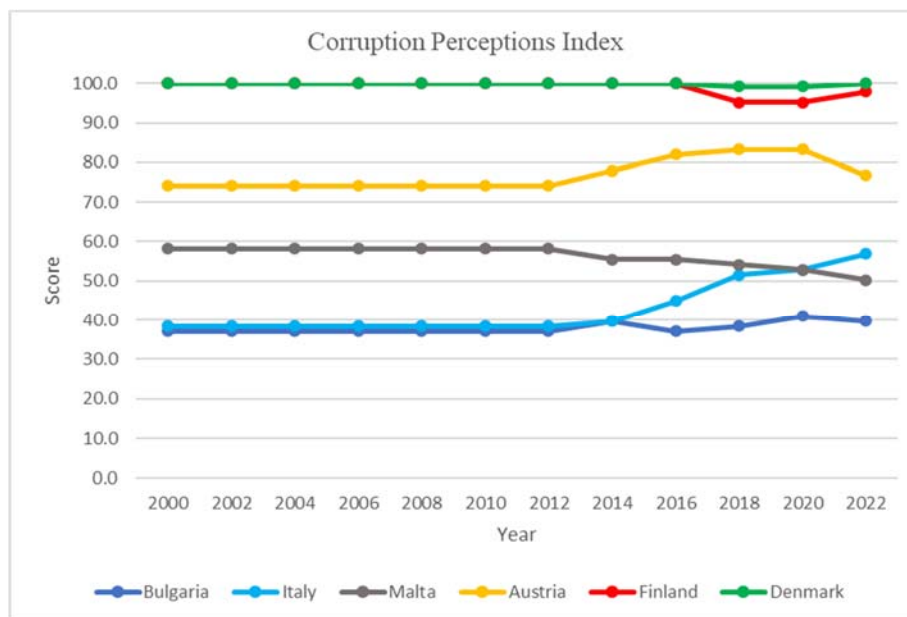
In this context, the case study focuses on assessing progress towards achieving SDG16 in EU member states from 2000 to 2022. The data used is available in the Sustainable Development Report (SDR) (<https://dashboards.sdindex.org/static/downloads/files/SDR2023-data.xlsx>), providing valuable information on the evolution of institutions and governance over the past two decades (Table 1). The main goal of this phase of the case study is to identify trends and performance of EU member states regarding SDG16, subsequently highlighting examples of good practice. By ranking EU member states based on their average scores over two decades for SDG16, the case study offers a perspective on the level of commitment and progress in building inclusive institutions and just societies within the EU. This analysis explores the impact of institutional performance on entrepreneurship for the top three ranked states (Austria, Finland, and Denmark) and the bottom three EU member states (Bulgaria, Italy, and Malta).

Table 1. Progress Towards SDG 16 in EU Member States (2000-2022)

No.	Country	SDG16 Score - Average 2000-2022
1	Bulgaria	67.7
2	Italy	68.2
3	Malta	68.7
5	Austria	90.5
6	Finland	90.7
7	Denmark	92.9

Source: Own processing of data available in the Sustainable Development Report
<https://dashboards.sdgindex.org/static/downloads/files/SDR2023-data.xlsx>

Austria, Finland, and Denmark are recognized for their high-quality, inclusive, and efficient institutions that facilitate the entrepreneurial environment and sustainable development. Conversely, Bulgaria, Italy, and Malta face challenges regarding institutional performance and the entrepreneurial environment, necessitating an analysis of additional aspects such as "Timeliness of administrative proceedings," "Corruption Perceptions Index," and "Access to and affordability of justice." These factors will help provide a comprehensive perspective on institutional performance and its impact on the entrepreneurial environment in these six EU member states.

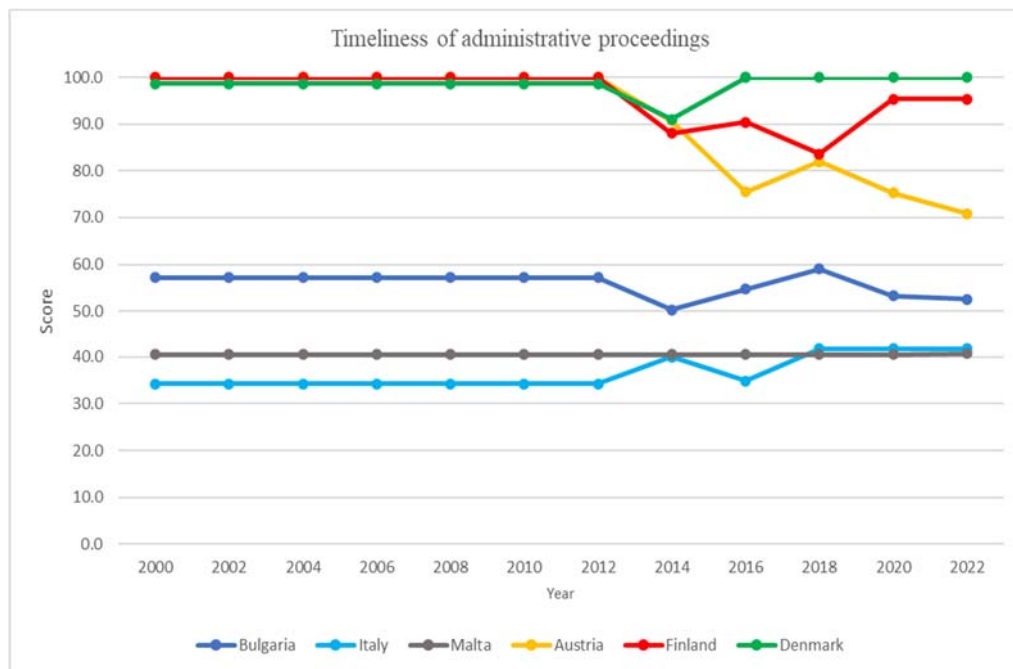
Figure 1. Corruption Perceptions Index (2000-2022)

Source: Own processing of data available in the Sustainable Development Report
<https://dashboards.sdgindex.org/static/downloads/files/SDR2023-data.xlsx>

Corruption Perceptions Index (CPI) represents an essential tool for evaluating the perceived level of corruption worldwide, impacting the quality of institutions and entrepreneurship. This index is developed by Transparency International and provides a measure of perceptions of corruption, ranging from 0 to 100, where 0 indicates a very high level of perceived corruption, and 100 indicates a very low level of perceived corruption. CPI

values are centered around attributes such as transparency, integrity, and accountability, which are necessary for the proper functioning of institutions. States with higher CPI scores are associated with a more transparent business environment, they are attractive for investments and for promoting sustainable development (Figure 1). The evolution of CPI for the two groups of states highlights significant differences in the perception of corruption. Austria, Finland, and Denmark have recorded high and stable scores over the 22 years, reflecting the presence of strong institutional arrangements and low perceived corruption. Austria showed improvement until 2015 but recorded a slight recent decline, while Finland and Denmark remained close to the ideal score, with minor variations. By contrast, Bulgaria, Italy, and Malta had lower scores, indicating higher levels of perceived corruption. Bulgaria and Italy showed gradual improvements, but Malta recorded a recent decline, highlighting persistent challenges in combating corruption and improving institutional performance.

Figure 2. *Timeliness of administrative proceedings (2000-2022)*



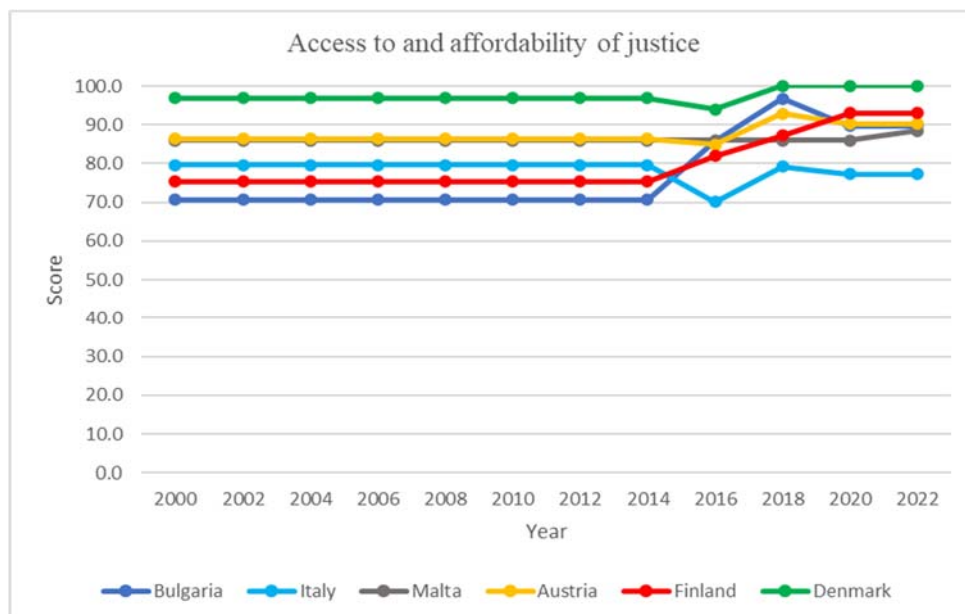
Source: Own processing of data available in the Sustainable Development Report <https://dashboards.sdindex.org/static/downloads/files/SDR2023-data.xlsx>

The efficiency of administrative procedures represents another crucial factor in determining the business environment and a state's ability to attract investors and stimulate economic growth. States where administrative procedures are fast and efficient are preferred by entrepreneurs because they benefit from greater flexibility and a quicker approach to obtaining approvals or documents necessary for their business development. Thus, administrative costs are reduced, and the business launch process is facilitated, supporting entrepreneurial initiatives and innovation.

The analysis of the average time required for administrative procedures in Austria, Finland, and Denmark over the past two decades has highlighted the efficiency of institutions, supporting entrepreneurship. These three states have demonstrated positive evolution over time regarding the efficiency of administrative procedures (Figure 2). With stable or consistently increasing indices, these countries have shown that investments in administrative reforms and digitalization can have a significant impact on the business environment and sustainable development, enhancing their attractiveness to investors (Finish Government, 2022).

Conversely, the last three states, Bulgaria, Italy, and Malta, face delays and excessive bureaucracy that negatively affect entrepreneurship. Administrative procedures are complex and discourage investments and innovation, slowing down the pace of business development.

Figure 3. Access to and affordability of justice (2000-2022)



Source: Own processing of data available in the Sustainable Development Report <https://dashboards.sdindex.org/static/downloads/files/SDR2023-data.xlsx>

Access to justice and the financial accessibility of the judicial system are essential aspects for entrepreneurs. States that offer easy access to and reasonable costs in the judicial system can create a more stable and secure environment to attract investments. In states with good access to justice, such as Austria and Denmark, entrepreneurs have confidence in a fair and impartial legal system, and the costs associated with resolving disputes will be reasonable (Figure 3). These characteristics encourage investments and innovation, contributing to the development of a safer and more stable business environment. Finland's score evolution reflects significant improvements in access to justice, with positive implications for the business environment, encouraging investments and innovation due to a judicial system in which entrepreneurs have trust.

Conversely, in states where access to justice may be limited and associated costs can be high, such as Bulgaria and Italy, entrepreneurs may encounter difficulties in protecting their rights and resolving disputes, posing additional risks for businesses. Thus, foreign investments and innovation are discouraged, making it crucial for states to invest in improving access to justice and reducing the costs associated with this system.

After analyzing the quality of institutions in these six states, the sphere of entrepreneurship and innovation will be detailed, according to the data available in the GEM. They are examined to better understand the entrepreneurial climate in each country and their trajectory towards sustainable development. Through this study, the aim is to highlight best practices and identify challenges and strengths from the experiences of the states, serving as a model for other countries in their own efforts to promote entrepreneurship, inclusive institutions, and sustainable development.

Additionally, to illustrate the progress of states towards achieving sustainable development goals, their score evolution from 2000 to 2023 and their positioning in rankings will be analyzed, with the aim of interpreting how entrepreneurial practices and institutional arrangements influence progress towards sustainable development in a variety of national contexts.

Table 2. *Rankings SDR*

SDR \ State	Bulgaria	Italy	Malta	Austria	Finland	Denmark
Score 2023	74.62	78.79	75.53	82.28	86.76	85.68
Score 2000	68.75	71.86	68.48	78.57	82.77	81.47
Rank	44	24	41	5	1	3

Source: Own processing of data available in the Sustainable Development Report
<https://dashboards.sdindex.org/rankings>

Discussions

For Bulgaria, the consolidation of a dynamic and competitive entrepreneurial ecosystem is essential for achieving sustainable development goals, while institutional challenges hinder entrepreneurial initiatives. Bulgaria's institutional arrangements are affected by corruption and inefficiency issues. According to the Corruption Perceptions Index (CPI), Bulgaria's score fluctuated throughout the analyzed period, starting with a relatively low score at the beginning of the period and remaining almost constant until 2013. However, the increase in CPI values is not sufficient to ensure the desired institutional transparency and integrity. Thus, Bulgaria continues to face significant challenges regarding perceived corruption and institutional quality, which could discourage investments and innovation. Regarding administrative procedures, Bulgaria has experienced regression from 2000 to 2022, decreasing from 57.1 to 52.6, which highlights the need to focus on administrative reforms and to invest in the digitalization of government processes.

Additionally, increasing transparency and predictability in administrative procedures could attract more investors and stimulate long-term economic growth. One of the challenges faced by Bulgaria's entrepreneurial climate is the issue of market dynamics and entry barriers, with limited openness of local markets due to institutions unfavorable to innovation and competition. The strengths of Bulgaria's entrepreneurial ecosystems lie in

access to physical infrastructure and commercial/professional services, which are crucial for sectors such as transportation, manufacturing, and knowledge-intensive industries, providing essential connectivity. Although the number of innovation-oriented entrepreneurs in Bulgaria may be limited, they demonstrate a focus on leveraging their institutional context, capitalizing on advantages such as cost efficiency, global mindset, and determination to bring about positive societal changes (Global Entrepreneurship Monitor, 2017).

Additionally, Bulgaria's position in global indices, such as the Global Innovation Index (GII) and the SDG Index, provides a broad perspective on entrepreneurship and the country's trajectory towards sustainable development. In 2023, Bulgaria ranked 38th out of 132 economies in the GII and 44th out of 166 countries in the SDG Index (Table 2), demonstrating its innovation and development potential, with a significant increase in its sustainable development score from 68.75 in 2000 to 74.62 in 2023, indicating a commitment to sustainable practices. However, improvements are needed to encourage innovation and entrepreneurship (United Nations, 2023), (World Intellectual Property Organization, 2023).

Italy is renowned for its rich cultural heritage and economic potential, yet despite significant progress in recent years, it continues to grapple with widespread corruption and administrative inefficiency that affect the business environment and institutional arrangements. Italy recorded a CPI score similar to Bulgaria's in 2000, around 38.4, which remained stable until 2013 and increased to 56.9 in 2022. This growth reflects Italy's considerable efforts to address corruption issues and improve institutional quality. However, Italy must continue its efforts to strengthen institutional arrangements and ensure a transparent, stable, and sustainable business environment. Additionally, streamlining administrative processes and reducing bureaucratic obstacles are essential to transparency and institutional consolidation, with progress observed over the analyzed periods, but reforms are still needed to fully support entrepreneurial initiatives and promote sustainable development. By analyzing GEM indicators from 2003 to 2023, a nuanced perspective of Italy's entrepreneurial ecosystem can be outlined, evaluating its strengths, opportunities, and obstacles towards sustainable development. The financial environment for entrepreneurship recorded a score of 4.47 in 2023, indicating a stable but evolving landscape, with fluctuations over the two decades.

To stimulate entrepreneurial activities and enhance economic resilience, reforms have been implemented and formulated, especially through the EU-funded Recovery and Resilience Plan. This plan aims to increase competitiveness and innovation and allocate funds to promote an attractive business environment. Data on access to infrastructure and market dynamics over the past twenty years indicate a conducive environment for business operations and market penetration, with consistently high scores, but challenges remain regarding cultural/social norms and the burden of administrative regulations. Additionally, analysis of data on entrepreneurial education and research and development transfer reveals necessary improvements: streamlining processes, encouraging collaboration between academia and industry, and promoting innovation.

Addressing these challenges, along with institutional consolidation, is imperative for Italy's journey towards a vibrant and sustainable entrepreneurial climate, stimulating economic prosperity and societal well-being in the years to come (Global Entrepreneurship Monitor, 2023). Furthermore, the improvement of Italy's SDR score from 71.86 in 2000 to 78.79 in 2023 and its global ranking, i.e., 24th, underscore the country's commitment to sustainable practices, but strategic investments are needed to create a resilient and prosperous economy (Table 2).

The administrative efficiency of Malta has experienced minimal improvement during the analyzed period, remaining below the ideal level for sustaining a prosperous and competitive business environment. The consistency of its administrative efficiency index suggests a stagnation that negatively impacts entrepreneurial activities, necessitating a focus on streamlining and expediting administrative processes, attracting investments in digital infrastructure and administrative capacities to strengthen the business environment and stimulate sustainable development. At the beginning of the analyzed period, Malta had a higher CPI score than Italy and Bulgaria, i.e., 58.2, which has since decreased to 50.3 by 2022. This indicates the need to improve transparency and integrity of institutional arrangements to maintain investor confidence and a business-friendly environment conducive to sustainable development.

Malta does not have available data on the GEM, but the entrepreneurial environment will be analyzed based on its performance in the GII 2023, ranking 25th out of 132 economies, with notable strengths in creative products, infrastructure, and Business Sophistication. These attributes highlight the potential for leadership in creative industries and sophisticated entrepreneurial environments, but investments in innovative technologies, human capital, and research will be necessary (World Intellectual Property Organization, 2023, pp. 1-5). Additionally, according to the Sustainable Development Report 2023, Malta ranked 41st globally, recording progress from a score of 68.48 in 2000 to 75.53 in 2023 (Table 2). This progress indicates a positive trajectory, but improvements are needed to achieve Sustainable Development Goals (SDGs) by stimulating investment in green technologies, implementing sustainable business practices, and addressing administrative inefficiencies.

Austria has demonstrated commitment to promoting an environment conducive to entrepreneurship and inclusive institutional arrangements during the analyzed period. Austria's Corruption Perception Index (CPI) was high in 2000, i.e., 74.1, and has increased since 2014, reaching 76.7 in 2022. This evolution indicates transparent institutional arrangements and a stable and business-friendly environment conducive to sustainable development and innovation. The efficiency of administrative procedures has shown significant variability. From 2000 to 2012, Austria maintained a perfect score of 100.0, but this efficiency has decreased, with the score dropping to 70.9 by 2022. Such fluctuations highlight the challenges companies face in navigating bureaucratic processes, which can negatively affect operational efficiency and growth potential.

The financial environment presents a mixed picture. While macroeconomic conditions are increasingly challenging for securing financing, informal investments are on the rise. Financing programs designed to support entrepreneurs are highly regarded, ranking first in

the international comparison conducted by GEM. Innovation among Austrian enterprises, according to the latest GEM Austria 2022/23 report, follows an upward trajectory, albeit at a moderate pace. Early-stage enterprises exhibit higher technological intensity compared to established businesses, indicating a trend toward more innovative and technologically advanced startups.

However, the overall adoption of advanced technologies is declining, requiring investments in digitalization and technological integration at all stages of business development. While Austria's entrepreneurial ecosystem is positioned at a medium level both in European and international comparisons, several areas require improvement. Government policies receive average ratings, and the dynamics of the domestic market face constant challenges (Global Entrepreneurship Monitor, 2023, pp. 2-4). Sustainable development is increasingly embedded in Austria's entrepreneurial ethos. Over two-thirds of entrepreneurs have set environmental and social objectives in their business strategies. This sustainability orientation is essential in addressing global challenges such as climate change and social inequality, thereby enhancing business resilience and long-term viability. In the SDR 2023, Austria scored 82.28, ranking fifth globally, demonstrating overall performance in pursuing sustainable development goals. In comparison, Austria's score in 2000 was 78.57, indicating significant progress over the past two decades due to Austria's dedicated efforts in addressing the multifaceted challenges of sustainable development (Table 2).

In Finland, the entrepreneurial landscape reveals the complex interaction of institutional arrangements and sustainable development goals. It is a country that has made significant progress in promoting entrepreneurship. Institutional support plays a crucial role in empowering entrepreneurship in Finland, which is exemplified by the availability and access to entrepreneurial financing, robust entrepreneurial education mechanisms and the transfer of research and development. All these factors have contributed to a favorable ecosystem for business creation and growth.

During the analyzed period, the trajectory of entrepreneurial spirit has shown a mixed pattern. While the percentage of adults involved in starting a business has declined since 2015, notable increases in entrepreneurial activity have been observed. The total early-stage entrepreneurial activity (TEA) rate in the population has recorded a slight increase from 6.6% to 7.9% between 2015 and 2021. The main challenges of entrepreneurship in Finland relate to fear of failure, societal norms, and cultural attitudes towards risk-taking and individual success, which are obstacles that need to be addressed.

Improvements have been made in these areas since 2016, but continued efforts are needed to cultivate a culture capable of encouraging entrepreneurial risk-taking. The strengths identified by the GEM include the effectiveness of institutional arrangements in stimulating entrepreneurial efforts and prioritizing sustainability goals over purely economic objectives. Finland's focus on sustainable development has contributed to its top ranking globally in the Sustainable Development Report (Table 2), reaffirming its leadership position in sustainability efforts (United Nations, 2023). Looking ahead, Finland must continue to prioritize entrepreneurship as a driver of sustainable development, requiring sustained efforts to address cultural barriers and improve institutional support mechanisms.

Additionally, Finland's orientation towards ecological and social sustainability aligns with global trends towards responsible entrepreneurship, with early-stage entrepreneurs prioritizing sustainability goals over purely economic considerations. Finland has demonstrated resilience and adaptability in the face of global challenges, serving as an example of innovation, economic dynamism, and alignment with sustainable development goals. Ambitious targets are oriented towards renewable energy, carbon neutrality, and biodiversity conservation, becoming a global model through its commitment to climate change and sustainable resource management (Global Entrepreneurship Monitor, 2022).

Denmark is renowned for its progressive policies and forward-looking approach, embarking on a visionary journey starting in 2006 with the strategy called "Progress, Change, and Security - Strategy for Denmark in the Global Economy," representing a roadmap with four essential objectives, including promoting a leading entrepreneurial society. Denmark's commitment to entrepreneurship has evolved over time, culminating in the most recent strategy: "Entrepreneurship for Everyone," which highlights the importance of innovation and sustainability. Encouraging entrepreneurship through inclusive institutions is indispensable for economic vitality and resilience, with initiatives launched to foster a culture of innovation and entrepreneurial skills for younger generations. Through this strategy, Denmark aims to both consolidate its position as a leader in entrepreneurial activity and align this environment with the SDGs and ecological transition.

The success of this state is the result of synergy between the public and private sectors, with the government actively supporting sustainable business models and export initiatives aligned with SDGs. Initiatives like the ODD acceleration schemes for small and medium-sized enterprises (SMEs) exemplify Denmark's proactive approach to promoting socially responsible entrepreneurship. The Climate Compass initiative captures the commitment to sustainable development, while microgrants for ODD-oriented entrepreneurship among students reflect this state's desire to instill a culture of sustainable entrepreneurship that transcends generational divides. The vision of entrepreneurship aims to decouple economic growth from resource consumption, setting ambitious goals such as a 70% reduction in greenhouse gas emissions by 2030. Through this plan, Denmark aims to align with global imperatives and become a leader in sustainable development (Ministry of Finance, 2021). Its ascent as an innovation leader is reflected in its consistent ranking in the top ten states in the GII serving as a beacon of progressive entrepreneurship.

Regarding green entrepreneurship, public funding mechanisms such as the Danish Growth Fund and the Danish Environmental Investment Fund stand out for providing financial support to entrepreneurs, including loans, guarantees, and direct investments to develop innovative solutions. Additionally, participation in the European Innovation Council (EIC) facilitates access to grants and capital investments, demonstrating a collaborative effort for positive change in pursuit of sustainable development. The Eurobarometer survey on consumer demand for ecological products and services has revealed increased awareness among Danes about the environment, thereby establishing the possibility of sustainable and innovative development (European Commission, 2021).

Copenhagen has the potential to become an international hub for green technologies, being a strong point for attracting investments in innovation and sustainability (OECD, 2021).

Moreover, Denmark ranks third in the implementation and promotion of the SDGs (Table 2), serving as a best practice example due to its inclusive and transparent institutional arrangements and its green and innovative entrepreneurial environment (United Nations, 2023).

Conclusions

The quality of institutional frameworks and entrepreneurship are crucially interconnected in shaping a favorable environment for sustainable development, while also influencing economic progress, environmental conservation, and social equity. An institutional environment characterized by inclusiveness and transparency forms the basis for building innovative and dynamic entrepreneurship. Predictability and security are attributes that can contribute to sustainable economic and social development, as entrepreneurs are more interested and motivated to allocate resources to more innovative and sustainable ideas. Responsible and innovative entrepreneurship can identify efficient solutions to current or potential challenges, yielding both immediate and long-term benefits.

Additionally, entrepreneurship requires a quality institutional framework to thrive. Transparent regulation, efficient bureaucratic procedures, and strong protection of property rights are features that instill confidence among entrepreneurs and investors, facilitating business creation and growth. Moreover, equitable institutions promote equal access to entrepreneurial opportunities regardless of gender, age, or socioeconomic background. By contrast, weak institutional quality is characterized by corruption and uncertainty, hindering entrepreneurial efforts, innovation, and economic development. Efforts to improve institutional quality will lead to the achievement of multiple sustainable development goals, with SDG 16 (Peace, Justice, and Strong Institutions) explicitly referring to the role of responsible and inclusive institutions. By encouraging entrepreneurship and improving institutional quality, policymakers can support progress towards achieving the SDGs and building a more prosperous, equitable, and sustainable future for all.

Through the analysis of six European states: Bulgaria, Italy, Malta, Austria, Finland, and Denmark, the interaction between institutional arrangements and entrepreneurship and their influence on sustainable development outcomes has been highlighted. States such as Austria, Finland, and Denmark are characterized by strong institutional arrangements and a dynamic entrepreneurial environment, achieving the best results in sustainable development, these countries ranking in the top five. At the other end of the spectrum, states with less developed institutions, such as Bulgaria and Malta, have had more modest performances in the Sustainable Development Report 2023, necessitating the encouragement of responsible and innovative entrepreneurship in a transparent and predictable institutional environment to contribute to formulating efficient solutions for managing current and future challenges.

In the coming years, it is anticipated that states will improve their institutional arrangements and invest in promoting innovation and green technologies, creating the necessary conditions for entrepreneurship to become a driver of sustainable development worldwide.

Institutions are essential for facilitating international collaboration, accelerating progress towards the goals set in the 2030 Agenda through the exchange of best practices and experiences. Empowering entrepreneurship through transparent and adaptable institutional arrangements is a solution to ensure societal progress, supporting the trajectory towards building a resilient and sustainable future.

Research Implications

This study highlights the crucial connection between entrepreneurship and institutional arrangements in the framework of sustainable development, providing guidance to experts, scholars, and policymakers. With the use of these insights, policymakers may create programs and policies that support entrepreneurship and improve institutional quality, ultimately aiding in the achievement of sustainable development objectives.

Research Limitations

This study, despite offering insightful information about the interaction between institutional arrangements and entrepreneurship, has limitations. One constraint is its focus solely on European states, potentially limiting the applicability of the results to other regions. Additionally, reliance on available data poses a limitation as it may not capture the most current trends. Data gaps, particularly from sources like the Global Entrepreneurship Monitor (GEM), restrict the depth of analysis.

Future Developments

To extend this research, future studies could explore the mechanisms through which institutional quality influences entrepreneurship and sustainable development outcomes in greater detail. Future developments could involve expanding the scope of research to include other regions, aiming to create a more comprehensive overview. Future research should strive to access more recent and comprehensive data to achieve a nuanced understanding. This broader approach would allow for a comparative analysis across different regions, providing a more holistic understanding of the relationship between institutional arrangements, entrepreneurship, and sustainable development on a global scale.

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The impact of implementing European-funded projects on the quality of services provided by school organizations

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Abstract. *The implementation of projects funded by European funds has a significant impact on the quality of services provided by school organizations. These projects bring additional financial resources and expertise to education and facilitate the modernisation of school infrastructure, the introduction of modern technologies in the learning process, the development of innovative educational programmes and the provision of continuous training for teachers. Through these investments, learning conditions are improved, academic performance of students is supported, and a quality education is promoted, so contributing to the development and progress of school organizations. This article aims to identify the impact of implementing European-funded projects on the quality of services provided by school organizations. Evaluating the impact of these projects is important to understand how these contribute to achieve educational objectives and improve the quality of education. By analysing this impact, effective practices and strategies can be identified and applied in other contexts to improve the quality of educational services at the European level.*

Keywords: European funding, quality of services, school organizations.

JEL Classification: M15, O15.

European projects are initiatives financed and carried out within the European Union or in partnership with it, in order to achieve the objectives set by the EU in various fields, such as education, research, innovation, regional development, environment, health, culture.

These projects, financed by the EU budget or through various European programs and funds, constitute a fundamental element in improving the quality of the educational system in Romania, covering a diverse range of identified needs. These include the modernization of the school infrastructure, the development of the professional skills of human resources, the professionalization of the management of educational units, the facilitation of access to education for disadvantaged groups, the improvement of learning outcomes, the increase of the school participation rate (Voiculescu F. 2014).

Projects with European funding have played a significant role in improving the quality of the educational system in the member states of the European Union and beyond. These projects have promoted innovation, exchange of best practices and collaboration between countries to bring about substantial improvements in education (Apostu, O., et al, 2015, p. 14).

I. Benefits generated by the implementation of projects with European funding

The ways in which European projects have contributed to increasing the quality of education can be grouped as follows:

- facilitating the exchange of experience and best practices

Collaboration between different countries in the management of educational systems, educational policies, teaching methodologies, educational programs helps to identify and implement the most effective strategies in education.

- modernization of the educational infrastructure

Funding attracted through these projects helped administrative-territorial units and educational units to expand/rehabilitate/modernize school infrastructure and facilitate access to modern educational resources such as STEAM labs, digital libraries, gyms, school spaces dedicated to education preschool.

- developing the professional skills of human resources

Through projects financed by European funds, teachers and educational trainers have access to professional training programs for the development of skills. Participating in these programs helps them improve their teaching skills and adapt to new demands and technologies in the field of education.

- the professionalization of the management of educational units

The management of school organizations is one of the aspects considered by the European projects, aiming to improve the process of elaborating educational policies, institutional development in accordance with the needs identified in the school and local community, the professionalization of managers, the improvement of management, climate and organizational culture.

- promoting diversity and inclusion

One of the components of the projects with European funding in the field of education is the promotion of inclusion and diversity, ensuring equal access to education for all students,

regardless of their social, ethnic or economic origin, reducing the risk of school dropout and increasing the school participation rate. These projects encourage cultural and linguistic diversity and promote a holistic approach to education.

- innovation and research

By attracting non-reimbursable European funding, research and innovation projects were carried out in the field of education, which contributed to the development and implementation of new and more effective methods of teaching and learning. These projects also promote the adoption of digital technologies and other innovative tools in the education process.

The European programs in the field of education and training are a special opportunity in terms of ensuring the internationalization and the European dimension of education and professional training also at the level of Dambovița schools.

At the level of educational units in our county, several types of projects with European funding took place:

- Erasmus+ projects - mobility projects in the field of education (KA101) and VET (KA102);
- Erasmus+ projects - partnership projects in the field of school education (KA229)
- The ROSE project
- Projects within PNRAS

Compared to the number of school units and the school population, our county benefits from diversity and a large number of projects financed by the Erasmus+ Program and other European programs.

Both VET projects are developed (for specializations in the technological and services sphere, in the vocational field (arts and pedagogy) and digital skills), but also interschool exchange projects and projects aimed at developing the professional skills of teaching staff.

From the analysis of the identified good practices, of the intermediate and final reports of the projects carried out in the educational units of Dâmbovița, several types of interventions were identified: at the level of the management of the school unit, at the level of the teaching staff, at the level of the students and their parents (Schleicher, A., 2006, p. 16).

II. The impact of projects on the performance of school organizations

In order to improve learning results and reduce the risk of dropping out, coherent action programs were implemented at the management level of the school organization that led to:

- developing the organizational capacity to identify, at the level of students, the risk and causes of early school leaving;
- developing the organizational capacity to implement school dropout prevention activities;
- developing the organizational capacity to implement intervention activities in order to improve learning outcomes;

- the development of partnerships at the /county level (with various other school organizations/representative institutions) on the topic of increasing the degree of school participation and improving school results;
- the development of monitoring and intervention tools on educational risk cases;
- the development of an inclusive and stimulating school climate;
- increasing the prestige and degree of trust enjoyed by the school/organization at the community level.

At the level of teaching staff, the effects are varied and mainly aim at the development of professional skills, but also other types of skills:

- the development of discipline-specific professional skills and transversal skills;
- the development of didactic and methodological skills, leading to the implementation of effective, attractive and stimulating teaching-learning-evaluation activities for students;
- the development of effective classroom management skills and the promotion of an inclusive school climate;
- developing the skills to apply the school curriculum in a differentiated/individualized way;
- development of communication skills in an international language;
- the development of digital skills;
- the development of communication skills with other actors at the school level, collaboration and teamwork.

All projects with European funding implemented by schools are carried out primarily for the benefit of students, whatever the activities carried out and the results obtained.

Significant in terms of impact are the following types of results obtained for the students included in the target groups of the projects:

- improving student attendance, decreasing the number of absences per student;
- increasing the number of students who make progress in learning;
- improving the results obtained in the national exams;
- increasing participation in extracurricular/extracurricular activities;
- the development of self-esteem, socio-emotional skills and life skills;
- the development of socialization, communication and teamwork skills;
- increasing motivation for learning and active participation in the act of learning.

The European projects have produced changes beyond the school, at the community level, and among them stand out:

- motivating local public authorities to support the school;
- increasing the degree of involvement in the life of the school through contributions and support for some activities;
- increasing the degree of involvement of the representatives of the local business environment, of non-governmental organizations and of the local administration in establishing the institutional development directions of the educational units, as well as in their implementation, as appropriate.

In order to investigate the opinions of the beneficiaries of European projects regarding the impact that the projects in which they were involved had for each of the identified levels, we conducted a survey based on a questionnaire, applied to a number of 45 teaching staff.

According to the respondents, the effects of the changes produced at the organizational level were assessed as follows:

Table 1. *The impact of the changes produced at the organizational level*

The change generated	Minimal impact	Medium impact	Maximum impact
Developing the organizational capacity to identify, at the level of students, the risk and causes of early school leaving	11,11%	68,88%	20,01%
Developing the organizational capacity to implement school dropout prevention activities	0	31,11%	68,88%
Developing organizational capacity to implement intervention activities to improve learning outcomes	0	31,11%	68,88%
Developing partnerships at the county/county level (with various other school organizations/representative institutions) on the topic of increasing the degree of school participation and improving school results	6,68%	48,88%	44,44%
Development of monitoring and intervention tools on educational risk cases	64,44%	11,11%	24,45%
Developing an inclusive and stimulating school climate	0	31,11%	68,88%
Increasing the prestige and degree of trust enjoyed by the school/organization at the community level	31,11%	37,77%	31,11%

Regarding the impact of the interventions on teachers, the opinions of the respondents highlighted:

Table 2. *The impact of the changes produced at the level of teaching staff*

The change generated	Minimal impact	Medium impact	Maximum impact
Development of professional skills specific to the discipline and transversal skills	0	84,44%	15,56%
Development of didactic and methodological skills, leading to the implementation of effective, attractive and stimulating teaching-learning-evaluation activities for students	0	13,44%	86,66%
Developing effective classroom management skills and promoting an inclusive school climate	11,11%	24,45%	64,44%
Developing the skills to apply the school curriculum in a differentiated/individualized way	0	84,44%	15,56%
Developing skills to relate to other actors at the school level, to collaborate and to work in a team	0	11,11%	88,88%
Development of communication skills in an international language	0	31,11%	68,88%
Developing digital skills	17,77%	13,35%	68,88%

Effects of the implemented interventions were achieved at the level of students, perceived by the respondents as having a significant impact:

Table 3. *The impact of the changes produced at the level of students*

The change generated	Minimal impact	Medium impact	Maximum impact
Improving student attendance, decreasing the number of absences per student	11,11%	24,45%	64,44%
Increasing the degree of involvement in the life of the school through contributions and support for some activities	11,11%	44,44%	48,88%
Improving the results obtained in national exams	31,11%	37,77%	31,11%

Increased participation in extracurricular/extracurricular activities	0	13,44%	86,66%
Developing self-esteem, social-emotional skills and life skills	17,77%	13,35%	68,88%
Development of social skills, communication and teamwork	0	31,11%	68,88%
Increasing motivation for learning and active participation in the act of learning	0	15,56%	84,44%

The implementation of European projects proves to be an opportunity that must be capitalized at the maximum level because, through integrated interventions, it can lead to an increase in the quality of education both at the level of educational units and at the level of the educational system.

III. Limits in the implementation of European projects

From the analysis of the applied questionnaire, it follows that the respondents manage to identify some barriers/limits in terms of maximizing the impact that projects can have on the performance of school organizations:

- the lack of support systems for school units in order to initiate and carry out European projects in disadvantaged areas, which justifies their fear/reticence in the face of this opportunity;
- the applicable legislation in the thick of things, unfamiliar to the management and teaching staff in the educational units, perceived as a barrier in initiating the writing and implementation of a project;
- the lack of financial resources to ensure the sustainability of the implemented projects, which leads to the diminishing of their impact over time;
- the insufficient capitalization of the results of such projects for the documentation, the justification of relevant educational policies for improving learning results and increasing the degree of school participation at the level of the system.

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- <https://vechi.anpcdefp.ro/userfiles/Studiul_ce_invata_elevii.pdf>

Progress towards sustainable development: the minimum wage outlook in Europe for 2024

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Abstract. *The long process of global economic development, focused exclusively on profit maximization and cost diminution, has serious consequences on the natural, social and even spiritual environment. Environmental issues, global climate change, and social and gender inequality are just a few of the systemic crises and challenges that countries, corporations, and individuals have faced in the late 20th and early 21st centuries. This conflict led to a reassessment of the global vision and a recognition of the importance of sustainable development. Recently, the European Union adopted a new directive designed to help establish an adequate minimum wage in the 27 member states. However, the minimum wage amounts and conditions will not be uniform. Despite efforts, the real minimum wage has fallen in most EU member states, with inflation peaking in 2022. The Organization for Economic Cooperation and Development (OECD) recommends a periodic review of the wage to protect low-income workers.*

The EU Directive aims to establish a framework for ensuring an adequate level of the legal minimum wage, promote collective bargaining to set wages and expand workers access to exercise their rights to receive the minimum wage.

In terms of determining an appropriate minimum wage, this process is not without its challenges. The EU directive gives member states the option to use international or national reference points to set the minimum wage. The ratio of the minimum wage to the median wage remains an important indicator that reflects the situation of workers receiving the minimum wage. According to OECD data, in 2022, the minimum wage represented less than 50% of the median wage in 10 EU countries. This paper is dedicated to identifying and finding solutions to solve the mentioned problems.

Keywords: Minimum Wage, Sustainable, Progress, Development.

JEL Classification: E24, J3, O11.

Introduction

Sustainable development has become an increasingly recognized and promoted topic in recent times. In most articles, the main subjects focus on conceptual ideas, transition strategies, social order modeling, and other individual components, but the possible implementation difficulties are not mentioned. This paper illustrates an analysis of the adequate minimum wage, as per the EU directive. Member states can use commonly used international benchmark indicators, such as 60% of the average wage and 50% of the median wage, or they can use nationally specific benchmark values. Data shows that in many European countries, the ratio between the minimum wage and these benchmark values has been lower.

Salaries are one of the main pillars of working conditions and an essential subject of collective bargaining. In the realm of wages and incomes, the International Labour Organization (ILO) is committed to implementing policies aimed at equitably distributing the benefits of progress and ensuring adequate wage levels for all workers who depend on this protection. To this end, the ILO conducts research and provides evidence-based advisory services on various aspects such as the minimum wage, public sector wages, wage negotiations, gender pay gaps, wage protection—including the prevention and resolution of salary arrears—and other wage-related issues.

Literature review

The European Commission came up with a proposal in 2020 regarding the adequacy of the minimum wage at the level of each EU member state. The main reason behind this proposal was insufficient incomes and the existence of various gaps in terms of minimum wage protection coverage. The proposed directive aims to provide as adequate a minimum wage as possible, regardless of whether it is determined through collective agreements or by law.

Therefore, Directive (EU) 2022/2041 was adopted by the European Parliament and Council in October 2022, with an implementation deadline for all member states set for the autumn of 2024. Its goal is to establish standards that will ensure the adequacy of minimum wages established by law or through collective bargaining. The implementation of the obligations will be carried out through two methods. The first method, for countries where the minimum wage is set by law or mandatory legal provisions, involves more complex obligations and applies to 21 member states. The method with fewer obligations refers to EU states that apply collective bargaining methods for setting wages (Austria, Cyprus, Denmark, Finland, Italy, and Sweden).

The difference in imposed obligations is determined by the need to respect the independence of social partners when they play the exclusive role of determining the minimum wage. Therefore, member states must adopt a set of very clear and stable criteria for ensuring that the minimum wage is stable and updated.

The Directive is based on four factors that constitute the essential criteria member states must consider: the purchasing power of the legal minimum wage; the overall level and distribution of wages; wage growth rates; long-term levels of national productivity and its

development. Thus, EU member states will have the opportunity to personalize the mechanism and decide what actions and decisions are necessary for implementing the directive.

Article 5 of the Directive stipulates the obligation for states to use indicative reference values to assess the adequacy of the legal minimum wage. These values typically include 60% of the average gross wage and 50% of the average gross wage, or indicative baseline values applied at the national level. The purpose of the directive is to ensure broad coverage of minimum wage standards. According to Article 6, member states must ensure that any different legal minimum rates for certain groups of workers or deductions that reduce remuneration below the legal minimum wage are in line with the principles of non-discrimination and proportionality and serve a legitimate purpose. Article 10 of the Directive establishes a monitoring mechanism for the degree of coverage and adequacy of the minimum wage. Member states are obliged to collect and report annually to the European Commission data on the level and coverage of the legal minimum wage, coverage of collective bargaining, existing changes and deductions, as well as wage levels for employees not covered by the legal minimum wage or collective agreements. The monitoring aims to serve as a self-assessment tool and allow EU institutions to conduct a review, with the ultimate goal of issuing recommendations for the European Semester. Lastly, Article 11 refers to the effectiveness of recognized individual rights. Member states are encouraged to ensure access to effective dispute resolution mechanisms and take action against retaliation against workers seeking to ensure compliance with the rights provided by the directive. Additionally, there must be effective, proportionate, and dissuasive sanctions applicable in cases of national law violations.

The suspension of regulations during an economic crisis is evidence that the new mechanism is ineffective. Therefore, the characteristics of the new EU directive that can be used as a basis are:

1. Establishing the criteria that the minimum wage must meet;
2. The link between the minimum wage and the poverty level;
3. Government support for collective bargaining in this field.

The Directive specifies that states with existing social protection policies, including a guaranteed minimum income through collective agreements, will not be obliged to adopt the new rules regarding a sufficient European minimum income, provided that the current standards and conditions are more advantageous than those imposed by the directive.

Exposure of the problem

As the minimum wage plays a crucial role in combating poverty, it is an important factor contributing to sustainable development. In 2024, it marks a significant turning point in efforts to improve living and working conditions in EU member states, as the new directive on the minimum wage from Brussels is scheduled to come into force before November 15. We are currently in a period where the current global development agenda has set priority areas for the consolidated efforts of the global community. The main elements were outlined by 2015 and included a post-crisis financial structure, the setting of new global

goals - Sustainable Development Goals, as well as the updating of issues related to climate change (the Paris Agreement). The last factor that led to new adaptations and evolution to fit the new contexts was due to the crisis generated by the COVID-19 pandemic. Additionally, the global economic landscape has changed, and the conditions that influence and limit the capacity to achieve established objectives have shifted. Thus, macroeconomic conditions are different from the favorable conditions of the first decade of the 21st century: despite low interest rates, global economic growth has slowed, and issues related to global governance and prioritization in the face of limited resources for development assistance have intensified. At the same time, delays in addressing global challenges contribute to further deterioration of the situation and an increase in demand for resources (especially financial) in the future.

Therefore, to address the problems created by crises, the EU Directive was adopted as a solution, aiming to establish a framework for ensuring an adequate level of legal minimum wage, increasing workers' access to it, and facilitating collective bargaining on wage setting. One of the issues caused by the Directive could be that it significantly changes the rules for determining incomes for millions of Europeans. The document requests that each country in the Union establish clear criteria for setting a minimum wage. In this regard, indicators such as purchasing power at the national level, cost of living, level, distribution, and wage growth rate in the country, labor productivity, poverty threshold, and average nominal wage should be considered.

Minimum wages vary considerably in the EU, currently ranging from 477 EUR per month in Bulgaria to 2,571 EUR per month in Luxembourg. Luxembourg, Ireland, the Netherlands, and Germany have minimum wages exceeding 2,000 euros, while in France the minimum wage is 1,767 euros, and in Spain, it is 1,323 euros. It may be considered a problem that the actual minimum wage has decreased in most EU member states, against the backdrop of high inflation in 2022. Especially for member states with a large number of employees on minimum wage. The problems and/or challenges faced by each member state since the Directive came into force refer to establishing a framework for: Ensuring an adequate level of legal minimum wage; Facilitating collective bargaining on wage setting; Expanding workers' access to their rights to receive the minimum wage.

Research methods

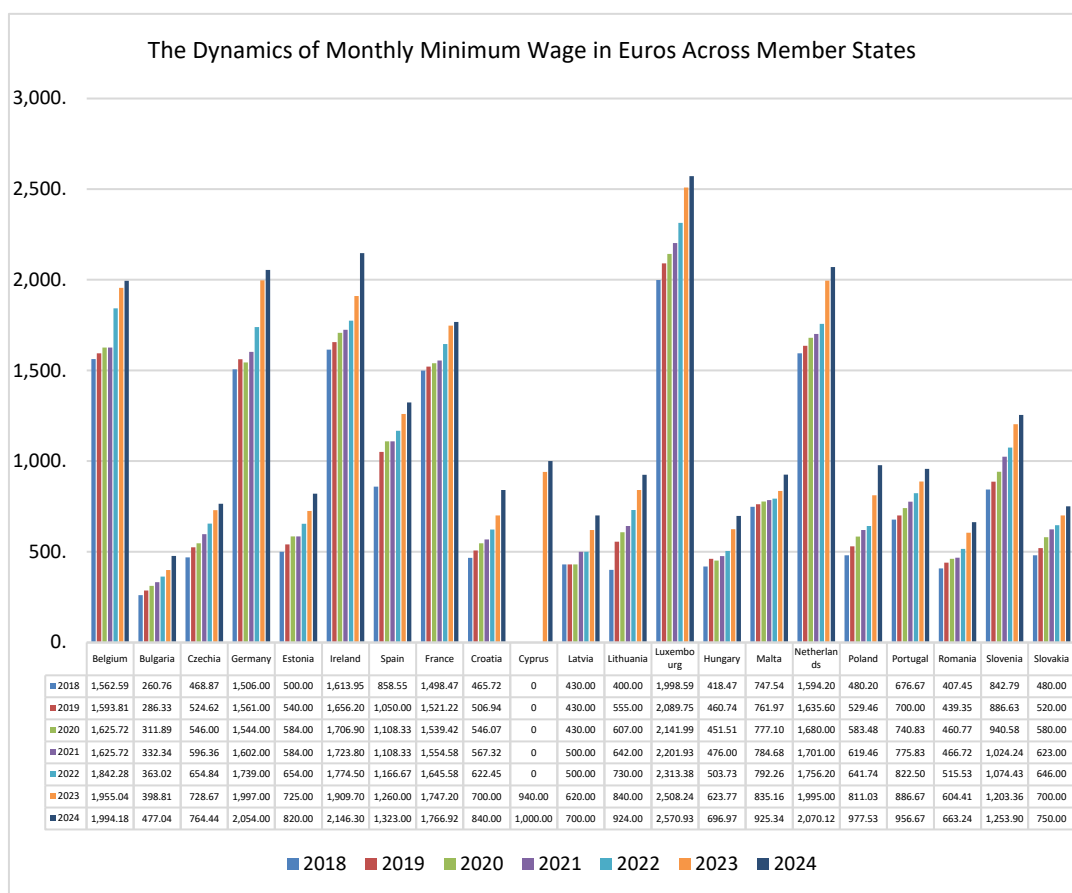
The main research method employed for this topic was an intensive analysis of official documents, regulations, etc., issued by the European Parliament, the European Commission, and the Council, as well as other official documents closely related to this topic. Additionally, examining and identifying previous studies/articles, reports, and other academic works that addressed the topic of minimum wage, collective bargaining, and the impact of wage policies. Another very important tool was the use of official statistical data, which formed the basis for the efficient evaluation of the minimum wage level in each EU member state, as well as examining its trends.

Findings

The minimum wage values in various European countries for each year between 2018 and 2024 have experienced the following fluctuations:

- Belgium: The minimum wage saw moderate growth during the period 2018-2021, with a significant acceleration in 2022 and 2023, followed by more moderate growth in 2024.
- Bulgaria: The minimum wage has steadily increased each year, but at different growth rates. There is an acceleration in growth in recent years, especially in 2023 and 2024.
- Germany: There is a consistent increase in the minimum wage during the analyzed period, but with minor fluctuations between years.
- Estonia: The minimum wage has steadily increased until 2023, then experienced a significant growth in 2024.
- Spain: The minimum wage had steady growth in the first three years but remained at the same level in 2021 and 2022, followed by moderate growth in 2023 and 2024.
- Romania: There is a consistent increase in the minimum wage each year, but with different growth rates. Fluctuations are more pronounced in recent years, especially in 2023 and 2024.

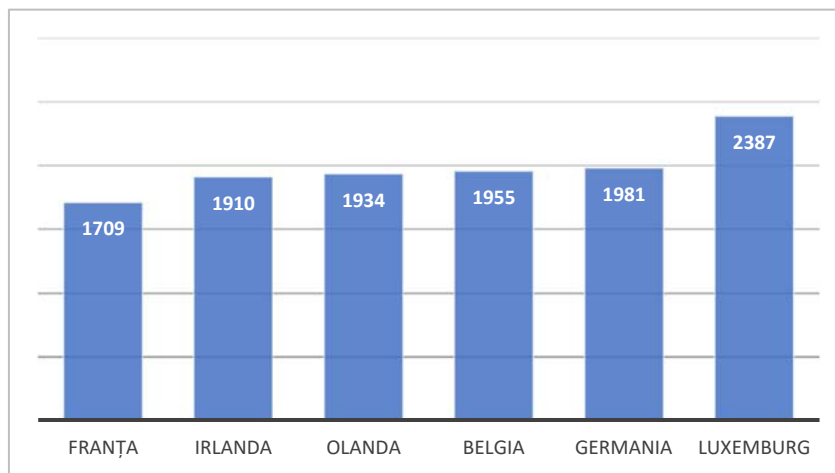
Figure 1. Own processing based on Eurostat data



The latest EU statistics published in January 2023 illustrate how national minimum wages in the EU vary from 399 EUR (approximately 440 USD) per month in Bulgaria to 2,387 EUR in Luxembourg, and how member states can be classified into three categories:

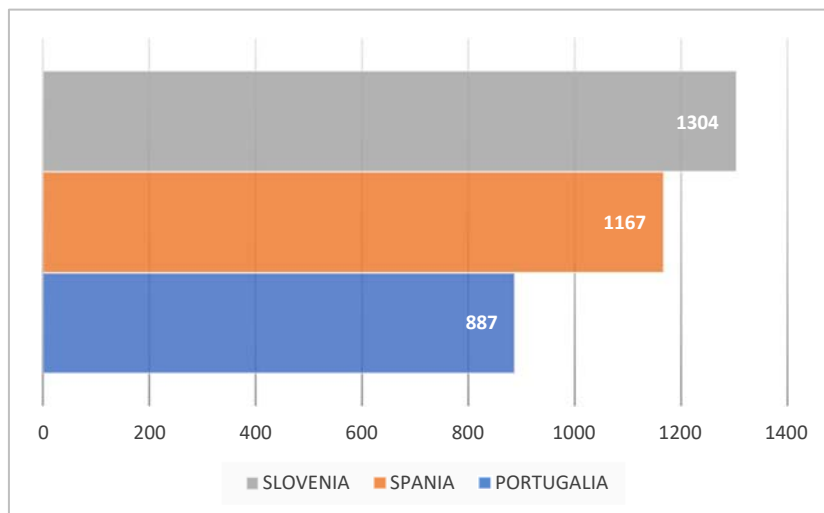
- Group 1 (Luxembourg, Germany, Belgium, the Netherlands, Ireland, and France), with a national minimum wage exceeding 1,500 EUR per month.

Figure 2. *Minimum wage (euro) group - I. Own processing based on Eurostat data*



- Group 2 (Slovenia and Spain), with a national minimum wage higher than 1,000 EUR but less than 1,500 EUR per month.

Figure 3. *Minimum wage (euros) group - II. Own processing based on Eurostat data*



- Group 3, with a national minimum wage below 1,000 EUR per month. This group includes Cyprus, Portugal, Malta, Lithuania, Greece, Poland, Estonia, Czech Republic, Slovakia, Croatia, Latvia, Romania, Hungary, and Bulgaria.

Even though the average annual growth rate over the past 10 years has been the highest in the EU (14.4%), Romania's national minimum wage of 606 euros is among the lowest among member states. The lowest-paid workers in Europe experienced a decline in wage value of up to 19% this year, representing the largest decrease in real minimum wages this century, according to an analysis by ETUC of Eurostat data. Legal minimum wages increased on average by 7.6% in the last year in the 21 EU countries that have one. However, in those same countries, the inflation rate increased by an average of 12.4%. This means that the real value of the legal minimum wage decreased by an average of 4.8%, leaving millions of workers struggling to afford the most basic costs of living, such as food, rent, and energy. It is only the second time since 2000 that the increase in real minimum wage has fallen below zero, and this reduction is significantly larger - at the peak of austerity in 2012, the increase in real minimum wage was -0.7%. Real legal minimum wages saw the most dramatic drop last summer in Latvia (-19%), Czech Republic and Estonia (-10%), and Slovakia (-8%). These developments have severely worsened the conditions of minimum wage workers in Europe, who often cannot make ends meet. Even before the cost-of-living crisis began, nearly one in ten workers in the EU27 was at risk of poverty, and 7 out of 10 minimum wage workers reported difficulties in making ends meet.

Conclusions and forecasts

The Directive on Adequate Minimum Wages indicates a significant shift in EU policy-making regarding employment and social affairs. With comprehensive provisions on minimum wage governance, it marks an important step towards achieving the objectives set out in the principles of the European Pillar of Social Rights, particularly a more socially resilient Europe. While time will tell whether the desired convergence in minimum wages will occur, the directive sets important guidelines on minimum wage governance, strengthens the role of social actors, and, more broadly, defines important normative notions about what the role of social actors should be in a fair and functional European social market economy. From a policy perspective, the changes introduced by the directive follow strong empirical evidence, identifying the adjustment of minimum wage rates to a range of economic indicators as an important tool for reducing inequality rates and promoting fair outcomes in the labor market. Similarly, timely and periodic updates to minimum wage rates, as well as the inclusion of social actors in minimum wage-setting mechanisms, have also been linked to positive outcomes. Beyond minimum wage regulation, the directive is noteworthy for the greater role it assigns to social actors: seen as key actors in implementing reforms that can improve working conditions for low-wage European workers.

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Beyond transactions: investigating consumer behavior in the digital economy

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Abstract. *The digital age has ushered in profound changes across various sectors, particularly in finance. Digitalization has transformed consumer behavior, introducing novel ways for individuals to manage and interact with their finances through digital money and cryptocurrencies. This abstract explores the intersection of digitalization, consumer behavior, and the emergence of digital currencies, emphasizing the implications and trends in this rapidly evolving landscape. The rise of cryptocurrencies, such as Bitcoin and Ethereum, has not only revolutionized the financial industry but has also sparked interest in understanding the factors driving their adoption and usage. These digital assets operate on blockchain technology, providing transparency and security, which are crucial in fostering consumer trust. However, the volatility and regulatory uncertainties surrounding cryptocurrencies pose challenges that need to be addressed to ensure their sustainable integration into the financial system.*

This article delves into these themes, presenting a comprehensive overview of the current state of digital money and cryptocurrencies. It also includes a case study based on a bibliometric analysis of research focused on cryptocurrencies. The case study aims to identify key trends, influential works, and emerging topics in this field, offering valuable insights into the academic and practical implications of cryptocurrency adoption.

Keywords: consumer behavior, digitalization, cryptocurrencies, Bitcoin, investments.

JEL Classification: A10, G41, D80.

Introduction

It has been noted that people are increasingly engaging with the digital environment. One of the main reasons for this, especially among consumers, is the desire to find information about the products they buy and use, as well as to hear other consumers' opinions about their purchasing experiences. In response, the digital environment has promptly adapted by enhancing the use of digital channels (Stephen, 2016).

Digitalization has fundamentally reshaped how consumers interact with products and services, providing unprecedented convenience, accessibility, and customization. Consumers now rely heavily on digital platforms for information gathering, purchasing decisions, and communication with brands. This shift has not only empowered consumers with greater choice and control but has also necessitated businesses to adapt their strategies to meet evolving consumer expectations in the digital realm. Understanding these dynamics is crucial for businesses aiming to leverage digital technologies effectively to enhance customer engagement, loyalty, and satisfaction. Moreover, as digital platforms continue to evolve, studying consumer behavior in digital contexts becomes increasingly vital for predicting trends, optimizing user experiences, and fostering sustainable business growth in a digitally-driven marketplace.

In today's rapidly evolving digital landscape, the relationship between digitalization and consumer behavior is becoming increasingly significant. The advent of digital money and cryptocurrencies has revolutionized the financial sector, introducing new ways for consumers to interact with their finances. As digital currencies gain popularity, understanding the behavioral patterns of consumers in this context is crucial. This article explores the intricate connections between digitalization, consumer behavior, and the rise of digital money and cryptocurrencies. Additionally, it presents a case study based on a bibliometric analysis focused on cryptocurrencies, providing valuable insights into current trends and research developments in this dynamic field.

Literature review

For billions of people, using the internet, social media, mobile apps, and other forms of digital communication has become an essential part of daily life. Research on consumer digital culture investigates in detail the online environments where they engage. An important aspect of these studies is how consumers' identities and personal perceptions are reflected and developed in digital spaces (Stephen, 2016).

In the digital age, businesses need to deeply understand their online customers. Successful online business models should include strategies like creating a good user experience, leveraging influencers, encouraging content created by users, and promoting word-of-mouth marketing. The interactions users have on social media, websites, and other digital platforms generate valuable data. This data helps businesses learn about their customers'

age, location, interests, and lifestyle, allowing them to better target their marketing efforts. Also, by looking at this data and studying how people act online, companies are trying to figure out what affects users' decisions. (Saura et al., 2020).

The financial sector is going through a major digital transformation. New mobile financial apps are now acting as intermediaries between consumers and traditional banks. These include social payment platforms, mobile banking, and digital payment services, which are the main ways consumers manage their finances. These payment services are often part of larger platform ecosystems that use integrated data to connect different parts of the market and expand across regions. Also, banks are facilitating this change by giving tech companies access to financial data networks through application interfaces and by outsourcing services to these tech providers. At the same time, tech companies are growing their businesses by incorporating payment features, allowing them to include financial transactions directly within their data streams (Ferrari, 2022).

Digital environments often operate in ways that are unclear and not transparent to users, leading to information imbalances. Users interact with these environments based on predefined technical features, tasks, and patterns set by the digital platform providers. The algorithms that determine how services are provided are hidden behind user-friendly interfaces. This information imbalance, combined with the power that digital companies gain from user data, allows these companies to exploit users' personal weaknesses. They use personal and behavioral data to subtly influence users' behavior and decision-making, for example, through personalized offers and pricing (Ferrari, 2022).

Case study - Cryptocurrencies

The digital economy, marked by the widespread use of digital technologies and the internet, has profoundly altered how we engage in business, communicate, and interact with financial systems. The cryptocurrency market has emerged as a substantial and transformative influence in this changing environment. Cryptocurrencies, spearheaded by Bitcoin and accompanied by numerous alternatives, are reforming financial transactions, investment methods, and even notions of value and trust.

The cryptocurrency market, as an alternative financial system, has drawn a wide array of consumers, from technology enthusiasts and libertarians to mainstream investors and speculators. Grasping consumer behavior in this dynamic and occasionally volatile market is of utmost importance for various stakeholders, including developers, investors, policymakers, and marketers, all of whom must cater to this diverse consumer base.

Consumer motivations in the cryptocurrency market are complex. Early adopters initially were motivated by ideological beliefs, especially those associated with libertarianism and a lack of trust in traditional financial institutions. These consumers valued the decentralized nature of cryptocurrencies, which offered increased financial privacy and independence.

The primary drivers for Bitcoin investments are social considerations, perceived benefits, a profound comprehension of financial problems, and the availability of essential resources (Gupta et al., 2020), while large investors base their investment choices on macroeconomic trends, fundamental technical research, and the diversification advantages offered by Bitcoin (Huang et al., 2022), which exhibits a low correlation with other assets (Nica et al., 2017).

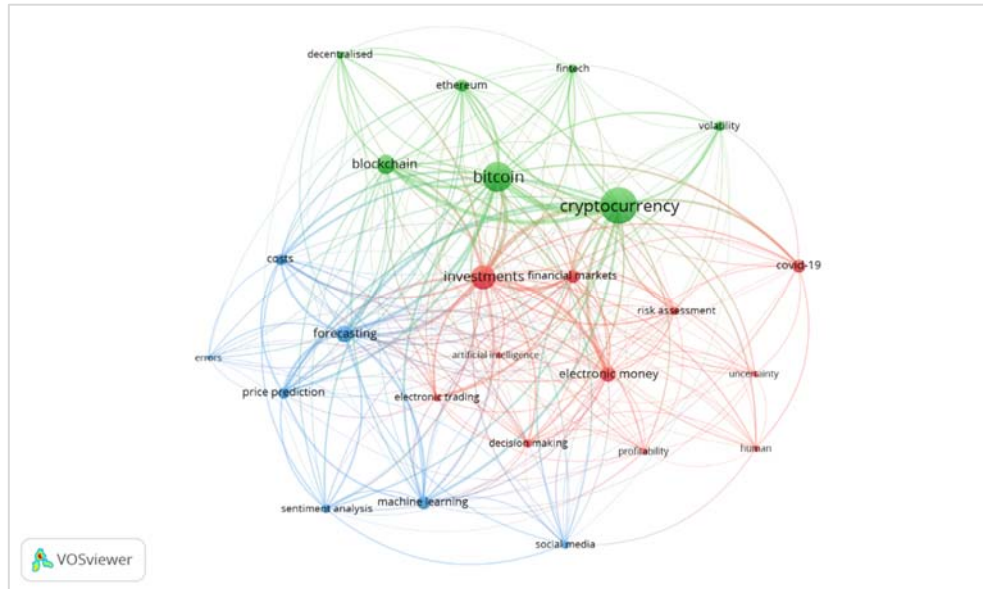
In the first quarter of 2024, the cryptocurrency market experienced substantial net growth of approximately 1 billion USD. Significantly, almost 61.8 billion USD entered the market via newly established Bitcoin ETFs according to theblock.ro. Although the new ETFs are approved for holding Bitcoin investments, the entire market is benefiting from the extra attention due to Bitcoin's dominance.

Bitcoin's huge success has led to the rise of many alternative cryptocurrencies, which are often called "altcoins." As the cryptocurrency ecosystem has grown, the Bitcoin dominance indicator has become a widely monitored metric. It shows the percentage of the total cryptocurrency market capitalization that can be attributed to Bitcoin (Lee et al., 2017) (Ballis & Δράκος, 2021) (Chuen et al., 2017) (Bonneau et al., 2015). This indicator is used to gauge market sentiment and provides insights into Bitcoin's relative strength and influence compared to other digital assets.

The Bitcoin dominance indicator is important because it helps us understand the overall trends and dynamics in the cryptocurrency market (Chuen et al., 2017). With over 4,000 cryptocurrencies currently tracked by CoinMarketCap, it's key to have a comprehensive understanding of the market's structure and the relationship between Bitcoin and the many other digital assets that have emerged in recent years (Chuen et al., 2017) (Bonneau et al., 2015).

Cryptocurrency bibliometric analysis

For the previously conducted bibliometric analysis, the Scopus database was used, from which 1,536 articles were downloaded. The VOSviewer software was also utilized to establish connections between keywords. From the mentioned articles, 5,696 keywords were selected. VOSviewer suggested a frequency of 5 occurrences for the keywords, which was adhered to. Out of the 5,696 selected keywords, only 425 met this criterion. Subsequently, to narrow the search scope, 50 keywords were chosen. After removing duplicates and grouping words with similar meanings into a single representative term, a final result of 25 keywords was obtained.

Figure 1. Co-occurrence network of articles - Keywords

Source: VOSviewer software

The analysis also revealed the presence of 3 clusters, forming 260 links. Cluster 1 includes the following keywords: artificial intelligence, Covid-19, decision making, electronic money, electronic trading, financial markets, human, investments, profitability, risk assessment, uncertainty. Research in this cluster explores how artificial intelligence and digital technologies are used to enhance decision-making processes in economic and financial contexts, particularly under increasing uncertainty caused by global events.

Artificial intelligence (AI) plays a crucial role in analyzing and predicting financial markets, decision-making processes, and risk assessment. The use of AI in these fields has grown exponentially, especially in the context of the pandemic. The Covid-19 pandemic has significantly impacted financial markets, generating an increased need for advanced tools to manage risks and make decisions under uncertain conditions.

The decision-making process in the financial context has become more complex during the pandemic, with AI playing an essential role in providing data-driven solutions. The rising popularity of electronic money and digital transactions has been accelerated by the Covid-19 pandemic, necessitating further research on their security and efficiency. Electronic trading technologies, which utilize AI to automate and optimize trading processes, are vital for modern financial markets. Financial markets are studied in the context of new technologies and the pandemic's impact, with a focus on adaptability and resilience. The human factor remains important in studying financial markets, particularly in terms of decision-making and risk perception. Investments are analyzed concerning profitability and associated risks, especially amid global economic uncertainty.

Profitability is a central objective of the research, assessed through the lens of new technologies and investment strategies during times of crisis. Risk assessment is crucial, particularly in the context of using AI to predict and manage financial risks in periods of uncertainty. The Covid-19 pandemic has introduced a high level of uncertainty, leading researchers to focus on finding ways to manage and reduce this uncertainty through advanced technologies.

On the other hand, cluster 2 includes the following keywords: Bitcoin, blockchain, cryptocurrency, decentralised, Ethereum, fintech, volatility. Bitcoin, as the first and most well-known cryptocurrency, serves as a foundational element of this cluster. Research likely examines its role as a digital asset, its market behavior, and its influence on the development of other cryptocurrencies and financial technologies. Blockchain technology, which underlies Bitcoin and other cryptocurrencies, is another critical area of study, with research focusing on its potential to revolutionize various industries by providing secure, transparent, and decentralized transaction methods.

The broader category of cryptocurrencies encompasses a variety of digital assets beyond Bitcoin. Studies explore different types of cryptocurrencies, their market dynamics, regulatory challenges, and their potential to disrupt traditional financial systems. Decentralization, a core principle of blockchain and cryptocurrencies, is investigated for its ability to improve security, reduce reliance on central authorities, and empower users by giving them more control over their transactions and data. The intersection of financial technology (fintech) with blockchain and cryptocurrencies is also a vital research area, examining how these technologies integrate into financial services, impact traditional banking, and drive the emergence of new business models. Additionally, volatility has been found to greatly influence the cryptocurrency domain, with the prices of digital currencies varying significantly. For example, in the early period, a bitcoin could be worth around \$4, and within 2-3 years, its value increased to approximately \$10,000, only to sharply drop to \$900 a few months later. Such events have been common in the cryptocurrency market, and high volatility is considered a risk for investors.

Lastly, the cluster 3 includes the next keywords: costs, errors, forecasting, machine learning, price prediction, sentiment analysis, social media. Research in this area examines the costs associated with implementing advanced analytical methods, including the financial investment in technology and infrastructure and the potential cost savings from improved forecasting accuracy. Managing and minimizing errors is a critical aspect of predictive modeling, with studies focusing on identifying sources of errors in machine learning models and developing methods to reduce these errors to enhance prediction reliability.

Forecasting is a central theme, with research exploring various techniques to predict future market trends and prices. This includes traditional statistical methods as well as advanced machine learning approaches. Machine learning is a key tool in this cluster, used for

analyzing large datasets, identifying patterns, and making predictions. Moreover, social media is a significant data source for sentiment analysis, with studies investigating how social media trends and public opinion can influence market behavior and how this information can be used in predictive models. The inclusion of social media highlights its role as a powerful data source for understanding market sentiment and trends, allowing researchers to capture real-time public opinion and its potential impact on market prices.

Conclusions

In conclusion, consumer behavior in the digital environment has become increasingly fascinating for companies. They are heavily investing in advanced technologies, including artificial intelligence, to gain profound insights into consumer preferences and significant data. Moreover, consumers are increasingly adopting digital payment methods, such as mobile banking apps or cryptocurrencies. The latter are characterized by high volatility, which can lead to consumer risk aversion.

Additionally, recent trends highlight that digital experience has become a critical factor in determining consumer behavior. Companies are adjusting their strategies to enhance digital interaction with customers and provide personalized services. Simultaneously, growing concerns about data security and privacy underscore the importance of trust and transparency in the digital realm.

Looking ahead, technological advancements will continue to redefine consumer behavior and companies' marketing strategies. Adaptability and the ability to quickly understand and respond to changes in consumer preferences and expectations will be crucial for success in an increasingly dynamic and competitive digital landscape.

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Shaping the EU map from the fiscal and labour cost approach

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Abstract. *Taxation plays a fundamental role in creating a fair society and building a strong economy. Through a well-structured tax system, it is possible to eliminate income inequalities and reduce production costs, including the labour costs. Fiscal policy can also have a large influence on employment decisions, investment levels and business expansion, all of which lead to stronger economic growth. At the same time, labour taxation plays an essential role in regulating imbalances on the labour market, influencing both labour supply and labour demand, through the impact on labour costs. Under such context, our paper aims to carry out a cluster analysis among the 27 EU member states to investigate how developed nations handle taxation of citizens' income and where Romania ranks in terms of fiscality, earnings and labour costs among European countries. Using a set of relevant indicators, we were able to group countries into 3 clusters and to differentiate between developed economies with a robust tax system and less developed economies with a tax system with frequent changes leading to a lack of predictability.*

Keywords: taxation, labour costs, earnings, cluster.

JEL Classification: J30, H24.

1. Introduction

Fiscal policies and well-structured tax systems play a fundamental role in fighting income inequalities, reducing labour costs and building strong economies worldwide. Labour taxation also helps regulating imbalances on the labour market, influencing both labour supply and labour demand, through the impact on labour costs. Clearly each of the components of the tax regime influences economic growth through several channels: total factor productivity and growth in the capital stock or labour supply.

Each country must build a fair and predictable taxation system on the labour market, especially since the labour supply of certain categories of the population (low-skilled workers, young people, elderly people, and people who have a second source of income of the family) is particularly sensitive to taxes and contributions to the social security system. At the same time, the structure of the tax burden on the cost of labour is important in the short term, because its various components can affect either labour demand or labour supply.

From the point of view of businesses, labour factor represents a cost (labour costs) that includes not only the wages and salaries paid to employees but also non-wage costs, social contributions payable by the employer. Thus, it is a key determinant of business competitiveness, although this is also influenced by the cost of capital (for example interests on loans and dividends on equity) and non-price elements such as entrepreneurship, skills and labour productivity, innovation, and product positioning within markets.

Having these into consideration, our paper aimed to shape the EU map from the fiscal and labour cost approach, through a cluster analysis among the EU member states. Comparing tax systems in EU countries involves understanding similarities in fiscal and tax regulations applied by the government to businesses and employees.

Using a set of relevant indicators, we investigated how developed nations handle taxation of citizens' income and identified where Romania ranks in terms of fiscality, earnings and labour costs among European countries. For that, a cluster analysis was performed using data from Eurostat website for the most recent available year- 2022, aiming to reveal similarities between countries. The selected variables were the tax rate, tax wedge on labour costs, hourly wages and salaries and hourly labour costs other than wages and salaries in industry, construction, and services.

The EU countries were grouped into 3 clusters, which could help us differentiate between developed economies with a robust tax system and less developed economies with a tax system with frequent changes leading to a lack of predictability.

The structure of the paper is the following. The brief literature review on the topic is presented in Section 2, while Section 3 describes the methodology and data used in the investigation. The main results of the analysis are presented in Section 4, while the last section concludes.

2. A review of the literature

Tax policies play a significant role in influencing both the economy and the labour force. When policymakers must make choices, they need to consider the trade-off between the benefits to the economy and the benefits to society. Gavouille et al. (2023) study labour tax evasion in Latvia using Machine Learning to classify companies as either following tax laws or evading them based on their wage reporting behaviour. The results show that companies which underreport wages do not react much to increases in minimum wage and adjust their strategy by shifting some of their undeclared wages to declared wages to comply with new minimum wage levels without significantly changing employment levels. On the other hand, companies that comply with tax regulations experience a greater decrease in employment after minimum wage hikes.

Daunfeldt et al. (2021) studied the impact of payroll tax cut implemented in Sweden in 2007, which aimed to lower labour costs for firms employing young workers (aged 19-25). The key findings of the research suggest that targeted payroll tax cuts can be an effective tool for boosting employment among specific groups without leading to significant wage-driven inflationary pressures. Authors estimate that reform created approximately 18000 jobs from 2006 to 2008, with many of these jobs being secured by the targeted young workers.

Abuselidze (2020) offers a detailed comparison of income taxation in developed and developing countries. The study concludes that developed countries focus on equity in taxation, while developing countries emphasize revenue mobilization with less consideration for fairness. Yet, the study suggests that implementing progressive tax reforms may improve the general economic welfare by boosting spending in lower and middle-income groups, thereby stimulating economic activity.

Previous study by Radu et al. (2018) classifies 41 OECD and EU countries into two categories according to their tax wedge, employment rates, and unemployment rates. The first group generally included nations with a higher rate of employment and a lower tax wedge. Romania was part of the second cluster, which had a higher tax wedge and lower employment rates compared to other countries. The analysis indicates that decreasing the tax wedge, especially by reducing the social contributions required from employers, could stimulate employment. This would be particularly relevant for countries in the second group, where there is a combination of high tax burdens and low employment rates.

Enache (2021) shows in a report that the tax burdens vary among countries, with Belgium having the highest and Chile the lowest. Moreover, countries with high tax burdens typically offer more extensive public services, funded through these taxes (Turkey had the highest family tax wedge in 2020, while New Zealand had the lowest). The report highlights how the marginal tax wedge can have a substantial impact on labour market behaviour, influencing decisions on additional working hours or taking on second jobs, distinguishing it from the average tax wedge.

Dolenc et al. (2010) have shown through the study conducted across 27 EU member states from 1999 to 2008 that reducing the tax wedge could be an effective policy tool for enhancing employment growth, especially in countries with higher initial tax wedges.

During the time of this research, the EU-27 average tax wedge decreased by 2.4 percentage points, correlating with initiatives across several countries to reduce unemployment and stimulate job creation.

From labour force mobility point of view, Tecl (2018) used various methodologies to compare the values for implicit tax rate across EU countries to the tax wedge measurement by Eurostat and OECD. He concluded that variances in tax rates are important for digital nomads and companies. Choosing a country can significantly affect their net income because of differences in labour taxation, leading to decisions on where to live or conduct business.

Aktaş (2023) used dynamic panel data analysis across 36 OECD member countries to explore the impact of tax wedges on income distribution across two household types: a single person earning 167% of the average wage and a one-earner married couple with two children earning 100% of the average wage. The main findings of this study reveal that larger tax wedges could lead to a more equitable distribution of income. The tax wedge's impact on income distribution does not differ by household size or income level, indicating a uniform effect across different family structures and economic statuses.

Analysing the impacts of increases in labour costs on companies' labour demand regarding employment and hours worked, Hamermesh (2021) highlighted that higher labour costs, which include wage rates and employee benefits, generally lead to reduced employment and fewer hours worked per employee. The paper outlined a general guideline based on research findings that suggests a 10% rise in labour expenses usually leads to approximately a 3% decrease in jobs or work hours. However, when confronted with similar rises in labour costs, employers are more likely to cut jobs for workers with lower skill levels than for those with higher skill levels.

3. Methodology and data

In order to investigate how developed nations handle taxation of citizens' income and where Romania ranks in terms of fiscality, earnings and labour costs among the European countries, we performed a cluster analysis. This method is an unsupervised technique that has the advantage of grouping similar observations by minimizing distance between objects within clusters and maximizing distances between clusters in a manner that distinct characteristics of the objects are captured.

Step 1: First step in conducting our investigation consisted in collecting the dataset for the EU countries from the Eurostat database for the year 2022, which was the most recent available year. The selected variables are presented in table below.

Table 1. *The dataset*

No.	Indicator	Abbreviation	Details
1	Tax rate	Earn_taxrate	Calculated for a single person without children earning 50% of the average earning
2	Tax wedge on labour costs	Taxwedge_labcost	
3	Hourly wages and salaries	Wages_salaries	
4	Hourly labour costs other than wages and salaries in industry, construction, and services	Labcost_other	The following sectors were excluded: public administration, defence, compulsory social security

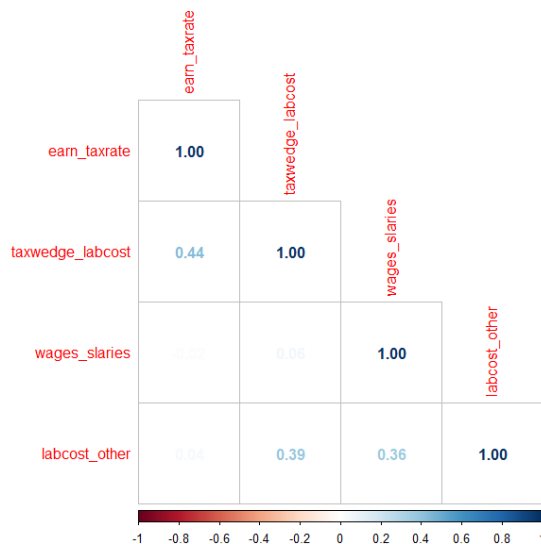
Source: authors' selection using the Eurostat database

Step 2: Next step consisted in checking the dataset through a brief data analysis and performing data preparation. More precisely, the data were standardized to ensure comparability of variables, by using the *scale()* function in the R software. Two countries were excluded from the analysis because of significant outliers (Malta and Cyprus). The correlation between variables was checked after that, using the Pearson coefficient. This coefficient calculates the linear correlation between two variables X and Y, represented by the formula:

$$r = \frac{\sum_{i=1}^n (x_i - \mu(X)) \times (y_i - \mu(Y))}{\sqrt{\sum_{i=1}^n (x_i - \mu(X))^2 \times \sum_{i=1}^n (y_i - \mu(Y))^2}}$$

where $\mu(X) = \frac{\sum_{i=1}^n x_i}{n}$ is mean of variables X, $\mu(Y) = \frac{\sum_{i=1}^n y_i}{n}$ is mean of Y and n is the number of observations. The correlation matrix can be visually represented using the R function *corrplot()*, as shown in figure 1. Since the correlation coefficients were all below 75%, we decided to keep all variables in the dataset.

Figure 1. *Correlation matrix*



Source: authors' own calculations in R.

Step 3 in our investigation consisted in applying a clustering method using an agglomerative clustering. Initially, each object was treated as a single-element cluster. The distance matrix was then created and populated with distances between every pair of objects, as illustrated in figure 2.

Figure 2. Selection from distance matrix

	Austria	Belgium	Bulgaria	Croatia	Czechia	Denmark	Estonia	Finland	France	Germany	Greece
belgium	1.2726063										
Bulgaria	3.5890326	4.1530473									
Croatia	3.2362747	3.8774292	0.4727784								
Czechia	2.4685277	3.3170041	1.6557665	1.2494609							
Denmark	3.2720723	3.4288991	3.5228019	3.3441632	3.7081172						
Estonia	2.8300412	3.8506712	2.0335550	1.6246325	0.7906177	3.9712752					
Finland	1.5477374	2.2964231	2.5717043	2.1855992	1.8371809	2.1748703	2.1343069				
France	1.0599623	1.5351722	3.8846174	3.6054951	3.0809229	3.1261614	3.4248888	1.9933118			
Germany	1.8749883	1.2904654	3.6212932	3.4477238	3.3064060	2.6341739	3.8954885	2.1608661	1.6277213		
Greece	3.1927415	4.1092105	1.4074949	1.0335579	1.0662706	3.6007323	0.8420154	2.1584441	3.6389351	3.8921480	

Source: authors' own calculations in R

The average linkage method was applied to merge the 25 EU countries into clusters. While it is a common practice to determine the number of clusters by cutting the dendrogram at the highest height, this research established the optimal number through repeated tests for the most accurate clustering evaluation.

Silhouette coefficient was used as the evaluation method for clustering algorithm, either for each individual object or the entire dataset. It is calculated based on the formula:

$$s_i = \frac{b_i - a_i}{\max\{a_i, b_i\}} = \begin{cases} 1 - \frac{a_i}{b_i}, & a_i < b_i \\ 0, & a_i = b_i \\ \frac{b_i}{a_i} - 1, & a_i > b_i \end{cases}$$

where a_i stands for the average dissimilarity between object i and all other neighbours in its cluster and b_i represents the minimum average distance between object i and a cluster which i does not belong. Overall, the silhouette coefficient is determined by averaging the individual coefficients of the objects in the sample.

4. Main findings

The European Union does not have a uniform labour tax system, allowing each country to establish the tax rates and purposes. Additionally, factors like economic growth, political ideologies, and the level of digitalization in a state can impact labour compensation. Table 2 shows a wide range of values for tax rates, tax wedge, and labour cost. Romania's comparison to other European countries can be established in this multi-criteria framework.

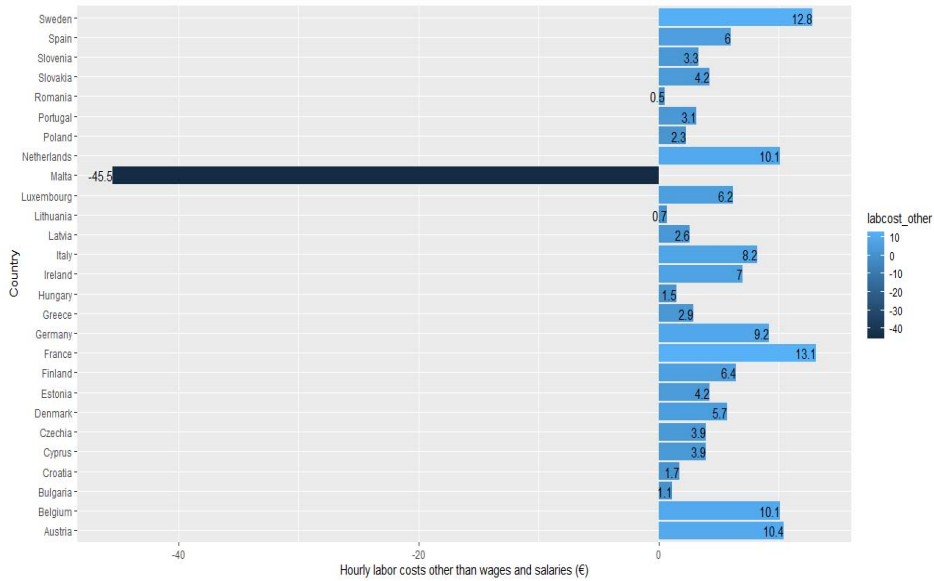
Table 2. Minimum, mean, and maximum values of the variables under analysis

	earn_taxrate		taxwedge_labcost		wages_salaries		labcost_other	
Minimum	6.87%	Spain	18.10%	Cyprus	€7.10	Bulgaria	€-45.5	Malta
Maximum	36.19%	Romania	46.5%	Belgium	€44.4	Luxembourg	€13.10	France
Mean	19.03%		35.58%		€20.04		€3.54	

Source: authors' own calculations.

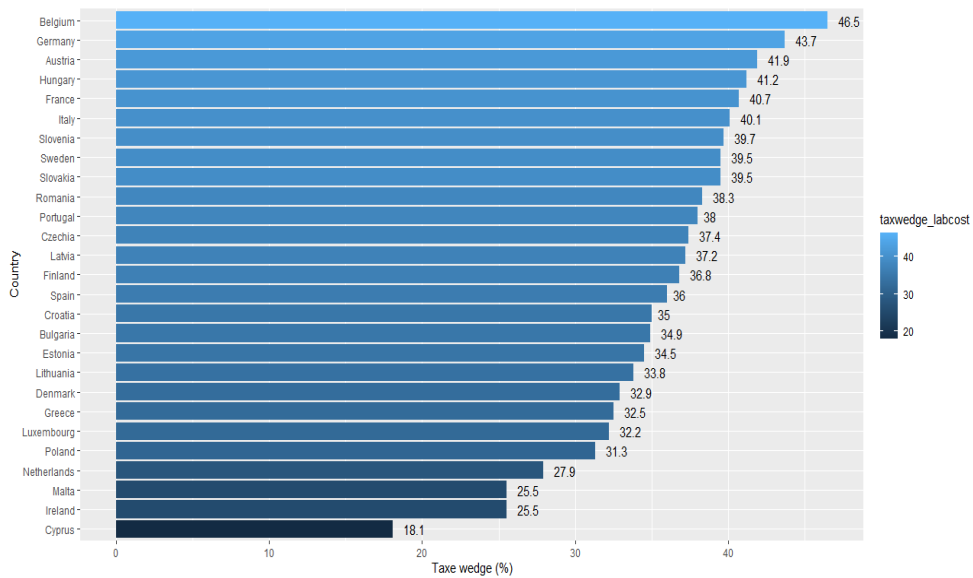
In terms of hourly labour costs other than wages and salaries, Malta is an obvious outlier, as can be noticed in Fig.3 below. After excluding Malta from the investigation, we notice that Romania had the lowest hourly labour costs other than wages and salaries in 2022 at €0.5, while France had the highest at €13.10/hour in 2022.

Figure 3. Hourly labour costs other than wages and salaries in 2022



Source: authors' own calculations in R.

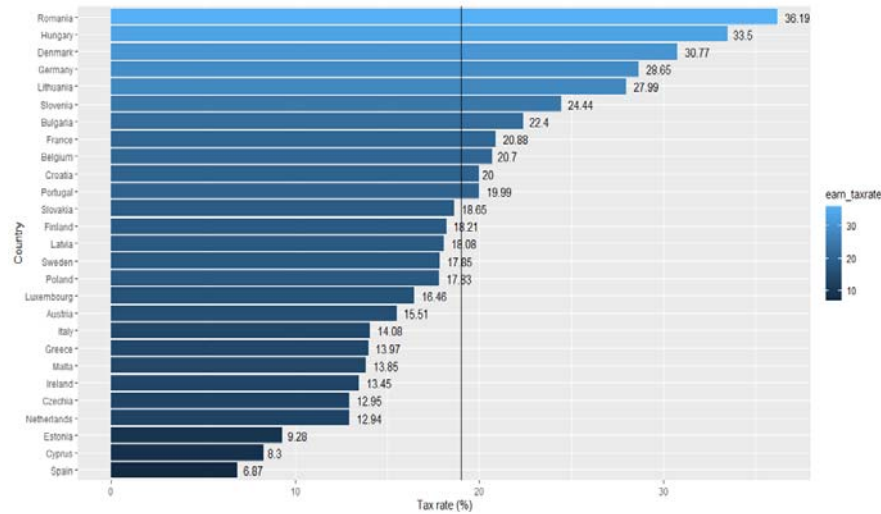
Figure 4. Tax wedges in 2022



Source: authors' own calculations in R

When looking at tax wedge, the value from Cyprus (18.1%, 7.4 percentage points lower than the next lowest value) impacts subsequent analysis. Like Malta, Cyprus was thus not included in the cluster analysis due to the same reasons. Therefore, after Cyprus, Ireland has the lowest tax wedge at 25% in 2022, while Belgium holds the highest percentage at 46.5% in 2022. Romania's fiscal pressure stands at 38.3%.

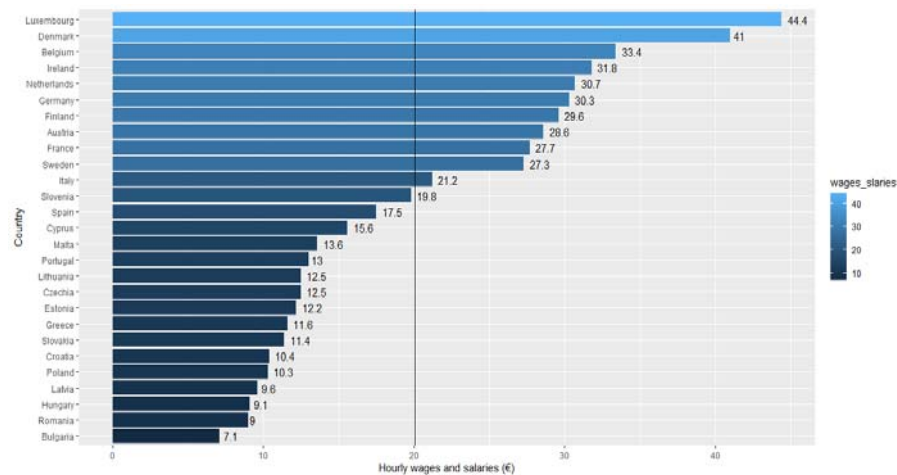
Figure 5. Tax rate in 2022 (mean: 19.03%)



Source: authors' own calculations in R

In 2022, Romania had the highest tax rate at 36.2%, while the average hourly wage for Romanian employees was the second lowest at €9/hour (€1.9/hour more than Bulgaria). The highest paid employees per hour are in Luxembourg at €44.4/hour with an income tax of 16.5% (lower than the 2022 sample average tax rate of 19.03%).

Figure 6. Salaries and wages in 2022 (mean: €20.04)



Source: authors' own calculations in R

Finally, the results of the hierarchical clustering for EU states up to 2022 is presented in the dendrogram and cluster plot below.

Figure 7. Dendrogram plot (average linkage method)

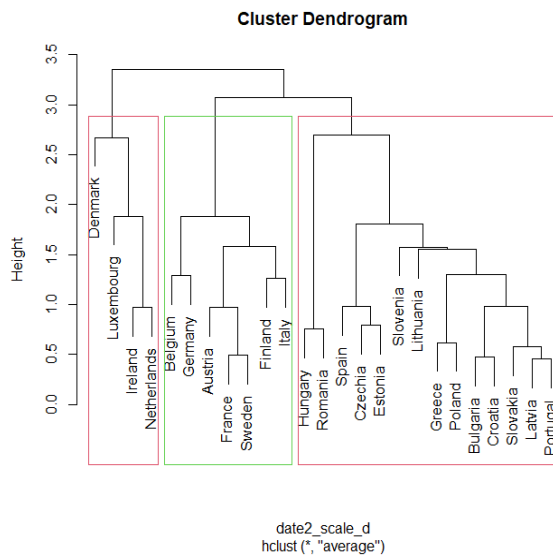


Figure 8. Cluster plot



Source: authors' own calculations in R

The dendrogram shows the countries' hierarchy and division into three clusters (fig. 8). According to figure 9, the clusters consist of:

- The first cluster (red cluster) includes Belgium, Germany, Austria, France, Sweden, Finland, and Italy;
- The second cluster (green) incorporates Hungary, Romania, Spain, Czech Republic, Estonia, Slovenia, Lithuania, Greece, Poland, Bulgaria, Croatia, Slovakia, Latvia, and Portugal;
- The third cluster (blue) comprises Denmark, Luxembourg, the Netherlands, and Ireland.

The first cluster includes economically strong developed countries in Central and Northern Europe with robust tax systems for both employees and employers. These countries typically have relatively high labour tax burdens compared to other countries. In general, they employ progressive taxation systems, with higher taxes applied for higher-income households. Moreover, these countries have rather robust social welfare systems which are to certain extent funded by taxes on labour, including funding for healthcare, education, unemployment benefits, and other social services.

The second cluster includes countries with small economies facing economic challenges and social unrest, being often referred to as Central and Eastern European (CEE) countries along with some Southern European countries. In general, these countries employ flat tax rates on households' income, which could generate higher tax burdens for lower-income households in comparison to progressive tax systems. Overall, these economies have lower tax burdens and less comprehensive social welfare systems than the Western European countries. The contribution rates to social security funds are also lower, being used to provide benefits such as pensions, healthcare, and unemployment insurance. Recently, some of these countries have undergone significant tax reforms to simplify their tax systems and to stimulate economic growth. For instance, Romania has recently undergone through numerous protests related to taxation on work and wages. Within this cluster, Romania shares most similarities with Hungary in terms of fiscal pressure and labour cost indicators.

Finally, the third cluster consists of four states (Denmark, Luxembourg, Netherlands, and Ireland) all ranking, in 2022, in the top five European countries for hourly wages and salaries among the first 8 states with the lowest fiscal pressure. Additionally, Luxembourg, the Netherlands, and Ireland have below-average payroll taxes, while all four states are among the top half for non-wage labour costs. In comparison to both the Western European countries and the CEE countries, the members of the third cluster have some distinct features in their labour tax systems. They are mostly characterized by high tax burden within progressive taxation systems, which helps fund their comprehensive social welfare systems and public services.

5. Conclusions

Having a well-structured tax system and effective fiscal policies could make the difference in fighting income inequalities and in reducing labour costs. At the same time, labour

taxation plays an essential role in regulating imbalances on the labour market, influencing both labour supply and labour demand, through the impact on labour costs.

We consider that to make the taxation of labour more efficient, policymakers should understand their country's tax wedge and how their tax burden funds government services. This will be particularly important as policymakers explore ways to encourage a robust economic recovery. Obviously, taxation causes a substantial deadweight loss in labour utilization which is larger than other labour market determinants, especially if the taxation system is not properly constructed and lacks continuity. This suggests that the latent welfare gains from a well-design tax system with minimum discouraging effects can go a long way and should be present for any country thinking about boosting their labour outcomes. Since rigidities in the labour market, to a significant extent, stem from policy making, there should be an integrated approach to structural reform implementation in each country.

Having these into consideration, our paper aimed to shape the EU map from the fiscal and labour cost approach, through a cluster analysis among the EU member states. Using a set of relevant indicators, we investigated how developed nations handle taxation of citizens' income and identified where Romania ranks in terms of fiscality, earnings and labour costs among European countries. The EU countries were grouped into 3 clusters, which could help us differentiate between developed economies with a robust tax system and less developed economies with a tax system with frequent changes leading to a lack of predictability.

In particular, the economies grouped in the first cluster are strong developed countries from the Central and Northern Europe, with robust progressive taxation systems and typically high labour tax burdens compared to other countries. The third cluster consisted of four states that were in 2022 in the top five European countries for hourly wages and salaries and among the first 8 states with the lowest fiscal pressure. On the contrary, the second cluster includes countries with small economies, characterized through lower tax burdens and less comprehensive social welfare systems.

Acknowledgments: *Part of this work was supported by the NUCLEU Program 2023–2026 funded by the Romanian Ministry of Research, Innovation and Digitization (PN-22100104).*

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Defining economic corridors: explaining the concept of economic corridors and their role in the European economy

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Abstract. *Economic corridors are a key idea in the framework of European economic integration, and they have a big influence on infrastructure connectivity and regional development. Geographical regions or transportation routes that make it easier for people, products, and services to move between states or regions are what they are known as. This essay delves into the idea of economic corridors and demonstrates their crucial function within the framework of the modern European economy. These efficiency instruments, which serve as vital transportation and infrastructure routes that ease the movement of people, products, and services between states and regions, have emerged as a key idea in European economic development. The definition of economic corridors in the context of Europe and their critical role in promoting regional cohesion and economic growth are the main topics of this essay. The study also identifies and highlights the ways in which economic corridors and traditional economies differ from one another and impact and changing the economic dynamics of EU member states and regions. Through a thorough analysis of the unique attributes of economic corridors and their influence on both economic and social integration, this paper offers a thorough understanding of their significance in the contemporary European economy and their ability to influence future regional and economic development. The study looks at various economic corridors and their effects on the European economy, including those related to transportation, energy, and communications. Along with the policies and tactics required to optimize their advantages, it also covers the opportunities and difficulties related to the creation and administration of economic corridors. This paper primarily investigates the definition and features of economic corridors through an extensive review of the literature and analysis of pertinent data. Included in these are factors like its geographic extent, the infrastructure that supports it, and the transportation and trade routes that traverse it. The statement underscores the significance of various forms of economic corridors, including those by land, sea, or air, in fostering regional cohesiveness and competitiveness.*

Keywords: cohesion, digitalization, corridors, competitiveness, opportunity cost.

JEL Classification: B41, E02, E44, E6, F4, F45.

Introduction

Economic corridors are networks of infrastructure that connect important economic hubs and help move information, goods, and services back and forth. Because they increase trade, facilitate access to markets, and foster regional cooperation, they are crucial for economic development. Economic corridors are crucial to the integration of national markets into the European single market. They promote economic expansion and regional unity by facilitating the free flow of products and services.

An indispensable instrument for advancing European economic integration and growth is the economic corridor. Governmental agencies can support Europe's economic and social objectives by creating more effective management and development strategies by having a better understanding of their concept and role. The study looks at the vital function that economic corridors play in the European economy. They are regarded as essential components for promoting economic integration, balanced regional development, and fortifying the European internal market. Corridors enhance Europe's economic competitiveness and stimulate trade and investment by facilitating better accessibility and connectivity among various regions and Member States. The planning, development, and sustainable management of the infrastructure and services connected to these corridors will require collaboration between Member States, European institutions, and the private sector. In the European Union, economic corridors can maintain their critical role in fostering social cohesion and sustainable economic growth by adopting an integrated and strategic approach (Wang and Fan). (2021).

Economic corridors are becoming a more important and vital idea in the age of globalization and economic integration as a means of promoting investment, trade, and transportation between states and regions. Economic corridors are routes of transportation or geographical areas that link various nations or regions and make it easier for people, products, and services to move between them. Depending on the size and economic makeup of the areas they travel through, they may be made up of land, sea, or air infrastructure. Though in the current economic context they can also include digital elements like communication and data transport networks, economic corridors are traditionally associated with land transport routes like highways, railways, or waterways. In order to improve regional competitiveness, promote trade and investment, and make it easier to access resources and markets, these corridors are crucial to the modern economy. Economic corridors have the potential to lower transportation and transaction costs, enhance connectivity among states and regions, and support sustainable development and economic growth. Therefore, in order to effectively and strategically address challenges and opportunities, it is crucial to understand the role and impact that economic corridors have in today's economy given the technological and economic changes of the last few decades (Abudayyeh and Alomar). (2021).

Literature review

Economic corridors are classified into various types based on their significance, the degree of participation needed to implement them, and the instruments' strategic, financial, and social value. The primary corridors are the air, sea, and land corridors, which are fundamentally communication corridors. Communication corridors are routes developed

for business purposes with the intention of streamlining work processes and involving various nationalities pursuing common goals. Additionally, there are a number of corridors that have less of an impact but still serve as indicators of cohesion. One example is the digital corridor, which is made up of digital communication infrastructures like the Internet and telecommunications networks and allows for the quick and easy exchange of information between various regions and EU Member States. They are crucial for fostering the EU's digital economy and for providing digital connectivity. Tourist corridors are also travel routes and destinations that draw tourists from all over the world and support the growth of the tourism sector and revenue-generating activities in various EU regions. Historic towns, tourist destinations, and natural areas (like Abudayyeh and Alomar) can all be found along tourist corridors. (2021).

The efficient movement and distribution of goods and materials between various production sites, warehouses, and consumption centers within the European Union is facilitated by the logistics and supply corridors, which are networks and routes. They are necessary for businesses' supply chains and the smooth operation of the economy. Complementing the aforementioned domains, research and innovation corridors comprise of research and development (R&D) networks and infrastructures that enable cooperation and technology transfer amongst various EU research institutions, universities, and businesses. They are essential for fostering economic competitiveness within the EU and innovation.

Cultural and educational corridors are bridges and initiatives that foster cross-national collaborations in the fields of education, art, and culture amongst various EU member states and regions. In the EU, they support communication and understanding among members and enhance cultural heritage. Corridors of this kind are special because they are the only part of the whole toolkit that deliberately targets the social and human side rather than simplifying profitable economic procedures or competitive tactics at the microeconomic level to boost productivity in comparison to competing economic entities. Economic corridors such as these highlight the significance of an integrated and coordinated strategy for fostering social cohesion and economic growth throughout the region and represent the diversity and complexity of connectivity and development within the European Union (Wang et al. 20, 2021).

Nonetheless, these corridors are frequently seen as incidental requirements or activities and mark an early stage in the development process. Depending on the primary objective of the route and the modes of transportation utilized, the various types of economic corridors can be categorized. Land, sea, and air corridors are among these varieties. Land corridors facilitate the overland movement of people and products and include inland waterways, railroads, and highways. They are categorized based on their final destination and direction, such as north-south or east-west corridors, based on the areas they cross. Depending on the transportation infrastructure utilized, they may also change based on the predominant mode of transportation, such as highways or rail lines (Wang et al. (2021).

These economic corridor types differ from one another in how they operate, what equipment and infrastructure they employ, and the particulars of the environments in which they operate. Various factors, such as the direction of trade flows, the type of transportation

used, or geographic connections, can be used to classify the main economic corridors at the international level. The three primary categories of these corridors are traditionally land, sea, and air, each with unique qualities and significance for the world economy. Transport routes utilizing land infrastructure, such as inland waterways, railroads, and highways, are referred to as land corridors. The efficient and convenient transportation of goods and services between adjacent or remote regions and countries is made possible by these corridors. Corridors that run east-west from Europe to Asia or north-south from Scandinavia to southern Europe are two examples of how they can be categorized based on their direction. If heavy goods and people need to be transported over long distances, they can also be categorized based on the predominant mode of transportation, such as railway corridors. Sea corridors are designed specifically for water transport, whereas land corridors are appropriate for land transportation. Air corridors are utilized for the rapid transportation of people and goods over long distances in a short amount of time. Accordingly, every kind of economic corridor has a unique role and set of advantages in the global economy, promoting communication and movement among various nations and regions (Liu et al. (2021).

Maritime corridors, which are shipping routes used to move cargo by water between ports and offshore terminals worldwide, are the second category. Since the majority of goods are transported by sea because of its low cost and high carrying capacity, these corridors are essential for international trade. The regions they travel through, such as the North Atlantic or Indian Ocean maritime corridors, determine how they are categorized. But these cases serve as a benchmark for global trade, which raises the competitiveness of third parties with comparable aims and objectives and affects European levels even though it is not a logistical or structural component of Europe. They can also be categorized based on the kind of goods that are transported; for instance, oil corridors or container corridors. Shipping lanes and seaports that are used to move cargo by water between various ports and locations are considered maritime corridors. Additionally, they can be categorized based on the kind of goods being transported; for instance, oil corridors or container corridors (Pandi et al. (2021).

Then there are air corridors, which are paths used to carry people and goods between airports all over the world. The quick movement of valuable goods and people between different regions and continents depends on these corridors for global connectivity. Major flight routes, like the transatlantic or transpacific corridors, or the principal air hubs along the route, can be used to categorize them. Routes utilized for flying passengers and cargo between various airports are referred to as air corridors. They can also be categorized based on the primary air hubs along the route (Abudayyeh and Alomar) and major flight routes like transatlantic or transpacific corridors. (2021).

Analysis

Understanding and efficiently managing the flows of international trade and transportation depend on the classification of economic corridors at the international level. It is possible to create suitable strategies and policies to support connectivity and sustainable trade

between states and regions worldwide by comprehending the diversity and unique characteristics of each type of corridor (Jena et al. (2021).

The Baltic Sea-Adriatic Corridor is a prominent illustration of a European economic communication corridor. It links ports on the Baltic Sea, like Gdansk in Poland, with ports on the Adriatic, like Trieste in Italy, through roads, railroads, and other transportation infrastructure. This corridor promotes economic growth and regional integration by easing trade and transportation links between the Adriatic region and Central and Eastern Europe. An additional noteworthy illustration is the Rhine-Alpine Corridor, which spans significant Western European regions like the Rhine Valley in Germany and Switzerland and the Alps. It serves as a vital conduit between North Sea ports and industrial and commercial zones in Central and Southern Europe. This corridor plays a vital role in the European economy and is essential for the flow of people and goods between northern and southern Europe. Another pertinent example is the Mediterranean corridor, which links the Mediterranean-bordering nations with Central and Western Europe through ports and transportation routes. This corridor serves as a vital conduit between Europe and the Mediterranean, promoting trade and cross-cultural interaction between the northern and southern parts of the continent. These instances highlight the significance of European economic communication corridors in promoting social and economic interaction among various EU member states and regions, thereby fostering economic cohesiveness and sustainable development throughout the continent (Liu et al. 2021).

It should be mentioned that every corridor is subject to a strategy with a defined goal and is discussed in relation to macroeconomic policies and objectives that are also clearly defined. However, the interdependence of influencing factors, which in turn create new markets and infrastructure, characterizes the operational aspect of these corridors. The communications corridor is the name given to the network of passageways that starve a self-contained infrastructure. Economic communication corridors are the networks and paths that facilitate the movement of people, products, and services between various states and regions. According to Jena et al., these corridors promote economic exchange and connectivity through land, sea, air, and energy transportation. (2021).

By their nature, economic communication corridors are connecting channels between markets, production and consumption, facilitating trade flows and economic cooperation between different economic entities. They play a key role in regional and global economic integration by promoting the mobility of goods and services and contributing to sustainable development and growth. They not only enable the transport of goods and people, but also facilitate the exchange of information and knowledge between different regions and states. They are important infrastructure for international trade, tourism, industry, agriculture and other economic sectors. In addition, they can also promote cooperation and dialogue between different communities and societies, thereby contributing to social and cultural development and strengthening relationships

From a variety of angles and with varying effects, economic communication corridors are significant. By facilitating the effective transportation of goods and people between various states and regions, they first aid in trade and economic interchange. They encourage economic growth and the creation of jobs by facilitating trade flows and assisting in the

expansion of both domestic and foreign markets. The European Union and other regional organizations' economic and social integration is supported by economic communication corridors that link various states and regions. They facilitate access to markets and resources, which helps to lessen economic disparities and foster regional cohesion (Krawczyk, 2021).

State and regional competitiveness can be raised by effective and well-developed economic corridors, which enable them to attract investment and realize their full economic potential. These corridors empower the private sector and foster innovation and expansion by cutting down on transaction and transportation costs. Transport and communication services must be developed, as well as sufficient infrastructure, for corridors to operate efficiently. This will have long-term positive effects on the economy and society by encouraging investment in infrastructure and related fields like information technology and telecommunications. Also, by promoting sustainable and effective transportation, they can lessen their negative effects on the ecosystem. They can aid in lowering traffic and pollution on the roads, safeguarding the environment and raising standards of living by encouraging more ecologically friendly forms of transportation like rail or inland waterway transportation (Jena et al., 2021).

An efficient method preferred by the European Union is to move transport methods from roads to other forms of infrastructure such as railways and shipping routes, both internal and external trade routes. Due to their ability to transport cheaper and more efficiently, these methods are preferable compared to other conventional means. First of all, both ships and trains can carry larger quantities of goods compared to other forms of transport such as trucks. A single ship or train can lead to significant cost savings on long distances. In fact, the longer the transport distance, the more efficient and practical alternative methods of transport become. This brings us to the second argument, namely the reduction of transport costs which, in maritime and rail terms, therefore significantly lower because significant costs for a producer such as fuel, maintenance and labour costs per unit of transport are eliminated from the supply process, which jointly become lower and more efficient. As a parallel topic, the advantages of a lower environmental impact are also constant, because the two alternative methods are less polluting and have a lower carbon footprint, which makes these transport methods more environmentally friendly.

Thirdly, reliable and regular transport scheduling are more affordable. The international freight exchange in this case acts as a vector of communication between providers and applicants. In most cases, these services are outsourced, and from an economic point of view, specialization on a certain segment of services or production leads to a greater competitive advantage through more added costs, thus being a win-win situation from which all economic agents have to win. Therefore, the reliability of alternative transport services arises as a result of fixed timetables which are commercially determined according to the intensity of ancillary traffic. Thus, the character of predictability appears, which gives economic agents the possibility to perform economic calculations, prior to the sale-purchase process, but also the efficiency that occurs as a result of a transport program designed to reduce traffic congestion and therefore unplanned delays.

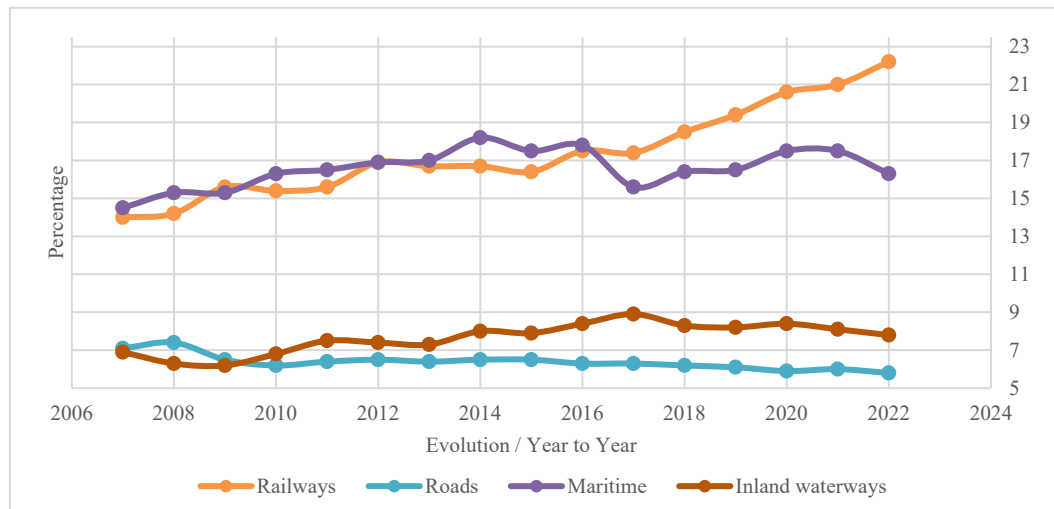
The last two advantages are those related to accessibility to the international market and the legal one to the scalability of transport. In terms of accessibility, ships allow access to continental markets, which is essential for business development and attracting capital and the national economy. Rail terminals and ports are built and optimized to facilitate the international exchange of goods. In terms of business scalability, companies have the choice to send more wagons or incinerate a larger space on a ship, depending on their needs, thus being about greater mobility and flexibility, which travels in both directions. In other words, if a company has to deliver a larger or smaller stock of goods, it can nominally choose, each time, depending on the contracted order, the necessary space for transport. Because of these sets of advantages, sea and rail transport are considered superior options for long-distance exports. They offer a higher economic efficiency and reduce from the entire work process an important series of costs that, besides reducing operating barriers on the market, also lead to cost reduction, which translates into a lower price borne by the final consumer, thus encouraging consumption.

In order to present these principles in a practical manner, it can be observe the composite indicator produced by Eurostat called Unitisation in the different modes of transport. These indicators proportionally reflect all goods that are transported and loaded into Domestic Transport Units (called ITUs), which are actually traditional, standardized transport units, but modified for multimodal transport. Modal transport represents different modes of transport that allow transport to be organized by choosing modules of combinations between different forms of transport. This process provides better economic efficiency, being essential in managing complex supply chains and facilitating international trade. These ITUs contain containers, bodies detachable from the main body and other removable packaging, in terms of the dimensions they offer. All these transport methods can be handled with simple equipment such as cranes. The indicator is calculated at European Union level, without a dedicated dataset for each country. The unit of measurement of data is based on millions of tonnes (of goods transported)/kilometres. The calculated rate is presented as a percentage of the total goods transported for each mode of transport, specifying that for rail and inland waterways, horse mode is made on the basis of estimates of gross weights. The indicator shows the potential for modal shift in transport for long-distance goods in different forms, while measuring the performance of transports and volumes of goods traded over a defined period of time, i.e. one year. This can be seen in Figure 1 below, which contains the data processed for intermodal transport, which were taken and processed from the Eurostat database.

Road transport between 2007 and 2022 had a reduction in use, implying a decrease in the efficiency and use of road transport for unit goods or a phenomenon of migration of parts of the freight flow to other modes of transport. At the same time, rail transport increased by more than 10 percentage points over the same period of time, which reveals companies' preferences for transporting goods by containers or other standardized unit methods through the rail network. The infrastructure developed as a result of investments and logistics efficiency are the main reasons that encouraged the reorientation of companies towards other methods of transport. Sea lanes have also become increasingly accessed by manufacturers, albeit not at the same rate. The main difference between sea and rail methods ultimately lies in the stability of the final destination, which is the decisive factor

in calling a particular means of transport. Sea transport has remained relatively constant, so preferred, because of its possibility to transport large quantities of products at the lowest costs.

Figure 1. Unitisation in the different modes of transport - tonne-kilometre for gross weight of goods (percentage of total)



Source: Authors own processing of data from Eurostat database.

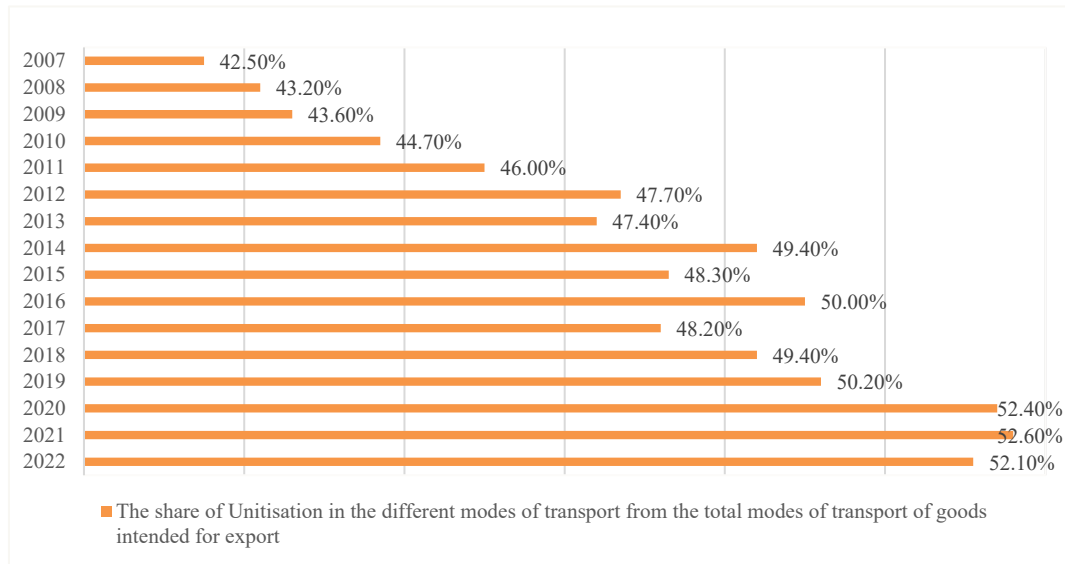
Finally, domestic shipping had a low upward trend. Although as useful as international shipping, domestic channels are not easy to access, and short distances do not allow costs to be amortized, so the opportunity cost of domestic shipping without traditional trucking methods is not as high as in the case of other modalities.

The data suggest a cratered trend in the utilisation rate of waterway and rail transport compared to low-utility and near-mature inland waterways, as well as the rate of traditional transport routes whose use is on a downward slope. The changes presented in Figure 1 suggest that alternative methods and multimodal transport lead to the increasing adoption of economic agents that are either not oriented towards supply chain efficiency, towards cost reduction, through logistical operational mechanisms.

Figure 2 shows the weight of the modal methods of transport of export goods from the total of transport channels. It can be seen how in the last 15 years at least, the economic operators have come to prefer the new transport methods in a greater proportion, being in 2022 a percentage of 52.10% of the modular transport methods compared to the traditional ones. The data reveals that economic agents significantly prefer alternative methods of transport.

As such, the development of economic corridors, specific to this sector, must be among the priorities of government representatives. The operational efficiency and usefulness is demonstrated, and as such their continued development represents a desired goal to be achieved.

Figure 2. The share of Unitisation in the different modes of transport from the total modes of transport of goods intended for export



Source: Authors own processing of data from Eurostat database

These debated aspects only concern the logistics part, but the theoretical applicability of the corridor savings are not applicable only in the transport area or even in areas with physical applicability. The field of service provision is equally subject to conceptual processes of efficiency through the integration of work operations through the formation of economic corridors. A modern economy and society depend heavily on economic communication channels for a number of reasons. Because they allow for the effective transportation of goods and people between states and regions, they promote trade and economic exchange. According to Jovanović and Petrović, they boost economic growth and market development by creating significant links between the production and consumption sectors. (20, 2021). Furthermore, they facilitate markets and resource access for underdeveloped and peripheral regions, and they support economic and regional integration. This contributes to lessening the disparities in social and economic conditions among states and regions. Economic corridors that are well-developed and efficient promote competition and innovation in the economy by making it easier for skilled labor, capital, and technologies to be accessed. This helps to increase economic growth and competitiveness. They facilitate the development of the private sector overall and businesses in particular. Moreover, they lead to decreased freight and passenger transportation costs and times, improving efficiency and boosting economic competitiveness (Thapa et al. 20, 2021). Companies and consumers can save a great deal of money thanks to them as they facilitate the optimization of logistics and supply chains. There is also the theoretical benefit of corridors strengthening social cohesion and connectivity. Economic communication corridors support social cohesion and enhance social connectivity by making it easier for people to access social services, employment opportunities, and quality education. According to Pandi et al., they guarantee citizens from

various regions and socioeconomic backgrounds equal mobility and access to opportunities. 20, 2021). Thus, because they facilitate trade, foster innovation and competitiveness, and support social and regional cohesion, the corridors are essential to the growth and operation of a modern, integrated economy. The long-term prosperity and sustainability of a country or region thus depend on investments and policies directed towards the effective development and management of these corridors (Jovanović & Petrović, 2021).

Nonetheless, corridors can also be found in places with strategic significance and occasionally even national significance, depending on the requirements that must be satisfied. The Energy Corridor, which is of strategic importance and aims to achieve economic security and European competitiveness at the European level, can be considered a communication corridor, but it is also the most pertinent example for this work. Energy is a component of all economic activity and is thought to be one of the key elements that can raise a country's competitiveness; however, if it is not managed well, it can become a vulnerability for the national economy and security (Krawczyk, 2021).

Energy corridors spanning Europe are transportation routes and infrastructures that are specifically designed to move energy, be it electricity, natural gas, oil, or other energy sources, between various EU member states and regions. These corridors play a critical role in today's economic development in a number of ways and are essential for Europe's energy security as well as for guaranteeing dependable and efficient access to energy resources. Energy corridors serve to reduce reliance on dominant transportation providers and routes by facilitating the diversification of energy supply sources and routes. By doing this, the risks associated with power outages and geopolitical pressures on energy supplies are reduced, and Europe's energy security is enhanced. Additionally, by making it easier for energy to move between various Member States, they support the integration of the European energy markets. Through more affordable prices and better services, it generates economic benefits for consumers and encourages efficiency and competition in the energy sector (Pandi et al. 2021).

Energy corridors have the potential to be extremely important for advancing sustainability and renewable energy in the energy industry. They help to achieve CO₂ reduction and climate protection goals by facilitating the movement of green energy between areas with high demand for clean energy and regions with high potential for producing renewable energy. Large investments in energy-related infrastructure, technologies, and services are necessary for their development and modernization. According to Jovanović and Petrović, these investments foster economic expansion and open doors for advancement and innovation in allied fields like information technology, engineering, and construction. 2021).

Because they support energy security, integrate energy markets, encourage sustainable energy, encourage investment and innovation, and fortify European integration and regional cohesion, energy corridors at the European level are therefore essential to today's economic development. Therefore, ensuring a competitive, sustainable, and resilient European economy requires efficient management and development of these corridors.

Discussion

Comparatively speaking to China and the USA, European economic corridors are essential for boosting competitiveness in external markets. European economic corridors are crucial for boosting exports and imports from the European Union (EU) relative to its major trading partners, China and the United States, in the context of global trade and goods flows.

The effectiveness and accessibility of the transportation and communication networks in the European economic corridors should be the first consideration. The EU is able to transport goods efficiently and competitively to and from foreign markets thanks to these well-developed corridors. European exporters and importers find the European economic corridors to be an appealing alternative to China and the USA, which occasionally experience issues with congested infrastructure and expensive transportation (Karapetyan and Karapetyan, 2021).

Second, a diverse network of economic corridors that ensures connectivity to multiple regional and international markets benefits the European Union. By doing this, European businesses will be able to expand their export markets and explore new ones outside of the EU. With its economic corridors, the EU can gain easy access to a wide range of foreign markets, unlike the US and China, which are perceived as dominant exporters in many sectors and having robust domestic markets, respectively (Poudel et al. 2021).

A common trade policy, as well as consistent rules and regulations for global trade, are additional advantages for the EU. In contrast to China and the US, which might be involved in trade disputes or implement protectionist measures, this provides a more stable and predictable environment for exporters and importers. The cohesiveness and consistency of European economic corridors contribute to the development of trade and trust relations with other countries.

Conclusions

The economic structure and strategy of the European Union (EU) are largely based on corridor economies, which offer a major strategic advantage to both individual economies and the region as a whole. These corridors—which are made up of highly developed and connected transportation networks like highways, railroads, ports, and airports—can promote economic development and growth in a number of ways and have a major positive impact on all EU member states. The corridors help to improve social and economic cohesion within the EU and make it easier for all of the region's economies to access both domestic and foreign markets. These well-built corridors facilitate easier access to external markets and supply chains for businesses operating in less developed and isolated regions, which in turn promotes economic growth and job creation in those areas. It ensures balanced development throughout the region (Karapetyan and Karapetyan) and helps lessen economic disparities between EU member states. (2021).

Second, by cutting down on the expenses and time associated with goods transportation, corridor economies improve the competitiveness of European businesses on the world market and promote global trade. These corridors facilitate more efficient supply chains

and easier transportation of goods, providing European businesses with a competitive edge over their global rivals. They also streamline customs and logistics procedures. Further encouraging economic growth and innovation throughout the region are corridor economies, which facilitate foreign direct investment and draw outside capital to the EU. They are necessary to fortify the European internal market and economic integration. In addition to removing trade and administrative barriers, these corridors foster regional and global cooperation and enable the free flow of goods and services between EU member states. In addition to raising the effectiveness and competitiveness of the whole region, it helps to establish a single market and an integrated economic area in Europe.

In summary, through effective transportation and communication infrastructure, a variety of reachable external markets, and a stable common trade policy, European economic corridors significantly contribute to the growth of external market competitiveness, particularly when compared to China and the USA. By making effective use of these corridors, the EU can outperform its principal international rivals in terms of imports and exports while also bolstering its position in the global market.

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Digitization in education: an analysis of trends, benefits and challenges

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Abstract. *Digitization is a complex and dynamic process that brings both opportunities and challenges, but it is essential to balance the use of technology with preserving the benefits of traditional learning to ensure quality and equitable education for all involved in the educational process. Digitization in education is a process of integrating technology into various aspects of both learning and teaching process, process which is wide-ranging and long-lasting and brings with it a number of pros and cons that need to be considered in order to fully understand the implications of this change. Current trends show a rapid increase in the use of technology in education, including the use of mobile devices, online learning platforms and digital collaboration tools. These offer significant opportunities for personalized learning, increased accessibility to education and the development of essential digital skills. The benefits of digitization in education include increased accessibility to educational resources, personalization of learning, increased interactivity, efficiency and time savings, extended collaboration and adaptability to individual student needs and pace. However, challenges such as unequal access to technology and internet, over-reliance on technology and loss of social skills, quality of educational content, and data security concerns require special attention.*

Keywords: digitization, education, community, technology, artificial intelligence.

JEL Classification: I20, I21, O33.

Introduction

Digitization has become a topic of increasing interest in recent years, reflecting the radical transformations brought by technology in all aspects of our lives, thus we can say that technology has become an essential part of education. Digitization in education is the process of integrating digital technology into learning and teaching process and can include the use of mobile devices, online learning platforms, digital resources and digital collaboration tools to support and improve access to and quality of learning. Digital education refers to the use of digital technology to support and enhance learning and teaching and can include the use of educational software applications, online learning platforms and other digital technologies for educational purposes.

The process of digitization in education is a necessary adaptation to this new reality, where technology is not just an auxiliary tool but becomes an integral part of the learning and teaching process. By implementing technology in classrooms and educational processes, new horizons of exploration and learning open up for students, and opportunities are created for teachers to diversify their teaching methods and improve their effectiveness in imparting knowledge. This rapid evolution of technology has brought a fundamental change in the way we learn and teach, creating new opportunities but also significant challenges. In this paper, we aim to explore current trends in the digitization of education, analyze the benefits of this transformation and identify the challenges it faces. We will examine how technology influences learning and teaching and its impact on students, teachers and educational institutions. Through this comprehensive analysis, we seek to better understand the implications of digitization in education and to highlight future directions in this crucial area for the evolution of our society.

Literature

Januszewski and Molenda, (2007), explore how technology can be used to support and improve educational practices in diverse contexts and environments, discuss current trends in educational technology and highlight the challenges associated with using technology in learning. Highlights that technology can stimulate student interest and engagement, support the development of their skills and competencies, can be used to assess student performance and monitor their progress over time. They provide both theoretical and practical aspects of educational technology and offer a valuable insight into the role of technology in education.

Davidson and Goldberg, (2009), explore how technology can be used to support equal access to education and highlight the importance of adapting educational institutions to emerging technological and social changes. They look at the challenges and opportunities of digitization, highlight the importance of collaboration and innovation in education, and

promote the idea of building a participatory and interactive learning environment where learners are encouraged to be active players in the learning process.

Collins, A., & Halverson, R. (2009), explore how digital technology is influencing and changing the educational system in the United States and propose a number of ideas for adapting it to the digital age. The authors examine how technology can influence both learning outcomes and teaching and assessment in schools, argue that technology can be used to adapt content and teaching methodologies to individual needs and pace to improve academic performance, and highlight the challenges as well as opportunities associated with the digitization of education, such as access to technology, the quality of digital content, the need for in-service teacher training and the protection of personal data.

Warschauer, M., & Matuchniak, T. (2010), *New technology and digital worlds: Analyzing evidence of equity in access, use, and outcomes*, *Review of Research in Education*, 34(1), 179-225. Warschauer, M., and Matuchniak, T. (2010), examine different levels of access to digital technology among students and communities, highlighting economic and social disparities and how these disparities may affect students' learning opportunities and academic performance. Discusses strategies and interventions that can help promote equity in access, use and outcomes of technology use in education and encourages ongoing research to identify best practices and interventions regardless of socio-economic or cultural context.

Bates and Sangrà, (2011), stress the importance of higher education institutions adapting to ongoing technological change, highlight the need for institutions to be flexible and open to adopting and integrating new technologies into learning and teaching, and outline various strategies and practices for using technology in different educational contexts, including distance learning, blended learning and problem-based learning.

Ferdi Serim, (2012), explores how digital technology can be used to develop and assess the skills needed for success in the 21st century, such as critical thinking, problem solving and collaboration, and also highlights how online learning platforms can make learning more engaging and attractive to students. The book provides detailed descriptions of each NET, offers clear instructions on skills learning, and includes dozens of activities that integrate NETS and a companion DVD with video interviews and project maps to track student progress.

Fullan, M. (2013), discusses the importance of involving the entire educational community in the technology integration process, highlights the importance of focusing on educational outcomes and performance improvement, and stresses the importance of creating a stimulating and motivating learning environment that encourages co-learning and critical thinking.

Ribble M., (2015), proposes to explore the concept of digital citizenship and provides a framework for asking what we should do to become productive and responsible users of

digital technologies. The author provides strategies and resources for integrating the concept of digital citizenship into the school curriculum and warns that there are risks associated with the security of students' personal data and sensitive information that may be exposed in the digital environment.

Lerman and Hicks, (2010) provide a practical guide for school administrators on how technology can be effectively integrated into the educational environment to support student learning. They explore issues such as equipment and software selection and acquisition, teacher training, technology infrastructure and resource budgeting, and offer practical suggestions for integrating technology into various aspects such as teaching and assessment, school administration, parent and community communication, and school data management. The paper offers a holistic approach to digitization and provides useful strategies and resources for the effective implementation of technology in learning and teaching.

Clark (2019), examines the dilemma between adopting technology in education or sticking to traditional teaching and learning methods and explores the pros and cons of digitization. It highlights the role of the teacher in the context of digitization and explores strategies and approaches they can adopt to integrate technology into the curriculum and adapt to the changes brought about by the digital world. It also outlines some future directions in the digitization of education and proposes ideas and strategies for minimizing the risks associated with the use of technology in learning and teaching.

Selwyn, N. (2016), proposes a critical approach to evaluating the role of technology in education, urges deep reflection on its benefits and limitations, recognizes that the impact of technology in education can be complex and ambiguous, and examines the multiple ways in which technology can affect learning by considering different contexts and perspectives. It highlights that technology can provide opportunities for improving the educational process, but also highlights the risks associated with misuse or overuse of technology. In 2022 we conducted a questionnaire on a sample of 269 respondents, students at ASE-Bucharest, aged between 18 and 24. The aim of the survey was to identify the most important issues facing students during the pandemic period (March 2020-March 2022) in terms of online educational activities. The results of the questionnaire confirmed the challenges they faced, namely: decreased attention, decreased motivation, impaired interpersonal communication, anxiety, depression, stress and inability to manage time properly. What helped them during the pandemic were the course and seminary materials posted on ASE.ro, the explanations and case studies solved together with the teachers on the zoom platform.

Digitization of educational processes – pros and cons

If we talk about digitization in general, we will certainly seek to make every effort to implement digital technologies in industry, transport, trade, marketing, administration, tourism, business and others, because digitization and technologies in some economic processes will make our work easier, we will get a certain good or service in a shorter time, we will have quick access to certain information, and other advantages, but when we talk about education, there are pros and cons.

Digitization of education – pros and cons

Pro-digitalisation of education	Opinions against digitisation of education
Increased accessibility to educational materials and online courses from anywhere, eliminating geographical and economic barriers	Unequal accessibility, students from disadvantaged backgrounds or rural areas may have difficulty accessing online resources and may be marginalised due to lack of technology, equipment and high-speed internet connection
Adapted to individual learning needs and pace, there are online learning platforms that offer personalised materials and activities	Digitisation can lead to an over-reliance on technology, which can affect critical thinking, problem-solving skills and the ability to communicate effectively offline
Using digital tools makes learning more interactive and engaging	There is a risk that personal data may be exposed or misused by third parties
Educational games, simulations and other multimedia activities can increase engagement and understanding of concepts	Technology offers access to a range of educational resources, but the quality of these may vary. There is a risk of being overloaded with information and having difficulty assessing and selecting relevant and reliable content.
Digitisation can make administrative and assessment processes more efficient and cost-effective, saving time for both students and teachers	Excessive use of technology in education can lead to social isolation, reducing human interactions, affecting the development of social skills and interpersonal relationships.
Online and automatic grading can reduce the time needed to correct work and provide instant feedback	The digitisation of education involves high costs for the purchase and maintenance of equipment and the necessary technological infrastructure
Accessibility to a wide range of educational resources, offering a variety of ways to learn, understand and process information	Reliance on technological infrastructure may be vulnerable to certain technical changes or failures and which may negatively affect the learning process
Digital technologies facilitate collaboration and communication between students and between students and teachers. Online platforms provide tools for sharing information, collaborating on projects and real-time discussions, encouraging collaborative learning and developing social skills.	Excessive digitisation impairs attention, memory and playback capacity, the ability to make connections is reduced and information from short-term memory is no longer stored in long-term memory

Sweden, which ranks among the top countries in terms of investment in digitization, will allocate €55 million for 2024 and €42 million for the following years to facilitate the switch back to traditional textbooks, following a study published in Reading Literacy International (PIRLS) which found that the proportion of 10-year-olds with severe difficulties in attention, reading and comprehension has increased over the past five years from 12% to 19%. Research has shown: multitasking impairs attention and working memory, affects test performance, recall, text comprehension, note-taking, self-control and personal effectiveness. The Netherlands, another digitally-oriented country, has decided to ban the use of digital devices in classrooms, so Dutch Education Minister Robert Dijkgraaf said that "students need to be able to concentrate and need to be given the opportunity to study properly, and mobile phones are distracting..." (www.activenews.ro)

UNESCO Director Audrey Azoulay also sounded a warning that "the digital revolution has immeasurable potential, but just as warnings have been issued about how it should be regulated in society, similar attention should be paid to how it is used in education". According to UNESCO's Global Education Monitor report for 2023, it points out that there are currently too few serious studies to show that digital technology brings real benefits in education, and while it may offer opportunities in terms of access to information, the downsides are far more numerous and dangerous for new generations (UNESCO calls for smart phones to be banned in schools worldwide, article available: <https://www.digi24.ro/stiri/actualitate/educatie/unesco-cere-ca-telefoanele-inteligente-sa-fie-interzise-in-scoli-in-toata-lumea-2440675>)

PISA (Programme for International Student Assessment) test results in Romania were below the world average, but with improving trends in some areas. In the PISA-2022, 7600 students from 260 schools took part and the results were similar to those recorded in 2018 in maths, reading and science, with 49% of those tested falling into the functional illiteracy zone and only 4% achieving high performance scores. Eighty-one countries were included in the test, and Romania ranks 45th or 48th, depending on the subject, and second to last in the European Union (https://www.edu.ro/comunicat_presa_103_2023_rezultate_PISA_2022).

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Digitizing education – an analysis of trends and benefits

Digitization in education took off with the COVID 19 pandemic and has become increasingly prevalent in recent years, and an analysis of trends in this area can provide useful insight into its evolution and impact on the whole educational process.

Trends and benefits in the digitization of education:

- Development of online learning - with the increase in internet accessibility and technological advancement, online learning has become a fast and efficient option for many pupils and students because online platforms offer interactive courses, varied educational materials, the ability to access and learn information at one's own pace, the advantage of rereading and viewing information whenever needed, etc.
- Technology will become an indispensable component of the educational experience - in schools and universities technology is integrated into the learning process, from the use of tablets and mobile devices to the use of learning management platforms, through apps, case studies and projects.
- Adapting content and teaching methods to the individual needs of learners allowing for personalization of learning, thus adaptive learning systems use data and algorithms to provide feedback and offer personalized resources for each learner.
- The use of augmented reality which makes it possible to superimpose a virtual reality on the real world and provides unique opportunities for immersive and interactive learning experiences. Basically this concept can enhance an observer's perception of the environment, can be used to create realistic simulations, virtual tours and other activities that enrich the learning process.
- In the context of a changing digital economy, there is a growing emphasis on developing digital competences and skills in education, so pupils and students are encouraged to acquire knowledge and develop new skills to prepare them for a changing labor market. The Romanian Ministry of Labour and Social Protection encourages short courses to acquire certain skills in a short time such as: IT and programming courses, massage courses, hairdressing and pedicure, barman, waiter, electrician, mechanic, carpenter, etc.
- The use of blockchain technology in education can revolutionize the way academic records, certificates and diplomas are managed, providing better data and information security, transparency and control over the verification of records and documents.
- Increasing the use of cloud computing services in education will facilitate access to educational resources, collaboration between students and teachers, because users can access a specific infrastructure, servers and software applications, provided cheaply and efficiently over the internet to build applications and efficiently manage data and IT infrastructure.
- There is growing concern about data security and privacy protection, and educational institutions will need to pay particular attention to protecting sensitive student and teacher information.
- The digitization of education can play a key role in making education accessible to people with disabilities by providing tools and resources tailored to their individual and special needs through virtual assistants and other specialized applications and provisions.
- Digital technologies can be used to stimulate creativity and innovation in learning, providing opportunities to explore and experiment with new ideas and concepts.

- The concept of micro learning (teaching and learning through short, focused lessons) is gaining popularity because micro learning platforms provide quick access to information and allow for lifelong learning.
- Increased investment in start-ups and educational technology projects (EdTech Projects), bringing innovations in educational content, assessment, classroom management and parent engagement.
- Digital education focuses not only on the development of technological skills, but also on emotional intelligence and social skills (SEL), providing access to a range of materials and tests to develop psycho-emotional skills.
- Technology facilitates access to educational content from around the world, allowing students to explore diverse perspectives on global cultures and topics.
- The use of technology can revolutionize the process of assessment and certification of competences, providing platforms for continuous assessment and validation of competences acquired outside the traditional educational environment etc.

Challenges in digitizing education

The challenges, in terms of digitizing education, require a holistic approach that considers both benefits and risks, and ensures that technology is responsibly and effectively integrated into the learning process. Moreover, it requires concerted efforts from all actors involved in the digitization of education, including governments, educational institutions, teachers, parents and the wider community.

Here are some challenges:

- Dependence on technology which becomes a substitute for basic skills such as reading, writing and mental arithmetic.
- Information overload, which may create confusion and make it difficult to distinguish relevant and valuable information from less important or even incorrect information.
- Social isolation and exclusion which can affect relationships and social skills.
- Reinforce teachers' work, teachers will have to adapt their educational content to new requirements, including developing digital content, managing online learning-delivery platforms and providing technical support to students.
- Intolerance to change, some teachers, especially those who are older, may develop a repulsive attitude towards new digital implementations in education.
- Excessive use of technology will have a negative effect on students' physical, mental health and emotional well-being. Sitting in front of the monitor, besides being addictive, affects the physical side, leading to pathologies such as obesity, cardiovascular disease, diabetes, etc. and from there it is one step further to the mental and psychological degradation of all actors involved in education.

Conclusion

In conclusion, digitization in education is a topic of great interest that is trending increasingly from year to year and brings both distinct benefits and challenges. The increasing development and adoption of technology in the learning-teaching process as well as the integration of innovations such as artificial intelligence are essential elements that the education system must actively regulate and adopt so that the quality of information that students assimilate is current and relevant to the society of 2024.

At the same time, it is crucial that these digital challenges are approached and implemented in a responsible way, ensuring that technology is used to support and enhance the digital experience and not make it more difficult.

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Economic inequality influences the trend of sustainability?

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Abstract. *Economic inequality poses a significant challenge in achieving sustainable development goals on a global aspect. The present paper delves into the complex relationship between economic inequality and sustainability trends, exploring how disparities in income and wealth distribution influence environmental degradation. In order to answer the present question, the author proposes a multidimensional approach, incorporating theoretical frameworks, empirical evidence, and a case study in order to highlight the impact of inequality. The paper examines the mechanisms through which economic inequality hampers progress towards sustainability. Also, it explores potential pathways for reducing these challenges, in ways that include policy interventions, community initiatives, and corporate CSR approaches. By exploring the existing literature and offering insights into future research directions, this paper contributes to a deeper understanding of the complex interconnection between economic inequality and sustainability, in the end aiming to inform strategies for fostering more equitable and environmentally resilient societies.*

Keywords: inequality, sustainability, environment, development.

JEL Classification: D63, F64, O56, Q01.

Introduction

Economic inequality is a big obstacle in the pursuit of global sustainable development, shaping the trajectory of progress in the global pursuit of sustainable development. This study examines the intricate relationship between economic inequality and sustainability trends, seeking to elucidate the profound impact of disparate income and wealth distribution on environmental well-being. By reviewing the existing literature, we aim to uncover the multifaceted ways in which economic inequality influences the journey towards sustainability.

Regarding unequal access to resources and opportunities for differential exposure to environmental hazards, scholars have identified a multitude of factors through which socioeconomic disparities undermine efforts to achieve development goals. By synthesising these findings, we aim to present a comprehensive understanding of the complex interplay between economic inequality and sustainability.

From policy interventions aimed at redistributing resources and enhancing social equity to community-driven initiatives and corporate sustainability practices, scholars have proposed a range of strategies for fostering more inclusive and environmentally resilient societies. By examining these interventions, we aim to gain insight into effective approaches for mitigating the adverse impacts of economic inequality on sustainability outcomes.

However, despite the wealth of scholarship on this topic, gaps in knowledge persist, highlighting avenues for further research. By identifying areas ripe for exploration, such as the present study of the intersectionality of economic inequality with other forms of marginalisation and the role of governance structures in shaping sustainability outcomes, we aim to catalyse scholarly inquiry into this critical issue.

The existing context

The issue of economic inequality remains a significant challenge in regards to global sustainability, throwing away efforts to establish equitable and environmentally resilient societies. This chapter highlights the profound consequences of economic inequality on sustainability trends, through a meticulous exploration, there will be exposed various aspects of this intricate issue, tracing its origins in historical and structural inequities to its far-reaching implications for environmental well-being.

To comprehend the full extent of the problem, it is crucial to situate economic inequality within the context of its historical origins. Income inequality is an old consequence of the way economic activity is carried out. Centuries of colonialism, imperialism, and exploitation have perpetuated enduring disparities in wealth and power, shaping the contours of the contemporary global economy. The impact of these historical injustices is evident in contemporary socio-economic structures, habits and ways of practice in perpetuating cycles of poverty and marginalisation that obstruct progress in flattening income inequality and towards sustainability.

There is an intricate network of structural inequities that propagate and amplify economic disparities. The literature suggests that inequality within countries can have dramatic economic, political, and social consequences, which may impede the achievement of sustainability goals (Litwin, 2022). Inequality obtained from the disparity in access to education, healthcare, and economic opportunities serves to entrench the chasm between the affluent and the disadvantaged, restricting upward mobility and perpetuating transgenerational cycles of poverty. Furthermore, discriminatory policies and practices marginalised vulnerable populations, exacerbating disparities along the lines of race, gender, ethnicity, and geography.

The link between economic inequality and ecological degradation is indisputable. Individuals at the lower echelons of the income ladder are disproportionately affected by environmental hazards, ranging from air and water pollution to climate change-induced catastrophes. Additionally, the pursuit of economic growth frequently comes at the expense of environmental sustainability, widening the gap between the wealthy and the impoverished and perpetuating a downward spiral of ecological deterioration. But interestingly, while some studies have found that economic growth is not influenced by a growth in income inequality in the short term, long-term income inequality can exacerbate the wealth gap, which may hinder sustainable development (Gan, 2023).

Regarding social cohesion and stability, economic inequality poses a significant challenge, resulting in decreased trust in institutions and an increase in resentment and discontent among the marginalised masses. As disparities widen, a gap emerges between the privileged elite and the disadvantaged population, leading to social unrest and political upheaval. The erosion of social cohesion not only impedes efforts to address pressing sustainability challenges but also threatens the very fabric of democratic governance. The problem of economic inequality extends beyond national boundaries, with far-reaching consequences for global sustainability. As wealth becomes increasingly concentrated among a privileged few, disparities between nations widen, exacerbating issues of poverty, migration, and geopolitical instability. Additionally, the interconnected nature of the contemporary economy means that environmental degradation in one region can have far-reaching consequences, reverberating across the globe and exacerbating inequalities on a planetary scale.

The issue of economic inequality is intrinsically linked to sustainability trends, from its historical roots to its modern manifestations. The problem poses a significant challenge that demands urgent attention and concerted action to address the structural inequities that underpin it. Only by fostering a more just, equitable, and environmentally sustainable world can we hope to overcome the challenges posed by economic inequality and achieve a more stable and cohesive society. (Masud et. al., 2018)

Case Study

Income differences affect the economy as a whole, because often the working class is poorly paid, the average income of society is small or non-existent, and those with high incomes are not interested in investing their short-term profits. In specific areas or

industries, the necessary infrastructure for sustainable initiatives may not yet be fully developed or may be lacking, such as renewable energy networks or waste management systems.(Carforaa et. al, 2019) Thus, without the regulatory intervention of an authority, the issue of sustainability ends up being among the last priorities. In certain situations, there may be resistance to adopting new practices from individuals who are used to traditional methods and are hesitant to embrace innovative solutions. (Chiara L., 2018)

However, European countries like Sweden, Denmark, the Netherlands, and Finland, as reported in the 2019 Global Competitiveness Report, have exhibited lower levels of economic inequality and more successful implementation of consumer behaviour that aligns with the sustainability principles. These countries have demonstrated a strong commitment and systematic approach to promoting sustainable practices and transitioning towards a circular economic model, although they are not entirely immune to issues related to economic inequality and consumer behaviour in the context of the circular economy.

For the purpose of this research, the author suggests choosing data from the following sources: the European Union (which represents the average of Europe), and the leaders in development and innovation, namely the Netherlands, Denmark, Finland, Belgium, and Sweden, as well as Romania, which serves as the antithesis and as an aspiration towards the future.

Table 1. *Income distribution on the areas of interest*

Areas of interest	2015	2016	2017	2018	2019	2020	2021	2022	2023
European Union - 27 countries (from 2020)	5.22	5.16	5.03	5.05	4.99	4.89	4.99	4.74	-
Romania	8.32	7.20	6.45	7.21	7.08	6.62	7.10	6.00	5.83
Netherlands	3.82	3.93	3.99	4.05	3.94	4.15	3.88	3.94	-
Finland	3.56	3.58	3.54	3.65	3.69	3.72	3.58	3.75	3.78
Denmark	4.08	4.06	4.08	4.11	4.09	4.	3.93	4.03	4
Belgium	3.83	3.85	3.84	3.79	3.61	3.65	3.42	3.57	3.38
Sweden	4.06	4.25	4.27	4.13	4.33	4.12	4.04	4.36	4.73

Source: Author's research based on Eurostat data.

Is important to note that the indicator used is designed to assess the level of income inequality within a given population. It is determined by dividing the total income earned by the top 20% of earners by the total income earned by the bottom 20% of earners. Also the symbol “-” is placed where there wasn’t data to display.

Studying the position of our country regarding sustainability and inequality is vital to highlight the disparities between our country and other leaders in the field and to gain a comprehensive understanding of the path that our country could take. Adopting a strategic approach enables us to recognize both our advantages and shortcomings, thereby facilitating the formulation of future policies and actions.

We can see the disparities in income distribution between Romania and other European countries. The fact that Romania surpasses the European average signifies that the nation confronts a more pronounced economic inequality, with a considerable segment of the population lacking access to financial resources and opportunities. This predicament can be attributed to various factors, such as high levels of poverty and unemployment,

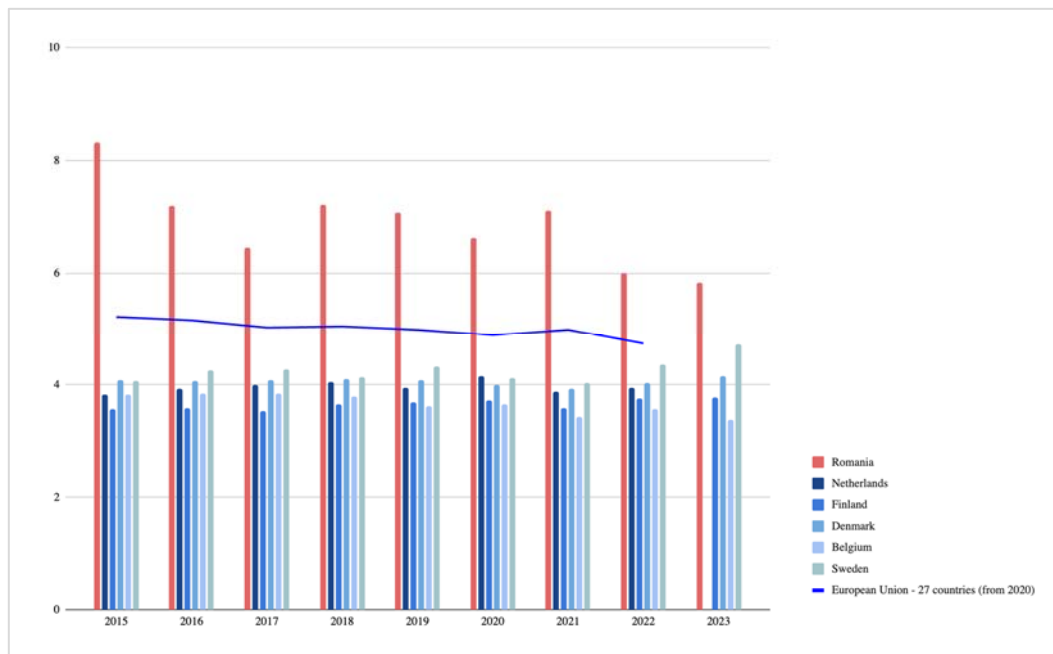
inadequate access to quality social and educational services, and disparities in regional development and access to opportunities.

The countries of the European Union, including the Netherlands, Denmark, Finland, Belgium, and Sweden, exhibit a lower level of economic inequality despite having a lower income distribution compared to the European average. This is largely due to their more progressive social and economic policies, which are aimed at reducing inequalities and promoting social and economic inclusion for all citizens.

Disparities in income distribution can result in significant consequences for a country's social cohesion and economic stability. Economic inequality can give rise to social tensions, marginalisation, and decreased social mobility, consequently affecting the sustainable and balanced development of society.

Given these findings, it is essential that economic and social policies address the concerns of inequality and work towards the fair distribution of resources and opportunities for all citizens. This might involve increasing the minimum wage, investing in education and vocational training, providing access to health and social care services, and implementing fair and progressive tax policies.

Figure 1. Chart of the income distribution



Source: Author's research based on Eurostat data.

The results obtained from the income distribution indicators suggest that Romania is in a less favourable position compared to the European Union average and to countries such as the Netherlands, Finland, Denmark, Belgium and Sweden.

The data indicate that Romania faces an unequal distribution of income, with a substantial part of the population belonging to the lower income categories. This can lead to social disparities and hinder the ability to ensure a decent life for all citizens.

Countries such as the Netherlands, Finland, Denmark, Belgium and Sweden are known for their substantial efforts in promoting sustainability. These nations have implemented policies and programs aimed at reducing carbon emissions, conserving natural resources, promoting renewable energy sources, and improving environmental quality.

Romania's ability to implement effective sustainability policies could be hindered by insufficient resources, underdeveloped infrastructure and conflicting public policy priorities.

Unequal income distribution can lead to increased social disparities and the marginalisation of certain segments of the population, thus hindering efforts to promote sustainability.

People with lower incomes, for example, may be more susceptible to the consequences of climate change or pollution and have fewer resources to protect their health and the environment.

It seems that more proactive political intervention is needed to reduce economic inequalities and promote sustainability in Romania.

Such interventions may involve initiatives such as redistributing income, improving access to education and health services, promoting employment and investing in green infrastructure. (Lehmann C. et al. 2022)

To effectively address economic inequality and sustainability issues, it is essential to coordinate policy areas such as the economy, environment, health and education.

In short, Romania faces obstacles related to economic inequality and sustainability, and addressing these challenges requires cohesive and coordinated political actions at both national and European levels.

Conclusions and recommendations

It is clear that economic inequality significantly impacts global sustainability trends. Growing economic disparities can hinder initiatives to foster a healthy environment, fair economic growth, and social unity. On the other hand, embracing sustainability can help alleviate economic inequalities by creating employment opportunities and promoting environmentally-friendly economic growth for all citizens.

To effectively tackle these intricate challenges, it is essential to implement comprehensive policies and practices that tackle economic inequality and environmental sustainability concurrently. This involves implementing equitable fiscal measures, ensuring access to education and healthcare for all citizens, investing in eco-friendly infrastructure and renewable energy sources, and fortifying social safety nets. (Snorre et. al., 2008)

Romania should enhance its international partnerships and collaborations to share experiences, access resources, and contribute to global efforts to tackle climate change and promote sustainable development. In addition, future studies ought to analyse the impact of circular economy practices on inequality, particularly in terms of resource access, employment opportunities, and environmental justice.

Global and regional collaboration is also essential to address these complex issues. By sharing best practices, cooperating between states and international institutions, and promoting dialogue and civic engagement, we can build a more sustainable and equitable future for all citizens of our planet.

For implementing a more sustainable model there will be needed investments in infrastructure and resources for collecting, recycling, and recovering materials and waste. In certain areas of Romania, the waste management infrastructure is lacking or inadequate, which presents obstacles in implementing circular practices. Income inequality can be flattened through education and access to resources, which can give people access to better living conditions and better paying jobs. In Romania, there is a need to raise awareness about the importance of environmental sustainability and circular economy practises and their advantages for the environment and society. For example, transitioning to a circular economy model often entails changes in consumer behaviour, production practices, and government policies. Resistance to change from consumers, industries, and governments can slow the implementation of sustainable practices. (Stiglitz J.E., 2002)

By addressing income inequality, implicitly, sustainability can be discussed more easily, this step can help Romania move towards a more sustainable and inclusive economic development model.

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EU transport policy and economic corridors: How EU transport policy affects the development and functioning of economic corridors

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Abstract. *Developing a transport policy to promote economic growth, maintain sustainability and enhance connectivity between its participant states has long been a priority of the European Union (EU). This paper examines the significance of economic transport corridors in EU transport policy. This research highlights the correlation between regional infrastructure advancement and broader European transport strategies by exploring the advancement of EU transport policy and its orientation towards the requirement of economic corridors. Facilitating smooth connectivity and incorporation between Member States is a priority of EU transport policy, allowing the unrestricted movement of people, products and services. By improving availability and reducing transport costs between regions, financial transport corridors – described by cautiously constructed networks of roads, railways, ports and airports – are crucial to attaining this goal. To promote financial growth and reinforce cross-border trade, EU transport policy often prioritizes the architecture and modernization of key transport corridors. Furthermore, promoting viable transport practices within the EU rests, relies on economic transport corridors. EU transport policy focuses on energy efficiency, traffic reduction and minimizing carbon emissions along transport corridors by placing a potent emphasis on multimodal transport solutions and environmental concerns. The European Union (EU) hopes to build a more resilient and viable transport procedure in agreement with its long-term and climate objectives by investing in green infrastructure and cutting-edge technologies. In addition, financial transport corridors within the EU act as a stimulus for cohesion and regional development. These corridors assistance less evolved areas integrate into the larger European market by promoting connectivity between peripheral and central regions, boosting financial growth and job creation. In authority to reduce regional discrepancies and promote social incorporation between Member States, EU transport policy prioritizes investments in transport infrastructure projects that facilitate the growth of economic corridors.*

Keywords: economic corridors, EU transport policy, connectivity, sustainability, regional development.

JEL Classification: Q48, R10, R40, R42, Z21.

Introduction

The objectives of the European Union (EU) transport policy are diverse and cover a wide range of issues that reflect the EU's transport policy concerns and priorities. These goals are intended to help improve the mobility, efficiency, safety and sustainability of transport across Europe. The EU's aim is to promote an efficient and interconnected transport network that enables the free movement of people and goods between member states and regions. The aim of this goal is to remove obstacles and barriers to mobility and create a European transport area without borders. Another important priority of EU transport policy is promoting sustainable mobility and a low-carbon transport system. This includes measures to reduce pollution, greenhouse gas emissions and congestion, as well as promoting cleaner and more energy efficient modes of transport (Makarova et al., 2020). The EU's aim is to improve the safety of road, rail, air and maritime transport and to reduce the number of accidents and deaths registered each year. This goal includes implementing high safety standards and strict driving rules as well as promoting innovation and advanced technologies to prevent accidents. The EU also wants to stimulate innovation and promote the adoption of digital transport technologies to improve efficiency, traffic management and the passenger experience. This includes developing digital infrastructure and intelligent mobility services as well as supporting transport research and development. EU transport policy also aims to promote social cohesion and integration and ensure fair access to transport services for all European citizens, regardless of their location or socio-economic status. This includes supporting local public transport in rural and peripheral areas as well as promoting mobility for people with disabilities or low incomes (Siddiqui et al., 2023). An economic corridor is an infrastructure route or network that serves as a main axis for the transport of goods, people and services between different geographical regions or countries. These corridors are strategically designed to facilitate the movement of goods and people, thereby contributing to economic development and regional integration. An economic corridor can include a variety of modes of transport, such as highways, railways, inland waterways, ports, airports and other transport facilities. In addition, economic corridors can also be developed for energy or data transmission, depending on the specific needs of each region or country (Makarova et al., 2020). The main purpose of an economic corridor is to create an efficient and competitive route for trade, social transport and communication, thereby facilitating exchanges and cooperation between different regions and economies. An economic corridor is not only a simple physical transportation route, but also a strategically planned and developed infrastructure to facilitate trade, social and cultural exchanges between different regions or countries. These corridors are often identified and developed according to the specific economic and geographical needs of a region or trade route and may require significant investment in the construction, modernization and maintenance of the relevant infrastructure (Sumbal et al., 2024).

An economic corridor can serve as an important channel for international and regional trade, facilitating the efficient movement of goods between producers and consumers. Economic corridors can also be used to promote industrial and economic development in less developed or isolated regions by stimulating investment and job creation. Another important aspect of economic corridors is their integration into the larger geopolitical context. They can serve as mechanisms for cooperation and integration between states and

regions, helping to strengthen political and economic relations and reduce geopolitical tensions. Economic corridors can also promote stability and peace in regions where economic exchange and cooperation are seen as factors for reconciliation and sustainable development. In summary, an economic corridor is an important infrastructure for connecting and integrating economies and societies and has significant impacts on regional and global development. By facilitating trade, promoting sustainable development and strengthening international relations, economic corridors play a critical role in promoting global prosperity and stability.

Economic corridors are routes or infrastructure networks that enable transportation and communication between different regions, states or geographical areas. These corridors are necessary to connect and integrate the economic, social and political strands, parts and components of different areas, thereby contributing to regional and international development. There are different types of economic corridors, some of which are particularly significant: transport, energy, communications, trade and visitor corridors. Transportation corridors are transportation routes or techniques that facilitate the flow of goods and population between different regions and countries (Siddiqui et al., 2023). These corridors include highways, railways, inland waterways, ports and airports, which are interconnected to ensure smooth movement of traffic and goods. Energy corridors These are routes or infrastructures for the transport of energy between production sites and consumers. These corridors include natural gas pipelines, oil pipelines, power lines and other infrastructure necessary for energy transmission and distribution. Communication corridors are communication infrastructures and networks that enable the transfer of data and information between different locations. These corridors include fiber optics, submarine cables, communications satellites and alternative technologies for communications and digital connectivity. Trade corridors are transportation and communication routes or networks that enable trade and commerce between different regions and countries. These corridors include ports, airports, logistics centers and other infrastructure necessary for the transport and distribution of goods. Tourist corridors are routes or areas developed and promoted to attract tourists and visitors. These corridors include popular visitor destinations, visitor trails, historic sites and other attractions connected by transportation infrastructure and visitor facilities (Witte et al., 2014).

The transport policy and the economic corridors of the European Union (EU) are closely linked and influence each other in many ways. EU transport policy is designed to promote connectivity, integration and sustainable development of transport infrastructure across Europe, and economic corridors play an important role in achieving these objectives, in particular in promoting infrastructure development, cross-border cooperation, promoting interoperability and promoting sustainability. EU transport policy aims to promote the growth of transport infrastructure, which includes important economic corridors. Investments are being made through EU funds and programs to modernize and develop the transport network to improve connectivity and availability between regions and countries (Reggiani et al., 1995). Economic corridors are a priority for improvement and financing because they facilitate the flow of goods and population and stimulate trade and economic development. EU transport policy promotes cooperation and coordination between Member States in the management and development of cross-border transport

infrastructure. Economic corridors often cross national borders and require an integrated and collaborative approach to planning, implementation and management. EU initiatives and programs promote partnership between Member States to develop and improve cross-border economic corridors. The aim of EU transport policy is to promote interoperability and standardization of transport infrastructure and operating regulations. This is necessary to ensure smooth and efficient transport on economic corridors, enabling cross-border transport and intermodality. Through European directives and regulations, the EU sets common standards and requirements for transport infrastructure and relevant services. EU transport policy is increasingly focused on promoting sustainable mobility and clean transport. This is reflected in the EU's approaches and initiatives to improve economic corridors, which aim to reduce carbon emissions, improve energy efficiency and promote greener transport modes such as rail and inland waterway transport (Witte & Spit., 2016).

Literature review

The European Union's transport policy is one of the most complicated and dynamic areas of European integration. More than sixteen years ago, at the start of European construction, it was recognized that transport was necessary for Europe's economic progress and territorial cohesion. The Treaty of Rome of 1957, the founding act of the European Economic Community (EEC), established the theory of free movement of goods and people within the territory of the Member States and paved the way for deeper integration into the subject, field and subject of transport. Over time, EU transport policy has evolved significantly, adapting to economic, technological and social changes. A crucial step in the development of EU transport policy was the adoption of the Single European Act in 1986. It introduced the idea of a "trans-European transport network" (TEN-T) and set priorities and targets for the development of transport infrastructure throughout European Union. In the 1990s, the EU placed great emphasis on improving connectivity between member states and promoting viable transport, particularly through investments in railway infrastructure and the development of trans-European transport corridors. The turn of the millennium has brought with it a host of new problems for EU transport policy, including increased freight and passenger traffic, road congestion and environmental impacts (Witte & Spit., 2016).

In this context, the European Union has used a variety of legislative measures and approaches to address these problems. One of the extremely significant initiatives was the launch of the Europe 2020 strategy, which focused on smart, sustainable and inclusive mobility. Another important milestone and breakthrough in the development of EU transport policy was the accession to the Kyoto Agreement in 2002 and the adoption of the climate change package in 2008 (Komornicki & Goliszek., 2023). These measures reinforced the EU's commitment to reducing greenhouse gas emissions in the transport sector and adopting cleaner alternatives such as public transport and electric vehicles. In recent years, digitalization and innovation have become essential parts of the transformation of Europe's transport systems. Initiatives such as Mobility as a Service (MaaS) and Connected and Automated Transport (CAT) have been promoted to improve transport efficiency and safety, as well as reduce congestion and pollution.

Although EU transport policy has led to significant improvements in promoting sustainable and integrated mobility, there are still major issues that need to be addressed. Some of these include inadequate infrastructure in some regions, differences in the pace of development of transport systems between Member States and the need to ensure a just transition to cleaner and more energy efficient technologies. The history and development of EU transport policy reflect the European Union's commitment to sustainable, efficient and integrated mobility. Since its humble beginnings in the 1950s, EU transport policy has come a long and challenging way, but it has managed to adapt and respond to the difficulties of each state (Witte et al., 2014).

The European Union's transport policy is based on fundamental principles and objectives aimed at promoting sustainable, efficient and integrated mobility across Europe (Boira & Berzi., 2023). These principles and objectives are reflected in a collection of strategic and legislative documents aimed at responding to the challenges and opportunities of transport in the European and international context. One of the basic theories of EU transport policy is that of territorial cohesion. The European Union is committed to ensuring accessibility and connectivity between regions and Member States, reducing advancement disparities and promoting social and economic inclusion (Reggiani et al., 1995). This principle underlines the importance of ensuring that all European citizens, regardless of where they live, have access to adequate transport services. Another basic principle is that of sustainable development. The aim of EU transport policy is to reduce the negative impact of transport on the environment and to ensure resource efficiency. This includes promoting low-carbon modes of transport such as rail, maritime and inland waterway transport or public transport, as well as taking measures to reduce congestion and pollution in urban areas. Another important principle is that of security. The aim of the European Union is to ensure a high level of safety in road, rail, sea and air transport for both passengers and goods. This requires the acceptance of strict standards and rules for transport welfare and safety, as well as the promotion of good practices in risk management and accident prevention (Witte et al., 2014).

Furthermore, EU transport policy promotes the theories of accessibility and non-discrimination. The European Union is committed to ensuring non-discriminatory access to transport infrastructure and services without discrimination based on nationality, residence or other grounds (Witte & Spit., 2016). This principle is necessary to promote social and economic cohesion across Europe and to increase competitiveness in the European internal market. The goals of EU transport policy are diverse and can be found in a large number of strategic and legislative documents, such as the Europe 2020 strategy, the European Green Deal or the action plan for sustainable and intelligent mobility (Komornicki & Goliszek., 2023). The main objectives include reducing greenhouse gas emissions in the transport sector, developing a sustainable and efficient transport infrastructure, promoting public transport and active mobility and optimizing connectivity between regions and Member States. Other important goals include increasing the competitiveness of the European transport industry, optimizing access to transport services for people with reduced mobility and promoting innovation and digital technologies in transport. In addition, the European Union wants to ensure a just and fair transition towards

more viable mobility, taking into account the social and economic impact of differences in the transport sector (Sumbal et al., 2024).

The principles and objectives of the European Union's transport policy reflect its commitment to sustainable, efficient and integrated mobility across Europe. These principles and objectives are fundamental to promoting sustainable economic growth, territorial cohesion and the quality of life of all European citizens. By adopting relevant policies and strategies, the European Union aims to respond to the challenges and opportunities of transport and contribute to building a more competitive, viable and inclusive Europe (Boira & Berzi., 2023).

Addressing the Challenge

Economic corridors significantly influence variations in transport policies across the European Union (EU) and profoundly impact the EU economy and specific transport objectives. These objectives include enhancing economic efficiency and competitiveness, fostering regional cohesion and development, reducing emissions, optimizing sustainability, as well as improving connectivity and mobility (Siddiqui et al., 2023). Economic corridors are strategic transport routes that connect regions and markets and enable the fast and efficient flow of goods and people.

By removing transport barriers and reducing the time and costs associated with logistics, economic corridors increase the competitiveness of European companies in the international market. This promotes investment and innovation and contributes to the development of the EU economy as a whole. Economic corridors are crucial for connecting less developed regions with more developed regions, thereby helping to mitigate economic and social disparities across the EU.

Through these corridors, peripheral or isolated regions can benefit from better access to markets, infrastructure and economic development opportunities. This supports the EU's goals of promoting territorial and social cohesion. Faced with growing problems related to climate change and environmental impacts, EU transport policy aims to reduce carbon emissions and promote greener and more environmentally friendly transport. Economic corridors can contribute to achieving this goal by facilitating the use of less polluting modes of transport, such as rail and maritime transport. Promoting green technologies and low-emission vehicles can also help reduce environmental impact. Connectivity and mobility are crucial for the efficient functioning of the European internal market and for promoting economic and social cohesion. Economic corridors ensure reliable and efficient interactions between different regions and modes of transport, enabling the flow of goods and people. It increases availability and connectivity and contributes to increased trade and economic cooperation in the EU. Through these aspects, economic corridors have a significant impact on transport policy in the EU and contribute to the achievement of the EU's strategic objectives in the field of transport and sustainable economic development (Witte et al., 2014).

Economic corridors are key components of the European Union (EU) transport policy and are crucial for developing infrastructure and facilitating the flow of goods and population in the internal market. The EU recognizes that economic corridors provide an important strategic framework to promote connectivity and sustainable mobility across the region, thereby contributing to financial growth and territorial cohesion. EU transport policy promotes economic corridors as necessary tools for economic and social integration, stimulates investment in infrastructure and enables cross-border partnerships between Member States (Komornicki & Goliszek., 2023).

A key part of the importance of economic corridors for EU transport policy lies in their ability to strengthen the European internal market. By facilitating the movement of goods and population between different EU regions and countries, economic corridors help remove barriers to trade and promote healthy competition in the internal market. This is necessary to strengthen the EU's international competitiveness and promote sustainable economic growth. In addition, economic corridors can play a crucial role in achieving the EU's sustainability goals and help reduce carbon emissions and environmental impacts by facilitating the use of greener transport modes and green technologies. EU transport policy therefore places particular emphasis on the further development and modernization of economic corridors, recognizing their important role in promoting sustainable mobility and growth across the region (Reggiani et al., 1995).

Economic corridors are the strategic infrastructure of the European Union (EU) that ensures the connectivity and flow of goods and population flows between regions and countries. These corridors are central to EU transport policy for numerous reasons. Firstly, they enable the movement of goods and services within the European internal market, thereby promoting competitiveness and growth across the region. Economic corridors reduce transportation costs and delivery times, making trade more effective and accessible for businesses. They also help promote regional cohesion and convergence, connecting less developed regions with more sophisticated markets and infrastructure (Witte & Spit., 2016).

Secondly, economic corridors are central to achieving the EU's strategic objectives in the area of sustainable mobility and reducing environmental impact. By promoting greener modes of transport such as rail and maritime transport, economic corridors help reduce carbon emissions and pollution, thereby supporting the EU's climate change and environmental protection commitments. These corridors also offer opportunities for the introduction of green technologies and innovative new transport solutions, such as electric vehicles and intelligent traffic management systems. In addition, economic financial corridors play an important role in promoting cross-border connectivity and partnership between EU member states.

They facilitate trade and cultural exchanges and support economic, financial and social inclusion across the European region. Through these corridors, the EU strengthens its territorial cohesion and solidarity between Member States, thereby strengthening the common European project.

Economic corridors are an essential part of the European Union's transport policy and have significant influence and impact on the economy, sustainability and cohesion in the region. Through these corridors, the EU promotes efficient, sustainable and integrated mobility, thereby contributing to strengthening its position in the international context and achieving its strategic objectives in the field of transport and regional development.

Data Analysis

The interface between European Union (EU) transport policy and the growth of economic corridors is an important part of the EU transport strategy. This junction reflects the EU's efforts to promote efficient, sustainable and interoperable transport infrastructure that strengthens economic growth and territorial cohesion across the region. The aim of EU transport policy is to improve connectivity between different EU regions and countries, thereby facilitating trade and social exchange and strengthening the European internal market. The development of economic corridors is an important factor in achieving this goal, as they ensure efficient and interoperable connections between different transport networks in the EU. Through economic corridors, the EU is strengthening its cross-border transport infrastructure and thus facilitating the flow of goods and population in the region. EU transport policy is increasingly focused on promoting sustainable mobility and energy efficiency in line with climate and low-carbon goals. Economic corridors play an important role in this regard, as they facilitate the use of cleaner and more energy efficient transport modes such as rail and maritime transport (Reggiani et al., 1995).

These corridors will enable the EU to improve its energy performance and reduce its environmental impact, while ensuring efficient and sustainable mobility for its citizens. EU transport policy promotes transnational cooperation and joint investments in the further development of transport infrastructure to strengthen connectivity and cohesion across the region. The development of economic corridors often requires a close partnership between the Member States and regions involved, as well as significant investments in transport infrastructure and technologies. Through these investments and cooperation, the EU can strengthen its transport infrastructure and promote economic growth and territorial cohesion across the region. The interface between EU transport policy and the growth of economic corridors is important for promoting sustainable and efficient mobility, optimizing cross-border connectivity and strengthening economic growth and territorial cohesion across the European region. Through this hub, the EU is strengthening its position in the transport sector and contributing to the achievement of its strategic transport objectives (Witte & Spit., 2016).

A concrete example of the interface between EU transport policy and the development of economic corridors is the Mediterranean Economic Corridor which crosses the coastal regions of the Mediterranean Sea, connecting ports in Northern Europe with those in North Africa and the Middle East. Through EU transport policy, the Mediterranean corridor has benefited from investments in modernising and further developing port and road infrastructure, enabling maritime and land transport. These initiatives have supported economic and trade progress in the region and strengthened links between Europe and

neighbouring regions. This economic corridor is located in southeastern Europe and connects the Balkan regions to the rest of Europe. As part of EU transport policy, the Mediterranean corridor has benefited from investments in modernising transport infrastructure and optimising interoperability between different modes of transport (Reggiani et al., 1995).

These efforts have facilitated the movement of goods and people in the region, thereby promoting economic and social inclusion in the Balkans and supporting sustainable development there. These examples show how EU transport policy supports the growth of economic corridors, contributing to economic growth, territorial cohesion and sustainable mobility across the European region. The North Sea – Mediterranean corridor (official name) is one of the ten economic transport corridors that have been defined within the Trans-European Transport Network called TEN-T, a policy belonging to the European Union. The purpose of this corridor is to improve transport connections between the North Sea region and the Mediterranean regions, routes that cross several European countries, and whose main purpose is to facilitate the efficient movement of people and goods in the region. The main advantage of this corridor is to connect seaports and rail and road networks as well as multi-node infrastructure between the northern and southern countries of the European Union. Through this corridor and beyond, investors in infrastructure and modernisation projects aim to reduce travel times and facilitate international trade, transport efficiency, and increase freedom and mobility of individuals. This corridor, although it consists of investments of several economic agents, has physical results in certain areas of the European Union.

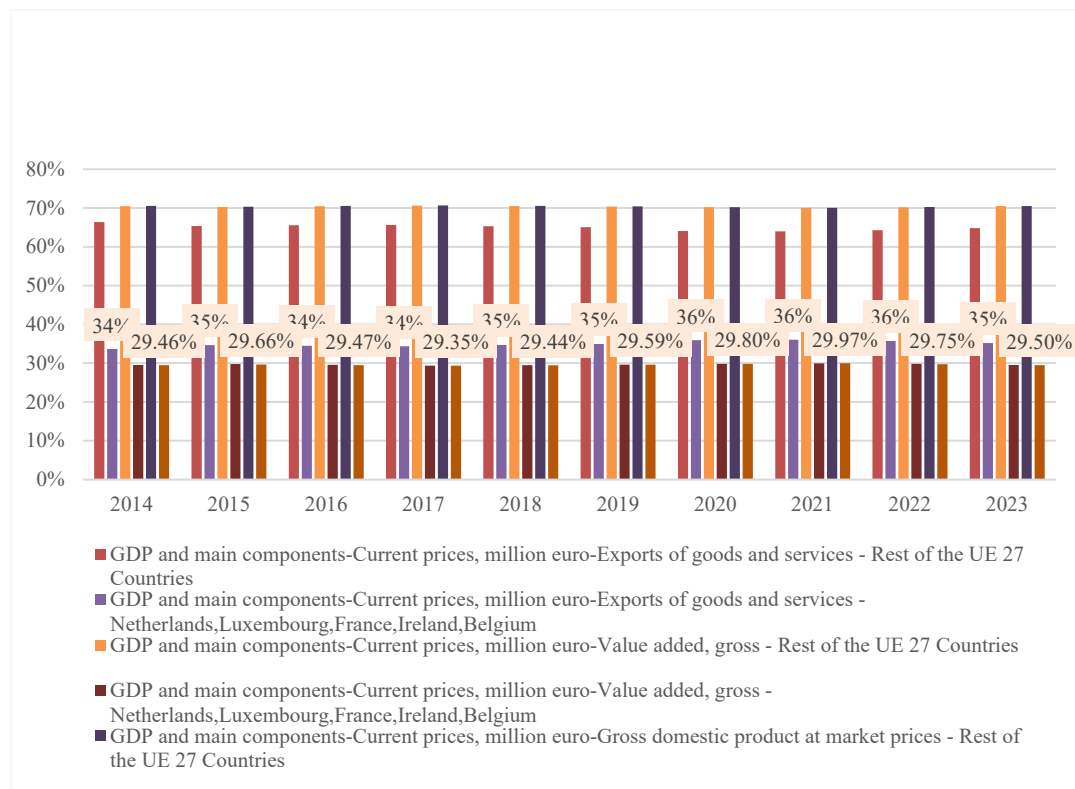
The North Sea – Mediterranean Economic Corridor has as its main participating countries Ireland (the extreme point of the route), France, Belgium, the Netherlands, and Luxembourg. They are part of the European Union 27, i.e., the form of organization with a number of 27 countries (as a unit of measurement) before Croatia's accession. Figure 1 shows how these five countries form an important part of the development of the European Union. The graph below highlights how the member countries of the corridor contribute to economic development in terms of aggregate value added as an economic activity, as the traceability of exports of goods and services to countries outside the European Union, as well as their share in the Gross Domestic Product calculated according to purchasing power parity. The analysis was carried out in the following way. Data on the Gross Domestic Product calculated by the contribution of the export sector to economic development, the nominal value added to the economy by each country, and lastly, the calculation of Burt Domestic Product in millions of euros, of each country, calculated according to purchasing power parity, were extracted from the Eurostat database. After extracting the data, those countries that are part of the economical group called European Union – 27 (until 2020) were recorded.

The Group measures a number of countries, namely Austria, Belgium, Bulgaria, Croatia, Cyprus, Czechia, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, and Sweden. Croatia has been removed from the spotlight in order not to be affected by the novelty element. Subsequently, after these values were

added, the share for each indicator was calculated separately for the member countries that operationally form the North Sea – Mediterranean corridor, namely the Netherlands, Luxembourg, France, Ireland, and Belgium. The strategic importance of the corridor also has a historical relevance considering that Belgium, France, Luxembourg, and the Netherlands, meaning 4 out of 5 countries, were also the ones that formed the basis of the first forms of organization of the European Union.

After performing the calculations, the sum of the values of the cynical countries for each year, as well as for the rest of the countries, was made. The value of the two groups was divided by the total value to determine the weight that the two groups had in the final formation (Wang et al., 2024).

Figure 1. The share of the countries in The North Sea - Mediterranean corridor in their economic development - Export of goods and services, Value Added and Gross Domestic Products at market place



Source: Authors own processing of data from Eurostat database

It is observed that in all three situations, the share of countries participating in the formation of the corridor is either almost 30% or over 35%. As such, in addition to the empirical quality of participation in economic development, the development of an economic corridor would lead to an even sharper growth of participating economies. As a consequence, the level of economic development at the European level would automatically increase, through the weights presented above. By building the necessary

infrastructure, operating time would be reduced. As a result, the production cycle would have shorter times and thus a higher cash flow that would be made possible by a higher transit of products. The corridors are not only intended for freight transport, but also for passenger transport. As a result, the mobility of persons would be greater and reaction times would be reduced, and the cash flow, in the present case, the speed of movement of money would increase as a result of the speed of transport of both staff and goods.

It is important to note that the five economies are essential for the European Union, and the progress made by them is certainly seen as a benefit of all other participating countries, or even of economies that have not directly concerned by operational economic processes, but rather benefit from externality effects that would generate added value to all areas that have transit or are using goods from economic corridor areas.

Other examples of economic corridors, although not of such scope, stand as proof of the importance and relevance that economic corridors have for the sustainable economic development of the European Union. It must be specified that the use of the corridor concept makes sense and is useful only if there is a clear definition and a detailed description of it. The corridor represents the instrument itself, and its delimitation is what determines the possibility of being measured, quantified and valued. Therefore, located in the heart of Europe, the Rhine-Alpine Economic Corridor connects the Rhine region with the Alps and the issues, topics and areas of southern Europe and represents a crucial junction for the transport of goods and people. Through EU transport policy, the Rhine-Alpine Corridor benefits from significant investments in the modernization and interoperability of its infrastructure, consisting of waterways, railways and highways. These efforts have increased the effectiveness and transportability of the corridor, thereby facilitating trade and promoting economic integration between regions and countries. The Baltic-Adriatic Strategic Economic Corridor crosses Central and Eastern Europe and connects ports in the Baltic Sea with those in the Adriatic. Through EU transport policy, the Baltic Sea-Adriatic corridor has benefited from investments in the expansion of rail and road infrastructure, improving interactions between regions and promoting intermodal transport. These initiatives have helped to facilitate the flow of goods and population in the region and promote economic growth and territorial cohesion (Reggiani et al., 1995).

Another example of the interface between EU transport policy and the growth of economic corridors is the Corridor V project. This is an important rail transport corridor that crosses Europe from east to west and connects the seaports of the Baltic Sea with ports in the North Sea and the Mediterranean. The V corridor is intended to facilitate the rapid and efficient transport of goods between northern and southern regions of Europe, thereby supporting economic growth and regional cohesion. EU transport policy supports the growth of Corridor V through funding programs and coordination approaches between the participating Member States. This corridor benefits from significant investments in the modernization and expansion of railway infrastructure, as well as in interoperability and advanced transport technologies. With Corridor V, the EU aims to improve connectivity between northern and southern regions of Europe, reduce transport times and costs and promote cleaner and more energy-efficient modes of transport. The development of Corridor V shows how EU transport policy and the growth of economic corridors work

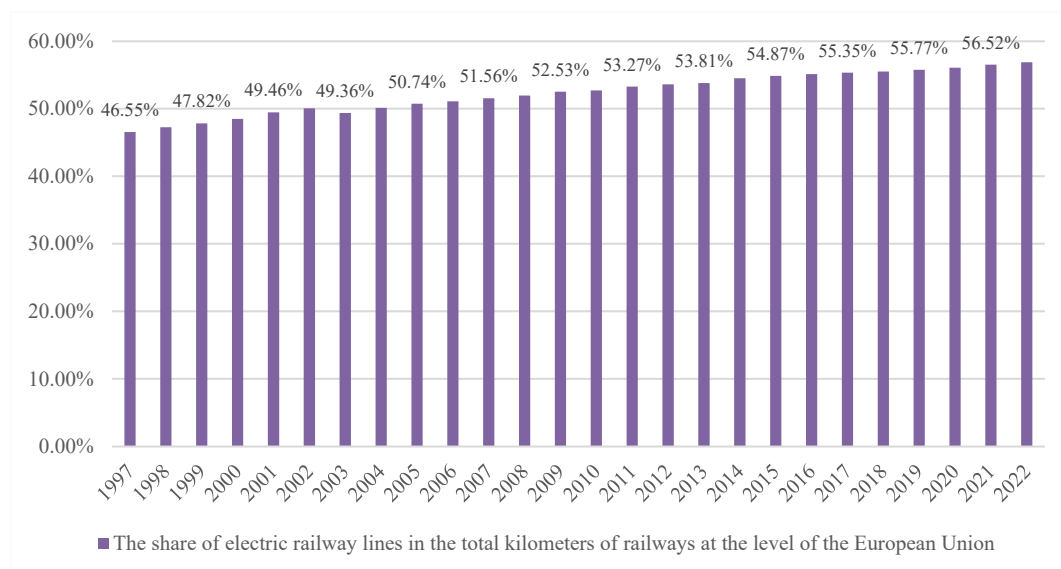
together to promote sustainable and integrated mobility across the European region. Through this hub, the EU is strengthening its transport infrastructure and strengthening economic growth and territorial cohesion in a way that benefits all citizens (Wang et al., 2024).

The transport policy of the European Union (EU) has a significant influence on the further development and productivity of the economic corridors in the region. EU transport policy is an important financing factor for the expansion and modernization of transport infrastructure, including economic corridors. Through funding programs such as the Connecting Europe Facility (CEF) and the European Regional Development Fund (ERDF), the EU supports projects that aim to optimize the connectivity and productivity of economic corridors, helping to increase transport capacity and reduce travel times. EU transport policy promotes the standardization and interoperability of transport infrastructure in economic corridors, thereby facilitating the flow of goods and population between different Member States. EU directives and regulations establish common standards for transport infrastructure, equipment and services, ensuring the compatibility and productivity of transport systems across the region. EU transport policy promotes cooperation and coordination between Member States in the development and management of economic corridors sustainability (Sukhinin et al., 2023). Through initiatives such as Corridor Coordination Groups (GCCs), Member States work together to identify and resolve common issues related to infrastructure, transport regulation and planning, thereby ensuring the efficient and integrated operation and cooperation of economic corridors. EU transport policy promotes the use of sustainable and energy-efficient transport modes in economic corridors, thereby contributing to reducing CO₂ emissions and environmental impacts. Through initiatives such as the Sustainable Transport Program and the Urban Mobility Action Plan, the EU is promoting investment in public transport, rail and cycling infrastructure within economic corridors, supporting sustainable development and reducing congestion and pollution. EU transport policy plays an important role in developing and streamlining economic corridors in the region, supporting investment, standardization, cooperation and promoting viable transport. Through these measures, the EU contributes to economic growth, territorial cohesion and sustainable mobility across its region sustainability (Sukhinin et al., 2023).

It is noted that the need to modernise transport routes takes place homogeneously at European level. The strategy for unifying transport infrastructure has as main objectives increasing the rate of economic development and increasing the level of competitiveness, but this last element cannot be achieved if the same result is not generated with lower implementation production costs. As such, it is important to mention that the realization of transport routes is not only important to reduce ancillary costs regarding the mobility of goods, but also to achieve a well-defined infrastructure that performs the same economic activities on modern channels, at lower costs. As seen in Figure number 2, the European Union has jointly focused efforts to transform the railway system into an economic system through the electrification of transport facilities. Transporting goods by means that use electricity instead of traditional fuel attracts an element of competitiveness through lower costs. Although fuel resources have a limited character and the current high consumption rate encourages the formation of a scarcity character regarding this resource, therefore a

higher cost, electricity has become a favourable resource that can be generated on several levels, from more resources and with increasingly lower costs. The figure below highlighted two key elements of this discussion, namely the level of development of traditional railways, i.e. the infrastructure used by traditional transport vehicles, compared to the number of kilometres achieved for electric transport infrastructure. The figure below was obtained by identifying at European Union level the total number of km of railway and the number of km of electrified railway (on which only vehicles using electricity for transport run exclusively). For each year that was available from the database from which the data were processed, i.e. Eurostat, the share of electrified railway lines was calculated by calculating the weighted average of the total km.

Figure 2. *The share of electric railway lines in the total kilometers of railways at the level of the European Union*



Source: Authors own processing of data from Eurostat database.

There is a major interest from authorities and government representatives regarding the electrification of railways. The export of goods and services thus becomes more competitive and a more advantageous EU trade balance is desired over time. The transport strategy thus should not be perceived only as a method of reducing the carbon footprint or as a method of concentrating the flow of capital, but as a method to make resource efficiency and achieve a high level of positive externalities on emerging partner economies.

Findings

The implementation of the European Union (EU) transport policy and the growth of economic corridors are currently facing numerous challenges. One of them is the inadequate funding of transport infrastructure projects. Even when the EU provides funds and subsidies for the growth of economic corridors, investment needs often remain high

and available resources are limited. This issue may have a negative impact on the pace and quality of infrastructure projects, potentially jeopardizing the EU's connectivity and growth objectives.

Furthermore, coordination between Member States is another important challenge. The development of economic corridors often requires a partnership between multiple countries and regions, each with its own priorities and interests. This diversity can make decision-making and the implementation of joint projects difficult, and close coordination and coordination between the participating states is required to ensure the effectiveness of transport initiatives at European level. Environmental and sustainability issues are another challenge in adopting transport policy and developing economic corridors. The aim of the EU is to promote sustainable mobility and reduce the impact on the environment through its transport policy. However, adapting existing infrastructure and transport modes to changing environmental demands can be difficult and costly and requires significant investment in clean technologies and green infrastructure (Makarova et al., 2020).

The implementation of EU transport policy and the growth of economic corridors face many challenges, including insufficient funding, coordination between Member States and the need to respond to new environmental demands. Addressing these challenges requires an integrated and cooperative technological between Member States and the European institutions, whose task is to ensure a sustainable, efficient, and interoperable transport infrastructure across the European Union (Sumbal et al., 2024). The future prospects of the European Union's (EU) transport policy and economic corridors are characterized by a variety of different directions and trends that will influence the development of these regions in the coming years. One of these perspectives is the increased focus on sustainability and green mobility in EU transport policy. Given the challenges posed by climate change and pollution, the EU will step up its efforts to promote sustainable, low-carbon transport and the use of alternative modes such as rail and maritime transport.

In addition, investments in transport infrastructure and the modernization of economic corridors are expected to increase in order to strengthen connectivity between Member States and European regions. Through the Connecting Europe Facility (CEF) and other funding programs, the EU will support projects that aim to optimize the interoperability and productivity of transport infrastructure to facilitate the flow of goods and population across the European Union (Makarova et al., 2020).

At the same time, digitalization and new technologies will play an increasingly important role in the future of EU transport policy and economic corridors. The use of artificial intelligence, the Internet of Things (IoT) and other digital technologies will help optimize transport operations, increase the well-being and productivity of the transport network and increase Europe's competitiveness in international transport. In the long term, EU transport policy should continue to promote an integrated and sustainable path of mobility, with a focus on connectivity, well-being and sustainability (Sukhinin et al., 2023). In this regard, the further development and modernization of economic and financial corridors will remain a strategic priority for the European Union, contributing to economic financial growth, territorial cohesion and long-term prosperity of the entire region (Reggiani et al., 1995).

Conclusions and predictions

The article analyses the transport policy of the European Union (EU) and its impact on the growth of economic corridors in Europe. Through an interdisciplinary approach, the role and evolution of EU transport policy in promoting connectivity and sustainable mobility in the European region is examined. In this context, it examines how the EU sets its transport objectives and priorities in line with theories of territorial cohesion, economic development and sustainability. The work analyses the most important instruments and mechanisms of EU transport policy, including funding programs, regulations, and strategies for the further development of transport infrastructure. In addition, it examines how the EU promotes the integration of transport modes into economic corridors, thus enabling efficient freight and passenger transport. Using case studies and comparative analyses, the dissertation highlights the benefits and challenges associated with the implementation of EU transport policy and the development of economic corridors in Europe. The importance of the partnership between Member States and European institutions in promoting sustainable mobility and a modern and efficient transport infrastructure is emphasized. Finally, the dissertation proposes recommendations and future guidelines to strengthen EU transport policy and optimize the growth of economic corridors to promote economic growth, territorial cohesion and sustainability in Europe (Sumbal et al., 2024). The implications of the results of the analysis of European Union (EU) transport policies and economic corridors are far-reaching and may influence the future direction of transport policy in Europe. The result of the study can serve as a guide for adjusting the EU's transport policy priorities. Effective identification of needs and challenges in the growth of economic corridors can lead to better resource allocation and a more coherent approach to promoting connectivity and sustainable mobility (Pries, 2023). The insights gained from the research can help optimize investments in transport infrastructure and projects related to economic corridors. Identifying critical areas or bottlenecks in the transport network can guide investment decisions to maximize the impact and productivity of available funds. The study can highlight the importance of the partnership between Member States and European regions for the growth of economic corridors. Identifying the benefits of collaboration and synergies between transport projects can stimulate collaboration and coordination between stakeholders, enabling the efficient implementation of cross-border projects. The insights gained from the research can help improve regional development strategies within the EU. Identifying economic corridors with high potential for improvement and integrating them into the European transport network can help boost economic growth and territorial cohesion in less developed regions. The study can highlight the opportunities and challenges associated with promoting viable mobility and environmentally friendly transport in economic and financial corridors. Identifying the results of technological and policy solutions to reduce carbon emissions and environmental impacts can guide policy decisions to promote more viable mobility in Europe (Pries, 2023). In conclusion, the results of the analysis of EU transport policies and economic corridors can provide essential guidelines and suggestions for the formulation and implementation of future transport policies in Europe. Through a deep understanding of the challenges and opportunities involved, the EU can adapt its transport policy to promote efficient, sustainable, and integrated mobility across the region.

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Evaluation of the event study in the case of mergers and acquisitions

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Abstract. *The subject under analysis pertains to the research field of semi-strong informational efficiency, which is established when the autocorrelation coefficient of stock prices during the event period being analyzed is zero. This indicates that stock price fluctuations before and after the mergers and acquisitions (M&A) event occur randomly. If the release of new information regarding mergers and acquisitions is followed by abnormal returns before or after the M&A event, then semi-strong efficiency is not confirmed.*

There is a notable movement in stock prices one day prior to the official announcement of mergers and acquisitions, followed by a significant reverse movement for several subsequent days. This fluctuation in returns, along with market movements, exceeds 11% over a 10-day period. The day of the event is considered to be the day when the Board of Directors' decision regarding the acquisition is made public.

Firstly, we highlighted the purpose of the event study, namely, to identify the „residuals” of returns between actual returns (R_{it}) and expected returns during the period when M&A information was publicly disseminated. Furthermore, we reviewed elements of the literature that addressed event studies in general, with a focus on the impact of M&A on the capital market in particular. Subsequently, we outlined the research methodology and hypotheses, and the models used to identify return residuals.

For analyzing the impact of M&A on market reactions, we used the market model and the Capital Asset Pricing Model (CAPM). Our empirical study estimates the impact on the stock price of Transilvania Bank resulting from the acquisitions of Volksbank Romania and Bancpost. Finally, we analyzed the impact of the merger between the Bucharest Stock Exchange (BVB) and SIBEX Sibiu. This paper offers a thorough empirical analysis of the economic advantages received by shareholders of acquiring companies after mergers and acquisitions. Our research findings show that, in general, acquiring firms yield positive abnormal returns. This stands in contrast to much of the existing literature, which indicates that, on average, there are losses (although not always statistically significant) associated with merger and acquisition transactions in developed countries.

Keywords: mergers and acquisitions, event study, semi-strong informational efficiency, abnormal returns, Market Model, Capital Asset Pricing Model (CAPM).

JEL Classification: G14.

Introduction

To examine the semi-strong form of informational efficiency, we investigated the autocorrelation of stock prices before and after the public dissemination of information. Semi-strong efficiency is confirmed if the autocorrelation coefficient is zero, indicating that price movements occur randomly, with any fluctuations being driven by factors beyond historical trends and public disclosures.

The event studies uses the „residuals” method, comparing actual returns (R_{it}) and expected returns (R_{it}^*) during the period of public information dissemination:

$$\varepsilon_{it} = R_{it} - R_{it}^*, \quad \text{where } R_{it}^* = \alpha_i + \beta_i R_{Mt}$$

Where,

ε_{it} = the „residual” profitability of the security, estimated at any given time, before and after the publication of the information.

R_{it} = the actual profitability of the security at time $t = 1, 2, \dots, T$ during the period when the information was disseminated.

R_{it}^* = the discounted profitability of the security „t” according to the market model, based on the actual profitability of the market portfolio and the β_i and α_i coefficients of the linear regression between R_{it} and R_{Mt} from the previous period.

The average of all „ ε_{it} ” residuals before and after the information is made public, must statistically remain close to zero to prove that the financial market has semi-strong efficiency. These residuals (ε_{it}) are considered abnormal profits compared to the expected profitability (R_{it}^*) according to the market model or compared to the market profitability (R_{Mt}). These abnormal returns are due to the integration of new information into the price, which has become accessible to the investing public.

Aligned with the semi-strong form of capital market efficiency, these abnormal returns are expected to emerge at the time „t” when new information is made public (regarding mergers/acquisitions, dividend rate, etc.). If the dissemination of new information at time „t” is associated with abnormal returns before or after time „t”, then the confirmation of semi-strong efficiency is undermined.

Event studies statistically examine whether new information known at time „t” leads to abnormal returns at the same time „t” (AR_t) or at different times („t-1” or „t+1”):

$$AR_t = R_{it} - (\alpha_i + \beta_i R_{Mt}), \text{ or more simply, } AR_t = R_{it} - R_{Mt}$$

A more detailed examination is conducted by studying cumulative abnormal returns (CAR) for a selection of companies that have disclosed the same new information (such as the absence of dividend distribution). In line with the semi-strong efficiency, CAR should reveal a significant drop in stock prices at time zero or at time -1 from the announcement of the dividend non-distribution. This decline in stock prices validates that the negative news was entirely factored into the stock price, neither before nor after, but on the day of the announcement.

Literature review

The relationship between the public disclosure of important information and market liquidity has been the focus of numerous researchers who have delved into this subject. Frost et al. (2006) demonstrated that the procedures for public announcement of significant information (represented by regulation, monitoring of their implementation) are directly related to market liquidity.

Haddad et al. (2009) studied the voluntary disclosure of significant information and the liquidity of public companies, reaching the conclusion that a high level of voluntary disclosure implies a reduction in the gap between supply and demand, significantly increasing market liquidity.

According to researcher Lakhal F. (2004), negative information tends to be more credible for investors compared to positive information. Furthermore, the disclosure of mergers and acquisitions enhances market liquidity. However, the varying impact of this information is notably emphasized by financial forecasts both preceding and following the official announcement. The author suggests that financial forecasts could potentially be manipulated and, therefore, should be viewed with less credibility by market participants.

Taking into consideration all the above mentioned scientific works, our goal was to assess the economic ramifications of acquisition and merger announcements, examining their effects both on individual investors in the market (micro level) and on the broader conditions of the capital market, particularly market liquidity (macro level). We observed that the operating profit's value significantly impacts investor behavior, and any failure to meet future performance commitments and target values results in various consequences. The impact of the event on the market is significant, considering that it directly influences market liquidity.

The announcement of mergers and acquisitions affects the regulated capital market. Studies in this area have focused on uncovering the effects brought about by such announcements.

Table 1. *Synthesis of the most important studies regarding the impact produced by the announcement of mergers and acquisitions*

Author	Year	Purpose	Methodology	Key points, results, conclusions
Cheung D. K. C. and Sami H.	2000	They examined how prices and trading volumes responded to announcements of mergers and acquisitions.	The Hong Kong market showed significant price fluctuations for both Blue Chip and Non-Blue Chip stocks, with corresponding effects on trading volumes.	The study revealed notable price and volume reactions for four days surrounding the annual announcements of mergers and acquisitions.
Ali A., Klasa S. and Zhen Li O.	2008	They tracked the correlations between the actions taken by institutional owners and the information provided to traders at the time of announcements of mergers and acquisitions.	They examined institutional investors holding varying proportions of shares in public companies: small, medium, and large investors. Small investors lack justification for fixed costs associated with providing private information, while large investors minimize all transactions around announcements of mergers and acquisitions.	Institutional investors holding medium-sized shares are most incentivized to gather private information during the pre-announcement period of mergers and acquisitions and to speculate based on such information.

Author	Year	Purpose	Methodology	Key points, results, conclusions
Francis J., Schipper K. and Vincent L.	2002	They studied the value of private information during the announcement period of mergers and acquisitions.	A positive relationship was found between absolute abnormal returns in two types of announcements: the dissemination of private information and official announcements.	The informative nature of announcements regarding mergers and acquisitions is diminished by competitive information presented in analytical reports.
Balakrishnan K., Bartov E. and Faurel L.	2010	They depicted the post-announcement trends of mergers and acquisitions, revealing the market's shortcomings in fully responding to public announcements.	The analysis conducted after forming the portfolio has distributed profitability across two portfolios: one formed from extreme losses and the other from extreme profits.	The anomaly of loss/profit is significantly influenced by adjustments in risk, insolvency risk, company size, short sale restrictions, and transaction costs.

Source: Author's consolidation

An important aspect in measuring the impact of mergers and acquisitions announcements is the correct selection of the analyzed window. According to the study conducted by Trueman B. Et al. (2003), there is a significant movement in stock prices one day before the actual announcement of mergers and acquisitions, followed by an aggressive reverse movement for several days. This evolution of returns, associated with market movements, exceeds 11% over a period of 10 days.

Ball R. and Kothari S. P. (1991) conducted a thorough analysis of stock returns during the announcement of mergers and acquisitions. They concluded that a period of 10 days before the announcement, 10 days after the announcement, and one day for the announcement itself (a total of 21 days) constitutes an optimal window for study.

Zhang Y. (2008) investigated how forecasts made by analysts respond to actual earnings announcements. The researcher suggests that these forecasts prompt the market to react more during the announcement stage than in the post-announcement stage. The study reveals that the most substantial change occurs within the first 10 days, accounting for up to 70%, with as much as 40% occurring on the first day alone, while the remaining 30% is spread out over the remainder of the analyzed quarter.

Researchers Lev B. and Zarowin P. (1999) take a critical stance towards the limitations of financial reporting. They argue that the usefulness of announcements regarding acquisitions, mergers, cash flows, and asset book values has declined over time. The authors highlight that current reporting methods fail to adequately capture innovation, competitiveness, and changes in operational flows or economic conditions. For instance, significant investments such as restructuring or research and development are initially recorded as expenses over multiple financial periods before eventually translating into tangible benefits. The authors suggest that the mergers and acquisitions process, reliant on periodic comparisons of company revenues and expenses, often inaccurately reflects the true state of the company. Ultimately, they conclude that changes in the business environment contribute to the weakening connection between market conditions and reported accounting values.

For conducting any event study, the following steps are mandatory (1):

1. **Defining the event:** This stage involves identifying the event of interest and the time/period during which the effects of the event will be analyzed (the so-called event window). It is crucial to estimate an appropriate window to avoid omitting any significant effects.
2. **Selecting criteria:** The selection criteria must be clearly presented and justified. For instance, publicly traded companies from a specific industry can be selected. The characteristics of the firms must be measurable, such as market capitalization, industry representation, and the frequency of certain events. Additionally, the analysis periods must be identical for all representatives.
3. **Quantifying normal and abnormal returns:** The importance of the event is defined based on the magnitude of abnormal returns. Abnormal returns refer to the differences between actual returns and expected or normal returns (those expected to be attained in the absence of the event). Abnormal returns can be calculated using statistical or economic models. This paper will present both types of models, using one representative model from each class.
4. **Estimation procedure:** Referring to the period preceding the window analyzed in the event study is crucial to eliminate any potential influence stemming from the event itself.
5. **Testing procedure:** Abnormal returns can only be calculated after the normal returns model is determined. The testing framework of the model is developed by defining the null hypothesis and aggregating abnormal returns into alternative hypotheses. Determining the significance levels of the test is also essential.
6. **Empirical results:** At this stage, presenting the results and conducting a subsequent diagnosis are crucial aspects. It's important to conduct a preliminary assessment of the obtained results to ascertain if they can be generalized to the entire sample.
7. **Interpretations and conclusions:** The purpose of the conducted event study is to determine if the empirical results obtained contribute to explaining the effects on the capital market. Certain additional factors that could provide further explanations regarding the obtained results should also be mentioned at this stage.

The day of the event is considered the day of the publication of the Board of Directors' resolution regarding the acquisition.

Research Methodology and Hypothesis Setting

Established Hypotheses

- H_0 : There is no correlation between the announcement of mergers and acquisitions and the stock market price. Daily abnormal returns are close to zero during the acquisition announcement period.
- H_1 : Daily abnormal returns will be different from zero during the pre-acquisition announcement sub-period.
- H_2 : Daily abnormal returns will be different from zero during the acquisition announcement sub-period.
- H_3 : Daily abnormal returns will be different from zero during the post-acquisition announcement sub-period.

Quantification of Normal and Abnormal Returns According to the Market Model

The calculation of abnormal returns specified in step three poses a real challenge for researchers in terms of quantifying abnormal returns. This subsection will address in detail the method of calculating abnormal returns based on the statistical model.

The typical hypothesis examined in the literature is that shareholders of acquiring firms involved in mergers and acquisitions activities do not experience excess returns. Therefore, our baseline methodology involves using the market model to determine the expected return of the acquiring firm's stock around the announcement date of the takeover:

$$R_{it} = \alpha_i + \beta_i R_{Mt} + \varepsilon_{it}$$

Where $E[\varepsilon_{it}] = 0$, and $\text{var}[\varepsilon_{it}] = \sigma^2 \varepsilon_{it}$; t is the time index, $i = 1, 2, \dots, N$ is the position of the stock, R_{it} and R_{Mt} are the returns of stock i and the market portfolio for period t , and ε_{it} is the residual term of the return of asset i . With the help of estimates α_i and β_i from this equation, the "normal" return can be predicted for the analyzed period window. The prediction error (the difference between the actual return and the predictable "normal" return) is widely termed as abnormal return (AR)(2) and is calculated as follows:

$$AR_{it} = R_{it} - \hat{\alpha}_i - \hat{\beta}_i R_{Mt}$$

When calculating abnormal returns, great attention is given to formulating the null hypothesis correctly. The null hypothesis of the study represents the probability of the absence of economic effects associated with the event under consideration. Under the influence of this hypothesis, the mean and variance of abnormal returns will be determined.

To provide a general conclusion regarding the generation of abnormal returns in a specific event, the aggregation of abnormal returns into a single calculation operation is practiced. Thus, the aggregated abnormal returns (AARt)(3) on day t represent the summed value of abnormal returns, where N is the number of companies in the analyzed sample, and are calculated as follows:

$$AAR_t = \frac{1}{N} \sum_{i=1}^N AR_{it}$$

Cumulating daily abnormal returns for the entire period of the analyzed event ($T_2 - T_1$) shows us the intensity of the impact produced by the studied event and is quantified with the help of the index ($CAR_i(T_1, T_2)$)(4) for company i in the period ($T_2 - T_1$):

$$CAR_i(T_1, T_2) = \sum_{t=T_1}^{T_2} AR_{it}$$

Aggregating the CAR_i variables can also be done at the level of period and event, also named aggregate cumulative abnormal returns (ACAR). In such a scenario, the cumulative abnormal return is defined as follows(5):

$$ACAR(T_1, T_2) = \frac{1}{N} \sum_{i=1}^N CAR_i(T_1, T_2)$$

Now, the central question here is whether all AAR and/or ACAR at a certain date are significantly different from zero statistically. In order to establish the statistical significance of the variables, the robust t-statistic test and the Wilcoxon z-statistic test are applied. The t-statistic test value must be significantly different from zero and is calculated as follows:

$$t = \frac{AAR_{it}}{[Var(AAR_{it})]^{1/2}}$$

The Wilcoxon z-statistic test is an alternative to the t-statistic test. It is a non-parametric test that compares sets of data by calculating the differences between each set. The test also performs an analysis of these differences. In this way, the Wilcoxon z-statistic test attempts to detect abnormal changes/fluctuations in the compared data.

The market model is part of a group of models that, throughout its existence, has endured a significant number of harsh criticisms. However, it has withstood all challenges and is still used to estimate normal returns in event studies. The primary criticisms focus on its effectiveness in a stable and predictable market environment.

For analyzing the impact of an event on market reaction, the Capital Asset Pricing Model (CAPM) can be used. However, there is a probability that the results obtained from CAPM could be influenced by the model's restrictions. Given that these deviations can be eliminated by using the market model, the use of CAPM has become increasingly rare for such studies.

In the study we conducted, the parameters of the market model as well as the CAPM model are determined for each company over a period of up to 230 trading days on the stock exchange prior to the event window, which represents approximately one year before the announcement of the acquisition. The event window was set for a period covering 20 days before the announcement, +1 day of announcement, +60 days thereafter.

Our study estimates the impact on the stock price of Transilvania Bank from the acquisitions:

- Volksbank Romania, on December 10, 2014;
- Bancpost, on December 31, 2018.

Subsequently, we will analyze the impact of the absorption merger of BVB with SIBEX Sibiu.

The Acquisition of Volksbank Approved on December 10, 2014

We tracked the stock prices over a period of two years (01.01.2014 – 31.12.2015), during which the acquisition event of Volksbank by Transilvania Bank (TLV) occurred (10th of December 2014). The monitoring window for the impact of the acquisition was set at a pre-announcement window of 20 days + 1 announcement day + 60 post-announcement days.

Market model: $R_{it} = \alpha_i + \beta_i \times R_{Mt} + \varepsilon_{it}$

For estimating the expected returns through the market model in the chosen window, we estimated the alpha coefficient (=0.0007) and the beta coefficient (= 0.6284) over a period preceding the acquisition (01.01. – 10.12.2014), and can be seen in table 2.

Table 2. The selected window for estimating expected returns through the market model

Date	TLV %	BET%	
Jan 03, 2014	-0.51%	-0.41%	alpha
Jan 06, 2014	-1.88%	0.64%	0.0007
Jan 07, 2014	1.22%	0.77%	
...			beta
Dec 29, 2015	-1.62%	-0.29%	0.6284
Dec 30, 2015	0.87%	0.34%	

Source: Author's calculations.

The calculation of abnormal returns (AR), listed in table 3, as well as cumulative abnormal returns (CAR), was performed for each day within the chosen window.

Table 3. Calculating AR and CAR for the market model

Date	Day	AR	CAR
Nov 11, 2014	-20	-2.59%	-2.59%
Nov 12, 2014	-19	0.24%	-2.35%
...			
Dec 09, 2014	-1	-0.85%	-4.71%
Dec 10, 2014	0	2.03%	-2.68%
Dec 11, 2014	1	-2.45%	-5.13%
...			
Mar 11, 2015	59	-0.91%	11.23%
Mar 12, 2015	60	1.45%	12.67%

Source: Author's calculations.

The evolution of AR and CAR is illustrated in figure 1, which also indicates the days where CAR is statistically insignificant (the interval between day 16 and day 30, post-announcement, with p-values > 5%):

Figure 1. The evolution of AR and CAR in the market model

Source: Author's computation.

According to the market model, the acquisition of Volksbank generated significant decreases (with a p-value of 1%) in the TLV stock price during the pre-announcement, announcement, and post-announcement phases until the 7th day. From the 7th day onwards, significant benefits are recorded, statistically speaking (with a p-value < 1%), for the acquiring bank (TLV) up to the 15th day.

$$\text{CAPM Model: } R_{it} = R_{ft} + (E_{Mt} - R_{ft}) \times \beta$$

For estimating the expected returns through the CAPM model, table 4, in the chosen window, we estimated the beta coefficient (= 0.6284), as well as the evolution of the returns of the entire Romanian stock market (the variation of the BET index) during the period prior to the acquisition (01.01. - 10.12.2014).

Table 4. The chosen window for estimating expected returns through the CAPM model

Date	TLV %	BET%	R _f	beta
Jan 03, 2014	-0.51%	-0.41%	5.27%	
Jan 06, 2014	-1.88%	0.64%	5.27%	0.6284
Jan 07, 2014	1.22%	0.77%	5.24%	
...				
Dec 29, 2015	-1.62%	-0.29%	3.70%	
Dec 30, 2015	0.87%	0.34%	3.70%	

Source: Author's calculations

We proceeded, in table 5, to calculate the abnormal returns (AR), as well as the cumulative abnormal returns (CAR) in relation to the expected returns according to the CAPM, for each day within the selected window:

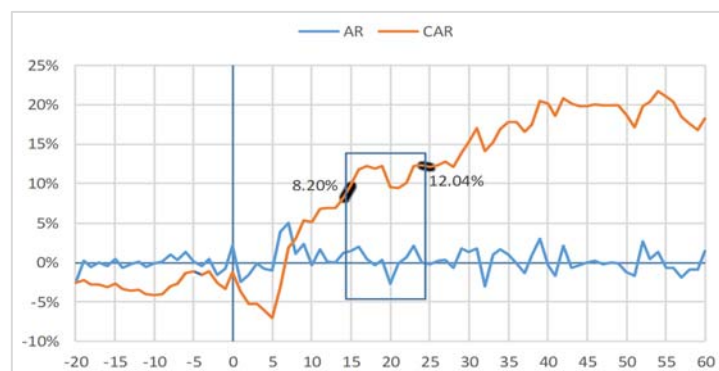
Table 5. The calculation of AR and CAR relative to expected returns according to the CAPM

Date	Day	AR	CAR
Nov 11, 2014	-20	-2.52%	-2.52%
Nov 12, 2014	-19	0.31%	-2.21%
...			
Dec 09, 2014	-1	-0.78%	-3.35%
Dec 10, 2014	0	2.10%	-1.24%
Dec 09, 2014	-1	-0.78%	-3.35%
...			
Mar 11, 2015	59	-0.84%	16.75%
Mar 12, 2015	60	1.52%	18.27%

Source: Author's calculations.

The evolution of AR and CAR is illustrated in figure 2 below, and indicates the days when CAR is not statistically significant (the interval between day 14 and day 25, post-announcement, with p-value > 5%):

Figure 2. The evolution AR and CAR in the CAPM model



Source: Author's computation.

According to the CAPM model, the acquisition of Volksbank resulted in significant reductions, with a statistical p-value < 1%, in the TLV stock price during the pre-announcement, announcement, and post-announcement phases until the 13th day. Significant benefits (p-value < 1%) for the acquiring bank (TLV) are recorded only from the 29th day to the 60th day. These benefits may also be generated by the announcement of preliminary mergers and acquisitions in preparation for the TLV's AGM.

The Acquisition of Bancpost Approved on December 31, 2018

We tracked the stock price movements over a period of two years (01.01.2018 - 31.12.2019), during which the acquisition event of Bancpost by Banca Transilvania (on December 31, 2018) occurred. The monitoring window for the impact of the acquisition was chosen to be the same pre-announcement window of 20 days + 1 announcement day + 60 post-announcement days.

Market Model: $R_{it} = \alpha_i + \beta_i \times R_{Mt} + \varepsilon_{it}$

To estimate the expected returns through the market model within the chosen window, we estimated the alpha coefficient (=0.0005) and the beta coefficient (= 1.4234) over a period preceding the acquisition, (02.01.18 - 28.12.18), as it can be observed in table 6 below.

Table 6. The chosen window for estimating expected returns through the market model

Date	TLV %	BET%	
Jan 03, 2018	2.11%	2.03%	alpha
Jan 04, 2018	-0.20%	0.69%	0.0005
Jan 05, 2018	-0.47%	0.25%	
...			beta
Dec 27, 2019	0.19%	0.71%	1.4234
Dec 30, 2019	0.19%	0.29%	

Source: Author's calculations.

The calculation of abnormal returns (AR), as well as cumulative abnormal returns (CAR), was performed for each day within the chosen window, as seen in table 7 below.

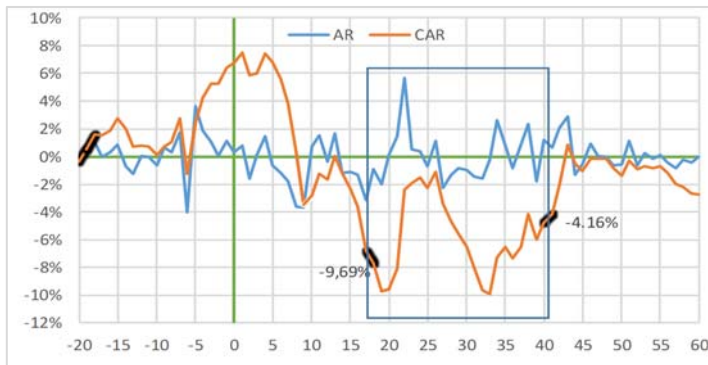
Table 7. Calculation AR and CAR through the market model

Date	Day	AR	CAR
Nov 28, 2018	-20	-0.34%	-0.34%
Nov 29, 2018	-19	0.87%	0.52%
...			
Dec 28, 2018	-1	1.13%	6.42%
Dec 31, 2018	0	0.30%	6.72%
Jan 03, 2019	1	0.75%	7.46%
...			
Mar 27, 2019	59	-0.47%	-2.70%
Mar 28, 2019	60	-0.03%	-2.72%

Source: Author's calculations.

The evolution of AR and CAR is illustrated in figure 3, which also shows the days where CAR is not statistically significant (the interval between day 19 and day 41, post-announcement, which have a p-value > 5%).

Figure 3. The evolution of AR and CAR with the acquisition of BANCPOST (market model)



Source: Author’s computation.

According to the market model, the acquisition of Bancpost generated significant benefits, statistically with a p-value < 1%, for the acquiring bank (TLV) both in the pre-announcement phase, at the announcement, and in the post-announcement period up to the 8th day. From January 9th to 17th, 2019, TLV recorded significant reductions, statistically with a p-value < 1%, in stock market profitability, reductions that can also be generated by the January effect.

$$\text{CAPM Model: } R_{it} = R_{ft} + (E_{Mt} - R_{ft}) \times \beta$$

To estimate expected returns through the CAPM model, in the selected window, we estimated in table 8, the beta coefficient (= 0.6284) as well as the evolution of the overall Romanian stock market profitability (the variation of the BET index) for the period before the acquisition (January 1st, 2018 – December 28th, 2018).

Table 8. The selected window for estimating expected returns through CAPM

Date	TLV %	BET%	R _f	
Jan 03, 2018	2.11%	2.03%	4.32%	beta
Jan 04, 2018	-0.20%	0.69%	4.31%	1.4234
Jan 05, 2018	-0.47%	0.25%	4.28%	
...				
Dec 27, 2019	0.19%	0.71%	4.44%	
Dec 30, 2019	0.19%	0.29%	4.44%	

Source: Author’s calculations.

We also proceeded to calculate abnormal returns (AR), as well as cumulative abnormal returns (CAR), in relation to expected returns according to CAPM, for each day within the selected window, as it can be seen in table 9 below.

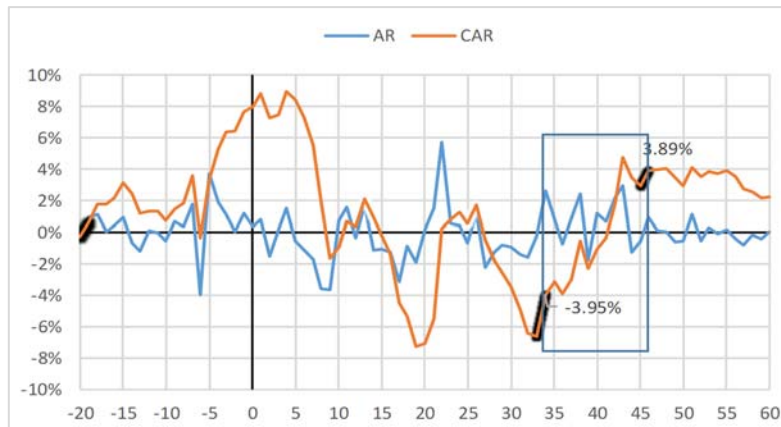
Table 9. Calculation of AR and CAR through CAPM

Date	Day	AR	CAR
Nov 28, 2018	-20	-0.28%	-0.28%
Nov 29, 2018	-19	0.93%	0.64%
...			
Dec 28, 2018	-1	1.19%	7.64%
Dec 31, 2018	0	0.36%	8.00%
Jan 03, 2019	1	0.81%	8.81%
...			
Mar 27, 2019	59	-0.40%	2.19%
Mar 28, 2019	60	0.03%	2.22%

Source: Author’s calculations.

The evolution of AR and CAR is illustrated in figure 4, which also shows the days when CAR is not statistically significant (the interval between day 34 and day 46, post-announcement, with p-value > 5%).

Figure 4. The evolution of AR și CAR with the acquisition of BANCPOST (CAPM model)



Source: Author's computation.

Similar to the results of the market model, the results of the CAPM model show that the acquisition of Bancpost generated significant benefits, with a statistical p-value of 1%, for the acquiring bank (TLV) both in the pre-announcement phase, during the announcement, and in the post-announcement period until the 8th day. With small exceptions (January 11th - 14th and January 22nd - 26th, 2019), TLV recorded significant reductions (p-value < 1%) in stock market returns, reductions that could also be influenced by the January effect.

The Merger by Absorption between the Bucharest Stock Exchange and SIBEX - Sibiu Stock Exchange S.A. Approved by the ASF Board on May 23, 2017.

We monitored the movement of stock prices for a span of 80 days (May 24, 2017 - August 21, 2017), coinciding with the merger of SIBEX Stock Exchange with the Bucharest Stock Exchange on May 23, 2017. The monitoring window for assessing the impact of the merger was chosen to include a pre-announcement period of 20 days, the announcement day, and 60 post-announcement days.

Market Model: $R_{it} = \alpha_i + \beta_i \times R_{Mt} + \varepsilon_{it}$

To estimate the expected returns using the market model within the selected window, we estimated the alpha coefficient (= 0.0001) and the beta coefficient (= 1.5413) over the 80-day period (table 10).

Table 10. The chosen window for estimating expected returns through the market model (BVB & SIBEX merger)

Date	BVB %	BET%	
Apr 24, 2017	1.13%	0.48%	alpha
Apr 25, 2017	1.05%	1.22%	0.0001
Apr 26, 2017	1.60%	0.30%	
...			beta
Aug 18, 2017	0.23%	1.07%	1.5413
Aug 21, 2017	1.78%	1.05%	

Source: Author's calculations.

The calculation of abnormal returns (AR), as well as cumulative abnormal returns (CAR), was performed for each day within the selected window (table 11).

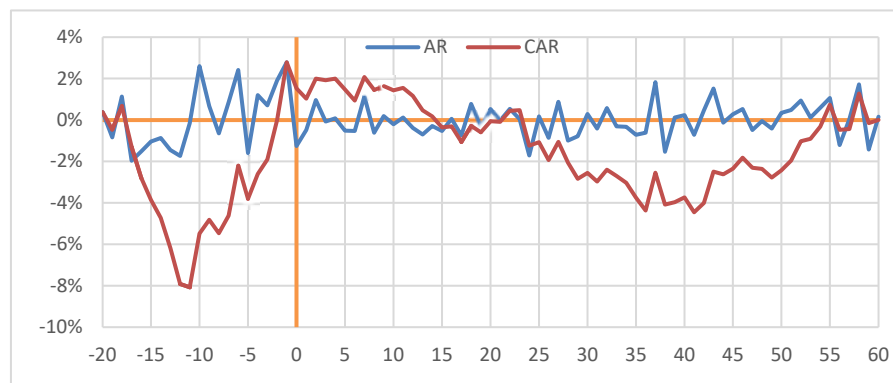
Table 11. Calculation of AR and CAR through the market model (BVB & SIBEX merger)

Date	Day	AR	CAR
Apr 24, 2017	-20	0.38%	0.38%
Apr 25, 2017	-19	-0.84%	-0.46%
...			
May 22, 2017	-1	2.78%	2.78%
May 23, 2017	0	-1.26%	1.52%
May 24, 2017	1	-0.49%	1.03%
...			
Aug 18, 2017	59	-1.43%	-0.15%
Aug 21, 2017	60	0.15%	0.00%

Source: Author's calculations.

The evolution of AR and CAR is illustrated in graph number [insert number], which also shows the days when CAR is statistically insignificant (the interval between day -19, -17, and -16, and day 30, pre-announcement, with a p-value > 5%)(6):

Figure 5. The evolution of AR and CAR estimated through the market model



Source: Author's computation.

According to the market model, the BVB-SIBEX merger resulted in significant decreases (with a p-value of 1%) in the BV stock price during the pre-announcement phase, from day -16 to day -3, followed by significant increases from day -1 to day 9 in the post-announcement phase. In other words, the BVB-SIBEX merger recorded significant benefits from day -13 to day 9 (table 12 below).

Table 12. Significant decreases/increases (p-value of 1%) in the stock price of BVB through the market model

-13	-1.45%	-6.18%	-2.757	=> significant with 1%
-12	-1.74%	-7.91%	-3.085	=> significant with 1%
-11	-0.16%	-8.08%	-3.495	=> significant with 1%
-10	2.59%	-5.48%	-3.976	=> significant with 1%
-9	0.66%	-4.82%	-4.429	=> significant with 1%
-8	-0.65%	-5.47%	-4.904	=> significant with 1%
-7	0.85%	-4.62%	-5.342	=> significant with 1%
-6	2.41%	-2.21%	-5.488	=> significant with 1%
-5	-1.60%	-3.81%	-5.855	=> significant with 1%

-4	1.20%	-2.61%	-6.070	=> significant with 1%
-3	0.70%	-1.91%	-6.165	=> significant with 1%
-2	1.91%	0.00%	-5.849	=> significant with 1%
-1	2.78%	2.78%	-4.920	=> significant with 1%
0	-1.26%	1.52%	-4.521	=> significant with 1%
1	-0.49%	1.03%	-4.274	=> significant with 1%
2	0.96%	1.99%	-3.924	=> significant with 1%
3	-0.08%	1.91%	-3.640	=> significant with 1%
4	0.08%	1.99%	-3.385	=> significant with 1%
5	-0.52%	1.47%	-3.213	=> significant with 1%
6	-0.54%	0.93%	-3.108	=> significant with 1%
7	1.13%	2.07%	-2.904	=> significant with 1%
8	-0.62%	1.45%	-2.771	=> significant with 1%
9	0.19%	1.64%	-2.631	=> significant with 1%

Source: Author's calculations.

According to the market model, the significant benefits of the merger (within the window -2; 2) indicate that the impact of this event was mainly observed after the approval by the ASF Board (within the window -1; 9).

$$\text{CAPM Model: } R_{it} = R_{ft} + (E_{Mt} - R_{ft}) \times \beta$$

For estimating expected returns using the CAPM model, in the chosen window, we estimated in table 13, the beta coefficient (= 1.5413) as well as the evolution of the overall Romanian stock market returns (variation of the BET index) during the 80-day period prior to the analyzed acquisition.

Table 13. Estimation of expected returns through the CAPM model for BVB and BET

Date	BVB %	BET%	
Apr 24, 2017	1.13%	0.48%	
Apr 25, 2017	1.05%	1.22%	
Apr 26, 2017	1.60%	0.30%	beta
...			1.5413
Aug 18, 2017	0.23%	1.07%	
Aug 21, 2017	1.78%	1.05%	

Source: Author's calculations

We proceeded in table 14 to calculate abnormal returns (AR), as well as cumulative abnormal returns (CAR), in relation to expected returns according to the CAPM, for each day within the chosen window.

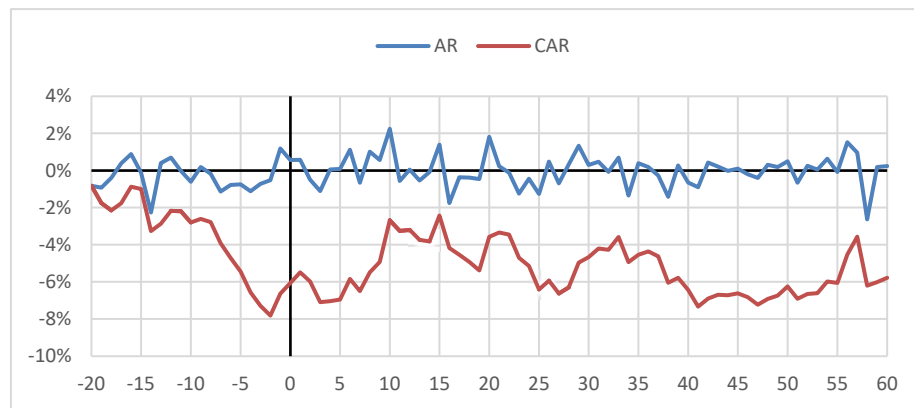
Table 14. Calculation of AR and CAR in relation to the expected returns according to CAPM

Date	Day	AR	CAR
Apr 24, 2017	-20	0.39%	0.39%
Apr 25, 2017	-19	-1.62%	-1.23%
...			
May 22, 2017	-1	4.18%	5.51%
May 23, 2017	0	0.18%	5.70%
May 24, 2017	1	-1.04%	4.65%
...			
Aug 18, 2017	59	-1.73%	7.45%
Aug 21, 2017	60	-0.43%	7.02%

Source: Author's calculations.

The evolution of AR and CAR is illustrated in figure 6, which also presents the days when CAR is statistically insignificant (the interval between day 14 and day 25, post-announcement, with p-value > 5%).

Figure 6. Evolution of AR and CAR



According to the CAPM model, the BVB-SIBEX merger has generated significant decreases (with p-values < 1% and < 5%), in the BVB stock price during the pre-announcement phase from day -16, announcement until day -3, followed by significant increases until day 2, the post-announcement phase. These benefits could also be generated by the announcement of preliminary mergers and acquisitions in preparation for the merger decision.

Table 15. Significant decreases/increases (p-value of 1%) in the stock price of BVB (CAPM model)

-16	-1.51%	-3.55%	-2.067	=> significant with 5%
-15	-1.04%	-4.58%	-2.553	=> significant with 5%
-14	-0.86%	-5.44%	-3.022	=> significant with 1%
-13	-1.44%	-6.88%	-3.387	=> significant with 1%
-12	-0.93%	-7.81%	-3.759	=> significant with 1%
-11	-0.15%	-7.96%	-4.198	=> significant with 1%
-10	3.69%	-4.27%	-4.652	=> significant with 1%
-9	-0.13%	-4.40%	-5.117	=> significant with 1%
-8	-0.10%	-4.49%	-5.590	=> significant with 1%
-7	1.14%	-3.36%	-5.935	=> significant with 1%
-6	2.16%	-1.20%	-5.828	=> significant with 1%
-5	-1.59%	-2.78%	-6.082	=> significant with 1%
-4	1.21%	-1.58%	-6.106	=> significant with 1%
-3	0.99%	-0.59%	-5.917	=> significant with 1%
-2	1.92%	1.33%	-5.291	=> significant with 1%
-1	4.18%	5.51%	-3.864	=> significant with 1%
0	0.18%	5.70%	-2.998	=> significant with 1%
1	-1.04%	4.65%	-2.507	=> significant with 5%
2	2.73%	7.38%	-1.859	=> significant with 5%

Source: Author's calculations.

Based on the CAPM model, the substantial advantages resulting from the merger, observed both prior to and following approval by the ASF Board (within the window of -2 to 2), underscore the pronounced impact of this event, particularly surrounding the merger decision.

Conclusions

Proving semi-strong informational efficiency requires a zero autocorrelation coefficient, signaling random price movements. However, if the introduction of new information at time "t" yields abnormal returns before or after this point, it contradicts semi-strong efficiency.

Our focus has been on identifying the economic ramifications of acquisition and merger announcements, spanning both micro and macro levels. At the micro level, these announcements affect market investors, while at the macro level, they influence overall market conditions and liquidity. The public disclosure of such events impacts the regulated capital market, and scientific inquiries have concentrated on elucidating the repercussions of acquisition and merger announcements.

There is a significant movement in stock prices one day before the actual announcement of mergers and acquisitions, followed by aggressive reversals for several days. This return pattern, coupled with market movements, exceeds 11% over a 10-day period. The day of the event is considered to be the day of the publication of the Board of Directors' decision regarding the acquisition.

For analyzing the market's reaction to an event, we predominantly used the market model as well as the Capital Asset Pricing Model (CAPM). Our study estimates the impact on the stock price of Banca Transilvania due to the acquisitions of Volksbank Romania and Bancpost. Lastly, we analyzed the impact of the merger between BVB and SIBEX Sibiu.

This paper offers an in-depth empirical examination of the economic advantages gained by shareholders of acquiring firms through their involvement in merger and acquisition endeavors. Our empirical findings regarding the returns acquired by these firms suggest that, overall, acquirers experience positive abnormal returns. This stands in contrast to much of the existing literature, which indicates that, on average, acquiring firms in developed countries tend to incur losses, although not always statistically significant ones.

Notes

(1) These steps are very well described in the book by Seiler, M. J. (2004), "Performing Financial Studies: A Methodological Cookbook," published by Prentice Hall in Upper Saddle River, NJ.

(2) AR – Abnormal Return

(3) AAR – Aggregate Abnormal Return

(4) CAR – Cumulative Abnormal Returns

(5) ACAR – AggregateCumulativeAbnormal Return

(6) Rules for two-tailed t-stat:

If the t-stat is between -1.64 and 1.64, then the t-stat is insignificant.

If the t-stat is < -1.64 or > 1.64 , then the t-stat is significant at 10%.

If the t-stat is < -1.96 or > 1.96 , then the t-stat is significant at 5%.

If the t-stat is < -2.58 or > 2.58 , then the t-stat is significant at 1%.

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A retrospective of material well-being and quality of life in the last decade

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Abstract. *This present retrospective of material well-being and quality of life in the last decade, completed through the study of the available knowledge, highlights the importance of increasing material well-being, an important and multidimensional factor in the evolution of humanity and economic development. This analysis, based on the current study of knowledge in order to research and develop the present article regarding the retrospective of the material well-being of the last decade, brought to light other theoretical works carried out by researchers devoted to the study of material well-being and the increase of the quality of life. This work aims to develop a concept about the evolution, development and interpretation of the well-being of the individual and society. Therefore, the evaluation of the indicators identified in this study of knowledge went from the oldest interpretations of subjective fertility to the latest of today.*

Keywords: subjective well-being; objective well-being; material well-being.

JEL Classification: I31, D60, D63.

Research methodology

The identification of the available existing research in the related specialized literature involved a meticulous process of selecting scientific articles indexed in various international databases, which directly addressed the concept of objective and subjective well-being. The research in the databases was conducted employing key terms such as “objective well-being” and “subjective well-being”, as well as other combinations of terms that focused on aspects such as the forms of definition and research of objective and subjective well-being. Following the application of these search terms, a number of 25 articles was selected in the initial phase. The articles were researched in minute detail, identifying and retaining in the presentation of this retrospective different conceptual approaches to subjective well-being. Different tools for quantifying the indicators of well-being subjective aspects of the factors that define the well-being of the individual and society have been proposed. Also, those scientific works whose relevance and notoriety is established through the number of citations accumulated from the date of their publication until now were analyzed in particular.

Introduction

The main purpose of this article is to realize a retrospective of material well-being, both subjective and objective, in order to identify how progress has been made over time in relation to its development and evolution. Authors presented in this retrospective study of knowledge of material well-being were selected by specific activity sectors specific to the indicators and forms of measuring subjective and objective well-being, showing how important they are in the evolution of increasing the quality of life. I took into consideration the report of the European Commission regarding the recommendations made in the perspective of improving economic performance, a determining factor in improving the quality of life. Material well-being, a symbiosis of subjective and objective well-being known since the times of Plato and Socrates up to the most effective developments of the present, has been studied and analyzed. Analyzes were presented on various sectors of activity, such as: economy, health, education and spirituality, sport and culture, social relations, human interactions, forms of communication and socialization, as well as the variables of income with advantages and its benefits for increasing subjective well-being and its objectives. This article also discussed the hybrid approach, which is different from the multidimensional approach to well-being inspired by philosophy to overcome the weak points of the subjective and objective approach to well-being. The evaluations made highlighted sports activities and physical health, an important part of individual health, with its manifold manifestations and benefits, but also the form of promotion of sport in society by the decision-makers of our society. We have not bypassed the durability and sustainability of the economy to increase the quality of life, given that the future of society, which must also be thought from the perspective of the economy and the environment in the medium and long term, is necessary for the generations to come.

The study of knowledge

Material well-being, the main factor of the quality of life, has become an increasingly debated topic in the specialized literature by certain authors who have conducted case studies and research analysis to identify positive and negative factors of the quality of life. One such example is (Stiglitz, et al. 2009), who developed a report for measuring economic performance and social progress, taking into account the GDP as an indicator of economic performance and social progress, and including the problems that emerged in the performance of statistical measurements for the production of relevant indicators. These said indicators are important for the design and evaluation of policies aimed at advancing the progress of society, especially the level of education of the population, which can be evaluated based on the growth of modern economies and the widespread use of information technology. The report clearly specifies that non-market measurements are different from measurements that express the income and expenses of the household defining the well-being of the citizen.

In this context, it was found that well-being is defined by subjective multidimensional well-being, identifying various factors that influence material well-being, health, education, personal activities, political voice, social connections, environmental conditions, personal insecurity, economic insecurity and other cross-cutting issues. Thus, material well-being is a multidimensional concept that is the basis of increasing the quality of speed, emphasizing that material well-being is divided into subjective well-being and objective material well-being.

The European Commission makes useful recommendations in the context of measuring material well-being: the GDP, which is the most used tool for measuring economic indicators and material well-being; and the rate of income and consumption, in comparison with the realized production, since income and consumption offers a general perspective of the household, assigning a specific importance to the distribution of the achieved income compared to consumption and wealth. Other indicators are the expansion of measures regarding income from non-market activities, the perception of the notion of abilities, the perception of the notion of fair allocation, the decrease in mortality and morbidity, the decrease in the number of people who have lower occupational activities, a low level of education, and lower incomes that complicate their lives abundantly.

Subjective well-being is the basic tool that economists and statisticians use for evaluation and determination, because the measurement of subjective well-being is conducted through the answers they receive from people using various types of interviews and questions, while objective well-being refers to the quality services and public activities necessary for a good life. (Voukelatou, et al. 2020) argue that well-being is an important value for people's lives and could be considered as an index of social progress addressing two types of well-being: objective well-being and subjective well-being. The objective approach investigates the objective dimensions of the good life, while the subjective approach examines people's subjective evaluations of their own lives. Traditionally, both objective and subjective well-being are measured through household income and consumption surveys, identifying six

major observable objectives: health, work opportunities, socio-economic development, environment, safety and politics. All these dimensions represent objective well-being. In this specific context, (Voukelatou, et al. 2020) say that subjective well-being highlights five main dimensions: universal needs (psychology of needs), social environment (education and health), economic environment (research on income and the development of economy), the existing political environment (government and government policies), democracy and political freedom (freedom to choose).

The scientific term for subjective well-being is given by the indicator of happiness, the central value that emerges from people's lives. Debate over the definition of the term has existed since antiquity. Aristotle expressed his interest in the subject, claiming that human well-being, labeled eudaimonic, is represented by people as conscious finites who can subjectively modify their appreciation of nominal life, having subjective well-being or happiness. Happiness as a definition can be evaluated affectively and cognitively on people's lives, analyzing the affects, thoughts, feelings, emotions and moods through the so-called hedonic style of the effect. The concept of happiness compared to traditional macroeconomic measurements, such as GDP, inflation and national income, can capture variations in people's perceived well-being. According to Esterlin's paradox, temporary incomes both within a nation and between nations directly affect happiness. But, over time it has been shown that happiness does not have an upward trend as income continues to grow, it rather remains constant regardless of the perceived degree of happiness. The concept of subjective well-being as seen by (Drakulić, 2012) in his article shows that happiness and satisfaction with life have long been a subject of philosophical speculation that shaped the vision of many influential writers on religious, ethnic or political issues.

In Aristotle's time, affective phenomena such as pleasure, sadness, power and fear, lust and want, were considered irrational and incompatible with human nature. Subjective well-being is a psychological construct in a relatively new field of positive psychology, and for about half a century there has been an increasing scientific interest of researchers and scientists to identify the various factors that influence subjective well-being. In his work, the author proposes three components of subjective well-being: life satisfaction, the emotions of joy or the unpleasantness encountered in the course of life, and the pleasure gained from certain aspects of life (such as marriage or leisure time activities)

The affective component of subjective well-being includes both positive moods and emotions, as well as negative emotions associated with our everyday life, mentioning that in this way positive or negative emotions are independent categories and interpreted in three ways: structural, causal, and momentary. Positive and negative emotions arise from various causes independent of the moment or the environment. (Charalampi, et al. 2020) show that researchers generally share the vision of well-being as a multidimensional concept of personal and social well-being, a combination of theoretical methods that is defined as a construct with nine dimensions: evaluative well-being, emotional well-being, functioning, vitality, community well-being, well-being derived from upholding democratic values, family well-being, health well-being and personal care. What interests

us in this work is how much subjective and objective well-being is involved in increasing the quality of life and how society reacts when an indicator of well-being increases or decreases. The well-being of individuals can be understood as a sustainable condition allowing an individual to develop and prosper. This is a combination between good feeling and good functionality. By expressing certain positive emotions such as happiness and contentment, sadness and want gain a certain control over life, as the more positive emotions are more frequent, the more the connection between subjective well-being and quality of life is increasing.

It should be noted that the measurements to identify the degree of long-term subjective and objective well-being can be identified in three types of measurements of subjective well-being. The first is evaluative well-being, which captures the individual's evaluations of their life, and is like a whole that refers to the aspects specific to it. Then, there is hedonic well-being, which refers to people's feelings and dispositions at a given moment by measuring both positive and negative feelings. Eudaimonic well-being, the third type, seeks to capture the psychological functioning of individuals. Eudaimonia is also presented by (Kłym-Guba & Kara 2018) as the highest achievement of nature. Moreover, according to classical Greek philosophy, true happiness can be found by leading a virtuous life and doing things worth doing. Plato and Socrates say that eudaimonia is the state of mind achieved by satisfying all needs in a balanced way. Aristotle developed their ideas through his writings and proposed a similar approach. (Kłym-Guba & Kara 2018) cite (Waterman, et al. 2010 p,41), saying that eudaimonic well-being is considered a capacious but consistent and undivided construct, a main component for increasing the quality of life. In addition to the eudaimonic analysis, there is another vision, hedonism, which is associated with experiencing pleasant feelings that maximize pleasure and minimize pain. The hedonic tradition is closely linked to emotional well-being, satisfaction with life and the display of positive affect, while the eudaimonic perspective emerges from Aristotle's philosophy the expression of pleasure and subjective well-being, stating that well-being is not only pleasure, but the fulfillment of human needs by involving oneself in current activities and planning future activities, investing in effort you obtain the satisfaction of pleasures, and transforming it into altruism and empathy.

(Svorc 2018) cites (Veenhoven 2008), who defines happiness as the degree to which a person favorably judges his general quality of life, arguing that the terms happiness and satisfaction possess identical meanings of the subjective evaluation favorable to life. (Withey 1976) shows that Diener made the distinction between three general components of subjective well-being: positive affect, negative affect, judgment and satisfaction. From this perspective subjective material well-being is cognitively and affectively evaluated by a person in one's life cycle. The term affect includes all moods and it basically represents people's instant evaluations of the events taking place in their lives. Svorc (2018) also says that it is not the income itself that makes people happy, but the consumption of goods and services that they purchase with the money they earn from work. (Andress and Lipsmeier 2001) and (Christoph 2010) cited by (Svorc 2018) distinguish three approaches for measuring the material situation: the consumption approach, the resource approach, and

the standard of living approach. The resource approach uses indirect variables such as income and wealth. Here, we notice that all variables revolve around income, which means that income is the basis of any variable for the three approaches, a fact that directs us to make a close connection between non-material well-being and material well-being. Thus, one can notice the relationship between the workplace and job satisfaction. On the other hand, happiness can cause economic prosperity that could be a byproduct of the obtained income. A more complex and recent research conducted by (Kwarcinski & Ulman 2020) applying the concept of measuring individual and social hybrid well-being refers to the field of philosophy and economics, showing that hybrid well-being is different from happiness. It takes into account the fact that that citizens of richer countries live in higher quality of life circumstances than their counterparts from developing Eastern European countries. The subjective and objective aspects of material well-being are also considered, and it is stated that in order to contribute to general well-being, a person's subjective state should match his objective state.

But there are a number of concepts and measurements of objective and subjective well-being in the context of material well-being of a person and a society. The rapid development of the concept of objective well-being is accompanied by the increased sophistication of understanding the objective states of human well-being, (Dainer 1984), cited by (Kwarcinski & Ulman 2020), emphasized three separate but interdependent concepts of subjective well-being: the eudaemonist concept, the concept of life satisfaction, and the concept of emotional experience. Experimenting the hybrid approach to well-being, one that is different from the multidimensional approach which treats happiness as one of the dimensions of well-being, the hybrid approach conceptualizes happiness as subjective well-being measured independently of the objective aspect of well-being. The hybrid version of well-being is a philosophically inspired attempt to overcome the weaknesses of both subjective and objective approaches to well-being. But, subjective well-being is based on self-evaluation, the state of satisfaction and happiness regarding one's life taken as a whole. If we look at a person's ability "to do" or "to be valuable" we will notice if a person is able to do an action or to be in a certain position or state takes into consideration ten distinct dimensions: life, bodily health, bodily integrity, senses, thinking, emotions, practice, motives, and affiliation. All these dimensions are conditioned by two factors: income and health. If the income is satisfactory in relation to usual expenses and optimal conditions for leisure - sport, tourism and culture - subjective well-being becomes a major contributor to the increase in the quality of life. (Wheatley & Bickerton 2017) take an overview of subjective well-being and describe some important activities that are part of leisure, such as cultural and sports-related or activities – visiting museums, attending art events, and visiting historical sites.

These measures were never conceived as complete measures of progress. On the contrary, they were criticized and categorized as auxiliary measures that do not directly contribute to subjective well-being, since they were supposed to present a limited relevance in increasing subjective well-being. Thus, one wonders whether these activities create a positive emotion and subjective well-being. Free time represents a complex human need in

the variable stage that is fulfilled through the consumption and production of experiences and leisure activities, such as outdoor relaxation. This is a product of the personal perception of what is discretionary, pleasant and satisfying. These activities are sources of both cultural and economic value. But cultural value is different from economic value, because cultural value is not measurable on the monetary scale, it is measurable on the emotional scale of happiness. Positive experiences in free time create life satisfaction and contribute to a clearer and less stressful form of action from an economic point of view.

Leisure activities are events that can lead to preventive activities and health improvement. For example, if a person spends a few hours a week in an atmosphere of recreational sports, health can be greatly improved, and a normal mental stability and a sense of well-being are induced. All these three factors contribute to improving health and are achieved by spending one's free time in recreational activities such as sports. (Roychowdhury, 2019) says that some researchers have identified a number of key areas for future practices, adding spirituality as an important factor in improving sports performance and the stimulation of excellent subjective well-being and individual growth of general well-being. The conceptualization of spirituality in research and practice showed that the psychological constructs of spirituality include both the sports and religious aspects, and were often used interchangeably in the sports psychology literature. New Age spirituality is understood as being characterized by an internal and reflexive search for meaning, keeping the scriptural reference on the one hand and the corporeal on the other. Spirituality is considered to be a process of human transformation in the modern era, addressing a conglomeration of metaphysical, moral, ascetic, subjective, experiential, existential, physical and social psychological forms in its somatic field.

We notice that spirituality today is regularly linked to physical and material actions, such as: yoga, martial arts, physical exercises. Thus, sports and faith act as a deterrent for negative behaviors. In this context appears the spiritual well-being invented by Eilison and Paloutzian in 1982, which incorporates dimensions of religious, spiritual and existential well-being. The introduction of a consultancy service and psychological guidance of spirituality among young people for the identification of meaning would bring substantial benefits to subjective well-being. Theoretical studies based on the theory of self-determination show the impact of sports activities on subjective well-being, (Say Jetzke & Mutz 2020) in their work, which hypothesizes that intrinsic sports-related motivations such as pleasure, socialization and relaxation can increase subjective well-being. Not the same can be said about the extrinsic effect of sports-related activities, when these are used competitively or to control weight.

Studies have highlighted positive relationships between sport-related activities and physical health. For this reason, many governments have engaged public policies in order to implement prevention policies to promote sports and physical activities. In addition, the importance of sport for psychosocial health and subjective well-being has also received considerable academic attention. Most of the existing studies demonstrate small to moderate effects of sport-related activities or sport-based interventions on subjective well-

being and mental health. However, recreational sports, especially fitness, contribute to the subjective well-being of a person by improving health, increasing mental stability and creating a state of well-being. Research shows that the frequency of physical exercises and the practice of recreational sports positively correlates with life satisfaction and an increase in the quality of life. Vieira, et al (2022) argue that fitness revealed a positive impact on the quality of life of fitness practitioners and professionals, and a positive impact on the community in which sport is promoted.

Physical activity plays an important role in achieving a healthy lifestyle. It is also important to say that practicing fitness is possible regardless of age, sex, marital status, educational qualifications, social status or other elements. The effect of physical exercises is quantified by the state of health. In this context we can identify the research done (Vieira, et al. (2022), which demonstrates that there is a causal relationship between sport and mind in the case of fitness practitioners. Sport reduces the level of stress, the state of anxiety, it brings a peaceful attitude and a great degree of mental stability. Sports and social activities done frequently, as Jetzke & Mutz 2020) say, seem to be more useful in terms of subjective well-being, especially when recreational sports are practiced in groups of two or three people. Practicing recreational sports, especially fitness, induces a greater self-determination in its practice and therefore the satisfaction with life increases in the people who practice recreational sports for pleasure. The self-determination to do recreational sports activities is facilitated when public policies promote sports and publicize its benefits. It would be advisable for public policies to introduce this necessity as a personal need for increasing and improving health. Conceptualizing basic needs as inherent tendencies to increase personal self-esteem motivated by key and intrinsic motivational factors leads to health and well-being.

(Ryan & Deci 2000), cited by (Jetzke & Mutz 2020), distinguish three basic needs: competence, autonomy and relationship. People feel competent when they experience challenging tasks and recognize that they can achieve their personal competencies. The sense of competence is related to the person's skills, but it also depends on the social environment. For example, the positive feedback provided by others significantly increases one's self-esteem, and conversely, continuous negative feedback diminishes one's feelings of competence and mental state. The feeling of autonomy is strongly influenced by the extent to which a person feels free with his own actions, as well as capable and personally responsible. Sport is the leisure activity that can satisfy the basic psychological needs of individuals and thus contribute to subjective well-being.

Competence is the starting point for subjective well-being, and it presents the following structure: Competences > self-determination > execution > results > satisfaction with life > increase in subjective well-being. A person who acts, perceives and executes these types of activities autonomously and voluntarily demonstrates the ability to identify the purpose of the proposed activity by trying to bring it to a successful end and by fulfilling the defined objectives which are considered relevant and valuable. From all the available research it

was found that individuals who practice sports regularly generally have a higher than normal life satisfaction compared to other individuals who do not.

The relationship between physical activity and quality of life is also analyzed by (Gill, et al. 2006) who addresses a gap by developing a measure of quality of life based on a conceptual model that reflects positive health and is relevant for physical activities and promotion programs of health. Physical activity is a key benefit in increasing the quality of life. For this reason, it is imperative to promote physical activities among citizens aimed to improve health and generate well-being. One of the benefits of improving health through physical activities is that it reduces the risk of major diseases. A large number of researchers indicate that physical activity also promotes psychological health, physical function, and social and spiritual well-being, extended to more related constructs such as depression, anxiety and the improvement of psychological state.

(Gill, et al. 2006) cite O'Connor (2004), who offers a series of definitions of Quality of Life, which connect quality of life with health and refer to the definition of the World Health Organization. Health is a state of complete well-being – physical, mental and social. This definition, which reflects positive health and departs from the traditional medical model, is the basis of analysis for most definitions of Quality of Life. The most common definitions of quality of life refer to a broad, integrative construct with multiple dimensions such as the goodness of life related to perceived psychological, spiritual, socio-cultural, ecological and environmental well-being. (Gill, et al. 2006) define quality of life as a subjective, multidimensional, and integrative construct, which reflects optimal well-being and positive health, an individual's perception of his position in life in the context of the culture and value systems in which he lives, also including the degree to which his, expectations, standards and concerns are met. This is a broad concept affected in a complex way by the physical and psychological health of a person for his convictions, through his social relationships and his relationship with the environment.

Lior, et al. (2018) present in their work the three pillars of sustainability: the environment, the economy and society. These are usually internationalized and dependent on time in their monitoring and aggregation, although there is no clear standard for their selection. However, everything is influenced by the economic development on existing natural resources measured by consumption, production as well as indicators of their replacement with renewable products. Measuring progress and implementing measures to promote sustainable development requires a definition and the supervision of the achieved and planned level individually adjusted for each country or region, especially in countries undergoing intensive transition of economic development and geopolitical positioning. We have to take into account that some of the eastern communist countries in central and eastern Europe the exploitation of mineral resources continues, and this is reflected by the delay in their conservation and the increase in the quality of the environment, a factor that determines the increase quality of life. For this reason, it is very important to note that sustainable development must reflect the development of society and the community, both now and for the future.

In this context, we can also take into account the GDP, which must be built and used by introducing new cost-effective sustainability measures, which are more suitable for the countries in the region, and relate to the social status of the citizens and the natural wealth that undoubtedly reflects the quality of life of the population. It is worth noting that the values of public expenditure indicators for health, education, human happiness index, social progress index, and the financial satisfaction of the household, together with the emancipatory values, prosperity, and political stability are the main indicators of the increase in the quality of life. Although some researchers generally share the vision of well-being as a multidimensional concept of personal and social well-being, Galinha & Pais-Ribeiro analyze cognitive, affective and co-textual factors of subjective well-being through four different components: positive and negative state affect, the affect of positive and negative traits, the standard of comparison, depression, anxiety and stress, life events socio-demographic variables, and the contextual variable of the educational status, as well as the interpersonal variables that are the main predictors of well-being. In this way we identify the relative contribution of several cognitive, affective and contextual factors. Subjective well-being is accepted to be a broad concept of a cognitive and an affective dimension, separate and moderately correlated. Their construction includes variables such as satisfaction with life as a whole, and specific domains with a positive or negative affect. In most studies, contextual factors such as socio-demographic variables and life events demonstrate low or short-term impacts on subjective well-being, but sometimes contextual factors can have a strong and long-term impact on the subjective well-being of individuals. Interpersonal factors such as temperament, social comparison, objective gap, achievement and adaptation to crisis situations are interpersonal contextual forms that are part of the subjective well-being of individuals.

Analyzing in society the human being as an individual physical person and as an individual part of a society, (Alartseva & Arysheva 2015) describe in their work that well-being gives us the opportunity to distinguish between the personal well-being of an individual and the social well-being of a member of society and status. For this reason the main goal of the state, society and man is to understand and accept that human well-being is an indispensable condition of a solid society based on development and prosperity, both from an individual and community point of view. In this context, well-being becomes an objective or socio-economic aspect. That is why we can say that human well-being is seen as an integral, multifaceted and multifunctional notion, described in four concepts:

1. Man has well-being if it is in accordance with his nature;
2. If he understands what the good things in his life are;
3. If he manages to achieve what he needs from his potential;
4. If the society he lives in manages to offer opportunities for them to exist in accordance with human nature.

Analyzing the four concepts, we could formulate the two known types of well-being: human well-being and material well-being. PUND & OECD (2013) cited by Alartseva & Arysheva (2015) say that the nation is based on two concepts - sustainable development and human development. Human development is formed by the formation of skills and

human opportunities, and sustainable development must ensure the prosperity of future generations through economic development and increasing the quality of life, as (Costanza, et al. 2007) say. Understanding, measuring and improving the human experience are the major objectives of individuals, researchers, communities and governments for the evaluation and improvement of quality life in the fields of psychology, medicine, economics, environmental studies and sociology.

Quality of life research is focused on two measurement methodologies. One is on social or economic indicators, and the second the self-report of happiness, pleasure and overall satisfaction with life. (Diener and Lucas 1999) cited by (Costanza, et al. 2007) argue that the so-called objective measurements of the quality of life focuses on social, economic and health indicators, instead. (Cummins, et al. 2003) cited by (Costanza, et al. 2007) state that they employed the Index of Human developments. Although these measurements can be a snapshot of how well certain physical and social needs are met, they are narrow and biased by opportunities, which cannot include many issues that contribute to measuring the quality of life and human well-being.

These objective measures are actually representative of the experience identified through the subjective associations of the decision-makers, and this means that the distinction between objective and subjective indicators is illusory and less relevant analysis. The author presents two categories of headings of objective indicators. The first category is comprised by economic production, literacy rates and life expectancy; the second category is represented by the indicators applied to a person without the respective person being evaluated subjectively. Objective indicators can be used individually or in combination with a form of summary indices, among the human development index. Next, the author discovers a category of indicators called reproduction that is part of subsistence, and falls into the concept of social reproduction that refers to future generations with significant political implications. In his discovery, the author added a category of indicators such as "spirituality", in which people include the mode of feeling and transcendence with a connection to a system or a greater power which may have religious affiliations. This forms the subjective well-being as mentioned by (Danna & Griffin 1999), (Lewin 1951), (Medow 1988) and others. (Sirgy 2002) cited by (Costanza, et al. 2007) claims that human beings structure or organize their cognitive and affective experiences in the domains of life, the personal history, the history of the community from which they come and continue their daily life, all based on the needs they had, and were fulfilled, but also on the future needs.

In this way, we observe Quality of life as a multidimensional construct resulting from multiple needs at the individual, community, national and global level. The basis of subjective material well-being is the person's income both for him personally and for the community. (Boo, et al., 2020) show that there is an academic and political concern regarding the fact that the increase in income leads to the improvement of subjective well-being in among individuals, which is defined as a general evaluation of a person's life, being determined to respect their wishes and achievements in order to reach the level of satisfaction with life and to increase the positive emotions of fulfillment and achievement.

Happiness and life satisfaction can be defined in different ways, because both can be influenced by different fields of life. (Veenhoven & Vergunst 2014) cited by (Boo, et al., 2020) argued that the increase in the income of a nation is associated with the increase in happiness. Nations with higher economic growth have higher average happiness, and for this reason we consider that subjective well-being influences the performance of a country. Subjective well-being can depend on absolute income and relative income. Absolute income on happiness refers to the ability of money to buy things and services that bring happiness, while relative income refers to a person's higher or lower income compared to others. Income may not be the only factor that contributes to subjective well-being, indicating that the middle-aged were less happy than those younger or older people. It should be noted that higher absolute income contributes to higher satisfaction compared to relative income, as if there is a gap between the expected income and the real one, the satisfaction with life decreases. We deduce from this analysis that if someone earns much less than expected, the level of satisfaction will be reduced. As you get older, the level of health is increasingly unpredictable, and for this reason we should accept the state of health as an indicator of measuring health in proportion to increasing age. If health is constant, the level of happiness is also constant, and if the state of health worsens, the level of happiness also decreases. Subjective and objective well-being must have a constant increase with income and economic development.

Income is conditioned by the nature of jobs, as (Voßemer. et al. 2018) analyze in their research. The insecurity of the labor market has increased in many European countries, especially where unemployment is in continuous variability, which negatively affects the well-being and health of people. In this context, social scientists from different disciplines have examined the consequences of these exchanges on the well-being and health of individuals. But a small number of previous studies adopted a transnational perspective, and addressed the moderating role of state institutions applying passive and active policies for the labor market, as well as the adaptation of a special legislation regarding labor protection. The moderator of these active and passive policies is the state, which elaborates and implements special and specific policies that shape the experience of unemployment and insecure jobs. The gathering of researchers regarding unemployment and job insecurity seems important because it has been suggested to increase employment and the flexibility of the labor market, which has blurred the boundaries between unemployment and employment. The policies applied for preventing insecurity at work are the most important, one being the unemployment allowance, and the second being the application of programs for training and the creation of new jobs.

Between indefinite and definite period jobs there is a difference in income security, which leads us to the fact that insecurity appears in work and implicitly subjective well-being and mental health decrease. The author mentions that in European countries individuals who apply for unemployment receive compensation that can support some of the basic needs of life for a definite period of time. However, these compensations do not cover enough the amount necessary to make the expenses with the utilities in the household. For this reason we can state the idea that when a sign of insecurity in the work appears, the first negative

emotions of concern for tomorrow also appear, automatically decreasing the degree of ferocity affecting subjective well-being and implicitly the decrease in the quality of life. The quality of life is a broad, complex and multidimensional construction, say (Stanimirov, et al. 2022) in their work, noting that the individual's perception of his position in life in relation to his goals, expectations, standards and concerns, which is his meaning in life and style his life.

The expression “quality of life” was used for the first time in the middle of the 20th century by politicians who promised voters that they would improve their quality of life by improving their socio-economic status. With the consolidation of the economy, this notion expanded and included in the search: happiness, and the state of health, that is, the introduction of the concept of health quality of life. But, the general, global quality of life is a broad multidimensional construct created by the interaction of several domains: the physical state, the social domain, the emotional state, well-being, satisfaction with life, as well as the social, psychological, economic and political domain, depending on the level of generalization. The desired number of Indicators of the quality of life that appear in the domains listed most often are: interpersonal relationships, participation in society, personal development, physical, material and emotional well-being, self-determination, rights, environment, family, rest, recreation and security. All the indicators are a conglomerate of factors that determine the state and way of life that individuals have. But, as technology evolves, the standard of quality of life increases and new indicators of quality of life appear.

The term “quality of life” is developed in several academic disciplines such as economics, psychology, sociology and geography. (Ivanová, et al. 2022) identify factors that influence the quality of life, mentioning that progress and prosperity were also they are still viewed only through the lens of economic growth usually expressed through the most complex measurement indicator which is the Gross Domestic Product. GDP is considered to be the most important and determined indicator of prosperity perceived by the lay public as something that must grow constantly, However, in recent years attention has been drawn to its deficiencies and limitations, as pointed by (Commins et al., 2003; Matiovic & Matiovicova, 2005, Zudel et al. 2007; Bucek et al., 2010; Giannetti et al. 2015; Figueres & Rivett-Carnac, 2020.)

According to several researchers, the policy of each country should focus more on people's satisfaction with their life and happiness, rather than on the economic growth of the country itself. (Fahrenberg et al. 2004) cited by (Ivanová, et al. 2022) defined ten elements of life and individual satisfaction with them: health, work, financial situation, free time, marriage and partnership, relationships with children, self-satisfaction, sexuality, friends, relatives and housing. The author evaluated in her work several groups of quality of life development; factors of material conditions with life, productivity and other main activities, economic security, health-healthy years of life; education and its effects; living environment, physical safety and life satisfaction. (Ivanová, et al. 2022)claims in their work that quality of life is strongly influenced by the social guarantees of society in terms of public policies and the development of subjective well-being, which is quantified by more

indicators, including spending free time, also described by (Yu, et al. 2022). This is also done by providing individuals with a form of entertainment that is frequently linked to the generation of happiness by creating a time and space of celebration separate from the daily routines of individuals. Here it is also taken into account the nature of events that convey meanings and symbolic cultures in order to enable individuals to fulfill their need for social interaction and self-realization, which results into various psychological benefits and self-esteem fulfillment generated by the attendance of certain events: festivals, cultural parties of theater and film, sports and recreation activities.

Understanding the psychological factors that make events and festivals bring a higher degree of happiness, especially to young people, could help every festival participant to understand the net benefits derived from participating in events and other recreational activities. Being an emerging subject of positive psychology, the subjective well-being reflected on a person's life as a whole refers to what constitutes a better life, say (Oishi et al. 2009) cited by (Yu, et al. 2022). The subjective element of subjective well-being is essential for people who react differently to the same circumstances and evaluate the "good life" based on their unique expectations, values and experiences, state (Yu, et al. 2022).

Early attempts to conceptualize subjective well-being used the term interchangeably with others such as happiness and well-being: however, universal subjective well-being frameworks have since argued that subjective well-being is synonymous with happiness or well-being, but in fact it encompasses a wider range of experience than pure hedonic pleasure, including values, goals and the fulfillment of needs. (Diener, et al. 2018) cited by (Yu, et al. 2022) says an independent concept that overlaps with what we understand to be "happiness" is the most recommendable approach, a perspective also shared by (Cummins 2013). (Hudson, et al. 2022) say that scientists are concerned with regarding the psychomotor properties of the global, retrospective self-reports of subjective well-being by introducing higher psychomotor experiential measures of well-being. Here we have three approaches to well-being: 1. Global well-being 2. Experimental well-being and 3. Global life satisfaction. Subjective well-being is a broad, multifaceted construct that reflects a person's overall assessment of the quality of their life as a whole, and it focuses on two separable subcomponents of this type of construct through an individual's cognitive assessment of the levels typical dissatisfaction in life or positive and negative effect. A defining characteristic of subjective well-being is that it is subjective for all people because they decide for themselves whether their life is evaluated positively or negatively.

Despite initial favorable evidence regarding the psychometric properties of global measures, several researchers have argued that providing an accurate assessment of global well-being may prove to minimize cognitive impairments, and researchers may obtain a seemingly objective assessment of participants' objective well-being. Specifically, the process of forming an accurate judgment about one's well-being requires mental processing and a considerable amount of relevant information, therefore, may force respondents to rely on potentially inaccurate heuristics and reduce the overall validity of measures of well-being. subjective at least in certain circumstances. Studies suggest that ratings for measures

of subjective well-being can be influenced by theoretically unimportant factors: such as his mood, fleeting and trivial positive or negative emotions.

That is why one observes theories according to which people's self-report about happiness in general and satisfaction with life, compared to their life as a whole, vary depending on the time and their health status at the moment the interview is taken. Another factor that influences the quality of the answer is the weather and the environment, as well as the activities they are carrying out at the time of reporting. An alternative to global self-report is the evaluation of the experience at the moment of well-being by mentioning the story about the emotional state that he had throughout his daily life, after which these reports can be aggregated. We will notice that a person with a high level of well-being will report the positive experiences first and the negative experiences afterward. Well-being must reach the evaluation of life as a whole by directly comparing self-reported global stability by summing up experiences of well-being. For this purpose it is possible to measure the two approaches in a stable way. People's moment-to-moment emotions are influenced by transient situational factors and show low stability. (Hudson, et al. 2022) cite (Schwarz & Clore 1983) and (Schwarz & Strack 1999), who analyze in detail the random situational effects which greatly influence the person's status, are: happiness, satisfaction with the workplace, satisfaction with the community, anger, sadness, frustration and worry. One can draw the conclusion that before an individual is evaluated from the point of view of subjective well-being, it is necessary to be evaluated personally and to know if the respondent believes an interview to be suitable given his present circumstances. Consequently, participants in these types of evaluations must be selected to respond to the evaluation object and not according to their emotional status. Subjective well-being is interpreted by each researcher according to the research object and the aspects of the individual's emotions and educational forms are taken into account.

(Das, et al. 2020) argue that that well-being has long been considered the key to creating and maintaining healthy and productive societies. For this reason, certain countries use objective indicators of well-being such as income, literacy and life expectancy as well as subjective measures, such as the way life is perceived and expressed by individuals. One of the scholars of subjective well-being, Diner, defines subjective well-being as "a person who feels and believes that his life is desired regardless of how others see it". This definition refers to the emotional/affective dimension where the predominance of positive emotion over negative emotion leads to better subjective well-being. Diner focuses on subjectively reported feeling and thinking and adheres to the hedonic vision of well-being. In contrast, the eudaimonic vision emphasizes the realization of a person's potential, as it is a normative construct viewed as the possession of desirable qualities. Diner also states that eudaimonic well-being does not reflect the subjective judgment of the actor, but the value framework of the researcher, and analyzes how someone lives a desirable or purposeful life, involving hedonic well-being - the individual's own feeling about his well-being. Subjective well-being is vast and dispersed in several disciplines such as philosophy, economics, and psychology, as well as in emerging fields, public health and human ecology. (Das, et al. 2020) divides subjective well-being into four broad categories:

fulfillment of commitment theory, personal orientation theory, evaluative theories and emotional theories. Other authors have theorized that personality not only influences the probability of events, but also causes people to react emotionally to certain events and in ways that influence subjective well-being by identifying five big personality traits: extroversion, agreeableness, openness, conscientiousness and neuroticism. But despite extensive theoretical studies, very few empirical studies closely follow subjective well-being, since most of them focus on examining how the determinants of subjective well-being are based on need, need fulfillment, wish fulfillment, and quality of life improvement. Quality of life is a strictly conditioned subjective state related to well-being and based on theories of commitment, personal achievements, theories and forms of evaluation of future perspectives as well as emotional theories based on happiness, fear and personal well-being in general.

Conclusions

The dimensions of subjective well-being in increasing the quality of life mentioned in this article were identified in the form of the growth and development of mankind, showing both positive and negative factors in the evolution of material development and the increase in the quality of life. The European commission report elaborated by (Stiglitz, et al. 2009) developed a series of useful recommendations for economic development and increasing the quality of life with important strong indicators that demonstrate the usefulness and necessity of increasing the quality of life. Material well-being was taken into account as a retrospective of evolution both for the subjective and the objective. We found that both types of well-being are closely related to income, which is in turn conditioned by the state and evolution of the labor market. During the research it was discovered that there are a multitude of indicators for measuring subjective well-being. Some are taken in groups by activity segments, others are taken according to strict development criteria, such as economy, social status and educational evolution. (Klym-Guba & Kara 2018) propose the system of eudaimonic well-being which is a main component of increasing the quality of life, but besides this eudaimonic form also appears conceptually in the form of hedonism, which is associated with experiencing pleasurable feelings that maximize pleasure and minimize pain. Another measurement indicator was the negative affect and judgment of satisfaction. From this perspective, material well-being is evaluated cognitively and affectively by each person in his life cycle.

Later I observed that a new concept of well-being has evolved in the world of researchers, namely, hybrid well-being, which measures both individual well-being and social well-being. These two types of well-being are mainly based on income. I have also identified a factor that is in an upward and popular trend, spirituality, which in the psychological constructs includes both the sports side and the religious side, using interchangeably on the sides the literatures of sports psychology and religion, and being considered a conglomeration of metaphysical, moral, ascetic forms, psychological, subjective, experiential, existential, physical and material.

It is greatly hoped that this retrospective of material well-being can be considered a future thinking for the development and progress of society, taking into account a multitude of factors that can be discussed and analyzed in further research.

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The socio-economic effects of infertility

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Abstract. *Endometriosis is a chronic gynecological condition, characterized by the growth of endometrial tissue outside the uterus, usually around the pelvic organs. The socio-economic impact of endometriosis is significant, affecting both the personal and professional lives of the affected women, as well as the health system and the economy as a whole. This condition can generate substantial expenses for treatment, medical visits, medications, and surgery. The psychological impact of chronic pain and fertility uncertainty can also be considerable, affecting the quality of life and mental well-being of affected women. In light of these aspects, the approach to endometriosis is not only medical, but also socio-economic, requiring increased attention from the medical community, governments and society as a whole to improve early diagnosis, effective treatment and appropriate support for affected women.*

The main objective of the research is to carry out a case study centered on endometriosis that evaluates the socio-economic impact of infertility for patients with surgical interventions and whose result will contribute to the education of patients and specialists interested in the evolution of this pathology. The study was designed to capture the feedback of patients, doctors who treat this disease as well as the perspective of the psychotherapist. The secondary objectives that derive from this case study are to highlight the diagnostic and treatment experience for patients – defining elements for the quality of the surgical act, as well as to correlate the perspectives of those involved. It was also intended to validate the studies presented in the theoretical aspects through the results of the proposed studies.

Keywords: infertility, medical economics, social and economic perspectives of health, population, economic growth.

JEL Classification: D6, D10, O3, I11, I12, I15.

Introduction

The World Health Organization defines infertility as a disease of the male or female reproductive system, defined as the failure to achieve pregnancy after 12 months or more from regular unprotected sex (World, 2003). It affects millions of people – and impacts their families and communities. It is estimated that approximately one in six people of reproductive age worldwide experience infertility in their lifetime (Boivin et al., 2007: 1506-12). In the female reproductive system, infertility can be caused by a number of abnormalities of the ovaries, uterus, fallopian tubes and endocrine system, while the male reproductive system is affected by the absence or low levels of sperm as well as their morphology and motility. Another important aspect to mention is that infertility can be primary or secondary. Primary infertility refers to people who have never achieved a pregnancy while secondary infertility refers to those who have achieved at least one pregnancy (World, 2003). In this regard, it can be added that treating infertility is a challenge in most countries, especially in low- and middle-income countries (Mascarenhas et al., 2012).

Endometriosis is a medical term that describes a chronic condition, which, according to the explanatory dictionary of the Romanian language, is characterized by the presence of endometriomas - fragments of endometrium (uterine mucosa), abnormally located, more precisely outside the uterine cavity (Little Academic Dictionary, 2010).

Also, the Merriam Webster medical dictionary, known as one of the most revised dictionaries, defines this pathology as functional endometrial tissue located outside the uterus that frequently triggers severe pain and infertility (Merriam-Webster Dictionary, 2024). The pathology was described in the literature about 300 years ago as an extremely painful and often progressive disease. Despite recent advances, fundamental problems in understanding and diagnosing endometriosis remain unresolved, the causes of the onset of the condition are practically unknown (der Weiden et al., 2020: 71-75), (Houston et al., 1987: 959-969), (Schmidt, 1995) .

Essentially it affects the reproductive system of the woman, these endometriomas sometimes migrate outside the normal organs reaching the surface of the intestines or even the surface of the diaphragm. Once installed on these surfaces of the aforementioned organs, this tissue fibroses and behaves characteristically during the woman's menstrual period. The released cells infiltrate deep enough into the pelvic area to create strong adhesions between the organs in this cavity. All this mechanism described associates symptoms such as:

- Pain before and during the menstrual period;
- Chronic pelvic pain;
- Infertility;
- Low back and abdominal pain;
- Constipation, flatulence, nausea, fatigue, rectal bleeding, etc.

Depending on the number of endometriosis lesions, as well as the size of the adhesions formed with the organs around them, this pathology has been classified into 4 progressive stages, from mild endometriosis to severe endometriosis. Although these symptoms are

common among women, the condition itself is not very well mastered by professionals, so we come to statistics that say that 2 out of 3 women are misdiagnosed or late. There are many discussions about the diagnostic protocol for this disease, but so far there is no unanimity on it. Since each patient is unique, she must be evaluated in a clinical context, so the right imaging examination option is chosen to determine the location of endometriomas.

The treatment of this condition is done medically or surgically depending on the stage and location of the endometriosis cysts. Considering the subject of research on the relationship between infertility and endometriosis, it can be added that surgery is the only treatment method through which these lesions can be eliminated, and in the case of patients who experience infertility associated with the disease, surgery is their only option to restore their fertile function (Vercellini et al., 2014: 261-75).

As mentioned before, endometriosis is a condition that we place in the gynecological sphere, but the migration of tissues in the intestinal area extends the horizon of surgical knowledge to abdominal or even thoracic surgery, in some cases. Experience and data allow us to emphasize the fact that the successful approach to patients is done in multidisciplinary teams that look at the patient from all surgical perspectives without neglecting the psychological component that brings frustration, helplessness, anxiety and fear for the one in suffering.

The research requires a series of clarifications on an essential aspect of the scientific approach. This pathology is not synonymous with infertility, it is a risk factor, what is interesting in this relationship is the fact that a third of the group of infertile women have endometriosis. A closely related relationship is created between an increasingly widespread pathology among women and a socio-economic problem, infertility.

Literature Review

At the national level, there are no data indicating the prevalence or incidence of endometriosis, as centralized reporting registers of cases in the clinics where these patients are diagnosed or treated are not implemented, but we have at our disposal some internationally published and documented statistics.

Dianne E. Huston and her collaborators first published in the American Journal of Epidemiology in 1970-1979 that the incidence of endometriosis in fertile women, aged 15 to 49 years, was 1.6 cases per 1000 patients, all surgically diagnosed. The study had certain methodological limitations, but it represents the starting point in the international epidemiology of the disease (Houston et al., 1987: 959-969).

On a national scale, the first guide specific to this pathology was published in 2019 by the Romanian Society of Obstetrics and Gynecology, together with the Romanian College of Physicians. The working group states that "the prevalence of endometriosis in women with chronic pelvic pain ranges from 2 to 74% depending on the studies, but these studies remain heterogeneous. The prevalence of endometriosis in women with acute pelvic pain is

reported to be greater than 33%. An annual incidence of about 0.1% has been reported in women aged 15 to 49 years." (Bratila et al., 2019: 7).

Regarding the etiological part of the disease, the following statement is recorded in the Guide of the Romanian Society of Obstetrics and Gynecology – "Endometriosis is a multifactorial disease resulting from the combined action of genetic and environmental factors and menstrual factors. Certain menstrual factors (early menarche, high menstrual volume, short cycles) are associated with the presence of endometriosis. The risk of developing endometriosis for first-degree relatives is five times higher than in the general population. However, there are no data to provide advice on the primary prevention of the disease. Data in the literature on the primary prevention of endometriosis are related to the administration of oral contraceptives combined with physical activity" (Vercellini et al., 2011: 159-170).

Most research evaluating the diagnosis of laparoscopy has focused on patients with infertility or pain. Diagnostic laparoscopy can be useful in patients with symptoms or infertility who present manifestations suggestive of endometriosis, but in whom preoperative investigations have failed to highlight endometriosis lesions. The diagnostic performance of laparoscopy in case of suspected endometriosis in symptomatic or infertile patients is between 62% and 86% (Bellelis et al., 2010: 467-471), (Somigliana et al., 2006: 331-341).

Authors Giulia Bonavina and Hugh S Taylor, publish an article entitled "Endometriosis-associated infertility: From pathophysiology to tailored treatment" in which they explore the complex relationship between endometriosis and infertility, highlighting how the disease affects reproductive capacity through a series of direct and indirect mechanisms. It is highlighted as a central problem that endometriosis disrupts ovarian function, pelvic anatomy and endometrial receptivity, thus complicating conception. Accurate diagnosis is difficult due to the diversity of clinical manifestations of patients. The treatment must be personalized, taking into account the clinical and unique situation of each patient. The authors emphasize the importance of new non-invasive diagnostic tools and discuss current treatment options, including surgery and assisted reproductive technologies, emphasizing the need for an individualized approach to managing infertility associated with endometriosis (Bonavina & Taylor, 2022).

It can be seen that there are numerous studies that aimed to make statistics relevant to this pathology as well as to establish the relationship between infertility and endometriosis. The epidemiology, etiopathogenesis, as well as the investigation of treatment methods are highlighted in the aforementioned literature. In the contemporary discourse on reproductive health, the phenomenon of infertility appears as a significant concern, affecting a notable fraction of the population that wants to have children. A cross-sectional study conducted in Copenhagen, Denmark, looks at the lifetime prevalence of infertility among women aged 15 to 44. This study, conducted via a mail-in questionnaire, had a response rate of 78%, thus providing a robust dataset for analysis. The data indicates that 26.2% of women who tried to conceive experienced infertility.

A critical aspect of the study is the investigation of infertility treatment methods by those affected. Remarkably, 47.4% of women who experienced infertility sought treatment, highlighting a proactive approach. However, it is noted that a significant proportion of infertile women do not seek treatment, possibly due to a lack of information or barriers to access. The study further identifies that the sample with a higher level of education resorted to seeking treatment for infertility, indicating a socio-economic gradient in the approach to infertility care.

The conclusion of this study refers to the health system that should not be limited to providing information about infertility treatment but actively promoting it, especially within the lower social classes (Schmidt, Münster & Helm, 1995).

În continuarea lucrării se vor evidenția aspecte privind sistemul medical și măsurile existente, preponderent la nivel național. To assess the scientific interest in the understanding of the benefits of preventing this medical issue, we conducted a bibliographical analysis of the works published in this field by querying the Web of Science, ProQuest and JStore database and also we conducted two studies on former and suitable patient of endometriosis.

Materials and Methods

As part of the research, we conducted two different studies to collect information related to the quality of the medical act in endometriosis. The first study was aimed at patients, and the second was addressed to specialists who treat the disease. These were given to participants within 2 months.

In the first study, we conducted a set of 21 questions centralized in a questionnaire tool. It was carried out in collaboration with the coordinating professor as well as with the endometriosis specialists.

We wanted a realistic and truthful approach to the results, which is why we opted for the mixed method – both qualitative and quantitative questions. Since the mixed method integrates two different methods that provide distinct results, I mention that the quantitative method was used to statistically centralize a number of qualitative indicators.

The questionnaire was applied to a target group of patients who were diagnosed with endometriosis.

In order to collect the answers, it was decided to send the questionnaire in electronic format in the online community to the Facebook group "Education in Endometriosis", a private group that counts about 12 thousand patients and specialists. The questionnaire was also distributed in physical format through a form with QR code access mode, within the event "Life with Endo – a new vision".

For the questionnaire as well as for the collection and analysis of the data, the "SurveyMonkey" platform was used. The questionnaire called "Research on the feedback of patients with endometriosis surgeries" collected 146 responses in about 2 months with an average completion time of about 8 minutes.

Out of the total 21 questions, 5 questions had a predetermined answer option, 9 of them had an open answer field for direct qualitative analysis, and another 7 had an answer scoring scale in the range of 1-5, (1 being the lowest grade, and 5 being the highest grade). The questionnaire can be consulted in Annex 1.

In the second study, we made a set of 8 questions centralized in an open-ended questionnaire tool to be easy to follow and send. The questions were structured using the qualitative method to track the flow of an interview. They were sent to three doctors with different levels of training and to a psychotherapist. All questions have been developed so that all 4 specialists can openly answer all 8 questions regardless of their stage of training or specialization.

The answers were collected by sending a link to the questionnaire with the name "Endometriosis - Specialists' Feedback" in electronic format by email. The elaboration of the questionnaire as well as the collection of responses was carried out using the "SurveyMonkey" platform. All 4 questionnaires were collected, targeted, with an average completion time of about 2 minutes.

Analysis methods - Study 1

As mentioned, in study 1 we had several types of questions, but we wanted to highlight the answers by combining qualitative and quantitative analysis methods. All responses are presented in graphical or average form of responses using the measurement scale from 1 to 5 (1 being the lowest grade, 5 being the highest grade).

For the answer grid questions – the processing was done automatically through the SurveyMonkey platform. Another 7 questions had a measurement scale from 1 to 5 (1 being the lowest grade, 5 being the highest grade) – the paper will present the average as well as the related statistics processed using the same software. The open-field responses were centralized in Microsoft Excel files, downloaded and analyzed.

The answers were numbered with corresponding labels, centralized in an Excel table and represented graphically to establish the dominances and identify the general feeling given by the totality of the answers.

All graphs are analyzed in the context of the present study by the author, following the model of the book "Qualitative Research Practice" edited by Jane Ritchie and Jane Lewis, evaluating the content and drawing the conclusions (Richie & Lewis, 2024)

Study 2

For study 2, only open-field questions were asked. They were centralized using the SurveyMonkey platform and presented in the paper in the form of an image, representing tables with the answers in their original form without mentioning the identity of the specialist. The aim of study 2 is to correlate the perspective of patients with that of specialists.

Note: The title of specialist is used for doctors and psychotherapists.

Results and Discussions

Medical system and intervention measures

Infertility management in the context of endometriosis must be holistic, addressing not only the pain associated with infertility, but also the assessment of the infertile couple before starting therapy. It includes the investigation of ovarian reserve, the condition of the fallopian tubes and spermogram, as well as the phenotype of endometriosis lesions. Optimal management involves the collaboration of multidisciplinary teams, which include radiologists specializing in pelvic imaging, gynecologist surgeons, gynecologists, urologists and general surgeons specializing in digestive surgery, specialists in assisted human reproduction, pain practitioners and psychologists. This approach provides complex information about the patient's health status and leads to early diagnosis.

As previously stated in this paper, the symptomatology of endometriosis is described by: intense dysmenorrhea (resistant to level 1 analgesics), pelvic-abdominal pain, pain on defecation with catamenial recrudescence, dyschesia, urinary functional signs with catamenial recrudescence, infertility (Arruda et al., 2003: 756-9). All these symptoms influence the patient's quality of life, thus highlighting the need for a psychologist to be involved in addressing this pathology.

The diagnostic approach for endometriosis is divided into two stages. The first of these is the clinical stage, in which the patient is evaluated using the clinical examination by the gynecologist and will correlate with the ultrasound examination, specific gynecological, according to the existing protocols. The second stage is the imaging stage, this type of examination is recommended at the time of suspicion of endometriotic tumor formations discovered or previously suspected by ultrasound. At this point, the MRI (Nuclear Magnetic Resonance Imaging) exam is recommended. This type of investigation provides information about the extensive location of these endometriomas, providing an overview that allows the disease to be staged. In certain cases where imaging investigations provide information about other locations of the formations, other investigations specific to the anatomical area where they are discovered will be recommended. These additional investigations are under the medical incidence of the doctors listed in the first part of this subchapter.

There are also cases, when this disease cannot be satisfactorily described by the previously mentioned methods. In these situations, laparoscopic exploration is used – this is a minimally invasive surgical method that penetrates the patient's abdominal cavity to explore and identify suspicious lesions, and the tissues identified as abnormal are taken for biopsy. Following the biopsy, the diagnosis and stage of the disease are established with certainty.

Most of the studies that have evaluated the diagnosis of laparoscopy in case of suspected endometriosis have been conducted in patients with infertility or pelvic pain. The use of laparoscopy for diagnostic purposes can be beneficial in patients who have symptoms or infertility and have signs suggestive of endometriosis, even if preoperative investigations have failed to detect endometriosis lesions. The diagnostic performance of laparoscopy in

case of suspected endometriosis in symptomatic or infertile patients varies between 62% and 86% (Marchino et al., 2005: 12-5), (Nisolle, 1990: 984-8).

When the diagnosis of endometriosis is confirmed, the patient will be approached by the multidisciplinary team of specialists in order to establish the appropriate treatment. The psychological impact of the disease, pain management and the preservation or restoration of fertile function are taken into account. The existing treatment methods are diverse depending on the stage of the disease and the clinical aspects of each patient. However, there are defined in the pathology-specific guidelines first-line treatments such as hormonal drug treatment with a contraceptive role.

Another method of drug treatment is the analgesic one used for painful symptoms. No other non-drug therapeutic options that can be applied en masse are highlighted in the literature. In cases of endometriosis associated with infertility, hormonal medical treatment is usually avoided, as it can suppress ovulation and lead to amenorrhea. Thus, the first-line treatment is often surgery, along with the use of assisted reproduction techniques. Numerous studies have demonstrated the benefits of surgery, which involves the removal of endometriomas larger than 3 cm in diameter and the restoration of local anatomy. The purpose of these procedures is to improve fertility and increase the chances of conception following assisted reproduction treatments (Hoffman et al., 2012:399-450).

The decision between medical and surgical treatment is influenced by several factors, such as the woman's expectations, the desire to conceive, the efficacy and adverse effects of the treatments, the severity and location of endometriosis lesions, as well as the intensity and characteristics of the pain (Chapron et al., 1994: 618-84). Surgical treatment is divided into two categories: the surgical technique of ablation and the surgical technique of excision.

The ablation technique is used in superficial endometriomas, often in stages one and two, which helps to improve quality of life by relieving pain associated with the disease and improving fertile function (Wright et al., 2005: 1830-6).

When voluminous endometriosis lesions are discovered, the surgical excision technique is recommended. These techniques are of three types: classical surgery or laparotomy – which is performed by open approach, laparoscopic surgery and robotic surgery – they use millimeter-sized access ports. The last 2 types of surgery mentioned above are types of minimally invasive surgery. These are associated with a low rate of postoperative complications, low duration of hospitalization, minimal postoperative pain, all of which lead to a price analysis that indicates a lower cost for the patient compared to laparotomy (Medeiros et al., 2005).

An important aspect to mention is that this pathology has a high risk of recurrence. This risk increases with the number of incomplete interventions.

Endometriosis is in some cases a complex disease that can affect various organs. In these situations, various specialists with competence in the excision of lesions on the target organs are surgically involved. For example, in cases where the lesions are infiltrative on the organs in the urological sphere, it is recommended to set up a multidisciplinary team

that includes a gynecologist surgeon and a urological surgeon who can manage the case as efficiently as possible.

Other complex cases are those of colorectal endometriosis that are proposed to symptomatic patients. The information in the literature does not allow the comparison between surgical treatment and hormone therapy administered before or after surgery, or even instead of it. There are three main techniques used for surgical excision of colorectal endometriosis: rectal shaving, discoidal anterior resection and segmental resection (Chapron et al., 2010: 884-9), (Chopin et al., 2005: 106-12). These techniques can generate considerable postoperative complications, it is recommended to inform the patient and provide her with specialized counseling. Although important risks are associated, minimally invasive surgery is the only one that can improve the quality of life of patients for the particularities described above. From a cost point of view, laparotomy is at a disadvantage compared to minimally invasive surgery. The latter requires less consumption of analgesics, blood loss is reduced, hospitalization is reduced, and the patient's reintegration is done much faster. All these benefits describe a qualitative surgical act.

In order to discuss the quality of the surgical act, aspects related to the postoperative results of the patients, the technological level used, the hospital's surgical protocols, the preparation of the medical team and the economic measures offered by the ministry to access a minimally invasive intervention are highlighted.

Endometriosis - economic impact

An essential aspect in accessing these types of interventions is the costs associated with both the intervention(s) and the technology. In the state medical system, these interventions are classified according to the DRG codes (system of classification into diagnostic groups). This system classifies patients into homogeneous categories based on their medical diagnosis and associated medical procedures. It is used to determine reimbursement rates in the healthcare system and manage hospital resources effectively. Each code has a fixed rate associated with it, which can vary depending on factors such as the severity of the disease or the associated comorbidities. The DRG system encourages hospitals to optimize case management to maximize efficiency and quality of care. It was developed in response to rising costs in the healthcare sector to control government spending. There are also criticisms of the DRG system that include concerns about underfunding for more complex cases and possible distortions in patient care (INMSS, 2024).

Endometriosis is classified in the DRG system between codes N80 -N98 in the category Non-inflammatory disorders of the female genital tract. In the statistics of the National Institute of Health Services Management, we find the general classifications given by the codes N1040 and N1080, as the most frequent.

From the information presented in the order of the Minister of Health and the President of the National Health Insurance House no. 1068/627/2021 regarding the approval of the methodological norms for the application in 2021 of the Government Decision no. 696/2021 for the approval of the service packages and the framework contract regulating

the conditions for providing medical assistance, medicines and medical devices within the social health insurance system for the years 2021 – 2022, DRG reimbursements for endometriosis can be calculated.

Several hospitals, both public and private, were analyzed to determine how much the Romanian state reimburses for such an intervention.

In the performance indicators of hospitals, published quarterly by the National Institute for Health Services Management, we can most often observe settlements for two codes in which endometriosis pathologies are frequently integrated, namely code N1040 and code N1080. In the case of the first code, endometriosis of the uterus is frequently integrated for advanced cases in which non-malignant hysterectomies are necessary (removal of the uterus without having an oncological cause), and in the case of the second code, all minimally invasive (endoscopic) procedures for endometriosis such as that of the pelvic peritoneum are integrated. It is important to note that in the major diagnostic categories, the notation of the letter N – is an indicator for diseases and disorders of the female reproductive system.

Having all this information, the DRG reimbursed tariff per type of case, mentioned above, as well as the relative value for the codes chosen in several hospitals selected as referral centers for patients with specific symptoms, were centralized in Table 1.

Table 1. *Tariff settled in the DRG system by type of case*

Crt. No.	Hospital Code	Hospital Name	Relative value N1040	Relative Value N1080	TCP - Standard 2022	TC -DRG Tariff by Case Type N1040	TC -DRG Tariff per Case Type N1080
1	B_34	Clinical Hospital of Obstetrics and Gynecology prof. Dr. Panait Sirbu Bucharest	1.1719	0.4536	1600	1,875.04 lei	725.76 lei
2	B_06	Philanthropy Clinical Hospital Bucharest	1.1719	0.4536	1600	1,875.04 lei	725.76 Law
3	B_33	Bucharest University Emergency Hospital	1.1719	0.4536	1850	2,168.02 Law	839.16 Law
4	IS05	Clinical Hospital of Obstetrics and Gynecologycuza-Voda Iași	1.1719	0.4536	1600	1,875.04 lei	725.76 Law
5	B_124	Medlife Hospital	1.1719	0.4536	1500	1,757.85 lei	680.40 Law
6	B_167	Monza Oncology Hospital	1.1719	0.4536	1380	1,617.22 lei	625.97 Law
7	B_128	Medicover Hospital	1.1719	0.4536	1475	1,728.55 lei	669.06 lei

Note:

N1080 – represents the diagnostic group of endoscopic procedures for the female reproductive system;

N1040 – represents the diagnostic group for hysterectomies for non-malignant condition;

TCP – (weighted case rate) is the reimbursement value of a weighted case at hospital level;

Relative Value (VR) – Coefficient that expresses the ratio between the tariff of one DRG and the average tariff of all DRGs. The relative value is assigned according to the consumption of resources necessary for the complete treatment of the patient with the respective condition(s);

Tariff per type of case (TC): The reimbursement amount for each type of case (DRG), it is calculated at the level of each type of case. It is obtained using the formula below:

$$TC_{DRG} = TCP \times VR_{DRG}$$

Calculation formula for the tariff per type of case reimbursed in the DRG system

Source: (INMSS, 2024), (OM 1068/627/20212).

Taking into account the information presented above, we can approximate the average rate per type of case reimbursed to both public and private hospitals:

- TCDRG(N1040) = 1850 Lei
- TCDRG(N1080) = 710 Lei

The research continues with an analysis of the real costs. In public hospitals, an intervention for the mentioned codes ends up costing 3000 lei for the first code, respectively 3500 lei for the second. Special mechanical suture instruments for endometriosis with intestinal implications are not included in these costs.

For this type of instruments, the Romanian state contributed to an improvement in costs by approving the national endometriosis program in 2023 through the state budget law no. 368/2022. It is the first step of the state in raising awareness of the socio-economic impact of this pathology. From the technical norms of this law we can learn that the average cost of 11000 lei is reimbursed for a patient with intestinal endometriosis, for a number of 137 patients per year (Endometriosis National Program, 2022).

"It is estimated that between 2% and 10% of women worldwide have endometriosis and that between 30% and 50% of infertile women have endometriosis" (ESHRE Guideline Endometriosis, 2022).

The National Institute of Statistics communicates the following data regarding the female population. "Of the 19054.5 thousand people who had their habitual residence on the territory of Romania on January 1, 2023, 9808 thousand are women, representing 51.5% of the total resident population. The fertile female contingent, consisting of women aged between 15 and 49, numbered 4063 thousand people, with potential mothers thus representing 41.4% of the total female population residing in Romania on January 1, 2023" (INS, 2024).

Performing a simple calculation we find out that:

- 2% out of 4,063,000 represent 81,260 women of childbearing age possibly affected by endometriosis according to the aforementioned statistics;
- 10% of 4,063,000 represent 406,300 women of childbearing age possibly affected by endometriosis, according to the aforementioned statistics.

It follows that the prevalence of endometriosis at national level can be between 81,260 and 406,300. If all patients suffering from endometriosis had intestinal damage, it would mean that the reimbursement of costs through the national endometriosis program covers between 0.03% and 0.16% of the total possible patients.

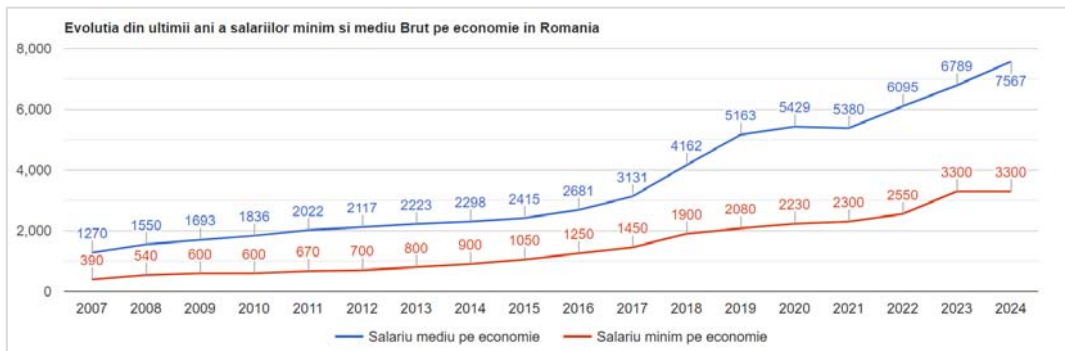
Globally, Wills et al., 2008 state that intestinal damage in women with deeply infiltrative endometriosis was reported in 5-12% of all women diagnosed with this disease (Wills et al., 2008: 292-95). At the national level, there are no data to prove how many percent of all patients diagnosed with endometriosis have intestinal damage.

Correlating the global statistics with the situation in our country, it can be approximated that the prevalence of deeply infiltrative endometriosis can reach a minimum of about 20,000 women.

It can be deduced that at the moment the reimbursed funds are insufficient to treat this pathology.

As this research aims to highlight the economic impact, it is necessary to mention aspects related to the minimum and average wage of a Romanian in 2024. This information can be found in the following graph.

Figure 1. Evolution of minimum and average gross wages in Romania



Sursa: <https://www.calculator-salarii.ro>, 2024

It is observed the increase of the average salary in the economy and the threshold of 7567 lei gross (4674 lei net), also the minimum wage is 3300 lei gross (2079 lei net).

It is worth mentioning that about 30% of Romanians are paid the minimum wage, which is often insufficient for a decent living. It can be said that the need for expensive surgery, such as endometriosis, is too much of a financial burden for a large category of citizens in Romania.

In order to have an overview of the costs of the intervention, it was necessary to identify the prices in private hospitals for similar interventions. The amount reimbursed by the Romanian State for both complex and early-stage procedures was mentioned above.

The price range frequented in private hospitals in Romania, depending on the complexity of the intervention, is between 10,000 lei and 50,000 lei. Certainly a much too high amount even for those who have an average salary in the economy or above average. Thus, access to private healthcare may be limited for a significant part of the population due to the associated high costs. This situation can underline the importance of developing a sound health insurance system and public health services in the most effective way possible to ensure access to quality health care for all citizens.

Infertility – social impact

As mentioned earlier, a significant proportion of all patients diagnosed with endometriosis also suffer from infertility. Most of the time they end up being diagnosed following the investigations necessary to get pregnant or following surgery for other pathologies.

In order to assess the social impact of infertility in the context of the study of endometriosis, it is considered important to understand the demographic transition and to analyze the existing demographic data.

Demographic transition is the process by which populations move from an old demographic regime, characterized by high birth and mortality levels, to a modern demographic regime, in which these phenomena are declining. This transition aims to provide an explanation for the evolution of the population, taking into account a number of socio-economic, legislative, educational, health, psychological and cultural factors.

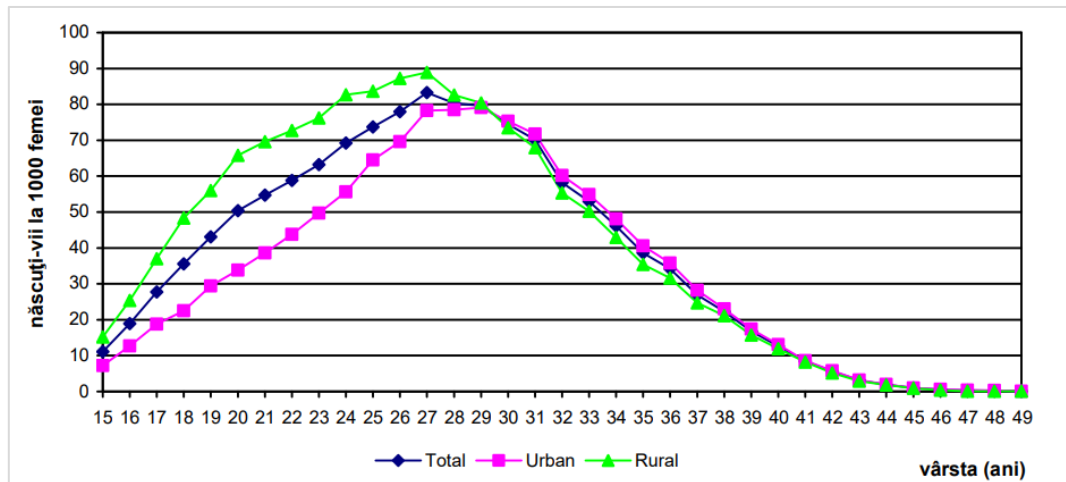
The theory of demographic transition was originally formulated by Warren Thompson (1929) and Frank Notestein (1954), who argued that with the transition of societies from pre-industrial to modern economies, birth and death rates begin to decline. In traditional agrarian societies, high fertility was balanced by high mortality. Over time, through the development of solutions against diseases and the adoption of preventive measures against epidemics, the level of mortality decreased. At the same time, traditional fertility (with 5-6 children per woman) has changed, with low rates due to industrialization, urbanization and increased levels of education, which has led to a decrease in women's desire to have more children (INS, 2024).

"As of January 1, 2022, Romania's resident population was 19042.5 thousand inhabitants, of which 9.8 million women (51.5%). The age structure of the resident population bears the specific imprint of a demographic aging process, marked mainly by the decrease in the birth rate, which determined the decrease in absolute figures of the young population (0-14 years), although there is a slight increase in its share in the total population (16.2%). The same evolution can be observed in the elderly population (aged 60 and over): a decrease in absolute figures (by 24.2 thousand people) and an increase in its share on January 1, 2022 (25.9%). The adult resident population (15-59 years old) on January 1, 2022 represents 57.9% of the total. Within the adult population, the share of the age group 50-54 years increased and that of the age groups 20-24 years, 25-29 years, 30-34 years, 35-39 years and 45-49 years decreased. The shares of the age groups 15-19 years, 40-44 years and 55-59 years remained relatively constant. As of January 1, 2022, the urban resident population was 10.0 million people, representing 52.3% of the country's population" (Pintilia et al., 2023).

In 2022, the number of live births registered at the civil status offices in Romania was 171,132 live births, the lowest number of live births since 1930.

Also, the average age of the mother at birth was 28.9 years, and the average age at first birth was 27.5 years. In rural areas, the average age of the mother at birth was lower, 27.4 years, compared to that in urban areas, where the average age at birth was 30.2 years (Pisica et al., 2022).

The graphic distribution of female fertility according to age and origin can be seen in the figure below.

Figure 2. Female fertility by age and average of residence in 2022

Source: (INSS, 2024), (Pisica et al., 2022).

Women's reproductive behavior differs in relation to their occupational status. In 2022, the share of live births by domestic mothers increased slightly compared to the previous year, from 33.0% in 2021 to 34.5% in 2022. A percentage of 54.3% of live births had salaried mothers. In the same year, in rural areas, 48.2% of the number of live births had domestic mothers, and in urban areas, 21.8% of the number of live births had domestic mothers.

Also, the share of live births by women with a higher level of education increased slightly compared to 2021, 29.0% of live births had mothers with higher education, down by 0.2 percentage points compared to the previous year, and the share of live births by mothers with a medium level of education: professional, high school and post-secondary education (41.1%) increased compared to 2021 by 2.8 percentage points (INS, 2024).

The demographics presented are relevant for the female population of Romania as endometriosis is a disease that affects only this category. However, male infertility reaches about 20% of all male infertility cases and about 30-40% of all infertility cases (Leslie et al., 2024). It can be said that infertility is a social problem that significantly impacts affected couples.

The psychological impact of infertility can be profound and complex. Couples experiencing infertility often go through a wide range of emotions, such as sadness, grief, frustration, guilt, and anxiety. The inability to conceive or carry a pregnancy can generate feelings of unfulfillment, loss of control, and a sense of isolation.

People undergoing fertility treatments may also experience stress related to financial burden, invasive medical procedures, and uncertainty about the outcome. The pressure to conceive can strain relationships, leading to conflicts and difficulties in communication between partners. In addition, infertility can call into question individual identity and expectations for the future, especially for those who have always seen themselves

becoming parents. It can also cause social and cultural stigmas related to fertility and status, adding additional stress or shame.

Support from family, friends, and mental health professionals can play a crucial role in helping individuals and couples cope with the psychological impact of infertility. Counseling, support groups, and mindfulness practices can provide a space for processing emotions, building resilience, and finding hope in the midst of challenges. Recognising and addressing the psychological impact of infertility is essential for the wellbeing of those involved and for navigating the journey to becoming a parent.

At the moment, technology and medical progress are coming up with solutions for couples facing infertility. There is this concern of society to become aware of the impact of infertility and to support couples who are willing to fight with this diagnosis.

In certain situations, in vitro fertilization (IVF) opens up a promising path for couples in difficulty. Although IVF can be expensive, access to state-funded treatments can increase the chances of a successful outcome. Romania approved a national in vitro fertilization program in 2022 that offered, starting with 2023, financial support in the amount of RON 15,000 for 10,000 beneficiaries struggling with infertility (National Program for Natality Growth, 2024).

Conclusions

The results obtained from the bibliometric analysis and review of relevant literature in the field of digital technologies for biodiversity conservation in agriculture provide a comprehensive perspective on the progress and challenges in this domain.

The review of relevant literature confirms the importance of digital technologies in promoting sustainable agricultural practices and biodiversity conservation. The examined

The literature analysis reveals that digital technologies can play a significant role in biodiversity conservation in agriculture, but an integrated approach is necessary, considering local specificities and government regulations.

Endometriosis is a significant medical challenge for both patients and physicians, due to the complexity of diagnosing and treating this condition. The main obstacle in the treatment of endometriosis is the delay in diagnosis, often caused by the long time between the onset of symptoms and the establishment of a correct diagnosis. This delay contributes to the worsening of symptoms and reduces the effectiveness of treatment. Other challenges are related to the complete excision of the lesions, the maintenance of ovarian reserves in order to achieve pregnancy and the prevention of recurrence of the disease. In addition, the complexity of surgeries and the multitude of information available can overwhelm both patients and doctors.

Conclusions of Study 1

The analysis of feedback from patients who have undergone endometriosis surgery reveals critical insights into their experiences and areas for improvement. The study captures the

challenges encountered, the impact of endometriosis on patients' lives and the importance of support measures. We remind the importance of age, hereditary aspects and background for the women surveyed, highlighting the importance of education and access to information related to the pathology studied.

It is also recalled that most of the respondents have had at least one surgery, which validates the theoretical data according to which there is a high risk of recurrence, and the improvement of symptoms is often done only surgically. The most mentioned aspects by the respondents referred to:

- Reasons for choosing surgical methods - The main reasons why patients opted for surgical methods were based on medical recommendations and a preference for minimally invasive techniques that provide a quick recovery. Financial considerations played a minor role in their decision-making process. Financial aspects require further research specifically on this segment.
- Speed of diagnosis - Patients reported varying experiences in terms of speed of diagnosis, many indicating a moderate to slow process. The average rating was 2.93, reflecting a general sense of frustration with the delay in diagnosis.
- Awareness and knowledge of the diagnosis - A significant portion of patients (52.05%) had very limited knowledge of the diagnosis at the time of notification, with an average rating of 2.07. This underlines the need for better education and information.
- Medical team information and responses - Patients generally provided positive feedback on the information and responses provided by the medical team, with an average rating of 3.58. This indicates a high level of satisfaction with the communication and information provided by healthcare professionals.
- Treatment by medical professionals - The majority of patients (60.96%) rated the treatment provided by medical professionals as very good, with an average rating of 4.13. This highlights the competence and professionalism of healthcare specialists and providers.
- Post-operative recovery - Feedback on post-operative recovery has been mostly positive, with a significant number of patients rating it very well. However, there is a notable percentage of patients who rated it moderately, suggesting varied recovery experiences.
- Preoperative anxiety – Patients reported varying levels of anxiety before surgery, with 33.56% expressing high anxiety. The average rating was 3.40, indicating a moderate level of preoperative anxiety overall. This emphasizes the need for pre-operative counseling and anxiety management.
- Important aspects of the medical team- The professionalism and experience of the medical team were highlighted as the most important aspects, followed by effective communication, empathy and trust. This reinforces the value of qualified and empathetic professionals in patient care.
- Lessons from experience - Patients emphasized the importance of sharing experiences related to treatment and recovery, the emotional and psychological impact, and the need for awareness and education. These insights can help provide better support to new patients and improve overall care.

All the information presented above outlines the conclusions of study 1 of this work.

Conclusions Study 2

From the specialists' feedback we retain the following aspects:

Endometriosis has a profound impact on patients' quality of life, affecting work capacity, fertility and psychological well-being. Chronic pain and infertility are among the most devastating symptoms, which not only reduce the quality of life, but also contribute to a state of anxiety and isolation. The social, professional and family impact of endometriosis is often underestimated, requiring greater awareness among society.

With regard to prophylaxis, the responses suggest the need for a holistic and integrated approach. This involves the use of specialized centers for treatment, constant monitoring of patients' health status, and educating both the general public and medical staff. Free access to investigations such as necessary imaging and their reimbursement through national programs are essential measures for effective diagnosis and treatment.

A crucial aspect in managing endometriosis is psychological support. Psychological training of patients is fundamental to reduce anxiety and improve postoperative adaptation. Counseling should be available at all stages of treatment, and the presence of a psychotherapist in the treatment team is essential. Psychologists specializing in endometriosis can provide personalized support and clear information, helping patients better manage the stress and trauma associated with the disease.

In order to improve health policies, the state should support specialized treatment centers and set up as many as possible, ensure free access to investigations and implement screening and education programs at national level. Awareness of the importance of continuing education for family doctors and including information about endometriosis in the school curriculum can contribute to better recognition and management of this condition.

The management of endometriosis in Romania requires a multidisciplinary and comprehensive approach, including early diagnosis, specialized treatments, psychological support and educational measures. Awareness and recognition of the impact of endometriosis on a social, professional and family level are essential to improve the quality of life of patients. The state plays a major role in facilitating access to treatment and promoting education and awareness, thus contributing to a more effective management of endometriosis.

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The future of sustainable development

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Abstract. *The point that innovation is an important milestone of sustainability is widely accepted among scholars, industry agents, and government representatives. This is due to the fact that sustainable development is an urgent issue that requires immediate action and transformation by government, industry, and society as a whole perspective.*

This paper reviews the literature on innovations that transform individuals, organizations, supply chains, and communities toward a sustainable future.

This paper reviews the literature on innovations that will transform individuals, organizations, supply chains, and communities toward a sustainable future. The major studies discussed in this review encouraged in their findings, recommendations, and contributions as we are facing in moving forward toward a sustainable society through innovation and transformation

Moreover, this article reviews the diversity of the literature on innovation for sustainable development and proposes a typology of such phenomena. The proposed typology of such phenomena is followed by an overview of the major debates, based on the main subjects it addresses. The point that innovation is a key statement of sustainability is widely accepted by scientists, industry professionals and government representatives. This aspect is possible only by creating sustainable development, which requires constant action and urgent solutions from governments, industry and society.

Furthermore, this article emphasizes the diversity of innovation for sustainable development in the literature, proposes a typology of such phenomenon, provides an overview of key articles based on the primary topics it addresses, and identifies a number of recommendations for the future development of the main field of study.

Keywords: social aspects, innovation, environmental management, sustainable progress, durable sustainability.

JEL Classification: M14, Q01, Q56.

Introduction

Sustainable development has received increasing attention from academics, industry and policy makers (e.g. United Nations in 2016 and European Union in 2014).

One of the main subjects that has been chosen is the role of innovations in order to improve sustainability and its costs.

As innovations constantly change the external environment and our way of life (Huisingh et al., 2013), it generates frequently many aspects through which organizations, retailers, institutions, communities, regions and countries must take a serious view about the right structure of sustainability implementation.

In fact, the literature shows that sustainability should be approached based on innovation-centered measures. However, in practice, trying to create a more sustainable world, seems to be a frustrating process that calls for further investment and initiatives from organizations, educational institutions and governments, in order to implement innovative multidisciplinary approaches, designed for solving pressing challenges.

Regarding the discourses about sustainability, it seems that is based on the connection between economic, environmental and social features. Moreover, it occurs in the process of depicting complex interactions and courses that pervade the complex frame represented by the active involvement of each category concerned.

For all that, many studies pursue the whole concept of DS (*Durable Sustainability*), having the intention to offer a whole definition about the concept and fill up with previous information.

In the first instance, we try to review and examine the topic of sustainability, as a major mark in proposing further methods of innovation for DS, based on the three fundamental aspects: society, environment and financial.

Then, into the second sight, we also try to present the main area of implementation of new technologies, authentic and successful management practices, chosen by the political framework laws.

The research ends up with conclusions and suggestions that offer a major significance for the future researches about the sustainable development and its relative fields of study.

Innovation for sustainable development

The process of innovation development and success is based on at three fundamental features, such as complexity, dynamism and uncertainty.

As a major subject, the innovation process is a complex one, because it usually involves multiple interconnected factors, which influence adaptability and continuity in other related fields.

Though, it is difficult to identify the main elements of the entire system owing the fact that the nature and external connections of the interacting factors may easily be misunderstood.

The innovation process could be described by dynamism since all the interacting factors change and evolve frequently, so it leads to changing contexts that transforms innovation unviable or produces unintended outcomes in a short period of time.

Thus, on account of these two features, the innovation process may also be uncertain, showing the complexity and dynamism of the innovation process whose main purpose are motivations, goals and outcomes.

In consequence, innovation is a very common topic in the literature. For example, the TCOS framework helps managers and scholars understand how organizations, supply chains, and communities could better overcome difficulties associated with the innovation process. The TCOS focus on the four types frame work of innovation, such as:

- a) technological feasibility, which focuses on the existence or not of the possibility of developing the necessary technology;
- b) commercial viability, which evokes the existence or not of the possibility of creating market practice for the innovation purpose;
- c) organizational connection, which presents the potential to generate benefits and outpace the competitors;
- d) social acceptability, that refers to the possibility of reaching the social support in the purpose of gaining positive effects, as environmental, social, cultural and political implications are related fields.

Innovation for sustainable development has been settled as a newer phenomenon, regarding that its development and implementation are complex, dynamic and uncertain like other types of innovation (Seyfang and Smith, 2017).

The main literature of this domain converges ideas that into the increased sustainability performance cannot be obtained without efforts and innovative strategies, instruments (Silvestre, 2018). It happens accordingly the process of achievement who places sustainability towards performance, that requires right adjustments and change in processes, management approaches and policy orientations. Hence, change is a fundamental instrument in organizations, supply chains and communities activity, as they wish has a clear target: build and follow a reliable sustainability path. In addition, sustainability innovations that are continuously adopted improve the view about the topic in specific organizations and the sustainability path requires a complex set of resources in order to enable the high level of the sustainability performance process.

As an important benefit of conceptualizing different innovations for SD (*Sustainable Development*) in terms of the key terms it addresses, we find out the potential which it offers to examine the complexity of these phenomena and its implications for society. Researching on SD innovation is a rich offer, reflecting the different perspectives and interests emerged in different communities (Franceschini et al., 2016).

Environmental challenges

A frequently discussed issue in the recent period, which prevents us as a society from following a sustainable development path, is related to the environmental challenges facing the world applications and priorities. These challenges include, for example, air and water pollution, waste disposal and its management, ozone depletion, and as a result, and perhaps most importantly, the climatic change.

The previous research done about the environmental challenges has examined how environmental changes influenced our routine and lifestyle. For example, Zachariadis (2016) points that climate change itself is responsible for a wide range of consequences, such as sea-level rising, ocean acidification, droughts, glacier loss, and the frequent increasing of extreme weather events such as heat, floods, storms and hurricanes. In addition, to these severe consequences, Wheeler and Von Braun (2020) also present that climate change affects agriculture productivity and has consequences on the production of food, which could disrupt aliment supply chains and our quality of life.

The data collected from such previous research, shows that it is generally admitted that environmental challenges are usually associated with the human way of living and its posture to environment, which affects the other two dimensions of sustainability (economy and society).

In order to explain these environmental challenges, scientists, industry and society have discussed and proposed measures and methods that could prevent or reduce the impact of the activities of organizations, supply chains and communities to the natural environment. Many researches are converging that to achieve a superior environmental performance, it is absolute necessary that organizations, supply chains and communities must align all their internal processes (including their decision-making processes) to focus on the impact of their activities on the natural environment.

Adopting such a perspective in a coherent and comprehensive way, may facilitate the emergence of the “green business models”, which its objectives are concerned to reduce or eliminate the impact of harmful activities on the natural environment.

Thereupon, changes and innovations are central elements which allows companies to improve their environmental performance and, consequently, to assure the success in building their sustainability path.

Social challenges

Another important aspect which prevents us from achieving a sustainable development path is the social habits, which faces the actual challenges. These challenges include, poverty, social exclusion, corruption, the innaccomplishments of the human rights, chaos and disorderly immigration.

Previous research on social challenges has examined how this dimension affects our lives as a whole society.

For example, McAra and McVie (2016) show that violence is strongly associated with poverty at the household and neighborhood levels. Han et al. (2018) also argue that poverty is one of the reasons why women are forced to choose prostitution, while Shively (2014) reinforces the idea that the poor are both agents of “environment degradation and social disruption”.

Scientific researchers, industry represents and social people had many attempts to discuss and propose strategies which could help in facing the new social challenges. Similar to environmental discussions, research and practice on social challenges converge towards the fact that to achieve superior social performance it is necessary to align all internal processes (including decision-making processes) to focus on the impact of its activities on society. Adopting such perspectives in a coherent and comprehensive way, could allow the emergence of social business models where the organization, supply chain, or community is focused on reducing or eliminating the impact of their activities on society.

Even though, social practice besides the supply chains may have different motivations and treat differently the meaning of the process.

In my opinion, change and innovation are equally appointed to the process companies undertaken to improve their social performance and consequently concerned about their sustainability path. Similar to green innovations, the mere availability of social innovation is not enough. A willingness to adopt and truly incorporate such innovations into business processes (desire of changing) is also a required aspect. These paths, connected to socially responsible behavior also will require changes in the mindset of top management and its strategy organization.

Conclusions

Every specific type of innovations for SD (i.e., green business, social and sustainable behavior) focus on key challenges and contribute in major ways to a sustainable future; there is a need to extend the research and practice towards a more comprehensive vision of sustainability discourse and practice.

It is approved that holistic approaches to SD are needed, more specifically because it address social, environmental and economic challenges and gives strength into the defeating previous challenges.

This paper contains the following aspects which concerns the domain: firstly, as innovation uncertainty remains one of the most important issues hindering the development of innovations for SD, adopted and disseminated. Then, depending of the side of the innovation (as a traditional, ecological, social or sustainable one) may generate uncertainty. For example, while ecological innovations may face more challenging technological uncertainty processes due to the need of developing and improving such innovative technologies as carbon capture, fuel cells, and battery technologies, social innovations may fail often according to commercial imprecise path, as financial viability. This contribution suggests that understanding the differences between the faces of innovations could help scholars and managers to find better ways of improving.

Second, improved sustainability performance requires profound changes in organizations, supply chains and communities, and that can only happen through learning and constant investigations.

This paper combines innovations for SD discourse and the notion of sustainability paths (Silvestre, 2018), and it suggests that as the nature of the innovation differs (i.e. traditional, ecological, social or sustainable), organizations, supply chains and communities could have to evolve differently on their sustainability path. This is generated because different types of innovations that enhance different types of learning, which leads to more conducive and different opportunities for innovations in SD.

Finally, communities, cities and regions can benefit from even more clearly perspectives, which reach sustainability principles go even further.

Based on these aspect, multiple opportunities for future research are identified. Firstly, further research can be done on the manner of innovations for SD vary in the broader literature within these three topics (technology, management and policy) and how innovation types (traditional, ecological, social and sustainable) are widespread. This will provide a more accurate understanding of what types of innovations are most relevant and can actually help research and practice establish the best measures.

Secondly, we seek further understanding of how different types of innovations and its focus (technology, management, policy) influence the four TCOS innovation uncertainties (technological, commercial, organizational and social). This opportunity gave us practical information on how to diminuate or warn uncertainties given the type and focus of a specific SD innovation.

Finally, this research opens up promising research opportunities for improving our understanding of the type and focus of SD innovations may actually provide additional

information about what people should expect in terms of maximizing its sustainability path and the suitable management approaches and perspectives for each organization.

We hope that this paper will become inspirational for researchers, practitioners and decision-makers who are involved in the field of sustainable development discourse.

This contribution is important because contextual and historical factors may be taken into account when approaching SD innovations.

Personal approaches

Social community, business sector and decision institution may face together all challenges brought up by quick shift of the rhythm of life, supporting the strategies and instruments which made the environment secured and protected.

The communication may be active between all the main actors involved in sustainable development.

All recommendations, solutions, strategies may be linked with the way of life, laws and real estates of living.

Society, business sector, institutions and politics may not exploit the insecurity of other actor involved and, moreover, sustain each other in financial and scientific aspect.

Every country and its institution may design guides dedicated to SD. It may contain effective strategies, opinions, selected theory and real information from researches etc.

Politics domain may readjust the actual law in order to facilitate the implementation of the optimum measures.

National laws regarding SD may be related to European and International laws, since the main objectives suppose the same categories of activity.

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The impact of the European social fund in Romania

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Abstract. *Enhancing economic, social, and geographical cohesion has been a primary goal of the EU since its founding. In order to do this, decision-makers developed and put into effect the Union's Cohesion program, which is currently the primary investment program in Europe and has a budget that is around one-third that of the European Union as a whole. The Cohesion Policy includes many funds, each with distinct goals. This paper focuses on the European Social Fund (ESF), which is the main tool used by the European Union to help its regional populations create jobs and accumulate human capital. We provide an empirical analysis of the effects of ESF on its primary objective, which is education. To do this, we relate population shares of with particular education to the ESF per capita in Romania, for the 2010-2022 period.*

Keywords: European Social Fund, Budget of Europe Union, Human capital.

JEL Classification: H54, J21, J24.

Introduction

Enhancing economic, social, and geographical cohesion has been a primary goal of the European Union (EU) since its founding. In order to do this, decision-makers developed and put into effect the Union's Cohesion program, which is currently the primary investment program in Europe and has a budget that is around one-third that of the European Union as a whole. The Cohesion Policy includes many funds, each with distinct goals.

The Cohesion Policy is delivered through three main funds (the European Structural and Investment Funds – ESI Funds): The European Social Fund (ESF) invests in people with a focus on improving employment and educational opportunities. The European Regional Development Fund (ERDF) aims to strengthen regional economic and social cohesion by financing cross-border cooperation projects and investing in growth-enhancing sectors to improve competitiveness and create jobs. Additionally, it seeks to assist those who are marginalized and at danger of poverty or social exclusion. (European Commission, 2014)

The Cohesion Fund, for example, enhances connectivity in member states where the GDP is less than 90% of the EU average while investing in green growth and sustainable development.

In this paper, we focus exclusively on the European Social Fund (ESF) which is the European Union's main instrument for investing in people. The ESF was the first EU funding instrument created by the Treaty of Rome and over the past 60 years, it has helped millions of people get jobs and also helped reintegrate disadvantaged people into society.

In Romania, the ESF plays a significant role in financing and implementing projects aimed at increasing employment, developing professional skills and promoting social inclusion.

The European Social Fund in Romania supports a variety of initiatives, including:

- Human Capital Operational Program: This is a strategic program co-financed by the ESF aimed at increasing employment and developing skills among the working population in Romania.
- Training and vocational retraining programmes: the ESF funds projects that offer training and vocational retraining courses to improve the employability of participants.
- Social inclusion projects: the ESF supports initiatives aimed at the social integration of vulnerable groups such as the disabled, Roma and other marginalized groups.
- Improving the quality of education and vocational training: FSE supports projects aimed at modernizing school infrastructure and improving the quality of vocational training and education in Romania.

Entrepreneurship and regional development: the ESF supports initiatives that promote entrepreneurship and economic development at the regional level, thus helping to reduce economic and social disparities between regions.

These are just a few examples of areas in which the European Social Fund is involved in Romania. The implementation of projects financed by the ESF is carried out in close collaboration with national and local authorities, non-governmental organizations and other

partner entities, to achieve the objectives set at the European and national level in the field of employment and social inclusion.

To highlight the role of ESF in Romania, in this paper we will develop an econometric analysis to determine the relationship between education (we chose the share of the population with lower-secondary, upper-secondary, or tertiary education as proxy variables for education) and ESF that Romania received during the period 2010-2022.

A closer review of European social fund

One of the primary EU investment policies is represented by the Cohesion Policy. Its overarching goal is to raise the standard of living for people living in Europe by encouraging economic expansion, the creation of jobs, and competition between various industries, all the while attempting to uphold a model of sustainable development.

According to Fusaro and Scandurra, almost thirty percent of the EU budget is set aside for these policies' implementation throughout each programming term. More precisely, 347 billion euros were set aside for CP during the 2007–2013 programming era, 351.8 billion during the 2014–2020 programming period, and 392 billion during the 2021–2027 programming period. (2023)

The policy's three primary objectives, each with a specific budgetary allotment, have been convergence, regional competitiveness and employment, and European territorial cooperation since 2007. The way a region's economy performed on these three main objectives during the preceding time frame determines whether or not it qualifies for these funds. To accomplish these objectives, the EU established various forms of regional funding. (European Commission)

ESF projects support people who would otherwise not have the opportunity to get training, qualifications, and good jobs. Due to its scope, the fund has a large influence on the labor market and society in general.

In some countries, around 90% of actual expenditure on labor market measures comes from the ESF. The fund is one of the tools the EU relies on to meet its goals of increasing employment, reducing poverty and improving school achievement across the Union. (Corcodel, 2018)

The Manuscript finalized in September 2016 by the European Commission outlines the key objectives of the ESF:

- *Employment:* The ESF funds projects across Europe that support people of all ages and backgrounds so that they have a better chance of finding work. Priorities evolve to provide the right support when needed. For example, following the financial crisis of 2008, the focus was on young people.
- *Social inclusion:* improving the lives of the poor and the socially excluded is also central to the ESF mission. The money goes to projects that help disadvantaged people find better-paying jobs, while improving their access to vital services.

- *Education:* Adequate education is a key element in finding the right job or re-employment. Lifelong learning and vocational training programs supported by the ESF give people the opportunity to improve their careers and chances of success in life. There are also benefits for children, with funding being used to prevent school dropouts.
- *Public services:* more efficient public services benefit businesses and people by reducing red tape and saving time. ESF investments are used to reform public administrations and the judiciary, making them more transparent and more accessible to citizens and businesses.

Methodology

In this paper, we empirically assess the effect of the ESF on education in Romania during the period 2010-2022.

We chose education because during the 2007-2013 and 2014-2020 programming periods, Romania benefited from a significant allocation of European funds for education, that covered a wide range of areas, such as: access to education for disadvantaged groups, continuous training for teachers, modernization of school infrastructure, development of curricula and promotion of vocational and technical education.

To determine the relationship between them, we used the linear regression model, starting from the equation:

$$y = \alpha + \beta \ln(\text{ESF}) + u \quad (1)$$

Y assumes the real values of the dependent variables, that is alternatively the share of population with lower-secondary, upper-secondary, or tertiary education; α assumes the real values of the independent variable, $-\ln(\text{ESF})$ is the (ln of) per capita ESF that Romania receive in year n .; α and β represent parameters of the model; and u assumes the residual variable that signifies the influence of other factors on Y.

The data related to education are taken from the Eurostat database and information on the ESF are drawn from the historic EU payments provided by the European Commission.

Results and discussions

The empirical results showed that the low level of education and tertiary education are positive and statistically significant, so an increase in EFS value contributed to the increase in the percentage of people who complete these levels of education.

Table 1. *The impact of ESF on education in Romania*

Variables	Coefficient	Std. Error	T-Statistic	Prob.
1. Lower-secondary education (ISCED 0–2)	2105	6017	34.684	0.000
ln(ESF)	4.618	1.473	3.135	0.014*
2. Upper-secondary education (ISCED 3–4)	3.096	0.245	12.625	0.000
ln(ESF)	-0.017	0.015	-1.152	0.252
3. Tertiary education (ISCED 5–8)	42.711	5.096	8.280	0.000
ln(ESF)	1.048	0.339	3.086	0.010**

Notes: The *,** denote statistical significance at 0,05% and 0,01% level.

Source: Authors' own data processing in Eviews 12.

Indeed, among the actions supported by the ESF are efforts to reduce of school dropout rates. The training courses offer a second chance to young people who leave the education system too early. ESF projects also support PhD students in their studies. Investments like these are essential for a person's career prospects, as well as for Romania's economy.

ESF funding has been used to improve access to education, particularly for marginalized and disadvantaged groups such as Roma communities, children from low-income families, and people with disabilities.

Upper-secondary education is not statistically significant, but it must be taken into account that the overall financing allotted to each area is decided upon at the start of each programming term based on its historical economic performance. This indicates that the amount of money received each year is more closely tied to past performance than to the state of the economy at the moment.

Conclusion

Particularly important is the fact that the ESF brings together the educational and professional environments. Mutual learning, as well as information from peer reviews, enables educational institutions to revise their qualification programs to meet the needs of the economy. Creating closer links with businesses opens up new internship opportunities for project participants.

The economy is constantly evolving, which means workers must adapt to stay in the workforce. ESF projects invest in training and lifelong learning programs to help people of all ages maintain their up-to-date skills and knowledge. The emphasis is placed on developing transferable skills such as languages and IT knowledge.

Our paper highlights that ESF has had a significant impact on education in Romania. Through various programs and initiatives funded by the ESF, Romania has been able to improve access to education, enhance the quality of education, and promote lifelong learning opportunities for its citizens. These initiatives support the development of entrepreneurial skills among students and educators, encourage collaboration between educational institutions and businesses, and foster a culture of innovation and creativity in schools and universities.

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Economic change of the energy transition

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Abstract. *The economic effects of energy progress are a subject of rising interest and worry as the world wrestles with the difficulties of environmental change and the need to move towards a more feasible energy blend. The change to sustainable power sources, for instance, sun-based and wind power, and the decrease of petroleum derivatives, are likely to achieve both positive and negative monetary effects. Energy change alludes to the shift from customary, petroleum product-based energy sources towards cleaner and more manageable waste-free solutions. This change has picked up critical speed lately because of developing issues about environmental change, ecological corruption, and the requirement for long-haul energy security. While the essential focal point of this development is on relieving an Earth-wide temperature boost and advancing maintainability, it likewise brings different financial ramifications that should be thought of.*

Upon the entrance of the last decade, fossil fuel sources accounted for more than 60% of utility scale electricity capacities on a global level. Ever since the Glasgow Climate Change Summit most countries have began implementing various regulations to eliminate carbon dioxide from their energy pool; in the United States, over 70% of the new energy capacities including renewables and nuclear are carbon free. Within the next 3 years of development, the additional global demand for energy shall consist of 90% from renewables and nuclear energy with additional technologies being developed and adjusted to meet the needs for each country's infrastructure and capability to adapt it.

Keywords: energy, transition, sustainability, economy, renewable.

JEL Classification: O13, Q43.

Introduction

The drive towards renewable energy began after the first stages of industrialization, when production points of energy like coal, oil and gas became the main sources of energy on a worldwide scale. Although these sources were abundant and several countries had the possibilities to produce at least one of them on a macro level, they also caused different environmental issues such as air and water pollution, deforestation and climate change. As the destructive effects of the use of fossil fuels became more visible in the world, there was a higher push for a transition to cleaner and sustainable energy sources.

A compelling turning point in this energetic process occurred with the evolution of renewable energy technologies such as solar, wind, hydropower and even storage capacity facilities. These advancements offered a new option to generate electricity without relying on fossil fuels and gained popularity in the late 20th century and beginning of the 21st century as concerns about climate change heightened. Governments and public institutions worldwide started implementing subsidies and incentives to start encouraging the adoption of renewables capacities, thus resulting in a rapid development of the industry.

Impact of economic change of energy transition

The economic change of energy transition has presented a deep impact on the global economy, emerging both positive and negative consequences. On the positive side, this energy transition has presented economic development with a steady growth rate of over 4% annually since the beginning of the pandemic with it only increasing over the course of the next years with higher investments in each source of production; it has also presented new opportunities for innovation and job creation. The “renewable” industry has become a major driver of economic development, creating millions of jobs in areas such as solar panel manufacturing, wind turbine installation and energy efficiency consulting. This helped economies to stimulate various communities to reduce dependence on imported fossil fuels and create independence based on renewable energy sources, with various plans implemented by governments which support households with financial aid to be able to gain their energetical independence by either installing small capacity of solar panels in their yards/rooftop or installing a small wind turbine which will help cover the electricity bill.

Furthermore, the switch to renewable energy has improved air quality in major cities (due to lowering the dependence of the existing polluting power plants that are located either in big cities or very close to highly populated areas), decreased greenhouse emissions and conserved natural resources, among other positive environmental effects. Countries can meet their climate objectives under the Paris Agreement and support international efforts to combat climate change by switching and promoting cleaner energy sources. This is essential to preserving and boosting future generations’ health and wellbeing as well as shielding delicate ecosystems from the effects of global warming (Dunne, 2024).

However, existing economies and industries have also faced difficulties and disruptions as a result of the energy transition. In many areas, the shift from the traditional ways of

producing energy have caused social and economic unrest due to job losses in industries like oil drilling and coal mining. Even more, various businesses and countries began facing financial difficulties due to the high upfront costs of renewable technologies, which has made it challenging to scale up clean energy projects and realize economies of scale. Whenever new technologies appear and start to be commercialized on free markets it takes a certain period of time until it becomes accessible from a market point of view, hence the desire of governments which offer incentives to unit consumption of clean sources through the possibility of household use of energy and to educate the population of what is yet to come on a micro and macro level in terms of energy consumption, how to access it and utilize it and how to decrease the need of traditional methods that will generate high consequences on a long term.

Influential figures in the field

Several influential individuals with a high reach have played a crucial role in promoting and generating the necessary drive into the economic change of energy transition and shaping the future of sustainable energy. One such figure is Elon Musk, the CEO of Tesla and SpaceX, who has been a leading advocate for clean energy and the main player in the electrical vehicle market, without whom the market would not have reached this growth rate on a global scale. The electric vehicle market size has reached a sizeable amount of USD 255.54 billions in 2023 and for the year 2024 it is projected to reach USD 623.3 billions worldwide. Musk's vision of a sustainable future powered by renewable energy has inspired many people around the world and catalyzed innovation in the transportation and energy sectors forcing other auto makers to stimulate production the in electric area (IEA, 2024).

Other well-known figures in the energy transition space include philanthropist and Microsoft co-founder Bill Gates, who has made investments in clean energy technologies through the Breakthrough Energy Ventures fund. Gates has advocated for increased funding for the exploration and creation of innovative energy solutions in order to expedite the shift towards a low-carbon economy from an early stage even when very few people were talking about clean energy or even investing in R&D or addressing strategies on a global level to combat climate change. His support of cutting-edge technologies like carbon capture and storage, grid-scale energy storage, and upgraded nuclear reactors has influenced the conversation about sustainable energy.

Perspectives on economic change of energy transition

Diverse viewpoints regarding the energy transition's economic shift are indicative of the varied priorities and interests of various stakeholders. Renewable energy proponents contend that the switch is necessary to lower carbon emissions, open up new business opportunities, and protect the environment for coming generations. As proof of the success of the transition, they cite the falling costs of wind and solar energy, the market's explosive growth for electric vehicles, and the rising investments in clean energy.

According to Lazard's 2023 compilation of unsubsidized Levelized Cost of Energy (LCOE) values by technology in the US, onshore wind and solar photovoltaics are currently the most competitive power generation technologies. Crucially, their individual LCOE rises if we additionally include storage expenses. Even so, they are still significantly lower than those of all other available conventional and renewable technologies and they roughly correspond with that of Combined Cycle Gas Turbines (CCGT). As renewable technology emerge and gain popularity by its implementation on both micro and macro level it also creates a disequilibrium in the electrical grid. Some countries have already changed the law and stipulate if an "entity wants to produce renewable energy it has to bring at least 15% of that capacity with balancing capabilities to regulate the market", this is where CCGT plays a very important role because it has the capability to produce all year long day and night and it does not depend on weather conditions and can act as a balancing element on any grid anywhere in the world with an crucial addition of capturing the CO₂ emissions to the powerplant that can later be used as a greenhouse effect to grow vegetables all year long even in countries that don't have the most suitable climate for this (Lazard, 2023).

Critics of the energy transition, on the other hand, raise concerns about the reliability and intermittency of renewable energy sources, the environmental impacts of large-scale solar and wind farms, and the potential costs of transitioning away from fossil fuels. They argue that renewable energy technologies are not yet mature enough to replace fossil fuels entirely and that a mix of energy sources, including natural gas and nuclear power, is needed to ensure energy security and reliability. Additionally, they raise questions about the economic feasibility of renewable energy projects and the potential impacts on energy prices and consumer bills.

Methodology and Findings

Research Question: *"How does the energy transition affect our economic state and lifestyle?"*

Methodology

1. Ground theory
2. Market analysis
3. Qualitative research
4. Economic outflows
5. Financial & macroeconomic impact

Future developments in economic change of energy transition

The future of energy transition and its accompanying economic shift is expected to be shaped by a number of significant developments. A highly increasing trend in the electrical grid is the growing incorporation of renewable capacities, which includes demand response

technologies, such as fast response production points, energy storage systems and smart grids. These developments will contribute to the development of a resilient and dependable energy system by assisting in overcoming the issues of intermittency and variability related to solar and wind energy.

Another relevant development in the transitional process is the increase of electrical vehicles presenting an annual growth rate of almost 10% projected over the next years until 2028 with a projected value of USD 343.01 between 2023-2028 and the decarbonization of the transportation sector, thus various methods of clean transportation have began to be implemented by governments such as electrical and hydrogen based buses. As countries around the world set ambitious targets for phasing out internal combustion engine vehicles and promoting zero-emission transportation, the demand for electric cars, buses and trucks is expected to soar; the concept of electrical trucks have passed from a prototype to testing phase and soon commercial access. This shift towards electrification will require significant investments in charging infrastructure, battery manufacturing and sustainable mobility solutions (Navio, 2024).

Furthermore, increasing investments on green construction and consolidation, energy efficiency, and sustainable urban planning will be necessary to make the shift to a low-carbon economy. Countries can cut energy consumption, greenhouse gas emissions and energy bill costs by increasing the energy efficiency of their buildings, appliances and industrial processes. Major players in such transitions are big production facilities who can start to consume clean energy by implementing roof top solar panel technologies or windmills to harvest clean energy and also automatization where it is possible.

The energy transition is an intricate and multidimensional process with the potential to change and improve the world economy and save the environment for coming generations. Moving to clean and sustainable energy sources has many advantages over the short and long-term costs, despite certain obstacles and uncertainties along the way. Through the adoption of creativity, cooperation and audacious measures, we can expedite the energy shift and establish a world that is thriving and sustainable for everybody.

Why is energy transition so important?

With a global effort to create a positive trend of moving toward a more sustainable and cleaner energy sources, what used to be a concept has transformed into the idea of economic transformation of energy transition that has gained importance in recent years. With the objective of lowering carbon emissions and diminishing the effects of climate change, this entails a fundamental shift in the ways that energy is produced, distributed and utilized.

The energy change includes moving from a framework in light of petroleum products (oil, gas, and coal) to one overwhelmed by spotless, sustainable power. Its point is to decrease energy-related carbon dioxide (CO₂) outflows to assist to meet worldwide environment targets.

Producing sustainable power is the most explicit stage of the energy progress. In any case, it is just a single part of the change. We have recognized various unmistakable speculation

regions. As well as environmentally friendly power age, these are energy stockpiling, electric vehicle framework, and transmission and conveyance organizations. The change is a drawn-out venture opportunity that will change the whole energy framework throughout the following 30 years and then some. The critical point is that in order to meet environment targets, speculation will be required across the entire worth chain, for example, every one of the areas referenced previously.

The energy change alludes to considerably more than the power age. Indeed, it incorporates the area's shift from consuming petroleum products – oil, coal, flammable gas - to create energy, to utilizing inexhaustible assets like wind, sun-based, hydro, or geothermal energy. The more extensive objective is to cut CO₂ emissions no matter how you look at the issue while creating energy stockpiling and zapping significant industry and transportation frameworks. Low-carbon or carbon-free fuels, for example, hydrogen, is being advanced as long haul answers for these difficulties due to the high level of complexity it requires to stabilize the process of creating a sustainable infrastructure (Lacey, 2020).

The way to decarbonize energy has accomplished critical achievements over the course of the last ten years. Among the features is the rise of wind power in Europe, which has diminished the expense of environmentally friendly power and made the business self-maintaining, setting a model for the world. The US, Asia Pacific, and Africa will be in the following rush of wind's prosperity.

In 2020, renewables surpassed the portion of petroleum derivatives without precedent for the European Union energy blend, and the European Commission assessed the carbon footprint of the power area had dropped by 14% in 2020 – yet because of extraordinary conditions. Organizations play an immense role in the perfect energy progress, conveying the administrations furthermore, advances required while likewise meeting their science-based focuses to diminish outflows. Those organizations that act now and give administration in conveying the change to clean energy will make the positions demonstrated in this examination and will most help their beneficiaries. To this end, such organizations with science-based targets will be the best institutions representing future prospects. China and the US; which is planning to arrive at 100 percent carbon contamination -free power by 2035 – are both expected to see an expansion in limit augmentations in 2020 and 2021, as per the International Energy Agency (IEA).

Renewables are likewise set to assume a central role in satisfying Africa's developing need, with the IEA foreseeing twofold digit development from both utility-scale and disseminated sunlight-based energy and other renewables. In any case, there is something else to do to accomplish carbon nonpartisanship, not simply to raise the portion of renewables in the energy blend, but to decarbonize the existing energy framework and to decrease additional emissions by the heaviest customers of petroleum derivatives (Willige, 2021).

The clean energy transition

The perfect energy change is critical. The most recent IPCC (Intergovernmental Panel on Climate Change) report shows that if we act presently, we might be able to maintain the

current level of 1.5C in the reachable future, as it has risen exponentially. The unlawful Russian intrusion of Ukraine and taking off expansion in numerous economies have put the subjects of petroleum derivative reliance and energy costs at the highest point of the political plan. The plan for sustainable energy progress is feasible. Answers for splitting worldwide discharges by 2030 can be conveyed. We can arrive at this with the suitable approaches that decarbonize power situations, increase energy productivity and environmentally friendly power advances, and adjust public expenditures and financial arrangements (Bauer, 2023).

Legislations hold the way of getting this going. What frequently keeps them down is the vulnerability of how this affects individuals and the economy of their country. Presently, it is the second for policymakers to pay attention to their residents and convey the protected, spotless, prosperous future they are calling for. The financial and development figures in this exploration offer nations a reasonable answer to assist with tending to rising costs that are influencing families from one side of the planet to the other (Gogol, 2022).

By making a definitive strategy plan, political pioneers can shield their residents from dirtying and unpredictable energy sources, offer fair positions, and defend a solid future for the planet and all who live on it. Organizations are calling for legislatures to convey explicit arrangements that will assist with speeding up the progress of the worldwide economy to net zero emanations mid-century.

Impact on global GDP

Energy progress requires tremendous interest in sustainable measures to accomplish energy proficiency, protection, and availability. This speculation prompts extra interest and results across monetary areas, like development and assembling, consequently emphatically affecting worldwide GDP (Gross Domestic Product). Because of this additional result, the energy progress would yield a higher worldwide Gross Domestic Product contrasted with the less aggressive reference situation, where the additional monetary streams will be more modest. The progress towards clean energy requires gear, advances, and different administrations, in this way offering critical business valuable open doors across the globe. Overall, 1% higher work throughout the progress (until 2050).

It is vital to understand that work creation that goes past the energy area. Specialists in lawful issues, tax collection, coordinated operations, and security and climate, as well as gifted workers like truck and crane drivers, are among those that will likewise have a significant impact on the change.

The energy progress will add positive effects on the more extensive human government assistance through the improvement of human well-being and admittance to energy transition. By embracing the concept that energy will become accessible to each household, individuals will become stimulated to accelerate the change and embrace the new possibilities of lifestyle (Öunmaa, 2021).

Air contamination is assessed to be the fourth driving risk factor for early deaths internationally. Gradually getting rid of petroleum derivatives - one of the principal

purposes for encompassing contamination - would further develop air quality and this way would fundamentally increase human well-being. The year 2019 saw 6.7 million passings because of air contamination - a figure which could be extraordinarily decreased by moving to cleaner energy. The nations in this district are portrayed by restricted financial expansion, overwhelmed by the mining business (counting coal extraction and other standard assets), and vigorously depend on environment touchy areas like the horticulture area. Broadening the economy by incorporating sustainable power and new advances could support development, and expanded requests from climate-related consumptions would probably emphatically affect the formation of green positions. The expanded result would, at last, emphatically affect the locale's Gross domestic product.

Electricity pricing

Decarbonization, mostly infers jolt: supplanting gas-powered motors by electric engines, and supplanting oil and gas warming by electric warming, obviously with the power produced from non-fossil sources. This milestone implies guaranteeing that power estimating offers employees the right motivating forces. Specifically, it means that we need the expense of utilizing an extra kWh of power to mirror its peripheral social expense. As of now, in New York City, and most other substantial urban communities in the U.S.; electric warming is many times more costly than oil or gas warming. This mirrors that power costs are in reach of \$0.15 to \$0.20 per kWh, which is way over the minimal social expense of power from sustainable sources. The peripheral social expense of force from inexhaustible sources is close to nothing, as wind, sun-based, and hydro all have basically minimum working expenses. It would require a lot of lower power costs to give the right motivators to utilize clean power instead of non-renewable energy sources. Unreasonably, not exclusively are sustainable energy costs way above negligible social expenses, yet petroleum product costs are underneath negligible social expenses (Heal, 2020).

Macroeconomic and financial effects

Interest for irrelevant administrations has steadily acquired significance in creating Gross National Product (GNP) over material products from farming or industry. It is often expected that administrations are less energy serious than material items, albeit this isn't the situation (e.g., monetary or data administrations as well as worldwide travel and the travel industry can be exceptionally energy escalated). Furthermore, innovative advancement has somewhat additionally taken more energy-proficient creation of material merchandise. In outcome, the elasticity of energy demand compared with Gross Domestic Product development has been declining and is under a true intent that for a given rate expansion in Gross domestic product, energy request will enlist a more modest increment. However, in an urgently significant rundown of energy-concentrated businesses (synthetics, metals, glass, paper, concrete, and so forth.), energy effectiveness has not advanced at the stage that institutions would have assumed ten years ago. It is unrealistic to close with conviction that the versatility of energy request compared with Gross

Domestic Product will undoubtedly decline further: it relies upon the idea of future innovation and structure of future interest (Luciani, 2022).

In examining the financial effect of the energy change, we want to keep the opposite side of the coin, or at least, the effect of monetary "advances" on energy, as a top priority. Segment, well-being, economic, political, and security improvements can hugely affect the interest in energy, either straightforwardly or by implication through financial development (or absence of it). The Coronavirus emergency has been an obvious delineation of how exogenous shocks (for this situation, well-being-related) can influence the economy and the energy business significantly.

Conclusion

The continuing energy progress will have significant impacts across the globe. Possible decreases in petroleum derivative interest present significant and intense dangers to fossil fuel producing locales, while minerals makers ought to see a drawn-out expansion in interest for their items. In the meantime, most of the world ought to benefit altogether from lower, less unstable energy costs and decreased air contamination. The possible ways of the energy progress differ greatly in the short and medium terms. A problematic way of high and unstable energy costs is conceivable; however so too is a way of sharp cost declines and a fast breakdown popular for petroleum derivatives. Accordingly, it would be advantageous for all nations to begin fabricating right away versatility and making suitable arrangements.

Petroleum product exporters can assemble cushions and leave on the primary changes expected to deal with the drawn-out decline of their essential businesses (eg, progress

to a less unpredictable expense base or to showcase-based trade rates). Petroleum derivative merchants, can involve the energy progress as a chance for primary change. By diminishing boundaries to the change - whether administrative or monetary - they can protect themselves from unpredictable worldwide energy markets, upgrade homegrown energy security, and work on general well-being.

The financial impact of the energy transition is multifaceted, encompassing initial investment costs, operational savings, job creation, and environmental benefits. While the transition to renewable energy sources requires significant upfront investments, technological advancements and supportive policies are gradually reducing these costs. Moreover, the long-term benefits, such as stable energy pricing, job creation, and improved environmental and health outcomes, make energy transition a financially viable and sustainable. By embracing this transition, societies can not only mitigate climate change but also unlock economic opportunities and build a more resilient future.

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Romanian public administration's digitalization within European context

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Abstract. *The digitisation of public administration offers many benefits for both employees and citizens, improving resource management and fostering the development of innovative public services. Effective digitisation prioritises the needs of citizens, with an emphasis on simplicity, speed and transparency in public services. This comprehensive digital transformation presents opportunities for increased transparency, accountability, efficiency and improved tax collection, which have become even more crucial during the COVID-19 pandemic as online solutions have soared. Our research provides an in-depth analysis of strategic management in public administrations, focusing in particular on the impact of digitisation on local tax revenue collection in Romania over the period 2015-2021. Authority for the Digitalization of Romania plays a key role in advancing the digitisation of public administration. This thesis examines the Authority's contributions to the transformation of public services through digital means, with a focus on improving efficiency, transparency and citizen engagement. Analysing key initiatives and strategic frameworks implemented by the Authority, the research highlights significant progress in streamlining administrative processes and improving public service delivery. The study also explores the challenges faced in the digital transformation journey and provides recommendations for overcoming these obstacles. Using data from the national e-payment platform ghiseul.ro, we used panel data analysis, complemented by reliability and robustness testing, to explore this impact. Through comprehensive analysis and case studies, the paper highlights the critical impact of Romania's efforts on the digital evolution of its public sector, promoting a more responsive and efficient governance model.*

Keywords: digital transformation, local tax revenue, public administration, Romania, Authority for the Digitalization of Romania, National Agency of Civil Servants, tax collection, tax compliance, efficiency, transparency, public services.

JEL Classification: H83, O33, O52, H11, L86.

Introduction

As governments undergo digitalization, significant capacity is needed to embed digital transformation into the administrative apparatus. The adoption of e-government tools and systems is a natural evolution of redefining the way the public system responds to the needs of its citizens, given the accelerating evolution of digitisation which is continuously redefining the way governments manage their resources. Effective models and strategies for the digital transformation of the public sector require specific mechanisms and operational procedures to ensure value for money and promote coherent, integrated and coordinated implementation. Creating organizational conditions for attracting, developing and nurturing digital talent and skills in the public sector is also a cornerstone of digital government strategies that seek to build on existing human resource capacities and strategies for successful and effective implementation.

Governments augment their spending on digital infrastructure to support the digitalization of public administrations. It is estimated that governments IT spending will increase by an average of 5.5% in 2023 compared to 2022, according to OECD (*OECD, 2024*). Romania is no exception, as indicated by the EU Recovery Plan (*European Commission*), in which 21% of the total budget of EUR 1.5 billion is earmarked for the digitalization of public administration¹. The “Digital Administration” component of the Romanian Recovery Plan includes funding for the digitalization of key policy areas such as justice, social protection, public procurement and public service management, as well as for the promotion of key digital public infrastructures such as the state cloud infrastructure through the Ministry of Research, Innovation and Digitalization (*MCID*). The Ministry of Research, Innovation and Digitalization exercises legislative control over the information society and ICT. This dedicated ministry is the main policy and strategy provider in this area and is the central public administration's specialized body in the field of information society and communication. In addition, the MCID, together with the subordinate agencies and departments in the information society and communications sector, is responsible for the implementation of policies and strategies (*MCID*). It also implements the government's information society and communication policies. The MCID works along with the Authority for the Digitalization of Romania (*ADR*), which is the authority subordinated to the ministry and is in charge of operating the eGovernment Portal, the IT system for the electronic attribution of international authorisations to transport goods, the Electronic System for Public Procurement, the Virtual Payment Desk. The Virtual Payment Desk (*Ghișeul.ro*) consists of tax payment systems for individuals and authorised individuals and *e-tax.e-guvernare.ro* for legal entities, electronic public procurement systems (*elicitatie.ro*), systems for obtaining transport authorisations (*autorizatiiauto.ro*), systems for obtaining permits or other documents, as well as for consulting the legislation in force for a wide range of services, such as the establishment procedure in Romania (*edirect.e-guvernare.ro*).

Moreover, the ADR has the legal authority to handle the development of digital talent and skills in the public sector. As specified in the framework law that structures ADR's mandate and responsibilities, the institution should “elaborate the national plan for the development of digital skills in the public administration and ensure its implementation in cooperation with other competent authorities, in accordance with the law” (*Romanian Government, 1999: 188*).

Literature review

The role of ADR and NACS can be relevant to formulate a measurement tool that takes into account both the priorities and objectives of digital governance as well as those of the public service.

Addressing the ADR's responsibility for digital talent and skills development in the Romanian public sector falls under the statutory role of the National Agency for Civil Servants (Agenția Națională a Funcționarilor Publici) under the Civil Servants Act (*NACS, 2022*) as the overarching institution responsible for national civil service policy, recruitment and talent development in the Romanian Government (*Romanian Government 1999: 188*). However, evidence from the fact-finding mission suggests that there is limited coordination between these two institutions in terms of adopting a comprehensive digital talent and skills framework. The limited coordination observed in the development of the national policy for digital talent and skills in the Romanian public sector leads to ambiguity as to who is the authoritative institution that public sector institutions can turn to in this area.

With the ongoing pace of digital transformation in all public sector institutions, the Romanian government is facing further structural challenges to recruit, train and retain digital talent. The salary systems in place for civil servants provide for lower salaries compared to other governments in the EU and the country's IT industry. While this problem occurs in all OECD member and partner countries, there are particular disincentives in Romania in place that further impede the public sector's ability to attract professional digital talent and skills.

The existing tax system for the IT sector involves an income tax exemption for IT employees from private sector companies (*Romanian Government, 2015: 218*). As a result, most digital talent is quickly absorbed by IT companies and recruitment processes for civil servants in digital and IT roles often fail to attract applicants, severely limiting the ability of public sector bodies to implement IT and digital projects. Some of these obstacles are overcome by the Civil Servants Act, which provides economic incentives for civil servants working on EU-funded projects, including ICT and digital projects. Against the backdrop of a very restrictive organizational environment for attracting, retaining and promoting digital talent from a financial perspective, OECD countries are looking for complementary measures to test and surmount some of the architectural challenges that hinder the

development of a digital workforce in the public sector. Teleworking rules, flexible working hours, upskilling programs or micro-learning are measures that have been adopted by some OECD countries to improve their capacity to develop digital professionals in the public service and could be jointly explored and tested by ADR and NACS to create better conditions for digital talent in the Romanian public sector. A prevailing formalistic culture in the Romanian government system is also reinforced by a pro-technology approach to ICT and digitalization projects. Consequently, there are cultural challenges in Romania to break down organizational barriers and foster trust and collaboration between public sector institutions that favor a digital governance mindset to align administrative processes and services with beneficiaries and their needs.

In this context, it is recognized that public servants generally lack agile approaches and skills to better understand and meet users' needs. This can jeopardize ongoing efforts towards transformative digital government policies and potentially lead to similar processes being replicated through digital means instead of truly transforming them. The ADR and relevant governance actors, including the Ministry of Research, Innovation and Digitalization and the National Agency for Civil Servants, could consider solutions that help overcome some of the structural barriers to digital talent in the administration while more transformative measures are taken. Under the implementation of the EU RRF, the most notable initiative on digital talent and skills in the Romanian public sector is led by NACS under the Investment 16 - Digital Skills Training Program for Civil Servants (*NACS 2023*). The program aims to train 32.500 Romanian civil servants through training programs defined on the basis of an analysis provided by the National Institute of Statistics (*INS*) of the digital skills needs of professionals and users in the country.

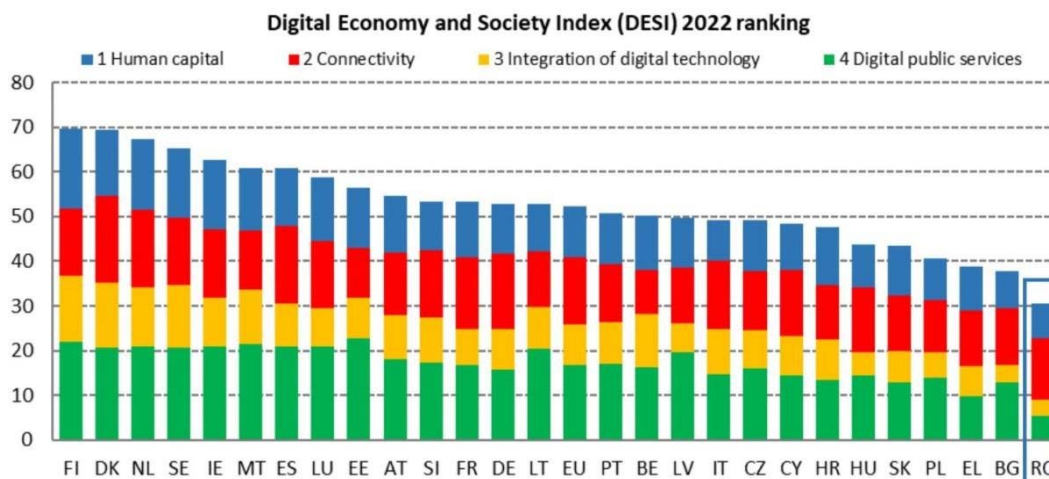
Methodology

In order to analyze Romania's performance in various skills benchmarks with regards to the digitalization field, the EU DESI (*EU DESI, 2022*) index is observed. The index reflects the positive progress which Romania has made over the past years. The digitalization indicator focuses on basic digital user and professional skills.

According to the 2022 edition of the Digital Economy and Society Index (*European Commission, 2022*), digital public services remain a challenge for Romania. The development level of e-government and the number and degree of development of public digital services in Romania is one of the lowest in Europe for almost all indicators measured, Romania ranks 27th among the 27 EU Member States. Of note, its relative annual growth lags behind its counterparts, suggesting that it is not converging with the rest of the EU Member States. The country lags behind in several human capital indicators, with a very low level of basic digital skills compared to the EU average, but maintains its high rankings in the share of female ICT specialists in employment (2nd place) and ICT

graduates (4th place). A significant improvement in digital skills in Romania readiness is critical if the EU aims to achieve the digital decade target in terms of basic digital skills and ICT specialists. Romania performs comparatively well in terms of connectivity, as it is the best performer in this area. The penetration of fixed broadband connections with at least 100 Mbit/s (57%) and the coverage of very high capacity fixed networks (87%) exceeds the EU average. This is also important in view of the Digital Decade goal of providing all households with 100% gigabit networks by 2030. However, the country's performance in the integration of digital technologies and digital public services is poor compared to other EU Member States. The percentage of SMEs that have at least a basic level of digital intensity (22%) and the percentage of companies that exchange information electronically (17%) is the lowest in the EU. The low level of digitalization and relatively slow progress are preventing the Romanian economy from taking full advantage of the opportunities offered by digital technologies. To make matters worse, the range of digital public services available to citizens and businesses is very limited.

Figure 1



For all indicators, the country ranks well under the EU average, particularly in terms of the availability of digital public services for citizens (a score of 44 compared to the EU average of 75) and businesses (a score of 42 compared to the EU average of 82). Digital interaction between public authorities and citizens is also low, with only 17% of internet users using eGovernment services. The high proportion of digital investments and reforms dedicated to this dimension in Romania's recovery plan offers an opportunity to improve these results.

Results and discussions

The timely implementation of the adequate digitalization policies will help Romania achieve the Digital Decade goal of 100% online delivery of key public services to the

Romanian citizens and businesses by 2030. Presently, there is no e-ID system in Romania. Deployment of electronic ID cards and digital signatures for the Romanian population is essential for the interaction between public and private sector organizations and the public. The RRP encompasses measures to supply 8.5 million electronic ID cards, receiving 200 million euros. The electronic ID card will embed two digital certificates enabling: (i) authentication for the use of public online services and (ii) qualified electronic signatures. The investments funded by the RRP also target the online provision of key public services and the development of a unified framework for a government cloud system. This includes: (a) development of government cloud infrastructure (EUR 675 million); (b) cloud development and migration (EUR 187 million); (c) development of e-health and telemedicine (EUR 400 million); (d) digitalization of justice (EUR 162 million), environment (EUR 52 million) and employment and social protection (EUR 85 million); (e) introduction of electronic forms in public procurement (EUR 0.85 million); (f) electronic identity card and digital signature (EUR 200 million); (g) digitalization of the NGO sector (EUR 10 million) and public service administration (EUR 10 million).

A few national digital platforms that can be part of a coherent infrastructure ecosystem (such as ghiseul.ro, an online payment platform) are already available, and - partly as a result of the Next Generation EU program - more such platforms are in various stages of implementation. In the following years, as this national infrastructure, both hardware and software, further grows, Romanian public institutions should be able to offer more and better electronic services with less effort. A majority of Romanians have access to at least some digital public services in theory. Nevertheless, the proportion of people interacting online with public institutions is the lowest in the EU (European Commission, 2021). These figures show us that it's not just a question of supply. To convince more citizens to access and demand more of the digital services available, there is a need to understand what drives the uptake of e- services and what factors drive adoption.

Conclusions

The digitisation of public administration in Romania yields substantial benefits for both employees and citizens by enhancing resource management and promoting innovative public services. Effective digitisation prioritises the needs of citizens, with a focus on simplicity, speed and transparency. Such a digital transformation increases transparency, accountability and efficiency and improves tax collection. This research delves into the strategic management of public administrations, examining in particular the impact of digitisation on local tax revenue collection in Romania over the timespan 2015-2024. The Authority for the Digitalisation of Romania (ADR), along with the Ministry of Research, Innovation and Digitalization (MCID), National Agency of Civil Servants (NACS) and other key public institutions plays a leading role in this process of transformation, leading initiatives to streamline administrative processes and improve public service delivery via

policies that are meant for the Romanian citizens to easier interact with the public authorities and to efficiently solve their tasks, with the unnecessary bureaucracy across institutions.

Through comprehensive analysis, significant progress in terms of efficiency, transparency and citizen engagement is highlighted, despite the challenges encountered along the way. Data from the DESI index, shows the positive impact on usage of digitalization skills among Romanians as a result of digitization policies.

Romania's drive towards digitisation is also illustrated by the substantial investments outlined in the EU's Recovery Plan, spanning various policy areas and digital public infrastructures. Nonetheless, challenges remain, such as attracting and retaining digital talent due to competitive disparities with the private sector. Initiatives such as the digital skills training programme for civil servants aim to address these issues.

Altogether, Romania's efforts to digitise its public sector have made good progress, but sustained improvements in digital skills, infrastructure and inter-agency cooperation are essential to fully realise the benefits of a fully competent digitised public administration, aligned with the EU's digitalization standards.

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Navigating the intersection of digitalization, pandemic, and business environment. Exploring a proposed framework on the Balkans

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Abstract. *This article delves into the intricate interplay among digitalization, the COVID-19 pandemic, and the business environment in the Balkans, presenting a robust framework to comprehend and navigate these intertwined influences. As digital transformation swiftly reshapes global business landscapes, its accelerated adoption during the pandemic has proven crucial in adapting to new economic realities. This study investigates how businesses across the Balkans have navigated these dual pressures, examining their adoption of digital technologies, shifts in consumer behavior, and the resilience of entrepreneurial ventures amidst uncertainties induced by the crisis. The research is guided by the question: What is the interplay between digitalization and the pandemic in restarting business activities? Insights include associations found between digitalization and the DiGiX 2022 index, and the correlation between restarting business and the annual real GDP growth rate in 2023. Moreover, the study explores how the COVID-19 pandemic has impacted the Harmonized Index of Consumer Prices (HICP), reflecting its broader economic effects. By synthesizing these elements, the framework aims to offer strategic guidance to businesses and policymakers navigating the evolving digital landscape and pandemic-induced challenges in the Balkans.*

Keywords: digitalization, business environment, digital economy, COVID-19 pandemic.

JEL Classification: O33, I15.

Introduction

In recent years, the world has witnessed an unprecedented convergence of three powerful elements: digitalization, a global pandemic, and the imperative to restart business activities. It should be considered the main triad of the current economic environment that has been reshaped by the latest encounters of the previous years, leading to significant changes into economic behaviors, on both organizations and individuals, determining the economic paradigm to shift to a more digitalized approach, by implementing the latest business trends, containing the use of digital technologies as tools and instruments for doing business.

Moreover, this triad has definitely reshaped the landscape of economies, businesses, and societies, fostering a new era of opportunities, but also a new era of challenges that have never been faced before. Therefore, it is important to pay attention to the interplay of these three elements, the corners of the triad, and the short theoretical approach of their implication on the process of restabilizing the business environment.

Literature review

The fast development of the COVID-19 pandemic determined businesses to rethink their approach on business strategies, business models and business activities, especially in a context in which lockdowns and other limitations have been imposed to restrict the spread of the global crisis. Therefore, business had to overcome the situation, by relying on already established good business relationships, using the digital tools provided by the current state of digitalization, redefining and redesigning value in interactive processes, investing in the online channels for providing new buyer-supplier interactions, and rethinking the concept of interaction while taking the most value from the online interactions (Runfola et al., 2021).

Moreover, since the COVID-19 pandemic and its impact on the business environment driven the economic paradigm to shift to a more digital economy, the modern world has been faced with various opportunities for economic growth towards innovation and digital technologies, key factors of digitalization. Therefore, various businesses had to be creative in order to fulfil the gap provided by the impact of the crisis, identifying their strengths and resources, and implement the best strategies for restarting businesses or for achieving the general goal of sustainable economic growth, even if the businesses in several industries have been closed or restricted due to the global limitations (Bogetić et al., 2021)

Meanwhile, beside the evidence provided by the physical implementation of the latest digital technologies in overcoming the impact of a crisis, evidence that can be scaled and measured, dynamism, vulnerability and inherent flexibility also represents one important aspect of businesses trying to reduce the impact of the COVID-19 pandemic, to maintain their operations or to restart their activities, because only by combining all of its resources and capitals, businesses can adopt and implement the strategy needed for keeping their activities going (Varma and Dutta, 2022).

Research methodology and methods

The current paper focuses on a theoretical approach for summarizing and presenting the main implications of digitalization and of the pandemic in restarting businesses. Therefore, the results will be exposed after interrogating the scientific literature using the keywords “digitalization”, “business environment”, and “the economic impact of the pandemic” while collecting the data and the information needed to state an answer for the research question of the paper, summarizing the previous published scientific literature.

Research question

The fact that digitalization and the latest global COVID-19 pandemic have both influenced the development of the current business environment is not a secret anymore. But the question that has been arisen by the scholar is how deep the three of them are interconnected, especially in the position of restarting businesses from industries that have been completely closed in the beginning of the world crisis.

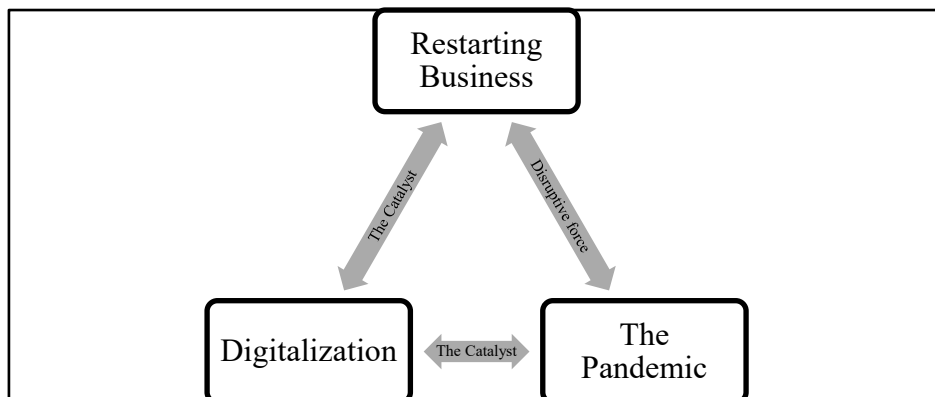
Therefore, a simple but effective research question that might be formulated is: *What is the interplay between digitalization and the pandemic in restarting business activities?*

Findings/theoretical approach

For a better understanding of the triad perspective that has been approached in this paper, a short visual representation is represented in Figure 1.

Therefore, we can consider the three agents of the triad as following: Digitalization (as the Catalyst), the pandemic (as the disruptive force), and restarting business as the main aim in which digitalization and the pandemic must be combined in order to provide the proper solution for the common goal of restarting business, or in a better situation, to keep businesses ongoing.

Figure 1. *The proposed triad*



Source: Adapted by the author.

Digitalization

The process of digitalization, often referred as The Fourth Industrial Revolution, or Industry 4.0 in the scientific literature, has been representing an on-going process in the past several years, alongside the development of the Internet of Things (IoT) and the development of the digital technologies, therefore reshaping industries and societies, forcing the business and the economic environment to react fast and efficiently to the fast-paced changes. The integration of digital technologies into various aspects of business procedures, strategies, and models, has not only increased businesses' efficiency, but has also laid the groundwork for resilience in the face of unexpected disruptions, as the global COVID-19 pandemic (Pilinkiene and Liberyte, 2021).

At the same time, the pandemic also acted as a catalyst for digitalization, forcing to extend the implementation of the latest digital technologies into business activities, providing therefore a solution for the powerful crisis that the economic environment has faced. Therefore, the rapid spread of the COVID-19 pandemic has enforced remote work, online collaboration and an increase of the e-commerce platforms, transforming them from convenient to necessities for businesses and individuals navigating the challenges imposed by lockdowns and social distancing measures.

The COVID-19 pandemic

The emergence of the COVID-19 pandemic and its fast-paced development represented an unforeseen disruptor that brought the paradigm shift on how businesses operate their activities. Lockdowns and restrictions forced businesses to reevaluate the traditional business model and to pivot towards digital solutions, therefore the increase in the adaptation, adaptation and implementation of the latest digital instruments and tools developed by the emergence of digital technologies, ensuring therefore the necessity of digitalization for businesses in order to keep their activities on the float line during the crisis (Stang, 2021).

Moreover, the pandemic highlighted the vulnerabilities of relying solely on physical infrastructure and emphasized the need for robust digital systems. As businesses grappled with uncertainties, the triad emerged as a framework for navigating the complex interdependencies of digitalization, pandemic and the response focusing on the imperative to restart economic activities and businesses operations.

Restarting business

As the initial shockwaves of the global COVID-19 pandemic begin to subside, the focus has been shifted towards restarting and rebuilding businesses, since various industries have been restricted or completely shut down by the implications of the development of the world crisis. Therefore, it is important to be acknowledged that the triad of digitalization, pandemic and restarting business doesn't represent a chronological process, but an intertwined process that must be addressed simultaneously (Assibi, 2022).

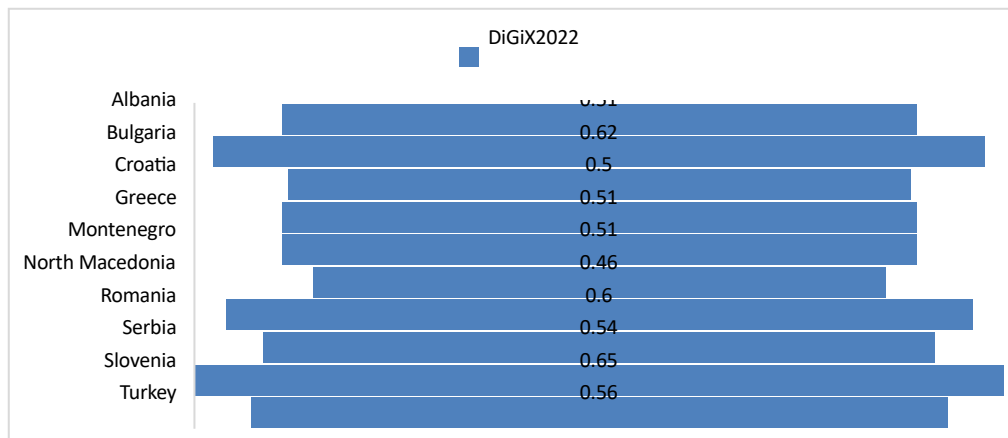
Hence, digitalization provides the tools, the instruments, and the platforms necessary for business to adapt and to innovate in response to the challenges posed by the global pandemic, but it is businesses duty to adopt and to implement the facilities provided by the development of the latest digital technologies in order to gain the benefits of their use. Therefore, without a good strategy shaped by business capacities to adopt, implement and use the digital technologies into its daily economic activities, digitalization has no power on providing returns on investment, even if that was the general trend followed during the direct effect of the global pandemic (Gopisetty, 2020).

Correlation inside the triad

As the theoretical framework should be always supported by data, some correlations between the edges of the triad should be consider. Therefore, the data will be analysed using Data Analysis tools from Microsoft Excel. To create the data base, the following elements have been considered: DiGiX 2022, Annual real gross domestic product (GDP) growth rate in 2023, and HICP (Harmonized Index of Consumer Prices) annual data (average index and rate of change) for 2023 as well. All the three above are one element of the presented triad as a framework. As for the Balkan region, the data has been collected for the following countries: Albania, Bulgaria, Bulgaria, Croatia, Greece, Montenegro, North Macedonia, Romania, Serbia, Slovenia, Türkiye.

Digitalization has been associated with **DiGiX 2022**. The association has been made because DigiX can serve as a comprehensive platform to illustrate and elucidate the concept of digitalization by showcasing practical applications and innovative technologies driving this transformation. By integrating various digital tools and processes, DigiX can demonstrate how traditional operations are being streamlined and enhanced through automation, data analytics, and interconnected systems. It provides a tangible example of how businesses and industries can leverage digital technologies to improve efficiency, enhance customer experiences, and foster innovation.

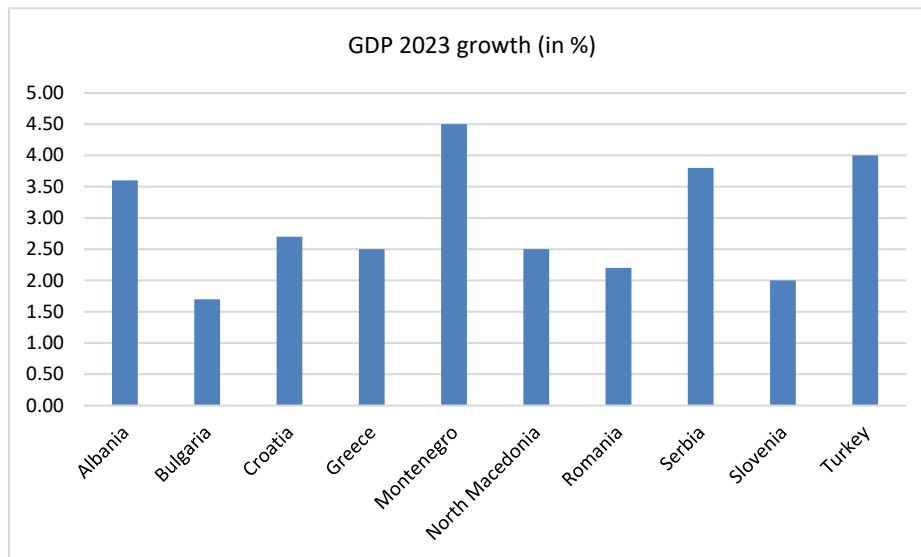
Figure 2. DiGiX 2022 for the Balkan countries



Source: DiGiX 2022 Updated.

Restarting Business has been associated with **Annual real gross domestic product (GDP) growth rate in 2023 (in %)**. The association between restarting businesses and the annual real GDP growth rate in 2023 is relevant because it underscores the pivotal role that business activity plays in economic recovery and expansion. As businesses restart and grow, they create jobs, boost consumer spending, and drive investment, all of which are essential components of GDP. Additionally, revitalized businesses contribute to innovation, efficiency, and strengthened supply chains, further enhancing economic stability and growth. This dynamic demonstrates how the health of the business sector directly influences broader economic performance, making it a key factor in achieving sustainable GDP growth.

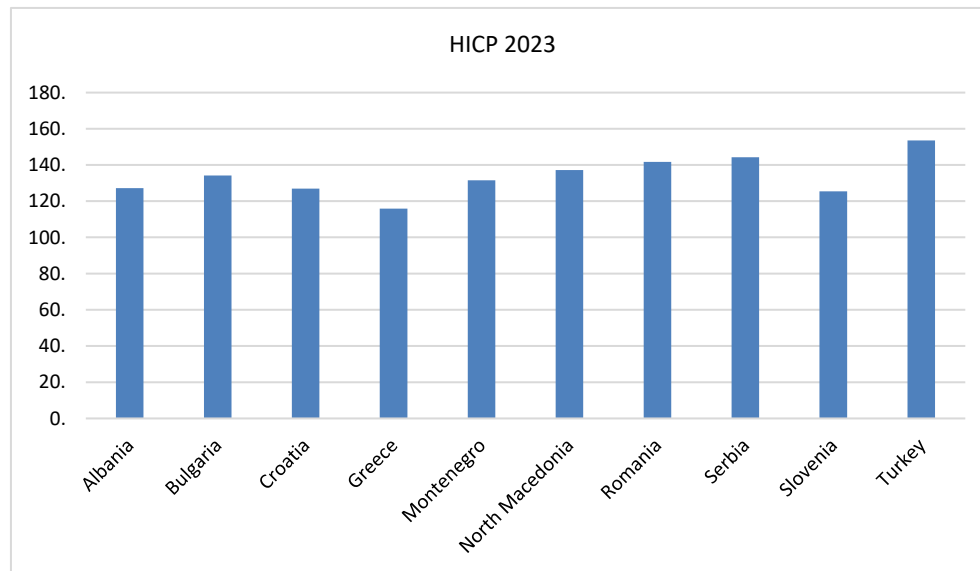
Figure 3. Real GDP growth rate in 2023



Source: Adapted by the authors from Statista (2024).

The association between **the COVID-19 pandemic** and the **Harmonized Index of Consumer Prices (HICP)** for 2023 is a significant one because it underscores the pandemic's profound impact on inflation and consumer prices. The disruptions caused by COVID-19, such as supply chain interruptions, changes in consumer behavior, and governmental fiscal and monetary responses, have all influenced price levels across various sectors. By examining HICP, policymakers and economists can gain insights into how these factors have affected inflation rates and cost of living, enabling them to make informed decisions to stabilize and support the economy. This association helps in understanding the economic ripple effects of the pandemic, ensuring that measures to manage inflation and support recovery are effectively targeted.

Figure 4. *HICP 2023 for the Balkan countries*



Source: Adapted by the authors from Statista (2024).

After the data has been collected, a short correlation has been run, as shown in table 1. As it can be remarked, the biggest surprize came with the negative correlation between the DiGiX and the Real GDP growth. This aspect is in a slight contradiction with the current economic paradigm in which the implementation of the latest digital instruments into businesses’ activities have conducted to higher production and better performance. Therefore, even if the assumptions have been justified, the correlation between them are not the strongest, so more detailed analysis has to be conducted for justified answers.

Table 1. *Correlation results*

	DiGiX 2022	Real GDP growth	HICP 2023
DiGiX 2022	1		
Real GDP growth	-0.45438	1	
HICP 2023	0.132905	0.340344	1

Source: Authors’ contribution

Conclusions

Therefore, from a theoretical point of view, this triad represents a complex system with powerful dynamic interactions. The theoretical framework involves a good understanding of the synergies and tensions between the use of digitalization, the economic impact of the global pandemic and businesses’ response to strive the restart of their operations. It is important to recognize that the concept of resilience has become central, emphasizing the urgent need for businesses to build adaptive capacities through digital transformation (Meyer et al., 2022).

Moreover, the theoretical model should account for the evolving state of digital technologies, the unpredictability of the development of a pandemic, and the on-going effort to restart business activities. Hence, the *digitalization-pandemic-restarting business triad* constitutes a transformative force that is demanding a nuanced theoretical perspective, capturing more than the immediate challenges and responses, in order to create the economic environment that facilitates sustainable development and resilient future for the business activities. As business keep navigate this triad, the integration and implementation of digital technologies into business activities should not be focused only on restarting businesses, but also on fostering long-term adaptability to reduce a crisis impact and to facilitate economic growth.

At the same time, the short exploration of the framework over the Balkan countries has revealed the first *raindrops* of the relevance of the proposed triad, but further research must be conducted to fully validate the scientific character of the triad.

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Socio-economic perspectives of the Republic of Moldova in the context of integration into the European Union. Arguments in favor of membership

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Abstract. *Integration into a free trade agreement union has the potential to expand economic growth by boosting exports and benefits from all the other outcomes that follow the integration process. This article explores the economic and political prospects of the Republic of Moldova as a small, poor, ex-communist country located between the European Union and the prospected Eurasian Union, against an uncertain and dynamic geopolitical background. In addition, the article reveals recommended policies in promoting the adoption of the European way as the best alternative for the future. Through a comprehensive literature review and an analysis of current trends and data reports, the article highlights the importance of Moldova's focus on European Union integration. It examines various facts and realities from the Republic of Moldova and the international business issues that connect the country with the rest of the countries in its area, especially Romania on the one hand, and the former communist countries on the other, in its attempt to escape from Soviet heritage. In addition, the article discusses the challenges and opportunities associated with the integration project. It ends by highlighting the benefits and presents recommendations for accelerating and implementing the integration of the Republic of Moldova into the European Union.*

Keywords: European Union, membership and integration, social and economic perspectives, European economic wealth, economic growth.

JEL Classification: B2, B5, P2, P5, O5.

Introduction

European economic integration has always been an economic solution to political problems. After the Second World War, the Economic Community of Coal and Steel had as its main mission the integration of German heavy industry and the extractive industry in a civilian, demilitarized way. The pacification of these branches prevented their centrifugal evolution towards armament and other wars. The solution found was not only a way out of the impasse, but marked the common future of Western Europe through the surprising well-being that the abolition of economic borders brought. Countries that we admire today, such as Portugal, Spain, Greece, have reconfigured their economic and social destiny with the accession to the European Union. For all these states, and for all those that followed, European integration was a turning point in their further development. At first out of necessity, then out of normality, European integration has become a natural path to follow for emerging economies, or for those left behind, such as the former communist states.

European political, social and economic belonging is a natural level of evolution for a country. Access to Europe's resources, knowledge, support and openness globally ensures net added value for all its members. The post-accession socio-economic development of the former communist economies in general, and of Romania in particular, demonstrates that the place of the Republic of Moldova is also in the great European family, all the more so as the new geopolitical realities recommend it.

In 1991, with the dissolution of the Soviet Union, the former Moldavian Soviet Socialist Republic found itself alone, face to face with the objective law of history, the market economy. Under the geopolitical pressure of post-Soviet uncertainty and the military conflict provoked by the Russian-backed separatism in Transnistria, a "lost decade" of Moldova begins, in which the pace of annual GDP decline (-8.5%) has more than doubled the pace of GDP decline of a state like Sierra Leone (-3.7%), a socio-political and economic reference for countries in civil war (for eleven years) and without Moldova's demographic resources. The manifestation of statehood in the conditions of gaining independence was put to the test by that post-Soviet political and economic context.

In general, the ex-communist states were initially confronted with the lack of a coherent plan of economic measures that would ensure the transition from the centralized communist economy to the economic system of the market economy. Only in 1997, for the first time since the beginning of the '90s, a symbolic increase of GDP was recorded in the Republic of Moldova, but the Asian currency crisis that broke out in the same year had repercussions and overwhelmed the Russian economy starting with 1998. At that time, the degree of exposure of Moldova's economy to the traditional markets of the former Council for Mutual Economic Assistance (CAER) or the traditional Eurasian markets of the former USSR was high, and on this principle the economic crisis in Russia had repercussions for the economy of the Republic of Moldova, especially for foreign trade, marking a decrease in GDP by almost 70% compared to 1990.

Literature Review

European economic integration has sufficiently consistent results that the methodological dispute over the pro and con literature tilts the balance squarely in favor of integration. Small states, such as Romania, have gained enormously from European integration: since joining the EU, Romania got 64 billion euros more than it contributed, government officials say, and also according to Romanian National Bureau of Statistics. The 64 net gain billion were used for infrastructure modernization, education, research, industrial development, resilience in the face of natural disasters or non-cyclical crises, such as the Covid-19 pandemic, aligning the quality of human resources in Romania with those of the rest of Europe or even the whole world. Many other good outcomes followed due to European integration. The advantages of integration are evident in specialized literature (Kutana & Yigit, 2007; Ferrera, Miró & Ronchi, 2007; Mitze & Breidenbach, 2007; Frey & Hussinger, 2010; Lupu, 2010; Popescu, 2015; Collignon, 2017; Secrieru, 2017; Pistrinciu, 2018; Bending & Bubbico, 2019; Serwach & Gabrielczak, 2021; Tocci, 2022; Bailey et al., 2024; Peñalosa & Castaldi, 2024; Campos, Coricelli & Franceschi, 2024; Di Bernardino et al., 2024; Reinert, 2024; Haroche, 2024). Other scientific paper presented incentives in favour of integration (Buscaneanu & Li, 2024; Bilichak & Huz, 2024).

We should also note the analytical reports of foreign experts and researchers regarding EU trade liberalisation (Langbein, Cenusa & Guruli., 2024; Meissner & McKenzie 2019; Saltnes 2021; Tröster et al. 2020) or private actors that are ready to seize opportunities for development, including those arising from trade liberalisation (Doner & Schneider, 2016).

A paradigm shift on labour market and retention policies due to European integration was also present in different articles (Bogdan, 2024) along with global development through European integration (Saltnes, 2021; Tröster, B. 2020; Balmaceda & Westpha, 2024).

However, integration into the European Union has always required sustained efforts from the candidate states, the challenges and difficulties of this process being also encountered in various works (Rodríguez, Dijkstra & Poelman, 2007; Recher & Kurnoga, 2017; Herranz-Surrallés, Damro & Eckert, 2024; Glawe & Wagner, 2021; Nielsen & Šiljak, 2024).

More, all along with the economic challenges of the integration process, several other shortcomings were to be analysed: a dynamic background with its neighbours and turmoil from the geopolitic perspective (Kemp, 2011; de Jong, Abdalla & Imanalieva, 2017; Kilpatrick, 2020; Deen & Zweers, 2022; Bilichak et al, 2024; Eggar, 2024; German, 2024; Kramer, 2024; Marandici, 2024), the Transdnistria secession challenge (Hyde Smith, 2005; Grund, Sieg & Wesemann 2011; Belitser, 2015; De Waal, 2018; Miarka, 2020) and the pandemic. Moldova is country with relatively high excess mortality during Covid-19 crisis. Moldova appears typical for the Eastern European and post-Soviet countries, with a decline in life expectancy for 2020–2021 and a more substantial decline for women. The country had one of the highest death tolls of the post-Soviet countries for which statistics were available (Kozlov et al., 2024).

The general outlook still reveals provocative geopolitics within former Soviet Union template (Richter, 2018) and complex foreign affairs with Russia (Polianskii & Wagner, 2020; Kosienkowski & Dembińska, 2024).

Despite these challenges, there are significant opportunities to improve the requirements for European membership. Republic of Moldova has made several steps forward: better civil society (Havlíček, 2020), global economy evolution openness (Casagrande & Dallago, 2024), improvement of society-business-government cooperation (Stychynska et al., 2024). Major economic issues were debated in Republic of Moldova and some researchers have investigated the use of: supporting democracy through integration (Meyerrose, 2024), monetary integration (Velić & Cvečić, 2024), economic growth (Magoutas et al., 2024), globalization (Akhromkin et al., 2024), fiscal union (Berriel et al., 2024).

The review of relevant literature in the field of European integration highlights significant progress in understanding and applying these policies.

Together, these studies provide a comprehensive overview of the Social and economic outlook of Republic of Moldova, potential trends and shortcomings, many geopolitical or non-cyclical, highlighting the benefits, challenges, and future perspective in this field of Eastern extension of European Union. The literature analysis reveals the opportunities and the development perspectives of Republic of Moldova as a member of European Union.

Additionally, this study has examined the positive impact of European membership for a country with left-behind infrastructure and emergent economies, deprived human resources and scarcity of raw resources.

To assess the scientific interest in the understanding of the benefits of European membership, we conducted a bibliographical analysis of the works published in this field by querying the Web of Science, ProQuest and JStore database.

Materials and Methods

As materials and methodology, we analysed secondary data collection from existing literature in journals, articles, and books. The literature review identifies concepts containing action statements applicable to economic policies and social and political frame in Republic of Moldova presenting outcomes of European integration. The study has also primary data collection from practitioners and official issues from Romania and Republic of Moldova. To evaluate outcomes and possible positive consequences of Integration of the Republic of Moldova into the European Union, we conducted a bibliographic analysis of relevant literature published in this field. We used the Web of Science database to identify relevant studies and articles, focusing on works that explore the relationship between the young European membership of a poor country and the future perspective of wealth grow, quality of life, economic and social development in an emerging context.

The primary scope of this article is to gain familiarity with existing literature on the chosen topic, while addressing all the research questions mentioned in the 'Introduction' section. 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 'ESG', 'CSR and ESG', 'Non-financial reporting' and 'Non-financial reporting in Romania' 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. Some other sources include articles, documents or reports published by prestigious global consulting firms like McKinsey & Company, Ernst & Young, PwC, Deloitte, and reports published by Bucharest Stock Exchange (BVB). The primary criteria used for selecting or filtering the data were relevancy and the recency. In total, twenty-five articles were identified and selected that fit into the applied criteria. All of these selected research works are mentioned in the reference list. Furthermore, in order to maintain credibility, attempts were made to avoid the researcher bias as much as possible. For this purpose, information from multiple data sources were verified and analysed thoroughly.

Results and Discussions

Moldova in geopolitics 2013-2023: ten important years of economic transition

After the rapid recovery following the Asian crisis of 1998, the economic decline entered a constant evolutionary course, in a first phase, creating the auspices for an economic equilibrium. In 2000 there was an economic growth of 2.1%, and in the next 8 years of 5-7% annually. At the same time, the GDP growth rate is lower than the one reached worldwide, in the Central and Eastern European states and even in the CIS states, and only in the coming years the Republic of Moldova could approach, according to the size of this indicator, the level reached in 1992. The situation is similar in terms of the size of GDP per capita by the purchasing parity of the national currency, which in 2011 was 9.4 times lower than in the European Union states and 3.5 times lower than in the average of the CIS states. After this indicator, the results of the Republic of Moldova present a lower picture compared to many of the post-Soviet states or in the region. Thus, in 2011 the GDP per capita accounted for 64.5% of the average recorded in the EU countries, in Lithuania – 59.7%, the Russian Federation – 52.9%, Latvia – 43%, Ukraine – 22.9%, while in the Republic of Moldova – only 10.7% (Moldova's National Bureau of Statistics). It can be concluded that in a first phase the post-communist transition surprised Moldova without an alternative plan, affecting the economy in the absence of economic reforms, the creation of institutions and legislation specific to a market economy, the development of the private sector, the formation and development of the business environment. The key issues that needed to be addressed were aimed at improving the quality of economic growth, reducing massive labour migration, creating a truly attractive environment for entrepreneurship activities and attracting foreign investment.

Between 2008 and 2009, the financial crisis started in the United States with the bankruptcies of the investment funds Freddie Mae and Bernie Mac in the portfolio of the investment bank Bear Sterns in August 2007, followed by the collapse of the other two major banks of the five largest in existence, Lehman Brothers and Merrill Lynch, hit Eastern Europe in the autumn of 2008, and in 2009 the deadly tide had already hit Romania, Moldova and its other neighbors, Ukraine and the Russian Federation. In this context, 2009 was a difficult year for the Moldovan economy, with a large budget deficit. As the economic crisis had hit Eastern Europe hard, Moldova was additionally exposed to the lack of external financial support, tense relations with neighboring states – main partners in

foreign economic activity and pronounced political instability with unpredictable prospects. Remittances proved to be essential in the context of the 2009 crisis, reaching 27.4% of GDP. Remittances remain for Moldova in times of crisis a "lender of last resort" and an important source of stimulating domestic demand and feeding the liquidity of the banking system. Paradoxically, in the Republic of Moldova there was a considerable increase in productivity, especially in the production sectors, but unfortunately the economic explanation was gloomy: higher productivity was a disguised consequence of massive layoffs, and the services sector was not able to absorb the freed workforce. For the Republic of Moldova, the negative scenarios, with or without economic crises, were mainly related to the reduction of remittances, the reduction of domestic demand, exports and, implicitly, of budget revenues but also of public expenditures, the increase in prices of energy resources with possible negative inflationary consequences.

In the shadow of the challenges listed above, except for some isolated episodes in time, throughout the post-Soviet period of the Republic of Moldova, the trade deficit was an economic normality, and had an increasing trend. Given that its considerable proportions have become threatening to the country's economic security, by increasing the state's dependence on foreign exports, the negative consequences have also spread to the stability of the national currency and the increase in unemployment. The trade deficit was a consequence of the inevitability of Moldova's economic reorientation from the insufficiently developed economy of the Commonwealth of Independent States (CIS) to the European Union, unfortunately, with very small steps. The reorientation of Moldova's trade opening surprised the country by forcing it to accept rapid increases in imports, but especially low exports to foreign markets. The period 2008 – 2012 was critical for Moldovan exports, under the blows of the 2008-2009 financial crisis and in addition by shaking the European macroeconomic stability by the sovereign debt crisis of 2010-2012. The Republic of Moldova cannot be reproached for too much in this context. Its economic survival during that period is a success story in itself (Polianskii & Wagner, 2020).

The year 2011 marks an inflection point in the trade policy of the Republic of Moldova. After the post-2012 European economic recovery, the negative trends in the Moldovan trade picture represented by the reduction of demand for Moldovan products on foreign markets, and first of all on those of the European Union, was caused by the reduced competitiveness of Moldovan products on potential markets. The need to increase their quality and improve productivity has become a priority. But the most important thing was the presence of considerable changes in the structure of the foreign trade of the Republic of Moldova, increasing its pro-European Union orientation and decreasing the share of the CIS as a traditional strategic partner. Thus, in 2011 the European Union states accounted for 49 percent of total exports and 43.5 percent of total imports from and to the Republic of Moldova, and 41.4 and 33.0 percent of the CIS states, respectively. This reality can be considered a political and economic paradigm shift of the Republic of Moldova. And with this change of vision, the configuration of the alternative also began: the European Union.

Table 1. Structure of export of goods of the Republic of Moldova to partner states in 2010-2011

States	2011		Percentage (%)	
	Million US dollars	Dynamics compared to 2010 (%)	2010	2011
Export total including:	2221,6	144,1	100	100
1 Russian Federation	625,5	154,8	26,2	28,2
2 Romania	376,4	152,8	16	16,9
3 Italy	215,1	145,9	9,6	9,7
4 Ukraine	153	167,1	5,9	6,9
5 Germany	111,2	147,4	4,9	5
6 United Kingdom	101,8	124	5,3	4,6
7 Poland	85,9	183,9	3,0	3,9
8 Belarus	75,6	94,2	5,2	3,4
9 Turkey	73,4	108,8	4,4	3,3
10 Kazakhstan	45,5	148,8	2,0	2,0
total for the first 5 partner states	1481,2	-	62,6	66,7
total for the first 10 partner states	1863,4	-	82,5	83,9

Source: Moldova's National Bureau of Statistics 2024, <https://statistica.gov.md>

In 2010-2011, the political leadership of Ukraine was represented by President Victor Yanukovich, whose pro-Russian orientation did not best suit the economic interests of the Republic of Moldova. In autumn 2011, the top 5 importing states (Russia, Romania, Italy, Ukraine and Germany) accounted for 66.7% of total exports, while the top 10 (to those indicated above are added Great Britain, Poland, Belarus, Turkey and Kazakhstan) – 83.9%. At the same time, the top 5 states in Moldova's imports (Russia, Ukraine, Romania, China and Germany) accounted for 54.6% of total imports, and the top 10 (to those indicated above are added Turkey, Italy, Belarus, Poland and Hungary) – 76.7%. The very high degree of concentration of the foreign trade of the Republic of Moldova led to a very high exposure of the country's economy to the unstable political climate of the former USSR. The trade relations with Russia (28.8% in total exports and 15.9% in total imports in 2011) and the multiple economic barriers (tariff and non-tariff) that Ukraine (with a share of 6.9% in total exports and 12.3% in total imports in 2011) systematically placed in front of Moldovan exports on this market, led to a negative balance of payments in economic relations with Ukraine, which constituted in 2011 - 488.1 mln. US dollars, the Republic of Moldova exporting goods of only 153.0 mil. US dollars, and imports amounting to 641.1 mil. US dollars. It should be noted the resilience of Moldova's trade policy, which had to cope with these pressures.

Moldova between Europe and Eurasia

On October 25, 2013, the Summit on the geo-political configuration of the Eurasian Union, coordinated by Russia, took place in Minsk. The summit was an early move and a replica of the one held on November 28-29, 2013 in Vilnius, where Moldova was invited to sign the Association Agreement with the European Union. Although at that time the context presented an apparent neutrality of Russia, the association agreement and Moldova's European prospects depended to a large extent on the game of Ukraine, traditionally closer to Russia, socially, economically and politically. But in February-March 2014, with the annexation of the Crimean Peninsula, a strategic antagonism occurred between Ukraine

and Russia that canceled the possible obstacles that Ukraine could have interposed to the process of rapprochement of the Republic of Moldova with the European Union. The fears for Moldova of the Prime Minister at that time, Iurie Leanca, "not to be the hostage of Ukraine", did not materialize. Moreover, with the war that broke out in February 2022, Moldova was on the front line of receiving hundreds of thousands of Ukrainian refugees, providing aid beyond the limits of its logistical means. 78,000 chose to stay in Moldova, in private homes, not in government buildings, according to Nicu Popescu, an important political figure in the Republic of Moldova at that time (The Economist, 2023).

In 2013, at the time of the Vilnius Summit, the Republic of Moldova was the poorest country in Europe, with a population of 3,600,000 people, along with 400,000 in the separatist region of Transnistria (With 4.3 million inhabitants in 1989, demographic forecasts present a gloomy situation, with 2.1 million in 2035, The Economist 12 Dec 2019). Half of the actively available population worked abroad. At that time, 25% of the GDP of the Republic of Moldova (calculated according to the expenditure method) was represented by the money sent to the country by Moldovans who went to work abroad. Politician Ioan Sturza, Prime Minister of the Republic of Moldova between February and December 1999, had expressed fears that the share of remittances in GDP is much higher because of undeclared money, with the suspicion that the real share in GDP may converge towards half (The Economist, 2023).

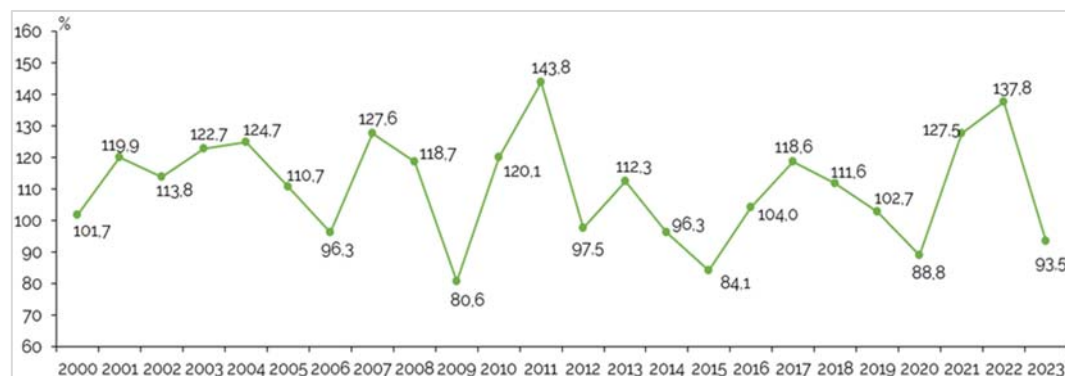
Russia has turned into an important pillar of foreign policy the pressures on the Republic of Moldova to join the customs union between Russia – Belarus – Kazakhstan and the planned Eurasian Economic Union. In September 2013, Russia banned the import of Moldovan spirits and wine, on unbelievable grounds of sanitary hygiene, more precisely, for the content of plastic. Periodic pressures and checks on Moldovan workers in Russia were tightened, and Dimitri Rogozin, Russia's deputy prime minister at the time, proliferated threats to cut off Moldova's gas supply. The first frost in Moldovan wine imports came from Russia in 2006, when Moldova refused the terms of a Russian-dictated deal on Transnistria. At that time, about 60% of Moldovan wine found its market in Russia. After 2006, Moldovan wine producers understood this new strategic tool of customs war and began to look at other markets, even in former communist states, where the quality of Moldovan wine was known before 1989. At the time of the new embargo in 2013, instead of 60%, only 29% was the degree of exposure of Moldovan wine production to the Russian market. This situation was also encountered with regard to Georgian wines or Lithuanian dairy products. What is important, however, is the remark of Moldova's strategic-economic maturity, which was somewhat prepared for these inevitable consequences of its European reorientation. As Moldova was exporting its two exceptional products, labor and wine, to Russia at that time, Russia responded with economic sanctions related to them.

The economic belonging of the Republic of Moldova to the unsustainable economic aggregate represented by the Commonwealth of Independent States (CIS), in parallel with the mirage of the Eurasian Customs Union in which Russia did not hesitate to convince only Belarus and Kazakhstan to join, did not represent a viable economic solution for the post-Soviet economy of the Republic of Moldova. Unlike the European Union, which is a reference point in the world economy and a primary vector of globalization, the CIS has

promoted an idea of a single economic space for all participating states, an economic paradigm doomed to certain bankruptcy in the context of current economic flows. Intending to set itself up as a locomotive of the CIS, Russia has failed to ensure its own macroeconomic stability and has lost international support as a result of its geopolitical program, focused on military blocs rather than economic unions. The lack of consistency of Russia's economic programs and political actions in its relations with neighboring states led to the withdrawal of Georgia in 2009, Ukraine in 2018 and, finally, the Republic of Moldova in 2023, one of the most important references in its European transition.

The Russian-Ukrainian conflict has affected Moldova's foreign trade, especially if it is considered that road transport in 2023 remains the most often used for exports of goods (80.8% of total exports), followed by maritime transport (13.5%), rail transport (3.4%), fixed transport facilities (1.1%), air transport (1.1%), postal items (0.1%). However, Moldova's economic repositioning from East to West can also be deduced from economic indicators (Moldova's National Bureau of Statistics, 2024).

Figure 1. The evolution of the value indicators of goods exports in the period 2000 - 2023 (% compared to the previous year)



Source: Moldova's National Bureau of Statistics 2024, <https://statistica.gov.md>

Exports of goods to European Union (EU-27) countries in 2023 totaled 2646.8 million US dollars (4.3% more than in 2022), accounting for 65.4% of total exports, 6.8 percentage points higher than in 2022. Exports of goods to CIS countries in 2023 amounted to US\$896.9 million (14.0% less than in 2022), which is equivalent to a share of 22.1% in total exports, down 2.0 percentage points compared to 2022. However, there is an inflection point in 2022, the year of the Russian-Ukrainian conflict, in which, despite the logistical restrictions and protectionist levers faced by Moldova's exports, there is a decrease in the share of exports to the European Union, from 61.1% to 58.6%, and a large increase in the share of exports to the CIS, from 14.8% to 24.1%. The explanation may be that the disruptive impact of the conflict on its borders and the preponderance of road transport for the export of goods, in the context in which the Ukrainian ports on the Black Sea were under military pressure in their turn, forced the Republic of Moldova to use the old outlets in the former communist countries that knew its products and where the barriers to market entry were lower. However, the trends are favorable: the share of exports to the European Union reached a higher level than in 2021, namely 65.4%. It is a confirmation of the fact

that Moldova's exports find a constant and safe cruising speed to the European Union (Moldova's National Bureau of Statistics, 2024).

According to National Bureau of Statistics of Moldova, in 2023, the main destination countries of goods exports were: Romania (35.1% of total exports), Ukraine (14.7%), Italy (6.4%), Germany (5.5%), Czech Republic (4.0%), Russian Federation (3.6%), Turkey (3.5%), Poland (3.3%), Bulgaria and Belarus (2.1% each), United States of America (1.5%), Spain (1.4%), Netherlands (1.2%), Hungary (1.1%), Kazakhstan, Greece, United Kingdom of Great Britain and Northern Ireland and France (1.0% each), which accounted for 89.5% of total exports (Moldova's National Bureau of Statistics, 2024).

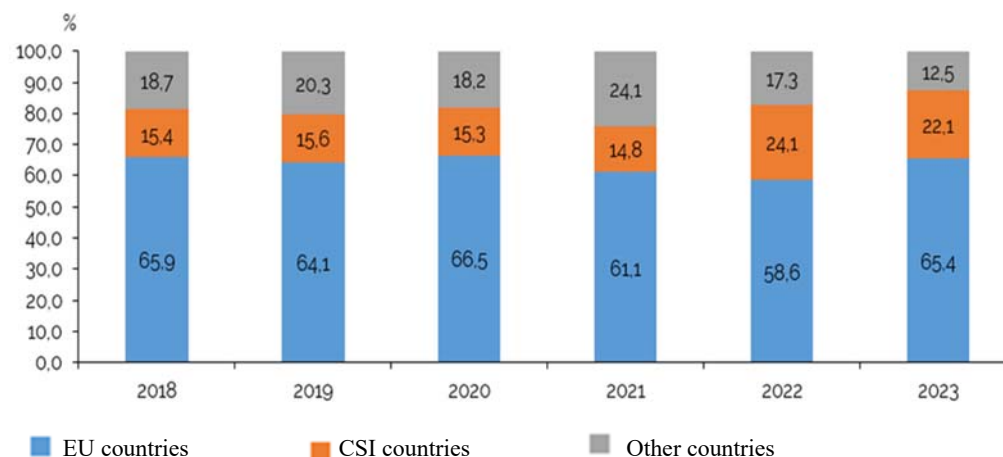
Table 2. *Value of exports*

	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
2018	220.3	215.5	242.1	199.7	223.0	214.1	218.8	218.6	207.3	259.0	268.9	218.8
2019	234.3	241.4	257.2	215.6	210.5	202.2	220.2	205.8	238.8	268.3	266.6	218.3
2020	219.5	245.3	210.2	149.8	155.7	189.6	191.1	163.9	212.3	249.4	262.0	218.3
2021	198.4	227.0	259.3	218.2	201.7	226.8	240.7	236.3	294.9	352.2	363.9	325.0
2022	330.4	336.5	395.8	396.3	416.0	416.4	338.2	329.4	318.8	351.9	355.4	347.0
2023	331.1	356.0	384.9	317.4	336.5	316.6	304.2	321.6	348.1	341.8	379.1	311.3

Source: https://statistica.gov.md/ro/comertul-international-cu-marfuri-al-republicii-moldova-in-luna9539_60951.html

The consequence of the Russian-Ukrainian conflict can also be seen in the change in the structure of Moldovan exports. The analysis of the evolution of exports by country, in 2023, compared to 2022 reveals the reduction of goods deliveries to Turkey (-53.3%), Ukraine (-17.3%), Italy (-21.5%), Bulgaria (-39.4%), Russian Federation (-24.2%), Switzerland (-50.0%), United Kingdom of Great Britain and Northern Ireland (-35.9%), Kingdom of the Netherlands (-26.4%), Portugal (-69.0%), Iraq (-70.5%), Germany (-4.1%), Hungary (-12.2%), Slovakia (26.2%), The Syrian Arab Republic (-98.5%), Belgium (-19.9%), Canada (-23.9%), which influenced the decrease in total exports by 13.7% (Moldova's National Bureau of Statistics, 2024).

Figure 2. *The structure of goods exports in the period 2018-2023, by group of countries (%)*



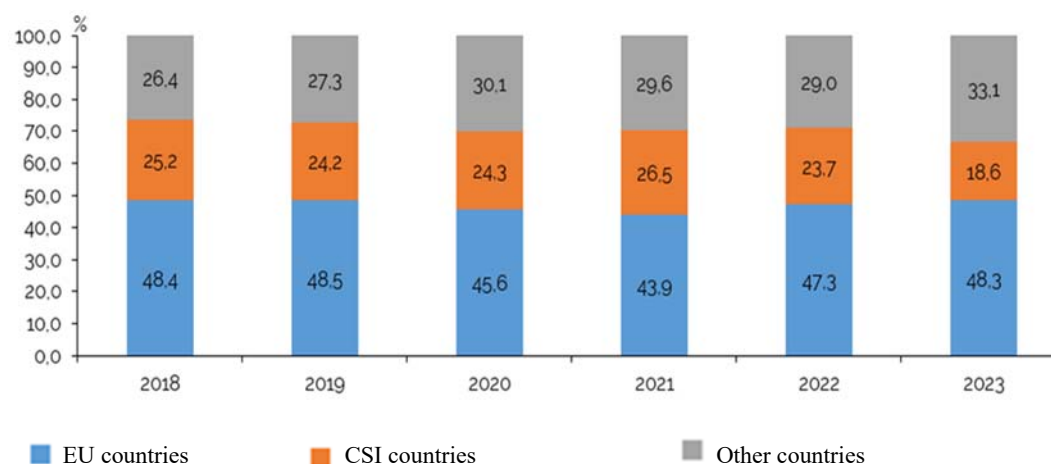
Source: Moldova's National Bureau of Statistics 2024, <https://statistica.gov.md>

Moldova's products that could be exported based on the reconfiguration of trade routes from Romanian ports to the Levant area, the Middle East or even the Far East registered significant increases. Exports of goods to Romania increased, as was natural, (+14.5%), Czech Republic (+54.6%), Kazakhstan (+44.0%), Egypt (2.6 times), Spain (+28.6%), Poland (+9.2%), United States of America (+19.7%), Lebanon (+54.8%), Cyprus (+47.9%), Indonesia (27.5 times), Malaysia (20.4 times), Greece (+21.2%), Croatia (2.6 times), Kyrgyzstan (2.0 times), Latvia (+58.8%), Lithuania (+20.7%), United Arab Emirates (+48.5%), Armenia (1.9 times), Saudi Arabia (+38.5%), Belarus (+3.6%), thus mitigating the decrease in total exports by 8.5%, according to National Bureau of Statistics of Moldova.

In the structure of exports in 2023, significant shares were held by the following groups of goods: electrical machinery and appliances and parts thereof (15.4% of total exports); cereals and cereal-based preparations (10.6%); petroleum, petroleum products and related products (9.8%); vegetables and fruits (9.5%); clothing and accessories (7.1%); oilseeds and oleaginous fruits (7.0%); fixed, crude, refined or fractionated vegetable fats and oils (6.1%); alcoholic and non-alcoholic beverages (5.1%); furniture and its parts (3.6%); articles made of non-metallic minerals (2.5%); yarns, fabrics, textiles and related products (2.0%); animal feed (1.6%), road vehicles (1.5%). With integration into the European Union, industrial sectors with the production of durable goods must be stimulated.

Imports of goods made in December 2023 amounted to 810.0 million US dollars, 9.9% more, compared to November 2023 and 7.3% less, compared to December 2022. Imports of goods from European Union (EU-27) countries in 2023 amounted to 4188.0 million US dollars (4.1% less than in 2022), holding a share of 48.3% in total imports, up 1.0 percentage points compared to 2022. Imports of goods from CIS countries in 2023 amounted to US\$1609.7 million (26.3% less than in 2022), which is equivalent to a share of 18.6% in total imports, down 5.1 percentage points compared to 2022 (Moldova's National Bureau of Statistics, 2024).

Figure 3. Structure of goods imports in the period 2018-2023, by group of countries (%)

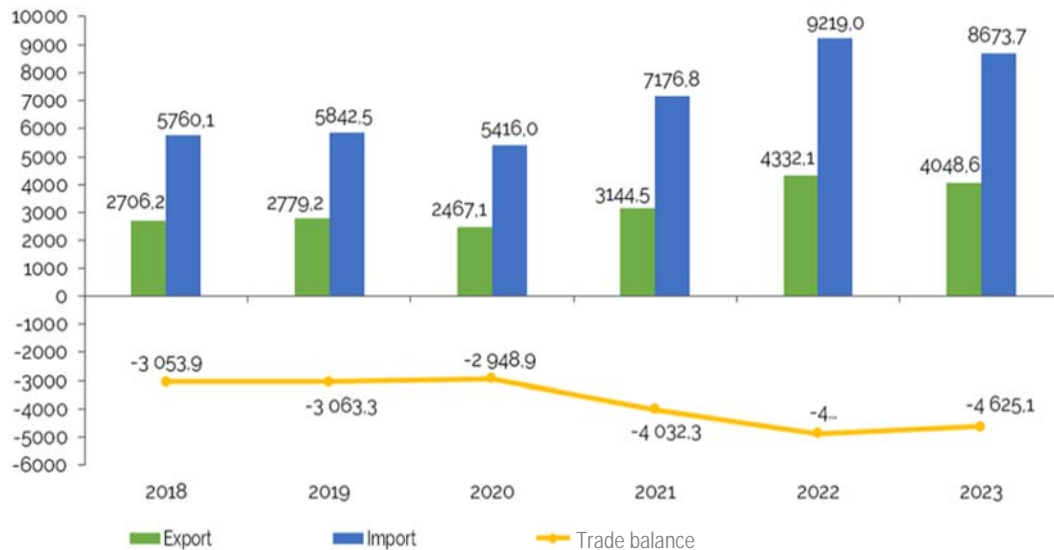


Source: Moldova's National Bureau of Statistics 2024, <https://statistica.gov.md>

The analysis of the evolution of imports by country in 2023, compared to 2022, reveals a decrease in imports from the Russian Federation (-71.9%), Romania (-21.1%), India (-17.3%), Greece (-18.6%), the United States of America (-8.6%), Belarus (-8.1%), Uzbekistan (-33.9%), which influenced the decrease in total imports by 13.8%.

At the same time, imports from Ukraine (+26.1%), Turkey (+12.0%), China (+7.4%), Germany (+6.9%), France (+22.1%), Italy (+7.3%), United Arab Emirates (4.5 times), Czech Republic (+19.7%), Japan (+34.8%), Kazakhstan (+58.5%), Slovakia (+30.8%), Vietnam (+40.6%), Spain (+14.3%), Poland (+4.7%), Sweden (+35.0%), Azerbaijan (2.0 times), Ecuador (+41.6%), Turkmenistan (+49.1%), Algeria (4.7 times), United Kingdom of Great Britain and Northern Ireland (+7.2%), Israel (15.0%), Egypt (+44.3%), thus mitigating the decrease in total imports by 7.7% (Moldova's National Bureau of Statistics, 2024).

Figure 4. Trends in international trade in goods in the period 2018-2023 (million US dollars)



Source: Moldova's National Bureau of Statistics 2024, <https://statistica.gov.md>

The analysis of the evolution of imports by country in 2023, compared to 2022, reveals a decrease in imports from the Russian Federation (-71.9%), Romania (-21.1%), India (-17.3%), Greece (-18.6%), the United States of America (-8.6%), Belarus (-8.1%), Uzbekistan (-33.9%), which influenced the decrease in total imports by 13.8%. At the same time, imports from Ukraine (+26.1%), Turkey (+12.0%), China (+7.4%), Germany (+6.9%), France (+22.1%), Italy (+7.3%), United Arab Emirates (4.5 times), Czech Republic (+19.7%), Japan (+34.8%), Kazakhstan (+58.5%), Slovakia (+30.8%), Vietnam (+40.6%), Spain (+14.3%), Poland (+4.7%), Sweden (+35.0%), Azerbaijan (2.0 times), Ecuador (+41.6%), Turkmenistan (+49.1%), Algeria (4.7 times), United Kingdom of Great Britain and Northern Ireland (+7.2%), Israel (15.0%), Egypt (+44.3%), thus mitigating the decrease in total imports by 7.7%.

According to Moldova's Bureau of Statistics, the trade balance deficit in December 2023 was US\$498.7 million (Figure 15), US\$140.7 million (+39.3%) more than in November 2023 and US\$28.1 million (-5.3%) less compared to December 2022 (Moldova's National Bureau of Statistics, 2024).

Table 3. *Moldova's Trade Balance*

<i>Years</i>	Export	Import	Trade Balance
2018	2706.2	5760.1	-3,053.9
2019	2779.2	5842.5	-3,063.3
2020	2467.1	5416.0	-2,948.9
2021	3144.5	7176.8	-4,032.3
2022	4332.1	9219.0	-4,886.9
2023	4048.6	8673.7	-4,625.1

Source: Moldova's National Bureau of Statistics 2024, <https://statistica.gov.md>

Moldova on the European Road

In June 2022, the Republic of Moldova obtained the status of candidate country for accession to the European Union. The enthusiasm of this moment, however, is in the shadow of the systematic challenges to socio-economic stability. The country needs a developed public administration, a reduction of economic vulnerability through exposure to Eurasian markets (which has already been on a favorable corridor of consistent reduction for several years), budget deficit and a more assumed popular support for Europeanization, in the current geopolitical context, of the conflict between the Slavic states on its borders. A key vector of Europeanisation is popular support, which has not yet reached its full potential, but is trending favourably, as The openness and constructive dialogue of President Maia Sandu left room for a clear understanding that Moldova's European future is both good through high standard of living and freedom for Moldovans of Russian ethnicity or roots (especially from Transnistria), Ukrainians, or for the Gagauz minority, pro-Russian through its secessionist manifestations in the 1990s, or later.

By obtaining the status of candidate country in 2022 and withdrawing from the CIS in 2023, Moldova is taking important steps on its European Path. However, the progress that supports this Road is proceeding slowly in the absence of correlation between Moldova's economy and the European Union economy: between 2010 and 2022, after the pandemic, GDP per capita (expressed as purchasing power parity) increased from 30% of the average of CEE countries in 2010 to only 36% in 2022. This key indicator is supported by the fact that productivity remained twice as low as the average of Central and Eastern European countries. The situation is in fact a consequence of the low share of areas with high added value and the existence of an advanced technological capital for the production and export of durable goods. This is visible by the fact that agricultural productivity still saves the economic balance of the Republic of Moldova, which is unnatural for a developed economy.

Table 4. Production of the main agricultural products in households of all categories

	Production, thousand tons		Agricultural production in 2023 in % compared to 2022	Degree of influence of agricultural products on the growth (+), decrease (-) of global agricultural production in 2023 compared to 2022 ⁴
	2022	2023		
Agricultural production - total	x	x	x	+23,6
Crop production	x	x	x	+24,2
<i>of which on the main types:</i>				
Cereals and legumes grains – total ⁵	1784,4	3196,4	179,1	+14,6
of which: wheat ⁵	855,0	1551,7	181,5	+7,7
barley	132,7	242,6	182,8	+1,1
corn for grains	752,3	1336,9	177,7	+1,1
Legumes for grains	26,3	37,7	143,2	+0,2
Sunflower	627,1	752,6	120,0	+3,1
Sugar beet	478,2	405,8	84,9	-0,2
Soybean	32,4	38,0	117,4	+0,1
Rapeseed	77,4	210,9	272,6	+3,3
Hetero-oilseed crops	10,6	21,5	203,5	+0,3
Potatoes	171,8	171,7	99,9	0,0
Vegetable – total	257,0	281,1	109,4	+0,7
Food crops	29,1	37,6	129,3	+0,1
Fruits, nuts and berries – total	650,5	754,1	115,9	+1,5
Grape	531,1	567,9	106,9	+0,5
Animal production	x	x	x	-0,6
<i>of which on the main types:</i>				
Animal husbandry (live weight)	170,6	168,2	98,6	-0,3
Milk	270,5	261,3	96,6	-0,2
Eggs (mil. pieces)	612,9	585,3	95,5	-0,1

Source: https://statistica.gov.md/ro/activitatea-agricola-in-anul-2023-9515_60969.html

The Republic of Moldova has shown coherence and verticality during the 30 post-Soviet years, through the stages it has taken: it has participated in pro-European summits, it has reoriented its exports, it has suffered from protectionism and other "Eurasian trade penalties", it has left the CIS, it has started reforms, finally managing to have in the personality of President Maia Sandu the providential leader of these new policies, But all these efforts must be financially supported. The international community must show objectivity and understanding towards the Republic of Moldova, which has been permanently deprived of the financial flows that would have facilitated all these political and economic processes. Under these circumstances, the existence of the budget deficit can no longer be considered a surprise. The budget deficit is financed through the support of development partners, which is essential for sustaining the country's European path. The liquidity of the banking system is insufficient for investments aimed at supporting economic growth. At this point, foreign direct investments guaranteed by the legislative umbrella of European-type institutions, as well as European financing programs through non-reimbursable funds are the main solutions through which Moldova's economy could be supplied with capital. Without it, only through the quality of the workforce and the fertility of the land, Moldova will not be able to step into the category of developed and modern states. Without European funding, only current activities can be ensured, and sometimes those from loans, and not the financing of technological progress and projects that provide capital accumulation. Therefore, a natural conclusion would be that by joining the European Union, the Republic of Moldova would benefit from the right funding that

allows a democracy to offer its citizens, regardless of ethnicity or political orientation, a high standard of living and individual freedoms.

At the end of 2022, the Moldova-European National Development Strategy 2030 was adopted. But the resources for the implementation of this strategy cannot be organized only by one's own effort, a situation in which it must be accepted that attracting foreign assistance will be indispensable for the Republic of Moldova. At this point, no more can be asked of entrepreneurship, already affected by the massive exodus of the workforce, especially from young people, who use university studies as a springboard to leave the country in the traditionally unfavorable and pessimistic context of future scenarios. And while the banking sector is resilient and stable, it lacks the resources to financially mediate growth and living standards. According to Moldova's National Bureau of Statistics, the situation as of August 31, 2023, the equity ratio in the banking sector registered a value of 31.6%, up 2.1 p.p. since the beginning of this year, while being well above the minimum limit of 10%, provided for in the legislation. The liquidity coverage ratio (LCR) exceeds 240%, given that the minimum value of the ratio is set at 100%. Solutions are expected from the state sector, which, after Moldova's integration into the European Union, would have the levers and resources to set a new growth rate, possibly capable of catching up as quickly as possible with the European averages.

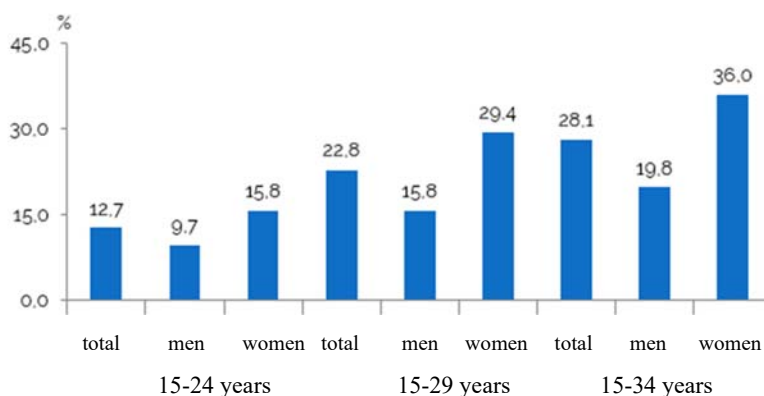
The need for Moldova's economic integration into Europe is also given by the limit of the workforce's efforts, characterized by "functional poverty": having a job is a necessary but not sufficient condition for avoiding poverty. The poverty line of many households cannot be excluded despite the employability of their members. With a high dependence on remittances, the low standard of living of households under threat of reaching the poverty line continued to deteriorate, as there was a trend of decreasing them, in nominal or real value during 2023. In this context, in order to maintain the social resilience of households in the face of poverty, state aid is needed for vulnerable categories.

The labor force is a special category in the analysis of the socio-economic context of the Republic of Moldova. Traditionally known as a qualified, gifted and talented one, the workforce is now facing shortages and the concern of employers who increasingly signal the maintenance of open positions in the absence of the possibility of filling positions with qualified personnel. The employment rate is still very low, at around 45% in 2022, compared to the European average or in the countries in the region. The problems related to labor shortages and underemployment are caused by a complex picture. One of the most important causes of low employability is therefore particularly low real wages, which are unable to allow many people to avoid the poverty line despite the work they do. In the second quarter of 2023, the inactivity rate of the population aged 20-64, although decreasing, remained high, respectively 41.2%, double the European Union average. The threat that exists is the following: even in the context of Moldova's integration into the European Union, mathematically followed by the improvement of the economic landscape, in the short term there will be a gap between the demand for labor that will increase more than the available supply, accentuating in a first phase the accentuation of the labor shortage. It will need to be stimulated by a higher adjustment of salaries based on attracting strategic loans from the available European funds to reduce the gaps between its members.

The Republic of Moldova still has the human resources based on a young population, represented by a significant share. According to the official data published, the National Bureau of Statistics informs that, according to the results of the "Labor Force Survey" (AFM) research, in the fourth quarter of 2023, young people aged 15-34 were represented by the following categories of people:

- young people who are not part of the employed population and who are not in education and vocational training (form the NEET3 group), whose proportion was 28.1%, decreasing by 0.6 percentage points compared to the level of the fourth quarter of 2022 (28.7%);
- young people who are not part of the employed population, but are following a level of education and/or a vocational training course, which reached the share of 27.9%, or 1.0 percentage points more than in the fourth quarter of 2022 (26.9%);
- young people who are part of the employed population, but do not follow a level of education and a vocational training course, which constituted 35.1%, increasing by 0.1 percentage points compared to the fourth quarter of 2022;
- young people who are part of the employed population and, at the same time, follow a level of education and/or a vocational training course, which marked 3.0%, increasing by 0.3 percentage points compared to the fourth quarter of 2022 (2.7%);
- young people who are abroad to work or look for work for a period of up to one year and are not following a level of education and/or a vocational training course, which constituted 5.9%, decreasing by 0.8 percentage points compared to the level of the fourth quarter of 2022 (6.7%).

Figure 5. NEET rate by age group and sex, fourth quarter 2023



Source: Moldova's National Bureau of Statistics 2024, <https://statistica.gov.md>

The total number of young people in the NEET group aged 15-34 was 164.5 thousand people, aged 15-24 in the number of 31.6 thousand people, in the number of 15-29 in the number of 90.2 thousand people. In all these three age groups, the majority is made up of women (62.4% in the 15-24 age group, 66.4% in the 15-29 age group and 65.6% in the 15-34 age group).

In the total number of NEETs aged 15-34, people aged 30-34 predominate, with a share of 45.1%, followed by young people aged 25-29 - 35.7%. The share of young people aged 20-

24 is 14.0% and of those aged 15-19 – 5.2%. By gender, the majority of all young NEETs are also made up of the age groups 30-34 years old (46.4% for men and 44.5% for women, respectively) and 25-29 years old (32.6% - men and 37.3% - women, respectively).

The share of NEETs in the total number of young people aged 15-24 was 12.7%, among young people aged 15-29 - 22.8% and among those aged 15-34 - 28.1% (SDG indicator 8.6.14). Among 15-19-year olds, the NEET rate was 6.4%, 20.4% among 20-24-year olds, 39.8% among 25-29-year olds and 39.1% among 30-34-year olds. The highest rate was recorded in women aged 25-29 years (51.0%).

In all these age groups, the indicator registers higher values among women compared to men, the gender gap being 6.1 percentage points for young people aged 15-24, 13.6 p. p for young people aged 15-29 and, respectively, 16.2 p.p. for young people aged 15-34 years.

Secondly, all efforts must be made to attract the inactive population already existing in Moldova. A special component will be represented by labor retention policies and programs to stimulate the population working abroad to return, with the capital and knowledge accumulated. Based on the efforts made, the Republic of Moldova has overcome the status of low-income country and can now be considered a middle-income country, but due to the high indicators related to the poverty line, this is difficult to notice, especially from the perspective of the gap between income distribution and the gap in living standards between urban and rural areas. The economic data on the ground highlight that Romania and Bulgaria also have high rates of absolute poverty, respectively of 32.2% and 34.4%, compared to the EU average of 21.7% - EU Integration Report.

In 2022, approximately one third of the population of the Republic of Moldova was below the absolute poverty line, data expressed in a significant gap between rural areas (40.1%) and urban areas (17.1%), in the context of the European average of 21.7%. Considering the generally large gaps between the indicators of the Republic of Moldova and the European averages, the relatively small difference between the urban poverty line in Moldova and the European average leads to the idea that where there were opportunities for investment, education, improvement of infrastructure and services, digitalization, the population has managed to keep up with technological development and the quality of output. The gap between urban and rural areas is mainly explained by the fact that the economic activity, especially the tertiary sector, is concentrated in the area of the main cities such as Chisinau, Balti, Cahul, the neighboring regions being affected by the lack of jobs with production or services with higher added value than agriculture. About half of the number of employees in the Republic of Moldova is concentrated in Chisinau and Balti. The regional location of production sources is a main solution, which is successful by allocating European funds from programs with non-reimbursable financing in poor areas of Romania or Bulgaria, for example, but only after the end of the European integration process. This is another aspect through which the Republic of Moldova could solve the problem of socio-economic polarization of the urban/rural relationship.

Systemic problems of the Republic of Moldova

Despite the change in the political paradigm and the economic-social environment due to President Maia Sandu and the political class that supports her, the Republic of Moldova continues to face a number of systemic problems: the decreasing workforce, the low volume of funds directed to research, technological progress and innovations, the low added value of the output of the tertiary sector and the lack of national production of durable goods, the low competitiveness of domestic products in relation to foreign markets. Integration into the European Union is the only viable solution, but the Republic of Moldova has the mission to fulfill its part of obligations in this process, namely to prepare for integration by promoting an unanimously accepted vision to focus on resilience, inclusion and connecting the economy to regional and global trends .

The convergence trends between Moldova's economy and the economies of the countries of the Central and Eastern European region are obvious, but their pace permanently places Moldova one step behind.

Along with the absolute poverty that affects an important segment of the population, another systemic problem is the lack of competitiveness of Moldovan exports, due to which the Republic of Moldova cannot access all the advantages offered by the EU market. At first, exports represented mainly by good quality or very high-quality agricultural products, such as wine products, were fully affected by the blockages caused by the traditional trade relations with the Russian Federation. The successive shocks, the largest in 1997, 2006 and 2013, have awakened the conscience of Moldovan wine producers, who have reduced as much as possible the exposure to the already risky Russian economy or to the economies of the former Soviet countries in Central Asia. After the Republic of Moldova left the CIS in 2023, Moldova's trade policy of reorientation towards Europe has begun a new chapter. The geographical diversification of exports and the industrialization strategy are aspects on which the authorities have already focused, but in the absence of adequate financing, they must be postponed based on the European integration calendar. The context regarding the funds needed for the development of Moldova's economy takes the form of a vicious circle: without European funding, the Republic of Moldova will have to rely on foreign direct investments, but foreign investors are held back in the absence of assurances from European institutions and country risk. A report published by the think-tank Expert Grup in the Republic of Moldova drew attention to a strange situation recorded at the end of 2021: 40% of foreign investments in the Republic of Moldova came from Russia or Cyprus, with suspicions that this was actually "recycled capital", taken out of the country through engineering and tax evasion schemes. Cheap labor can no longer be considered an investment motive either, as there is currently a shortage of labor or a shortage of skilled labor at a high technological level (Expert Group and Foundation).

One of the main systemic problems that can be solved by the integration of the Republic of Moldova into the European Union is the lack of resources for the investment process. Moldovan companies remained insufficiently capitalized, with a limited capacity to finance investment projects. Compared to the European average of 90%, and that of the countries in the region with an average of 45%, in the Republic of Moldova, private sector lending is included in only 30% of the companies or population that needed financing. Even in the

case of the companies that received credit, only 18% were destined for the manufacturing industry (including the food industry), which leads to the mathematical calculation that only 7.2% of the lending is directed to the manufacturing industrial sector, an alarm signal that should be considered for when vast resources will be available for financing.

The preparation of the financing capacity of the Republic of Moldova for the absorption of European funds becomes an important step of the European Road. In this regard, the Republic of Moldova needs advice and support and funding, as much as possible, to prepare the people, institutions and implementation mechanisms necessary following European integration. The status of EU candidate country and the prospect of opening accession negotiations with the European Union open significant opportunities to access European funds for the development of the economy. Access to the European funds that will be available for the reconfiguration and modernization of the economy will not be enough. Particular attention should be paid to the absorption rate, which will depend primarily on the capacity of the implementing institutions in the Republic of Moldova to have efficient mechanisms for the distribution of resources, of sound governance, which would ensure the administrative objectivity of the economic stakeholders, respectively of the beneficiary local institutions in front of the external partners. From this perspective, it is imperative to align institutions such as AIPA, the State Road Administration, the Energy Efficiency Agency, ANOFM, ODA or the Investment Agency with these rigors. In total, the Government formulated 60 actions, integrated into an "Action Plan" adopted in August 2022, to meet the nine EU requirements.

In June 2023, the Summit of the European Political Community was organized in Moldova, at the same time as the design of the Support Platform for Moldova by Romania, France and Germany, an important sign in the institutional openness that the Republic of Moldova enjoys from the European Union. Added to this are the political dialogues in which Moldova has been invited to participate, such as those with the EU, USA, NATO, G7. Through the socio-economic institutional effort, through the political orientation and the progress made during the mandate of President Maia Sandu, the country's external image is now placed in the collective appreciation of the partner states. In July 2023, the process of detachment of the Republic of Moldova from the CIS was intensified and *de jure, in fact* this has existed for a long time. The Government in Chisinau has approved draft laws to denounce two other agreements signed by the Republic of Moldova within the CIS. These relate to labour protection and the exchange of information on exceptional situations between member countries. „*The agreement on cooperation in the field of labour protection, signed in Moscow in 1994, is inapplicable and has not brought clear benefits to the Republic of Moldova*”, explained the Minister of Labor and Social Protection, Alexei Buzu. The second agreement, signed in Yalta in 2003, provided for the exchange of information on exceptional situations of a natural and technological nature, information cooperation in liquidating their consequences and providing aid to the affected population. Prime Minister Dorin Recean suggested that the denunciation of this agreement will not influence the help that Moldova will provide to the CIS countries in case of exceptional situations: "*The Republic of Moldova helps when needed. And with agreement, and without. It's a matter of humanity and friendship*", according to International Monetary Fund, World Economic Outlook Database, April 2019.

The inclusive nature of the EU, which conducts study visits for Moldovan parliamentarians with the participation of opposition MPs, contrasts with the non-inclusion in the CNIE of any representative of these political forces. At the same time, the decision of the Presidency to exclude the Bashkan of Gagauzia and the Speaker of the People's Assembly of Comrat from the CNIE risks leading to the deepening of the isolation of large social segments that share other geopolitical preferences. Support for EU membership fell from 56.8% in June 2021 to 47% in August 2023, when sympathies for the Eurasian Economic Union were expressed by about 32% of the population. One way to improve support for the European course can be to engage the authorities in a dialogue with Eurosceptic socio-political categories, and this requires expanding the composition of the CNIE. It is therefore recommended to expand the composition of the National Commission for European Integration, in order to increase its representativeness.

The economics of integration as an objective reality

Moldova has only one way to go: to be well. And this may be possible to a greater extent alongside Europe. Its economic collapse that followed the collapse of the USSR was reflected in its traditional dependence on Eurasian markets, characterized by economic instability and stagnation. The situation is similar in terms of the size of GDP per capita according to the purchasing parity of the national currency, which in 2018 was 5.9 times lower than the average in the European Union states and 2.9 times lower than the average in the CIS states (Table 5).

Table 5. Value of GDP per capita at purchasing parity of the national currency in the years 1992-2018 (current prices, US dollars)

	1992	1995	2000	2005	2010	2014	2015	2016	2017	2018
EU countries	17757	19504	24327	29650	33723	37344	38514	39643	41394	43148
CIS States	8236	6479	7673	11952	15904	19147	18871	19144	19888	20827
Estonia	N/A	8124	12198	19837	21746	27951	28786	30107	32130	34096
Latvia	6008	6087	8923	15683	17852	23560	24709	25717	27685	29901
Lithuania	N/A	6817	9657	16433	20547	27622	28751	30129	32463	34826
Moldova Republic	3206	2309	2239	3573	4640	6037	6085	6426	6864	7305
Romania	6160	7566	7943	12345	16388	20042	21123	22509	24686	26447
Russian Federation	11494	9381	11175	17184	22556	27063	26645	27002	27964	29267
Ukraine	6164	3879	3991	6505	7710	8760	8020	8340	8754	9283

Source: International Monetary Fund, World Economic Outlook Database, April 2019

Table 6. Ratio of GDP per capita by purchasing parity of the national currency in various states compared to the EU average in the years 1992-2018 (current prices, US dollars)

	1992	1995	2000	2005	2010	2014	2015	2016	2017	2018
EU countries	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
CIS States	46.4	33.2	31.5	40.3	47.2	51.3	49.0	48.3	48.0	48.3
Estonia	n.d.	41.7	50.1	66.9	64.5	74.8	74.7	75.9	77.6	79.0
Latvia	33.8	31.2	36.7	52.9	52.9	63.1	64.2	64.9	66.9	69.3
Lithuania	n.d.	35.0	39.7	55.4	60.9	74.0	74.6	76.0	78.4	80.7
Moldova	18.1	11.8	9.2	12.0	13.8	16.2	15.8	16.2	16.6	16.9
Romania	34.7	38.8	32.7	41.6	48.6	53.7	54.8	56.8	59.6	61.3
Russian Federation	64.7	48.1	45.9	58.0	66.9	72.5	69.2	68.1	67.6	67.8
Ukraine	34.7	19.9	16.4	21.9	22.9	23.5	20.8	21.0	21.1	21.5

Source: calculated by the author from International Monetary Fund, World Economic Outlook Database, April 2019.

Although at the moment the European commitment of the Republic of Moldova is undeniable, its economy is still based on the intensive use of primary factors, such as developing countries. More precisely, there is a specificity of exports in industries that exploit the advantage of the low price of primary factors (natural resources, climatic conditions, labor force). Economic competition is low, sub-supplying industries are insufficient or non-existent, low purchasing power makes the market unattractive, technology and technology are mainly imported. When an economy is at this stage of maturity, it is highly exposed to the contagion effects of global economic crises and exchange rate changes, which lead to instability of demand and prices. In addition, the competitive advantages based on the endowment of the production factors are fragile and can be easily dissipated. The extensive use of production factors is an inertia of Soviet economic processes, but significant progress has been made for the new configuration of an economy based on innovation, especially in the Information and Communication Technologies sector, a field with a highly competitive potential. Young Moldovans who returned to the country after graduating from studies abroad could constitute a modern nucleus of the workforce around which these industrial sectors would crystallize. Through consistent retention policies, in the context of Moldova's integration into the European Union, this can be achieved.

The Republic of Moldova continues to present significant gaps in terms of competitiveness with the absolute majority of European states, at the level of all elements that determine the competitive capacity, and the largest gap is manifested, first of all, in terms of market size (position 127), the degree of development of the financial market (position 124) and innovations (position 109). Equally, however, the efforts made by the Republic of Moldova to develop the factors with a positive influence on its position in the Global Competitiveness Ranking should be recognized, these being technological readiness (position 48), labor market efficiency (position 56), consumer goods market efficiency (position 68) and business complexity (position 68), the latter being largely influenced by the extensive use of the opportunities offered by information technologies. Based on these indicators, the following conclusions and recommendations can be considered:

- Without integration into the European Union, the Republic of Moldova will have to constantly manage the risk of falling behind in terms of development and economic competitiveness compared to EU states and other states in the region. In this context, economic modernization becomes a priority, and its main goal must become to increase the competitiveness of products, services, but also of the economy as a whole.
- The Republic of Moldova must redefine the dimension of national competitiveness. New stakeholders need to support this new competitiveness: a trained workforce, competitive institutions and businesses;
- Foreign direct investments must become a component of the competitiveness policy, and until their maturity, non-reimbursable European funds programs available to states in the process of accession to the European Union must be accessed;
- The acceleration of the European integration of the Republic of Moldova can be done through the cooperation of Moldovan enterprises with large international companies through participation in the value chain;

- The Republic of Moldova has an economy based on the intensive use of primary factors, therefore it is necessary to continue structural reforms and implement an economic development model based on investments and innovations, which would generate an increase in labor productivity, structural changes in favor of more competitive branches, but also an increase and diversification of exports;
- The human resources of the Republic of Moldova have always been represented by a population that deserved much more, being one of the most wronged in the face of the harsh lessons of history. Talented by nature and educated by tradition, Moldovans need the correlation of educational standards with Europe, as well as competitive and modern health services. Low labour costs have been the main definition of competitive advantage, but in the new economic realities, between the service-based economies of developed economies and the artificial intelligence that is catching up strongly, cheap labour can no longer be considered a strategic economic vector.
- Economic growth supported by research-development and innovation expenditures is a natural feature of a developed economy, and the Republic of Moldova must also include this important point on the agenda of its economic future. It is necessary to support the development of a knowledge-based economy, and increasing the role of research-development-innovation in developing competitiveness and ensuring sustainable economic growth must be based on:
 - Accelerating the pace of research and innovation, including in terms of efficiency, performance, and its correlation to the realities of the national economy;
 - Establishing a business environment favorable to innovation and promoting a clear and realistic policy in the field, starting from stimulating research-development-innovation activities in the real sector of the economy as well;
 - Promoting a systemic approach to innovation, in the context of the interdependencies between the stakeholders involved in this process: universities, research institutions, companies, funders, government institutions. In this new framework, there is the possibility of a better integration of academia, research and business.

For the period following the official status of candidate country for integration into the European Union, the Republic of Moldova needs investments in energy infrastructure, regional development and transport infrastructure, both to improve connectivity with the European Union and to capitalize on the geographical opportunity for the Republic of Moldova to become an important economic cluster in the post-war reconstruction of Ukraine. The long-awaited economic growth will be correlated with the state's ability to create opportunities and premises for the development of the socio-economic environment, for strengthening the resilience of production chains, but also for reorienting the economy towards the production of goods with higher added value. The financing of the business environment must be focused on the revitalization of manufacturing industries, the import of technical capital and modern technology that support economic growth by generating high added value, improving productivity and creating jobs.

Conclusions

The results obtained from the bibliometric analysis and review of relevant literature in the field of European Union economic policies provide a comprehensive perspective on the progress and challenges in this domain.

The review of relevant literature confirms the importance of European membership in promoting sustainable economic development for Republic of Moldova.

Forward thinking: Moldova's moment

Small and poor economies face strategic risks through higher social and economic costs, trying to reduce the economic gap between them and the advanced states through globalization, respectively in the current context, through integration into customs unions, as the Republic of Moldova could do with the European Union. And competition between states means the competition between their legislations, administrative procedures, fiscal, monetary, financial, commercial, educational, social, ecological, judicial and other systems, and a number of indicators related to their content are usually also used in the elaboration of international rankings of the competitiveness of the world's states. As a rule, for states with stable societies, a political climate based on democracy and individual freedoms and strong economies that support them, and better positions in the global competitiveness rating, the following characteristics are specific: an open and functioning market economy, with the pricing system responsible for the optimal allocation of resources and output; low customs duties; supporting competition in the internal market; ensuring a legal and institutional framework that ensures the equality of citizens in rights and freedoms, as well as the preservation of private property; a well-managed and transparent tax system; quality public services and the cancellation of the disruptive risk of corruption; a democratic political system for which political competition is specific; compliance with the law by all economic agents and citizens. Moldova can achieve all this through integration into the European Union.

It is very interesting that, in line with the risks analyzed, social polarization and lack of economic opportunities are the world's only major fears in the next two years. The outlook gets worse when people have expressed their fears for the next ten years, when economic problems are almost out of sight of their interest. The main fears of the next ten years are related to the unforeseen evolution of artificial intelligence and negative climate change, dictated by environmental depreciation. *Against the background of these realities, Moldova must not register stagnations in the process of integration into the European Union, because in the coming years the interest of the European Union will be to respond to challenges greater than the pandemic or armed conflicts, or the enlargement of the union. Moldova must get on this train.*

Many countries will remain digitally isolated, if they ignore the impact of AI that will set the pace of new productivity standards, financial methods and activities, climate realities, education and health, but especially the creation of new professions. Those who will not correlate with AI will lag behind greater than those imprinted by the gaps of victims who have not understood globalization.

Both a cause and a consequence of the solidity of the state structure, armed conflicts between countries represent a novelty in the list of risks listed by people in the short-term horizon given by the next two years. The belligerent contagion that can derive from this is the main threat from the perspective of geostrategic risk, in Europe, and even on Moldova's borders, having two of these forms: a war between two sovereign states, Ukraine and Russia, politically masked in the form of an intermittent conflict caused by secessionist actions in the Lughansk and Donetsk areas on the Russian-Ukrainian border, or the frozen conflict with the separatist province of Transnistria, which is *de jure* still in the state composition of the Republic of Moldova. Also, the Republic of Moldova should pay special attention to the dialogue with Gagauzia, in which a Turkic ethnic minority of the Christian religion lives, which can significantly facilitate its political and economic integration. Their secessionist tendencies, manifested in the early 1990s, have been exploited by Russia: at the moment, wines from the Gagauzia region, Comrat wines, are an exception to the acceptance of wine imports from the Republic of Moldova. Gagauzia must be encouraged to feel and enjoy the standard of living of a European district within the Republic of Moldova, not the reactivity of a separatist province with sympathies and hopes for help from outside the country for the recognition of its rights. Moldova's European integration can be an economic solution to a socio-political problem that persists with the cohabiting ethnic groups.

Worldwide, the main risks identified by people are: extreme weather effects (66%), misinformation and misinterpretation of information generated by AI (53%), political and socio-economic polarization (46%), cost-of-living crisis (42%), cyberattacks (39%), according to WEF, The Global Risks Report, 2024. All these risks fit the socio-economic picture of Moldova, in different proportions. We can estimate that in the current geostrategic context, disinformation and the use of AI for information intoxication, as well as cyberattacks could be two much more pronounced risks, which find their purpose in the "invisible war" around trench warfare. Given Moldova's proximity to Odessa, the main Ukrainian port, the common border with a country at war, Moldova's humanitarian involvement through the assistance provided to a number of immigrants that has permanently exceeded its logistics and possibilities, the frozen conflict with the separatists in Transnistria, which has a different importance in the current context, it can be appreciated that there is no room for other cyber vulnerabilities and "fake news".

An interesting thing emerges from the Global Risk Report regarding the two-year forecasts, horizon 2026, made by the sample members: disinformation and information intoxication have risen to the first place, and a new risk has entered the top five: interstate armed conflict. Global Risk Report estimates that in terms of the armed conflict between Ukraine and Russia, the evolution, although unpredictable, may migrate to a protracted conflict marked by alternating periods of tactical apathy or battles. The instability in the Middle East has not allowed effective sanctions against Russia, a special case being represented by the countries of Central Europe, whose position on the Russian-Ukrainian conflict has sometimes been opportune depending on state interests. On the same coordinates, the support given to Ukraine by Europe or the United States depends on the unity in Brussels or on the vision of the Democrats or Republicans in the American Congress. Among all these intercontinental power relations, there is the Republic of Moldova, between NATO

and its neighbors at war. Each of the ongoing, or potential, conflicts have an important stake: trade routes and oil prices in the Middle East, the balance of forces in Eastern Europe and the redefinition of Russia's geopolitical place between Europe under the NATO umbrella and the rise of China, the supply chains of advanced technological equipment in Southeast Asia, where major competitors such as China operate, Singapore, Taiwan or Japan. *It seems that the whole world is busy with something. Moldova wants only what the European Union offers: peace, social cohesion, democracy, respect for human rights. The Republic of Moldova in the European Union is in fact an investment in the stability and mutual security of Europe.*

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The importance of sustainability in the modern world

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Abstract. *Having a sustainable behaviour does not solely refer to the environment and having a green approach of the consumption habits. Of course, that has been the focus in the recent years, but there is more to cover. Being sustainable has become a trend due to the updated regulations that want to meet the United Nations' Sustainable Development Goals (SDGs). Indeed, we are going through a climate crisis, but that is not the only reason we need to shift towards a change for the better. Practices such as recycling or consuming less meat are good, however these are not of high impact if not implemented efficiently. Sustainable development has vast meanings, and, in this article, we will look over the definitions and current practices, what is working and what could be improved for the future taking into consideration the everchanging needs of the world. The problem nowadays is not that the society does not consider sustainability an important issue, but rather that it is not as relevant compared to personal needs. If we would ask why this topic is important, we need to address the question properly "why is sustainable development important for one individual?" rather than asking why is important for the planet. Through the spectrum of SDGs, sustainability means durability and continuation of practices that enhance prosperity (economic, social, environmental) and wellbeing. This is the balance we strive to achieve with this article by analysing all the factors coming with the sustainable development.*

Keywords: sustainable development, sustainability, stakeholder engagement, environmental issues, green solutions.

JEL Classification: M14, Q01, Q56.

Introduction

Nowadays, everyone, from certain consumers to businesses and industries, is trying to adapt to the new sustainability trends and implement good practices in their approach of doing things. We are hearing very often the term of sustainable development and the reason it has become so popular and trendy has emerged from a need to become more careful of our actions and habits that seem to have created many problems. All around us we cannot fail to notice the changes that impact in a certain manner our lives. On a local level at least, we can see the economical, social and environmental problems we face. We would much desire to solve them, but who is the responsible person or institution of doing so?

If we look at the sustainable development topic from the economical point of view, there will be some very interesting discoveries. Is it truly only the economical aspect the one that concerns us as society? Is everyone more concerned about being more sustainable with their actions because they are forced by fines and laws? We like to live comfortably and not to make an effort that might seem too much if not necessary. It might not be the easiest task to collect waste separately because it looks like a supplementary effort, and at the same time can be discouraging since there are not many other people or companies doing this thing or supporting it genuinely.

It comes down to what are the most concerning aspects for the consumers in order to show an expected behaviour. Everyone reacts to different factors according to the certain backgrounds they are coming from. This paper has the aim to explore various definitions and concepts when it comes to sustainability and which ones are the factors that form part of this concept.

Literature Review

To begin with, it is very important to understand some terms that are essential to know in order to address better the topic of this article. Sustainability means, as defined by the Brundtland Commission, “meeting the needs of the present without compromising the ability of future generations to meet their needs”, whereas environmentalism refers to the “concern for the environment and particularly actions or advocacy to limit negative human impacts on the environment” (Davis, 2020, p. 259).

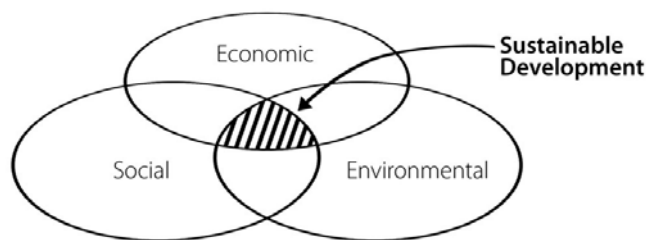
When we think of environmental problems, we can name some obvious ones such as: climate change, global warming caused by the greenhouse gas emission, depletion of important resources such as water and energy. Is important to notice that everyone is affected by these problems in different ways. The people who are most affected are the ones who cannot do much about them, whereas the people who are affected least can do much more to help. It is good to understand that our actions are interrelated and even though something doesn't affect us personally, it might affect others.

It is a common misconception to associate sustainability only with the environmental part, with actions that can save the environment such as recycling or polluting less. As many people know, there are the 17 Sustainable Development Goals from the United Nations that want to achieve certain specific results until 2030. It is important to keep in mind that these goals follow various types of problems to solve such as social and economic, not only environmental.

Is it good to know that there are three pillars of sustainability that are very important to consider when we talk about it: social, economic and environmental.

Sustainability is the idea that environmental objectives are compatible with the ongoing economic prosperity (Grant, 2007, p.2). The actions a person takes during their lifetime are imposed by the necessity of satisfying their own needs (Gherasim, 2022). For sustainable development, is it needed to build-up initiatives, measures, assessment and monitoring production processes that may cause environmental, social and economic impacts on society. The contribution to the reduction of these impacts could increase the prominence of sustainability (Alves et al, 2020).

Figure 1. *Main pillars of sustainability*



Source: Some examples of socio-economic problems are inflation and cost of living, unemployment, recession, tax burden.

An interesting definition to also cover would be the one of the word “trend”. As people, we follow trends because we find them somehow interesting, and we can relate to them in a certain way. At the same time, we do that in order to get a sense of belonging in the society or other groups. According to the Oxford Dictionary trend means “a general direction in which something is developing or changing”.

There is also a difference between need and want. When we need something is it to satisfy or solve a problem. Such as we need to eat food when we are hungry. It is compulsory, whereas to want something can be optional because it doesn’t make a big difference after acquiring it.

As important is to know who the stakeholders are when it comes to sustainable development. We can define a stakeholder as “person, group or organization with a vested interest, or stake, in the decision-making and activities of a business, organization or

project". Everybody plays a specific role, the consumers, the industries, the institutions and so on. Something that is overlooked is how these stakeholders work together, because if everyone fulfils their role separately, and there is no collaboration, the desired outcome might not come to life. We cannot

In their work Beck and Ferasso (2023) notice that governments, industries, and non-governmental organizations (NGOs) are supposed to be interested in achieving the Sustainable Development Goals (SDGs) as well as by governmental policies and regulations. The most important is that the assumption of Stakeholder Theory is bringing ethics and sustainability concerns in social, environmental, and economic terms. Therefore, it is worth exploring how Stakeholder Capitalism can really contribute to the world economy moving toward sustainable development.

Understanding the opinion of Romanians on sustainability can be complex and multifaceted, influenced by various factors such as cultural values, socio-economic conditions, and environmental awareness. While it's challenging to generalize, here are some perspectives commonly found within Romanian society:

Growing Environmental Concern: In recent years, there has been a noticeable increase in environmental awareness among Romanians, driven by concerns about pollution, deforestation, and climate change (Popescu, 2019). Citizens are becoming more vocal in advocating for sustainable practices and policies to protect the environment for future generations.

Economic Priorities: Despite environmental concerns, economic factors often play a significant role in shaping opinions on sustainability. In a country where economic development and job creation are pressing priorities, there may be tensions between promoting sustainable practices and pursuing economic growth, particularly in industries such as mining and energy (Țiplea, 2020).

Government Policies: Public opinion on sustainability in Romania can also be influenced by government policies and initiatives. While there may be support for sustainable development goals in principle, perceptions of government effectiveness in implementing environmental regulations and addressing environmental challenges may vary (Bădescu & Popescu, 2018).

Urban vs. Rural Perspectives: Perspectives on sustainability may differ between urban and rural areas in Romania. Urban residents may prioritize issues such as air quality, waste management, and green spaces, while rural communities may focus on agricultural sustainability, land use, and access to clean water (Ionita et al., 2021).

Education and Awareness: Education and awareness-raising efforts play a crucial role in shaping public opinion on sustainability. As educational initiatives and environmental campaigns increase awareness of environmental issues and sustainable practices, there may

be a shift towards more environmentally conscious attitudes and behaviours (Furdui & Chiforeanu, 2017).

Cultural Values: Romanian cultural values, including a strong connection to nature and a sense of stewardship towards the environment, may influence attitudes towards sustainability. Traditional practices such as organic farming, preservation of natural landscapes, and respect for wildlife can contribute to a broader cultural ethos of sustainability (Matei & Şerban, 2019).

Overall, while opinions on sustainability in Romania may vary, there is a growing recognition of the importance of environmental protection and sustainable development for the well-being of present and future generations. As awareness continues to increase and environmental challenges persist, there is potential for greater engagement and action towards building a more sustainable future in Romania.

Problem exposure

People have their own passions and objectives to achieve based on their own needs. A question I find relevant is “Why is sustainable development such an uninteresting topic for some of the stakeholders?”. It is needed to engage the stakeholders in a way that is beneficial for them and the societal goals on local, national and international plans. Of course, the bigger the area, the hardest it is to control and implement the desired changes, therefore is much better to start from the local plan and make sure is working accordingly.

Research methodology

Through the methods we have used we want to analyse the view over the sustainability in today’s world and why it is considered important.

In the methods we have used the analysis of a survey study on the Romanians opinion about certain aspects of sustainability. The study was made in 2021, the collection period of the data was 12-17 of October 2021. The sample was of 1003 internet users, both male and female, aged 13-64 years old. According to this study conducted in 2021 by Embassy of Sustainability in Romania it shows that most Romanians see sustainability as care towards the environment through the elimination of pollution and as having quality resources for everyone. As previously mentioned in the first chapter, sustainability is associated with environmental issues mainly, when there are other problems to consider as well.

Talking about sustainability, in the study the responders were asked who they believe is responsible for the wellbeing of the planet and of the people. The answers were as follows: government (64%), international institutions (59%), me (56%), companies (51%), my generation (35%), younger generations (32%), older generations (26%).

As another part of the research method, there was used a face to face a focus group in the format of a round table of 20 teenagers and young people aged 14-22 years old interested in nature-based activities. At the discussion took part as well a local counsellor and two representatives of a state environmental agency. During the interaction it was noticed that there was a communication gap as the terms used and way of expressing were very complicated and not adapted to the understanding of the young people. It was a free and open discussion that approached the ecology and sustainability topics. The time frame was of an hour, and it was moderated by the organization. The structure followed some general questions that introduced the main speakers and the topic of sustainability.

Someone suggested that it would be an interesting idea to pay people a certain monthly fee in order for them to sort their waste. This would work only in the context of people that are driven and motivated by the financial intake. In this case, the financial benefit that they receive makes them more open to having a behaviour that is environmentally friendly. However, if this would be a sustainable approach for the environment, it would not be the same for the economy. It could work for a certain period and for a certain group of people, but it would not last for a long time.

Results and discussion

At the local level in Romania authorities in power see sustainability and being green as something that is imposed and tried to be controlled with fines and special taxes.

It is important to consider the fact that there are various groups of people and that they would react differently to stimuli. For example, a person who is struggling financially would be more likely to collect and recycle a bigger amount of the warranty labelled pets to get back the money, compared to a person that would find it inconvenient to go to the special recycling machine that is far away to just throw only one pet bottle.

Somehow, they came to the agreement that the reason we are not advancing in being more sustainable environment wise is because of the lack of education, fact which is true, but is not the only factor that influences a bad behaviour from the local population. Indeed, there is required more education on sustainability topics, problems and behaviors.

There is also a communication gap between younger and older generations and between consumers and companies or institutions. If we would bridge the gap for this there could be a better collaboration and more visible results.

Control is hard and making people comply to certain regulations, especially when they are new and not properly accommodated.

Conclusions

Sustainable development is a vast topic that includes various pillars. Is it important not to generalize the topic and be specific according to the problems that we want to address. The way we express and communicate on this topic is important in order for everyone at least understand the terms. Education on the sustainability topic is lacking in Romania and there are many aspects that can be improved for people to understand that it is a concerning topic on a general level.

The grade of convenience and commodity plays a huge role for a certain behaviour to be considered worthy of being implemented by an individual or group of people. Understanding the stakeholders and their roles is a starting point for further understanding the workflow in the sustainability ecosystem.

Sustainable development offers a roadmap for making our world more balanced, fair, and prosperous. It means taking care of the environment, making sure everyone has a fair shot at a good life, and building economies that work for everyone without harming the planet. But achieving this vision needs ongoing commitment from leaders, cooperation among different groups, and big changes in how we do things locally, nationally, and globally. By working together and making smart choices that consider the environment, people, and the economy, we can create a better world for everyone, now and in the future.

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Green human resource management: a new approach to employees for organizational sustainability

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Abstract. *Human resources and sustainability are intertwined in contemporary organizational management. Green human resource management (GHRM) is a new approach in the field that focuses on integrating environmental issues into various human resource management functions and practices. The main goal is to promote sustainability, environmental responsibility and environmental awareness throughout the organization's workforce. GHRM is a manifesto that helps create a green workforce that can understand and appreciate the green culture in an organization. Such a green initiative can maintain its green goals throughout the HRM process of recruiting, hiring and training, compensating, developing and promoting the company's human capital. In this context, the objective of the article is to analyze the key components of the GHRM and the advantages and disadvantages arising from the implementation of this approach.*

Keywords: green human resources management, sustainability, performance, human capital, business economics.

JEL Classification: M12, O15, M52, M53, M21.

1. Introduction

The Sustainable Development Goals (SDGs) that were established in 2015 by the United Nations for the year 2030 are considered the blueprint for reaching a sustainable future through addressing poverty eradication, education, social protection, environmental protection, climate change, health, job opportunities, and strong institutions (Popescu et al., 2018). According to the European Commission (2024), the SDGs are the following ones: SDG 1 No poverty, SDG 2 Zero hunger, SDG 3 Good health and well-being, SDG 4 Quality education, SDG 5 Gender equality, SDG 6 Clean water and sanitation, SDG 7 Affordable and clean energy, SDG 8 Decent work and economic growth, SDG 9 Industry, innovation and infrastructure, SDG 10 Reduced inequalities, SDG 11 Sustainable cities and communities, SDG 12 Responsible consumption and production, SDG 13 Climate action, SDG 14 Life below water, SDG 15 Life on land, SDG 16 Peace, justice and strong institutions, SDG 17 Partnership for the goals. The classification of SDGs in the social, economic and environmental pillar can be seen in the following table (Freihat et al. 2024):

Table 1. *The classification of the SDGs*

Pillars	SDGs
Social	SDGs: 1, 2, 3, 4, 5, 7, 11 and 16
Economic	SDGs: 8, 9, 10 and 12
Environmental	SDGs: 6, 13, 14 and 15

Source: Freihat et al. 2024, Eurostat

As emphasized by the United Nations General 17 Sustainable Development Goals (SDGs), organizations need to operationalize and integrate sustainability in their strategy, plans, and actions. Therefore, they can address the current and forthcoming stakeholder needs and ensure a better and sustainable future for all, balancing economic, social, and environmental development (Fonseca et al. 2020; AlKetbi and Rice, 2024).

One way to foster sustainable practices can be the application of Green Human Resource Management (GHRM) (Pham et al. 2020, AlKetbi and Rice, 2024). GHRM, as a general term, refers to the integration of environmentally friendly practices into HRM strategies and policies (Ren and Hussain 2022, AlKetbi and Rice, 2024). The concept of Green Human Resource Management (GHRM) refers to the integration of environmental practices and policies into human resource management processes in an organization. This involves adopting policies, procedures and initiatives aimed at promoting environmental sustainability while effectively managing human resources (Das and Singh, 2016).

This term has also secured its position as a hot topic in recent research as the awareness of environmental management and sustainable development has been increasing day by day across the globe. Today, the topic of GHRM does not only include environmental business awareness, but also represents the social and economic well-being of both the organization and the employees in a broader perspective. By integrating GHRM practices into HRM strategies, organizations aim to foster positive attitudes, behaviors, and overall performance (Farrukh et al. 2022, AlKetbi and Rice, 2024).

The primary purpose of GHRM is to promote human resource practices that support the organization's commitment to environmental sustainability. GHRM refers to the

incorporation of environmental considerations into human resource management with the aim of addressing significant environmental challenges on a wider scale (Renwick et al, 2013).

In this article we analyze GHRM starting from the concepts related to GHRM, the key components of GHRM, focusing on the implications of GHRM, respectively analyzing the advantages and disadvantages/barriers of implementing this approach.

2. Green Human Resource Management (GHRM) – concepts and objectives

GHRM practices refer to a set of environmentally conscious strategies that organizations adopt to align human resource functions with sustainability goals (Zaid et al. 2018, Altketbi and Rice 2024). In other words, GHRM includes implications for hiring and retaining green employees and ways to motivate them (Susanto et al., 2022). Moreover, in order to have a strong GHRM department, organizations should implement adequate training, reward and benefit programs (Mishra, 2017). GHRM practices facilitate the application of green practices through various practices such as recruitment and selection, salary management, performance management and promotion policies (Nisar et al., 2021).

Specifically, GHRM practice refers to the collection of regulations and policies that govern all green activities within institutional frameworks (Saeed et al. 2019, Altketbi and Rice 2024). The employee life cycle within GHRM is an organizational approach to visualize the degree of employee engagement within a given institution (Khan et al. 2022, Altketbi and Rice 2024). This engagement includes integrating eco-friendly principles from recruitment to retirement, emphasizing the importance of environmental responsibility at every stage (Zhang et al. 2019, Altketbi and Rice 2024). Rewards systems are designed to recognize and incentivize green behaviors, promoting a culture of sustainability within the workforce (Ahmad 2015, Altketbi and Rice 2024).

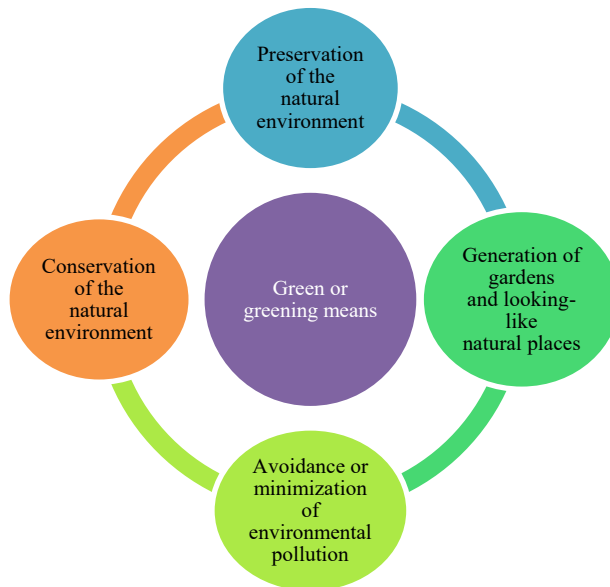
Opatha and Anton Arulrajah (2014) argue that green human resource management refers to all activities carried out in the development, implementation and ongoing maintenance of a system that aims to transform employees into a green organization. The purpose of GHRM is to create, enhance and maintain greening within every employee of the organization so that he gives maximum individual contribution to each of the four roles of sustainability, namely, preservation, conservation, non-polluter and producer (Opatha and Hewapathirana, 2019; Opatha, 2013).

According to the same authors, some of the essential roles that the human resources have in the greening process are the following ones:

- 1) *Avoiding or minimizing global warming.*
- 2) *Reducing natural disasters such as acid rain, red rain, tsunamis, floods, hurricanes, droughts, etc. because of the informal, harmful and greedy use of natural resources for production and consumption.*
- 3) *Avoidance or minimization of health diseases due to pollution.*
- 4) *Avoiding or minimizing harm to animals and other natural creatures.*

- 5) *Ensuring an appropriate balance of relationships between plants, animals, people and their environment.*
- 6) *Ensuring the survival of people and organizations for a long period of time.*

Figure 1. *The four meanings of greening in the context of HRM*



Source: Opatha and Hewapathirana, 2019; Opatha, 2013.

Special policies in recruitment, performance appraisal, training and development, employee relations and reward systems are considered powerful tools for aligning employees with a company's environmental strategy (Renwick et al., 2008) and therefore GHRM can make a decisive contribution to successful environmental management. (Jackson et al., 2011).

According to Rothenberg (2003), successful environmental management in an organization requires contributions from human resource management. Similarly, Jabbour et al. (2010) also stated that a superior environmental performance result requires human resources practices that support the entire implementation and maintenance of environmental management systems in organizations. Organizations that are able to align HRM practices with environmental management objectives can be successful in the corporate environmental management journey (Jabbour et al., 2011).

Employee empowerment in GHRM involves fostering a sense of responsibility and involvement in sustainable initiatives, encouraging employees to participate in green practices actively (Tirno et al. 2023, Altkebi and Rice, 2024). Manager involvement is crucial in leading and supporting green HR practices, ensuring sustainability is integrated into organizational strategies and decision - making processes (Tuan 2022, Altkebi and Rice, 2024). Overall, G-HRM aims to create a holistic and environmentally responsible workplace by addressing various aspects of the employee experience (Altkebi and Rice, 2024).

These best practices include green recruitment and selection, green training and development, green reward management, green performance management, green communication and green teamwork (Jabbour et al. 2010; Renwick et al. 2013). In the following, we are going to analyze the key components or best practices of GHRM previously mentioned.

3. Key components of Green Human Resources Management

According to the literature, there are several key components of the green human resources management, as it follows:

▪ Green recruitment and selection

According to Freihat et al. (2024), green recruitment involves the process of selecting and hiring individuals with environmental management skills, mindsets, and behaviors that promote sustainability objectives. Jamal et al. (2021) stressed that green recruitment resulted in the growth of a green workforce that consistently and professionally contributed to the organization's environmental objectives. Green recruitment has been related to the strengthening of environmental policies that promote to sustainability as well as an improvement in workforce loyalty to the organization (Radwan et al., 2021).

Green recruitment can be linked to the SDGs 8, 12, 13 and 15 by promoting sustainable workplace practices and reducing their operations' environmental impact (Freihat et al., 2024). According to Ajadi et al. (2022), this can include the use of automated application processes, green interview processes through Skype and Zoom, the advertisement of jobs on e-career portals, psychometric tests to evaluate applicants' green behavior value system, digital tools, telecommuting and remote work, and the inclusion of green competencies in job requirements and advertisements.

▪ Green training and development

Green training and development (Freihat et al., 2024) is a combination of coordinated activities that encourage and empower employees to acquire skills related to environmental protection, with a focus on addressing essential environmental issues that play a pivotal role in achieving environmental objectives. According to Fapohunda et al. (2021), the indicators for this component are: developing green abilities and green knowledge, promoting environmental awareness and improving employee commitment toward the environment. Genty (2021) states that aspects relating to the environment such as energy, safety, recycling and management of wastes should top the list in educating employees during training and development programmes. Green training and development can be linked to the SDGs 4, 8, 12, 13 and 17 (Freihat et al., 2024).

▪ Green performance management

According to Freihat et al. (2024), green performance management encourages employees to improve their professional skills while also considering the environmental concerns and policies of the company. It includes indicators for evaluating green behavior, such as compliance with standards, progress in the acquisition of environmental responsibilities,

and corporate-wide environmental performance standards. Elshaer et al. (2023) reported that the adoption of GHRM practices has the potential to enhance several aspects of organizational performance, including environmental, economic, and social performance. Rawasdeh (2018) found a positive significant correlation between GHRM components and organizational performance. Liu et al. (2022) found that green performance management help in achieving SDGs 8 and 12.

▪ **Green compensation/reward management**

Accomplishing the objectives of greening the organization can be improved by rewarding employees (including financial and non-financial rewards) for their commitment to exhibit and promote green behaviors as well as sustainable practices (Alhaddi, 2015). Freihat et al. (2024) suggest that it can be linked to the SDGs 3, 7, 8, 12 and 13 by promoting sustainable workplace practices and reducing their operations' environmental impact.

• **Green internal communication**

According to Cesário et al. (2022), green internal communication means that in an organization successful initiatives that promote environmental sustainability are publicized and celebrated, plus the organization uses communication channels, formal or informal, to disseminate guidelines on environmental protection and the employees have the opportunity to make suggestions or to get involved in work groups to solve environmental problems. The authors obtained that green internal communication is sometimes present in the organizations that were used in the study. Plus the authors obtained high correlations between green recruitment and green training and between green internal communication and green sustainable culture.

4. Advantages and disadvantages of Green Human Resources Management

According to the literature, there are several advantages of GHRM, such as:

- positive correlation between GHRM Practices and employees' work values (Ali and Hassan, 2023; Altkebi and Rice, 2024), defined as the beliefs and attitudes employees hold toward their work and the workplace; Ali and Hassan (2023) further argued that work values can influence employee motivation, job satisfaction, and commitment to the organization.
- positive organizational culture: GHRM fosters a culture of responsibility and sustainability; a positive culture enhances teamwork, morale, and overall organizational effectiveness (Farrukh et al., 2022);
- improved stakeholder relationships: GHRM practices can strengthen relationships with various stakeholders, including customers, suppliers, investors, and the community; Positive stakeholder relationships can enhance loyalty and collaboration (Altkebi and Rice, 2024).
- regulatory compliance: GHRM helps organizations stay ahead of environmental regulations and standards. Proactive compliance can prevent potential fines and legal issues, reducing risks associated with non-compliance (Saeed et al., 2019).

- long-term sustainability: adopting GHRM and enhancing technical innovations can contribute to improving sustainability and economic performance, contributing to resilience and longevity of the business (Shah et al., 2021);
- cost savings: implementing green practices can lead to significant cost savings in the long term (Bombiak and Marciniuk-Kluska, 2018); for example, reducing energy consumption, minimizing waste, and optimizing resource use can lower operational costs;
- better employee health and well-being: GHRM initiatives often include promoting a healthier work environment, such as improved indoor air quality, green office spaces, and wellness programs (Yang et al., 2023). This can lead to better health outcomes for employees.
- innovation and creativity: focusing on sustainability encourages innovation as employees are often inspired to develop new, eco-friendly processes and products.

According to the literature, there are several barriers associated with its implementation (Kodua et al., 2022), such as:

- lack of environmental management knowledge and skills among employees (Islam et al., 2020);
- time-wasting and incompetence if there is inadequacy of expertise in environmental management (Aragon-Correa and Rubio-Lopez, 2007)
- initial costs and investments: implementing GHRM practices often requires substantial upfront investment in training, technology, and infrastructure (Ren et al., 2018). For example, transitioning to energy-efficient systems or sustainable supply chains can be costly.
- legal and regulatory issues: navigating the legal and regulatory landscape related to environmental practices can be complex Baah et al. (2021); organizations need to ensure compliance with various local, national, and international regulations, which can be burdensome and costly.
- complexity of implementation: integrating GHRM into existing HR processes and organizational practices can be complex. This might involve redesigning job roles, altering performance metrics, and revising recruitment strategies to align with sustainability goals (Gedam et al., 2021).
- lack of ongoing commitment from all levels of the organization (Yong et al., 2019)
- lack of green culture (Bombiak, 2020);
- trade-off between economic and environmental goals: finding the right balance between achieving environmental goals and maintaining economic performance can be difficult; companies might struggle to align their sustainability initiatives with profitability and competitive pressures (Roscoe et al., 2019).

4. Conclusions

In conclusion, the study sheds light on how an organization implements green human resources management initiatives by involving its employees in green practices. Organizations should focus on the key components of this approach: green recruitment and selection, green training and development, green performance management, green

compensation management and green internal communication. Organizations should provide training courses both for management and executives positions in order to develop a green attitude, green skills and to learn using green internal communication. In this way, it becomes more feasible for an organization to achieve the sustainable development goals. The findings of the study emphasize the positive link between the key practices of green human resources and some of the sustainable development goals, such as: green recruitment and SDGs 8, 12, 13, 15; green training and SDGs 4, 8, 12, 13, 17; green performance management and SDGs 8, 12; green compensation management and SDGs 3, 7, 8, 12, 13.

Plus, the results of the study help organizations to see the advantages and disadvantages/barriers of focusing on green human resources management. In other words, green human resources management has the potential to bring about positive environmental and organizational outcomes, but its implementation comes with several challenges that need to be carefully managed in order to achieve sustainable success, especially the balance they have to make between economic and environmental goals. Among the advantages of practising green human resources management, the organizations should focus on: positive organizational culture, improved stakeholder relationships, regulatory compliance, long-term sustainability, cost savings, better employee health and well-being, innovation and creativity, a more developed employee motivation, job satisfaction and commitment to the organization.

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