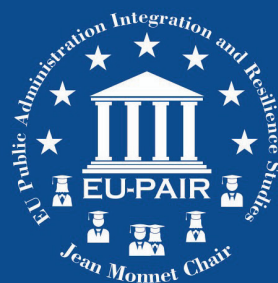


EU Digital Strategy: Governance, Innovation and Business



Proceedings of the International Conference EU-PAIR 2025

ANA-MARIA BERCU
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(editors)

EDITURA UNIVERSITĂȚII „ALEXANDRU IOAN CUZA” DIN IAȘI

Ana-Maria Bercu • Irina Bilan • Constantin-Marius Apostoaie
(editors)

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EDITURA UNIVERSITĂȚII „ALEXANDRU IOAN CUZA” IAȘI
2025

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EDITORIAL MESSAGE

Esteemed Readers,

During 19th –20th of June 2025, at the Alexandru Ioan Cuza University of Iași, Romania, Faculty of Economics and Business Administration, was held the EU-PAIR 2025 International Conference. The proceedings volume with the title *EU Digital Strategy: Governance, Innovation and Business. Proceedings of the International Conference EU-PAIR 2025* gather the research studies, insights and perspectives of the members of academia, PhD. students and practitioners who share the views on the EU future in the era of digital transformations and AI challenges.

This volume brings together a collection of studies that examine the evolving landscape of the European Union’s digital transformation. The contributions address key dimensions of the EU Digital Strategy, with particular focus on governance mechanisms, innovation ecosystems, and the shifting dynamics of digital business models and public affairs. The papers reflect the growing importance of coordinated policy action, cross-sectoral collaboration, and responsible technological development in shaping Europe’s competitiveness and resilience.

The works included here highlight both the opportunities and the complexities of the green-digital transition, offering analytical perspectives on regulatory frameworks, public administration reforms, data governance, artificial intelligence adoption, and the integration of digital tools across industries. Authors provide empirical insights and conceptual approaches that advance scholarly debate, while also informing practitioners and policymakers engaged in designing and implementing digital initiatives.

The volume addresses several core dimensions of Europe’s digital transformation. Contributions examine the evolution of the digital economy and finance, highlighting how emerging technologies reshape markets, services, and regulatory expectations. Several papers investigate business transformation driven by big data and machine learning, detailing shifts in organizational models, operational efficiency, and innovation capacity. The proceedings also explore the rise of smart working and the competencies required of smart workers in increasingly flexible and technology-intensive environments. GDPR compliance and related ethical issues are discussed as essential components of responsible data governance and trustworthy digital ecosystems. Additionally, authors analyze how digital tools and analytical methods influence the decision-

making process across public and private sectors, providing insights into evidence-based and technology-enhanced management practices.

The editorial team acknowledges the rigorous efforts of the contributors and reviewers, whose work ensures the scientific quality of these proceedings.

We hope that this volume serves as a valuable resource for researchers, decision-makers, and professionals committed to understanding and strengthening the EU's digital future.

Sincerely,

Prof. Dr. Hab. Ana-Maria BERCU

*Editor-in-Chief EU Digital Strategy: Governance, Innovation and Business.
Proceedings of the International Conference EU-PAIR 2025*

DECISION-MAKING PROCESS IN HIGHER EDUCATION AND DIGITAL TRANSFORMATION: A BIBLIOMETRIC ANALYSIS

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Abstract

The present study provides a bibliometric analysis of scientific publications addressing the relationship between managerial decision-making processes in universities and digital transformation, using data extracted from the Web of Science Core Collection. A total of 905 articles published between 2010 and 2025 were analyzed to identify productivity trends, key contributors, thematic clusters, and emergent research areas. The results show a significant increase in publication volume after 2020, reflecting the growing academic interest in digital governance in higher education, as well as the challenges and opportunities associated with the implementation of digital technologies in decision-making processes. "Digital transformation", "higher education", and "artificial intelligence" are among the most recurrent terms, highlighting the multidimensional nature of the digital shift in university management. The study concludes with recommendations for future research and university policy in the context of institutional digitalization.

Keywords: *Management decision-making process, digital transformation, bibliometric analysis, higher education, academic governance*

JEL Classification: I23; O33.

1. INTRODUCTION

University management plays a crucial role in creating a learning environment that supports both the academic development and the personal well-being of students and staff (González, Abad, 2020). Educational leaders significantly influence both institutional and student success, exerting a direct impact on the quality and effectiveness of educational processes. By implementing effective management practices, educational institutions can ensure the alignment of resources with strategic objectives and foster a climate conducive to learning.

In the context of new technologies, the management of higher education institutions is a dynamic and constantly evolving field. Digital technologies have brought fundamental changes to the way universities coordinate and manage academic and administrative activities (Onan, 2024), while also creating new opportunities for enhancing the educational process (Zizikova *et al.*, 2023). Emerging technologies, including online learning platforms, learning management systems, and artificial intelligence-based solutions, exert a profound impact on university management strategies and practices (Bit *et al.*, 2024). In this context, higher education institutions must address emerging challenges and develop adaptive strategies in order to fully harness the potential of digital technologies.

Digital transformation represents one of the most significant and impactful directions of development for contemporary economies and societies. Consequently, it is generating profound changes within all organizations, both in the private and public sectors, including universities (Nugraha *et al.*, 2018). In an era marked by globalization, internationalization, and heightened competitiveness, digitalization is becoming not merely an option but a strategic necessity (Al Nuaimi *et al.*, 2022) for strengthening the decision-making and managerial capacities of higher education institutions. Digital solutions, ranging from academic management platforms to data analytics tools, enable the optimization of operational processes, increased efficiency and transparency, as well as the development of robust forecasting and planning mechanisms (Badhe, *et al.*, 2020).

The specialized literature frequently refers to this phenomenon as the Fourth Industrial Revolution (Berawi, 2018), a shift driven by the critical role of digitalization and emerging technologies. Digital development has significant implications for the Sustainable Development Goals (SDGs) set out in the United Nations' 2030 Agenda: countries, institutions, and organizations must commit to narrowing the digital divide to avoid the negative impacts of digital exclusion (Kulkarni and Ghosh, 2021).

The digitalization of education constitutes not only a step toward modernizing educational processes, but also a fundamental transformation of the educational paradigm. Ugur *et al.* (2024) emphasize that the digital

transformation of education opens new opportunities for higher education yet requires a substantial shift in managerial and organizational mindsets within universities. Furthermore, studies indicate that the integration of educational technologies enables significant improvements in accessibility and flexibility of learning, addressing the diverse needs of students from various regions across the globe.

An essential aspect of digitalization concerns the digital competencies of teaching staff – a topic explored by Momdjian *et al.* (2024), who argue that preparing educators with digital skills is vital for the successful integration of technologies into education. In this context, digital education becomes a continuous process, where teacher training plays a pivotal role in ensuring the effectiveness of new educational methods.

Another important argument for the transition to digital tools lies in the growing complexity of the university environment, which necessitates the adoption of digital management models tailored to the knowledge economy. University decision-making is increasingly dependent on rapid and efficient access to relevant information, the integration of data sources from multiple departments, and the use of advanced analytical and simulation tools (Carayannis and Morawska-Jancelewicz, 2022). This dynamic fundamentally transforms the role of university leadership, requiring more rapid and efficient responses to challenges, effective management of uncertainty, and the ability to capitalize on opportunities offered by new digital technologies.

At the European Union level, university digitalization is anchored in both European and national priorities concerning sustainable development, competitiveness, and inclusion (Bradley, 2007). Through the European programme "Digital Decade 2030," the importance of digital public services, digital competencies, and secure infrastructures is highlighted, with concrete objectives for the digitalization of education and university administration. Within this framework, one of the central goals is the development of digital skills among the population and workforce, with the ambition that at least 80% of the EU population will possess basic digital skills and 75% of enterprises within the European Union will employ advanced technologies such as cloud computing, artificial intelligence, and Big Data by 2030. Successfully implementing these policies requires not only investment in technology but also a paradigm shift in the management of decision-making processes, emphasizing the role of data, artificial intelligence, and evidence-based management.

Scientific research conducted in the pre-pandemic period, between 2015 and 2019, focused on the initial adoption of educational technologies and their benefits in education (Daniel, 2014). Studies from this period demonstrated that the onset of digitalization in higher education was facilitated by the availability of accessible educational platforms, as well as the desire to improve students' academic performance through distance learning and hybrid learning models

(Glowatz, Bofin, 2014). Bilynska *et al.* (2024) emphasize that digitalization in education has enabled universities to meet modern learning requirements by developing interactive and accessible educational content.

Since 2020, the COVID-19 pandemic has had a significant impact on research in this field, with studies focusing on the challenges related to the rapid transition to online learning. Pan *et al.* (2024) argue that the COVID-19 pandemic forced higher education to adopt digital technologies at an accelerated pace, permanently changing the way courses and assessments are designed.

As digitalization continues to become a fundamental element in higher education (Hannan, 2023), future research will focus on the integration of emerging technologies and the personalization of learning (Maulana *et al.*, 2023). Komljenovic *et al.* (2024) highlight that the future of digital education will involve not only advanced technologies such as artificial intelligence and augmented reality but also a redefinition of the relationship between teachers and students in digital environments (Ahmed, 2010). In this regard, studies will emphasize the sustainability of digital education and its long-term impact on educational quality and academic performance (Guevara-Reyes *et al.*, 2025).

In conclusion, university management and institutional digitalization cannot be viewed separately, but rather as two interdependent components of a profound transformation process aimed at enhancing performance, transparency, and sustainability in higher education. This context justifies the need for a detailed analysis of how digitalization shapes university decision-making processes and its impact on long-term institutional development strategies.

The aim of this article is to identify and analyze global trends in scientific research concerning decision-making processes in the context of digital technology use in higher education, through a bibliometric analysis of articles published between 2010 and 2025 in the Web of Science database. To conduct this quantitative research, a bibliometric analysis was employed, which is a useful tool for identifying development trends, research priorities, and key references within a topic, based on geographic location and research networks (Wang, 2016). These techniques enable researchers to examine a research field through the distribution, analysis, and frequency of keywords. Additionally, they provide scholars with various instruments to evaluate academic productivity, its impact, and relative influence, to define the research topic structure and its evolution, as well as to identify different subthemes and their conceptual frameworks.

The objectives of this study can be summarized in several research questions (Table 1): questions 1 to 5 were addressed through a productivity analysis, while questions 6 and 7 were examined using a bibliometric mapping approach with the VOSviewer software. The results are presented as visual networks derived from the analysis of common keywords.

Table 1. Research Objectives and Questions

<i>Objective</i>	<i>Research Questions</i>	<i>Bibliometric Method</i>	<i>Analysis</i>
(1) <i>Assessing academic impact and relative influence</i>	Q1 <i>Historical evolution of the literature</i>	<i>Productivity measurement</i>	<i>Historical evolution of publications</i>
	Q2 <i>Most productive journals</i>		<i>Distribution of articles by journals</i>
	Q3 <i>Most productive authors</i>		<i>Distribution of articles by authors</i>
	Q4 <i>Most influential articles</i>		<i>Distribution of articles by institutions and countries</i>
	Q5 <i>Most important institutions and countries</i>		
(2) <i>Determining the evolution of research themes</i>	Q6 <i>Main themes addressed in articles</i>	<i>Impact measurement</i>	<i>Keyword co-occurrence analysis</i>
(3) <i>Identifying significant themes</i>	Q7 <i>Evolution of main research topics</i>	<i>Co-occurrence analysis</i>	<i>Keyword analysis</i>
(4) <i>Identifying research trends</i>			

Source: own processing

2. ANALYSIS METHODS USED

Bibliometric analysis is a scientific field that applies mathematical and statistical methods to scientific literature for the study and analysis of scientific activity. The term "bibliometrics" as a scientific domain was officially introduced in 1969 by Alan Pritchard in his documentary note entitled "Statistical Bibliography or Bibliometrics?" However, the concept and early concerns related to the quantitative measurement of literature date back to the early 20th century, when E. Wyndham Hulme used the term "statistical bibliography" in May 1922 while delivering two lectures at the University of Cambridge. In the last century, classical literary databases predominated, serving as the primary resource for researchers conducting literature reviews. Yet, with the advent of digitalization of literature and online databases, researchers gained the ability to analyze the body of literature more easily and efficiently (AlRyalat, Malkawi, Momani, 2019). This type of analysis is known as bibliometric analysis.

Bibliometric methods are frequently used to evaluate the evolution of a research field by analyzing bibliographic data through two main approaches: performance analysis and scientific mapping (Cobo *et al.*, 2011). The advantages of bibliometric methods include: (i) providing an overview of the scientific literature; (ii) generating a more objective synthesis of selected scientific works

compared to traditional techniques (e.g., literature reviews); and (iii) attracting increased attention from the scientific community (Corsini *et al.*, 2019).

To select the papers included in the bibliometric analysis and to avoid subjectivity in data collection, a systematic literature search was conducted in the Web of Science database, in accordance with the standard practices commonly employed in this type of analysis in the literature. The choice of this database is justified by its extensive coverage of scientific publications and by the fact that journals indexed in this database are selected based on strict quality criteria and are subject to a peer-review process (Birkle *et al.*, 2020).

The search was structured using Boolean logical connectors to ensure broad coverage of the investigated topic. The following keywords were included: "decision making," "digital technolog*," and "higher education," searched within the title, abstract, and keyword fields. The use of the asterisk (*) allowed the inclusion of all word forms derived from the specified root (e.g., "technology" and "technologies"), thereby contributing to the inclusion of as many relevant articles as possible. Only scientific articles (both open access and restricted access) were included, as these are the only documents subjected to peer review, thus guaranteeing scientific accuracy. The final sample, obtained from the search conducted in May 2025, consisted of a total of 905 articles.

The methodology developed throughout this article aims to investigate the structure and dynamics of scientific communities involved in the topic area. To this end, we analyzed collaboration relationships among authors, institutions, and countries, as well as the organization, analysis, and presentation of scientific materials based on central themes recurrent in the domain's publications. Using this approach, we identified, grouped, and analyzed the main ideas and concepts found in the specialized literature (Abad-Segura *et al.*, 2020).

In the first stage of the research, Web of Science statistics were used to conduct an analysis of productivity by examining the historical evolution of publications, the most relevant journals in which articles were published, the institutions producing the highest number of articles, and the most productive authors. Additionally, the analysis allowed for the extraction of productivity and impact statistics, and the data were processed to analyze the evolution of research in the field.

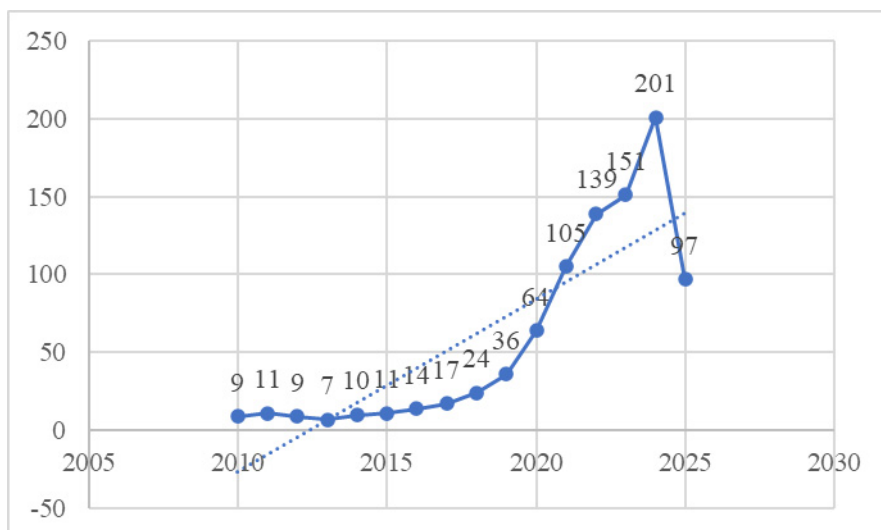
In the second stage of the research, keyword analysis was performed using VOSviewer software, developed by Van Eck and Waltman. This analysis provides insight into the main research themes and trends by studying the most frequent keywords. Visual maps of keyword networks and their co-occurrences were created, aiding in the identification of central themes and the visualization of relationships between different research areas. The generated maps offered a clear representation of keyword clusters and their evolution over time.

3. RESULTS AND DISCUSSION

3.1. Scientific Production and Thematic Areas

Figure 1 illustrates the evolution of the 905 articles identified on the topic of decision-making in the context of digital transformation (DT) in higher education (HE) during the period 2010–2025. The data highlight an exponential increase in publications, particularly in recent years. Notably, 693 articles – representing 75.32% of the total – were published in the last five years (2021–2025), reflecting heightened academic interest and increasing relevance of this topic. In comparison, only nine articles were published in 2010, the first year analyzed, while in 2024, the last complete year studied, the volume reached 201 articles. Between 2010 and 2018, interest in the topic of digitalization in higher education and management was still limited. After 2020, coinciding with the COVID-19 pandemic, there was an exponential rise in the number of publications. The urgent need for universities to adapt to online methods (Hasanov, Hashimov, 2025). stimulated research in the field of digital transformation and institutional change management. The period 2023–2024 witnessed a publication peak, demonstrating that digitalization is not a temporary phenomenon but one with lasting structural effects on the higher education system.

This growth trajectory mirrors global trends identified in recent literature describing the digital transformation of higher education institutions (HEIs) as a strategic imperative driven not only by emergent technologies but also by shifting educational paradigms and management approaches. The pandemic acted as a catalyst accelerating digital adoption, compelling HEIs to rapidly redesign academic delivery and administrative operations. Beyond crisis response, current research emphasizes the ongoing integration of advanced technologies such as artificial intelligence (Kalniņa *et al.*, 2024), learning analytics, big data, and blockchain to enhance personalized learning (Onyebuchi *et al.*, 2024), institutional efficiency, and governance transparency (Aguado-García *et al.*, 2025). Moreover, scholars note increasing attention to comprehensive maturity models that guide universities in assessing and optimizing their digital capabilities, ensuring sustainable and innovation-driven transformation processes. These findings suggest that research in this domain is evolving from descriptive analyses to strategic frameworks aimed at long-term institutional resilience and competitiveness in a global knowledge economy.



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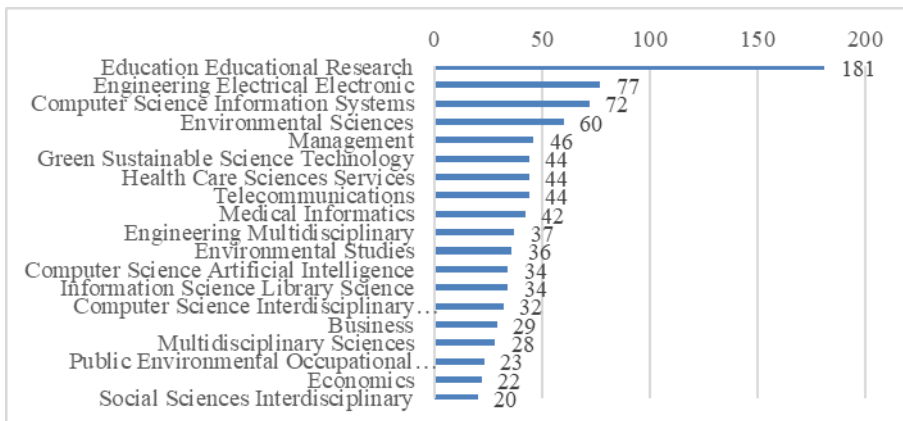
Figure 1. Evolution of the number of articles on decision-making in the context of digital technology use in higher education (2010–2025)

The vast majority of these articles are written in English (95.8%), as is customary in searches within the Web of Science database. Additionally, articles have been published in other languages such as Spanish (1.99%), Russian (0.88%), and Portuguese (0.55%). Over the analyzed period, 2010–2025, the trend line indicates that the number of articles on the studied topic is increasing at an accelerating rate.

Throughout the analyzed timeframe, 2010–2025, works related to decision-making in the context of digital technology use in higher education were identified across various fields of knowledge. According to the Web of Science database, most of the 905 articles analyzed are classified into 25 thematic areas. It is important to note that the same article can be categorized into multiple fields depending on the interests of the author and the publisher.

Figure 2 shows how the thematic classification of articles on this research topic evolved. The Education Sciences category stands out consistently throughout the studied period, accounting for 20% of the articles published on digital transformation (DT) in higher education (HE). This is followed by the Engineering Sciences category with 8.5%. Computer Science (7.95%), Environmental Science (6.63%), Management (5.08%), and Sustainability (4.86%) are the next significant categories in order of importance. Together, these six main categories represent 53.02% of the articles published in this research field between 2010 and 2025.

This disciplinary distribution underscores a multidisciplinary approach to understanding digital transformation in higher education, highlighting the converging interests of pedagogical innovation, technological development, managerial strategy, and sustainable practices. The prominence of Education Sciences reflects the prioritization of instructional design, learner engagement, and educational policy reforms catalyzed by digital tools Parkin *et al.* (2011). Meanwhile, the strong presence of Engineering and Computer Science emphasizes the technical foundations and infrastructure necessary to support these educational innovations. Environmental Science and Sustainability’s inclusion signal an emerging recognition of the ecological dimensions of digital technology deployment, encouraging sustainable digital practices within academia. Moreover, the Management category points to strategic decision-making processes driving organizational change, reinforcing the role of leadership in effective digital transformation. This thematic interplay signifies the complexity and integrative nature of research addressing digitalization in higher education, demanding collaborative approaches to bridge technical, pedagogical, and organizational domains.



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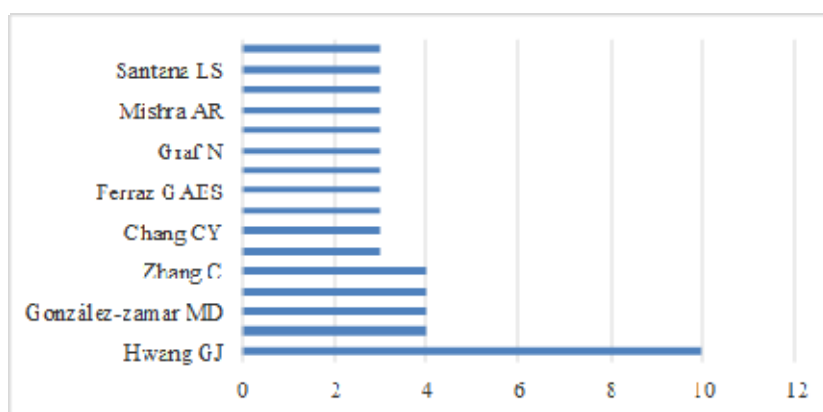
Figure 2. Main thematic areas regarding decision-making in the context of digital technology use in higher education (2010–2025)

The distribution of articles by Web of Science categories highlights the interdisciplinary perspective of research dedicated to managerial decision-making and digital transformation in universities. The "Education Educational Research" category holds a significant proportion (20%) of the total 905 articles analyzed. This value underscores that digital transformation in higher education is primarily addressed from the perspective of educational practices, the efficiency of the teaching-learning process, and new technology-assisted

pedagogical models. Categories such as Engineering Electrical Electronic (8.5%), Computer Science Information Systems (8%), Computer Science Artificial Intelligence (3.75%), and Computer Science Interdisciplinary Applications (3.5%) suggest that studies on university digitalization frequently include technical dimensions, such as digital infrastructure, intelligent educational platforms, and the integration of artificial intelligence in academic administration. The fields of Management (5.1%), Operations Research Management Science (1.8%), and Economics (2.4%) demonstrate a consistent concern for decision-making efficiency, digital strategies, and the economic impact of transformations in universities.

3.2. Publications by Authors, Institutions, and Countries

Regarding authors, the analysis results indicate an uneven distribution of productivity. The most productive authors were Hwang GJ, who distinguished himself by publishing 10 articles, while Li X and Yu H contributed 7 and 5 papers, respectively. The remaining authors included in the analysis (Abad-Segura E, Gonzalez-Zamar MD, Niyato D, Wang J, Zhang C, Zhang J, Bazzi CL, Chen Y, De Souza EG, Ferraz GAES, Gintciak AM) each published between 3 and 4 articles, reflecting a more limited involvement in the specialized literature on this topic. This distribution highlights the existence of a small core of prolific authors who contribute significantly to the specialized literature. This phenomenon is also known as Lotka's law (Lotka, A. J., 1926), one of the fundamental laws of bibliometrics. It describes the unequal distribution of author productivity in a scientific field, emphasizing the presence of a group of prolific authors who contribute disproportionately to the specialized literature.



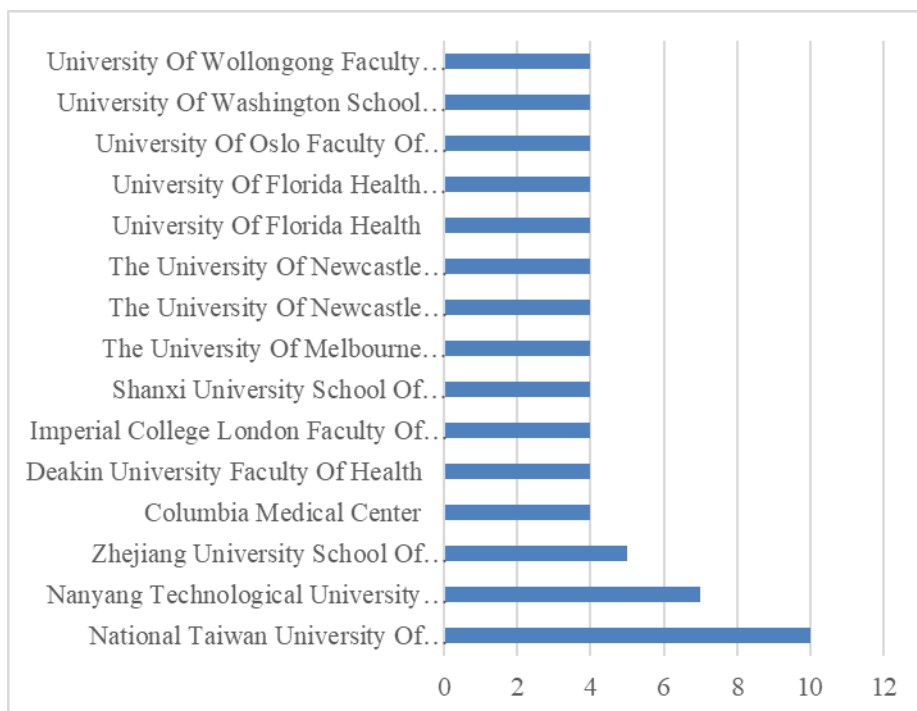
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Figure 3. Authors with the highest number of articles on decision-making in the context of digital technology use in higher education (2010–2025)

Figure 4 provides a clear overview of the academic institutions with the highest number of publications in the field of digital transformation in higher education, based on the affiliations of the most productive authors. National Taiwan University of Science and Technology leads the ranking with 10 articles, confirming a strong commitment to digital educational research, particularly through its Graduate Institute of Digital Learning and Education. Nanyang Technological University (Singapore), represented by the College of Engineering, follows with 7 articles, suggesting an interdisciplinary interest spanning engineering and digital education. Zhejiang University School of Medicine, with 5 articles, indicates involvement from medical universities in adopting digital technologies for management and education. Many of the institutions listed (Columbia Medical Center, Imperial College London Faculty of Medicine, University of Florida Health) belong to the medical field, suggesting that medical universities are among the most active in digitalizing administrative and teaching processes.

From a geographical distribution perspective, institutions in Asia (Taiwan, Singapore, China) are prominently represented at the top, reflecting an advanced regional strategy for the digitalization of education. Australia is represented by the University of Melbourne and Deakin University, both focused on health-related fields. Europe appears through Imperial College London and the University of Oslo, both prestigious, confirming the European commitment to transforming the educational system through digitalization.

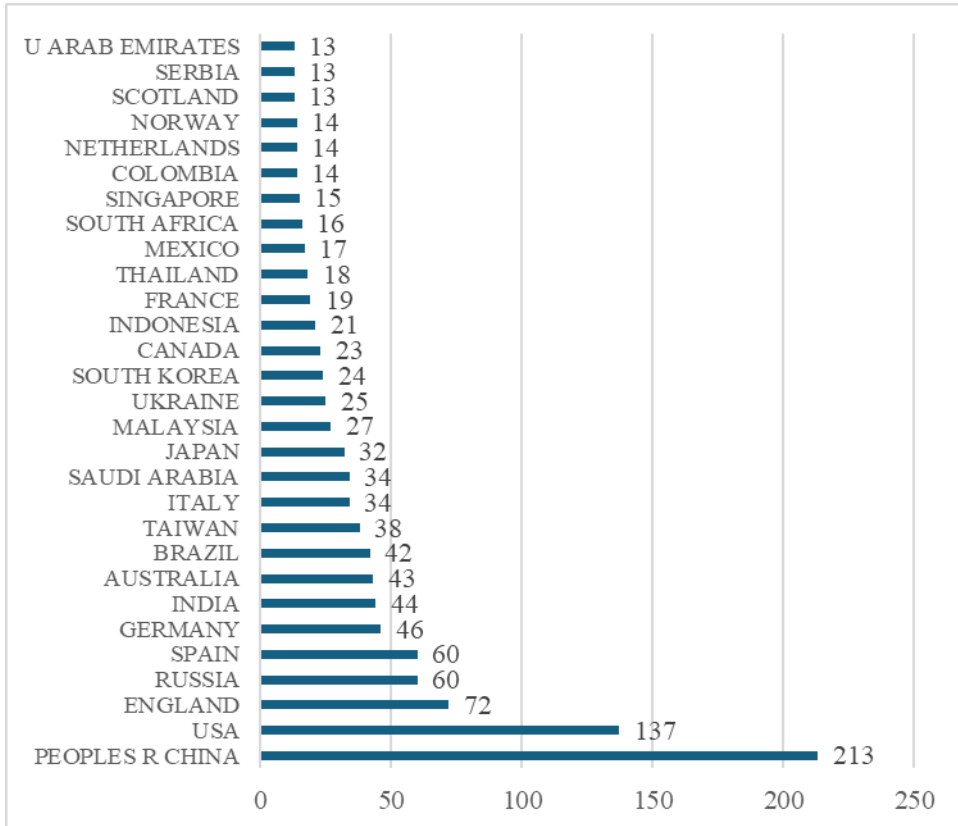
Furthermore, this institutional landscape reveals a pattern where technologically advanced and research-intensive universities serve as pioneers in shaping digital education practices. The prominence of Asian institutions signifies substantial investment in educational technology and research infrastructure, aligned with broader governmental digital transformation policies. Meanwhile, the presence of established Western universities highlights a continued leadership role in integrating innovation with academic governance and pedagogical improvements. The collaboration and competition among these institutions drive knowledge exchange and the development of best practices, fostering a fertile environment for the diffusion of digital transformation strategies worldwide. This institutional diversity also points to evolving research priorities, encompassing not only technological innovation but also organizational change management, digital equity, and lifelong learning frameworks, which are crucial for sustaining progressive digital education ecosystems.



Source: own processing

Figure 4. Affiliations of the most productive authors (2010–2025)

All 905 articles included in the analysis were authored in a total of 127 countries. China leads scientific production in the field by a significant margin, contributing 213 articles (23.5%), followed by the United States with 137 articles (15.1%), the United Kingdom with 72 articles (7.9%), Russia with 60 articles (6.6%), and Spain with 60 articles (6.6%). European countries such as Germany, Spain, and Italy also show consistent contributions. In Asia, besides China, countries like India, Taiwan, Japan, and South Korea stand out as academic centers investing heavily in educational digitalization.



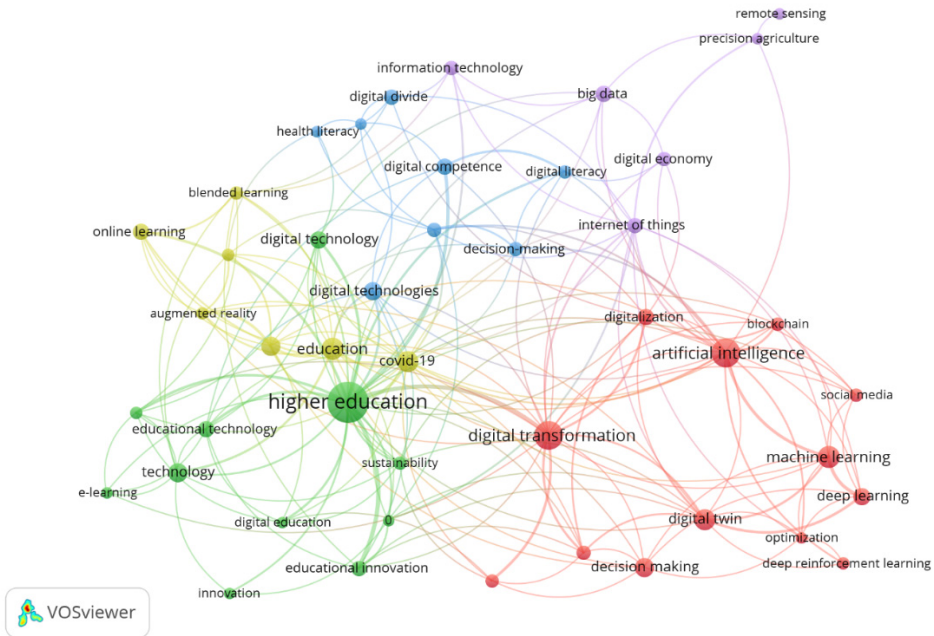
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Figure 5. Distribution of articles by country (2010–2025)

Figure 5 reflects a global concentration of research in a few academic power centers, particularly in East Asia (China, Taiwan, Japan), Western Europe (United Kingdom, Germany, Spain, Italy), and North America (United States, Canada). This concentration indicates both the research capacity and the strategic interest in the digitalization of higher education as a tool for managerial reform and academic competitiveness.

Figure 6 presents the collaboration network among the main countries based on co-authorship of their authors over the past 15 years. Distinct colours represent different clusters formed by groups of countries, while the size of each circle varies according to the number of articles contributed by each country. Thus, the larger the circle of a country, the higher the number of articles it represents through authorship. The contributions of countries in this research field regarding decision-making in the context of digital technology use in higher education have been grouped into three clusters.

"digital transformation," "artificial intelligence," "higher education," "decision making," "education," "machine learning," "digital technologies," and "big data." Additionally, major groups of keywords were identified through the co-occurrence analysis of articles published on this topic. Each cluster consists of numerous interdependent and correlated terms.



Source: own processing

Figure 7. Keyword network based on co-occurrence

Figure 7 presents a keyword co-occurrence network generated with VOSviewer, based on a minimum threshold of 7 occurrences for each keyword (out of a total of 3,602 terms, 45 met this criterion). This visualization highlights the main themes and relationships among key concepts in the literature on digital transformation and higher education.

From a general interpretative perspective, the nodes represent keywords, with their size reflecting the frequency of occurrence in the analyzed corpus. The lines between nodes indicate co-occurrences of terms within the same articles, highlighting thematic connections, while colors represent thematic clusters – groups of terms that frequently appear together and define subfields of the research.

Within this map, five clusters marked with different colors are identified, whose analysis is detailed below.

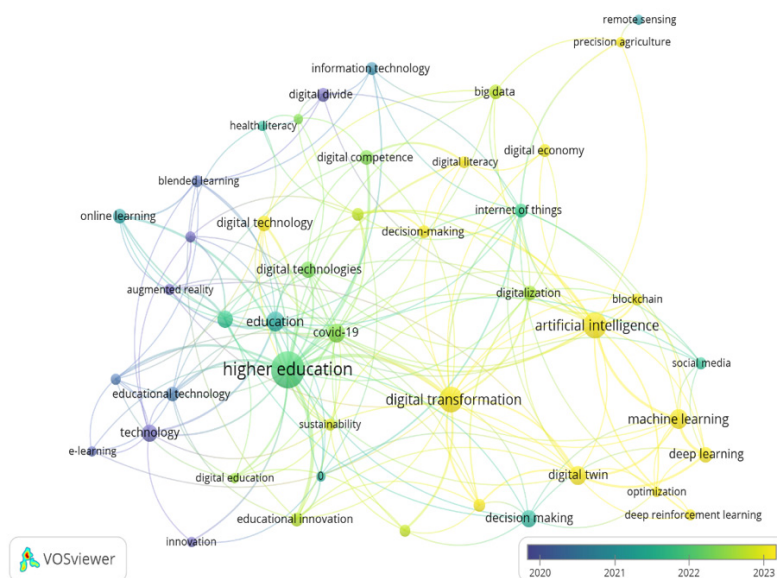
1. **Green Cluster** – *Higher Education and Digital Education.* The largest node is "higher education," located at the network's center, indicating the primary theme of the corpus. Associated terms include "education," "digital technology," "digital technologies," "educational technology," "digital education," "innovation," "sustainability," and "COVID-19." This cluster reflects concerns about the impact of digital technologies on teaching, learning, and university management processes, emphasizing innovation and sustainability. Concepts such as "educational technology," "digital education," and "e-learning" highlight the integration of digital platforms and innovative tools in the academic environment. Terms like "blended learning," "online learning," and "augmented reality" underscore diversified teaching methods, highlighting flexible learning and the use of immersive technologies. "COVID-19" emerges as a catalyst accelerating digitalization in university education.
2. **Red Cluster** – *Digital Transformation and Artificial Intelligence.* This cluster concerns advanced technologies and digital transformation in higher education, focusing on innovation, automation, and artificial intelligence. It includes terms such as "digital transformation," "artificial intelligence," "machine learning," "deep learning," "blockchain," "digitalization," "digital twin," "optimization," "social media," and "decision making." "Digital transformation" and "digitalization" are central nodes, reflecting the processes by which universities adopt and integrate digital technologies on a large scale. "Artificial intelligence," "machine learning," and "deep learning" highlight the focus on technologies revolutionizing not only administrative processes but also teaching, assessment, and personalized learning. Literature emphasizes the opportunities (personalization, efficiency, innovation) and challenges (adoption, infrastructure, training, ethics) associated with these technologies. Universities must develop coherent strategies for integrating AI, ML, and other digital tools (Kasneci et al., 2023) to maximize benefits for students and meet future labor market demands.
3. **Yellow Cluster** – *Online Learning, Blended Learning, and Augmented Reality.* This cluster highlights research focusing on digital methods and technologies transforming higher education, emphasizing online learning, blended learning, and the use of technologies like augmented reality. Online and distance learning have become essential for ensuring educational continuity, especially following the COVID-19 pandemic,

which accelerated their adoption (Treve, M., 2021). These methods facilitate flexible access to resources, personalized pacing, and expanded educational opportunities for diverse student populations. Furthermore, educational innovation driven by these digital technologies contributes to reducing access inequalities and enhancing equity by providing flexible and accessible learning solutions (Sova, Rusov, Cotos, 2018). Innovation is viewed as a deliberate process aiming to improve learning outcomes and participant satisfaction.

4. **Blue Cluster** – *Digital Competencies and Decision-Making in the Context of Digital Transformation of Education.* The blue cluster in the keyword co-occurrence map reflects themes related to digital competencies, digital literacy, and decision-making within the context of digital transformation in education. These concepts are essential for understanding how individuals and institutions adapt to and leverage new technologies in the educational environment. The main terms comprising this cluster are: "digital competence," "digital literacy," "decision-making," "health literacy," and "digital divide." Digital competencies and literacy are fundamental for active and effective participation in contemporary digital society. Research (Pangrazio, Godhe, Ledesma, 2020) emphasizes the need to develop these competencies among both students and teaching staff to ensure equitable access to digital educational resources and facilitate the learning process.
5. **Purple Cluster** – *Advanced Digital Technologies and the Digital Economy: Impact on Education and Related Sectors.* The purple cluster in the keyword co-occurrence map represents themes related to advanced technologies and the digital economy, highlighting the broad impact of digitalization on education and other connected sectors. Key terms in this cluster include "information technology," "big data," "internet of things (IoT)," "digital economy," "precision agriculture," and "remote sensing." Terms like "information technology," "big data," and "internet of things" indicate a strong focus on integrating sophisticated digital technologies across various domains, including education. These technologies enable the collection, analysis, and use of large volumes of data to optimize educational processes, personalize learning, and support evidence-based decision-making. The terms "precision agriculture" and "remote sensing" reflect the extension of digitalization into specialized fields such as smart agriculture, where digital technologies enable efficient monitoring and management of natural resources (Nicoleşcu, O., Popa, I., Dumitraşcu, D., 2020). Such applications can be integrated into educational programs to develop

technical and interdisciplinary competences, preparing students for future challenges. Thus, the purple cluster serves as a bridge between the educational/technological area (green cluster) and the digital transformation/AI area (red cluster). It highlights the link between digital competency development, information technology use, and their impact on society and the economy. It also underscores the importance of equitable access to technology and digital literacy to fully exploit the potential of digital transformation.

This bibliometric analysis suggests that digital transformation is not a unidimensional process, but rather an orchestrated convergence of multiple dimensions: the technological dimension, represented by the red and purple clusters; the educational dimension, represented by the green and yellow clusters; and the social dimension, represented by the blue cluster.



Source: own processing

Figure 8. Evolution of the keyword co-occurrence network

Detailed temporal analysis of the co-occurrence network during 2020–2023 reveals a clear and structured evolution of scientific interest in digitalizing education over the past four years. This evolution can be segmented into four distinct stages, each marking a significant transition in the approach to and integration of digital technologies in the educational process.

The first stage, the crisis response phase (2020), was triggered by the COVID-19 pandemic. Educational institutions faced the urgent need to ensure

continuity of learning by rapidly transitioning to online teaching (Dhawan, 2020). This period highlighted systemic vulnerabilities such as lack of equipment, connectivity, and basic digital competencies of some teachers (Sibug *et al.*, 2024) and students, but it also fostered national and European cooperation to manage the situation. The terms "e-learning" and "online learning" emphasize the shift to virtual environments, while "blended learning" suggests the initial integration of digital elements into traditional education.

The second stage, consolidation and adaptation (2021), focused on strengthening digital infrastructure and developing digital skills. At the European level, initiatives like the Digital Education Action Plan 2021–2027 were launched, highlighting the importance of a high-performance digital ecosystem (Szanter *et al.*, 2024) and digital skill development. This phase laid the foundation for legislative frameworks, curriculum updates, and continuous teacher training, emphasizing digital literacy and online safety. The terms "digital competence" and "digital literacy" underline the need for student and teacher training in technology use, while "health literacy" appears in the context of online health concerns.

The third stage, strategic development and innovation (2022), marked the maturation of education digitalization. Terms such as "digital transformation" and "innovation" denote strategic change and the integration of emerging technologies in education. "Big data," "blockchain," and "IoT" indicate the expansion of digitalization into other fields, such as the economy and industry (Bravo-Jaico *et al.*, 2025). During this stage, pilot projects for integrating artificial intelligence and learning analytics were launched, and institutions developed their own digitalization strategies (Perwej *et al.*, 2024). Efforts intensified to develop digital educational resources and to certify digital competencies nationally and internationally.

The fourth stage, specialization and expansion (2023 and beyond), reflects a focus on advanced technologies such as artificial intelligence, blockchain, digital twin, big data, and sectoral applications. The emphasis is on personalized learning, automation of administrative and teaching processes (Akinwalere, Ivanov, 2022), and the extension of digitalization beyond education into sectors such as the economy, agriculture, and health. In this latest stage, the terms reflect specialization and application of digitalization in specific domains. "Digital twin," "precision agriculture," and "remote sensing" highlight the use of digital technologies in agriculture, monitoring, and other sectors. "Emerging technologies" and "data analytics" suggest ongoing innovation and advanced data analysis. "Specialization" and "sectoral applications" indicate the expansion of digitalization into new fields and adaptation to the specific needs of the economy and society.

4. CONCLUSIONS

This study examined the main global research trends concerning decision-making within the context of digital technology use in higher education over the period 2010–2025, employing a bibliometric analysis of 905 articles from the Web of Science database. Dominant thematic areas, as well as the most productive authors, institutions, and countries in the field, were identified.

A significant annual increase in publications was observed, particularly in the last five years, accounting for over 75% of the total contributions. The most prominent thematic categories included Education Sciences, Engineering Sciences, Computer Science, Environmental Science, and Sustainability. This reflects a multidimensional approach whereby digitalization is understood not merely as a technology but as an institutional strategy for supporting educational sustainability and excellence.

Keywords such as "digital transformation" and "artificial intelligence" highlight universities as adaptive ecosystems integrating advanced technologies into decision-making processes. The geographical diversity of authors underscores a pronounced globalization of interest in innovation in higher education, though substantial disparities remain between developed and emerging countries in implementation capabilities.

The most prolific institutions include National Taiwan University of Science and Technology, Nanyang Technological University (Singapore), Zhejiang University School of Medicine, and Columbia Medical Center, while countries such as China, the United States, the United Kingdom, Russia, Spain, and Germany dominate scientific output. International collaboration appears to be driven more by institutional alliances and scientific globalization dynamics than by cultural or political factors.

Keyword analysis revealed five major clusters structuring the thematic research, featuring frequently co-occurring terms such as "digital transformation," "artificial intelligence," "higher education," "decision making," "education," "machine learning," "digital technologies," and "big data." Their temporal evolution indicates progress toward integrating digital technologies to enhance the quality of educational and decision-making processes at the university level.

The co-occurrence network highlights that successful digital transformation depends on a balanced integration of technological innovation, adaptive education, and digital inclusion, which together form the foundation of a sustainable digital society. Consequently, digitalized education emerges as a cornerstone for guiding society through the complexities of the contemporary world.

Temporal analysis of the keyword network reveals a clear progression from reactive responses to the COVID-19 crisis toward strategic, interdisciplinary, and innovative approaches in digital education. This rapid transformation

reflects the maturation of educational systems adopting emerging technologies to accelerate innovation and social inclusion.

The main limitations of this study stem from the bibliometric methodology itself, which, as a quantitative method, could be complemented by qualitative or mixed-method approaches in future research. Extending the analysis timeline could also provide a broader perspective on evolving trends in the field.

It is also important to emphasize that the increasing interest of authors, institutions, and countries, as demonstrated by the significant rise in publications in recent years, reflects strong support from the international scientific community for the study of various thematic directions related to digital transformation (DT) in the higher education (HE) sector.

Future research lines in this field should consider, among other aspects, the development of integrated institutional digitalization strategies that combine technological infrastructure with continuous training of management personnel to enhance digital decision-making processes. Promoting multidisciplinary and international research is essential, given the global nature of digital transformation. Encouraging international collaborations (e.g., with universities from Asia or Western Europe) can bring direct benefits in know-how and institutional innovation. Furthermore, clarifying the future of higher education within the context of Industry 4.0 remains a critical priority.

Finally, it is noteworthy that university digitalization has become a mature research domain, experiencing exponential growth in publications over the last five years. University management is increasingly analyzed through the lens of digital transformation, with a focus on emerging technologies and adaptive decision-making models (Akmad, 2025). Research in this field is predominantly international but is dominated by contributions from Asia and North America, particularly China and the United States. Keywords and prolific authors identified in this study can guide future research directions, especially concerning artificial intelligence, educational data analytics, and digital university governance.

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ACCOUNTING – FROM TRADITIONAL TO DIGITAL

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Abstract

In its classical sense, accounting is considered as the "language of business", being indispensable in substantiating economic-financial decisions, because by recording economic-financial transactions and preparing annual financial statements, accounting contributes to transparency, control and financial efficiency. Accounting has evolved continuously, adapting to the economic, social and technological context. In the context of the rapid evolution of information technology, accounting has entered a profound process of transformation, driven by current trends of digitalization. Traditionally, accounting has been perceived as a bureaucratic field, centered on manual processing of documents and financial statements. With the advent and integration of digital technologies such as artificial intelligence, process automation through software robots, cloud platforms, blockchain and advanced data analytics, a paradigm shift in accounting practice has occurred. Thus, accounting can no longer be conceived without the integration of technology and analytical thinking, which is leading to a redefinition of the accounting profession, the tools used and the relationship between accountants, management and state institutions. The study aims to capture the main challenges of the accounting profession imposed by the implementation of new digital technologies, in order to chart the new trajectory in the training and development of this profession. For this purpose, a descriptive analysis of the new trends in the field of accounting was used with the help of information gathered from various sources such as media, literature, legislative regulations etc.) The results of the research consist in presenting the latest information, which will help us to reach a conclusion on how the implementation of digital technology will change the future of the accounting profession.

Keywords: *accounting, accountancy profession, digital technology, digitalization*

JEL Classification: M40; M41; M49.

1. INTRODUCTION

In its classical sense, accounting is considered the "language of business" (Bloomfield, 2008), i.e. an organised system for recording, processing and reporting information on the economic and financial activity of an entity, with the aim of providing useful information to internal (managers) and external (investors, creditors, tax authorities) decision-makers for assessing performance and financial position, which contributes to transparency, control and financial efficiency. With the "robotization" of accounting, a new term has emerged, namely ***Continuous Accounting***, which involves the inclusion of control, automation, and end-of-period tasks in daily activities. (Emetaram and Uchime, 2021)

Accounting has undergone continuous evolution and has always adapted to the economic, social, and technological context. While in the past, accounting was done exclusively on paper, with a large volume of documents and long processing times, the advent of computers and the first accounting programs marked the beginning of the computerization of accounting, significantly reducing human effort and increasing accuracy. and today, digitalization is profoundly transforming the way accounting information is collected, processed, and analyzed. Thus, today we can talk about "hybrid accounting," which means that 80–90% of repetitive tasks are automated, and the accountant only intervenes as a verifier and consultant, although the global trend is toward automated accounting, with artificial intelligence capable of interpreting legislative texts and learning accounting treatments

2. LITERATURE REVIEW

This study is a continuation of my personal approach as regards concerns related to the evolution of the accounting profession and the training of professional accountants (Apostol, 2019, 2020, 2021a, 2023a), given that the economic and financial environment is dynamic, constantly changing, developing and even innovating. (Apostol, 2021b, 2022a, 2022b, 2023b, 2024a, 2024b)

The digitalization, in general, and accounting digitalization in particular, represents a real interest for both practitioners and theorists in the field, given that there is increasing speculation that the accounting profession will disappear with the implementation of automation in the accounting field. Thus, many studies present the advantages of digitalization accounting (Ashraf, 2025; Baiod *et al.*, 2025; Gu *et al.*, 2025; Pragma Sharma, 2025; Yang, 2025), while others also highlight a number of challenges (Bhawna and Gupta, 2025; Karim, D. *et al.*, 2025; Tabaku, E. *et al.*, 2025), but all of the researched studies have concluded that accounting cannot be 100% automated, because decision-making, responsibility and consulting remain the duties of the professional accountant. (Ghosh and Jose, 2023; Purba A., 2023; Eulerich *et al.*, 2024; Mohamed Saad, 2024; Elo *et al.*, 2025).

3. RESEARCH METHODOLOGY

The study aims to capture the main challenges of the accounting profession imposed by the implementation of new digital technologies, in order to chart the new trajectory in the training and development of this profession. *Non-participative observation* was used for this purpose, and *a descriptive analysis* highlighted new trends in accounting, using information collected from the most recent and diverse sources. *The results of the research* consist in presenting the latest information, which will help us to reach a conclusion on how the implementation of digital technology will change the future of the accounting profession.

4. RESULTS AND DISCUSSIONS

Traditionally, accounting has been perceived as a field focused on manual document processing and financial statement preparation. The emergence and integration of digital technologies have generated a paradigm shift in accounting practice.

The digitalization is the process of transforming the socio-economic environment through the adoption, application and use of digital artifacts (Gradillas and Thomas, 2025) or, in other words, the transformation of traditional information and processes into digital format using advanced technologies for automation and optimization of activities. In accounting, digitalization involves the transition from physical documents to digital flows, from manual processes to automated processes integrated into intelligent systems.

In a world where technology is undergoing rapid evolution and development, more and more professions are undergoing radical changes, some even being replaced by algorithms and artificial intelligence. In this context, a legitimate question arises: will accounting disappear in the era of digitalization? To answer this question, we have summarized the main characteristics of automated accounting.

Globalization, efficiency requirements, the need for tax compliance and the rapid development of emerging technologies are a series of factors that have favored the acceleration of digitalization processes in all economic areas, including accounting.

The digitalization of accounting involves the use of the following technologies:

- *Automation of accounting processes*, namely accounting software, which can automate invoicing, financial reporting etc. and software robots (RPA), which can take over manual tasks such as document processing, data entry into ERPs and bank reconciliation (Plattfaut and Borghoff, 2022).
- *Artificial intelligence*, which can analyze large volumes of data for fraud detection, financial forecasting, risk assessment etc. and which learns from

previous transactions and can thus identify anomalies or optimize accounting decisions (Hasan, 2022; Khaled AlKoheji and Al-Sartawi, 2023);

- **Cloud computing**, which allows real-time access to accounting data from anywhere using online platforms, facilitates collaboration between accountants, managers, and auditors, reduces IT costs, because it does not require dedicated servers and provides automatic backup (Dimitriu and Matei, 2014);

- **Blockchain**, which provides transparency and traceability of accounting records, reduces the risk of fraud, enables real-time transaction verification and provides data security (Eyo-Udo *et al.*, 2025; Pragya Sharma, 2025).

Increased efficiency and reduced processing time, quick access to up-to-date information, reduced risk of human error, improved transparency and internal control and improved decision support through advanced analytics are just some of **the benefits of digitalization accounting**, while cyber vulnerabilities and data security risks, high initial costs for implementing new technologies, lack of digital skills among staff, resistance to change and slow organizational adaptation etc. are some of **the challenges and risks** associated with it (Hentati *et al.*, 2025; Quraishi *et al.*, 2025; Đurović and Dečman, 2025; Valentinetti and Rea, 2025).

The digitalization of accounting is also a consequence of digital regulations and initiatives in the field of taxation and accounting. Thus, the European Union's strategy to modernize public administrations through digitalization and interoperability has led European tax administrations to initiate extensive digitalization processes over the past two decades to combat tax evasion, reduce administrative costs and increase transparency in financial reporting. Relevant examples include **SAF-T (Standard Audit File for Tax)**, implemented in several European countries as an international standard defined by the Organization for Economic Cooperation and Development (OECD) for the electronic exchange of accounting data from entities to a national tax authority or external auditors (Wikipedia, 2025), **mandatory e-invoicing**, adopted in some countries, such as Italy (SDI), France (Chorus), Spain (eFacturae) and Poland (KSeF) (Ravari, 2024), as well as **electronic VAT reporting systems**, such as SII (Sistema Inmediato de Información) in Spain. (Longás Lafuente, 2017) Romania has introduced the **SAF-T** reporting obligation, locally known as the **D406 Declaration**, as part of the National Agency for Fiscal Administration (NAFA) digitalization strategy, which involves the electronic transmission of a standardized set of accounting and tax data to the tax authorities. (Ionescu and Haralambie, 2024) Also, according to NAFA data, it manages other digital systems, namely: **RO e-Factura**, for issuing, transmitting and archiving electronic invoices in a standardized format; **RO e-Transport**, for the efficient control of domestic road transport of high-risk goods and international road transport of goods; **RO e-TVA**, to enable taxpayers to manage and declare value

added tax (VAT) digitally and minimize errors, combat tax fraud and reduce the time allocated to filing returns, among others. Thus, the digitalization of public administrations at European and national level facilitates the automatic transmission of tax data and reduces the time spent on tax control and inspection, but at the same time has a number of implications for taxpayers and accounting professionals, by increasing the level of transparency and control and reducing bureaucracy. They must also adapt technologically by using software that complies with the requirements of the authorities and continuously upgrading their skills.

Based on studies conducted to date, we have found that although there are countries where the digitalization of company accounting is very advanced, there is no country where it is 100% automated, without human intervention. While importing and classifying transactions, repetitive entries, issuing and recording invoices, bank reconciliation and basic financial analysis are operations that can be automated (see software such as Saga Cloud, SmartBill Conta, Xero, SAP etc.), operations such as interpreting tax legislation, atypical situations (litigation, mergers, reorganizations etc.), strategic consulting and legal responsibility remain the responsibility of the professional accountant (Kokina and Blanchette, 2019; Kroon *et al.*, 2021; Perdana and Kim, 2023; Mgammal, 2024; Gaitan, 2025).

5. CONCLUSIONS

The digitalization has brought about a paradigm shift in accounting practices and the way that financial data is recorded, processed and analyzed is now completely different from what it was before the development of new technologies. Thus, emerging technologies such as artificial intelligence (AI), process automation through software robots (RPA), cloud platforms, blockchain and advanced data analysis contribute to streamlining accounting activities and increasing the accuracy of financial information. In this context, the role of the accounting professional is changing from that of a simple data operator to a strategic financial consultant, capable of interpreting complex data and providing decision support. At the same time, digitalization imposes new standards of data security and tax compliance through the adoption of systems such as SAF-T, e-Invoicing and electronic reporting to tax authorities. Thus, at this stage of socio-economic development, accounting can no longer be conceived without the integration of technology and analytical thinking and requires digital skills and adaptability to the new requirements of the contemporary business environment.

In conclusion, accounting automation does not mean the disappearance of the profession, but its transformation. Repetitive activities are taken over by technology, but interpretation, analysis and financial consulting remain fundamental responsibilities of the accounting professional, which implies a

redefinition of the accounting profession, the tools used and the relationship between accountants, management and state institutions. Currently, the accounting profession requires a solid knowledge base in finance and taxation, as well as digital, analytical and interpersonal skills and only through continuous training adapted to new requirements will it remain relevant and continue to provide added value to the business community.

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THE IMPACT OF DIGITAL TRANSFORMATION ON THE ADMINISTRATION OF THE EUROPEAN JUDICIAL SYSTEM: NORMATIVE, INSTITUTIONAL AND ETHICAL CHALLENGES

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Abstract

The present paper engages in a critical and methodological analysis of the effects generated by the digitization process on the organization and administration of the judiciary within the European Union, placing itself in a context where national legal traditions face the imperative of technological modernization. The study rigorously evaluates the concrete implications of the integration of digital tools in the judicial activity, manifested by the implementation of electronic systems for the management of judicial files (e-justice), the algorithmizing of the distribution of cases and the use of artificial intelligence technologies in the decision-making processes of the courts.

Starting from a detailed analysis of the relevant European framework – including the European e-Justice strategy and related policy documents – the research identifies the main legal and institutional challenges driven by digital transformation. In particular, it examines the need to ensure independence and impartiality in the context of digitization, the strict protection of personal data and the confidentiality of judicial proceedings, the risks associated with external influence on the management of judicial data, as well as the danger of excessive standardization that could compromise the specificities of national legal systems. The methodology adopted is of a comparative nature and includes case studies of European states recognized for their technological advance, such as Estonia and Germany, alongside a thorough examination of the situation in Romania, in the context of recent judicial reforms. The conclusions undertaken aim to issue precise institutional and legislative recommendations, aimed at optimizing the integration of digital

technology in judicial systems, while guaranteeing a harmonious balance between administrative efficiency and the functional autonomy of the judicial authority.

Keywords: *digital justice; judicial governance; algorithmic decision-making*

JEL Classification: H83; K23; O33.

1. INTRODUCTION

Digital transformation has become a key factor in the modernization of public services globally, including in judicial systems. In the European context, the digitalisation of justice – i.e. the adoption of information and communication technologies (ICT) in courts and judicial proceedings – is seen as a means to improve access to justice, the efficiency of the judicial act and the transparency of the judicial process (European Commission, 2020). The European Commission has highlighted that digital technologies have the potential to keep justice systems functioning even in crisis situations (such as the COVID-19 pandemic) and to ensure effective cross-border judicial cooperation (European Commission, 2020). Thus, digitalisation has become a priority on the European Union's agenda, materialised through e-Justice Action Plans, Commission Communications and dedicated financial instruments (e.g. funds allocated through the Recovery and Resilience Facility) to support Member States' efforts to modernise their courts (European Commission, 2020).

However, the implementation of digital transformation in the judicial system involves a series of complex challenges, which go beyond the simple purchase of IT equipment. First, there are regulatory challenges – legislation and regulations need to be adapted to enable the full use of digital tools (such as electronic documents, digital signatures, online filing platforms) in conditions of validity and respect for fundamental rights (CMS, 2023). Secondly, institutional challenges are manifesting – the digital transformation requires organisational changes within courts and judicial administration, investment in infrastructure and staff training, as well as overcoming resistance to change from judicial actors accustomed to traditional procedures. Last but not least, ethical challenges arise – from ensuring the right to a fair trial under the conditions of using new technologies (e.g. remote hearings), to the protection of personal data and the avoidance of any discrimination or prejudice introduced by algorithms or artificial intelligence in the act of justice (Council of Europe, 2018). These three categories of challenges – normative, institutional and ethical – are interdependent and require a comprehensive and cross-sectoral vision.

The digitalisation of justice is not only a technical or administrative issue, but also involves legal issues (such as the legal validity of electronic documents, the amendment of procedural codes, judicial cooperation at EU level), public management issues (organisation of courts, allocation of resources, training of digital skills among staff) and ethical and human rights issues (confidentiality of judicial data, the right to a defence and to a fair trial, the impartiality and

transparency of the algorithms used). The present paper aims to investigate the impact of the digital transformation on the administration of the European judicial system from this multiple perspective, identifying the main challenges in the three mentioned spheres and illustrating them with relevant comparative examples from three EU Member States: Romania, Estonia and Germany. The choice of these comparative examples is based on different situations: Estonia as a pioneer of e-government in Europe, with an advanced level of digitalisation in the legal field, Germany as a large judicial system that is gradually implementing digital reforms and Romania as a transitional system, at an average level in the EU in terms of e-justice, facing both progress, and significant obstacles (Szentpáli-Gavallér, 2024).

The methodology will describe how the analysis was carried out (mainly through desk research and legal-administrative comparison). The Results section will present findings on the impact of digital transformation in the judicial system and the associated challenges – organized on normative, institutional and ethical dimensions, with examples from Romania, Estonia and Germany. Finally, the Discussions and Conclusions section will interpret these results in a broader European context, highlighting the practical implications of the findings and possible courses of action for policymakers.

2. METHODOLOGY

The present study is based on a qualitative research methodology, having as its main tool the documentary analysis of legal sources and specialized literature. Policy and legislative documents at European Union level (such as European Commission Communications on the digitalisation of justice, e-Justice Action Plans, Commission and Council of Europe reports), studies and research reports (including articles from legal and public administration journals, comparative studies and relevant statistical data) were examined. Quantitative data and indicators available in official European reports – in particular the EU Justice Scoreboard – were also used to contextualise the level of digitalisation of justice systems in different Member States and highlight comparative gaps and progress (European Commission, 2022).

The comparative approach consisted of the selection of three case studies: Romania, Estonia and Germany. The selection criterion was the varying degree of advancement in the digitalisation of the judiciary, thus ensuring a comprehensive perspective:

Estonia is an advanced model of e-government and e-justice, recognized for its almost complete integration of online public services (100% public services accessible online) and robust infrastructure (digital identity for every citizen, X-Road interoperability platform, etc.) (E-Estonia, 2024). The Estonian case study makes it possible to identify good practices and the maximum benefits that digitalisation can bring to the courts.

Germany offers the prospect of a large-scale traditional judicial system, which has started the digitalisation process more slowly, but which in recent years has implemented significant legislative and technological reforms (e.g. mandatory electronic communication for lawyers from 2022, introduction of the electronic court file gradually until 2026) (CMS, 2023). The case of Germany highlights the challenges of a complex system in adapting to the digital age, as well as the importance of the regulatory framework in this transition.

Romania illustrates the situation of a system in the process of digitization, which has made progress (implementation of electronic file solutions, online case law portals, the use of electronic signature in certain procedures) and which benefits from European support (through funds and recommendations) for modernization, but which still faces infrastructure and resistance to change problems (Szentpáli-Gavallér, 2024). The Romanian case study allows highlighting both the beneficial effects and the perceived obstacles and risks, including on the constitutional rights of citizens (Bănică, 2020).

The concrete method used was the comparative analysis of the legal and institutional framework in the three countries, corroborated with the analysis of doctrinal positions and empirical studies on the effects of judicial digitization. Elements such as: legislative changes adopted to allow electronic procedures (e.g. rules on digital signatures, tele-court hearings), the existing judicial IT infrastructure (e.g. e-File system in Estonia, electronic case management systems in Germany and Romania), the level of adoption of digital solutions (proportion of proceedings managed online, services offered to litigants via the internet) and lawyers' perspectives/attitudes towards them changes (including ethical and rights protection aspects).

For the ethical and fundamental rights dimension, the methodology also included an analysis of the guiding principles formulated by relevant bodies (such as the European Ethical Charter on the use of artificial intelligence in judicial systems, adopted by CEPEJ in 2018, and the case law or recommendations of the European Court of Human Rights on due process in a digital context). Reports by professional organisations (Councils of the Magistracy or associations of judges and lawyers) reflecting ethical concerns related to the digitalisation of justice were also considered.

It should be emphasized that, given the rapidly evolving nature of the subject, the analysis has an exploratory and descriptive character, synthesizing the information available until 2024-2025. No field research or sociological studies were carried out, but data from existing surveys and questionnaires were integrated (e.g. a 2020 CCJE questionnaire on the use of video sessions in courts to which judges from Romania, Germany, etc. also responded) (Sanders, 2021). The methodological limitations are related to the dependence on secondary sources; however, the triangulation of legal, statistical and doctrinal sources

provides a sufficiently robust basis for drawing conclusions on the impact of the digital transformation on the administration of justice in Europe.

3. RESULTS

3.1. Normative challenges of the digitization of justice

A first stage of analysis is the normative frameworks necessary for the integration of digital technologies in the judicial system. Effective digitalisation cannot take place in a legislative vacuum – it is essential that laws and regulations recognise and facilitate the use of electronic means in judicial proceedings, while ensuring the protection of parties' procedural rights. At the European level, the European Commission proposed as early as 2020 a "legislative toolbox" for the digitalisation of justice, stressing that the use of technology must be carried out in full respect of fundamental rights and the principles of the rule of law (European Commission, 2020). Relevant initiatives include the eIDAS Regulation (Regulation (EU) No 910/2014) on electronic identification and trust services, which provides the legal basis for the recognition of qualified electronic signatures and electronic seals in all Member States – crucial for the validity of documents filed online with courts. The e-CODEX Regulation was also proposed in 2021, which would institutionalize the IT system for secure communication in cross-border judicial proceedings (European Commission, 2020), facilitating the electronic transmission of applications and evidence between courts in different countries.

In practice, each Member State has had to adapt its national legislation to allow for electronic procedures. An eloquent example is Germany, which, through the 2013 Act on the Promotion of Electronic Legal Communications, amended the Code of Civil Procedure (ZPO) to introduce the use of electronic documents and electronic evidence in courts (CMS, 2023). A key element was the creation of the electronic mailbox for lawyers (in German, *besonderes elektronisches Anwaltspostfach – beA*), a secure system launched in 2016. Subsequently, Germany required by law that, as of January 1, 2022, all lawyers and public authorities must submit documents exclusively in electronic format, except in situations of technical force majeure (CMS, 2023). This obligation (provided for in Art. 130d ZPO) represents a major step in the normalization of digital communication with courts and was accompanied by provisions on the probative value of electronic documents: if an electronic document is signed with a qualified electronic signature, it has the same probative value as a document under a handwritten signature (CMS, 2023). Moreover, documents issued by public authorities in electronic format enjoy the presumption of authenticity specific to official documents (CMS, 2023). All these legislative changes in Germany have ensured legal equivalence between traditional and digital procedural acts, removing uncertainties regarding, for example, the acceptability of an email or PDF file as a means of filing a legal action.

However, the German case also highlights temporary regulatory limitations: although lawyers are obliged to communicate electronically with the courts, the German courts themselves are not yet required by law to communicate exclusively online with the parties (at least until the deadlines for full implementation) (CMS, 2023). Basically, some courts can continue to send summons or judgments on paper until the transition is finalized. In addition, although many German courts have already implemented the electronic file system (e-Akte), it will only become uniformly mandatory from 1 January 2026 (according to Art. 298a ZPO) (CMS, 2023). This transition period shows that regulatory adaptation comes gradually, allowing the judiciary to get used to the new procedures and to solve any secondary technical or regulatory problems (such as electronic archiving standards, backup procedures, etc.).

In Romania, regulatory efforts to digitize justice have been more fragmented until recently but have accelerated under the pressure of the COVID-19 pandemic and the objectives assumed through the National Recovery and Resilience Plan (PNRR). The Romanian Code of Civil Procedure has been amended to allow for videoconference hearings in certain situations, and the related legislation has been adapted to recognise digitally signed electronic documents in interaction with the courts (the High Court Electronic Record Act and some courts of appeal) – although practical implementation varies. An interesting aspect of comparative law highlighted by the literature is that, in Romania, as in other Eastern European countries, the law requires the consent of the parties to conduct court hearings by videoconference (in the absence of the express consent of the parties, the use of this alternative procedure could be considered a violation of the right to a fair trial) (Sanders, 2021). Therefore, the Romanian regulatory framework tends to protect traditional procedural rights, allowing technology an auxiliary and voluntary, rather than mandatory, role. This precautionary approach reflects a legitimate concern to guarantee the principles of adversarial and orality – the Romanian legislator wanted to avoid the situation in which a party is forced to participate in an online trial against its will, for fear that it would not benefit from the same conditions as in a physical courtroom.

At the same time, Romania has also adapted its national strategies to integrate European digitization objectives. The National Strategy on the Digital Agenda and the Strategy for the Development of the Judicial System (Strategy for the Development of the Judicial System 2015-2020 and the recent one 2022-2025) mention digitalisation as a priority direction, including measures such as the development of an IT system for case management (modernised ECRIS), the scanning of court archives, the implementation of the case law portal with the anonymisation of personal data and the interconnection with the European e-Justice portal. According to a 2024 study, Romania's strategy emphasizes the need to adapt legislation to digitalization, including planning Romania's participation in European projects on the anonymization of court decisions (for

publication as open data) and exploring the use of artificial intelligence in justice, within the e-Justice Action Plan 2019-2023 (Szentpáli-Gavallér, 2024). This commitment suggests that, at the regulatory level, Romania recognizes the challenges (the need to protect personal data in published judgments, where anonymization is essential for GDPR compliance) and seeks to address them through pilot projects and European cooperation.

At the European Union level, it is also worth mentioning the EU Charter of Fundamental Rights and data protection legislation (General Data Protection Regulation – GDPR) which provide an imperative framework in any digitalization approach. Digital records management involves the storage and processing of large volumes of sensitive personal data (names of parties, CNPs, data on criminal cases, etc.), which means that cybersecurity is a first-rate legal requirement. Any forensic IT architecture must ensure the secure authentication of users (e.g. the use of digital identity – electronic identity card or digital signature – for access to files), audit logs for accesses, encryption of transmissions and compliance with data retention and deletion rules. Normatively, the challenge for legislators was to balance the transparency of justice with data protection: the publication of court decisions online increases transparency and access to jurisprudence but requires the anonymization of personal data so as not to violate the right to privacy (Bănică, 2020). In this regard, it should be noted that many states (including Romania) have adopted rules on the anonymization of the names of the parties in the decisions placed on public portals, and at EU level, common standards of judicial data are being discussed to reconcile free access with confidentiality.

The analysis of the regulatory challenges indicates that the digital transformation of justice requires complex but feasible legislative updates: from adapting procedural codes to recognise digital tools (such as online submission of applications, remote hearings), to ensuring the legal value of electronic documents and up to creating the premises for digital judicial cooperation between states (e.g. the e-CODEX framework). Countries that have made the most progress (such as Estonia) have benefited the early existence of an enabling legal framework – in Estonia, electronic identification and digital signatures have been fully legally recognised since the 2000s, and legislation has been rapidly adjusted to allow all communications between parties and courts to be made electronically (E-Estonia, 2024). Countries such as Germany have adopted a gradual path, first legislating optionality, then the gradual obligation of electronic means. Romania and other states in the region have started more slowly, but under the impetus of the pandemic and the EU agenda, they have gradually aligned their laws, emphasizing the simultaneous guarantee of traditional rights (e.g. the condition of consent for video-sessions as a security measure of the right to defence). Overall, the European and national regulatory framework is evolving towards the institutionalization of e-justice, the main

challenge being that this legal evolution is always one step ahead of (or at least in step with) the technological evolution, avoiding the legislative vacuum or the conflict of norms with the new digital realities.

3.2. Normative challenges of the digitization of justice

In addition to legislative adjustments, the digital transformation of the judiciary also entails institutional challenges. Court administration – i.e. the way cases are handled, hearings are scheduled, staff interact with the public – is changing significantly with the introduction of new technologies. The experiences of European states show that the success of digitalisation depends to a large extent on institutional capacity: adequate technical infrastructure, digital skills of staff, reconfigured working procedures and an organisational culture open to innovation.

A positive example is Estonia, where judicial institutions have been prepared and reorganised to make the most of digital opportunities. Since the 2000s, Estonia has invested heavily in e-government infrastructure, and the judiciary has been no exception. The central e-File system in Estonia is the core of the digital administration of justice: it connects all courts with prosecutors' offices, police, prisons and other relevant institutions, enabling the electronic circulation of data and documents in an integrated way (E-Estonia, 2024). Basically, when a file is entered into the system, all relevant parties can access the allowed information about the case, updates are made in real time, and the workflow (issuing summonses, transmitting the minutes of the hearing, communicating the judgment) is electronically automated (E-Estonia, 2024). The once-only principle, followed by the system's architecture, ensures that data entered once (e.g. parties' data) is automatically reused throughout the judicial chain, avoiding redundancy and errors. Also, each citizen or lawyer, using their digital identity (ID-card or Mobile-ID), can file actions online and consult the status of their file 24/7 through the public portal e-Justice (E-Estonia, 2024). The institutional effect of this system is dramatic efficiency: paper or over-the-counter communications have been replaced by electronic interactions, saving time and resources. It has been reported, for example, that in Estonia questions or requests for information to courts are answered in an average of 1.5 seconds via the digital system, compared to 20 minutes in the previous analogue regime (E-Estonia, 2024). Therefore, it is not surprising that Estonia has some of the shortest process resolution times in Europe – a benefit partially correlated with the intensive use of technology, according to data from the European Commission (E-Estonia, 2024).

To achieve these performances, institutional challenges had to be managed through exemplary change management in Estonia. Estonian courts, under the coordination of the Ministry of Justice and with the support of the Register Information Systems Centre (RIK), have developed new working procedures

adapted to the digital environment. Protocols have been established for the electronic signature of judgments by judges (which can be done either with a qualified digital signature or – where needed – by physically printing and signing, depending on the situation) (E-Estonia, 2024). Clerks and auxiliary staff have been retrained to use computer systems, and the way of storing files has shifted from physical archives to secure digital databases. A specific challenge was ensuring interoperability: Estonia solved it through the X-Road platform, which ensures the exchange of data between different institutions in a standardized and secure way. Thus, courts can check data from the population register, criminal records, commercial registers, etc. directly through the system, without paper or separate applications – which greatly shortens the time for obtaining administrative evidence. This example shows that institutions can be reorganised around the digital flow of information, with tangible benefits such as shorter proceedings and increased transparency (parties always have online access to the status of their case).

In contrast, larger, decentralised judicial systems, such as Germany's, have faced institutional challenges of a different kind. Germany, with a very large number of courts and a pronounced federalism, had to coordinate digitization efforts at the level of the Länder and the federal government. The challenge was to ensure the compatibility of IT systems between the Länder, so that a document sent electronically in one Länder can also be read and processed by the court of another Länder (especially relevant in domestic cross-border appeal or enforcement cases). The solution was the development of common standards (e.g. the XJustiz standard for legal data exchange) and the involvement of the IT Council for Justice (IT-Planungsrat) which coordinates interregional digital projects. At the same time, the introduction of the electronic file (e-Akte) involved a huge administrative work of scanning and converting the existing archives, as well as creating temporary parallel infrastructures (hybrid, paper and electronic system until the complete transition). German judicial institutions have invested in secure data centers for storing electronic files, with geographical backup, and in equipping courtrooms with equipment for videoconferencing and electronic display of evidence. An obstacle reported in the literature is the resistance to change of some users – certain judges or lawyers, accustomed to physical file volumes, have shown reluctance to use exclusively screens for case management. In Germany, the need for continuous training has been highlighted: IT training courses have been organised for magistrates and staff, manuals for using the new systems have been developed and an accommodation period has been offered (until 2026, judges can also work on paper if they wish, although they are encouraged to use e-Akte). This institutional flexibility is part of the strategy of gradual change, avoiding sudden disruption of judicial activity.

Romania is also facing its own institutional challenges. A recent study highlighted that although important progress has been made in recent years in terms of access to legal information and the implementation of IT systems, many initiatives have encountered barriers related to adoption, quality, legislative framework and consistency (Szentpáli-Gavallér, 2024). Romanian judicial institutions – courts, prosecutors' offices – have implemented systems such as ECRIS (case management system) and have developed the electronic file module that allows parties to consult the documents in the files online, but the effective use of these facilities is not uniform. A major challenge is the availability of IT infrastructure: not all courts (especially small ones, judges) have sufficient equipment or high-speed internet connections to hold online hearings or simultaneous access of many users to electronic files. Also, the workload and insufficient number of IT staff is an impediment – the administration of electronic systems requires specialized programmers and technicians, and the courts often do not provide sufficient posts in this regard. In recent years, the Romanian Ministry of Justice, financially supported by the EU, has initiated projects to strengthen the infrastructure (purchase of servers, videoconferencing equipment, courtroom computers, etc.), but their implementation at local level may be uneven.

Another institutional aspect is the training of human resources. Successful digitalisation requires judges, clerks, lawyers, auxiliary staff to acquire appropriate digital skills. In Romania, there was a need to expand the training of magistrates and justice personnel in the direction of using technology in the courts (Bănică, 2020). Institutions such as the National Institute of Magistracy and the National School of Clerks have started to include in their training programs modules of legal informatics and the use of electronic file applications. However, the literature points out that the digitization process is still in its early stages, with many efforts focused on the electronic duplication of existing procedures rather than on fundamentally rethinking the judicial workflow (Szentpáli-Gavallér, 2024). In other words, Romanian courts mostly use computers to draft and communicate documents, but the way of working remains like the paper era (the same procedural steps but intermediated by e-mail or pdf). This situation is characterized as partial digitization, without full organizational transformation.

Studies highlight that, in order to move to the next level, Romanian judicial institutions will have to approach digitalization as a process of structural change. This involves: better inter-institutional coordination (between courts, the Ministry of Justice, the SCM, IT providers), the sustainable allocation of financial resources (including from the national budget, not just EU funds, for system maintenance), as well as the involvement of end-users in the design of solutions (judges and lawyers must be actively consulted when developing platforms, in order to meet real needs). A positive aspect is that, according to the

EU Justice Scoreboard 2023, Romania ranks in the middle of the EU ranking in terms of judicial digitization indicators, which suggests that it is neither at the bottom nor among the leaders (Szentpáli-Gavallér, 2024). For example, there is the possibility of submitting documents online in civil and administrative proceedings and the possibility of the parties accessing electronic files for some courts, but not in all cases and not uniformly across the country (European Commission, 2022). This intermediate position indicates potential for improvement, but also the existence of a base from which to build.

Another type of institutional challenge, valid in all countries, is to maintain the resilience and security of judicial services in the digital environment. Judicial institutions need to adapt their business continuity plans to risk such as IT failures, cyberattacks or power outages. In Estonia, for example, investments have been made in blockchain backup solutions to ensure the integrity of judicial data (the KSI blockchain timekeeping project) and in periodic cyber incident response simulations (E-Estonia, 2024). In Germany, redundancy standards have been called into question – courts are required to keep backups of electronic files and have procedures in place for offline operation if systems fall apart. Romania, in the PNRR, provided for the creation of a secondary data center for justice, precisely to improve the resilience of the current infrastructure (which had been criticized as obsolete and vulnerable to interruptions). Therefore, from an institutional point of view, digitalization also brings with it the requirement to develop new administrative functions: IT security experts, disaster recovery procedures, periodic updates of equipment and software – all of which must be integrated into the way the judicial system works.

Institutional challenges in the digitalisation of justice include ensuring the appropriate technological infrastructure, managing human and organisational change, as well as guaranteeing security and interoperability. The Estonian experience shows the maximum benefits that can be achieved when these challenges are overcome faster procedures, reduced costs, increased access for citizens. The German case shows the importance of long-term strategic planning and gradual implementation, with a focus on compatibility at national level. The Romanian situation reveals the need to strengthen investments and training, in order to move from simple pilot projects to a substantial administrative transformation. At European level, the Commission and the Council have supported institutional efforts through funding (the Cohesion Fund and the RRF, which make the allocation of money conditional on reaching milestones related to the digitalisation of the courts) (European Commission, 2022) and through technical cooperation mechanisms (networks of experts, exchange of best practices through the European Network of Councils for the Judiciary, the Justice programme, etc.). This is shaping up a trend for European judicial institutions to become more agile, interconnected and service-oriented to citizens

online, although the pace and effectiveness of these transformations still vary significantly from country to country.

3.3. Ethical and deontological challenges in the digitalization of justice

The digitalisation of the judiciary not only brings technical or legal problems, but also a number of ethical challenges, which require careful reflection so as not to affect the fundamental principles of the act of justice. The main ethical aspects include ensuring the right to a fair trial under the conditions of new technologies, protecting fundamental rights and freedoms (in particular privacy and personal data), as well as maintaining impartiality, non-discrimination and human control in the context of the possible use of artificial intelligence in the judicial field.

A first aspect is the right to a fair trial (Article 6 of the European Convention on Human Rights) and how it is guaranteed in digital proceedings. The videoconference hearings raised questions about the effectiveness of the parties' participation and the perception of impartiality. How can the judge assess the credibility of a witness through a screen? Does the accused have the right to sit with his lawyer in the same room during an online criminal trial? Such questions have been intensely debated with the expansion of remote hearings during the pandemic. Many states have imposed procedural safeguards: in some jurisdictions (such as Romania, Austria, etc.), videoconferencing is allowed only with the consent of the parties, considering that the absence of consent could prejudice the right to a public and oral hearing (Sanders, 2021). The courts were warned to ensure the confidentiality of lawyer-client communication during video sessions (through separate chat channels or technical breaks), so that the right to defence is not compromised. A comparative analysis at the Council of Europe level revealed that, where videoconferencing was used, judges identified both advantages (e.g. avoidance of delays caused by the impossibility of physical appearance, reduction of the resolution time) and disadvantages (difficulty in questioning witnesses, technical problems that may interrupt the hearing, risk that the parties will not perceive the solemnity of the act of justice in the virtual environment) (Sanders, 2021). A Romanian judge, expressed an optimistic view, arguing that the potential drawbacks of online hearings can be overcome and that it is up to judges to find ways for "remote justice" to have a human face and be prompt (Sanders, 2021). This perspective highlights the importance of the ethical attitude of the judge himself: even with interposed technology, the judge must ensure that the parties feel heard, that the procedure does not become purely formal or rushed, and that the dignity of the trial is maintained.

Another major ethical concern is related to equality of arms and non-discrimination. The digital divide can create new inequities: people or lawyers with low digital skills, or without easy access to the internet and equipment, can

be at a disadvantage compared to those who master technology. In the context of justice, this could mean difficulties in filing actions online, consulting electronic files or participating in videoconferences. For this reason, many states have maintained traditional alternative channels in parallel with digital ones, so as not to exclude anyone. In Germany, although lawyers must communicate electronically, litigants without representation (natural persons) can still submit applications on paper if they do not have the technical possibility to use the electronic portal. Similarly, Romanian courts accept both documents with a handwritten signature (scanned and sent by email) and documents with a qualified digital signature, not wanting to reject applications for purely technical reasons. Ethically, the judicial system has the obligation to be inclusive and ensure access to justice for all categories of the population, which means that digitization must be accompanied by digital literacy efforts and possibly assistance (guides, information centers) for those unfamiliar with the new procedures.

The protection of personal data and privacy is another essential ethical dimension. Court files contain sensitive information – from medical data in a malpractice case, to financial details in a commercial litigation, or to protected addresses and witnesses in criminal cases. The digitization of these files involves storing data on servers and possible online access, increasing the risk of security breaches or misuse. Cases of hacking of public institutions are not theoretical; That is why digital justice must adhere to the principles of privacy by design. Ethically, it becomes imperative that only authorized persons can access the data of a file and that the parties are informed how their data is used. In Europe, GDPR rules require courts (as data controllers) to protect data and report potential security breaches. The additional challenge in justice is that the balance must be maintained with the publicity of court hearings and with the transparency of justice. The publication of judgments, for example, is considered beneficial (it increases the predictability of the act of justice, allows monitoring by society), but it requires the anonymization of names and other elements to protect the people involved (Bănică, 2020). Romania intends – as mentioned – to participate in automatic anonymization pilot projects, recognizing that this is both a topical ethical and technological issue (Szentpáli-Gavallér, 2024). Moreover, data security also involves the integrity of digital evidence: the risk of digital documents being falsified has already arisen (e.g. changing the content of an electronic file without leaving visible traces). Courts must be vigilant to such risks – digitization brings "the emergence of new risks in the process, which imply increased vigilance of the court, for example the risk of falsification of data in files" (Bănică, 2020). Ethically speaking, we are faced with a technological due diligence obligation: judges and lawyers must be educated to verify the authenticity of electronic evidence (digital signatures, timestamps,

electronic chain of custody), just as in the past they learned to detect paper forgeries.

A separate discussion is needed regarding artificial intelligence (AI) in the judicial system, an advanced component of the digital transformation, which raises perhaps the most complex ethical dilemmas. The use of AI can range from modest tools (e.g. jurisprudential search engines that suggest solutions from previous practice to judges) to potentially intrusive applications (algorithms that assess the risk of recidivism to influence parole decisions, or even "virtual judges" for simple cases). The Council of Europe, through CEPEJ, adopted in 2018 the first European Ethical Charter on the use of AI in judicial systems, precisely to establish clear limits and principles (Council of Europe, 2018). This Charter sets out five fundamental principles that must be respected in any use of AI in justice:

The principle of respect for fundamental rights – ensuring that the design and implementation of AI tools are compatible with human rights (an automatic conviction algorithm would violate the right to a fair trial; or a facial recognition system used without regulation would violate the right to privacy) (Council of Europe, 2018).

The principle of non-discrimination – preventing the development or amplification of any discrimination between individuals or groups through the use of AI (Council of Europe, 2018). In practice, this means that if an algorithm is used, it must be avoided that it systematically disadvantages a group (it has been discussed that certain risk assessment algorithms in the US were biased against racial minorities, which would be unacceptable in Europe).

The principle of quality and security – ensuring that the processing of judicial data and decisions by algorithms is done with quality data (certified, verified) and in a secure technological environment (Council of Europe, 2018). An algorithm that learns from court decisions must be fed with accurate and representative data, otherwise its conclusions may be erroneous or dangerous.

The principle of transparency, impartiality and fairness – the methods of data processing by AI must be accessible and understandable, and their use externally audited (Council of Europe, 2018). In other words, the algorithms used in justice must not be "black boxes"; Parties should know whether a decision was assisted by an algorithm and be able to understand its underlying logic. By default, judicial decisions should remain motivated by a human being, even if software has provided a suggestion.

The 'under user control' principle – ensuring that AI solutions are used as tools for human decision-makers, without substituting for the final human decision. CEPEJ stresses that a prescriptive approach to AI must be avoided; users (judges, clerks) need to be informed, have the choice and control over how they use an AI tool (Council of Europe, 2018). In simple terms, the decision

belongs to the judge, and the algorithm can only assist him – never the other way around.

These ethical principles, accepted at European level, guide the debate on the introduction of AI in the judiciary. In practice, most Member States are only at the level of pilot projects or limited use of AI (such as algorithm-based random case allocation systems, or tools for automatic anonymisation of documents). Estonia has even explored the bold idea of a "virtual court" for low-value commercial disputes, where software could propose a solution that becomes binding if the parties do not challenge it before a human judge. However, this idea has sparked heated ethical discussions, invoking the risk of violating the right to an independent and impartial tribunal – a computer program is not "independent" in the constitutional sense nor imputable from the point of view of responsibility. So far, no proper "AI judge" has been implemented anywhere in Europe, and it is unlikely to happen without major legislative changes. Germany and other countries have used AI more in court administration (predicting the future volume of cases and allocating resources) and less in making concrete judicial decisions, precisely out of ethical precautions.

Even simpler digital tools raise ethical issues. The use of social networks by the courts (for communication with the public) was discussed: on the one hand, it can increase the accessibility of information (announcing postponements, public hearings), on the other hand, there is the risk of the appearance of lack of sobriety or inappropriate comments that can undermine the judicial authority. Judges' codes of ethics must also extend to online conduct – judges communicating by email or participating in virtual hearings must show the same level of professionalism as in the physical courtroom. The human touch in justice remains crucial: "in the rush to align with the digital age, the human component risks pale in front of the benefits of artificial intelligence", adaptation to new technologies being demanded "at any cost" by society and the state, sometimes without providing the necessary resources for a smooth transition. This ethical warning suggests that the digital transformation must not degrade the fundamental values of justice: empathy, conscientious deliberation, procedural guarantees. Justice cannot become excessively automatic and "dehumanized", because it would lose its legitimacy.

The ethical challenges related to the digitization of justice require a principled approach. It is imperative that the implementation of technology be accompanied by safeguards to maintain the fairness of trials and the dignity of the act of justice. Principles such as transparency of algorithms, human control, non-discrimination and respect for privacy must be inscribed in the "DNA" of any digital solution adopted by the judicial system. Both decision-makers and legal professionals have an ethical responsibility to ensure that digital tools serve justice, and not the other way around – that is, justice does not become subjugated by technical constraints. In Europe, where the rule of law and human

rights are core values, the digitalisation of justice will be judged not only by the efficiency achieved, but also by the extent to which it succeeds in strengthening or at least preserving existing ethical and fundamental rights standards.

4. DISCUSSIONS AND CONCLUSIONS

The impact of the digital transformation on the administration of the European judicial system is proving to be profound and multidimensional. The present analysis highlighted that digitalization, although it brings undeniable benefits in terms of efficiency, accessibility and cooperation, also generates significant challenges in the normative, institutional and ethical spheres. The integrated discussion of these aspects allows us to outline an overview of how the digitization process can be optimally managed in the future, so as to serve the interests of justice and society.

A first major gain of the digital transformation, underlined by the Estonian example and beyond, is the increase in procedural efficiency. Case resolution time can be significantly reduced by eliminating bureaucratic delays (postal correspondence, unnecessary trips to court) (E-Estonia, 2024). Access to justice is improving, litigants can submit applications online at any time, check the status of the case free of charge and even participate in remote hearings if their presence would otherwise be difficult. This is in line with the European Commission's vision that justice must keep pace with the development of the digital society, so as not to become an opaque structure and backward from the rest of the public services (European Commission, 2020). In addition, digitalisation offers opportunities for more efficient cross-border judicial cooperation: tools such as e-CODEX, secure communication platforms between authorities or common databases (interconnected criminal records or insolvency registers) facilitate the application of EU law and mutual recognition tools.

However, the critical discussion reveals that the benefits are not achieved automatically, and the way of implementation makes the difference between success and relative failure. A key point is political and strategic commitment. Countries that have achieved a high level of judicial digitalisation (such as Estonia) have benefited from a clear strategic vision and consistent government support for e-government. On the other hand, where digitalization was perceived as an isolated project of the justice system, unrelated to the general e-government efforts, progress was slower. Romania addresses the digitization of justice in the context of the digital transformation of the entire public sector, which is an important step – the PNRR and the Digital Agenda include components dedicated to justice, integrating it at the national level.

Coordination at European level also remains crucial. Large differences between states (northern Europe and some eastern countries move faster than others) can create an uneven landscape. The EU, through tools such as the EU Justice Scoreboard, highlights these differences and encourages the exchange of

best practices. Moreover, by linking FRR funding to achieving digitalisation targets, the EU is putting positive pressure on Member States to act (European Commission, 2022). This mechanism proves the awareness that the digitization of justice is not only an internal matter of the states but also has a European dimension (in the context of the functioning of the single market, of free movement – decisions and procedures need to be easily accessible and enforceable across borders).

The discussion on the normative dimension suggests a balance: on the one hand, uniform rules are needed at EU level to ensure interoperability (mutual recognition of electronic documents, common security standards), on the other hand, the details of implementation remain at the discretion of the states, which allows adaptations to the local context (principle of subsidiarity). European law is expected to evolve in the future as well – the draft Artificial Intelligence Regulation (AI Act) is likely to set special requirements for AI systems used in the public sector, including justice, as high-risk applications requiring strict conformity assessments. The adoption of the AI Act would complement the already existing ethical framework (CEPEJ) with binding legal force, which would be a step forward in the ethical legislation of digitalization.

From an institutional and management perspective, the discussion highlights the importance of the human factor and leadership in justice. Technology, no matter how advanced, is just a tool; Success depends on how people in the system – judges, clerks, lawyers – accept it and integrate it into daily practices. The organisational culture of the courts must evolve towards openness to innovation, and this can be achieved by involving innovative judges (so-called early adopters can become ambassadors of change), recognising efforts (prizes or incentives for courts adopting pilot solutions) and, last but not least, by demonstrating positive results. If staff see that a new system makes their work easier (searching for a file takes seconds instead of hours in the physical archive), reluctance decreases. On the other hand, if the implementation is flawed or the system is going slowly, scepticism grows. Therefore, rigorous testing and piloting are essential before large-scale releases, as well as having prompt technical support in place to resolve issues.

Another aspect discussed is the long-term sustainability of digitalization. Once the enthusiasm of European funds and initial projects has passed, the systems will have to be maintained, updated and possibly replaced with technological progress. That means multi-year budget planning and prioritization. It is possible that in the medium term, the costs of IT in the judiciary will increase, but these costs should be seen as necessary investments for an essential public service. In fact, economic studies cited by the European Commission argue that the efficiency of the justice system has a direct impact on the economy: where justice is faster and more predictable (which correlates with digitalization), companies are more willing to invest, lending increases, and

GDP can be positively influenced (European Commission, 2022). Thus, governments have reason to consider the digitalisation of justice a strategic priority, not just an internal administrative matter.

From an ethical point of view, the discussions show that digitalization must be a citizen-centered process. The ultimate goal is not "technology for technology's sake," but more accessible and just justice. It would be a paradox if digitalization, meant to improve the service of justice, led to the distancing of justice from the citizen (through digital alienation or algorithmic opacity). That is why the focus on transparency and accountability is vital: every innovation (whether it is an online filing portal or an AI system) should be explained to the public, showing how it works, what benefits it brings and what guarantees there are. Collaboration with civil society and academia can be useful to assess ethical impact – human rights organisations or professional associations may be invited to participate in impact assessments when a new technology is introduced to the judiciary.

The impact of the digital transformation on the administration of the European judicial system is revealing we see a new paradigm of justice emerging – e-justice or e-justice – which promises more efficient procedures and extended access, but which also requires vigilance to preserve the core values of the act of justice. The normative, institutional and ethical challenges analyzed in this paper are not insurmountable obstacles, but problems that can be solved through well-thought-out public policies, European cooperation and ethical reflection. Europe can be a global leader in shaping quality digital justice, combining technology with deep respect for the rule of law. The comparative experiences of Estonia, Germany, Romania (and other countries) show various ways forward and highlight the importance of context: there is no one-size-fits-all solution, but there are common principles – legality, efficiency, accessibility, equity – that need to be achieved everywhere.

In the long term, we can expect the courts of the future to operate in an increasingly digitized way: physical files will become the exception, artificial intelligence will help manage the volume of information, and citizens will be able to solve many of their legal problems online. The generational challenge for judicial systems is to make this transition without abdicating their fundamental mission – that of delivering justice, in the name of law and justice, for every person. Digital transformation, as shown, can and must be the ally of this mission, not an end in itself. Through an interdisciplinary approach, the European judicial system can enter the digital age by preserving what is essentially human in the act of justice and enhancing its ability to serve the public.

In the light of the above, it is necessary that decision-makers and justice professionals continue to work together – at national and European level – to overcome these challenges. Continuous updating of the regulatory framework,

institutional strengthening through investment and training, as well as strict compliance with ethical principles will be the pillars on which the future of digital justice in Europe will be based. Only in this way will the impact of the digital transformation be a positive one, strengthening citizens' trust in the justice system and affirming democratic values in the information society of the 21st century.

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JUDICIAL INDEPENDENCE AND EUROPEAN GOVERNANCE: INSTITUTIONAL DYNAMICS AND CHALLENGES OF EUROPEAN INTEGRATION FOR THE JUDICIAL SYSTEM IN ROMANIA

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Abstract

This paper is devoted to an in-depth analysis of the complex interactions between European governance mechanisms – including, but not limited to, the Cooperation and Verification Mechanism, the Annual Rule of Law Report and the budgetary conditionality framework – and the autonomy of the national judiciary. The main purpose of the research consists in the critical evaluation of the way in which the European standards regarding judicial independence, administrative efficiency and institutional integrity have influenced both the structure and operation of the Superior Council of Magistracy, as well as the legal status of judges and prosecutors, together with the inter-institutional relations within the state apparatus. The adopted methodology is based on a particularly rigorous normative analysis, combined with the systematic evaluation of strategic documents issued at the European and national level, as well as relevant comparative case studies (comparative analyzes focused on the experiences of Romania, Poland and Hungary). This analytical approach allows the identification of institutional adaptation models and the exposure of tensions inherent in the implementation of European standards. In addition, special importance is given to the jurisprudential interpretations issued by the Court of Justice of the European Union and the European Court of Human Rights, whose decisions are essential in articulating the normative framework of reference regarding judicial independence. The conclusions presented in the paper critically approach the integrated effects of the European integration process on the autonomy of the national judicial system, emphasizing both the risks arising from a possible institutional over-compliance, as well as the opportunities to strengthen the autonomy and efficiency of the judicial system. In conclusion, proposals for institutional optimization and practical recommendations are formulated, intended for decision-makers in Romania and European institutions involved in monitoring and evaluating the performance of the judicial system.

Keywords: *judicial independence; EU rule of law; legal reform*

JEL Classification: K10; H11; F53.

1. INTRODUCTION

The independence of the judiciary is a fundamental pillar of the rule of law and an essential condition of democracy, being the guarantor of the separation of powers in the state and the protection of citizens' rights. At European Union (EU) level, respect for the rule of law – including ensuring the independence of the judiciary – is enshrined as a fundamental value in Article 2 of the EU Treaty and is a prerequisite for European integration. European governance in the field of justice refers to the set of mechanisms, policies and institutions through which the EU promotes and monitors these values among the Member States. The practical importance of judicial independence for the EU has been underlined by the European Commission, which warned that "in the absence of judicial independence" at national level, the uniform and effective application of EU law is called into question (European Commission, 2022). Thus, maintaining high standards of the rule of law in all Member States is essential both for the protection of citizens and for the proper functioning of the internal market and European judicial cooperation (European Commission, 2022).

For the countries of Central and Eastern Europe that joined the EU in the 2004 and 2007 enlargement waves, European integration involved deep reforms aimed at strengthening democratic institutions, including judicial systems. Romania, in particular, has undergone significant institutional transformations in preparation for accession in 2007, many of them under the direct influence of the conditionalities imposed by the EU in the field of justice and anti-corruption. A special mechanism called the Cooperation and Verification Mechanism (CVM) was established by the European Commission at the time of the accession of Romania and Bulgaria, with the aim of continuously monitoring justice reforms and the fight against corruption. For more than 15 years, the CVM has acted as a post-accession European governance tool, setting specific benchmarks to be met and publishing regular reports on progress or setbacks. This extensive monitoring has made Romania and Bulgaria are, *de facto*, in a unique situation of institutionalized surveillance of the rule of law after accession (Tănăsescu, 2021).

In parallel, other Member States, such as Poland and Hungary, which have not been subject to a similar post-accession mechanism, have experienced, more than a decade after accession, worrying developments indicating an erosion of the independence of the judiciary and a weakening of the guarantees of the rule of law. Since the second half of the 2010s, these two countries have undertaken controversial reforms that have undermined the autonomy of the courts and placed the judiciary under the influence of the executive and legislative branches. In response, the EU has sought to expand its governance tools: from political dialogue and recommendations, to infringement proceedings before the Court of Justice of the EU (CJEU) and even the activation of the political mechanism provided for in Article 7 TEU (the so-called "nuclear option" that can go as far as suspending the voting rights of a member state). More recently,

the Union has linked access to European funds to respect for the rule of law, adopting financial conditionality mechanisms aimed at discouraging violations of fundamental values (International IDEA, 2023). In February 2022, the Court of Justice rejected Poland and Hungary's appeals against the new conditionality regulation, paving the way for the suspension of EU funds in cases of serious breaches of the rule of law (International IDEA, 2023).

Taking into account these developments, the present paper aims at an in-depth and comparative analysis of the institutional dynamics of the Romanian judicial system under the influence of European governance, respectively of the mechanisms through which the EU has shaped national justice reforms and policies. At the same time, a comparison will be made with the parallel developments in Poland and Hungary – two emblematic cases of challenges of European integration in the field of justice, where there have been trends of retreat of judicial independence. Through this comparison, we will highlight both the differentiated role of EU instruments (such as the CVM, annual rule of law reports or financial conditionality mechanisms) and the internal factors (political, legal, administrative) that led to different results in Romania compared to Poland and Hungary. The approach will be an interdisciplinary one, combining the legal perspective (analysis of the normative framework and relevant decisions), with the administrative-institutional perspective (reorganization and functioning of judicial institutions) and the political perspective (the role of political actors, civil society and political culture in relation to European norms).

2. METHODOLOGY

The present study is based on a qualitative methodology, of the comparative case analysis type, integrated in an interdisciplinary framework. Three national case studies – Romania, Poland and Hungary – were selected to examine the influence of European governance on the independence of the judiciary and how European integration has shaped (or, in some situations, failed to maintain) the institutional architecture of the judiciary. Romania is a particular case due to the existence of the post-accession Cooperation and Verification Mechanism, while Poland and Hungary illustrate the challenges faced by the EU in the absence of a similar mechanism and under governments that have shown illiberal tendencies. The data and information sources used include:

Official EU documents: European Commission reports (CVM reports for Romania, annual rule of law reports for all Member States), Commission communiqués and recommendations on the rule of law (including proposals to activate Article 7 TEU against Poland and Hungary), relevant judgments of the Court of Justice of the EU, as well as documents on the new conditionality mechanism linked to EU funds. The latest CVM Report (2022) on Romania (European Commission, 2022), the Commission's reports on the rule of law

situation (2020-2023), as well as the CJEU decisions of 2021-2022 on the independence of the judiciary in Romania, Poland and Hungary were analysed.

Literature and specialized studies: articles published in journals (both Romanian and international) addressing the issue of judicial independence and the rule of law in the European context, relevant books and chapters, as well as analyses carried out by non-governmental organizations or think-tanks about judicial reform and EU mechanisms for ensuring the rule of law. Studies on the Europeanization of justice and democratic backsliding were consulted, as well as expert comments on the cases of Poland and Hungary. A notable example is the comparative analysis showing that the degradation of the rule of law in Hungary and Poland has been a gradual process, starting in 2010 (Hungary) and 2015 (Poland), leading to a significant reduction in judicial independence and democratic oversight mechanisms (International IDEA, 2023).

National documents and reports: relevant legislation (e.g. the Laws of Justice in Romania initially adopted in 2004 and substantially amended in 2017-2018 and again in 2022; legislative amendments in Poland on the organisation of courts, the National Council of the Judiciary and the Supreme Court; constitutional and legislative changes in Hungary after 2010 affecting the courts and the prosecutor's office), as well as reports of national institutions (reports of the Ministry of Justice, of the Superior Council of Magistracy of Romania, communiqués of the Constitutional Courts of the three countries, etc.). It also included the evaluations of international bodies such as the Venice Commission or GRECO (Group of States against Corruption), which issued opinions on judicial reforms in these countries.

Perspectives of civil society and the media: given the important role played by civil society in reporting slippages and defending the independence of the judiciary, views and reports from organizations such as the Romanian Judges' Forum, Freedom House, Amnesty International, European Judicial Network, etc., as well as relevant press investigations were considered. The massive protests in Romania in 2017-2018 (#rezist) against the weakening of justice laws have been documented and analysed by civil society, highlighting public vigilance as a deterrent to the violation of rule of law standards (Tănăsescu, 2021).

The methodological approach was comparative and longitudinal. The temporal evolution of the institutional and legislative framework of justice in Romania from the moment of pre-accession (when the reforms for European integration were initiated) to the present was followed, highlighting the key stages: (1) the pre-accession period and immediately after the accession period (2004-2012) – the initial consolidation under the pressure of the Copenhagen criteria and the CVM; (2) the period of maturation and internal tensions (2012-2016) – when, although the institutions were functional, internal political crises arose (the institutional conflict of 2012) managed under EU supervision; (3) the period of attempted and corrected slippage (2017-2020) – when a populist government

initiated measures to undermine the independence of the judiciary, later tempered by the domestic and European reaction; (4) the recent period (2021-2023) – marking the resumption of the pro-reform course, the closure of the CVM and the transition to general EU monitoring mechanisms (Rule of Law Report).

In the mirror, for Poland and Hungary, their post-accession path in terms of the rule of law was analysed, with a focus on the turning points: in Poland, 2015 (the coming to power of the Law and Justice – PiS party) and the gradual measures to take control of the courts; in Hungary, 2010 (the return to power of the Fidesz party under Viktor Orbán) and the adoption of the new Constitution of 2011 that restructured key institutions. For these countries, the comparative analysis was oriented towards identifying common factors (e.g. sovereigntist rhetoric, invoking national "constitutional identity" to reject EU interference, using legislative majorities for rapid institutional changes) and differences (e.g. civil society reaction, position of the political opposition, degree of economic dependence on EU funds, etc.) that may explain why developments have been more pronounced negatively there compared to Romania.

The methodology included the content analysis of the documents (to extract the central themes – references to the independence of the judiciary in CVM reports and rule of law reports, specific recommendations and their justifications), as well as legal analysis (correlating national legislative changes with European standards and CJEU jurisprudence). The impact assessment approach was also used to assess the extent to which the European mechanisms (CVM, Article 7, conditionality of funds) have produced concrete changes in the judicial architecture of the studied states – from the establishment or reform of institutions (courts, specialized prosecutors' offices, judicial councils) to the modification of the behaviour of political actors (acceptance or, on the contrary, challenging EU decisions and recommendations).

The methodological limitations of the study lie in the constantly evolving nature of the subject: many of the processes described (EU proceedings against Poland and Hungary, domestic legal reforms) are ongoing, so their interpretation is inherently provisional. However, by corroborating multiple and updated sources up to 2024, the paper aims to provide a more rigorous and complete picture of the up-to-date situation.

3. RESULTS

3.1. Institutional transformations in the Romanian judicial system under the influence of European governance. Pre-accession period and establishment of the CVM (2004-2007)

In the years leading up to EU accession, Romania was subject to stringent judicial reform requirements as part of the Copenhagen political criteria. The first Justice Laws were then adopted (the 2004 package on judicial organization, the status of magistrates and the Superior Council of Magistracy), aimed at ensuring the

independence of courts and prosecutors' offices. A major change was the consolidation of the role of the Superior Council of Magistracy (SCM) as a guarantor of the independence of judges and prosecutors, by transferring the powers of appointment and promotion of magistrates from politics (Ministry of Justice) to this autonomous collegial body. Also, under the pressure of integration, key anti-corruption and integrity institutions have been created or strengthened, recognizing that the fight against corruption is closely linked to the independence of the judiciary. In 2002, the National Anticorruption Prosecutor's Office was established (later transformed in 2005 into the National Anticorruption Directorate – DNA), with specialized and relatively independent prosecutors, and in 2007 the National Integrity Agency (ANI) was operationalized, in charge of verifying the assets, incompatibilities and conflicts of interest of dignitaries. These new institutions were responses to the EU's recommendations to create effective tools to prevent and combat high-level corruption as an integral part of ensuring the rule of law.

At the time of accession (1 January 2007), the European Commission found that, although Romania had made important progress, there were still deficiencies in the area of justice and public integrity. Therefore, the Cooperation and Verification Mechanism (CVM) was established, with four reference objectives for Romania: (1) ensuring a more transparent and efficient judicial system, strengthening the SCM; (2) the establishment of an effective integrity agency (ANI); (3) the continuation of progress in the investigation of high-level corruption (through the DNA and other prosecutors' offices); (4) preventing and combating corruption at the level of local administration. The CVM established a formal framework through which the Commission would periodically assess, through public reports, the steps taken by the Romanian authorities to achieve these objectives. This post-accession conditionality mechanism did not have direct sanctions, but negative reports could influence the country's reputation and, implicitly, certain political decisions (such as accession to the Schengen Area, which was de facto linked to progress on the CVM by some member states). In the first post-accession years, under the supervision of the CVM, Romania continued to adopt important framework laws – e.g. the null Criminal Code and the Code of Criminal Procedure and civil equivalents (which entered into force between 2009-2011) – aimed at modernising the legal system and aligning it with European standards. Overall, the period 2007-2012 was characterised by a gradual institutional consolidation, in which the Commission noted progress such as the existence of an increasingly coherent case-law, the establishment of specialised courts (commercial courts, specialised sections, etc.), as well as the increase in the efficiency of the DNA in prosecuting cases of grand corruption. A study of the evolution under the CVM concluded that, at this stage, Romania has made major progress in meeting the milestones, including through the creation of key institutions and the adoption of important laws, with the reform of the judiciary being largely considered on track (Tănăsescu, 2021).

3.2. The 2012 political crisis and the EU's role in managing it

A major early challenge to the rule of law in Romania arose in the summer of 2012, when an acute political crisis escalated into an attempt to impeach the president and a series of emergency ordinances criticized for undermining the constitutional balance. Those events – which also included the tension of the relationship with the Constitutional Court – raised questions regarding the observance of the rules of the rule of law. The European institutions reacted promptly: the European Commission invoked the CVM and issued a list of 11 urgent requirements addressed to the authorities in Bucharest to return to the constitutional order (compliance with the decisions of the Constitutional Court, transparency of the decision-making process). This episode was considered a one-off "constitutional crisis" rather than a systemic regression of the rule of law, as the fundamental institutions (the Constitutional Court, the courts) maintained their functions, and the situation was remedied relatively quickly under common internal and European pressure (Tănăsescu, 2021). The fact that the CVM was in force provided the Commission with a formal instrument of intervention, and the presence of this monitoring mechanism was credited by analysts with the role of having prevented a more serious deterioration of the rule of law at that time (Tănăsescu, 2021). In other words, even if the EU did not have tough sanction instruments at its disposal, the political conditionality exercised by the CVM helped to keep Romania on track with its accession commitments.

3.3. Progress and then slippage (2013-2019)

In the following years, Romania continued to achieve notable results in strengthening the independence of the judiciary, but not without periodic tensions. On the one hand, the DNA and the High Court of Cassation and Justice have recorded numerous convictions in high-level corruption cases (including parliamentarians, ministers, mayors), a fact welcomed by the CVM reports as an indicator of the increased efficiency of the judicial system and intolerance towards corruption. The SCM and the body of magistrates, in general, have become more vocal in defending their independence, including through professional associations such as the Romanian Judges' Forum. On the other hand, the political class has shown a growing resistance to these developments, especially against the background of the change in parliamentary majorities. The peak of tensions was reached between 2017 and 2019, when, after the 2016 elections, a coalition dominated by a populist party came to power and initiated an extensive revision of the justice laws and criminal codes. The legislative changes proposed and adopted in 2017-2018 were perceived by civil society, the opposition and international bodies as a direct attack on the independence of the judiciary. Among the changes were: the reduction of the powers of the President in the appointment of chief prosecutors, the strengthening of the control of the

Minister of Justice over the career of prosecutors, the restriction of the freedom of expression of magistrates, the facilitation of the early retirement of judges (which could have emptied the higher courts), as well as the decriminalization or reduction of penalties for certain corruption crimes. A particularly controversial measure was the establishment in 2018 of the Special Section for the Investigation of Crimes in Justice (SIIJ), a hierarchically subordinate special prosecutor's office that had the exclusive competence to investigate magistrates, seen as an instrument of intimidation and pressure on uncomfortable judges and prosecutors (Selejan-Gutan, 2021). This "reform" was immediately criticized by the European Commission (through CVM reports and public statements), the Venice Commission and GRECO, all of which warned that the changes undermine the institutional architecture of the rule of law and turn Romania back from the path of previous progress (Tănăsescu, 2021).

The domestic reaction was also vehement: hundreds of thousands of citizens took to the streets in 2017 and 2018 in the largest protests since 1989, demanding respect for the independence of the judiciary and the withdrawal of controversial laws. An informal alliance between civil society, part of the judiciary, the President of Romania and the parliamentary opposition has managed to postpone or mitigate some harmful changes, using all available tools: challenging laws at the Constitutional Court, referring the matter to the Venice Commission for opinions, referring the matter to the CJEU (through preliminary questions asked by the courts) on the compatibility of the reforms with EU law, as well as the temporary presidential veto (Selejan-Gutan, 2021). However, a good part of the legislative changes has nevertheless entered into force, generating negative effects: the SIIJ has started investigations against vocal magistrates, many experienced prosecutors have left the DNA and DIICOT citing pressure, and the CVM has recorded a setback for the first time. The 2018 CVM report noted "possible systemic threats to the independence of the judiciary" and set out additional urgent recommendations, highlighting that the situation required immediate corrective action (Tănăsescu, 2021). Basically, the Commission warned that Romania deviates from the assumed objectives, stressing that guaranteeing the independence of the judiciary remains a *sine qua non* condition for consolidating progress.

A positive element in this context was the involvement of the CJEU. Due to preliminary questions submitted by Romanian courts (including the High Court and courts of appeal), the CJEU was called upon to interpret whether the 2017-2019 justice reforms complied with Romania's obligations under EU law (in particular, Article 19 TEU – the obligation of states to ensure effective judicial protection through independent courts, and the Commission's decision establishing the CVM). In May 2021, the CJEU gave an important verdict (the joined cases "Forum of Judges of Romania" Association, etc.), stating that the existence of the CVM and its reports are part of Romania's accession

commitments, so that the CVM recommendations must be seriously considered by the authorities (Selejan-Gutan, 2021). The CJEU also stated that the establishment of the SIIJ and other amendments, if they are likely to affect the independence of judges, may contravene EU law, and national judges have the obligation to ignore (not apply) national rules contrary to EU law, even if they have been validated by the Constitutional Court of Romania. This position of the CJEU has created a situation of tension between the national and European legal order, especially after the Constitutional Court of Romania (CCR) issued a decision (390/2021) in December 2021 rejecting the supremacy of EU law in the field of judicial organization, stating that judges cannot ignore CCR decisions even if the CJEU required otherwise (Hogić, 2022). Thus, Romania temporarily entered a situation comparable to that of Poland (where the Constitutional Tribunal had challenged the supremacy of EU law), albeit on a more moderate tone. However, a distinguishing factor was that, unlike Poland or Hungary, in Romania the main political actors do not openly contest the supremacy of European law and EU membership (Hogić, 2022). While at the technical level the CCR tried to defend its competences, at the political level there was no consistent anti-EU rhetoric; On the contrary, the Government and the Parliament have avoided open confrontation with the European institutions. This aspect facilitated possible corrections to be made.

3.4. Post-2020 recovery and closure of the CVM

The parliamentary elections of December 2020 brought to power a pro-European coalition that explicitly assumed on the governing agenda the reparation of the damage done to the independence of the judiciary in the previous period. In 2022, the new government abolished the Special Section (SIIJ) – considered a symbol of political interference in justice – and promoted a new package of Justice Laws (promulgated in October 2022). These laws gradually replaced the controversial provisions of 2017-2018, restoring the balance between powers regarding the appointment of senior prosecutors, strengthening the role of the SCM in managing the career of magistrates, and eliminating early retirement schemes that could have emptied the courts (European Commission, 2022). Reforms were initiated to make justice more efficient (a new strategy for the development of the judicial system, digitization, staff supplementation) and efforts to amend the Criminal Code and criminal procedure were resumed in accordance with CCR decisions and European requirements (European Commission, 2022). In terms of combating corruption, the DNA maintained its activity, and the Parliament adopted amendments aimed at facilitating the lifting of parliamentary immunity in corruption cases, responding to a deficiency reported for a long time in the CVM reports (European Commission, 2022).

All these positive developments were recorded in the latest CVM Report of the European Commission, published on 22 November 2022. The Commission noted with satisfaction that Romania had made "sufficient progress" in meeting all the benchmarks assumed upon accession, highlighting the significant efforts made to strengthen the independence of the judiciary and fight corruption through new laws and policies (European Commission, 2022). The report welcomed the adoption of the new justice laws and the commitment of the Romanian authorities to take into account the recommendations of the Venice Commission (which, however, had made some observations on the drafts) (European Commission, 2022). As a result of this progress, the Commission concluded that all CVM criteria can be satisfactorily closed, practically marking the fulfilment of the conditionalities that underpinned the mechanism (European Commission, 2022). The announcement had an important symbolic charge: after 15 years of monitoring, Romania (along with Bulgaria) was coming out of the CVM. However, the Commission has made it clear that the monitoring of reforms will continue under the generalised mechanism of the Annual Rule of Law Report, to which all Member States are now bound (European Commission, 2022). In other words, Romania was to be treated similarly to the other states, without a special surveillance regime, but remaining under the magnifying glass of annual evaluations on justice, anti-corruption, media pluralism, etc.

This transition indicates both the relative success of the CVM and the maturation of EU instruments: instead of a dedicated ad hoc mechanism, a common framework (annual reports) will be used to maintain the focus on the independence of the judiciary. It should be noted that the termination of the CVM was formalized in January 2023 and agreed by the Council of the EU in June 2023. At the time, the Commission stressed that Romania would continue the reforms remaining through the National Recovery and Resilience Plan (NRRP), where certain milestones concern the entire sphere of justice – the completion of the reform of the Criminal Codes and the strengthening of the integrity framework (European Commission, 2022). Thus, European conditionality in the field of justice does not disappear but is recalibrated: from the CVM based on recommendations and public monitoring, to financial mechanisms (PNRR, structural funds conditional on the rule of law) that offer concrete incentives or disincentives.

For Romania, the institutional dynamics under the influence of European governance was characterized by a cycle of reform – retreat – recovery. The EU, through the CVM and other interventions (reports, legal actions), has played a role as an external guardian that has helped to accelerate reforms and correct deviations. Romanian judicial institutions have become more robust and autonomous, although the events of 2017-2019 have shown that these gains are not irreversible and that their maintenance depends both on domestic political will and on the persistence of European conditionality. A favouring factor in

Romania's case was the broad pro-European societal consensus and the absence of an official political agenda challenging EU values – unlike the situation encountered, as we will see, in Poland and Hungary (Hogić, 2022). This internal context has allowed the EU's governance mechanisms (CVM, reports, CJEU decisions) to be ultimately accepted and implemented, albeit sometimes with delay or reluctance.

3.5. The case of Poland and Hungary: challenges and EU reactions to the backsliding of the rule of law

If Romania offers the example of a winding trajectory but ultimately maintained within the parameters of the rule of law under European influence, Poland and Hungary illustrate a much more pronounced slippage and the difficulties that the EU encounters in ensuring respect for the independence of the judiciary in states where governments deliberately act against these principles. In both countries, the problems have become systemic, with even talk of a political capture of the judiciary, which threatens democracy itself.

After the fall of communism, Poland gradually built an independent judiciary, including a strong Constitutional Court and guarantees similar to other European democracies. When Poland joined the EU in 2004, it was considered to meet the political criteria, and its judicial system did not raise any particular concerns. However, the situation took a dramatic turn after 2015, with the seizure of power by the national-conservative Prawo i Sprawiedliwość (PiS, "Law and Justice") party. Over the course of several years, PiS initiated a series of legislative changes aimed at subordinating justice to the executive and legislative branches. The first target was the Constitutional Tribunal: The PiS government refused to recognize the appointment of three judges made by the old Parliament and instead appointed other loyal judges, in violation of legal norms (Adamska-Gallant, 2022). Subsequently, he placed an ally in the position of president of the Tribunal, ensuring his control over this supreme guarantor of the Constitution. According to analyses, since 2017 the Polish Constitutional Tribunal has practically abdicated its role as guardian of the Constitution, becoming an instrument that uncritically validates the initiatives of the government majority (Adamska-Gallant, 2022). The Constitutional Court, instead of censuring manifestly unconstitutional laws, ended up playing into the hands of the government, thus allowing the de facto modification of the system of government without formally changing the Constitution (Adamska-Gallant, 2022). This undermining of the constitutional institution was the prelude to the attack on the entire judicial system.

Next, PiS focused on the ordinary courts and the Supreme Court. Among the "reforms" adopted: the reduction of the retirement age of judges (which forced the early retirement of some senior judges, allowing them to be replaced by those close to the power), the change in the way judges are appointed to the

Supreme Court and its president, as well as the politicization of the National Council of Magistracy – the judicial self-administration body responsible for appointments and promotions. By a 2017 law, the mandates of the judicial members of the Council were prematurely interrupted and the new members were elected by Parliament, instead of being elected by the body of magistrates, as was previously the practice, which compromised the independence of the Council. Moreover, PiS has set up a new Disciplinary Section at the Supreme Court, made up of politically appointed judges, with powers to discipline judges for various reasons, including their decisions. This section has become an instrument of pressure, and disciplinary sanctions against critical judges have exploded: since 2017, more than a thousand Polish judges have been targeted by disciplinary investigations (Duncan & Macy, 2020). The peak was reached with the adoption in December 2019 of the law popularly known as the "muzzle law", which stipulated that judges could be punished if they questioned government reforms or if they applied EU law to the detriment of national legislation declared constitutional by the Constitutional Tribunal (Duncan & Macy, 2020). This law actually allowed for the dismissal or reduction of the salary of judges who criticized the power – a frontal attack on their freedom and independence (Duncan & Macy, 2020).

The cumulative effect of these measures has been described by experts as the "collapse of judicial independence" in Poland. Basically, in less than five years, the PiS government has managed to subordinate the Constitutional Tribunal, neutralize the Council of the Magistracy and intimidate the judiciary through an arbitrary disciplinary regime. At the same time, political rhetoric has often delegitimized the courts, with leaders in Warsaw arguing that reform is necessary because judges are "a corrupt caste" or heirs of the old regime.

The EU's reaction to Poland was gradual but increasingly firm as initial warnings were ignored by Warsaw. The European Commission initiated a dialogue under the Rule of Law Framework (an informal precursor to Article 7) as early as 2016, issuing successive recommendations to the Polish government. The protracted negotiations did not yield results, so on 20 December 2017 the Commission took the unprecedented step of activating Article 7(1) TEU against Poland, finding "there is a clear risk of a serious breach of the rule of law" in Poland (European Commission, 2023). In the reasoned proposal sent to the Council, the Commission stressed that PiS reforms "placed the judiciary under the political control of the government majority" and in the absence of judicial independence, serious questions arise about the application of EU law and judicial cooperation (recognition of European arrest warrants issued by Polish courts) (European Commission, 2023). It was the first time that Article 7 had been invoked against a Member State on the grounds of violation of fundamental values.

At the same time, the Commission – supported by the European Parliament and numerous member states – has opened multiple infringement actions at the

CJEU. The Court of Justice has ruled in favour of the Commission in every major case, ordering Poland to suspend the application of new laws undermining independence. An emblematic decision was that of 2019, when the CJEU obliged the reinstatement of forcibly retired Supreme Court judges and declared illegal the provisions allowing the executive to intervene in the extension of the term of office of judges (Case C-619/18). Subsequently, in another case, the CJEU ordered in 2021 the immediate suspension of the functioning of the Disciplinary Section of the Supreme Court, considering that it does not offer guarantees of impartiality and independence. For non-implementation of this ordinance, Poland was sanctioned with penalties of 1 million euros per day, accumulated over several months – an unprecedented coercive measure in the EU. However, the Polish government largely ignored these rulings and kept the disciplinary section active until 2022. Moreover, the Constitutional Tribunal of Poland – transformed, as we have shown, into a body loyal to the executive – has frontally counterattacked the European legal order. In October 2021, at the request of Prime Minister Mateusz Morawiecki, the Constitutional Tribunal ruled that key articles of the EU Treaty (such as Article 19 on the binding effect of CJEU decisions) were incompatible with the Polish Constitution, thus denying the primacy of EU law in the field of the organisation of justice. This decision, which came amid the dispute with the CJEU, was compared to a declaration of legal sovereignty by Poland and fueled discussions about a potential "Polexit" (implicit exit from the EU legal order).

Faced with this situation of "stubbornness" of the Polish authorities, the EU has resorted to a new approach: financial conditionality mechanisms. In the negotiations for the 2021-2027 Multiannual Budget, Poland and Hungary initially tried to veto the introduction of the rule of law conditionality regulation, but after political compromises (an interpretative declaration) the regulation entered into force in 2021. Once validated by the CJEU (February 2022), the Commission made the approval of Poland's National Recovery and Resilience Plan (NRRP) – necessary to access post-Covid recovery funds – conditional on the abolition of the Disciplinary Section and the reform of the disciplinary regime for judges. Basically, special "milestones" were set on justice: Poland had to adopt laws to close the old section and create a new disciplinary system, with guarantees of independence, before receiving the money (Csaky, 2025). Based on the same principle of conditionality, in September 2022 the Commission formally suspended part of the cohesion funds intended for Poland (around €75 billion), citing non-compliance with the Charter of Fundamental Rights and rule of law issues (Csaky, 2025). These financial measures have put massive pressure, equivalent to ~17% of Poland's GDP being blocked (Csaky, 2025), signaling that the EU is willing to use economic leverage to defend the independence of the judiciary.

The effects were seen in 2022-2023: under pressure, the Polish government (still led by PiS) passed a law in July 2022 formally abolishing the Disciplinary Section and replacing it with a new Chamber of Professional Responsibility at the Supreme Court. Some provisions have been watered down (previously dismissed judges could request reinstatement), but critics have said the new chamber does not remove political influence. In parallel, in order to obtain the approval of the PNRR, the authorities showed willingness to compromise with the Commission. However, the real change came only after the parliamentary elections in October 2023, when the pro-European opposition won and formed a government that promised to restore the rule of law. In the first months of 2024, Poland's new ruling coalition began legislative steps to revise justice laws, aligning them with EU requirements, and halted practices undermining independence. As a result, the European Commission unblocked Poland's access to recovery funds in early 2024, considering that the new authorities have credibly committed to remedying the situation (Csaky, 2025). The Polish case thus demonstrates the limited but nevertheless visible effectiveness of financial conditionality: although it convinced the old PiS government to make only minimal concessions, the change of government allowed the financial levers to take effect, quickly prompting measures to re-enter legality. It remains to be seen whether these reforms will be sustainable and whether the Polish judiciary will fully regain its independence after the purges.

3.6. Hungary – institutionalisation of illiberalism and the EU's delayed response

Hungary's situation has some similarities with that of Poland (a dominant party that has gradually captured institutions) but also notable differences. Under the leadership of Prime Minister Viktor Orbán and the Fidesz party, Hungary has experienced since 2010 a much broader process of "dismantling the rule of law", which has affected not only the judiciary, but also the media, civil society, and control institutions. In 2011, Fidesz – with a two-thirds majority – adopted a new constitution and organic laws that reshaped the constitutional order from the ground up. In the judicial field, among the first measures was the reduction of the retirement age of judges from 70 to 62 years, which forced the retirement of about 10% of judges, including many experienced presidents of courts. Although the CJEU later found that the measure amounted to age discrimination and forced compensation for the affected magistrates, the managerial damage had been done – the vacancies allowed the appointment of people close to the new power. Also in 2011, a new institution was created, the National Office of Judges (OBH), with a president appointed by the Parliament (controlled by Fidesz) for a very long term (9 years) and with extensive powers over the administration of courts (including redistribution of cases, interim appointment of presidents of courts). The first head of the OBH thus accumulated immense

influence over the judiciary. Although there was also a Judicial Council (made up of elected judges), its powers were drastically limited, making it unable to counterbalance the decisions of the OBH. This model has been criticized at the European level as contrary to the principles of separation of powers, as it provided the government with an indirect instrument of control over the courts.

Another front was Hungary's Constitutional Court. Fidesz has expanded the number of judges on the court and changed the appointment rules, effectively allowing its coalition to appoint judges without consensus with the opposition. In a short time, most judges were replaced by people loyal to the government and the Court's powers were restricted (it was forbidden to examine budget or tax laws from the perspective of fundamental rights). With a docile Constitutional Court, Orbán was able to move forward without major legal obstacles.

Throughout the 2010s, the Hungarian government continued to centralize power. In 2018, it was planned to set up a system of separate administrative courts, directly subordinate to the Ministry of Justice, which would judge sensitive cases (electoral disputes, public procurement, administrative corruption) – practically creating a parallel jurisdiction over which the executive had full control. Due to EU pressure and fears about receiving EU funds, the plan has been postponed indefinitely, but its mere proposal shows the government's ambition to control the judiciary. Overall, it was found that the independence of the judiciary in Hungary has eroded significantly: the degree of autonomy of judges and prosecutors has decreased, and verification and balance institutions such as the Constitutional Court or the prosecutor's office have largely aligned themselves with the government agenda (International IDEA, 2023). International indices reflect this reality: between 2017 and 2022, Hungary recorded notable declines in indicators on judicial independence and lack of corruption, ranking among the weakest in the EU. (International IDEA, 2023)

The EU's response to Hungary has often been perceived as delayed and hesitant, in part because the deterioration of the rule of law has been gradual and devoid of a singular moment of crisis (such as that in Poland 2017). Initially, the reaction was manifested in political discourse – the Commissioner for Justice was talking about the need for a new EU instrument for the rule of law (prefiguring the mechanism later adopted) (Tănăsescu, 2021). But for almost a decade, there were no major consequences. However, as Orbán's regime became increasingly autocratic, the European Parliament took the initiative and, in September 2018, voted to activate Article 7 against Hungary (the Sargentini Report), signalling "a systemic risk to EU values". However, the procedure progressed slowly in the Council, Hungary also benefiting from the tacit alliance with Poland (the two countries promised each other to block sanctions against the other, which made it impossible to obtain the unanimity required for Art.7(2)).

In parallel, the Commission has also launched actions against Hungary at the CJEU on specific issues (e.g. the NGO Act, restriction of academic freedom – the

Central European University case). It was only in 2022, with the operationalisation of the financial conditionality mechanisms, that the EU exerted real pressure. The Commission has set no less than 27 'super-milestones' for Hungary related to the rule of law (aimed at strengthening the independence of the judiciary, anti-corruption measures, transparency of public procurement), thus making access to recovery funds (NRRPs) and part of cohesion funds conditional (Csaky, 2025). Specifically, in December 2022, the EU suspended around €6.3 billion of Hungary's structural funds through the conditionality mechanism and fully froze the ~€5.8 billion allocated through the PNRR, until the agreed milestones were met (Csaky, 2025). The total amount blocked (including other funds subject to horizontal conditionality) accounted for around 16% of Hungary's GDP (Csaky, 2025), a similar, proportionate level of pressure to that on Poland.

Under this financial imperative, the Orbán government mimicked an opening: it created an independent Integrity Authority (theoretically to fight corruption), agreed to strengthen the role of the Council for the Judiciary (giving it a stronger say in judicial appointments) and to reduce the influence of the president of the OBH. He also promised legislative changes such as increasing transparency in the use of EU funds and protecting whistleblowers. By the end of 2023, some laws had been adopted, and the Commission partially appreciated the efforts, but considered that the reforms were not yet sufficient or fully implemented (International IDEA, 2023). As a result, most of the funds remain blocked, with Hungary being pressured to do more. The situation is complicated by the political context: Orbán continues defiant rhetoric, often presenting EU conditionalities as political blackmail related to other issues (International IDEA, 2023). In addition, Orbán uses Hungary's position within the EU (unanimous veto on certain files, such as NATO enlargement, sanctions against Russia or budgetary decisions) as a bargaining chip, thus slowing down the common reaction of the other states.

Thus, although recent European governance mechanisms have forced some concessions from Budapest, their real effect on the independence of the judiciary is so far modest. The Hungarian judiciary remains under the influence of the executive in many respects, and the illiberal core of the regime has not been dismantled. The EU faces a dilemma: continued financial pressure risks deepening the political rift and Eurosceptic discourse in Hungary, but abandoning conditionality would be tantamount to tacitly accepting deviations from common values.

3.7. Synthesis comparison Poland–Hungary–Romania

The cases of Poland and Hungary highlight the initial limits of European rule of law governance and the need to develop stronger instruments. Unlike Romania (and Bulgaria) which had the CVM as a post-accession preventive mechanism, Poland and Hungary were not subject to a special control after

2004, starting from the (optimistic) premise that democratic standards will be maintained. This proved to be a vulnerability of the enlargement process ('the Copenhagen dilemma': strict criteria before accession, but weak instruments after). In both Warsaw and Budapest, once governments with an anti-liberal agenda were installed, the EU found that its traditional levers (dialogue, warnings, trials at the CJEU) were necessary, but not sufficient to reverse the course, especially in the face of some internal popular leaders who presented the EU's intervention as an illegitimate interference in sovereignty. It was only the introduction of conditionality on funds that changed the balance of power, giving Brussels a tangible means of pressure.

Comparatively, Romania benefited from a different political context: even if there was a period of populist rule (2017-2019) with similar tendencies (undermining justice to protect party interests), internal counterpowers (the President, civil society, media) and the CVM framework prevented the consolidation of an illiberal regime. Unlike Poland and Hungary, where governments have encouraged nationalist narratives against the EU, in Romania the majority public discourse has remained pro-European. Thus, it has not been possible for the Romanian Parliament or Government to formally challenge the supremacy of EU law; even in cases of tension with the CJEU, the Romanian authorities sought compromise solutions (sometimes slow, but ultimately aligned with EU requirements) (Hogić, 2022). This has facilitated cooperation with European mechanisms, rather than open confrontation.

Another element of contrast is the duration and reversibility of reforms: in Hungary, after 13 years of Orbán's rule, key institutions (the Constitutional Court, the prosecutor's office, the public media, the electoral system) are profoundly transformed, which makes it difficult to restore democratic balance in the short term. In Poland, after 8 years of PiS rule, the damage is considerable, but the recent change of power offers the chance for remedies if the new majority has the determination and ability to repair the damaged structures (restoring the independence of the Council of the Magistracy, disciplinary review of controversial appointments). Romania, on the other hand, did not have such a long period of political capture of justice; The 2017-2019 window of vulnerability was succeeded by a return to the previous status quo, which shows greater institutional resilience, possibly due to the combination of EU pressure and societal reaction.

Last but not least, the EU mechanisms have also evolved in the mirror of these cases. The lessons learned from the management of Romania's situation through the CVM were later useful: the Commission developed the 2020 Annual Rule of Law Report that uniformly assesses all countries (avoiding the accusation that only the East is targeted), insisting that "we are all subject to monitoring". At the same time, the existence of the CVM precedent helped the CJEU to argue that the rule of law is not only a political issue, but also a legal

one – in this case, the CJEU recognized the binding nature of the obligations assumed by the CVM, thus strengthening the legal ground for the EU to engage in national judicial reforms (Selejan-Gutan, 2021). For Poland and Hungary, not having the CVM, the general basis of Article 19 TEU and the values of Article 2 TEU has been used, the CJEU repeatedly stating that states have an obligation to guarantee the independence of the courts, otherwise they are in breach of EU law. With each judgment (C-216/18 LM, C-619/18 Commission v. Poland, C-824/18 AB and Others v. Poland, etc.), case law has reinforced the idea that the independence of the judiciary is an integral part of the EU acquis and that the EU institutions can intervene when it is jeopardised.

4. DISCUSSIONS

The comparative analysis of Romania, Poland and Hungary reveals a fundamental tension between national sovereignty in the organization of the judicial system and the commitments assumed through European integration, a tension that underlies the observed institutional dynamics. The experience of these countries provides important lessons about the effectiveness and limits of European governance in promoting the rule of law.

In Romania, the EU's direct influence through the CVM has been the main catalyst for initial progress and a stabilising factor in times of crisis. The presence of clear benchmarks and constant monitoring has created a positive external pressure, helping to adopt measures that the local elites would otherwise have hesitated to implement (the establishment of ANI, the maintenance of relatively independent anti-corruption prosecutors, the transparency of the procedures for appointing judges). At the same time, through the CVM public reports, the European Commission provided civil society and the Romanian media with an early warning tool – each negative report was used internally as an argument to correct the direction of policies. This phenomenon highlights an aspect of European governance: when the EU institutions work together with internal actors (civil society, the judiciary, citizens) who share European values, a synergy is created that can oppose the drift of national governments. In contrast, in Poland and Hungary, where governments went in the opposite direction, the EU's efforts encountered an internal political deadlock: recommendations were ignored, and sovereigntist rhetoric undermined the legitimacy of the European message in the eyes of a part of the population. Only the application of tangible positive/negative stimuli (money or lack thereof) has managed to generate a change in approach, demonstrating that, beyond soft power (dialogue, recommendations), the EU also needs economic hard power to impose its values in practice (International IDEA, 2023).

The CVM was an innovative tool for its time (2007) but limited in power – it could not directly prevent a setback, but only to note it and appeal to the political will of the state concerned. In the case of Romania, this limitation was

not fatal because society and some of the institutions took these calls into account; but if a determined government had completely ignored the CVM, the EU would only have extreme political sanctions at its disposal (Article 7, unlikely to be used against a new member state) or the postponement of Schengen accession (which happened de facto). Therefore, the CVM functioned more through the power of shame (naming and shaming) and Romania's aspirations (to be a full member, to accede to the Schengen Area) than through legal constraints. Its effectiveness depended on the context: in 2007-2012, Romania was willing to make efforts to get rid of the label of "supervised student", and later, in 2017-2019, the CVM provided morality to the anti-corruption opposition. With the generalisation of the instruments (the rule of law report), the CVM has become redundant, but its lessons have been transferred to the new policies: the annual reports include recommendations for all states, and the Commission has calibrated its tone to highlight that no one is above assessment. However, the rule of law report is an eminently "soft" instrument, not accompanied by direct consequences. As the 2023 edition showed, the differences between states are enormous, and countries such as Poland and Hungary appear with serious unresolved problems (International IDEA, 2023). Critics have called these reports a "no-holds-barred monitoring" exercise, useful for transparency but insufficient to bring about change where the will is lacking.

In contrast, the financial conditionality mechanism adopted in 2020-2022 represents a qualitative leap in European governance. For the first time, non-compliance with the rule of law can lead to significant financial losses for a Member State, without requiring unanimity (decided by qualified majority in the Council) (Csaky, 2025). This mechanism immediately proved controversial – as evidenced by the fierce opposition of Poland and Hungary, which challenged the regulation at the CJEU (unsuccessfully) and threatened a budget veto. Its application in 2022 against both countries confirmed that the EU is willing to go all the way. The short-term results look promising: Poland has taken a step backwards, partially changing the justice laws to unlock the funds (Csaky, 2025); Hungary has adopted anti-corruption laws that it has been procrastinating for a long time. However, the lasting effect remains uncertain. There is a risk that these changes will only be "on paper", without a real transformation of mentalities or practices. Poland has created a new disciplinary chamber, but if the composition and method of appointment remain questionable, the substantive problems persist. Hungary can set up an Integrity Authority, but if the Prosecutor General (a long-term political appointee) does not handle large corruption cases, then the effort is superficial. Another risk is that, once the money is obtained, states will postpone the completion of reforms indefinitely – after all, conditionality must be accompanied by careful monitoring and permanent political will at EU level in order not to succumb to pressure. On the other hand, these financial instruments raise questions: by punishing a government, aren't ordinary citizens also punished?

Is it fair that the beneficiaries of the funds (civil society, local authorities, students) suffer from rule of law disputes? To mitigate this effect, the EU has tried to direct alternative funds directly to citizens (programmes managed by the Commission, support for NGOs), but the macroeconomic impact of the suspension of funds will be felt inevitably.

A crucial aspect highlighted by the cases discussed is the interaction between national and European legal orders. In all three countries, the Constitutional Courts have become key players. In Romania, the CCR entered a tense dialogue with the CJEU on who has the last word (CCR invoking constitutional identity, CJEU invoking the supremacy of EU law) (Hogić, 2022). In Poland and Hungary, the Constitutional Courts have been politically instrumentalized to issue decisions against the primacy of EU law, creating a precedent of fragmentation of the Union's legal order. This "judicial rebellion" at national level poses an existential challenge for the EU, as the entire European legal edifice is based on the premise of uniform application and acceptance of the authority of the CJEU. If more and more states (or constitutional courts) follow suit, the legal integrity of the EU is called into question. The solution can only be a high-level political one: a clear reaffirmation of the commitment to common values and, possibly, reforms of the Treaties that clarify competences. Also, the role of the domestic Constitutional Courts must be rebalanced: they remain guardians of national constitutions, but they cannot serve as a screen for the violation of the treaties that the respective states have ratified. In this regard, one could imagine an increased dialogue between the CJEU and the constitutional courts (possibly through mechanisms such as the preliminary opinion of a Constitutional Court before ruling against EU law, or the inclusion of national judges in the CJEU panel when national identity issues are discussed). In the absence of a constructive approach, we can expect the continuation of conflicts such as the Polish-European one, which affect litigants (e.g. courts in other countries become reluctant to recognize judgments in Poland, due to doubts about judicial independence). Another challenge is to ensure the irreversibility of reforms. Romania has demonstrated that reforms once considered consolidated can be overturned relatively easily by a conjunctural majority. Therefore, it is essential that reforms are deeply institutionalized: the independence of the judiciary is constitutionally protected (explicit guarantees in the Constitution regarding the irremovability of judges, appointment procedures free from abuse), the judicial culture is imbued with the values of the rule of law (judges themselves become defenders of their independence, as happened when they sent questions to the CJEU) (Tănăsescu, 2021), and public education to support the importance of the separation of powers. The EU can support these issues through funding (legal education programmes, exchanges between magistrates), by promoting good practices (Council of Europe standards on the administration of courts, recommendations of the European Network of Councils for the Judiciary) and by keeping the topic on the political agenda.

Last but not least, the case of Hungary raises the question of the real effectiveness of EU intervention in the context of entrenched illiberal regimes. If a government is willing to bear economic costs and political isolation in order to maintain its control over justice, then the EU's options become limited. An extreme scenario – the suspension of voting rights or long-term funds – risks creating an open conflict that can further fuel domestic Eurosceptic tendencies. On the other hand, non-intervention would normalize the deviation. The EU must therefore navigate carefully: be firm in principles but also seek constructive engagement where possible. Instead of endlessly penalizing a country, a gradual plan of action can be offered: gradually unlocking funds as certain milestones are verifiably met (this is already happening through the milestone system but could be communicated more clearly to the public to show that the ball is in the court of those governments).

The independence of the judiciary in Romania has evolved under the considerable influence of European governance, and currently the national judicial architecture is more institutionally robust than it was before accession. The EU acted as an accelerator and protector of reforms, although the ultimate responsibility remained with domestic actors. By comparison, developments in Poland and Hungary show that European integration is not a permanent antidote to illiberal drift – without genuine internal engagement with democratic values, external instruments have limited or belated effect. New mechanisms such as the annual rule of law report and the conditionality of funds reflect the lessons of these crises and the EU's desire to strengthen its responsiveness. Their success, however, will depend on the political unity of the other Member States and the ability of the EU institutions to act consistently.

For Romania, the end of the CVM does not mean the end of reforms, but the transition to another stage, where internal responsibility will matter even more. Without special monitoring, the challenge is for the independence of the judiciary to be maintained by its own internal democratic forces, with the support of the EU's overall mechanisms. At the same time, Romania – along with the other member states attached to the rule of law – has a major interest in bringing the situations in Poland and Hungary back to normal. At stake are not only abstract values, but also practical interests: from the credibility of judicial cooperation (European warrants, recognition of judgments) to the principle of solidarity in the EU (which is affected when a state deviates from the rules).

Ultimately, the institutional dynamics analyzed here demonstrate that European integration is a two-way process: the EU can shape national systems, but national resistance or slippages can also force the EU to reconsider its instruments and even its principles. The case of judicial independence confirms that integration does not stop at accession, and defending the rule of law is an ongoing task, requiring vigilance, political will and institutional innovation on both sides.

The challenge of European integration for the judiciary is to combine the diversity of national legal traditions with respect for common standards of independence and impartiality, in a way that strengthens mutual trust between Member States and strengthens democracy in Europe. Romania, Poland and Hungary show us both the risks and the potential solutions on this winding road: from preventive mechanisms such as the CVM, to financial sanctions, from domestic civic activism to the innovative jurisprudence of the CJEU. The lessons learned will be crucial for future EU enlargements (where the application of a generalised "CVM" for future members is already being discussed) and for the resilience of the European project as a whole in the face of illiberal waves that can re-emerge at any time.

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eID – CHALLENGES AND OPPORTUNITIES IN EUROPEAN PUBLIC ADMINISTRATION

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Abstract

The European Union wants the Member States to continue the digitization process by moving to the next stage, the implementation of the European digital identity. To this end, a legislative framework has been regulated to support a secure and competitive digital economy, based on the protection of fundamental rights and personal data.

The aim of our paper is to see whether the implementation of the European electronic identity card positively influences the quality and efficiency of public administrative services offered to the citizen. The research methodology is based on the European legislative framework, its transposition at national level and on the comparative analysis of the evolution between Romania and the other European countries. The results of our analysis show that Romania, as a member state of the European Union, has transposed into national legislation the policies related to digitization, personal data protection and interoperability, considering both the benefits and the challenges associated with the European electronic identity. eID is an important step towards reducing bureaucracy, increasing transparency and digital governance.

Keywords: *digitization; legislation; European ID card; interoperability; security and protection of personal data*

JEL Classification: K23; K24; H83; O33.

1. INTRODUCTION

In recent years digitization has become an important factor in public institutions' efforts to implement new technologies and the way they work. Digitization has basically modernized the daily work of the administration in order to provide the end consumer with quality, efficient and transparent services. At the same time, the citizen also wants a collaboration based on mutual respect, easier and faster, without bureaucracy.

Cross-border access will positively influence the number of people using digital services in the public and private sector. As these are increasingly offered online, secure digital authentication is required (European Commission - European Digital Identity, 2019-2024). Each country has developed its own non-standardized system, and the barriers resulting from the interconnection of each country's system with all the others need to be overcome by finding reliable solutions.

To this end, a unified and trustworthy framework must be ensured to give any citizen the possibility to access digital services without having to rely on the host state platforms, in safe and secure cyber-secure conditions. The aim is to increase the number of citizens living and working in other EU countries to use the internet and digital technology to interact with public administration in their home country (European Digital Identity (eID): Council adopts legal framework for a secure and reliable digital wallet for all Europeans, 26.03.2025 (European Council, 2024)).

2. LEGISLATIVE FRAMEWORK FOR ELECTRONIC IDENTIFICATION

2.1. Relevant European Regulations

Wanting to make the interconnection between Member States as strong as possible, the European Union has created the legislative framework to ensure the safe use of digital identification services, improve digital literacy and strengthen a digital economy.

EU Regulation 2019/1157 adopted in June 2019, covers the security of citizens' identity cards and residence permits of their family members.

Given the free movement of goods and persons, forged identity documents have been discovered, both during checks at the borders of the European Union and during unannounced checks within the Community. Nowadays, national ID documents vary in form from state to state, but at the same time, the level of security varies. For these reasons they can be forged more easily.

The European Union has decided to require specific elements and a standardized minimum level of security for identity and travel documents in order to eliminate fraud. In addition, storing biometric data (a facial image and two fingerprints) makes these documents much more secure. The biometric data used to personalize documents must be protected and kept until the date of collection, but no longer than 90 days. They will then be erased or destroyed.

This decision has been taken to protect both the security of the European Union and the national security of each Member State, with the aim of establishing a person's identity in good time. The new documents will be introduced gradually. Identity cards will be replaced by new ones in a maximum of 10 years, and residence permits in a maximum of 5 years. (Regulation (EU) 2019/1157, 2019).

Regulation (EU) 2024/1183 on the establishment of the European Digital Identity Framework adopted in April 2024 is also known as eIDAS 2.0. In fact, it amends Regulation (EU) 910/2014. The aim is to establish clear and concise rules on interoperability, security of electronic transactions, security of personal data and protection of digital identity against theft and fraudulent use.

eIDAS 2.0 foresees the implementation of the EU eID Wallet by all EU member countries within a maximum of two years after its adoption, i.e. by the end of 2026 (Regulation (EU) 2024/1183).

eIDAS 2.0 is a big step towards a digital single market.

The Digital Compass 2030: the European blueprint for the Digital Decade launched in March 2021, sets out four clear objectives to be achieved by 2030 for Europe's digital transformation.

These are:

➤ Digitally literate citizens and skilled IT professionals – by 2030, 80% of adults are expected to have basic digital skills to use online services safely, to protect themselves from cyber-attacks, misinformation or fraud. The expected number of ICT experts in 2030 is 20 million, preferably with a gender balance. The number of men is currently 4 times higher than that of women (DESI 2024 index).

➤ Sustainable, secure and high-performance digital infrastructure - the EU wants all households to benefit from 5G networks and gigabit connections by 2030, with 20% of the world's semiconductor and processor production in Europe.

➤ Digital business transformation – 75% of EU businesses are expected to use AI, Big Data or cloud services by 2030. SMEs 90% to be using a basic level of digital intensity.

➤ Digitization of public services – the aim is that by 2030, 80% of citizens will be using a digital identification solution, medical records will be available online for everyone, and digital services for citizens and businesses will be delivered entirely online. (Digital Compass, 2030).

The General Data Protection Regulation (GDPR) was adopted by the European Union in 2016 with the aim of creating a unitary legal framework for the processing of personal data, ensuring its protection and privacy. The GDPR is based on seven clear and concise principles, which if breached can attract administrative fines of up to €20 million or 4% of annual turnover. Personal data

are: name, surname, personal numerical code, home address, e-mail address or telephone number.

2.2. Relevant national regulations

Romania has complied with the requirements of the European Union and has transposed the directives on digital identity into national legislation.

The first piece of legislation is Emergency Ordinance no. 97/2005, which has undergone a series of subsequent amendments and additions, sets out how the national system of population registers operates and how identity cards are issued. The Romanian population register is kept both for those living in Romania and for those living abroad, according to domicile or declared residence. (GEO no. 97/2005 republished October 2011). Each inhabitant is assigned a personal number code (C.N.P.) which is unique and remains unchanged. It consists of 13 digits (Table 1.).

Table 1. How the C.N.P. is established

Personal numeric code						
S	AA	LL	ZZ	JJ	NNN	C

Source: Own processing

Note: S – represents the gender of the person (male/female);

AA – indicates the last two digits of the year of birth;

LL – is the month of birth (from 01 to 12);

ZZ – is the day of birth (from 01 to 31);

JJ – indicates the county code;

NNN – is a sequential number that distinguishes persons of the same sex, born in the same locality, on the same day;

C – is the check digit, its role is to identify possible errors in the composition of the C.N.P.

Ordinance No. 12/2023 - introduces provisions on the electronic ID card and the digital signature which will have the same value as a handwritten signature. In addition, it provides for the possibility of issuing the electronic ID card also to persons under 14 years of age, with different validity for each age category, only upon the request of the minor's legal representative. (Ordinance No 12/2023).

Law 214/2024 transposes the eIDAS Regulation on electronic identification into national law, ensuring security and trust in electronic transactions. It also provides for sanctions for providers, depending on the degree of violation of the law (administrative fines, temporary suspension of the right to issue qualified certificates, up to revocation of accreditation) (Law 214/2024).

General Data Protection Regulation (GDPR) has been implemented and takes effect in Romanian law since 2018.

3. DEFINITION AND FUNCTIONALITIES OF THE EUROPEAN DIGITAL IDENTITY CARD

3.1. What is the European digital identity card?

The electronic ID card is the European Digital Identity Wallet (EUDI Wallet). It is a tool for EU citizens and businesses to securely identify themselves online and offline.

The wallet gives citizens the possibility to access cross-border public and private services, manage their personal data, share information without disclosing additional data. For example, they can upload or remove civil status documents, diplomas, driving licenses, bank accounts, medical certificates or electronic signatures from their digital wallet. They can also see what information they have shared, with which provider and on what date. They can ask a provider to delete personal data from the database. Every citizen or resident has the right to a digital identity that gives them access to online services in a secure and controlled way. Each Member State must recognize and accept the electronic identification system issued by other Member States (eIDAS Regulation).

To gain the trust of the end-beneficiary and for this wallet to be used, it is necessary to ensure the security and confidentiality of the stored data.

3.2. Technical components and how the European identity card works

The EUDI Wallet has been designed as a highly secure instrument. The main technical components are:

- Secure authentication system. The citizen can authenticate using biometric identifiers, i.e. fingerprint or facial recognition. Or they can choose to use their PIN code. If fingerprint is chosen, a scanner is used. With facial recognition, a camera is used to identify facial features: the shape of the chin, cheekbones, nose or the distance between the eyes. The PIN is a four-digit password chosen at random by the beneficiary.

- Digital identity certificate. To obtain a digital identity certificate, the applicant is first physically identified, and then the electronic document is issued by a certified authority, linking the electronic identity to the user's real identity. Each certificate is unique and contains the following information: the name of the holder, the unique identification number, the name of the issuer, the associated public key, the validity period and the algorithm used. Certification Authorities are required to maintain a public register of both valid and revoked certificates.

- Secure storage of various documents: diplomas, certificates, permit, etc.

- A qualified electronic signature has the same value as a handwritten signature. To be valid, it must meet certain requirements such as: it must be generated using a token or smartcard and be based on a qualified digital certificate. Changes to a signed document cannot be made undetected. (CertSIGN – www.certsign.ro, Romanian Digitization Authority www.adr.gov.ro).

- Interoperability – is essential for the public administration systems of the European Union's Member States to be able to communicate quickly and efficiently with each other through the eIDAS nodes.

- Consent – the user decides to whom, if, when, to what extent and up to what date he/she shares the information in EUDI Wallet.

3.3. Romanian electronic identity card

The current Romanian ID card is a 1997 model, it has an outdated technology, the security conditions are outdated, and the security has decreased over time due to the use and emergence of other technologies, thus becoming easy to forge. Unfortunately, the rule on upgrading security features every five years has not been complied with. From this perspective, the European Union's initiative to introduce electronic ID cards with clearly defined specifications is welcome.

In Romania, the implementation of the CEI started on August 2, 2021 through a pilot project in Cluj-Napoca. Initially, an older generation chip model was used and the technical problems encountered led to a delay in nationwide implementation. In August 2022 the testing of the new chip will start, which is more powerful, has a higher storage capacity and a higher level of security, a dual interface, one for contact and one contactless. Thus, the IT infrastructure and the extended applications needed to be adapted to the new requirements (Ministry of Internal Affairs, 2021).

The electronic identity card (CEI) is funded by the National Recovery and Resilience Plan (PNRR) to the tune of €150 million. Romania has pledged that by June 30, 2026, 5 million CEI will be issued, and 11 public services will be integrated, but without mentioning which ones.

Now the issuing of CEI has been extended to the following counties: Brasov, Constanta, Iasi, Oradea, Ploiesti, Timisoara, Ilfov and Bucharest. The new electronic ID card will have to replace the current one until 31.08.2031.

3.4. Technical components and how the Romanian European ID card works

The electronic ID card looks like a bank card, and the following information is written on the physical format: name and surname of the holder, personal numeric code, date of birth, gender, nationality, date of issue and expiration date, holograph signature, Romanian and European Union flag, document serial number, document number, blank serial number.

The storage medium (chip) has all the data in the physical format plus the following:

- address of domicile/residence – this can be changed from the application if the holder changes his/her domicile/residence, no need to change the physical ID card;

- biometric data – the image of two fingerprints and a photograph of the face, which are secure and can only be accessed by the competent authorities;
- two classified digital certificates – one is used for authentication in IT systems, the second for electronic signature of documents;
- cryptographic mechanisms – data stored on the chip is protected by advanced encryption.

The Romanian authorities, wishing to make the CEI as secure as possible, have complied with EU requirements, but have also added other safety elements (Law No. 455 of July 18, 2001 (*republished*) on electronic signature). These are:

- special material – there are several layers of polycarbonate, only one is graded;
- special graphics, micro text and nanotechnology – the electronic ID card has lines from Eminescu's poems with deliberate mistakes written on it; these will change after a certain period of time, 4-5 years, the aim is to make it difficult to forge;
- special inks – change their hue depending on the light they are exposed to (natural or ultraviolet);
- multi-layer laser engraving – a certain layer of polycarbonate is burned, not the top one; on the top back, CEI has a portative engraved with the melody of the first two verses of the Romanian anthem;
- hologram – the holder's photo is superimposed with holograms that change appearance or color depending on the angle from which it is viewed;
- MRZ (Machine Readable Zone) code – is an internationally standardized machine-readable zone (Ministry of Home Affairs. 2025).
- CEI functionalities are the possibility of using it as a travel document, online authentication for private and public administration services (ghiseul.ro, SPV, anaf.ro), in the health system as a national health card (cnas.ro), remote document signing and apostille services.

4. OPORTUNITIES, RISKS AND CHALLENGES

Opportunities: The introduction of the CEI is an important step towards secure electronic authentication. Citizens can now identify themselves in public and private platforms using a single device at any time they want. Also, thanks to interoperability, they will be able to sign documents and access digital services in other EU Member States. Bureaucracy will be reduced, physical presence will no longer be necessary every time, saving time and resources.

The fact that the CEI has a built-in chip like biometric passports means it can also be used as a travel document.

The IEC benefits from enhanced security systems, which reduces the risk of forgery or identity fraud. At the same time, it also helps reduce

economic/banking fraud, as citizens have control over the personal data they share.

Risks: One of the risks associated with the CIS is ensuring the security of the large amount of personal and confidential data being handled. For this reason, data storage is limited for a strict time. To gain citizens' trust, it is necessary to put in place an IT infrastructure that can prevent and protect data from possible cyber-attacks, misuse or unauthorized access (Puterea.ro, 2025).

Another risk is digital exclusion due to limited access to technology in some areas of the country. The lack of connectivity and digital literacy means that a part of the population is unable to use the CEI, especially the elderly and people with disabilities (van der Hof, 2022).

Challenges: The resistance to change of part of the population is one of the biggest challenges. In the EU, 30% of Europeans are reluctant to use digital identity. That's why the Romanian authorities have decided to introduce a simple, chip-free card in addition to the electronic ID card. This card serves only as an ID card, not a travel document (no EU flag), with the same data inscribed on it as the CEI, plus the holder's home address.

Resistance to change is also found among civil servants as they think they may lose their jobs if everything is digitalized and their work is no longer needed.

Promoting digital inclusion, especially among people from disadvantaged groups, is essential to increase the use of public administration systems. Hard work, effort, commitment and investment are in vain if citizens are not convinced to use them.

The lack of unitary strategic planning has led each institution to develop its own IT system, and now solutions must be sought and found to interconnect them. It is very true that these systems were developed with funding from various EU programs, which had certain requirements in their specifications.

5. CASE STUDIES: ESTONIA, GERMANY, SPAIN, ROMANIA

In the European Union, the degree of implementation of the electronic ID card varies from country to country, depending on national legislation, digital infrastructure and citizens' trust.

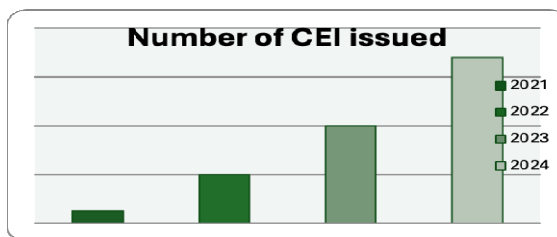
Estonia was the first country in the European Union to launch an electronic ID card (ID-kaart) in 2002. It is compulsory for all citizens and permanent residents. It is integrated into the X-Road platform, which is Estonia's national interoperability system. All secure data transfers between national digital systems are done through it (PublicTechnology.net, 2023). Another ingenious program is the e-Residency which allows investors from any corner of the world to set up and manage companies exclusively online. Through this opportunity Estonia has significantly increased revenues to the public budget, there are

currently over 118,000 e-Residents from over 170 countries (Republic of Estonia e-Residency, 2025).

The first electronic ID card issued (Personalausweis) in Germany was in 2010, with a chip, and as biometric data it contained only the facial image. From 2021, mandatory two fingerprints were introduced to increase document security and prevent forgery. From 2025, a different procedure will apply for photographs used in the production of CIS. These will either be submitted electronically from authorized photographers or will be taken at the population evidence centers. It is intended to eliminate the use of different programs for editing photos according to the owner's wishes. The facial image should not be distinct from the real one. (Bundesdruckerei Group, 2020).

In 2006 the electronic identity card (DNI) was also introduced in Spain, and in 2015 it was replaced by an improved version. To align with EU legislation, the strict requirements to be met, in 2021 the current upgraded version was implemented in compliance with the regulations. In April 2025, the MiDNI mobile application was launched, allowing the use of the DNI directly from the phone, without the need for the document in physical format. It is a compulsory document for all citizens from the age of 14. To issue or renew it, citizens must go in person to the National Police (Ministerio del Interior, 2025).

In Romania the project on the implementation of the electronic identity card (CEI) started in August 2021. From then until 31.12.2024 about 32500 electronic ID cards have been issued. The number has increased year on year, but not at the expected pace, as there were technical problems during testing, difficulties with external suppliers for certain components, and a public tender by the National Printing House was challenged (Figure 1). All of this has led to a postponement of the targets initially set. It should be noted that the CEI is currently only issued by the National Printing Office.



Source: authors own processing

Figure 1. Number of electronic identity cards issued

The Romanian authorities estimate that by 2025 they will be able to issue around 3350000 electronic ID cards. As of June 2, 2025, this document can also be issued to minors under 14 years of age, only at the request of the legal representative, but it has a different validity period depending on the age of the child.

Table 2. Degree of the IEC implementation

Country	IEC implementation	eIDAS interoperability	Current challenges
Estonia	Advanced	Complete	Developing new IT programs to maintain data security
Germany	Partial	Partial	Limited use and citizen distrust
Spain	Advanced	Complete	Increasing digital literacy in selected areas
Romania	In progress	In development	Technical difficulties, delayed implementation

Source: authors own processing

Estonia and Spain have made steady and effective progress in implementing the CIS. While Estonia is continuously looking for ways to protect and secure personal data, Spain is struggling with low levels of digital literacy in some parts of the country, especially in rural areas (Table 2).

The CEI in Germany has limited use, primarily due to a lack of information among citizens. They do not know exactly how to activate it, where and under which conditions they can use the electronic ID card. Lack of information is at the root of citizens' mistrust and reluctance, preferring direct communication with public officials. Unfortunately, Germany fails to take full advantage of the functionality of the CEI.

CEI in Romania is at the stage of a pilot project extended in several counties, it has been delayed for technical reasons. The opinion of the population is divided, some want to get the electronic ID card as soon as possible, others, on the contrary, and do not want to give up the current one. It remains to be investigated and analyzed the degree of implementation and use when the project will be fully operational nationwide.

The countries analyzed in this paper are at par for three functionalities of the CIS: personal data storage, biometric data and RFID chip, because they have complied with the EU requirements. For the other functionalities they have different levels of implementation.

6. RECOMMENDATIONS

The adoption of the electronic identity card is an important step for all EU states because it simplifies the relationship between the citizen and the public administration. The CEI was designed and created based on compliance with the strictest European standards in the field of security and protection of personal data. However, the degree of implementation varies greatly from one country to another depending on the infrastructure, the way public systems are interconnected, the laws adopted and the level of use by the population.

To increase the use of the electronic identity card and gain the trust of the end user, it is necessary for the state authorities to come up with a clear and concise information campaign on the role, benefits and functioning of the CEI. Any possible suspicion (e.g. fear of surveillance) must be eliminated through precise and transparent explanations.

Another recommendation is to organize digitalization courses, especially for civil servants, the elderly, those with disabilities or those belonging to disadvantaged categories, with a predilection for remote or rural areas of the country.

Increasing the degree on interoperability between institutions by adding as many public and private services as possible to the EUDI Wallet.

RoeID must be expanded more quickly at the national level, it is important that the entire population of the state can use the benefits of the CEI.

7. CONCLUSIONS

The purpose of our work is to analyze to what extent the electronic identity card and its implementation contribute to increasing and improving the quality and efficiency of services offered by the public administration to the end user. Another aspect researched is the technological functionality and the degree of acceptance of the CEI.

The research methodology is based on the European legislative framework, its transposition at the national level and the comparative analysis between Romania and other European states. The degree of legislative correlation is followed to see the progress made by Romania in the process of digitalizing public administration.

The results of our analysis show that, as a member state, Romania has transposed into domestic legislation the policies related to digitalization, EUDI Wallet, interoperability and personal data protection. In this approach, Romania considers the opportunities, benefits, but also the risks and challenges associated with the European electronic identity.

The research is limited by the low level of CEI implementation in Romania, the limited production capacity and the technical obstacles encountered during the pilot project.

Romania has made progress, but there is still much work to be done, digital gaps between different geographical areas and population categories persist, resistance to novelty and acceptance of innovation represent a major challenge.

Although Germany has one of the most secure electronic identity cards in the EU, it has a very low level of use, around 10%. The process of activating the card is quite complicated: the pin code gets lost in the park, reissuing is difficult and expensive, and the actual activation is cumbersome. The lack of information among the population is very high.

In Spain, the electronic identity card is implemented, but two versions are used (DNI3.0 and DNI 4.0), because several versions of digital signature certificates are used. In addition, it faces differences in the digitalization of the population in different areas.

Estonia is at another level; it has overcome all these stages and is now a leader in the implementation and use of digital identity. It is a model to follow. Now, its main concern is to ensure data security and protect the fundamental rights of citizens. It continuously monitors and searches for new techniques to deter and prevent possible cyber-attacks.

The implementation of the CEI is a complex, large-scale project with legal implications. Its success lies in the degree of acceptance and use by the population based on the guarantee of personal data protection. It is very important that it does not become a factor of social division.

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FROM SUPERVISION TO DIGITAL TRUST: REDESIGNING MANAGEMENT STYLES FOR THE HYBRID WORKFORCE

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Abstract

In the evolving landscape of hybrid and digitally mediated work, traditional models of supervision – centered on control, visibility, and proximity – are increasingly misaligned with the expectations and values of younger generations. Recent studies show that digital trust has become a central factor for engagement and retention in hybrid workplaces (Wang et al., 2023). This paper explores how Generation Z employees experience supervision in modern work environments and how managerial reliance on traditional oversight methods may hinder trust, motivation, and retention. Drawing on qualitative interviews with Generation Z employees and Generation X/Y managers, the study reveals a generational divide in perceptions of effective supervision. While many managers emphasize the need for direct monitoring to ensure accountability and productivity, younger employees interpret this approach as a lack of trust (Stiglbauer et al. 2022). For them, autonomy, flexibility, and purpose-driven work are key motivators, and excessive supervision is often perceived as intrusive and demotivating. The findings underscore the need to shift from supervision rooted in control to models based on trust, transparent expectations, and measurable outcomes. This includes redefining accountability frameworks, encouraging self-directed performance tracking, and fostering communication that emphasizes guidance over surveillance. Such models not only align with the intrinsic motivations of Generation Z but also support broader organizational goals related to innovation, agility, and employee engagement (Carnevale and Hatak 2020). This paper contributes to ongoing discussions about the future of management in digitally enabled organizations and offers practical recommendations for adapting leadership strategies to build trust without sacrificing accountability.

Keywords: *hybrid workforce; digital trust; generation z; leadership; employee autonomy*

JEL Classification: M12; M54; J24; O33.

1. INTRODUCTION

The rapid spread of hybrid and digitally mediated work environments has challenged traditional approaches to management. Supervision practices that relied on visibility, proximity, and direct control appear increasingly difficult to sustain when employees divide their time between physical and virtual spaces. At the same time, younger generations entering the workforce, particularly Generation Z, often articulate different expectations regarding autonomy, flexibility, and purpose in their work (Stiglbauer *et al.*, 2022).

This paper draws on a small-scale qualitative study to explore how supervision is perceived by managers from Generations X and Y compared with employees from Generation Z. Through interviews with 20 participants, the study offers an exploratory perspective on how differences in expectations may influence the relationship between supervision, trust, and motivation. While the findings cannot be generalized, they provide insights that contribute to ongoing discussions about management in digitally enabled organizations.

Preliminary results suggest that several interviewed managers continue to emphasize direct monitoring as a mechanism to ensure accountability. Some younger employees, however, interpret this approach as a lack of trust, describing it as intrusive or demotivating – an interpretation that echoes themes raised in prior studies on generational differences (Wang *et al.*, 2023). These observations point to the potential value of leadership models that balance accountability with trust, transparent communication, and measurable outcomes.

Research aims and contribution

This study seeks to explore how managers from Generations X and Y, and employees from Generation Z, experience supervision within hybrid workplaces. The aim is not to produce generalizable results but to generate exploratory insights into how generational differences may shape the meaning of supervision and trust. The paper contributes by highlighting potential areas of tension and adjustment in management practices, while also suggesting directions for further, larger-scale research.

2. LITERATURE REVIEW

The literature on supervision, trust, and generational differences provides an important background for interpreting the findings of this study. Existing research emphasizes that management practices developed in traditional, face-to-face contexts often struggle to adapt to hybrid and digitally enabled environments. At the same time, studies highlight that generational shifts in values and expectations may further complicate this transition (Stiglbauer *et al.*, 2022).

2.1. Supervision and control in traditional management

Classical management approaches positioned supervision as a tool for control and accountability, with managers expected to monitor performance closely to ensure compliance and productivity. This model was effective in environments where visibility and proximity were possible and often necessary. However, hybrid work settings limit physical oversight, requiring alternative mechanisms to sustain performance and accountability (Wang *et al.*, 2023).

2.2. Trust in hybrid and digital workplaces

Trust has been identified as a critical factor in remote and hybrid teams. Employees often interpret visible monitoring as a lack of trust, which can reduce motivation and weaken engagement. Scholars argue that digital trust – defined as confidence in colleagues, systems, and leadership in digitally mediated environments – has become central to sustaining performance in flexible work arrangements (Carnevale and Hatak 2020). Trust-based leadership emphasizes transparency, clear expectations, and empowerment rather than surveillance.

2.3. Generational perspectives on work and supervision

Generational theory suggests that different age cohorts bring distinct values and expectations into the workplace. For example, employees from Generations X and Y often adapted to management models emphasizing presence and accountability, while Generation Z tends to prioritize autonomy, flexibility, and meaningful work (Stiglbauer *et al.*, 2022). These differences can create tensions when managerial reliance on control is perceived by younger employees as restrictive or misaligned with their motivations. The literature also indicates that bridging these perspectives requires new approaches that balance accountability with empowerment.

2.4. Brief analysis of findings

The reviewed literature highlights persistent tensions between supervision rooted in control and emerging expectations for autonomy and trust in hybrid environments. While prior studies emphasize the importance of digital trust and generational differences (Carnevale and Hatak 2020; Stiglbauer *et al.*, 2022; Wang *et al.*, 2023), less is known about how these dynamics are experienced in practice across different generations in specific workplace contexts. This study addresses that gap through a small-scale qualitative exploration. The findings suggest that managers from Generations X and Y often associate accountability with visible monitoring, while Generation Z employees more frequently interpret supervision as a signal of mistrust. These insights, discussed in the following sections, illustrate the need to reconsider leadership practices in digitally mediated work settings.

3. METHODOLOGY

This study adopts a qualitative design in order to explore how supervision is experienced differently by managers from Generations X and Y and employees from Generation Z. The aim is not to produce generalizable conclusions but rather to capture insights and tendencies that can inform future research and practical discussions on leadership in hybrid environments.

3.1. Research design

A qualitative, exploratory design was selected as the most suitable approach for investigating perceptions and experiences of supervision. Such a design allows the researcher to capture how participants describe and interpret their own workplace realities. The study follows the principles of thematic analysis, which provides a systematic method for identifying, coding, and grouping recurring ideas into themes.

3.2. Data collection

Data were collected through semi-structured interviews with a total of 20 participants. The sample included 10 managers from Generations X and Y and 10 employees from Generation Z. Participants were recruited from diverse organizational contexts to allow for variation in experiences. Each interview lasted between 30 and 60 minutes and was conducted either face-to-face or online, depending on availability and participant preference. The interview guide focused on topics such as supervision practices, trust, motivation, and the role of digital tools in hybrid work.

3.3. Data analysis

The interviews were transcribed and analysed using thematic analysis. Initial coding was applied to identify key concepts mentioned by participants, such as supervision, autonomy, and trust. These codes were then grouped into broader categories and themes, which are presented in the findings section. The analysis emphasized patterns across the two groups of participants while remaining sensitive to individual variations. To enhance credibility, the coding process was reviewed multiple times and compared with relevant literature.

4. FINDINGS

The analysis of the 20 interviews revealed several recurring themes that highlight generational differences in how supervision is understood and experienced. While the sample is small and exploratory in nature, the patterns observed across participants offer useful insights into tensions between traditional approaches to supervision and the expectations of younger employees in hybrid environments.

4.1. Supervision and control

Several interviewed managers emphasized the need for direct monitoring as a way of ensuring accountability and productivity. This perspective reflected a continued reliance on visibility and presence. By contrast, many employees from Generation Z described such monitoring as excessive or intrusive, interpreting it as a signal of mistrust. One employee noted: *“When my manager constantly checks on me, it feels like they don’t believe I can handle my work independently.”*

4.2. Motivation and work values

Managers often associated motivation with discipline and accountability, expecting employees to demonstrate reliability through consistent presence and reporting. Employees, however, spoke more frequently about motivation in terms of autonomy, flexibility, and purpose. As one Generation Z participant explained: *“I’m motivated when I understand the bigger picture of why my work matters, not just when someone checks if I’m online.”*

4.3. Trust and technology

Trust emerged as a critical theme across both groups but was interpreted differently. Managers described trust as something that develops gradually through consistent oversight and reporting, while employees expected trust to be given upfront and strengthened through transparency and open communication. Technology played a mediating role: for managers, digital tools provided mechanisms to track performance, whereas employees valued these tools for enabling collaboration and self-management.

Table 1. Main themes identified from interviews with managers and employees

Theme	Managers (Gen X/Y) perspective	Employees (Gen Z) perspective
Supervision & Control	Several managers stressed direct monitoring as essential for accountability and productivity. <i>“If I don’t check in regularly, how can I be sure the work is actually getting done?”</i>	Many employees described supervision as excessive and interpreted it as a sign of mistrust. <i>“When my manager messages me every hour, it feels like they don’t trust me.”</i>
Motivation	Motivation is often linked to visibility of effort, measurable presence, and accountability. <i>“Accountability is what keeps people motivated; they know I am watching.”</i>	Motivation is described as driven by autonomy, flexibility, and purpose in tasks. <i>“I’m motivated when I’m given space to work in my own way, not when someone tracks me.”</i>

Theme	Managers (Gen X/Y) perspective	Employees (Gen Z) perspective
Trust	Trust is seen as conditional and built through ongoing oversight and regular reporting. <i>“Trust builds over time, after I’ve seen consistent performance.”</i>	Trust expected as the starting point, strengthened by transparent goals and open communication. <i>“Trust should be the starting point – otherwise it feels like I have to prove myself all the time.”</i>
Technology Use	Digital tools are used mainly to monitor work progress and outputs. <i>“We use the system to track who logs in and how many hours they spend online.”</i>	Digital tools valued when enabling collaboration, self-tracking, and flexibility. <i>“I like tools that help me track my progress, not tools that just track me.”</i>
Work Values	Emphasis on accountability and discipline to maintain productivity. <i>“Discipline and presence are the foundations of productivity.”</i>	Emphasis on meaningful work and balance between freedom and responsibility. <i>“Meaningful work matters more to me than just showing I’m online.”</i>

Source: author’s qualitative interview data (2025)

5. DISCUSSION

The findings of this exploratory study highlight tensions between traditional supervision practices and the expectations of younger employees in hybrid environments. While managers from Generations X and Y frequently described monitoring and visibility as central to accountability, Generation Z employees more often interpreted these same practices as intrusive and misaligned with their values. This suggests a generational shift in how supervision is understood, echoing earlier research on differences in work attitudes across cohorts (Stiglbauer *et al.*, 2022).

5.1. Generational perspectives and work values

Generational Theory proposes that formative experiences shape distinctive values and expectations in the workplace. The managers in this study, primarily from Generations X and Y, emphasized presence, discipline, and accountability, reflecting values consistent with earlier career models that linked supervision closely to control. By contrast, Generation Z employees described motivation in terms of autonomy, purpose, and flexibility, aligning with recent research suggesting that younger cohorts place greater importance on meaningful work and empowerment (Carnevale and Hatak, 2020). These differences may lead to

misinterpretations, where practices intended by managers as supportive oversight are perceived by employees as restrictive.

5.2. Motivation and Herzberg's Two-Factor Theory

The contrast between supervision as control and supervision as guidance can also be considered through Herzberg's Two-Factor Theory (Herzberg *et al.*, 1959). For managers, supervision appears tied to hygiene factors – structures that prevent failure but do not necessarily motivate. For employees, however, supervision intersects with motivators: autonomy, recognition, and meaningful work. Excessive oversight may therefore reduce motivation by undermining these drivers, whereas trust-based approaches may reinforce them.

5.3. Trust, social exchange, and digital tools

The findings also point to the importance of trust in shaping workplace relationships. Social Exchange Theory emphasizes reciprocity: when employees perceive trust, they are more likely to respond with commitment and effort. In contrast, when supervision is interpreted as mistrust, employees may disengage. Hybrid environments amplify these dynamics, as digital tools can function either as mechanisms of surveillance or as enablers of transparency and collaboration. This duality was reflected in the interviews, with managers often describing technology as a monitoring tool, while employees valued it as a means of self-management and cooperation.

5.4. Implications for leadership in hybrid work

Taken together, these insights suggest that leadership models in hybrid settings may need to shift from control-oriented supervision toward trust-based accountability. Such a shift would not eliminate the need for oversight but would reposition it within a framework that emphasizes clear expectations, outcome-focused measures, and guidance rather than surveillance. While the present study is limited in scope, its exploratory findings reinforce arguments in the literature that digital trust is central to sustaining motivation, innovation, and engagement in hybrid workplaces (Wang *et al.*, 2023).

6. CONCLUSIONS

This study explored how supervision is perceived by managers from Generations X and Y compared with employees from Generation Z in hybrid work environments. The findings indicate that while managers often associate accountability with visible monitoring, younger employees tend to interpret such practices as signals of mistrust. These differences underline the role of generational perspectives in shaping workplace experiences and highlight the tensions between control-oriented and trust-oriented models of supervision. Although the study is based on a small qualitative sample and cannot be

generalized, it offers exploratory insights that contribute to ongoing discussions about leadership and employee relations in digitally mediated organizations.

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INVISIBLE TALENT: RECOGNITION AND PROMOTION BIAS IN THE HYBRID WORKPLACE

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Abstract

The growing adoption of hybrid and remote work models has reshaped how employees contribute to organizational success, yet recognition and promotion practices have not evolved at the same pace. This paper investigates how reliance on physical presence as a marker of commitment and value disproportionately affects Generation Z employees, who increasingly prioritize results, autonomy, and digital efficiency over traditional visibility. Based on a qualitative study involving 20 in-depth interviews with Generation X and Y managers and Generation Z employees, the research reveals a persistent presence-based bias in how performance and promotability are assessed. While many managers associate physical attendance with loyalty, initiative, and readiness for advancement, younger employees report frustration at being overlooked despite delivering high-impact outcomes through flexible work methods. These findings point to a growing disconnect between generational values in the workplace and outdated recognition frameworks. The study argues for a shift toward outcome-based, transparent, and inclusive recognition systems that reflect the realities of contemporary work environments. By exposing how traditional evaluation norms may unintentionally disadvantage a new generation of workers, this paper contributes to the ongoing dialogue about managing generational diversity in the digital age and ensuring that recognition systems are both equitable and future ready.

Keywords: hybrid work; recognition; promotion bias; generation z; workplace visibility

JEL Classification: M12; M54; J24.

1. INTRODUCTION

The rapid adoption of hybrid and remote work has transformed how employees contribute to organizational outcomes. However, recognition and promotion practices continue to rely heavily on physical presence and visibility as markers of commitment. This creates a potential bias in how talent is

identified and rewarded, particularly in hybrid environments where contributions are not always visible in traditional ways.

1.1. Background and Context

Research has shown that visibility at work often influences career advancement and recognition, sometimes more than actual performance outcomes (Ng and Parry, 2021). For younger generations, especially Generation Z, this reliance on presence may conflict with their preference for autonomy, efficiency, and results-oriented work.

1.2. Aim of the Study

This article presents findings from a small-scale qualitative study of 20 interviews with Generation X and Y managers and Generation Z employees. The study provides exploratory insights into how presence-based recognition bias is experienced across generations. Managers tended to associate attendance with loyalty and promotability, while employees described frustration at being overlooked despite achieving meaningful results through digital and flexible work methods.

1.3. Contribution

While limited in scope, this study contributes to the discussion on generational differences in evaluation and advancement practices, and on the need to understand how recognition frameworks adapt, or fail to adapt, to hybrid contexts (Choudhury, 2022).

2. LITERATURE REVIEW

Recognition and promotion systems have long been studied in organizational research, but the shift to hybrid and remote work introduces fresh challenges, particularly around visibility and bias. The following subsections review research on recognition and promotion in organizations, the dynamics of visibility/proximity bias, and generational perspectives relevant to your topic.

2.1. Recognition and Promotion in Organizational Research

Recognition is broadly understood as acknowledgment of employee contributions, which can influence motivation, engagement, and performance (Yang *et al.*, 2022). In their study of 256 employees across leader–member dyads, Yang *et al.* found that recognition is positively associated with task performance and organizational citizenship behaviour, mediated by pride (Yang *et al.*, 2022). At the same time, fairness in recognition practices is critical – inequitable recognition or perceived bias undermines trust and may fuel dissatisfaction (Brun and Dugas, 2008).

In promotion studies, biases related to favouritism, information asymmetry, and connection effects have been documented. For instance, Bramoullé and

Huremović (2017) examine how promotion decisions may reflect both favouritism and informational advantages from connections. Their work underscores how subjective aspects and network ties can influence promotion beyond merit.

2.2. Visibility, Proximity Bias, and Recognition in Hybrid Work

One challenge in hybrid contexts is that “out of sight” often translates into “out of mind.” Proximity bias refers to favouring those who are physically present or close to leadership, regardless of actual performance (SHRM article, 2022). Many managers unconsciously overvalue in-office employees, affecting performance evaluations, development opportunities, and promotion decisions (Tsipursky, 2022).

The notion of visibility and “hypervisibility,” showing how employees may strive to be seen to be recognized, but such efforts can backfire or lead to distortions in how contribution is judged (Settles *et al.*, 2019). More recently, Mehrvarz *et al.* (2025) examine how remote knowledge workers engage in visibility practices – self-presentation, reporting, communication strategies – to counter invisibility (Mehrvarz *et al.*, 2025).

2.3. Generational Differences in Work Values and Recognition

Generational theory suggests that cohorts shaped by distinct socio-historical contexts hold different values and expectations in work. Generation Z, having grown up with digital tools and flexibility, tends to emphasize autonomy, efficiency, and outcomes over traditional markers of commitment like presence. In hybrid settings, this may bring them into conflict with legacy recognition systems.

Further, survey data shows that many hybrid or remote workers (especially younger ones) believe they have been overlooked for advancement because of their remote status (People Management, 2024) (People Management, 2024). Such perceptions reflect a disconnect between older managerial frameworks and contemporary workforce expectations.

3. METHODOLOGY

This study adopts a qualitative approach to explore how recognition and promotion are experienced differently by managers and employees in hybrid workplaces. The objective is not to generate generalizable findings but to capture insights into how presence-based evaluation frameworks may shape perceptions across generations.

3.1. Research Design

An exploratory qualitative design was chosen to capture the subjective experiences of both managers and employees. Semi-structured interviews were conducted, allowing participants to describe their views on recognition,

promotion, and workplace visibility in their own words. This design supports the identification of themes and tensions that may not be easily captured through quantitative methods.

3.2. Data Collection

A total of 20 interviews were carried out, including 10 managers from Generations X and Y and 10 employees from Generation Z. Participants were recruited from diverse organizational settings to ensure variation in perspectives. Each interview lasted between 30 and 60 minutes and was conducted either face-to-face or online, depending on availability and participant preference. The interview guide included questions about recognition practices, promotion experiences, and perceptions of fairness in hybrid work.

3.3. Data Analysis

The interviews were transcribed and analysed thematically. Initial codes were generated to capture recurring concepts such as presence, visibility, bias, trust, and outcomes. These codes were then grouped into broader themes, which form the basis of the findings presented in the next section. To enhance credibility, the analysis was cross-checked against the existing literature on recognition, visibility, and generational differences.

4. FINDINGS

The thematic analysis of the 20 interviews revealed recurring patterns that illustrate how recognition and promotion are shaped by presence-based bias in hybrid workplaces. Although the findings are exploratory, they highlight consistent differences between managers' and employees' perspectives.

4.1. Presence as a Marker of Commitment

Several managers emphasized physical presence as an indicator of loyalty and promotability. For them, attendance was linked with initiative and readiness for advancement. By contrast, many employees – particularly from Generation Z – felt that presence was overvalued compared with actual outcomes. As one participant explained: “I deliver results, but if I’m not in the office, it feels like my work doesn’t count as much.”

4.2. Recognition and Frustration among Younger Employees

While managers often described visibility as proof of reliability, younger employees expressed frustration at being overlooked despite high performance. A Generation Z employee noted: “It’s demotivating when showing up matters more than what you actually achieve.” This reflects a disconnect between performance outcomes and the criteria used for recognition and promotion.

4.3. Generational Differences in Expectations

Generational contrasts were evident in how recognition was understood. Managers, largely from Generations X and Y, tended to equate recognition with demonstrated loyalty through attendance. Employees from Generation Z described recognition as acknowledgment of results, creativity, and efficiency, regardless of where the work was performed.

Table 1. Main themes identified from interviews on recognition and promotion

Theme	Managers (Gen X/Y)	Employees (Gen Z)
Presence as commitment	Attendance signals loyalty and promotability. <i>“Being in the office shows me who is really committed to the organization.”</i>	Presence overvalued; outcomes overlooked. <i>“I deliver results, but if I’m not in the office, it feels like my work doesn’t count as much.”</i>
Recognition	Visibility is seen as proof of reliability. <i>“It’s easier to recognize those I see working hard in front of me every day.”</i>	Recognition expected for results, creativity, and efficiency. <i>“It’s demotivating when showing up matters more than what you actually achieve.”</i>
Promotion criteria	Linked to initiative and discipline, shown through presence. <i>“It’s demotivating when showing up matters more than what you actually achieve.”</i>	Promotion should reflect impact, not attendance. <i>“Promotion should be about the impact you make, not about being seen at a desk.”</i>
Emotional response	Presence reinforces fairness and accountability. <i>“When people are present, it feels fair to reward them because they demonstrate effort.”</i>	Frustration at being overlooked despite delivering strong results. <i>“It’s frustrating to be overlooked just because I’m not physically there all the time.”</i>

Source: Author’s qualitative interview data (2025)

5. CONCLUSIONS

This study explored how recognition and promotion are understood across generations in hybrid work environments. The findings suggest that managers from Generations X and Y often equate physical presence with commitment and promotability, while Generation Z employees emphasize outcomes, creativity, and efficiency. This presence-based bias was perceived by younger employees as a source of frustration and as a barrier to fair recognition.

Although limited in scope, with only 20 qualitative interviews, the study offers exploratory insights into how traditional recognition frameworks may be

misaligned with the expectations of digitally fluent employees. By documenting these generational contrasts, the paper contributes to the broader discussion of evaluation and advancement practices in hybrid workplaces.

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SMART WORKING UNDER THE MAGNIFYING GLASS. SMART WORKERS AND ORGANISATION OF LABOUR

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Abstract

Smart working has become one of the most used words in the organisations and research in the last years. The pandemic of COVID 19 had brin into attention the necessity to adapt the work environment to become more flexible and resilient, given to the employees and employers the opportunity to change the traditional work models into more innovative ones. Under the magnifying glass, smart working reveals its multifaceted impact on individuals, organizations, and society. The main aim of our study is to explore how smart working change the work organisation, analysing the employee's engagement and connection during crises times. Furthermore, the interview process facilitated the exploration of specific nuances and contextual factors that might influence the phenomena under investigation. The findings indicate that on an individual level, it fosters a healthier work-life balance, empowering employees to better manage their time and responsibilities. The elimination of commuting time contributes to reduced stress and increased job satisfaction. However, the blurred lines between work and personal life require careful navigation to prevent burnout and maintain mental well-being. For organizations, smart working presents an opportunity to tap into a global talent pool, breaking down geographical barriers and promoting diversity. Societal implications of smart working include reduced traffic congestion, lower carbon emissions, and a potential shift in urban planning dynamics. However, concerns regarding the digital divide, as not everyone has equal access to technology and a conducive work environment, need to be addressed to ensure inclusivity. The magnifying

glass reveals a landscape where adaptability, communication, and technology converge to shape a new era in the way we approach and perceive work.

Keywords: *smart working; out-of-office work; employee engagement; flexible work; productivity*

JEL Classification: J81; M54; M12.

1. INTRODUCTION

Remote working has become increasingly popular with the advancement of technology and therefore the multitude of remote working tools. This includes both advantages such as savings through reduced travel costs, flexible working hours and greater productivity, and disadvantages such as social isolation, more frequent arguments with partners or lack of distinction between personal and professional life. Recent years have brought the phenomenon of smart working back to the attention of workers and employers alike, largely due to the outbreak of the COVID-19 pandemic, testing the capacity of organisations to respond to the challenges. The period between 1999 and 2019, according to a study by the CIPD (2020) marked an increase in the percentage of jobs where people work from home to 80%, with one in 20 jobs involving working from home, or 1.8 million people (5.3%) opting to work from home.

At EU level, according to a study by the Joint Research Center (2020), the teleworker rate has grown slowly from 2009 to 2019. The workers most likely to choose this way of working were the self-employed. In 2019, 36% of them worked sometimes or usually from home, compared to 30% in 2009. Among dependent workers, it increased from 7.5% in 2009 to 11% in 2019. After the outbreak of the pandemic, the share of dependent workers working from home increased to 19% in 2020 and to 22% in 2021, with a marked increase among employees who usually work from home (Eurofound, 2022). In terms of the share of employees who worked from home before and after the pandemic, according to a study based on data collected from the EU Labour Force Survey for 8 countries between 2011 and 2019, there are important differences in working from home by industry and occupation. Education and ICT industries have seen the highest increases, while manufacturing, mining, and construction industries have the lowest (Jerbashian and Vilalta-Bulfi, 2022).

The main aim of our study is to explore how smart working change the work organisation, analysing the employee's engagement and connection during crises times. Furthermore, the interview process facilitated the exploration of specific nuances and contextual factors that might influence the phenomena under investigation. This paper is divided into five parts as follows: introduction, where general aspects related to smart work will be presented, theoretical background part which will include theoretical aspects on smart work and its other forms, methodology where the method of work approached in the analysis of keywords and the two co-occurrence maps of keywords will be presented.

The discussion part will include a presentation of the two maps and an overview of the disadvantages and benefits of opting for smart work.

2. THEORETICAL BACKGROUND

If before the pandemic the use of technology in the workplace was not so widespread, the pandemic led to a paradigm shift in terms of its usefulness, becoming during the pandemic crisis the basic infrastructure that supported the conduct of daily activities. At the same time, this acceleration of digitization led to another issue of ensuring equitable and inclusive access for citizens (Pan *et al.*, 2022). The pandemic has provided an opportunity to reinvent cities and the way they are seen, and with cities and the way the labour market will be reorganised, with remote working becoming increasingly accessible (Florida *et al.*, 2021).

The term telework was first conceptualised in 1976 by Nilles (1976). Since then and to date, its meaning has encompassed various meanings through the eyes of researchers, but all of them have one thing at their core, and that is the performance of work in a place other than the traditional office, using information technology. In what follows, we will briefly review some definitions for the term smart working and by default for the other varieties of the term.

Thompson and Vivien (1998) define telecommuting as a way of working in which employees choose to work from home rather than from the office, maintaining contact with the organisation via telephones, faxes or computer modems. Whether we're talking about smart working, teleworking, flexible working or agile working, we're really talking about the same thing. In the absence of a consensus in the literature on smart work, we find several definitions and meanings for the same concept (Cuel *et al.*, 2021). However, between these concepts we find differences, such that telework is the activity that involves working in a place other than the office space, where there is the possibility to connect to platforms that facilitate communication. Flexible working, on the other hand, refers to the flexibility to choose hours or locations. Flexible working thus encompasses teleworking. Agile working, on the other hand, refers to the adoption by the organisation of more practices to optimise work and to put more emphasis on the proactive side of work. Smart working refers to the design of work, considering the efficiency and effectiveness of activities that can be achieved by combining flexibility, autonomy and an optimization of work tools (Cuel *et al.*, 2021). Smart working is seen as a holistic approach to what is meant by the concept of remote working, which places greater emphasis on employee flexibility, empowerment and the creation of trust-based relationships (Errichiolo and Pianese, 2019). Another definition offered by Angelici and Profeta (2020) describes smart work as a flexible form of work that requires the ability to adapt quickly to different unforeseen situations. In this context, smart workers, carry out their work according to a personalised schedule, outside the office space.

The International Labour Organisation (2020) also provides several definitions of telework, telecommuting and work from home. In their understanding, telework refers to a situation where work is carried out in an alternative location to the default location, where workers use ICT to carry out their work. Telework, on the other hand, can also be carried out outside the default workplace in the same way as telework. Homeworking involves carrying out activities at the employee's home.

For a worker to become a smart worker, an essential condition to be considered is the extent to which the work they do can be carried out remotely using the technology available to them. Eurofound (2022) identifies three main categories of the type of tasks to which a worker may be exposed and the extent to which they can be carried out from home, as follows: tasks involving information processing do not require a physical presence in the office and can therefore be carried out remotely, and tasks involving social interaction can be carried out remotely, but there may be a loss of quality of performance. Finally, physical tasks that cannot be performed remotely, which eliminates the possibility that occupations that involve performing them can be done remotely (Sosterero, 2020).

3. METHODOLOGY AND RESULTS

The present research is qualitative, based on a thorough analysis of the literature on smart working, using mainly databases such as Web of Science or Scopus.

For the bibliometric map of keyword co-occurrence, we used the Web of Science database. The main reason for choosing this database was its reputation for quality of publications. We conducted two bibliometric analyses, one for the period 2015-2019 which are the pre-pandemic years and 2020-2024, post-pandemic. The key words searched by were "smart working" AND "public administration", the type of documents selected were articles, proceeding paper, review article, editorial material and book chapter, the language selected was English. For the years 2015-2019, our search returned 127 articles, and for the period 2020-2024 the search returned 161 articles. The next step was to export the complete records from WoS into VOSviewer compatible format. VOSviewer is a software tool, intended to help in the creation of maps based on network data. In the map view, the map components are represented by a label and a circle. The size of the circle and label denotes the weight of that element, and the higher the weight of that element, the larger its label and circle will be (van Eck and Waltman, 2023). The type of analysis selected was co-occurrence, the unit of analysis was represented by the keywords, and the counting method was full count.

The results obtained materialized in the map in Figure 1 for the period 2015-2019 and the map in Figure 2 for the period 2020-2024, respectively.

4. DISCUSSIONS

We therefore observe that the co-occurrence map from the pre-pandemic period contains keywords that indicate a greater inclination towards the smart cities side and its development. In this map, the public administration sphere has e-government as its main term, which in turn has links with *bureaucracy*, *e-services* or *policy* which are represented by the purple cluster. The yellow cluster has predominantly terms related to human resources, public sector performance management and job satisfaction. The third cluster containing keywords related to public administration is the red cluster, containing terms such as *telework*, *collaboration*, *smart government* and *innovation*. The fourth cluster focuses on smart cities and their sustainable development.

The co-occurrence map for 2020-2024 shows a greater concentration of terms on issues related to the sustainable development side of a smart city. As with the 2015-2019 map, the main keyword is the *smart city* concept, which is to be expected as smart working is part of the smart city. While the pre-pandemic map had the keyword *telework* present, the post-pandemic period marks a change in perspective in the literature, with the concept of *smart working* present. We can see that it is part of the yellow cluster, together with terms such as *job satisfaction*, *time*, *stress*, *health*, *management*, *digital transformation* and *knowledge*, being a cluster that better encompasses the components of smart working, compared to the pre-pandemic map. Another observation that needs to be made is that in the post-pandemic period we find terms such as stress or health that may indicate the negative effects of smart working on health.

4.1. Smart working in public administrations. Well-being, autonomy and communication

According to authors Radu and Voda (2023), the pandemic has contributed to a digital acceleration in several industries, which has contributed to a change in the attitude of local public managers towards technology, making them more confident in its ability to support the activities they undertake and respond to the challenges they face. Pandemic and by implication the momentum with which pandemic has evolved in recent years have been the most important external factors that have contributed to the diminishing resistance on the part of managers to adopting the smart working model (Williamson *et al.*, 2020), and Mele *et al.* (2022) suggest that teleworking will become a staple in public administrations, with policy makers needing to focus on integrating teleworkers into the office environment and promoting better socialisation between colleagues.

At the level of public institutions, considerable efforts should be made to be able to reduce this deep-rooted bureaucratic culture, which prevents new solutions or intelligent ways of working, adapted to the changes brought about by technology (Palumbo *et al.*, 2022). When we talk about smart working in

public administration, in Romania this is more difficult to do. According to a study carried out by Moldovan *et al.* (2022) in the framework of a project that studied the phenomenon of smart working in five European Union countries, due to the lack of provisions and regulations, this type of work is difficult to achieve. But in the context of the COVID-19 pandemic, the authorities, like many other entities, were obliged to adopt measures to be as close as possible to their citizens, so e-government measures were implemented.

Before the pandemic, following a questionnaire to civil servants, 85.7% of survey respondents said they worked less than 25% of their time at home and only 7.1% of respondents more than 25% of their time at work. The pandemic has changed the perceptions of civil servants so that 20% of respondents said they would work between 50-75% of their work from home and only 6.7% said they would like to work more than 75% of their working time from home. Although civil servants' perception of smart working has changed, it is difficult to practice due to a lack of adequate infrastructure and activities that could be done from home. Moving from traditional to smart working in public administration may not always be a solution to bureaucratic inefficiency, Hur *et al.* (2019) conclude. At the root of this bureaucratic inefficiency are various forms of psychological, cognitive, technological or political inertia, which have led to a reinforcement of the need to communicate face-to-face rather than via videoconferencing platforms. This need to communicate face-to-face with colleagues comes as a result of social isolation and is also perceived as a restriction of smart work (Eom *et al.*, 2016). An interesting study undertaken by Boulet and Parent-Lamarche (2022) reveals that there is a positive association between teleworking and well-being, but this association disappears when the sector is introduced. Thus, workers in the public sector have a higher level of well-being compared to those working in health or social services. Telework in the pandemic, although imposed, has contributed to influence in a positive way the professional autonomy of workers and favoured the creation of a work-life balance, but at the same time it has negatively influenced collaboration between colleagues (Giauque *et al.*, 2022).

4.2. Consequences of smart working

If we look at the concept from the perspective of the disadvantages of smart work, these are found on many levels of life, many of them exacerbated by the pandemic period. The pandemic crisis has brought to light research that the concept of smart working is not as smart as it was once thought to be, with workers experiencing the less pleasant side of smart working. The lack of boundaries between personal and professional life has led to an "always on" style (Risi and Pronzato, 2021). According to a study by Medina *et al.* (2021), there is a positive relationship between work-family and burnout, and the impact

of this relationship was manifested in higher burnout but telework overload did not influence the relationship between work-family conflict and burnout.

Todisco *et al.* (2022) also examined the benefits and pitfalls that arose as a result of implementing smart working after the outbreak of the COVID-19 pandemic. They stressed the importance of communication and that it is less stimulating when it is done solely through technology, and that practicing smart working can lead to the blurring of boundaries between personal and professional life, increased stress levels and reduced well-being. Another important aspect highlighted by Todisco *et al.* (2022) is that smart working can lead to increased family conflicts. Along the same lines is de Vries *et al.* (2019) who demonstrated that teleworking led to less professional isolation and organisational commitment from employees. These negative effects could be mitigated if relationships based on mutual trust or a sense of appreciation coming from the supervisor are developed between the leader and the team member. In this way, each party offers something they feel is valuable to the other (Graen and Uhl-Bien, 1995). In terms of colleagues' attitudes towards teleworkers, the study by Mele *et al.* (2022) shows that gender and age are factors influencing these attitudes, with men being less opposed than women, along with those in the under 35 and over 60 age groups. Whereas men are the least opposed to carrying out work at home, a study by Eurofound and Labour International Office (2017) shows that they are also the most likely to opt for smart work, but are less consistent than women, with women carrying out work at home much more regularly than men.

In addition to the disadvantages mentioned above, this way of working has a number of benefits both for the individual and the organisation. Among the advantages we can mention a reduction in commuting hours, a much greater autonomy in terms of work deployment which in turn leads to a much greater flexibility in terms of scheduling, higher productivity, a much better work-life balance (Eurofound and ILO, 2017) or more free time (Angelici and Profeta, 2020). There is a direct relationship between work engagement, i.e. job satisfaction, and the worker's positive attitude towards smart working, with work engagement mediating the relationship between positive attitude and job satisfaction. Positive attitude towards smart work had significant influences on work engagement and life satisfaction (Zammitti *et al.*, 2020). Thus, high engagement at work can lead to increased life satisfaction as well as job performance and decreased potential health problems (Shimazu *et al.*, 2015; Hakanen and Schaufeli, 2012). In maintaining employee engagement, an important role is played by the organizational support that employers provide to their teleworkers. Organizational support provided by the manager also leads to increased individual well-being, performance, job satisfaction and thus decreased psychological stress caused by the social isolation assumed by telework (Bentley *et al.*, 2016).

Martin *et al.* (2022) conducted a comparative study to determine whether workers' use of digital communication tools affects work productivity, satisfaction or stress. The study focused on the period before and after the end of 2020, and their findings show that the group that included employees with a master's degree or higher who used these digital tools daily or weekly experienced an increase in productivity and a decrease in job satisfaction, with one of the causes being a lack of social interaction. On the other hand, participants who experienced pressure and stress due to increased use of digital tools reported significantly lower efficiency and job satisfaction compared to the group listed above. In an experiment conducted by Angelici and Profeta (2020) they found that smart workers were much more productive than those who chose to work in the traditional method, they also had a better social life, had greater concentration power but also felt less stressed and tired.

Increasingly significant technological advances in recent years have become one of the key components in making work smarter as cities become smarter. In terms of sustainability and caring for future generations, the concept of smart working could be a help in decreasing pollution and greenhouse gas emissions or traffic congestion (Hopkins and McKay, 2019).

5. CONCLUSIONS

As we have seen during the paper, the last few years have seen developments in the concept of smart working, due to ICT developments, but also due to a less happy context, the COVID-19 pandemic, which forced a reorganisation of the way of working in order not to spread the virus. To be able to see what the changes have been in the literature regarding teleworking/smart working, we made a co-occurrence map of keywords for the periods 2015-2019 and 2020–2024, and the results showed a paradigm shift about this concept. While in the pre-pandemic map the focus was on the notion of telework, the post-pandemic period changes this and brings us into the analysis keywords such as smart working, stress, and health, but also more terms from the semantic field of sustainable development, which indicates that the literature dealing with the study of smart work/telework puts more emphasis on the smart side of work as an integral part of a smart city. This evolution of the concept from telework to smart work may also be due to the increasing focus on smart cities, and work is also an integral part of smart city.

On the other hand, in terms of the advantages and disadvantages of opting for this type of work, we could see that opinions in the literature are divided. It is not possible to make a comparison as to whether smart work is better or worse compared to traditional work, but we can conclude that the experiences of each individual worker are unique, and several factors, such as the infrastructure provided, the relationship between manager and employee, how effective the communication between the two is, and how effective it is with other colleagues

in the organisation, need to be taken into account. One of the most discussed disadvantages of smart working is the disappearance of the boundary between personal and professional life, so it is imperative to consider measures to reduce technostress and give workers the right to disconnect.

The present study has several limitations. Firstly, the Web of Science database search was conducted only based on the concept of smart working, without including the other terms that the concept of smart working has, such as teleworking, which limited our search area. The reasoning behind the decision not to include other keywords in our search is that we wanted to observe how this concept has evolved, as it is closely related to the concept of smart city, which has evolved a lot in recent years. Secondly, only the Web of Science database was considered, not the Scopus database, which leads to the non-inclusion of certain concepts in our analysis. Regarding the literature review in the field, the authors of the study hope that in the future they will be able to conduct a more systematic and comprehensive literature review on the given topic, considering high ranking peer-reviewed articles.

In a future study, for a clearer picture of the smart working phenomenon, a search for more keywords and an extension of the analysis over a period of several years should be carried out. Another aspect that could be further explored is how smart working could contribute to increasing employment, especially among young people, where there are problems of high youth unemployment in the EU.

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FISCAL DECENTRALIZATION AND THE DEVELOPMENT OF THE DIGITAL ECONOMY

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Abstract

This paper provides insight into how fiscal decentralization supports the growth of the digital economy, highlighting how decentralized fiscal frameworks and the autonomy of local governments enable responsiveness to technological advancements, promote innovation, and foster public-private partnerships. The research methodology aligns with the paper's objectives and employs qualitative research, including descriptive analysis and an exploratory literature review on fiscal decentralization and the digital economy. By providing an understanding of this dynamic, the paper contributes to the literature that investigates local government fiscal performance.

Keywords: *fiscal decentralization; digital economy; sustainable development; public-private partnership*

JEL Classification: H7; H83.

1. INTRODUCTION

Fiscal decentralization has emerged as an effective governance strategy for reshaping the role of local governments, grounded in the principles of autonomy and subsidiarity. The stage of society, known as a knowledge society, is characterized by the advancement of the digital economy. Delegating fiscal powers and duties from the central government to subnational governments enables more adaptable, locally specific responses to economic challenges, especially as the digital economy gains prominence in society and is the future. The swift expansion of digital technologies has reshaped global economic, social,

and governance frameworks, and local governments should adapt their strategies, being target-oriented toward the development of a digital economy using all instruments, like public-private partnerships. Based on digital technologies, there is an increase in productivity, stimulating innovation, and opening new markets. In this context, local governments can be creative and innovative.

This paper offers insight into how fiscal decentralization supports the growth of the digital economy by being a partner in fostering innovation, research and development, enhancing public-private collaborations, and supporting all components of sustainable development (social, environmental, and economic). The digital economy can also serve as leverage for maintaining local government autonomy.

The paper is organized as follows: Section 2 provides a literature review on fiscal decentralization, local governments' competencies, and the digital economy. Section 3 presents the methodology, Section 4 discusses the results, and Section 5 presents the principal conclusions of the study.

2. LITERATURE REVIEW

Research on fiscal decentralization emphasizes its effects on the efficiency, responsiveness, and fairness of subnational governance. Peterson (1995) argues that local governments should be responsible for developmental policies because local developments must be designed and implemented according to their own specific characteristics. Oates (1972) formulated the decentralization theorem, suggesting that decentralization enhances allocative efficiency by aligning public services with local preferences. This is based on the fact that local governments are closer to residents and better understand their needs and preferences compared to the central government, which is more distant. In this context, fiscal decentralization increases resource allocation efficiency and improves local performance. (Oates, 1972, 1993; Tiebout, 1956; Ezcurra and Pascual, 2008). In the era of a rapidly evolving digital economy, researchers and practitioners have noted that decentralized public systems can better adapt to swiftly changing technological environments (Shah, 2004; Martínez-Vázquez and McNab, 2003). Fiscal decentralization in European Union countries refers to the delegation of budgetary and fiscal responsibilities from the central government to local governments, allowing them to have greater control over their revenue and expenditures.

The digital economy literature emphasizes the importance of supportive policy environments in promoting innovation and entrepreneurship (OECD, 2019). Local governments in the EU, enabled by fiscal decentralization, can offer customized tax incentives and infrastructure investments. Additionally, through administrative decentralization, they can create regulatory frameworks that foster digital transformation. (Rodríguez-Pose and Gill, 2005). Nowadays, the digital economy is an evolving economic model that plays a crucial role in

promoting green innovation through externalities and economies (Qiu, Liu, and Wu, 2023). Fiscal decentralization plays a crucial role in shaping strategic decisions for providing economic incentives and investments in economic development. (Zhao, Shao and Ye, 2022; Liu *et al.*, 2024).

However, the risks of fiscal fragmentation and regional inequality remain salient (Bird and Vaillancourt, 2006). This duality, opportunity versus inequality, frames the core debate: whether fiscal decentralization can serve as an enabler of digital innovation while ensuring equity across regions.

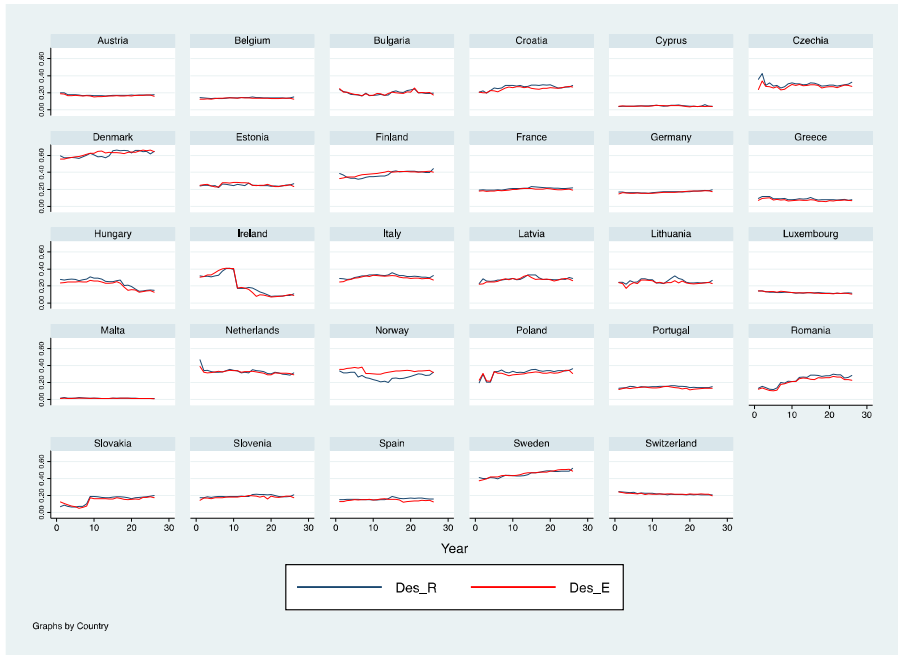
3. METHODOLOGY

The research methodology aligns with the paper's objectives and employs qualitative research, including a descriptive analysis of the dynamic relationship between fiscal decentralization and the digital economy. Quantitatively, it draws upon cross-country datasets, such as the Eurostat (European Commission, 2025a), World Bank database (World Bank, 2025), the Digital Trust Index (2025), and the Digital Economy and Society Index Dashboard (European Commission, 2025b), to understand the status of the significant indicators regarding fiscal decentralization and digital economy performance. The indicators considered include revenue decentralization, expenditure decentralization, the Digital Economy and Society Index (DESI), and the Digital Trust Index, among others.

4. ANALYSIS

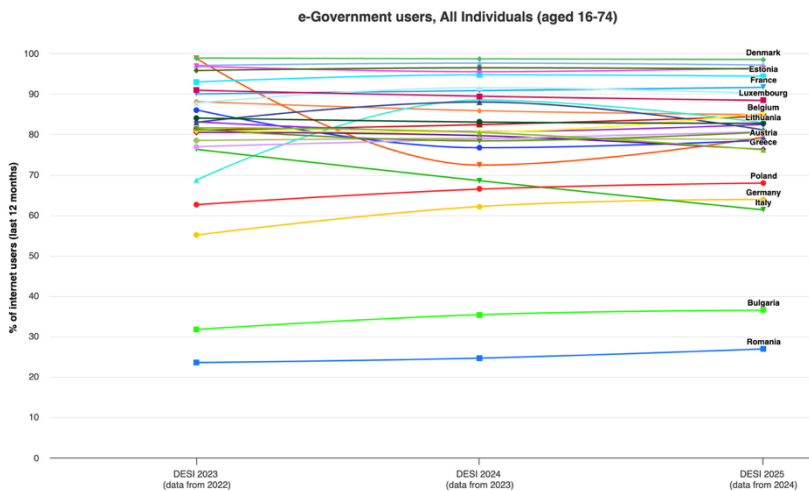
The fiscal decentralization status of European Union countries is defined by a few key indicators, with the primary ones being expenditure decentralization (the proportion of local public expenditure in total government expenditure) and revenue decentralization (the proportion of local public revenue in total government revenue).

According to Figure 1, Denmark is the most decentralized country, and it is also the most digitally advanced in public services (Figure 2). In general, Scandinavian countries, which are members of the European Union, have a high level of fiscal decentralization and a high level of digitalization in public services (Figure 3) based on the Digital Economy and Society Index (DESI) as a crucial indicator in shaping and guiding Europe's digital transformation. By integrating digital tools and data-driven decision-making, the public sector becomes more agile and responsive to society's needs, and one of the most important roles is at the local level. The digitalization of public services therefore acts as a bridge between citizens, businesses, and government, promoting a more connected, inclusive, and competitive digital economy.



Source: computed by authors using Stata 14.2, based on the EUROSTAT database (European Commission, 2025a)

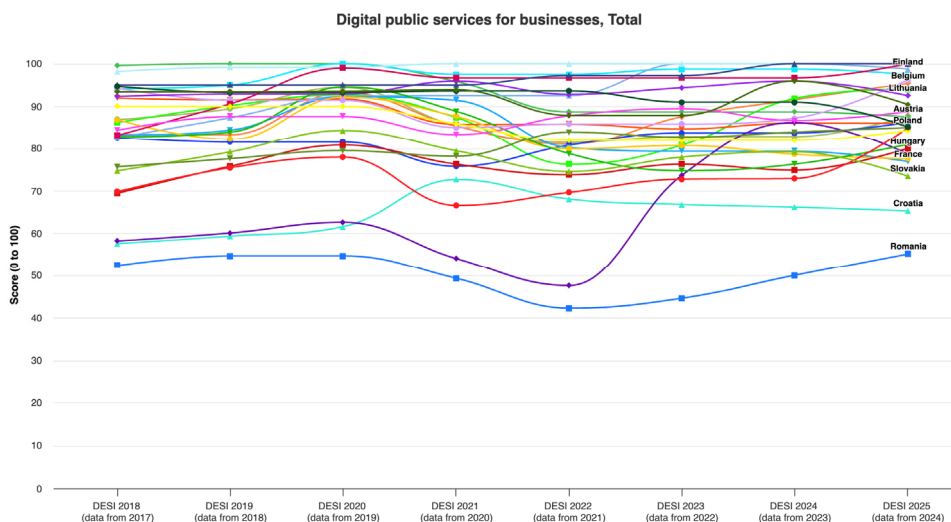
Figure 1. Status of Fiscal Decentralization in the European Countries



Source: The Digital Economy and Society Index (DESI) Dashboard (European Commission, 2025b)

Figure 2. DESI Index – e-Government users in the EU

Estonia presents a unique case, where local governments have worked with the central government to support e-governance infrastructure. Fiscal flexibility enabled municipalities to co-finance digital platforms, boosting Estonia’s reputation as a leader in digital governance.

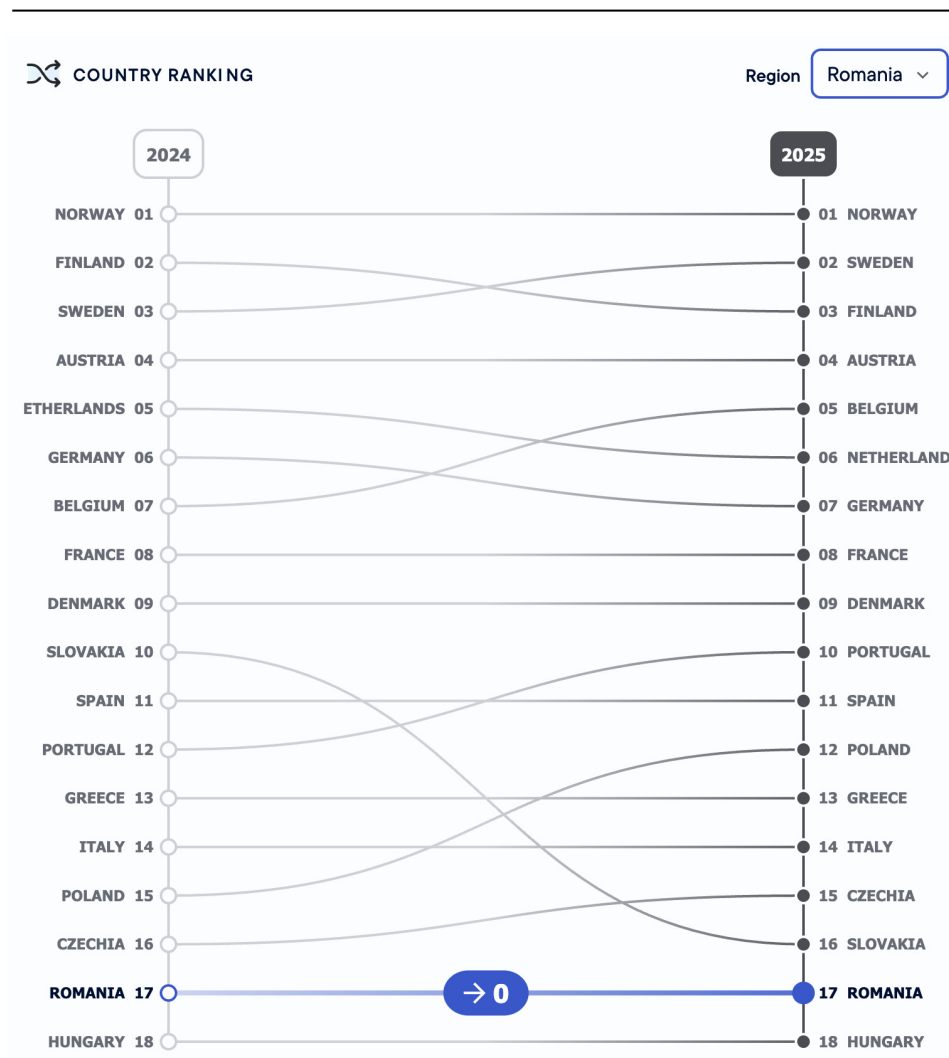


Source: The Digital Economy and Society Index (DESI) Dashboard (European Commission, 2025b)

Figure 3. DESI Index – Digital public services for businesses in the EU

Preliminary analysis and correlation suggest a positive correlation between higher levels of fiscal decentralization and indicators of digital economy performance. Countries with greater local control over revenues and expenditures tend to exhibit higher rates of digital public services.

The Digital Trust Index (2025) serves as a benchmark for evaluating the trustworthiness and inclusivity of European websites.

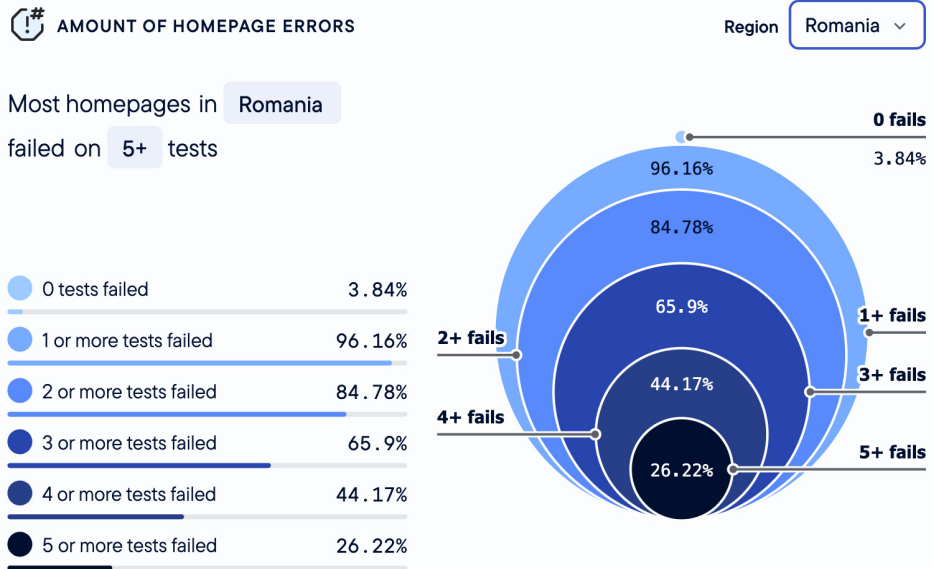


Source: The Digital Trust Index (2025)

Figure 4. The Digital Trust Index country ranking

According to Figure 4, Norway, Finland, and Sweden have the highest (least bad) scores, while Slovakia, Romania, and Hungary are the lowest. Belgium barely makes it into the top five.

The Digital Trust Index profile for Romania is presented in Figure 5.



Source: The Digital Trust Index (2025)

Figure 5. The Digital Trust Index Romanian country ranking (in detail)

The findings emphasize both the opportunities and challenges of fiscal decentralization in the digital economy. On one hand, decentralization gives local governments the freedom to encourage innovation, address community needs through policy, and develop digital ecosystems. On the other hand, unequal fiscal resources and institutional weaknesses can intensify disparities. Effective governance requires a balance between sufficient local independence to foster innovation and strong intergovernmental transfers to promote fairness. This suggests that fiscal decentralization should not be implemented in isolation, but rather integrated into a broader, multilevel governance framework, ensuring alignment between national strategies and local implementation.

5. CONCLUSION

The conclusion suggests that fiscal decentralization is a crucial tool for advancing the digital economy, enabling local governments to develop tailored policies, infrastructure investments, and regulatory frameworks. While decentralization enhances responsiveness and fosters innovation, it also poses the risk of regional inequality. Policymakers must therefore craft fiscal frameworks that balance local autonomy with mechanisms to support equity and inclusion. By

strengthening the link between fiscal governance and digital transformation, this study contributes to discussions on how states can leverage decentralization as a pathway to sustainable, innovative, and inclusive growth in the digital realm era.

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GOVERNMENT EXPENDITURE AND THE E-GOVERNMENT DEVELOPMENT: EVIDENCE FROM EU COUNTRIES

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Abstract

The COVID-19 pandemic accelerated the implementation of e-government in the public sector in order to increase its efficiency and effectiveness. According to the European Digital Strategy, by 2030, the EU's goal is to ensure that democratic life and online public services are fully accessible to all, including people with disabilities, and benefit from a top-quality digital environment offering user-friendly, efficient, and personalized services and tools with high levels of security and privacy. The purpose of this paper is to investigate the relationship between e-government development (digitalization of public services) and government expenditure, with a focus on general public services expenditure for the 27 European Union countries (EU) over the period 2003-2022. For this purpose, we apply panel data estimation techniques, and we use E-Government Development Index (EGDI) as dependent variable and expenditures on general public services, research and development expenditure, total public expenditures, internet penetration rate, human development index, GDP per capita, level of digital skills and corruption perceptions index as independent variables. Our findings confirm significant differences among the levels of e-government development in the EU-27 countries. Moreover, our results show that EGDI is significantly and negatively associated with government expenditure, especially general public services expenditure. This paper aims to fill the gap and to bring useful results for governments and its institutions.

Keywords: *government expenditure; e-government; digitalisation; EGDI; panel data models*

JEL Classification: C23; H11; H50.

1. INTRODUCTION

Beginning with the 2000's the internet and digital technologies have transformed our world at a fast pace, which has been accelerated by the COVID-19 pandemic. Anticipating this evolution and the need for society to adapt to new transformations, the European Commission launched in 2019 a digital strategy to empower people and businesses with a new generation of technologies, in line with the European Green Deal (EGD) that require Europe to become the world's first 'climate-neutral' continent, with net zero greenhouse gas (GHG) emissions by 2050.

The digital strategy "*A Europe fit for the digital age*" (European Commission, n.d.) was one of the six political priorities established for the period 2019-2024, which was accompanied by the main project "Europe's Digital Decade", proposed in March 2021 by the European Commission to transform Europe digitally by 2030. This policy programme is guided by the *2030 Digital Compass* (European Commission, 2021), a plan to achieve digital transformation of the EU economy and society. The Compass indicates four cardinal points for this trajectory: digital skills, secure and performant digital infrastructure, digital transformation of businesses and the digitalisation of public services.

Regarding *the digitalisation of public services*, by 2030, the EU's goal is to ensure that democratic life and online public services are fully accessible to all, including people with disabilities, and benefit from a top-quality digital environment offering user-friendly, efficient, and personalised services and tools with high levels of security and privacy. In order to respond to this aim, the Digital Compass proposed four targets:

- Key public services: 100 % online provision of key public services available for European citizens and businesses;
- e-Health: 100% of European citizens have access to medical records (e-records);
- Digital Identity: 100% of citizens have access to digital ID.

As respects the *digitalisation of public services*, the newest Report, State of the Digital Decade 2025 (European Commission, 2025) highlighted that EU made steady progress in digitalising key public services, but an important part of governmental digital infrastructure continues to depend on service providers outside the EU. Thus, at the EU level, compared with the 2030 targets, in 2024, digital public services for citizens are at 82.3%, digital public services for businesses are at 86.2%, access to e-health records is assured for 82.7% and 89% of the EU27 citizens have e-ID.

At the global level, according to the United Nations Department of Economic and Social Affairs (2024) Europe continues to lead e-government development, recording the highest level of EGDI (0.8493). It is important to mention that all EU member states reached very high (84% of EU countries) or high levels (16% of EU countries) for EGDI.

Even the Digital Strategy covered the period 2019-2024, for the next five years, the European Commission continues to follow its priorities, including the green and digital transitions, comprising a genuine energy union and investment in game-changing digital technologies in Europe, as established by the Strategic Agenda 2024-2029 (European Council, 2024).

In the literature, the role of e-government in sustainable development has been studied by many authors, the primary hypothesis being that the digital transformation has a positive impact on increasing governmental efficiency (Doran *et al.*, 2023), reducing corruption, and improving socio-economic conditions.

Thus, this paper examines how government expenditures, particularly general public expenditures, impact the e-government development, based on the evidence from EU countries. The novelty of our research consists in the panel econometric analysis of the relationship between a series of public expenditures – namely general public services, research and development spending, and total government spending – and the E-Government Development Index (EGDI) using the most recent available data.

Next, the organization of the paper is as follows: Section 2 reviews briefly the literature regarding the e-government and the main topics analysed in this regard. Section 3 describes the data used for our analysis and also the methodology applied in order to reach our objective of investigating the relationship between government expenditure and e-government development. Section 4 presents the main results and discusses the implications. Finally, Section 5 concludes the research, emphasizing our contribution to the field, policy implications, limitations, and future research directions.

2. LITERATURE REVIEW

Various empirical studies concluded that digital transformation reshaped the functioning of the public sector and that the e-government trends may increase the quality of life and public performance. Niftiyev (2022) highlighted that “appropriate e-government development has a significant effect on overall economic growth” given the improved interactions between the government and the citizens resulting from minimization of bureaucracy, corruption and high public expenses. As such, e-government is viewed as a sign of transparency, linked to good public governance (Von Haldenwang, 2004) and sustainable and democratic institutions (Lenk and Traummüller, 2000).

Considering the e-government objectives, the literature emphasizes two main directions, stating that the external objective of e government is to satisfy the citizens needs in a more accessible manner, while the internal objective focuses on facilitating a “speedy, transparent, accountable, efficient and effective process for performing government administration activities” (Basu, 2004). Basu also found that although public services digitalization can have a

significant effect on public service quality and overall efficiency, there is a list of factors that should be examined before implementing such projects as: political stability, level of trust in government, economic and government structure, adequate legal framework etc (Basu, 2004), which could arise as barriers to the proper functioning of e-governance.

The evolution of e-government implementation was separated into four stages: cataloguing, transaction, vertical integration, and horizontal integration (Layne and Lee, 2001), which describe the process based on empirical observation. Still, the advancement of e-government implementation and diffusion is yet limited, one possible explanation being the substantial differences (Chen *et al.*, 2009) between countries resulting from economic and socio-cultural factors. Another important factor is the interdependence between e-government and corruption, as the e-government may eliminate many opportunities for corruption (Androniceanu and Georgescu, 2021), increasing the transparency and diminishing the power of officials, but also enabling corrupt behaviour due to weaknesses and flaws in technological frameworks (Elbahnasawy, 2014).

Numerous empirical studies suggest that even within groups of countries with a relatively similar degree of development, such as EU member states, the degree of e-government adoption varies, and the digital divide persists. In their research on the adoption of e-government across Europe using a sample of 26 member countries, Yera *et al.* (2020) found that “not all countries have the same e-government use level, and, although with exceptions, more developed and wealthier countries seem to have higher levels of e-Government use”. Moreover, based on the data, they identified that the main factors affecting the practical use of e-government tools across the sample of eight countries are citizens’ levels of internet literacy and their higher educational attainment (Yera *et al.*, 2020). Therefore, it is necessary to narrow the digital divide across European states by integrating anti-corruption policies with those promoting the use of technology (Androniceanu and Georgescu, 2021).

Another research direction is the analysis of the relationship between public sector digitalization performance and economic growth in the European Union. (Androniceanu and Georgescu, 2021) found that most EU countries are located in the group with an average level of e-government implementation. There is also a group of advanced European states in the e-government process, such as Austria, Switzerland, Latvia, Malta, Germany, the Netherlands, Denmark, France and Italy, as well as a group with lower level of implementation, including Romania, Bulgaria, Hungary and Slovakia. While the widely accepted explanation lies in the differences in digital skills, a study examining e-government adoption and use in the European Union found that the behavioural patterns were identified at the EU level, leading further to inequalities among citizens and a certain digital divide (Rodríguez-Hevía *et al.*, 2020).

At the same time, there are studies that inquire into the reverse relationship between e-government and the level of administrative development and performance in EU member states. Using a least squares regression method to examine the relationship between e-government development index (EGDI) and government effectiveness, Doran *et al.* (2023) demonstrated that the online skills of the population and the telecommunication infrastructure have a significant positive impact on governmental efficiency, while online services offered by government bodies have a negative influence on efficiency. Exploring the issue of determinants of e-government use, Horobeţ *et al.* (2023) found that education is the central factor of e-government use. They also established that better institutional performance does not automatically result in economic growth, concluding that countries' levels of development are basic conditions for the use of efficient use of public services.

In other papers focused on the influence of e-government on government effectiveness and efficiency in the EU member states, the results showed that “e-government maturity is positively and significantly associated” (Hodzic *et al.*, 2021) particularly during the COVID-19 pandemic. The authors also highlighted that although the COVID-19 pandemic forced digital adaptation of public services, the long-term sustainability and effective functioning of e-government is empirically correlated with rule of law as a variable which appears to be another essential factor in e-government usage.

Complementary, the economic literature also focuses on the relationship between e-government and ESG factors in EU countries. In a study using the E-Government Development Index (EGDI) and linear ordering method, the findings suggest a significant and positive impact of e-government on sustainable development (Ziolo *et al.*, 2022). The results imply that given the long-term relationship between all three key dimensions of modern sustainable development and the digitalisation of public services, e-government is regarded today as an “indicator of our evolution towards the green economy” (Ziolo *et al.*, 2022).

The academic literature predominantly concentrates on the performance outcomes of e-government implementation and on its effects across various socio-economic dimensions, as well as on the structural factors that may encourage its adoption and development, such as driving factors and the role of various social variables. The purpose of our paper is to address the financial effort undertaken by the state for the digitalization of public services, namely the resource allocation, in order to determine whether there is a relationship between public expenditures and the level of e-government development.

3. DATA AND METHODOLOGY

The primary objective of this research is to examine the relationship between the e-government performance and the input dimension considered as a budgetary effort. The performance index used in this empirical work is E-

Government Development Index (EGDI), a composite index based on the weighted average of three normalized indices which is used to measure the readiness and capacity of national institutions to use information and communication technologies to deliver public services (United Nations, 2018), according to equation (1).

$$EGDI = \frac{1}{3} (TII_{norm} + HCI_{norm} + OSI_{norm}) \quad (1)$$

where: TII – the Telecommunication Infrastructure Index; HCI – Human Capital Index; OSI – the Online Services Index.

Most of the existing studies conceptualize the E-Government Development Index (EGDI) as a function of its three core components- online services, telecommunication infrastructure, and human capital-based on the methodological framework established by the United Nations. This infrastructural prerequisites for digital governance. However, this study adopts an alternative perspective following the study of Niftiyev (2022), which explores the influence of broader macroeconomic and institutional factors, such as public spending and the quality of public services, on the development of e-government. By extending the analytical framework beyond the standard UN methodology, we aim to assess how fiscal policy choices and socio-economic conditions contribute to variations in EGDI across countries, thereby offering a more comprehensive understanding of the determinants of digital government performance. Table 1 reports the variables of interest collected for the 27 EU countries from 2003 to 2022, which are used in our empirical study.

Table 1. Description of variables

Abbreviation	Definition	Unit of measurement	Variable type	Source
EGDI	E-Government Development Index	Score between 0 and 1	Dependent variable	United Nations
GPS_EXP	Expenditures on General Public Services	% of GDP	Independent variable – expenditure	Eurostat
RD_EXP	Research and Development Expenditures	% of GDP	Independent variable – control	Eurostat / OECD
TOTAL_EXP	Total Public Expenditures	% of GDP	Independent variable – expenditure	Eurostat

Abbreviation	Definition	Unit of measurement	Variable type	Source
NET_ACC	Internet Access Rate	Percentage of population	Independent variable – control	International Telecommunication Union
HDI	Human Development Index	Score between 0 and 1	Independent variable – control	United Nations
GDP_PC	GDP per capita	USD / capita (current prices)	Independent variable – control	World Bank / Eurostat
NET_USE	Internet usage rate	Percentage of population	Independent variable – control	International Telecommunication Union
CPI	Corruption Perceptions Index	Score between 0 and 100	Independent variable – control	Transparency International

Source: authors' elaboration

In the present study, the E-Government Development Index (EGDI) is modelled as a function of the previously mentioned variables, reflecting the assumption that both public expenditure components and relevant socio-economic control factors jointly influence the level of digital government development across countries. This functional relationship forms the basis for the econometric analysis conducted within the research (equation 2).

$$EGDI = \beta_0 + \beta_1(GPS_EXP) + \beta_2(RD_EXP) + \beta_3(TOTAL_EXP) + \beta_4(NET_PEN) + \beta_5(HDI) + \beta_6(GDP_PC) + \beta_7(NET_USE) + \beta_8(CPI) + \varepsilon \quad (2)$$

A similar methodological approach was adopted by Horobeț *et al.* (2023), who employed an econometric framework to investigate the factors influencing e-government usage across EU member states, incorporating a broad range of socio-economic and institutional variables.

Table 2 presents a summary of the dataset. According to Table 2, the data is not normally distributed, as expected for several reasons. Firstly, most variables exhibit heterogeneous values across countries and time periods, reflecting economic and social developments as well as trends and external shocks, which further contributes to deviations from normality. Secondly, certain variables are inherently bounded, resulting in clustering within specific ranges rather than a normal distribution. Nevertheless, the most asymmetric variables, such as Research and Development Expenditures, Total Public Expenditures, GDP per capita, and the Corruption Perceptions Index, were logarithmically transformed.

The EGDI index has an average level of 0.738 units, the lowest value being observed in Romania in 2003, and the highest in Denmark in 2020. Across all

the countries of the sample, EGDI followed a positive growth trajectory, with an average increase of 36% in 2022 relative to 2003, while Romania registered the maximum increase of 58% increase in the same period.

Table 2. Descriptive statistics for the variables of interest

	EGDI	GPS EXP	RD EXP	TOTAL EXP	NET ACC	NET USE	HDI	GDP PC	CPI
Mean	0.7351	6.1172	0.4097	30.7782	65.6002	0.6768	78.8635	28637.57	62.2958
Median	0.7380	5.8	0.3	30.4	72.7	0.7343	79.4317	21420	60
Maximum	0.9758	12.4	1.7	58.6	97.6389	0.9845	86	106870	97
Minimum	0.4827	2	0	17.5	5	0.089	71.2536	5020	0
Std. Dev.	0.1146	1.9394	0.3810	5.9721	24.7897	0.2195	3.3495	20884.01	17.2491
Skewness	-0.0513	0.6205	1.6164	0.5666	-0.7769	-0.6863	-0.4821	1.9011	0.0898
Kurtosis	2.0137	2.4910	5.6192	4.0718	2.5106	2.3985	2.3977	7.1237	2.5774

Source: Authors' elaboration

The dataset presents limitations due to the unavailability of the EGDI index for the years 2006, 2007, 2009, 2011, 2013, 2015, 2017, 2019, 2021, and 2023, affecting the temporal continuity of our analysis. Furthermore, data on Research and Development (R&D) expenditures are unavailable for Austria and Germany. Despite these constraints, the methodological framework adopted ensures the robustness and consistency of the findings.

The panel regression analysis was conducted using Panel Least Squares (PLS) method, also including cross-section fixed effects, to adjust for unobserved heterogeneity across individual units by introducing dummy variables for each cross-section. Standard errors and covariances were estimated using the White period (cross-section cluster) correction, which adjusts for heteroskedasticity and interunit correlation.

The model shows a robust explanatory power, the R-squared value of 0.830 suggesting that roughly 83% of the variability in the dependent variable (EGDI) is explained by the selected variables. The adjusted R-squared of 0.804 confirms that the model has substantial explanatory capacity even after adjusting for the number of predictors. The standard error, equal to 0.0509, indicates a minor discrepancy between the observed outcomes and the predicted values and the F-statistic of 32.912 is highly significant ($p < 0.001$), providing strong evidence that the overall model is statistically significant. At the same time, the Durbin-Watson value of 1.411 reveals a minor positive autocorrelation in the residuals, yet it is not of significant concern. The following section outlines the main empirical findings.

4. RESULTS AND DISCUSSIONS

Table 3 shows the correlation matrix for the analysed variables. The matrix indicates that the dependent variable EDGI is positively correlated with all examined variables, showing a very strong correlation with internet use ($r = 0.799$) and internet access ($r = 0.781$), which aligns with economic logic, as

these two are key determinants and precursors of the phenomenon measured by EGDI, and a strong correlation with HDI ($r = 0.541$), GDP per capita ($r = 0.652$), and CPI ($r = 0.676$) suggesting that the socio-economic development is also relevant in our analysis.

Furthermore, internet access and internet use have an extremely high correlation ($r = 0.964$), reflecting a direct causal relation, the internet access being the determinant factor of internet use. Also, we identified a strong correlation between GDPs per capita and CPI ($r = 0.813$), implying that higher levels of economic development are generally associated with lower perceived corruption, given that higher CPI values reflect better performance. Regarding our variables of interest, the categories of public expenditure included in the analysis show moderate correlation with EGDI, with R&D expenditures exhibiting the more notable correlation ($r = 0.384$).

Table 3. Correlation matrix

	EGDI	GPS EXP	LOG RD	LOG TOT	NET ACC	NET USE	HDI	LOG GDP	LOG CPI
EGDI	1	0.03291	0.38392	0.11072	0.78177	0.79915	0.54102	0.65161	0.67649
GPS EXP	0.03291	1	0.15281	0.29452	-0.03907	-0.07890	0.25967	0.16709	0.10798
LOG RD	0.38392	0.15281	1	0.37221	0.28139	0.33907	0.18128	0.25071	0.39328
LOG TOT	0.11072	0.29452	0.37221	1	0.12985	0.10442	0.00800	0.06106	0.06935
NET ACC	0.78177	-0.03907	0.28139	0.12985	1	0.96444	0.61082	0.55807	0.53260
NET USE	0.79915	-0.07890	0.33907	0.10442	0.96444	1	0.56993	0.59474	0.60155
HDI	0.54102	0.25967	0.18128	0.00800	0.61082	0.56993	1	0.70381	0.50001
LOG GDP	0.65161	0.16709	0.25071	0.06106	0.55807	0.59474	0.70381	1	0.81277
LOG CPI	0.67649	0.10798	0.39328	0.06935	0.53260	0.60155	0.50001	0.81277	1

Source: Authors' elaboration

The results of the empirical analysis for the assessment of the influence of government expenditures on e-government in the EU-27 are presented in Table 4. The findings reveal that only two variables are statistically significant at the 10% significance level: expenditures on general public services and internet usage rate.

The model reveals a significant negative relationship between general public expenditures and EDGI, with a coefficient of -0.01 , suggesting that such expenditures are not allocated towards the development of digital services or IT infrastructure, but rather to the current functioning of government institutions. Another perspective on this result concerns the efficiency of these allocations, with numerous empirical critiques regarding the allocative performance of public spending. Niftiyev (2022) obtained similar results, arguing that this outcome denotes the inefficiency of public expenditures on e-government “even if the country increases government expenditures, it may not favor e-government development”.

Table 4. Estimation results

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.82631	0.886203	-0.932411	0.3612
GPS EXP	-0.01006	0.005536	-1.816915	0.0829
LOG RD EXP	-0.00546	0.016151	-0.338088	0.7385
LOG TOTAL EXP	0.043731	0.045806	0.954705	0.3501
NET ACC	0.000364	0.001274	0.285950	0.7776
NET USE	0.244295	0.127709	1.912905	0.0689
HDI	0.004385	0.005081	0.863075	0.3974
LOG GDP_PC	0.091071	0.061535	1.479985	0.1531
LOG CPI	0.005032	0.043017	0.116985	0.9079

Source: Authors' elaboration

The remaining categories of public expenditure are not statistically significant in our model. Although in theory, research spending could contribute to the digitalization of public services, the results suggest a negative relationship with the dependent variable. Nevertheless, total public expenditure shows a positive correlation with EDGI, indicating that European countries tend to allocate resources also toward digitalization.

The internet usage rate has a coefficient of 0.244, suggesting that the pressure for digitalizing public services emerges once citizens actively use the internet. In practice, in countries with higher levels of internet penetration and online engagement, citizens are more inclined to access public services digitally. This result provides evidence that the key driver of e-government development are not governmental digitalization policies, but rather citizens demand for digital services. Consequently, our analysis can be further developed by including variables that reflect human capital and online presence indicators, while on the side of public expenditures, as well as additional categories of public expenditures, such as spending on education and investments in telecommunications infrastructure, which are expected to have a positive impact on EDGI.

5. CONCLUSIONS

This paper investigated the impact of public expenditures on e-government, assessed through the EGDI, for 27 EU countries for a period of 20 years (2003-2022). The study focused on two types of expenditures, general public services spending and research and development (R&D) expenditures. General public spending covering maintenance and operational expenses of institutions, implicitly including the infrastructure, functioning and management of e-government platforms, thereby theoretically directly affecting public sector digitalization. R&D expenditures were included because they reflect allocations aimed at IT development, enhancing the efficiency and security of existing

platforms, and supporting the creation of new dedicated technologies. Additionally, we included total government expenditures as a control variable, aimed to indicate whether other sectors also have an influence on e-government.

The empirical results show that both categories of expenditures are negatively correlated with the EGDI, consistent with findings of other relevant studies (Niftiyev, 2022; Doran *et al.*, 2023), suggesting that they do not positively influence e-government and highlighting inefficiencies in public spending. Expenditures on General Public Services are statistically significant and suggest that an increase in the share of these expenditures would reduce the EGDI by 0.01, a possible red flag for misuse of these funds or their focus only on functioning of government institutions.

At the same time, total expenditures show a positive, though statistically insignificant, impact on the EGDI, suggesting that other public spending categories may also influence e-government. Based on this, our study could be extended by introducing new expenditure categories, such as education or infrastructure development, which might have a positive effect.

Even the paper presents some limitations related to available data, this study contributes to the development of the literature by providing useful results for governments, which must continue to invest in the digitalization of public services, by allocating more efficient the financial resources for this priority.

In addition, to continue the digital transformation, EU offers 288.6 billion euro to fund this objective, of which 205.1 billion euro are from public budgets (equal to 1.14% of the EU's GDP) (European Commission, 2025). In the light of the important position of digital objectives on the European states' agendas, the budgetary allocations and the new funding directions may become significant factors in e-government development.

Another phenomenon worth considering is the impact of the COVID-19 pandemic, which acted as a catalyst for the digitalization of public services. Accordingly, future research could focus on a shorter time frame that specifically examines the pandemic and post-pandemic years.

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GOOD FAITH (*BONA FIDES*) IN CONTRACTS AND GOOD FAITH IN GDPR

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Abstract

The principle of good faith, as a fundamental principle in civil law, must be respected when negotiating, concluding and performing contracts, and it is regulated by the Civil Code. The article makes some connections between the principle of good faith in contracts and the principle of good faith that must be respected for the processing of personal data, according to the GDPR. Although the principle of good faith is not expressly stated in the GDPR, it results from compliance with the other principles related to data processing expressly stated in Article 5 GDPR

Keywords: *good faith; bona fides; contract; personal data; GDPR; General Data Protection Regulation; Romanian Civil Code*

JEL Classification: K12; K22.

1. CONSIDERATIONS ON THE CONCEPTS OF GOOD FAITH IN CONTRACTS AND GOOD FAITH REQUIRED FOR THE PROCESSING OF PERSONAL DATA OF THE DATA SUBJECT

Good faith is a concept with a comprehensive meaning and of constant interest both at the national and European level, being a complex notion based on a profound moral content and which applies to the entire legal system, being a principle regulated in the Romanian Constitution.

Article 57 of the Romanian Constitution (Exercise of Rights and Freedoms) stipulates that all citizens „must exercise their constitutional rights and freedoms in good faith, without infringing on the rights and liberties of others”. By regulating good faith as a constitutional principle (Dobrilă, 2014), the existence of a balance between the exercise of individual rights and the rights of others is guaranteed, with respect for morality and public order.

Good faith means psychological manifestations that underlie certain facts and legal acts and is based on both "right intention, as well as prudence and diligence" (Gherasim, 1981).

Good faith is a common principle for both contract law and GDPR, by providing guidelines for both how the data subject's personal data should be processed, and because it aims to ensure the fairness and protection of the contracting parties to the contract, and, similarly, the protection of the rights of the data subject with regard to the processing of personal data.

According to Recital 4 of the GDPR, "the processing of personal data should be designed to serve mankind. The right to the protection of personal data is not an absolute right; it must be considered in relation to its function in society and be balanced against other fundamental rights, in accordance with the principle of proportionality".

In contract law, the principle of good faith is reflected in a model of conduct for the contracting parties and emphasizes the responsibility of the contracting parties, as an aspect that concerns both the concluded contract and the future contractual relations between the contracting parties. The principles regarding the processing of personal data are expressly regulated in article 5 of the General Data Protection Regulation (Regulation (EU)2016/679- GDPR) and are intended to guide the behavior of data controllers towards the data subject, in order to ensure the protection of the data subject; although the principle of good faith is not expressly regulated in article 5 GDPR, it results from the interpretation of the principles regarding the processing of personal data in article 5 GDPR: the principle of legality, fairness and transparency towards the data subject is based on the idea of good faith, beyond legality and compliance with technical requirements; the principle of purpose limitation is based on the idea of good faith because personal data are collected for specified, explicit and legitimate purposes and the data subject must be informed of these purposes, without the data being subsequently processed for other incompatible purposes; the principle of data minimization is closely linked to the good faith of the operator who must process only those data of the data subject that are adequate, relevant and limited to what is necessary in relation to the purpose of the processing, which can only happen if the operator is in good faith (a use beyond this limit cannot be correlated with a data operator in good faith); the requirement that personal data be accurate and up-to-date means that the controller must take steps to rectify or erase inaccurate data and this is based on the idea of a good faith controller; the principle of storage limitation means that the controller, who must be in good faith, must keep the data only for the period necessary to achieve the purpose for which the data are processed; the principle of security and confidentiality means that the good faith controller will process the data in a way that ensures the security of the personal data and will take appropriate technical or organizational measures against unauthorized or

unlawful processing, against accidental loss, destruction or damage. For the processing of personal data, special emphasis is placed on the principle of responsibility which is based on the good faith of the operator, who must act responsibly, ensure that the above principles are respected and be able to demonstrate this respect. Thus, although it is not expressly regulated in Article 5 of the GDPR, it is indisputable that the good faith of the operator is the basis for compliance with the principles regarding the processing of personal data.

The importance of the infringement of the principles for the processing of personal data in article 5 GDPR is highlighted by the sanctions indicated by the GDPR; according to article 85 para. 5 GDPR, infringements of the basic principles for processing, including conditions for consent, pursuant to Articles 5, 6, 7 and 9 shall "be subject to administrative fines up to 20 000 000 EUR, or in the case of an undertaking, up to 4 % of the total worldwide annual turnover of the preceding financial year, whichever is higher". Taking into account the close connection between these principles and the principle of good faith, we consider that the application of sanctions must also take into account the good faith of the operator. In this regard, an argument is given by the fact that art. 85 para. 2 GDPR indicates the circumstances that must be taken into account when deciding to sanction the operator: in addition to aspects regarding "the nature, gravity and duration of the infringement taking into account the nature scope or purpose of the processing concerned as well as the number of data subjects affected and the level of damage suffered by them" or "the categories of personal data affected by the infringement", it is expressly mentioned that "the intentional or negligent character of the infringement" or "any action taken by the controller or processor to mitigate the damage suffered by data subjects" or "the degree of responsibility of the controller" or "any relevant previous infringements by the controller or processor" or "the degree of cooperation with the supervisory authority, in order to remedy the infringement and mitigate the possible adverse effects of the infringement" must be taken into account, all these elements having the role of shaping the operator's conduct and from the perspective of good faith.

The National Supervisory Authority for Personal Data Processing – ANSPDCP found that a professional law firm in Romania violated in 2022 the provisions of article 5 para. (1) letters a), b), c), f) and para. (2) GDPR (principle of legality, fairness and transparency, principle of purpose limitation, principle of data minimization, principle of data integrity and confidentiality and principle of accountability) and of article 6 GDPR (regarding the lawfulness of personal data processing) and fined the law firm 4946 lei, equivalent to 1,000 EURO. In this case, the personal data controller disclosed the data of a client, without his prior consent and information, by posting an address received by him from a public institution on a WhatsApp group used by lawyers of a bar (with 247 members) and disclosed the personal data of the data subject (name, surname, home address, information regarding a file pending in a court) without legal

basis, in an excessive manner and incompatible with the initial purpose of their collection, as well as without adopting technical and organizational measures to preserve the confidentiality of these data (The National Supervisory Authority for Personal Data Processing-ANSPDCP, 2022).

The National Supervisory Authority for Personal Data Processing – ANSPDCP sanctioned a data controller (online lending platform) in 2019 because it sent documents containing the personal data of another person to the email address and did not remedy this after the error was noticed; in addition to other sanctions applied because the controller did not take sufficient personal data security measures and for not notifying the Supervisory Authority of the security incident, a fine of 14,336.1 lei was applied, the equivalent of 3,000 euros [based on article 83 para. (5) letter a) GDPR] because the controller "processed the data without proving the application of effective mechanisms for verifying and validating the accuracy of the data collected and subsequently processed, respectively, for preserving their confidentiality, according to the principles set out in article 5" (The National Supervisory Authority for Personal Data Processing-ANSPDCP, 2020a).

After completing an investigation at a bank, the National Supervisory Authority for Personal Data Processing – ANSPDCP sanctioned the operator (bank) for violating the GDPR principles of article 5 para. (1) let. a)-d) (lawfulness, fairness and transparency; purpose limitations; data minimization; accuracy) and for processing data without fulfilling the conditions of legality of processing with a fine in the amount of 14,619.9 lei (equivalent to 3,000 EURO) because it processed the personal data of a natural person after the conclusion of the contractual relationship with the bank, by sending e-mail messages to the natural person to update the data after the closure of banking services (The National Supervisory Authority for Personal Data Processing-ANSPDCP, 2020b).

There is a link between compliance with the principles indicated above and the principle of good faith because the data controller must act in good faith when processing the data subject's data in order to respect their rights.

Historically, *bona fides* in contract law is correlated with morality and is connected to the idea of justice and a loyal person, and the contract is considered executed in good faith when the behavior of the parties is in accordance with the moral standards accepted at a social level, but the contemporary context no longer allows good faith to play this role and instead of referring to morality, it refers to legal institutions and good faith in contracts is correlated with compliance with the rules imposed by these legal institutions or public order (Ruen, 2011).

In civil law, good faith is a fundamental principle that requires compliance with the requirements of honesty, loyalty, cooperation, respect when negotiating a contract, concluding and executing the contract, and which also involves transmitting essential information between the contracting parties, in a complete and honest manner, to ensure a contractual balance; under the GDPR, the

principle of good faith (although not expressly regulated and must be viewed in connection with the other principles) requires correct, clear, accessible, transparent information to the data subject (as a natural person) and requires that personal data be processed in a manner that is fair to the data subject, without abuse and without processing personal data for other hidden purposes.

The contracting parties must act in good faith throughout the contractual process, from the negotiation stage to the conclusion of the contract and up to the execution of the contract, because the fulfillment of the contractual obligations implies the idea of good faith of the contracting parties. In the case of the processing of personal data, the GDPR requires the protection of the rights of the data subject, and this is based on the idea of good faith; according to Recital 74 of the GDPR, "responsibility and liability of the controller for any processing of personal data carried out by the controller or on the controller's behalf should be established", "the controller should be obliged to implement appropriate and effective measures" taking into account "the nature, scope, context and purposes of the processing and the risk to the rights and freedoms of natural persons".

2. CONNECTIONS BETWEEN THE PRINCIPLE OF GOOD FAITH IN CONTRACTS AND THE PRINCIPLE OF GOOD FAITH THAT MUST BE RESPECTED FOR THE PROCESSING OF PERSONAL DATA, ACCORDING TO THE GDPR

Good faith in contract law means honesty in negotiations, in the conclusion of contracts and in the execution of contracts and sometimes even in the case of non-execution of contracts without justification, but without bad faith; good faith implies loyalty in complying with obligations and executing contracts and cooperation of the parties, taking into account the reasonableness of pursuing their own interest which must be correlated with the common purpose pursued by the parties in the contract. Similarly, for data controllers, in order to comply with the GDPR, good faith is closely linked to the principle of fairness and the principle of transparency (article 5 GDPR) because the processing of personal data must be carried out fairly and must be foreseeable for the data subject; the data subject must be fully informed in clear, accessible language about the processing of personal data, without concealing essential information (for example, processing data for a purpose other than that indicated by the controller).

As a guideline for the interpretation and effects of civil law, in the Romanian Civil Code - Law no. 287/2009, in article 11 regarding the observance of public order and good morals, it is expressly mentioned that "one cannot derogate through conventions or unilateral legal acts from laws that concern public order or good morals" (Civil Code, article 11). Public order refers to legislative regulations that protect a general interest, and the notion of good

morals also refers to a general interest and signifies the set of rules imposed by a certain social morality as a standard of human behavior, meaning good and correct practices (Perju, 2021).

According to art. 14 on good faith of the Civil Code, "any natural or legal person must exercise their rights and perform their civil obligations in good faith, in accordance with public order and good morals", and "good faith is presumed until proven otherwise" (*bona fides praesumitur*) (Civil Code, article 14). Good faith has the value of a guiding principle of civil law through its "informative function" and "role as a guiding idea" (Perju, 2021). Individuals must act in good faith in the exercise of their rights and obligations.

Art. 1170 on good faith of the Civil Code is a particularization for contracts of the guiding principle of good faith, for each stage of the contract, the period of negotiations, the conclusion of the contract and its execution, and provides that the parties must act in good faith both when negotiating and concluding the contract, and throughout its execution, that is, throughout the contract, and they cannot remove or limit this obligation. This article has the role of limiting the principle of contractual freedom in art. 1169 Civil Code, according to which the parties are free to conclude any contracts and determine their content, because the will of the parties is the essential element of the contract, but they are allowed to do so only within the limits imposed by law, public order and good morals, and, in relation to art. 1170 Civil Code, within the limits imposed by compliance with the requirements of good faith.

Good faith is "the expression of the general duty of loyalty in behavior and consists for each party in not betraying the trust" that the other party has placed in it, and in an objective sense "it signifies loyalty, honesty or fairness in the exercise of rights and the fulfillment of obligations and requires compliance with the rules of fairness" (Moise *et al.*, 2021).

As a connection between good faith in contracts and good faith in the processing of personal data, similarly, good faith in contracts implies an active attitude based on fairness and cooperation, more than a simple compliance with contractual obligations, in order to protect mutual trust and maintain contractual balance, and good faith in the processing of personal data is manifested by the principle of legality, fairness and transparency (art. 5 para. 1 lit. 1 GDPR) but must not be limited to simple compliance with the principles related to data processing in art. 5 GDPR nor to strictly formal compliance with the obligations imposed by the GDPR. Good faith in the processing of personal data is based, as in contract law, on the idea of loyalty in behavior, honesty and trust between the operator and the data subject, and the operator must not deceive the trust of the data subject, although he is in a stronger position which, however, he must not exploit or abuse. Regarding the parallel between good faith in contracts and good faith in the processing of personal data, in both cases the aim is to protect mutual trust, either between the contracting parties in the case of contracts, or

between the operator and the data subject in the case of the processing of personal data, and in both cases good faith implies self-control and a limitation of the power of the party in a position of power (for example, the seller towards the buyer, the contractual partner who has more information, a party towards the party in a position of vulnerability, etc., or, for the second case, the operator towards the data subject); however, each category pursues a broader purpose, in the first case trust in the contractual partner as a characteristic of the contract, and in the second case, the protection of trust in data processing, as a general element, not specific to a particular situation.

The loyalty of the parties to the conclusion of the contract imposes on the parties “the obligation to inform each other” and “to present all the data and elements necessary for the proper formation of the contract” (Moise *et al.*, 2021).

A parallel can be drawn with the obligation to inform the data subject under the GDPR, in the sense that the operator must ensure that the data subject is informed if personal data obtained from the data subject are processed (art. 13 GDPR) or even if they are not obtained from the data subject (art. 14 GDPR), and in order to comply with the principle of transparency, the operator must provide the information "in a concise, transparent, intelligible and easily accessible form, using clear and plain language, in particular for any information addressed specifically to a child" (art. 12 GDPR).

Each party to the contract has the duty to ensure that the other party is informed so that they act with knowledge of the facts (Gherasim, 1981; Moise, 2021). Regarding good faith in the GDPR, the operator must inform the data subject correctly, completely, transparently, clearly, in order to facilitate the exercise of the data subject's rights (art. 12 para. 2 GDPR, art. 15-22 GDPR).

Regarding good faith in the execution of contracts, the contracting parties must fulfil their obligations, in order to efficiently execute the contract, without behaviors that would prejudice the proper execution of the contract (Moise, 2021).

Processing is lawful only if and to the extent that a legal basis for processing under Article 6 (a-f) GDPR applies (e.g. consent, conclusion or performance of a contract, legal obligation of the controller, vital interest, public interest, legitimate interest) or if, as an exception, a legal basis under Article 9 GDPR (e.g. consent, public interest) applies.

With regard to the legal basis for processing under Article 6(1)(b), processing is lawful if “processing is necessary for the performance of a contract to which the data subject is party or in order to take steps at the request of the data subject prior to entering into a contract”. There must be a link between the processing of personal data and the purposes of entering into or performance of a contract to which the data subject is party.

The legal basis under Article 6(1)(b) GDPR means processing only of data necessary for the performance of a contract to which the data subject is a party, and the operator must respect the principle of purpose limitation and act in good faith and not process other data that are not considered necessary or data of other persons who are not parties to the contract; not all personal data in connection with a contract can be considered necessary for the performance of a contract, in which case the operator must use another legal basis for processing, if applicable.

The processing of data under Art. 6(1)(b) GDPR does not allow the processing of personal data for which consent would be required, but which the controller includes in the contract, by including consent in the contractual terms, to be accepted together or where the performance of the contract is linked to the granting of consent for the processing of personal data which are not necessary for the performance of the contract (EDPB, 2020); this ground cannot be used for the processing of data relating to the user's tastes and lifestyle in relation to their activity on a website and what they buy because the processing concerns the goods purchased and not profiling (Article 29 Data Protection Working Party, 2014).

Regarding the obligation to inform and compliance with the principle of transparency, for the conclusion of the contract, the transmission of information by the operator to the data subject regarding data processing must be carried out in a clear, concise form and this information must be differentiated from other information, such as that regarding contractual provisions (Article 29 Data Protection Working Party, 2018).

Regarding contracts, the idea of "elasticity of the concept of good faith" (Moise *et al.*, 2021) is highlighted and when good faith is lacking in contracts, the form of liability will be shaped depending on the specifics of the situation in which good faith was violated.

For example, lack of good faith in contracts may refer to the lack of transparency through the failure to communicate relevant information, which entails contractual liability for failure to perform an information obligation (such as a hidden defect in a good sold) or the contract is void for defects of consent (error, fraud), or the contract is not valid if essential elements for the conclusion of the contract are hidden; breach of good faith in data processing may concern lack of information, unclear information, excessive processing, use of personal data for another purpose, breach of confidentiality, refusal to delete the data subject's data if the exercise of the right to delete data is requested, lack of measures to ensure data security, etc., sanctioned under the GDPR and with the possibility for the person who has suffered material or moral damage as a result of the GDPR violation to obtain compensation from the operator.

Although the principle of good faith has a clear outline in civil law and contract law, the processing of data by the controller in good faith is a legal

concept not defined by the GDPR and may be difficult to understand. Although the principle of good faith is not expressly stated in the GDPR, it results from compliance with the other principles related to data processing expressly stated in article 5 GDPR.

„The GDPR fails to explain what fairness is and how it should be achieved” and „focuses mostly on procedural fairness: if personal data are processed in compliance with the GDPR, for instance, by ensuring lawfulness and transparency, such processing is assumed to be fair” (Häuselmann and Custers, 2024). If we make a comparison with what it means to respect good faith in contracts, the question arises whether respecting legality and respecting transparency towards the data subject are truly sufficient to consider that personal data is processed in good faith, in compliance with the GDPR, and whether the processing is fair and honest. The reason for asking this question is determined by the fact that respecting the principle of good faith in contracts requires greater clarity, by explaining compliance with good faith in contracts and by explaining what constitutes conduct contrary to good faith, i.e. characterized by bad faith. For example, in article 1183 of the Romanian Civil Code, in addition to establishing an obligation to respect good faith in negotiations, it also provides guidelines for understanding its meaning because it details the meaning of not respecting the principle of good faith in negotiations and the consequences for not respecting good faith in negotiations: “the conduct of the party that initiates or continues negotiations without the intention of concluding the contract” is considered contrary to the requirements of good faith, and the party that did not respect good faith in negotiations is liable for the damage caused to the other party.

„Neither is the essential element of substantive fairness mentioned in the GDPR nor is any guidance on substantive fairness provided therein or elsewhere” and „even if all procedural rules of the GDPR are complied with, data processing can still be unfair from a substantive perspective” (Häuselmann and Custers, 2024).

It should be highlighted that in the national regulation prior to the entry into force of the GDPR, Law no. 677/2001 for the protection of individuals with regard to the processing of personal data and on the free movement of such data (repealed from the moment of application of the GDPR) expressly regulated the principle of good faith in the processing of personal data. In the category of general rules regarding the processing of personal data, the characteristics of personal data were mentioned during the processing and it was expressly indicated that the personal data intended to be the object of processing must be: “processed in good faith and in accordance with the legal provisions in force” (Law no. 677/2001, article 4 para. 1 letter a), therefore with a separate emphasis on good faith and then on compliance with the legal provisions, which indicates a separate analysis of the two aspects. Then, article 31 of the chapter on

contraventions and sanctions of Law no. 677/2001 expressly referred to the omission to notify the supervisory authority before carrying out any processing, as well as to "bad faith notification", which meant "incomplete notification or notification containing false information" (Law no. 677/2001, article 31).

Legal order, the stability of social relations and trust in legal relationships are based on the good faith of people, who must be honest, sincere and loyal in legal relationships, and the entire system is based on trust and fairness and not on the intention to deceive (Gherasim, 1981). Good faith is a fundamental principle and is presumed and protected, regardless of the legal relationship. It is assumed that the subjects of the legal relationship are animated by the sincere intention to behave honestly and in accordance with the law.

We consider that it was appropriate to expressly mention the principle of good faith in the legislation on the protection of individuals with regard to the processing of personal data and we consider that the express regulation of this principle in the GDPR would be appropriate because it would emphasize the need to respect good faith in the processing of personal data and would determine the supervisory authority to carry out a careful analysis of the good faith of the operator, in the case under analysis, without limiting itself to an analysis of formal compliance with the GDPR. Since data processing is based on the idea of trust (operator-data subject), *de lege ferenda*, we consider that it would be appropriate to expressly mention in the GDPR the principle of processing personal data with good faith and in accordance with the legal provisions in force.

3. CONCLUSIONS: REGARDING *BONA FIDES* IN CONTRACTS AND GDPR

Good faith is a common principle for both contract law and GDPR because it aims at the fairness and protection of the parties involved (contracting parties or controller and data subject). Good faith is reflected in a model of conduct for the contracting parties, and in the processing of personal data, good faith, although not a principle expressly regulated by the GDPR but resulting from the interpretation of the principles regarding the processing of personal data in art. 5 GDPR, has the role of guiding the behavior of data controllers towards the data subject, for the protection of the data subject.

In contracts, good faith is a principle that requires honesty, loyalty, cooperation, respect at the time of negotiating a contract, at the conclusion and execution of the contract; under the GDPR, the principle of good faith, which must be correlated with the other principles for data processing, requires correct, clear, accessible, transparent information of the data subject.

Good faith guarantees legality from a moral point of view, because concluding a contract does not only mean formally complying with the law, but also respecting the contractual partner, and processing personal data in good

faith means not only processing data in the interests of the operator, but also respecting the rights of the data subject and respecting the trust given by the data subject. In contracts, it is necessary to comply with legal norms and fulfil obligations, as well as respecting the trust between contractual partners, which is based on loyalty, honesty, collaboration, in order to maintain contractual balance. In the case of processing personal data, good faith means both complying with the requirements imposed by the GDPR for lawful processing, in accordance with the legal grounds and the principles regarding data processing, i.e. lawful, fair, transparent processing towards the data subject, only for the explicit and legitimate purposes declared, but also the need not to limit oneself to formal compliance with the obligations imposed by the GDPR; fairness is linked to the good faith of the operator, which requires him to act loyally towards the data subject and not to betray the trust of the data subject. In contracts, it is necessary to maintain a contractual balance, and the good faith of the parties through loyalty towards the contractual partner contributes to this; in the case of data processing, it is necessary to have legitimate data processing, processing that respects the rights of the data subject, and the good faith of the operator contributes to protecting the interests of the data subject (right to privacy, right to protection of personal data) and to maintaining general trust in data processing.

We recommend, *de lege ferenda*, the express regulation of the principle of good faith in the GDPR, as an essential point in the legislation on the processing of personal data for the protection of the data subject; we consider that the express regulation of this principle in the GDPR would be appropriate because it would highlight the importance of respecting good faith in the processing of personal data, the effective protection of the data subject, beyond the formal compliance with the GDPR, which could contribute to increasing general trust in the processing of data in safe conditions.

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PREMISES AND IMPACTS OF IMPLEMENTING AI IN PUBLIC ADMINISTRATION

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Abstract

While the latest years were marked by a rapid development of the AI technologies and of the increasing attractivity of using them by people and also companies for solving more simply their issues, it has become obviously that also the interaction between them and the public authorities may be improved by using such technologies. Therefore, step by step AI technologies tend to become not only of interest for the Public Administration because of their benefits, but also a necessity in order to keep up with the transformation of the society. In this context, our paper proposes an analysis on the impacts that AI has already made during the latest years in the public administration area, but also on the expected impacts that are likely to occur in the next years, using data at global level, but mainly from the EU area. The analysis intends to find out the positive or negative impacts of AI, both from the point of view of the public administration, but especially from the point of view of the beneficiaries of public services and, finally, to forecast an image on the future of the public administration and society driven by the impact of AI technologies.

Keywords: *artificial intelligence; public administration; government*

JEL Classification: H89; O33.

1. INTRODUCTION

For several decades and, especially, during the present millennium, the world was marked by an extremely rapid development of the technologies, mainly in the information and communication area. That determined a similar rapid evolution from the information society to the so-called knowledge society and by the progressive development of this new society the new discovered technologies have accelerated this development of knowledge society, changing significantly also the way of life of the people.

The Internet has been for many years and still is maybe the most important technology that influenced the development of the society and every aspect of it,

by facilitating the access to information otherwise difficult to obtain. Internet has become the basic mean of development in all areas, such as economy, education, services etc. and impacted significantly on all economic and social processes especially by growing the speed and the number of these processes. It also brought alternatives for the people to fulfil more rapidly their needs, going from specific ones for goods and services to even special social ones related to interactions from the distance between people. However, the basic role of the Internet was to facilitate access to different things and the way that things were used by the people remained at their disposal and capabilities. This means that people's use of the information requires their efforts and may be subject of human errors. Therefore, it was obvious that the next expected progress of the society should bring better solutions for reducing both the efforts and the potential errors and this is how it emerged the idea of artificial intelligence that should replace the peoples' work and the peoples' reasoning.

Artificial intelligence (AI) is becoming nowadays increasingly important in peoples' life and in the society and facilitates solving more problems of the people most of them simple ones but also some complex ones. People get increasingly acquainted with AI and tend to use it in more situations, and this tendency determines a new shift in the society that must adapt to the demands of people for AI. This means that beside the citizens that have quite clearly expressed the interest in AI, all the other participants in the society, such as companies and governments need to adapt themselves to this new reality and to adjust their processes to these new demands.

This paper will approach the subject of the use of AI in public administration, concentrating first on the premises for implementing AI by the governments and going further in analysing the potential impacts of the AI in the relationships between government and the society.

2. LITERATURE REVIEW

In searching for solutions to simplify or more rapid solve different problems, humans have developed more complex technologies. In this context they developed specific tools for work, then computers and Internet for more rapid information and communication, going now towards robots to replace the human effort and finally towards artificial intelligence to replace even the human thinking.

Artificial intelligence is with no doubt the most complex innovation of the humanity and it opens almost unlimited possibilities for its use, especially when combining it with robotics or other advanced technologies. This new kind of technology needs to be developed and implemented however in accordance with the necessities of the society and having also in mind that beside the many benefits it can bring, there are also potential negative effects and threats that could be also brought.

Due to its complexity, also defining this concept has proved to be difficult and subject of several debates and interpretations. In this regard, maybe a very appropriate way of defining AI has been shaped by European Commission High Level Expert Group on AI which stated that "Artificial intelligence (AI) systems are software (and possibly also hardware) systems designed by humans that, given a complex goal, act in the physical or digital dimension by perceiving their environment through data acquisition, interpreting the collected structured or unstructured data, reasoning on the knowledge, or processing the information, derived from this data and deciding the best action(s) to take to achieve the given goal. AI systems can either use symbolic rules or learn a numeric model, and they can also adapt their behavior by analyzing how the environment is affected by their previous actions." (AI HLEG, 2021). Later the European Commission adopted the AI Act (European Commission, 2021) that sustained that "Artificial intelligence system' (AI system) means software that is developed with one or more of the techniques and approaches and can, for a given set of human-defined objectives, generate outputs such as content, predictions, recommendations, or decisions influencing the environments they interact with" (European Commission, 2021).

Another significant definition of AI comes from OECD which considers that "an AI system is a machine-based system that can, for a given set of human defined objectives, make predictions, recommendations, or decisions influencing real or virtual environments. AI systems are designed to operate with varying levels of autonomy" (OECD, 2019). This definition however is the result of adapting the previous book on AI of Russel and Norvig (2010) according to which an AI system is a machine-based system that is capable of influencing the environment by making recommendations, predictions or decisions for a given set of objectives, by utilizing machine and/or human-based inputs to perceive real and/or virtual environments, abstract such perceptions into models manually or automatically and use model interpretations to formulate options for outcomes.

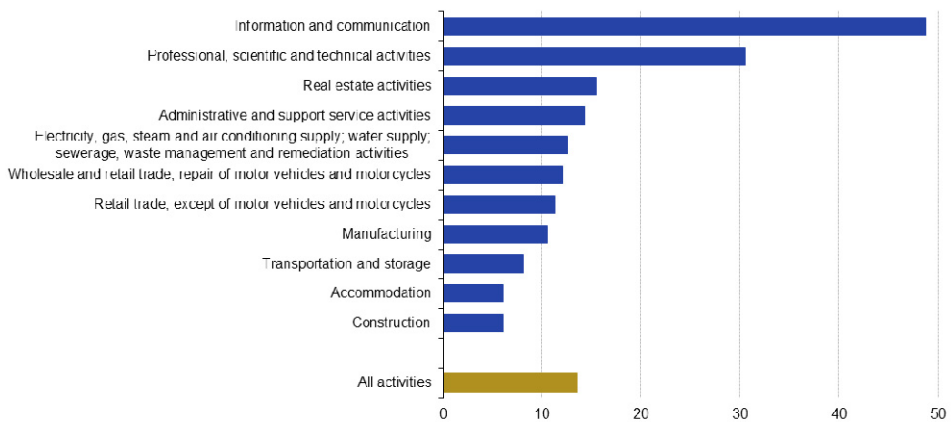
In time, several authors such as Minsky (1969), McCarthy (1989), Nilsson (2010), Poole and Mackworth (2017) or Kaplan and Haenlein (2018) have approached the subject of AI, trying to give comprehensive and also synthesized definitions of AI leading basically to the idea that AI mean machine-based systems capable of reasoning and even acting as a human person with extensive knowledge, usually faster and with less errors than the human.

Even if artificial intelligence has become now most interesting for the people it should be acknowledged that it hasn't emerge recently, but it was the result of a quite long and progressive process. According to Delipetrev *et al.* (2020), the interest for and the development of AI followed an ascending but sinuous trend starting from 1950s, with the establishment of the foundation of most of the AI algorithms and followed later by other important periods such as 1970s, with the paradigm shift in symbolic algorithms and building of expert

systems and later the development of machine learning in the 1990s, which led to the development of deep learning.

All the developments of the AI have attracted more and more attention to this technology and opened new possibilities of using such technology first by the companies and in the latest years by the general public which started to use it extensively and adopted it as part of their life. Therefore, on the background of an increasing demand of AI services, obviously also the offer of such services is expected to grow and while people use AI in more and more domains, also the offer of AI based services tend to cover these domains, as it can be noticed in Figure 1.

Enterprises using AI technologies by economic activity, EU, 2024
(% of enterprises)



Source: Eurostat (online data code: isoc_eb_a1n2)

eurostat

Figure 1. The use of AI in EU enterprises by activity in 2024

As Figure 1 shows the main use of AI remains that of Information and communication, followed by the professional, scientific and technical activities, Real estate activities and also administrative and support service activities etc. This image may be on the other hand interpreted as relevant not only for the enterprises themselves and for the specific business, but also as an image of the services demanded by the customers to be fulfilled by the enterprises and accepted to be received via AI use.

Looking from the perspective of any entity, either a company or a human person, each of them need to interact with other enterprises as suppliers of private goods and services but also need to interact with the public administration as supplier of public services and sometimes even public goods. Therefore, it is to be expected that also the second kind of interactions can be

improved by using AI within the government to citizens or government to businesses processes.

3. ANALYSIS OF IMPLEMENTING ARTIFICIAL INTELLIGENCE IN PUBLIC ADMINISTRATION

Implementing AI technologies in Public Administration can bring important advantages both in terms of improving the quality of the public services delivered and fastening the access to such services, but also in terms of optimizing the functioning of the public institutions by reducing significantly their costs and by more efficiently use of their human resources.

According to OECD (2024), AI technologies can run many complex tasks within the public administration, supporting internal operations, policy making, service delivery and internal and external oversight functions, having as impacts increased efficiency and effectiveness, responsiveness and accountability of the public administration (Table 1).

Table 1. AI impacts on public administration processes

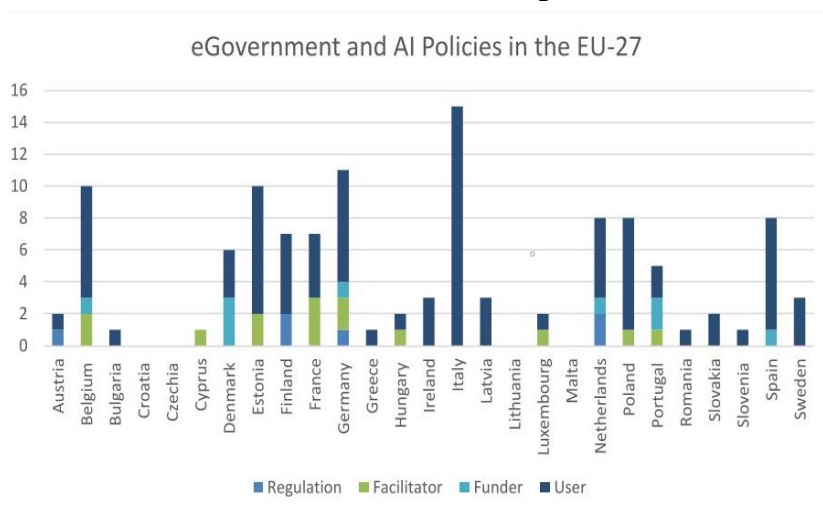
Tasks	Function	Impact
<ul style="list-style-type: none"> • Recognition. • Event detection. • Forecasting. • Personalisation. • Interaction support. • Goal-driven optimization. • Reasoning with knowledge structures. • Content generation 	Internal operations	Productivity (efficiency and effectiveness)
	Policy making	
	Service delivery	Responsiveness
	Internal and external oversight	Accountability

Source: OECD (2024)

AI has an important potential on improving the internal operations or management in public organizations (Medaglia *et al.*, 2021). In this regard, van Noordt and Misuraca (2022) detailed this impact stressing that AI can improve the allocation of human resources and also the recruitment services, the financial management, the detection of fraud and corruption, the public procurement processes and increase the cybersecurity.

On the other hand, Valle-Cruz *et al.* (2020) have concluded that AI technologies can positively impact on the policy making processes, by making them more dynamic and data-driven. Moreover, Aoki (2020) shows that AI can have a significant impact on improving the public services delivery.

Due to the advantages of using AI technologies, governments all over the world, but especially of the developed countries tend to give more attention to implementing AI for delivering quality public services. In this regard, a relevant example is that of the countries of the European Union that have engaged in the latest years in developing specific policies meant to implement AI technologies in public administration, as it can be seen in the Figure 2:

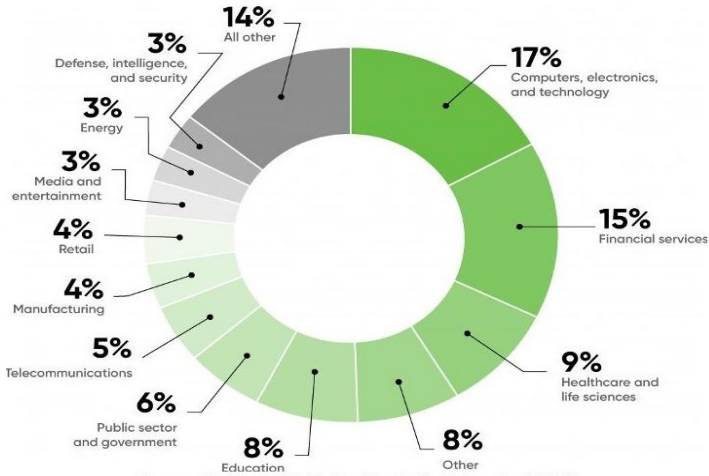


Source: European Commission (2024)

Figure 2. AI policies in EU27 in 2024

According to European Commission (2024), most of the EU27 countries have developed policies regarding the use of AI in public administration, but while some countries as Italy, Germany Belgium or Estonia have developed more such policies, other countries such as Croatia, Czechia, Lithuania or Malta, have still no such policies.

Many governments developed policies in which they play a role of facilitator, regulator and even funder for such technologies, that are supposed, from their perspective, not only to improve the public administration, but to play also a catalyst role also for other industries. That actions corroborated with the efforts of the private sector have led to the adoption of AI more or less in almost all the industries, as Figure 3 shows.

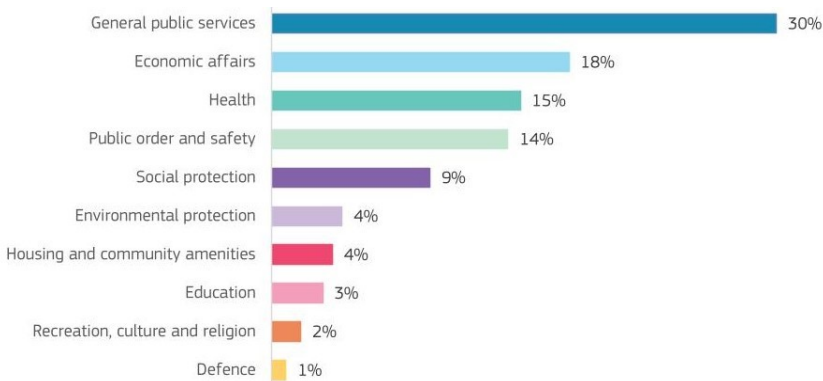


Source: European Commission (2024)

Figure 3. AI adoption in EU27 per industry by 2021

As Figure 3 shows, the interest and the engagement in implementing AI technologies is present in almost all economic and social areas, including in the public sector. Even the percentages of AI adoption are still low, it must be considered, especially in the case of the public sector, that the process of implementation has started only few years ago, and given the short period such percentages can be considered to be significant and sustain the idea that there are good premises for an extensive use of AI in next years.

At the same time, according to Tangi *et al.* (2022) the distribution of the use of AI on public services in EU27, is the following one (Figure 4):



Source: Tangi *et al.* (2022)

Figure 4. The distribution of the use of AI in EU27 by 2021

The distribution of the AI use in the public services shows almost a third of it is destined to general public services, 18% for economic affairs and 15% for health services, but only 1% in defence and 3% in education services, even that at least in the case of the later the potential of AI use is very high.

There are several specific challenges that must be surpassed in order to increase the adoption of the AI in public administration. According to European Commission (2024) the major challenges in this regard can be categorized in procurement process challenges, data challenges, AI technology challenges and organisational capacity challenges.

McBride *et al.* (2021) analysed the procurement process challenges and sustain that the procurement process of AI technologies in the public sector is different than the other traditional procurement processes, which represents itself a challenge because public administration must adapt the procurement process by mitigating its own needs with the limited existing AI technologies. Moreover, as World Bank (2020) drew a similar conclusion and added the idea that there are needed new legislation, new policies and new strategies in order to clarify the role and the ethics of AI using.

The data challenges include the unclear data-ownership in the public sector, the issues regarding data sovereignty, the insufficiency of digital infrastructure and of high-quality data (McBride *et al.*, 2021).

The category of AI technology challenges were synthesized by the European Parliament (2021) as regarding firstly to possible discrimination due to data bias and hard coding of presumptions, secondly difficulties of ensuring the transparency and explicability (while the algorithms of AI systems are not public) and thirdly, the so-called dehumanization of the public services(while the AI systems solve the cases the same way regardless of the existence of some particular cases that should be treated differently).

Finally, the organisational capacity challenges consist in managerial, technical and human capital issues that exist both in public and private organizations. Beside the need of leaders skilled to conduct the AI implementation there is a need of leaders capable to communicate with all parties involved, including the beneficiaries of public services regarding the utility of AI technologies (Campion *et al.*, 2020). Also, in terms of technical issues there are possible functioning difficulties such as the lack of interoperability between an AI system and government applications, while the human capital issues are basically regarding the lack of digital skills (Kankanhalli *et al.*, 2019), both of the governmental employees, but also of the beneficiaries of public services.

Beyond these challenges that must be surpassed basically by the public administration, there are also other challenges that regard the beneficiaries of the public services, especially the citizens. In their case there also might appear issues regarding their capacity to use public services based on AI technologies

and moreover it is uncertain, even they have such capacity, how will they react to this new kind of services (Chatterjee *et al.*, 2021).

People and companies are already using some AI technologies to interact in private relations so they are acquainted to technologies such as chatbots, Therefore, we expect that such technologies will be used in the future on large scale also for the interactions between the public administration and citizens and companies. On the other hand, it will be more difficult to implement AI technologies to serve more complex tasks, especially regarding the optimization of the internal functioning of the public institutions, but, even more slowly, such technologies will be progressively implemented.

4. CONCLUSIONS

Using AI technologies becomes nowadays more and more a general phenomenon for people and companies and while such technologies advance rapidly and are increasingly used in the private processes, it is natural to expect an increased use of these technologies also in their relationships with public administration. Therefore, there is a specific need for the public administration to adapt itself to the needs and the demands of the society by implementing such technologies in delivering modern public services. Moreover, beside improving the interactions of the public administration with the beneficiaries of public services, AI technologies are able and expected to contribute to the optimization of the internal functioning of the public institutions.

The analysis performed, focused mainly on the case of the European Union countries revealed that all EU countries governments are engaging themselves in adopting AI technologies, but there are many discrepancies between them regarding the steps made toward this goal, some countries advancing more rapidly than others. Moreover, there are differences regarding the role of the governments in relation with AI, most of the governments focusing on the role of user, while others considering also the role of facilitator, regulator and funder for the use of AI not only in the public administration, but in all industries.

Implementing AI technologies in the public administration brings on the one hand many advantages for them, as stated before, but raises also many challenges for the public administration, such as procurement process challenges, data challenges, AI technology challenges and organisational capacity challenges, on the other hand. Moreover, the success of implementing AI, especially in the public services delivery processes, depends significantly on the willingness and the capacity of the beneficiaries to access such services.

However, looking how fast the use of AI in public administration grew in quite few years, we can consider that there are good premises for expecting a rapid growing of the use of AI in the public administration, both in the external and also in the internal processes developed by public institutions.

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DEFENCE POLICIES IN EUROPE: A HISTORICAL APPRAISAL

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Abstract

This paper aims to provide a long-term historical perspective on the development of defence policies in Europe. It first presents the Westphalian system that structured inter-state relations from the end of the Thirty Years' War (1648) to the end of the Second World War (1945). The Cold War period is then presented. This is followed by the post-Cold War period, the turning point in 2007-2008, the war in Ukraine and the American shift. This allows us to present the beginnings of a European response and to draw some conclusions.

Keywords: *European Union; Common Security and Defence Policy; NATO; international system; history*

JEL Classification: N44.

1. WESTPHALIAN SYSTEM

The Westphalian system, named after the most important peace treaty to end the Thirty Years' War in 1648, recognises the historic importance of the role of states in Europe. They were the holders of sovereignty, and from then on nothing surpassed them at international level. The Pope and the Emperor were politically relegated and could no longer oppose them. State defence policies are regal policies par excellence. Indeed, external and internal security, diplomacy, justice, currency and taxation lie at the heart of state sovereignty and are not normally shared.

In the history of the European continent, certain states have made hegemonic claims. These include the Spain of Charles V and Philip II (1516-1598), the France of Louis XIV (1643-1715) and then Napoleon Bonaparte (1799-1815), and the Germany of William II (1888-1918) and then Adolf Hitler (1933-1945). These ambitions have always been thwarted. This shows the historical importance of the balance of power system, where coalitions are

formed to counter a potential hegemon. This system of balance worked best when international politics was a matter for sovereigns and peoples were kept out of the equation. In other words, with professional armies and before the emergence of nation states. In this constellation, past alliances do not prejudice future ones. A key moment, for example, was when Louis XV's France and Maria Theresa's Austria sealed their alliance (1756).

The French Revolution represented an upheaval for the continent. One nation, France, took up arms in 1792. New values – liberty, equality and the rights of peoples – burst onto the international scene. Conflicts between powers became virtually uninterrupted for a generation. The Congress of Vienna, which ended in 1815, turned the page on the Napoleonic era. A system of directories by the great powers (Austria, France, Prussia, Russia and the United Kingdom) and a system of international law could not be established. A system of equilibrium prevailed once again.

The period 1815-1914 proved to be one of the most peaceful in European history, except for the sub-period between 1854 and 1871, which was characterised by five wars involving the great powers. This was the era of nationalities and Italian and German unification. The transition was towards an era of nationalism. It was also a time of rapid industrialisation and major technological developments in armaments. The idea developed that a war could be won by swift, even lightning, action. The German Schlieffen plan, dating back to 1905, was emblematic of this. The debate about the primacy of the sword or the shield is eternal in the history of warfare. Decision-makers then placed themselves in the perspective of a cult of the offensive. Nationalism was exacerbated before the First World War. Two alliances that had become rigid, the Triple Entente of France, the United Kingdom and Russia on the one hand, and the Triple Alliance of Germany, Austria-Hungary and Italy on the other, stood face to face. Leadership was also weak and disappointing. The Sarajevo attack, which led to the assassination of the Crown Prince of Austria-Hungary, Franz Ferdinand, and his wife by a Serbian nationalist on 28 June 1914 was just the spark that ignited the fuse. Through the interplay of alliances, a large part of Europe found itself at war within a matter of weeks. Europe and the world entered the era of total war. The societies of the countries at war were fully mobilised. The economy and society had to place themselves at the service of the war effort (Droz, 1973; Lejeune, 1992; Van Evera, 1984).

The major economic interdependencies could not prevent war in Europe in 1914. In the history of human societies, we are forced to note the primacy of the political and military over the economic, except sometimes during historical parentheses that may last a few decades. To move beyond the natural state of war between human beings, a given area – in this case Europe, or indeed the whole world – would have to live under a regime of true democracy. We are therefore talking about democratic states united not only by economic

interdependence, but above all by a community of values and the rule of law. One lesson of history seems to be that true democracies do not go to war with each other. But a democracy may well wage war and be imperialist, whether we look at the history of France, the United Kingdom or the United States.

Inter-state relations therefore need to be civilised by bringing in supranational law and institutions, in other words federal elements. Simple intergovernmental cooperation is obviously better than no cooperation, but it is not powerful enough to tame states at certain crucial moments. Europe has seen and experienced so much violence and misfortune in the course of its history. The first part of the twentieth century was particularly bloody. The historic low point was reached in 1945 at the end of the Second World War, with a battered and divided Europe (Davies, 1997; Duroselle, 1993b; Grin, 2022; Judt, 2007; Merriman, 1996; Rich, 1992).

2. COLD WAR PERIOD

The post-Second World War international order was characterised by the emergence of two antagonistic blocs: East and West. Their antagonism was ideological, as well as political, economic and social. Europe was torn apart by the Iron Curtain and the Cold War. The presence of nuclear weapons in both blocs from 1949 onwards changed the global strategic landscape forever. Two antagonistic military alliances structured the continent: the North Atlantic Treaty Organisation (NATO) and the Warsaw Pact. Only a few European countries remained neutral or non-aligned. During this period, the defence policies of European countries were supranationalised as soon as they joined one of the two alliances. This was because two states exercised domination within their respective alliances: the United States and the Soviet Union. But their domination was of a different nature: consented and enlightened in the West, imposed and brutal in the East (Rothschild, 1993; Schöpflin, 1993; Wandycz, 1992).

In the West, a crucial question of this historic period was whether Europeans should form the European pillar of the Atlantic Alliance in a dispersed fashion, state by state, or in a coordinated way. The European Defence Community (EDC) project, proposed by France in 1950 based on an idea by Jean Monnet and torpedoed by that same country in 1954, represented an attempt at European coordination based on supranational principles. However, the EDC was not conceived outside the transatlantic framework. During the rest of the Cold War, nothing could replace the stillborn EDC. This was despite the very in-depth reflections and proposals to begin Europeanising defence issues put forward by Jean Monnet and his Action Committee for the United States of Europe in the 1960s. In fact, the national, even nationalistic, visions of the United States, the United Kingdom and France prevented this from happening. In this context, a country like the Federal Republic of Germany valued above all the American guarantee of security (Grin, 2011). Apart from France, which developed a defence

policy independent of the United States and acquired nuclear weapons in 1964, the other Western countries fell into a kind of indolence. They accepted the American protectorate but were reluctant to invest as much as the US in their defence. There were already American complaints in the 1960s that Europeans were not shouldering their share of the transatlantic defence burden (Dunbabin, 1994; Duroselle, 1993a; Trachtenberg, 1999; Young, 1996).

3. AFTER THE COLD WAR

The end of the Cold War and the historic division of the European continent between 1989 and 1991 seems to have opened a new era of possibilities. With the notable exception of France, however, European countries did not want to risk American disinvestment in European security. They like this historically benevolent and generous protector, far enough away not to give the impression that it controls the destiny of Europeans and close enough not to run the risk of seeing it replaced by another hegemon, this time a European one. The United States at the time, under the administration of President George H.W. Bush and still scalded by the historical experiences of the twentieth century, did not want to withdraw from Europe for fear of having to return in the event of another catastrophe (Grin, 2024a).

The defunct Soviet Union had been sufficiently harsh, domineering and exploitative for the former Warsaw Pact countries to dream only of joining the benchmark Western institutions of NATO and the European Community, which became the European Union in 1993. The countries of Central and Eastern Europe joined NATO in waves, as a guarantee of their future security, and the EU, as a guarantee of their future prosperity and their return to the great European family. As during the Cold War, the defence of Europe remained both transatlantic and national. The Russian bear was now dormant and no longer frightening in the short term, but the transatlantic security guarantee was seen as the best possible life insurance policy.

The French vision promoting the development of an autonomous European defence was not being heard. The Maastricht Treaty, which came into force in 1993, admittedly launched a Common Foreign and Security Policy, the CFSP. But it did so without appropriate institutions and without a hint of supranationality. Following the Maastricht Treaty and the subsequent ones (Amsterdam, Nice, Lisbon), the European Union developed its CFSP. Institutions and agencies were set up around the High Representative (a post created in 1999), in particular committees within the Council (Political and Security Committee, Military Committee), the European Defence Agency and the European External Action Service, inaugurated in 2011 and reporting neither strictly to the Council nor to the Commission. The successive High Representatives are Javier Solana (1999-2009), Catherine Ashton (2009-2014),

Federica Mogherini (2014-2019), Josep Borrell (2019-2024) and Kaja Kallas since 2024 (Grin, 2025).

A common strategic vision was sought through successive documents, from the 2003 European Security Strategy to the 2022 Strategic Compass for Security and Defence (Council of the European Union, 2009b; European Union, 2016; European Union, 2022). Low-intensity external operations were launched in 2003. There have been almost 40 to date. A permanent structured cooperation was set up in 2017 to promote cooperation leading to the development of military capabilities (Verdes, 2025). The European Union's security action has provided added value for its Member States and for the security of Europe and the world in areas that are admittedly concrete but nonetheless limited. The Union has acted as an intergovernmental forum for cooperation, the mutual taming of military forces, the beginnings of greater convergence in strategic matters, limited industrial policy actions and low-intensity peacekeeping operations in Europe, Africa and the Middle East. However, NATO has stayed the ultimate insurance policy for Europeans. Genuine defence remains both national and transatlantic. The European level cannot really emerge, as if smothered between the two dimensions that frame it.

4. 2007-2008 INFLECTION POINT AND WAR IN UKRAINE

The inflection points in the European security order, which was highly significant but underestimated at the time, came in 2007-2008 with Russian President Vladimir Putin's vindictive and revisionist speech at the Munich Security Conference in February 2007 and, the following year, the war in Georgia (Fried and Volker, 2022). Russian imperialism was back, based on historical revanchism. From 2008 onwards, Europe's security began to crumble crisis by crisis. The beginning of Russia's aggression against Ukraine, sensing that it was tipping over to the West, began in earnest in 2014 with the seizure of Crimea and the start of unrecognised military operations in eastern Ukraine. From then on, European states began to spend more on their defence, albeit modestly at first. At the same time, Russia was only moderately sanctioned by the Europeans and the Americans. The Minsk I and II agreements, signed in 2014 and 2015, proved futile in the face of Russia's bad faith (Kim, 2024).

The Russian escalation against Ukraine in 2022, with the all-out aggression launched on 24 February to bring about regime change in Kyiv, was a shock for Europeans. German Chancellor Olaf Scholz called it a "change of era". The first high-intensity inter-state war has hit the European continent since 1945. This is against international law, against the free will of a sovereign state on the continent and its people, namely Ukraine, but also against humanity and against the rationale that all human beings on this planet should be united against possible existential threats, whether we think of global warming, the accelerating

loss of biodiversity, new pandemics, the nuclear risk or the threats of an artificial intelligence that could get out of control (Grin, 2023; Grin, 2024b).

5. AMERICAN TILT

In 2022, Europe was taking a great leap backwards by almost 80 years. But the new factor that calls into question many things that Europeans took for granted is the change in international politics initiated in the United States by the Trump II administration coming to power on 20 January 2025. Since then, presidential decrees and shock statements have been flying thick and fast. Behind a fog of communication, no doubt intended to provoke a stupefaction effect, it is hard to discern what exactly American policy towards Europe will be.

We have known since the Obama administration that the USA is more aware of the risk of global overstretch and wants to pivot towards Asia, with China seen as the main source of future challenges and threats. It is always dangerous for the world to experience a shift towards a potential new hegemon, and, in any case, the United States does not seem ready to see itself supplanted by China. Like tectonic plates colliding, these historic turning points are often sources of conflict. The last tipping point, between the British Empire and the United States, was peaceful because of the cultural and political affinities between the two Anglo-Saxon entities. But things look set to be different this time.

The Trump administration has reinforced the imperialist, mercantilist and transactional features of American policy and its vision of the world. Yesterday's allies often seem to be treated less well than their declared enemies. Europeans are being urged to take matters into their own hands and spend more on their own defence. But it is not yet clear whether the United States intends to draw a definitive line under the Atlantic Alliance. The next steps could be the abandonment of Ukraine and the disengagement of military forces from the European continent. In any case, the damage has been done in the sense that the American guarantee of security for the continental countries belonging to NATO, based on the famous Article 5 of the Washington Treaty, is no longer guaranteed. For the record, here is what this key article says (North Atlantic Treaty Organisation, 1949):

The Parties agree that an armed attack against one or more of them in Europe or North America shall be considered an attack against them all and consequently they agree that, if such an armed attack occurs, each of them, in exercise of the right of individual or collective self-defence recognised by Article 51 of the Charter of the United Nations, will assist the Party or Parties so attacked by taking forthwith, individually and in concert with the other Parties, such action as it deems necessary, including the use of armed force, to restore and maintain the security of the North Atlantic area.

Any such armed attack and all measures taken as a result thereof shall immediately be reported to the Security Council. Such measures shall be terminated when the Security Council has taken the measures necessary to restore and maintain international peace and security.

The countries of the Eastern Front, on the front line of the Russian imperialist threat, are cruelly aware of the American mortgage. Germany, too, is seriously shaken. Europeans have been dumbfounded since 20 January 2025. The prevailing desire on the continent to continue to support Ukraine, a candidate country for membership of the European Union since June 2022, remains strong despite growing opposition. But will the Europeans really be able to make up for America's withdrawal? And we know the vigour of Russian destabilisation operations, including interference in the democratic processes of European states and hybrid warfare cyber operations.

6. THE START OF A EUROPEAN RESPONSE

National commitments to increase defence spending are accelerating, particularly in the Baltic States, Poland and Germany. Using data from the Stockholm International Peace Research Institute (SIPRI), our calculations show that the evolution of military spending in the 27 current Member States of the European Union between 2007 and 2024 is as follows in Table 1(Stockholm International Peace Research Institute, 2025a):

Table 1. The evolution of military spending in the 27 current EU Member States

Year	Military expenditure (in billions of US dollars at current prices and exchange rates)	Military spending (in billions of constant 2023 US dollars)	Index based on constant dollars (2024 = 100)
2007	212	228	64
2008	237	230	64
2009	226	232	65
2010	214	225	63
2011	222	217	61
2012	206	213	59
2013	207	206	58
2014	207	205	57
2015	178	211	59
2016	183	218	61
2017	194	225	63
2018	215	234	65
2019	217	247	69
2020	238	264	74
2021	262	274	77
2022	260	283	79
2023	307	307	86
2024	370	358	100

Source: Stockholm International Peace Research Institute, 2025a

It is best to use the constant dollar figures in the third column. It should be noted that the trough in military spending was reached in 2014, and that an upward break occurred in 2019. According to the announced intentions of the Member States, military spending is set to rise sharply over the next ten years (North Atlantic Treaty Organisation, 2025). To date, the 27 national armies of the EU Member States total 1.5 million men (Da Silva and Verdes, 2025).

SIPRI estimates global military spending for 2024 at 2,718 billion dollars, an increase in real terms of 9.4% compared with 2023. This represents 2.5% of world GDP. The upward trend in spending has been uninterrupted since 2015. Russia is spending \$149 billion on defence, 38% more than in 2023 and twice as much as in 2015. This figure represents 7.1% of Russian GDP and 19% of all public spending. Ukraine, a sovereign state under attack from Russia, has military spending of \$65 billion, 34% of its gross domestic product and the highest military burden in the world. Military spending by NATO countries totals 1,506 billion dollars, or 55% of global military spending. That is ten times more than Russia. 18 out of 32 countries have reached the target of 2% of GDP set in 2004. The United States has military spending of 997 billion dollars, i.e. 66% of total NATO spending and 37% of world military spending. The 30 European members of NATO spend 454 billion dollars. As we saw above, the EU Member States spend 370 billion dollars, i.e. 14% of world spending, two and a half times more than Russia and more than China. China's spending reaches 314 billion dollars after three decades of consecutive increases (Stockholm International Peace Research Institute, 2025b).

With the "Readiness 2030" programme announced in 2025, flanking measures are being taken at EU level, including in particular the SAFE initiative to the tune of 150 billion euros in joint borrowing, but in the form of loans rather than individual grants, as well as a relaxation of the budgetary rules to which the Member States are subject and the mobilisation of the European Investment Bank. In all, we are talking about a package worth 800 billion euros. Instruments are being created to strengthen the European Defence Technological and Industrial Base (EDTIB) and procure critical weapons in short supply, such as missiles, drones, artillery systems, cyber protection instruments and space tools (European Commission, High Representative of the Union for Foreign Affairs and Security Policy, 2025).

Since 1 December 2024, the new post of Commissioner for Defence and Space has been filled within the European Commission by the Lithuanian Andrius Kubilius. The EU institutions base their analysis on the fact that the European states have five years, until 2030, to massively rearm and eliminate their security shortcomings, because it is at this point that the Russian threat of aggression of a new country is considered realistic (European Commission, High Representative of the Union for Foreign Affairs and Security Policy, 2025). In the meantime, however, the Europeans must not allow Ukraine to collapse or be

nibbled away at an accelerated pace. This has not been the case so far, but American aid is still available. This was lacking for six months in 2023-2024, which had serious consequences on the ground. Ukraine has become a leading producer of certain weapons, including drones, and has acquired first-rate industrial and military experience; it has much to offer the rest of Europe if the latter remains loyal to it (Grin, 2023; Grin, 2024b).

We are also witnessing the emergence of a coalition of the willing towards Ukraine, made up of 31 States and led by major European countries that want to continue to support Ukraine: France, the United Kingdom, Germany and Poland. The Weimar+ group, also created in 2025, represents a European diplomatic and geopolitical alliance aimed at promoting support for Ukraine and European sovereignty in the face of the Russian threat and the risk of American disengagement. In terms of members, the European Commission joins France, the UK, Germany, Poland, Italy and Spain. In other words, the UK joins the five main EU Member States and the European Commission.

Despite the very high level of popular support for the Union's Common Security and Defence Policy, reaching a record 81% in 2025 (European Union, 2025b), the EU still appears too weak in several respects to take over the place partly vacated by the United States: it does not include the United Kingdom, which is a first-rate military power and indispensable in this area, or Turkey for that matter. Its action extends to the broad economic spheres of the internal market and industrial policy applied to the EDTIB. When it comes to defence, it remains intergovernmental (Grin, 2025). Hungary does not pull the same strings as its partners, and they constantly have to negotiate with it, as when renewing sanctions against Russia, which have to be unanimously adopted every six months. Other countries, such as Slovakia, are critical of the support for Ukraine. Many national elections have become tests of European resolve, which can stumble at any moment. It must be said: the European Union remains structurally too sensitive to policy changes in national capitals. Because of its largely intergovernmental nature in matters of sovereignty, it is not sufficiently immune to political changes at national level. This is why it seems to be partly bypassed by new *ad hoc* cooperation structures as mentioned above.

Despite the absorption of the Western European Union (WEU) in 2011, which was in the shadow of NATO the sleeping beauty of European defence during the Cold War, the EU cannot, or at least not yet, aspire to the establishment of a true European defence. European defence has made progress, as mentioned earlier. But the defence of Europe, in other words the ultimate guarantee of the security of the territory, the population and vital interests, is something much more demanding. That is why the discussions that are likely to follow on the European dimension of France's nuclear deterrent will be so important.

Article 42(2) of the Treaty on European Union (TEU), since the entry into force of the Treaty of Lisbon in 2009, has read as follows (European Union, 2025a):

The common security and defence policy shall include the progressive framing of a common Union defence policy. This will lead to a common defence, when the European Council, acting unanimously, so decides. It shall in that case recommend to the Member States the adoption of such a decision in accordance with their respective constitutional requirements.

The policy of the Union in accordance with this Section shall not prejudice the specific character of the security and defence policy of certain Member States and shall respect the obligations of certain Member States, which see their common defence realised in the North Atlantic Treaty Organisation (NATO), under the North Atlantic Treaty and be compatible with the common security and defence policy established within that framework.

We are struck by the apparent voluntarism of the legal text, even though it recalls that some Member States of the Union are neutral or non-aligned (currently Austria, Cyprus, Ireland and Malta) and that the others belong to NATO (currently 23 of the 27 EU Member States).

Mutual assistance and solidarity clauses have also been in place since 2009. The first is found in Article 42(7) of the TEU and reads as follows (European Union, 2025a):

If a Member State is the victim of armed aggression on its territory, the other Member States shall have towards it an obligation of aid and assistance by all the means in their power, in accordance with Article 51 of the United Nations Charter. This shall not prejudice the specific character of the security and defence policy of certain Member States.

Commitments and cooperation in this area shall be consistent with commitments under the North Atlantic Treaty Organisation, which, for those States which are members of it, remains the foundation of their collective defence and the forum for its implementation.

The solidarity clause is set out in Article 222 of the Treaty on the Functioning of the European Union and reads as follows (European Union, 2012):

The Union and its Member States shall act jointly in a spirit of solidarity if a Member State is the object of a terrorist attack or the victim of a natural or man-made disaster. The Union shall mobilise all the instruments at its disposal, including the military resources made available by the Member States [...].

At its meeting on 18 and 19 June 2009, the European Council gave Ireland guarantees to help ratify the Treaty of Lisbon in a second popular vote - which was won. It states in particular (Council of the European Union, 2009a):

It will be for Member States - including Ireland, acting in a spirit of solidarity and without prejudice to its traditional policy of military neutrality - to determine the nature of aid or assistance to be provided to a Member State which is the object of a terrorist attack or the victim of armed aggression on its territory.

The Treaty of Lisbon does not provide for the creation of a European army or for conscription to any military formation.

Despite popular support for the Common Security and Defence Policy, the European Union does not have, or at least not yet has, the political structure and associated popular legitimacy to become a fully-fledged political union that would take decisions of an existential nature with sufficient legitimacy, affecting matters of life and death through armed conflict.

However, the Union has progressed through crises. In particular, there was the health crisis of 2020-2022 linked to Covid-19, a crisis without historical precedent for a century. In this context, its action usefully complemented that of the Member States. The latter can no longer act alone in the event of a systemic threat, as we saw with the coronavirus, and as we see today with the great fear linked to the joint Russian American double challenge (Grin, 2020). But this does not mean that the EU has acquired competence, even shared with the Member States, in matters of public health or defence. From the point of view of the reality of the challenges, Europe is undoubtedly a community with a shared destiny, but some national decision-makers are slow to fully recognise this fact.

Europe will undoubtedly be investing ever more in its defence in the future, which raises a number of difficulties. Firstly, there is the butter-and-cannon dilemma. Unless taxes can be increased, more money for defence means less for social and cohesion policies. There is a risk of undermining the hard-won social balance in some countries. Additional debt might appear to be a way out. But some countries, including Italy, France and Spain, with debt-to-GDP ratios of 135%, 113% and 102% respectively, are already in a difficult financial situation and risk finding themselves at the mercy of negative assessments by the financial markets (Bachler, 2025).

The "bang for the buck" effect, i.e. the return on investment from military spending, represents a second difficulty. If the European states do not coordinate their production and procurement of military equipment, or its deployment, they will miss out on economies of scale and the best technological acquisitions (Burilkov and Wolff, 2025). If they buy American, as they still do for more than 60% of their military purchases, they will maintain a toxic dependence on the USA (Draghi, 2024). Moreover, it is not clear whether Donald Trump's United States is really prepared to accept that a military disconnection with Europe means the end of major military purchases by the old continent. The capacity of the US administration to cause harm and threaten individual European countries is undoubtedly considerable.

Thirdly, Vladimir Putin will of course not be in power in Russia forever. But there is nothing to suggest that his successors will not continue his aggressive and imperialist policy, with substantial human and financial resources. A fundamental question is: what is the true state of the Russian economy? Russia, which has switched to a war economy, certainly does not have unlimited resources to devote to extending its territory and influence. Moreover, it recently suffered a heavy setback in the Middle East and there is

nothing to suggest that the future of its Iranian and North Korean allies will be bright. The fundamental question is to what extent China will support Russia, and with what ambitions to take effective control of the latter.

7. THE FUTURE IN QUESTION

Clearly, European countries cannot accept Russian imperialism, and they must counter it. At the same time, as long as there is a schism between Russia and its affiliates on the one hand, and the rest of the continent on the other, any European peace will ultimately be no more than a peace of equilibrium, which may well last, but is inherently fragile, especially as hybrid warfare operations are deployed.

Genuine and lasting peace in Europe would require three conditions: a change of regime in Moscow, the maintenance or even strengthening of the European unity embodied today by the EU, and finally a genuine outstretched hand from the EU to the new Russia when the time comes. But we seem to be a long way from that, and every day that the war in Ukraine drags on, the future historic reconciliation of the continent becomes more difficult to achieve. Tomorrow, just as in the aftermath of the Second World War, Europe will need its future Jean Monnet, Robert Schuman and Konrad Adenauer. One might even go so far as to say that this European anchorage would be the best chance for the Russia of tomorrow to exist in the service of its people.

Will Europe in the years ahead be able to develop a truly integrated defence policy that goes beyond the coalitions of the willing that are typical of intergovernmentalism? It seems clear that the EU can offer its Member States a strengthened defence industrial and technological base and a reduction in the financial constraints they face. But, in the context of the United States' disengagement from and even hostility towards Europe, will this be enough without tackling head-on the issue of the Union's full political federalisation? If this accelerated federalisation were to take place, it is hard to imagine that it would involve all the current EU Member States. More differentiation between them would be likely. The Westphalian system seems to have run out of steam in Europe, but it is hard to see its successor in the form of a fully-fledged European federation. The quote by the Italian political theorist Antonio Gramsci seems to apply perfectly: "*The old world is dying, and the new world struggles to be born: now is the time of monsters*" (Boniface, 2025). There is no doubt that Europe's interstate structures will continue to undergo profound changes in the years and decades to come. May peace prevail, respecting the rights of peoples and safeguarding the common interests of humanity.

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RESILIENCE AMONG NURSE MANAGERS: A NARRATIVE LITERATURE REVIEW ON INFLUENCING FACTORS AND STRATEGIES FOR STRENGTHENING RESILIENCE

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Abstract

Healthcare systems worldwide experience challenges and crises that include pandemics, emergency events, wars, and so on. During these events, nurse managers are required to provide a professional response, handle many burdens, resolve continuous pressures, make determined decisions, and cope with uncertainty and rapidly changing situations. This might undermine the nurses' personal resilience. Nevertheless, the empirical literature about nurse managers' resilience is limited, and studies focus more on nursing staffs and less on their managers. When the world continues coping with wars and emergency situations, it is highly important to explore how nurse managers address the meaningful challenges that are likely to affect their personal resilience.

This narrative review aims to investigate available literature dealing with resilience in the healthcare system, identifying the state of knowledge about personal resilience, as well as strategies for enhancing personal resilience in order to handle crises at work. The literature review illustrates that exposure to emergency situations, workloads, and insufficient resources, constitute factors that affect nurse managers' resilience. The strategies identified as promoters of nurse managers' resilience are: creating a balance between work and life, establishing positive relationships and communication with colleagues, training designed to improve resilience, offering social support, and thinking positively in times of crisis.

Keywords: *personal resilience; nurse managers; resilience-enhancing strategies; crises; emergency situations*

JEL Classification: I11; I118; M1; M12.

1. INTRODUCTION

In recent years, mankind has witnessed a high number of crises, the most devastating among them being crises resulting from endless wars waged around the globe. Throughout the crisis, managers are supposed to manage the situation.

Nevertheless, every crisis management differs from the other and it has its own uniqueness. In states of crisis, communication has a meaning prior to, during, and following the crisis. Thus, it is important to be deeply acquainted with the organization's culture, properties, and values of the population that experiences the crisis (Zamoum and Gorpe, 2018).

Healthcare systems around the globe have experienced severe crises and upheavals throughout the last decade. These upheavals attributed an increasingly growing attention to the concept 'resilience' in the worldwide healthcare system. It has been argued that building up the resilience of the healthcare systems will reduce their vulnerability to crises, by ensuring a better comprehension and more effective response to the crisis (Barasa *et al.*, 2018). Crisis is a negative event or consequence that encompasses the element of surprise or disruption, threatening people's resources and well-being. Usually, it starts with a meaningful event that might be a catastrophe or a series of pressure factors that have an accumulated effect (Rajabipoor Meybodi and Mohammadi, 2021).

2. LITERATURE REVIEW

The impact of nursing staffs' psychological trauma, as well as the effect of terrorism or war on healthcare systems were the focus of a limited number of studies (Al-Hawdrawi *et al.*, 2017). Exposure to emergency situations is associated with lower levels of resilience at work, a factor that is particularly important for healthcare institution workers in the course of emergency situations that involve high demands and strong pressure (Shmul *et al.*, 2024).

Nurse managers cope everyday with the responsibility of supervising the staff, ensuring high quality of care on the unit's level, and mediating between the nursing staff and senior management. As managers, they play a positive role in the promotion of positive working climate that can serve as a factor that protects against their subordinates' burnout at work. Consequently, nurse managers' professional well-being and psychological safety are crucial. This is important particularly during periods of crisis, when they are expected to offer support and guidance under unusual conditions (Labrague *et al.*, 2018).

Difficulties at work are an issue that invokes an increasing attention in the international literature dealing with nurses. Extensive literature attests to the industrial and organizational challenges faced by nurses in numerous places around the world. Nurses handle a wide variety of problems and challenges during the course of their work. These difficulties include a severe shortage of experienced nurses, aging workforce, health and occupational security problems, and continuous challenges (Jackson *et al.*, 2007).

Nurse leaders are coping today with an increasingly growing responsibility and with challenges that involve many continuous pressures that might have an adverse impact on leaders' ability to succeed. The nurse leaders play a key role in the tutoring of their staffs under conditions of high tension (Abd-El Aliem and

Abou Hashish, 2021), as well as making decisive yet informed decisions, while coping with uncertainty and rapidly changing situations (Alazmy *et al.*, 2022).

Nurse leaders in the current healthcare environment must work incessantly in complex situations. They are expected to do more with less means, maintain quality of care standards, and preserve satisfied human resources. A growing pressure on all levels requires a set of well-equipped leadership skills, resilience being one of the most important competences of this leadership. Nurse leaders' personal resilience, combined with the ability to promote the resilience of a group and an organization, enhances considerably the success and long-range functioning of the group or the organization (Cline, 2015).

In spite of the growing interest in the concept of resilience, there are but a few evidences regarding the way of creating or strengthening resilience in healthcare systems or in other sectors. The empirical literature that discusses resilience is mainly conceptual, focusing on terms and principles. Nevertheless, understanding what makes systems strong in the real world is crucial and important, and so it the development of strategies for promoting their resilience (Barasa *et al.*, 2018). The challenge of managing staffs in emergency times, coping with an increasing sense of burnout, and dropping out from the profession is extensive, and there are several gaps in the research of this topic around the world (Heeb and Haberey-Knuessi, 2014). Furthermore, there is insufficient research of nurses' accumulated experience in caring for the wounded at times of war (Rahimghaee *et al.*, 2016), and nurse leaders frequently lack the management and leadership training required during war crises (Warshawsky and Cramer, 2019).

This narrative review aims to explore the available empirical literature dealing with the concept resilience with respect of nurse managers, the factors that affect nurse managers' resilience, and the strategies for improving personal resilience for the purpose of handling crises at work.

3. RESILIENCE OF NURSE MANAGERS

Resilience is defined as the ability to overcome distress, be developed, and get reinforced by the experience (Thomas and Revell, 2016). This is a process of negotiations, management, and compliance with meaningful or traumatic sources of tension, in which assets and resources in individuals' life and the environment, facilitate the ability to adjust to and cope with various states of discomfort. Resilience is the capability of overcoming trauma, accompanied by a positive and optimistic approach towards the future. Healthcare workers' resilience is defined as a personal capacity that helps them in resolving difficulties and overcoming demands at their place of work (Handini *et al.*, 2020). This is a process that is activated as a response to complex events and challenges and is usually described as the ability to recuperate from negative occurrences. Moreover, the term resilience in a process of adjustment is

associated with people's ability to accomplish their essential goals under given or accepted conditions (Aryuwat *et al.*, 2023); assist them in the confrontation with factors of pressure and distress (Sihvola *et al.*, 2022); as well as be renewed and re-build a stable psychological and physical situation when coping with extensive adverse events (Rajabipoor Meybodi and Mohammadi, 2021).

Resilience at work is described as an index of recovery from work demands, degree of involvement in the work, extent of physical health, and indices of chronic exhaustion and impaired sleep, and it is considered as a competence that can be taught, exercised, and developed (Carpio *et al.*, 2018). Moreover, it was recommended as a personality trait that can serve as a defense mechanism against burnout at work (Labrague *et al.*, 2018).

There is no clear definition of nurse managers' resilience, since only a few studies have explored this topic. Based on previous studies, nurse managers' resilience encompasses the ability to cope with distress at work, combined with their personal resilience (Sihvola *et al.*, 2022). Hospitals, as permanent and specialized centers for granting medical services, with their availability of facilities and experienced human resources, constitute one of the important elements of the process of response to unexpected events, being responsible for maintaining the patients' life and health (Rajabipoor Meybodi and Mohammadi, 2021).

Current studies have identified the resilience's role of protection against burnout among healthcare professionals. In a cross-sectional study of 1061 nurses, conducted by Luo *et al.* (2022), the participants who reported low level of resilience, demonstrated more burnout symptoms, among them emotional fatigue, cynicism, and reduced professional efficiency. Furthermore, evidences showed a close relation between leadership and resilience among nurse managers, and nurse managers with low level of resilience manifested a less empowering leadership (Luo *et al.*, 2022).

The relationships between nurse managers' organizational support, leadership, resilience and burnout are complex and insufficiently understood. Studies (e.g.. Luo *et al.*, 2022) have indicated that organizational support has a positive impact on the enhanced psychological resources of nurse managers, such as leadership. Nevertheless, there are limited evidences that back up the positive role of organizational support, leadership, and resilience with respect of nurse managers' burnout, since most studies have focused mainly on bedside nurses and head nurses (Luo *et al.*, 2022). On the global level, nurse leaders have the task of ensuring high quality care, also in times of crisis that require an active problem-solving and confidence in the future (Sihvola *et al.*, 2022).

During the COVID-19 pandemic, nurse managers demonstrated different levels of resilience, ranging between intermediate to high (Sihvola *et al.*, 2022), and there are only a few studies of nurse managers' resilience during that period. Future research should provide a response to nurse leaders' personal resilience due to the relation with the nurses' resilience (Sihvola *et al.*, 2022).

Voices of criticism are hesitant about the concept “resilience”, believing that it serves for hiding the responsibility for political and systemic failures. Hence, if the occupational environment fundamentally lacks resources, communication, collaboration, joint decision-making, as well as support and acknowledgement systems, it is difficult to have resilient workers. Consequently, these organizational factors cannot settle for resilience training designed for individuals; rather, they require a more systemic approach (Labrague *et al.*, 2018).

Enhancing personal resilience has become a superficial response to the preservation of nurses during a global shortage of nurses. Nurses’ resilience must be considered as a dynamic process that necessitates a continuous handling and commitment, as well as an adjustment ability and flexibility vis-à-vis changing professional and personal demands. An active handling of nurse managers’ need to maintain, preserve, and build their resilience, may facilitate some of the challenges of manpower preservation and recruitment, faced by nurses and leaders in the field of healthcare (Udod *et al.*, 2021a, 2021b).

Resilience is an essential element of effective nursing leadership, affecting the performance of the organization. Nurse leaders at all levels should develop these competences in order to survive and prosper in an environment of health that is increasingly becoming more complex. Today’s nurse leaders need leadership skills that are constantly developed in order to manage an advanced and complex environment of health (Cline, 2015). Moreover, nurse managers’ preservation is important, and it will retain stable human resources that constitute a larger pool of nurses for senior positions, promoting a nurse managers’ team that benefits from job satisfaction (Carpio *et al.*, 2018).

4. THE FACTORS THAT IMPACT NURSE MANAGERS’ RESILIENCE

Nurse managers are not resilient and are sensitive to work-related tension. The environment in which nurses work today is characterized by a growing complexity of the healthcare system. Insufficient number of workers, patients’ changing needs, and nurse managers’ expanding function have considerably contributed to their experiences of tension. Furthermore, nurse managers have to cope with several challenges, both on the high and low management levels in the organization, or in the staffs that have various perspective and contradictory values (Labrague *et al.*, 2018).

Healthcare workers frequently face challenges, heavy workload, fatigue, as well as internal and external stress factors. They must be able to balance between various stress factors present in or outside the work environment, and the services that have to be provided by professional healthcare workers (Handini *et al.*, 2020). Exposure to states of emergency are associated with lower levels of resilience at work, a fact that is particularly vital for healthcare

institution staffs during emergency situations that encompass high demands and strong tension (Shmul *et al.*, 2024).

Resilience in the field of healthcare implies the individuals' capability and its support system, designed to help the healthcare system in coping with difficulties, demands, and stress sources at work. If the healthcare system can cope with tension in the work environment, and can provide an optimal service, it is reasonable to say that the staff has a high level of resilience (Handini *et al.*, 2020). Numerous inconvenient events in the work environment endanger the nursing staff's resilience. For example, unpredicted workloads, fatigue, insufficient resources, bullying at work, and inability, can affect the staff's performance results, one of them being patients' care. Hence, it is highly important to build and reinforce resilience in the work environment. Nurses and nurse leaders function in an intensive environment and are obliged to comply with unprecedented demands, as well as with tense working conditions. As a result, nurses and nurse leaders might abandon their position, entailing a greater uncertainty of the labor force (Udod *et al.*, 2021a, 2021b).

Successful nurse leaders reflect principles of professionalism, apply efficient inter-personal communication skills, and are extensively acquainted with the healthcare system and its complexity. Nevertheless, in spite of their in-depth training, nurse leaders have for a long time been a considerably unappreciated and invisible force, maintaining the health of the healthcare systems and acting as a safety net for patients and nursing staffs. During the COVID-18 pandemic, nurse leaders were under strict inspection and were more exposed to the exceptional tension associated with the challenges faced by leaders who navigated that unprecedented pandemic (Bergman *et al.*, 2024).

Resilience can serve the individuals for problem-solving (overcoming), strength and time for resolving problems (navigating), recovering from inconvenient conditions, and being resistant or resilient (Handini *et al.*, 2020). In terms of factors that enhance resilience, studies have explored the impact of physiological factors, such as protection of the body against reactions to tension. For example, the sympathetic nervous system; external factors such as social media; internal factors such as positive emotions, sense of self-efficacy, and demographic variables, e.g., years of experience. Moreover, studies have examined the protective role of various coping strategies, designed mainly for workhours, as well as the protective role of leisure-time activities. Nevertheless, the comparative efficiency of various factors that enhance nurses' resilience have not yet been examined (Manomenidis *et al.*, 2019).

Labrague *et al.* (2018) conducted a study of 291 nurses working in acute hospitals in the United States. Approximately 62% of the participants indicated their plan to dropout from work within the next 2-5 years, tension and emotional fatigue being the main reason. The research findings showed that one out of six nurse managers experienced occupational tension and emotional fatigue due to

different tension factors, among them job conflict, pressure at work/time, workload, role unclarity, insufficient social support, insufficient leadership, organizational restrictions, constant exposure and inability to manage the pressure. All these factors were associated with the individuals' adverse implications, such as fatigue, emotional exhaustion, lack of job satisfaction, intention to drop out and poor emotional health. Continued exposure to tension not only had a negative effect on the nurse managers' health, but also on their decision-making process that could have impacted the staffs and the patients (Labrague *et al.*, 2018).

Several studies (e.g., Udod *et al.*, 2021a, 2021b) illustrated that prolonged exposure and failures to manage the pressure were frequently connected to negative implications. Thus, fatigue, emotional exhaustion, job dissatisfaction, tendency to drop out, poor decision-making, reduced mental health, healthcare system complexity, and work-life balance require innovative approaches to the accomplishment and maintenance of strong and healthy work environment for nurse managers and the staff. A workplace with a continued tension can undermine the mental and physical health of nurse managers, entailing a low level of performance and adverse effects on the patients. For example: patients' satisfaction, patients' mortality rate, errors in prescribing and administering medication, use of restrictions, and infections acquired in the hospital (Udod *et al.*, 2021a, 2021b).

A qualitative study, conducted by Udod *et al.* (2021a), aimed to investigate 16 nurse managers' perceptions of the tension involved in their function, and the way their coping strategies developed their resilience in their workplaces. The findings showed that the main factors that affected their nursing managers' role comprised insufficient resources, response and adjustment to constantly changing situations, and human resources pressure. The nurse manager succeeded in coping with these factors by a proactive approach they had adopted in order to solve urgent problems by setting priorities and establishing relationships and, thus, reduced or facilitated the burden of problems or challenges. The participants applied preventive or predictive approaches that constituted one step ahead for the purpose of moderating the negative impact of a situation, loyalty to and concern for the patients and the workers, and psycho-social support and nurturing by colleagues, family and friends (Udod *et al.*, 2021a).

5. STRATEGIES OF PERSONAL RESILIENCE IMPROVEMENT FOR COPING WITH CRISES AT WORK

A crisis is an unexpected event that is meaningful, disrupting, harmful or threatening for organizations, creating confusion, uncertainty, and suffering. It can also be defined as a period of psychological imbalance that occurs as a result of a dangerous event or situation that constitutes a considerable problem the handling of which is not possible by means of familiar coping strategies. Leadership during a crisis is meant to be meticulously shaped for focusing on

meaningful, disrupting, harmful, and threatening event, based on the understanding that every state of crisis is unique and requires a flexible and special approach (Turnipseed and VandeWaa, 2022).

In recent years, humanity has witnessed a high number of crises, the most destructive among them being the endless wars waged around the world. During a crisis, managers are supposed to manage the crisis-based situation, taking into consideration that communication is meaningful before, during and following the crisis. Hence, it is vital to know in-depth the organizational culture of the organization, its properties, and the values of the population that experiences the crisis (Zamoum and Gorpe, 2018).

While resilience is sometimes an innate characteristic, it can be developed in an initiated way, guide it and teach it. Furthermore, resilience can be reinforced during a defining moment in the career of nurse managers. Unfortunately, some of these defining moments turn into a breaking point of nurse managers that decide to reject their role (Cline, 2015).

People can develop and reinforce their personal resilience by developing personal strategies and the effect of their personal injuries. In the workplace, all people have a potential of resilience; yet, its level is determined by experiences, properties, the environment and people's balance between danger and protection factors (Jackson *et al.*, 2007). In light of the attention attributed recently to tension, fatigue, compassion, and moral harassment in leadership roles, resilience as a coping strategy has become a core issue for nurse managers. Nurse leaders carry the burden of responsibility for promoting their levels of personal resilience and, at the same time, developing this property among staff members, teams, and other leaders. Managers should have high levels of resilience in order to lead efficiently and implement effective resilience approaches (Udod *et al.*, 2021a, 2021b).

Studies of nurses' resilience underscored their protective role against nurses' turnover, post-traumatic stress, emotional exhaustion, and fatigue. Moreover, resilience is associated with improvement of patients' satisfaction, sense of better quality of care, and better attitudes towards patients (Manomenidis *et al.*, 2019). As a response to the increasing pressures on nurses that work in healthcare systems that are tense and lack resources, building personal resilience was identified as essential for coping with tension and discomfort at work, maintenance of job satisfaction, engagement in self-care, and assistance in coping with problems of human resources preservation and team well-being (Udod *et al.*, 2021a, 2021b). Nurse managers' resilience can be enhanced by using evidence-based strategies in a healthcare environment that is growing more complex (Udod *et al.*, 2021a, 2021b).

Establishing positive relationships, maintaining positive attitudes, developing emotional insight, creating a balance between work and life, and reflecting successes and challenges are effective strategies for building resilience

(Cline, 2015). Analyzing and changing points of view and thinking patterns in a positive and adjusted way, as well as extending the individuals' resources for dominating themselves and overcoming problems without feeling burdened and negative, together with the use of adapted coping patterns, constitute a strategy that can be applied while coping with problems. Thus, healthcare workers can remain productive, informed, and pleased even when they cope with various problems or challenges in their work environment (Handini *et al.*, 2020).

Carpio *et al.* (2018) conducted a study of personal resilience and workplace resilience among 77 nurses. The research findings indicated that managers with a longer management seniority demonstrated a higher workplace resilience than did younger managers. The researchers explained that the difference probably stemmed from the fact that seniority years caused managers to develop a higher workplace resilience.

Another research of 1012 male and female nurses at the northern part of Greece (Manomenidis *et al.*, 2019), aimed to investigate and compare the effect of personal features, external factors, and coping strategies on nurses' resilience. The study illustrated that education level, anxiety, and the general use of mental preparation strategies (using a tool that measures resilience, anxiety and depression before the beginning of the shift) were the main predictors of nurses' resilience. More educated nurses demonstrated a higher level of resilience, lower degrees of anxiety, and more frequent use of mental preparation strategies before the beginning of their shift (Manomenidis *et al.*, 2019).

Training might improve the resilience of nurses and nurse managers. Moreover, resilient nurse managers may empower nurses by granting them self-confidence, caring for their well-being, assisting them in identifying and applying their strengths, nurturing and promoting their professional development and encouraging self-care, and preserving skills of managing relationships (Sihvola *et al.*, 2022). Expanding nurse managers, knowledge and confidence for managing disasters can provide an efficient approach to the nurses' promotion and their skills of recovering from the crisis (Sihvola *et al.*, 2022). Nurses attest to tragedy, suffering, and human distress as part of their daily work life. Thus, due to tension factors associated with helping others in overcoming distress, resilience is identified as vital for nurses' everyday work (Jackson *et al.*, 2007).

Nurses should develop competences that assist them in being more resistant and more capable of coping with and protecting themselves against effects of distress at the workplace. An increasingly growing database of evidence indicates that a personality feature of toughness helps in neutralizing stressful events or extreme distress. Toughness was described as having three dimensions: commitment to finding a meaningful goal in life, belief in the ability to influence the environment and the results of the events, and the belief in being able to learn and grow following both positive and negative experiences. This is due to

the fact that autonomy, empowerment, emotional awareness, and self-care are important factors in the development of resilience (Jackson *et al.*, 2017).

Additional strategies for improving resilience include establishing professional relationships and positive cultivators, setting up social support networks that help in the creation of professional support, maintaining positive attitudes aiming to reinforce emotional feeling and laughter. Despite the sense of distress, tension, and difficulty for the purpose of reducing the levels of tension associated with distress by reducing negative emotions and attaining a balance of life and spirituality regardless of spiritual beliefs, it is important to participate in a variety of health-oriented activities outside one's professional life. These activities should ideally comprise activities that nurture physically, emotionally, and spiritually. Thus, people can maintain a certain balance in life, even when they engage in a highly demanding career such as nursing (Jackson *et al.*, 2007).

Labrague *et al.* (2018) performed an integrative review with the aim of assessing and synthesizing empirical studies that examined sources of professional tension and coping methods used by nurse managers while coping with tension. The review found three major coping methods: (1) freedom of decision or control: four studies found that a higher control over work or decision authorities were related to lower occupational tension and a higher occupational well-being among nursing managers; (2) organizational support – was found as the most common coping method among nurse managers. It was manifested by the perception of social support from the other teams, contributing to lower levels of occupational tension and the intention of leaving the organization, as well as sufficient support of the managers of nurse managers (CEOs and medical managers); and (3) impact of nurses' characteristics on tension – nurse managers with less seniority years experienced more tension than nurse managers with more years of experience. Female nurse managers experienced more tension than did male nurses (Labrague *et al.*, 2018).

A qualitative study (Kim and Windsor, 2015) explored the way nurse managers built the meaning of resilience and its connection to life-work balance. The researchers interviewed 20 nurse managers in Korean hospitals and found that the participants perceived that resilience and life-work balance were affected by dynamic and reflective processes. The resilience-oriented contents encompassed 'positive thinking', 'flexibility', 'assuming responsibility', and 'separation between work and life'. This perception of resilience facilitated the change of focus from negative experiences to positive experiences, from rigidity to flexibility, from task-orientation to people-orientation, and from the organization to life. The researchers concluded that the importance of maintaining a home-work balance was important for nurse managers, allowing maintenance of resilience and preservation of labor force among nurse managers (Kim and Windsor, 2015).

Nurse managers can respond to reality patterns by using a positive perspective for encouraging resilience. For example, they can use positive

thinking, decision change, and organizational activities as an optimistic yet realistic approach that can lead to meaningful work, building confidence for future challenges. A cognitive change, related and adapted effort of work-life balance, as well as development of collaboration, are also identified as effective strategies for building nurse managers' resilience. Moreover, social support is important for the maintenance of mental health, and according to assumptions, social support may prevent the effect of environmental pressures in order to strengthen the resilience. Udod *et al.* (2021a, 2021b) found that positive social interactions and relationships were crucial for nurturing patterns of resilience.

Luo *et al.* (2022) conducted a cross-sectional study of 45 nurse managers from 13 Chinese hospitals, aiming to explore the relationship between organizational support, nurse managers' anxiety, and effects on leadership and resilience. The findings showed direct and indirect effects of organizational support on anxiety, leadership and resilience. The researchers concluded that among nurse managers, an organizational support could be serially associated with the improvement of leadership and resilience, that in its turn, is related to the reduction of anxiety (Luo *et al.*, 2022).

Research conducted in the United States (Bergman *et al.*, 2024) examined the experiences and scenarios that confronted nurse leaders who experienced a moral harm during the COVID-19 pandemic. Moreover, it investigated the strategies and solutions that nurse leaders used in order to strengthen their moral resilience. The findings illustrated that nurse leaders felt alone during the pandemic, felt that their voice was not heard, they could not say "no" to the management's demands, that the management attributed greater importance to the budget than to the patients' good, and that they were incapable of containing challenges and processes that occurred during the pandemic. The solutions proposed for raising the nurse leaders' sense of resilience were: creating models of common work, mainly during the decision-making process in periods of emergency; a yearly training according to a standard of care during crises in order to prepare the staff for states of emergency; formulating a recording policy for situation of care during a crisis; determining a proactive assessment in order to identify needs in the field of mental healthcare and well-being; supplying resources for mental health and well-being and proactive conducting of debates; inter-colleague support; forums of nurse leaders for discussing feelings and concerns during and following the crisis; and maintaining transparency vis-à-vis the nurse leaders regarding everything connected with the allocation of resources and funds (Bergman *et al.*, 2024).

Nurse leaders at all levels can build and enhance resilience through self-awareness and strategic mental models that consist of several steps: assessment, acceptance, adjustment, and progress. Assessment comprises assessment of events, the environment and people, with the purpose of predicting responses to negative events; acceptance of the fact that changes, failures, and obstacles are predicted events and, hence, develop a contingency plan for the identification of

existing resources; adjustment that requires leaders to change their thinking, re-frame the event, and seek creative ways for solving the crisis. Furthermore, leaders must establish positive and supportive professional relationships in the workplace, maintaining a positive approach and accomplishing life balance and spirituality (Cline, 2015).

Nurse leaders are expected to take care of the workers and provide a guidance for operating the organization, be available, be present, as well as reflect health-oriented positions and behaviors. Hence, leaders must first of all provide their basic needs and make sure that they have an available psychological support when pressures are increased. Nursing leaders' key strategies for building personal resilience include establishment of positive and nurturing professional relationships with colleagues and mentors who think like them; join them after work hours so that they serve as a source of professional and personal questions outside the hospital framework, as well as a source of discussion about challenges and problems; be aware of emotional factors and their impact, creating safe spaces at work in order to handle decision-making and difficult failures (Udod *et al.*, 2021a, 2021b). Building and maintaining nurse managers' resilience in complex and tense work environments are a necessary need for attracting and preserving skilled and qualified managers at work. Maintaining and strengthening the resilience will enhance preservation of nurses and managers, for the patients' safety and high-quality results (Udod *et al.*, 2021a, 2021b).

6. CONCLUSIONS

This narrative review identified complexities and challenges in the healthcare system, among them: exposure to states of emergency, crises that caused internal and external stress, workloads, insufficient resources and workers' shortage. These factors affected the level of resilience among nurse managers. Furthermore, several studies identified that seniority years, professional experience, and education were connected to the level of resilience demonstrated by nurse managers. The more seniority years, education, and experience nurses have, the higher their level of resilience is.

The strategies identified in the literature review as promoting nurse managers' resilience were: creating a work-life balance, establishing positive relationships, communication with colleagues, training for resilience improvement, social support, and positive thinking during times of crisis.

The literature review can expand the knowledge and the importance of engaging in nurse managers' resilience. It is mainly essential when this concerns a topic that has not been sufficiently examined or investigated, in spite of the major challenges faced by nurse managers around the world. It is highly important to explore what affects nurse managers in the management of crises and how their personal resilience can be strengthened so that they succeed in managing the

nursing staff during a crisis. The strategies identified in the empirical literature can assist in finding solutions for maintaining and strengthening resilience among nurse managers. This will improve this important labor force, mainly while managing crises that undermine nurse managers' resilience.

Healthcare systems around the globe have experienced meaningful crises and challenges. Nevertheless, most studies of this topic have explored the caring teams and have investigated very little the nurse managers. Consequently, it is necessary to conduct additional studies of nurse managers' resilience, as well as coping methods and strategies for maintaining the resilience, due to their considerable role of managing staffs and coping with challenges.

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RESILIENCE, EQUITY, AND INNOVATION IN EDUCATION: FOUNDATIONS OF A RESILIENT AND EQUITABLE SYSTEM

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Abstract

In a global context marked by uncertainty, rapid change, and systemic challenges, education must become a pillar of both social and individual resilience. This paper explores the interdependence between resilience, equity, and innovation as essential foundations for building a sustainable, inclusive, and adaptable educational system. It argues that educational resilience cannot be achieved without equitable policies that reduce disparities, nor without pedagogical and technological innovations that address the diverse needs of learners. The analysis includes international case studies, models of best practices, and recommendations for policymakers, educators, and educational communities. The paper proposes an integrated vision of education as a space for social transformation, where equity and innovation are indispensable conditions for resilience. The paper pursues five key objectives: to conceptually define the interrelated roles of resilience, equity, and innovation in education, to analyze the structural and policy-based conditions that support or hinder resilient and equitable learning environments, to identify and evaluate innovative practices that promote inclusion and adaptability, especially in response to systemic disruptions, to propose a multidimensional model for integrating these principles into educational policy and practice, and to formulate actionable recommendations for policymakers, educators, and institutional leaders.

Keywords: *educational resilience; equity in education; educational innovation; educational policy; social transformation; adaptive learning systems; global education challenges*

JEL Classification: I28

1. INTRODUCTION

Education is a fundamental pillar of social and economic development. In recent decades, global challenges such as economic crises, climate change, migration, and most recently, the Covid-19 pandemic have tested the capacity of educational systems to adapt and sustain their mission. The sudden closure of schools in 2020 revealed both the vulnerabilities and the adaptive potential of institutions, teachers, students, and communities.

The purpose of this paper is to analyze the interdependence between resilience, equity, and innovation in education, using both theoretical insights and empirical data. The study is grounded in a field research project that investigated teachers' perceptions of their ability to adapt to crisis conditions, as well as the institutional support they received.

The main objectives of the article are:

- To define the conceptual foundations of resilience, equity, and innovation in education;
- To examine international and national responses to the Covid-19 crisis, identifying strengths and weaknesses;
- To analyze the results of a field study conducted with teachers, highlighting dimensions of resilience at personal, interpersonal, and institutional levels;
- To propose recommendations for building more resilient, equitable, and innovative educational systems.

By addressing these objectives, the paper seeks to contribute to the ongoing debates on how education can be transformed into a system capable of withstanding crises while ensuring inclusive and sustainable learning opportunities for all.

2. CONCEPTUAL FRAMEWORK: RESILIENCE, EQUITY, AND INNOVATION

In addition to general definitions, several theoretical models provide a deeper understanding of resilience in education. Masten (2001) describes resilience as 'ordinary magic', emphasizing that it is not an extraordinary trait, but rather a set of adaptive systems that exist in all individuals and communities. According to this perspective, resilience in education is sustained by everyday processes such as supportive relationships, effective schools, and access to learning resources.

Michael Ungar (2012) expands the concept by stressing the ecological dimension of resilience. He argues that resilience depends not only on internal

traits but also on external conditions such as community support, cultural context, and social policies. This model is particularly relevant for education, as it highlights the importance of the interaction between students, families, schools, and wider society in fostering adaptive capacities.

Another relevant framework is Bronfenbrenner's ecological systems theory (Bronfenbrenner, 1979), which situates resilience within multiple layers of influence: the microsystem (family, peers, school), mesosystem (interactions between these settings), exosystem (indirect influences such as parental work conditions), and macrosystem (cultural values and national policies). This model shows that resilience is not only a personal quality but also the outcome of systemic interactions across levels.

Applied to education, these models suggest that resilient systems require:

- Individual capacities of students and teachers (motivation, adaptability, emotional regulation);
- Interpersonal support (peer collaboration, teacher-student relationships, family involvement);
- Institutional resources (training, leadership, infrastructure);
- Policy frameworks that guarantee equity and innovation.

By integrating these perspectives, resilience in education emerges as a dynamic and multidimensional construct that must be addressed holistically. Such an approach ensures that resilience is not only about surviving crises but also about transforming education to better serve all learners. Resilience has become a central concept in psychology, education, and organizational sciences, particularly in the context of global crises such as the Covid-19 pandemic. It is broadly defined as the ability of individuals, communities, or systems to recover from adversity, adapt to change, and even transform in response to disruptive events (Masten, 2001; Linkov and Trump, 2019). Within educational systems, resilience refers to the capacity to maintain learning processes despite shocks such as school closures, health emergencies, or socio-economic disruptions.

Historically, resilience has been studied in medicine and behavioral sciences, later becoming a key concept in education and public policy. According to OECD (2021), educational resilience involves three major capacities: absorptive capacity (the ability to withstand shocks and minimize negative impacts), adaptive capacity (the ability to adjust teaching and organizational strategies), and transformative capacity (the ability to create new structures and practices when existing ones are no longer sufficient).

At the individual level, resilience in education manifests through students' ability to regulate emotions, maintain motivation, and continue learning in adverse conditions. For teachers, resilience involves coping with stress, adapting pedagogical methods, and using innovative tools to support learners (Booth and Neill, 2017; Ainsworth and Oldfield, 2019). Resilient teachers are able to

reframe challenges as opportunities, sustain their energy, and draw upon professional and personal resources to overcome difficulties.

Equity represents the principle of ensuring fairness and equal opportunities for all learners, regardless of gender, socio-economic status, ethnicity, or geographic location. During the pandemic, equity became a pressing issue as inequalities in digital access and resources became more visible (Varaprasad *et al.*, 2016). Resilient educational systems cannot exist without equity, since exclusion or systemic disparities undermine both the continuity of learning and the well-being of learners.

Innovation acts as the third pillar of resilient education. It refers to the introduction of new pedagogical practices, digital tools, and organizational strategies that enable adaptation. For example, the rapid transition to online learning highlighted the importance of innovative teaching methods, such as blended learning, flipped classrooms, and interactive digital platforms. Innovation not only ensures continuity during crises but also opens pathways for long-term educational transformation (Taylor and Johnson, 2019).

Therefore, resilience, equity, and innovation should not be treated as separate dimensions but as interdependent principles. Resilience provides stability in crises, equity guarantees inclusion, and innovation creates the means for adaptation and progress. Only when integrated can these elements generate a sustainable and future-oriented educational system capable of addressing both present and future challenges.

While resilience, equity, and innovation are frequently highlighted as essential and complementary principles, critical scholarship warns against certain oversimplifications.

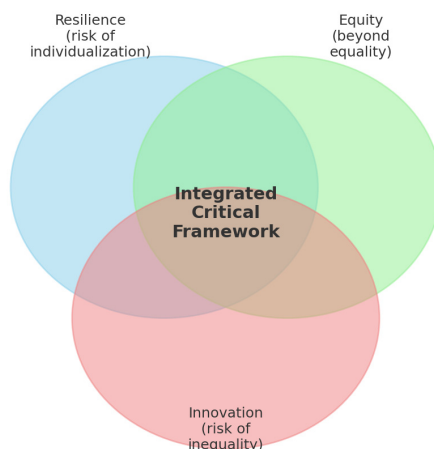
Resilience: Some scholars argue that resilience discourse risks placing excessive responsibility on individuals – students and teachers – rather than on systems and institutions. By celebrating resilience as an individual trait, there is a danger of obscuring systemic inequalities and policy failures (Joseph, 2013). Critical perspectives thus emphasize the need to balance recognition of individual coping strategies with accountability at institutional and policy levels.

Equity: The concept of equity is often confounded with equality, but the two are distinct. Equality refers to providing the same resources for all, whereas equity requires differentiated support that addresses structural disadvantages. Without acknowledging this distinction, educational policies may inadvertently reproduce existing inequalities (OECD, 2021; UNESCO, 2021).

Innovation: Innovation is celebrated for its transformative potential, but critical voices caution that technological innovation may deepen divides if not accompanied by inclusive policies. For example, the rapid adoption of EdTech tools during the pandemic benefited students with digital access while excluding those without. Therefore, innovation without equity can exacerbate, rather than resolve, disparities (Zhao, 2020).

Integrative Critique: Taken together, these critiques highlight the importance of adopting a systemic and contextual approach. Resilience should not mask systemic deficits, equity must move beyond formal equality, and innovation must be inclusive by design. A critical, integrative framework, therefore, situates resilience, equity, and innovation within broader socio-political contexts, ensuring they reinforce rather than undermine each other.

Interpretation: The framework illustrates how resilience, equity, and innovation intersect. Each concept carries critical challenges, but when integrated they create a systemic foundation for more sustainable and inclusive education policies. Figure 1 presents an integrated critical framework where resilience, equity, and innovation intersect. The model highlights potential tensions – resilience may risk individualization (Joseph, 2013), equity extends beyond formal equality (UNESCO, 2020), and innovation can inadvertently reproduce inequalities (OECD, 2021). The overlapping space illustrates the need for a holistic approach that balances these dimensions.



Source: Author's own elaboration

Figure 1. Integrated critical framework linking resilience, equity, and innovation.

3. BUILDING RESILIENT EDUCATIONAL SYSTEMS DURING THE COVID-19 PANDEMIC

The Covid-19 pandemic created an unprecedented disruption for educational systems worldwide. According to UNESCO (2020), over 1.6 billion students were affected by school closures at the peak of the crisis. This situation highlighted both the vulnerabilities and the adaptability of educational systems.

3.1. International context

Several countries demonstrated strong resilience due to prior investment in digital infrastructure and teacher training. For instance, Finland leveraged its long-standing tradition of student-centered learning and strong digital platforms to ensure continuity. Teachers were already accustomed to integrating technology into lessons, which facilitated the rapid transition to online and hybrid models.

South Korea is another example, where government initiatives had previously established nationwide digital learning platforms. During the pandemic, the Ministry of Education quickly expanded access and provided extensive teacher training. The strong collaboration between schools, families, and policymakers minimized learning disruptions.

In Italy, one of the European countries hit hardest in the early stages of the pandemic, resilience was achieved through community-driven innovation. Teachers and schools experimented with new methods such as flipped classrooms and blended learning. Although infrastructure gaps existed, innovative teaching strategies and strong professional networks supported adaptation.

3.2. The Romanian case

In Romania, the pandemic revealed systemic weaknesses, particularly the rural-urban divide. According to Ministry of Education data, approximately 250,000 students lacked access to digital devices or stable internet connections during the first months of lockdown. NGOs and private companies, in partnership with local authorities, donated tablets and laptops, but disparities persisted.

The national program *Teleşcoala* provided televised lessons to mitigate the digital gap, reaching students without online access. Teachers reported that while such initiatives were useful, they could not fully replace classroom interaction. Many educators developed coping strategies, such as sharing digital content, collaborating with colleagues, and intensifying communication with parents.

Despite these efforts, a 2021 study by World Vision Romania found that nearly 40% of rural students were at risk of learning loss. This statistic underscores the importance of equity in building resilient systems.

3.3. Equity and innovation as drivers of resilience

Research objectives

The aim of this study is to investigate the intersections between *resilience*, *equity*, and *innovation* in educational systems, with particular attention to Romania in the post-pandemic context. The study further seeks to identify

strategies that can strengthen these dimensions to ensure sustainable and inclusive education.

The specific objectives are:

1. To define the conceptual foundations of resilience, equity, and innovation in education.
2. To analyze international and national responses to the Covid-19 crisis and their implications for educational resilience.
3. To compare Romania with other countries regarding readiness, equity gaps, and innovation capacity.
4. To examine the results of a teacher questionnaire on perceptions of resilience, equity, and innovation.
5. To formulate policy recommendations for building more resilient and equitable educational systems.

Rationale for the Research Objectives

International and national experiences during the pandemic converge on a central point: *resilience in education requires both innovation and equity*. Countries with robust digital infrastructures were able to innovate rapidly, while those with entrenched inequalities struggled to maintain learning continuity. In Romania, persistent equity challenges constrained the effectiveness of technological and organizational innovations, underscoring the urgent need for systemic solutions. Building resilience for the future therefore rests on three critical pillars: universal access to technology, continuous professional development for teachers, and inclusive policies that prioritize disadvantaged learners. The Covid-19 crisis functioned both as a severe disruption and as a catalyst, compelling schools to adopt innovations at unprecedented speed while simultaneously exposing structural inequalities. Addressing these gaps is essential if education is to become not only resilient but also equitable and transformative.

4. FIELD STUDY: QUESTIONNAIRE RESULTS AND INTERPRETATION

4.1. Methodology

The field study was conducted using a structured questionnaire consisting of 50 items, applied to a representative sample of primary and preschool teachers. The questions were designed to explore three main dimensions of resilience: internal resilience (teachers' psychological resources and coping strategies), interpersonal resilience (relationships with students, parents, and colleagues), and institutional resilience (support from schools and authorities). Respondents rated their answers on a five-point Likert scale (1 = strongly disagree, 5 = strongly agree). The teacher questionnaire revealed important patterns regarding equity, system adaptability, digital training, and peer collaboration. As illustrated in Table 1, a majority of respondents (60%) felt that

equity in educational opportunities was maintained, while only 20% considered the system adaptable to new challenges.

Bridging to the second table

A second validation of the same indicators, presented in Table 2, confirmed these trends. Peer collaboration received the highest positive assessment (75%), whereas digital training sufficiency was evaluated negatively by almost half of the teachers (45%).

Drawing conclusions

Taken together, the results presented in Tables 1 and 2 suggest that while interpersonal collaboration among teachers is a strong resilience factor, systemic adaptability and professional digital training remain critical weaknesses that must be addressed through targeted policies.

Table 1. Responses at the questionnaire regarding equity, system adaptability, digital training, and peer collaboration

Question	Main focus	Positive responses (%)	Negative responses (%)
Q16	Equity (equal opportunities)	60	30
Q25	System adaptability	20 (High)	35 (Low)
Q32	Digital training sufficiency	40	45
Q47	Peer collaboration	75	15

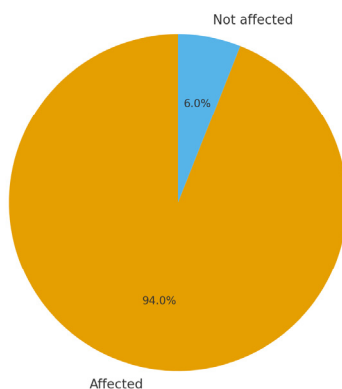
Source: author’s own data, based on teacher questionnaire (2025)

Table 2. Responses at the questionnaire regarding equity, system adaptability, digital training, and peer collaboration (second validation)

Question	Main focus	Positive responses (%)	Negative responses (%)
Q16	Equity (equal opportunities)	60	30
Q25	System adaptability	20 (High)	35 (Low)
Q32	Digital training sufficiency	40	45
Q47	Peer collaboration	75	15

Source: author’s own data, based on teacher questionnaire (2025)

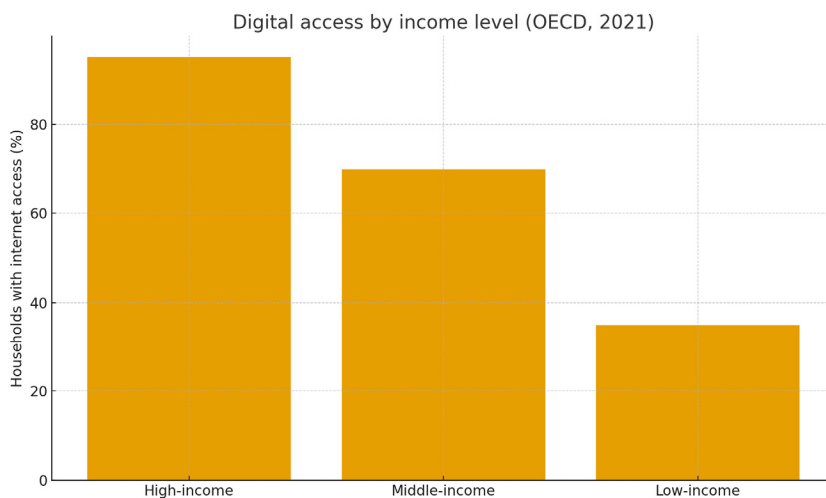
Global student population affected by school closures (UNESCO, 2020)



Source: UNESCO (2020)

Figure 2. Global student population affected by school closures

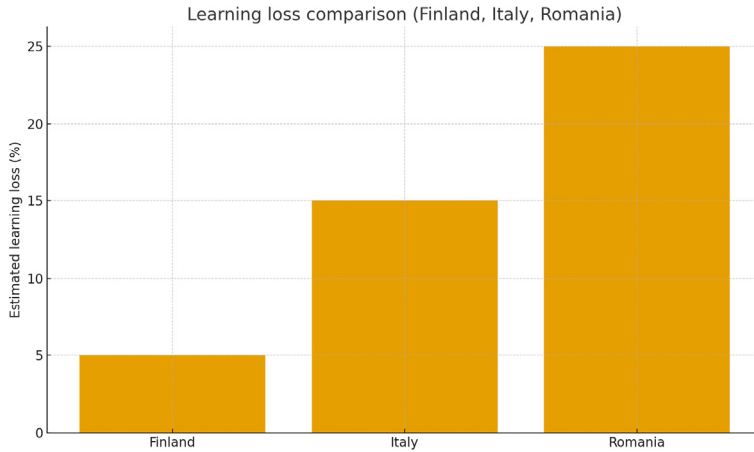
Data in Figure 2 shows that approximately 94% of students worldwide were affected by school closures, illustrating the unprecedented scale of disruption and the pressure on system resilience.



Source: OECD (2021)

Figure 3. Digital access by income level

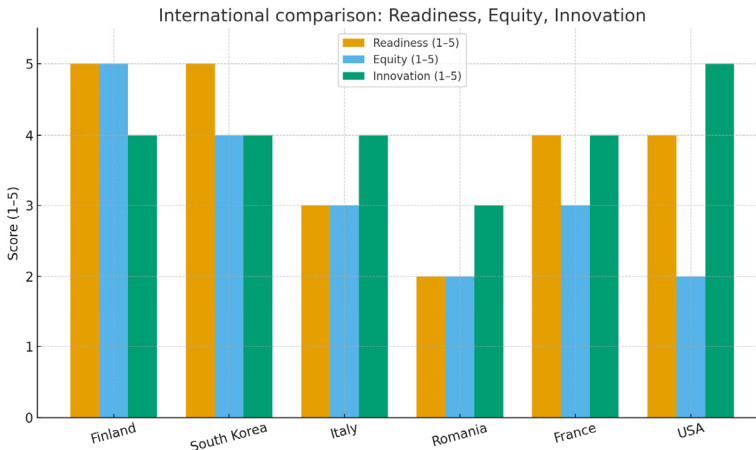
According to Figure 3, digital access varies widely by income level; limited connectivity in low-income contexts exacerbated equity gaps during remote learning.



Source: author’s own data, based on questionnaire (2025).

Figure 4. Estimated learning losses across countries (Finland, Italy, Romania)

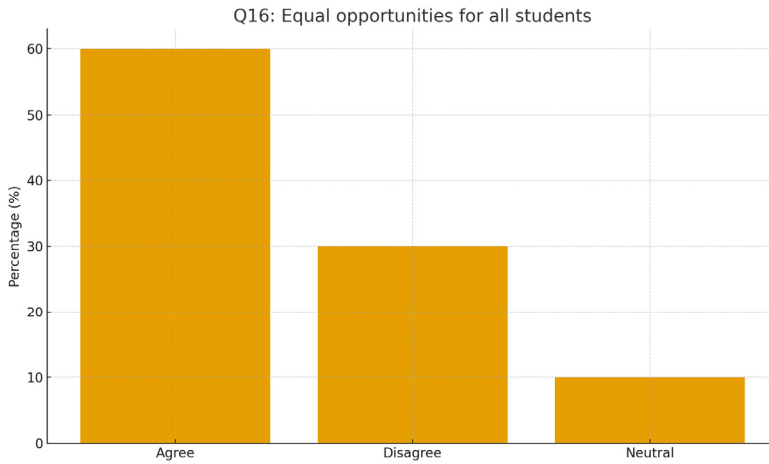
Data in Figure 4 shows that strong digital preparedness limited losses in Finland; Italy showed moderate losses; Romania recorded the highest losses, consistent with pre-existing infrastructure and equity challenges.



Source: author’s own data, based on questionnaire (2025).

Figure 5. International comparison of readiness, equity, and innovation (scores 1–5)

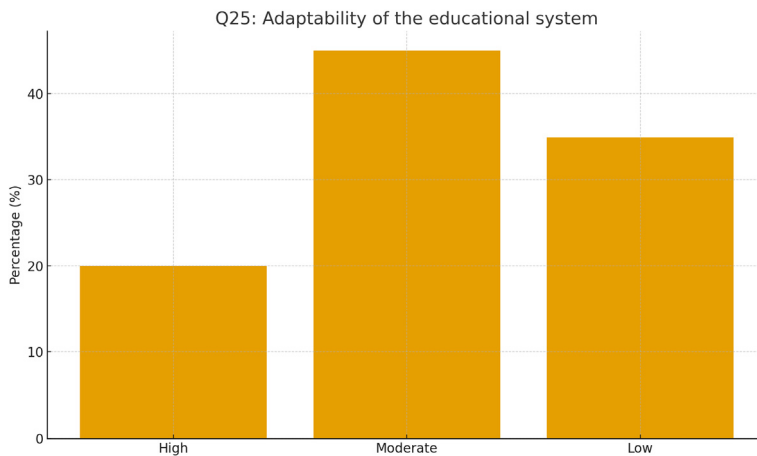
According to Figure 5, Finland and South Korea combine high readiness with strong equity; the United States leads on innovation but faces equity gaps; France sits mid-range; Italy and Romania reveal uneven readiness and persistent equity barriers.



Source: author’s own data, based on questionnaire (2025).

Figure 6. Teachers’ perceptions of equity (Q16)

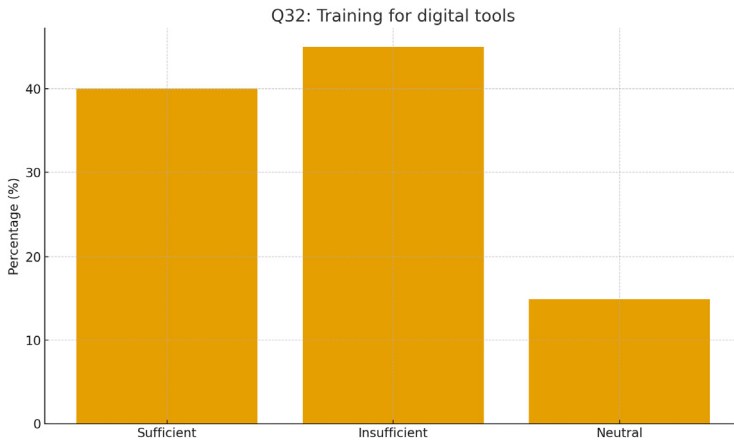
Data in Figure 6 shows that most teachers confirmed that schools provide equal opportunities, though disparities persist, particularly in rural contexts.



Source: author’s own data, based on questionnaire (2025).

Figure 7. Teachers’ perceptions of adaptability (Q25)

Data in Figure 7 shows that system adaptability was rated predominantly as moderate, signaling structural constraints in crisis management and policy response.



Source: author’s own data, based on questionnaire (2025).

Figure 8. Teachers’ perceptions of digital training sufficiency (Q32)

Data in Figure 8 shows that less than half of respondents considered their digital training sufficient, highlighting the need for systematic professional development.

Table 3. Summary of selected questionnaire results

Question	Main focus	Positive responses (%)	Negative responses (%)
Q16	Equity (equal opportunities)	60	30
Q25	System adaptability	20 (High)	35 (Low)
Q32	Digital training sufficiency	40	45
Q47	Peer collaboration	75	15

Source: author’s own data, based on questionnaire (2025).

Table 3 highlights differences across resilience dimensions. While collaboration and equity were rated relatively high, adaptability and digital training remain weak points.

Table 4. Comparative overview of resilience, equity, and innovation in selected countries

Country	Resilience (Readiness)	Equity	Innovation
Finland	High digital readiness; strong pedagogy	Universal access; strong welfare	Teachers trained in digital pedagogy
South Korea	Nationwide e-learning platforms	Equity gaps minimized by state	Rapid adaptation with online tools
Italy	Moderate readiness; rural gaps	Equity challenges in disadvantaged regions	Community-driven innovation
Romania	Low readiness; emergency programs	Severe rural-urban divide	Fragmented innovation, limited training
France	Moderate readiness; central policies	Policies unevenly implemented	Hybrid/blended learning adoption
USA	High readiness urban; rural gaps	Equity linked to socio-economic status	High EdTech innovation, persistent inequality

Source: author’s own data, based on questionnaire (2025).

According to Table 4, countries with strong digital readiness and robust equity policies (Finland, South Korea) were more resilient. Nations with pre-existing inequalities and weaker infrastructures (Romania, parts of Italy) struggled more. The USA innovated strongly but with equity gaps, while France demonstrated mid-range resilience with centralized policy interventions.

4.1. Results

The questionnaire revealed important insights into teachers’ capacity to adapt during the Covid-19 pandemic. Selected results include:

- Q5: I managed to maintain my motivation despite the stress caused by the pandemic. → 58% of teachers agreed or strongly agreed, showing internal resilience, while 25% reported difficulties in sustaining motivation.
- Q12: I was able to communicate effectively with parents during online schooling. → 72% responded positively, underlining the importance of interpersonal resilience in maintaining learning continuity.
- Q16: My institution provides equal opportunities for all students. → Over 60% confirmed, but 30% highlighted persistent disparities in resources, especially between urban and rural areas.
- Q25: The educational system is adaptable to sudden changes such as the transition to online learning. → Most respondents rated adaptability as moderate (45%), while 35% considered it low, indicating structural weaknesses.
- Q32: I received sufficient training to use digital tools effectively. → Only 40% agreed, with 45% reporting insufficient preparation.

- Q40: Innovative digital tools were integrated into my teaching practice. → 68% reported increased use of platforms such as Google Classroom, Zoom, and Microsoft Teams, though many emphasized gaps in advanced digital pedagogy.
- Q47: I collaborated with colleagues to overcome difficulties. → 75% of teachers highlighted peer collaboration as a key coping strategy.

4.2. Interpretation of results

The results illustrate that resilience in education is multidimensional:

- Internal resilience was visible in teachers' ability to maintain motivation and develop coping strategies, though stress levels remained high.
- Interpersonal resilience played a crucial role, as communication with parents and collaboration with colleagues were consistently rated positively.
- Institutional resilience was mixed, with significant gaps in training and unequal access to resources undermining long-term sustainability.

Equity issues emerged clearly, as disadvantaged students were disproportionately affected by lack of access to technology. Innovation, while sometimes a forced adaptation, opened opportunities for blended and digital learning models. Teachers emphasized the need for continuous training and systemic support to fully capitalize on innovation.

In summary, the field study confirmed that resilience, equity, and innovation are interdependent. Without equity, resilience is fragmented; without innovation, adaptability is limited; without resilience, equity and innovation cannot be sustained in times of crisis.

The results indicate significant differences between teachers in urban and rural areas, confirming the persistence of the digital divide. While urban teachers reported greater adaptability and access to training, their colleagues in disadvantaged areas faced major difficulties in using digital platforms. At the same time, a positive trend was observed: the development of informal support networks among teachers, which partially reduced individual pressures. These findings are consistent with OECD (2021) and UNESCO (2020) reports, which highlight that digital equity is a critical condition for educational resilience.

The interplay between resilience, equity, and innovation can be visualized through a triadic framework (see Figure 9). This model emphasizes that sustainable and inclusive educational systems emerge not from one dimension alone but from the intersection of all three. Resilience ensures continuity in the face of crises, equity guarantees fairness and access for all learners, and innovation drives adaptation and long-term transformation.

Triad of Resilience - Equity - Innovation



Source: author's own data, based on questionnaire (2025).

Figure 9. Synthesis model of the triad Resilience – Equity – Innovation

5. CONCLUSIONS

The study highlights that resilience in education is inseparable from equity and innovation. Teachers showed remarkable adaptability during the Covid-19 pandemic, but systemic weaknesses in infrastructure, access, and training revealed persistent vulnerabilities. Equity is a prerequisite for resilience, as disparities in digital resources and institutional support compromise the ability of students and teachers to cope with crises.

Innovation proved to be a double-edged sword: while it created challenges in terms of digital skills and workload, it also offered opportunities for long-term transformation of teaching and learning practices. Digital platforms, interactive tools, and blended learning approaches can strengthen resilience if integrated systematically and equitably.

Policy recommendations include:

- Investment in digital infrastructure and universal access to devices and connectivity;
- Professional training for teachers in digital pedagogy and crisis management;
- Development of inclusive policies that target disadvantaged learners;
- Institutional frameworks that foster innovation and collaboration among schools.

In conclusion, resilience, equity, and innovation form an interdependent triad essential for sustainable educational systems. By embedding these

principles into policy and practice, education can become more adaptive, inclusive, and capable of withstanding future disruptions.

The conclusions of the study show that educational resilience cannot be conceived merely as a temporary reaction to crises but must be integrated into a long-term strategy. It requires the continuous strengthening of institutional capacities, investment in infrastructure and ongoing training, as well as the assumption of an ethical dimension: reducing educational inequalities is a collective responsibility, not just an individual one. In this regard, national and European educational policies must move beyond a remedial logic and adopt a preventive and inclusive vision, capable of transforming education into a space of equity and sustainable innovation.

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THE NECESSITY OF A COHERENT DIGITAL STRATEGY IN
ROMANIA IN THE CONTEXT OF THE DIGITAL DECADE AND
FOR ELIMINATING STRUCTURAL DISPARITIES COMPARED TO
DIGITALLY DEVELOPED COUNTRIES

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Abstract

This paper presents a comparative analysis of Romania's progress in the context of the Digital Decade compared to digitally advanced countries within the European Union. It highlights the necessity for a coherent digital strategy in Romania to eliminate structural disparities, as there is a noticeable gap between the development of digital infrastructure and the level of digitalization of public services, the economy, and society in general. Although Romania ranks among the top countries regarding coverage with high-capacity fixed networks, the digital transformation of public administration faces challenges related to digital skills, digital education, and the low level of digitalization of SMEs. Platforms like ROeID are a promising step toward digital identity, but their

impact is limited by poor interoperability between databases and the fragmented nature of government initiatives. Compared to the European average and leading digital nations, Romania is still far behind in e-government, data integration, and digital innovation. The analysis underlines the urgent need for coherent, cross-sector public policies aligned with European priorities for digital transformation in public administration. Achieving this will require a unified national strategy, backed by sufficient funding and effective e-governance mechanisms, so that Romania can capitalize on its structural advantages and meet the goals set out in the Digital Decade.

Keywords: *digital decade; digitalization; DESI; public policies.*

JEL Classification: O38; R11; H11.

1. INTRODUCTION

Prospective public policies help anticipate changes, assess scenarios, and create proactive solutions for a modern public administration. Their innovative approach tackles challenges like digitalization and disruptive technologies. In Romania, these policies can boost institutional performance, cut bureaucracy, and strengthen ties between administration and citizens.

Our study presents a comparative analysis of Romania's progress within the framework of the Digital Decade, in relation to the standard of digitally advanced member states of the European Union (Grigorescu *et al.*, 2021; Sfetcu, 2024; Belciu and Miron, 2024). The analysis accents the urgent need for a coherent national digital strategy to address persistent structural disparities (Radu and Petcu, 2021; Lungu *et al.*, 2025; Horobeț *et al.*, 2023). The analysis highlights the urgent need for a coherent national digital strategy to address persistent structural disparities. It shows a significant gap between the expansion of digital infrastructure and the relatively limited digitalization of public services, the economy and the broader social area.

While Romania ranks among the leading countries in terms of high-capacity fixed network coverage, the digital transformation within public administration is significantly constrained by structural challenges. These include persistent deficits in digital skills, systemic weaknesses in digital education, and the limited digitalization among small and medium-sized enterprises (SMEs), which together delay the digital innovation.

Platforms such as ROeID constitute an important step for the development of digital identity; however, their effectiveness is constrained by limited interoperability among databases and the fragmentation of governmental initiatives, which significantly reduces their overall impact (Bilouseac, 2025; Lungu, 2025; Haraguș *et al.*, 2024).

Relative to the European average and to digitally advanced member states, Romania manifests a pronounced lag in the areas of e-government, data integration, and digital innovation (Lobonț *et al.*, 2025; Vărzaru *et al.*, 2023).

Our analysis indicates a critical need for coherent, cross-sectoral public policies that reflect European priorities in the digital transformation of public

administration (Gherghin, 2025; Mariani and Bianchi, 2023; Tangi *et al.*, 2023; Di Giulio and Vecchi, 2025; Millard, 2023).

Achieving progress in this area necessitates a coherent national strategy, reinforced by sufficient budgetary commitments and robust e-governance mechanisms, to ensure that Romania effectively leverages its structural advantages and aligns with the objectives of the Digital Decade (Golea *et al.*, 2025; Kotnik, 2025).

2. LITERATURE REVIEW

2.1. The Concepts of Europe's Digital Decade

The Digital Decade policy programme (DDPP) is Europe's plan to shape its digital future by 2030 through shared goals and collaboration. The DDPP sets targets for digital skills, connectivity, and secure infrastructure, fostering teamwork between EU countries and the Commission. As the first joint digital strategy of the Commission, Parliament, and Council, it provides a clear vision and governance framework to drive Europe's digital transformation (European Commission, 2025).

The Digital Decade Programme (European Commission, 2025) centers on four key areas, with specific targets to drive Europe's digital transformation:

- A population with strong digital skills and expert digital professionals;
- Secure and sustainable digital infrastructure;
- Digitally transformed businesses;
- Digitized public services.

The Digital Decade policy programme 2030 establishes a system to monitor progress toward its 2030 goals at both national and EU levels. Through this framework, the Commission and Member States collaborate to evaluate advancements and adjust keep the EU on course to achieve its digital transformation targets (European Commission, 2025; Magoutas *et al.*, 2024; Bendiek and Stuerzer, 2023).

The Digital Decade monitoring system includes (European Commission, 2025; Torrecillas *et al.*, 2023; Laitsou *et al.*, 2025; Svennberg *et al.*, 2023): Key Performance Indicators, EU-level Trajectories, Annual Digital Decade Report and National Roadmaps.

2.2. Methods and techniques used in prospective planning

In the context of digital transformation that requires continuous adaptation, forward-looking public policies are particularly important for strategic planning and efficient resource management. They ensure the anticipation of economic, social and technological trends, and the development of coherent long-term strategies (Monteiro and Dal Borgo, 2023). These are based on analytical methods and techniques to forecast various possible scenarios, providing decision-makers with a framework for adopting proactive and adaptive measures

(Hakim *et al.*, 2024). Foresight policies are relying on a set of analytical tools combining quantitative and qualitative methods. Quantitative methods examine existing data, uncover emerging trends, and create predictive models. Qualitative methods, on the other hand, offer in-depth insights into factors shaping the future and actively involve stakeholders in decision-making. Prospective planning combines both approaches, providing a comprehensive and integrated perspective on potential future scenarios (Bugeau and Ligozat, 2023).

2.3. Relevance of prospective public policies in the context of digitalization

Digitalization represents a significant transformation of contemporary society, with a profound impact on how the economy, public administration and social relations function (Millard, 2023; Latupeirissa *et al.*, 2024; Omar *et al.*, 2024). In this context, prospective public policies play a crucial role in anticipating digitalization-driven changes, identifying opportunities and risks, and strategically guiding decisions to ensure a sustainable and equitable digital transition (Sun, 2025; Nyangon, 2025; Obasi and Benson, 2025).

Digitalization reshapes not only technology but also the fundamental processes and structures of public administration, changing how it functions, interacts with citizens, and provides services. Emerging technologies like AI, blockchain, IoT, and big data offer opportunities for efficiency, transparency, and automation while posing challenges like cybersecurity risks, digital exclusion, and resistance to change (Balaji, 2025; Latupeirissa *et al.*, 2024; Damar *et al.*, 2024).

Prospective public policies are key to navigating these challenges and maximizing digitalization's benefits. Tools like scenario analysis and predictive modeling help decision-makers craft flexible strategies that balance innovation, security, and inclusion (Ködding *et al.*, 2023; Akpe *et al.*, 2023). National digitalization strategies, investments in infrastructure, digital skills, and clear regulations, alongside collaboration with academia and the IT sector, are vital for an effective transition (Denysenko, 2024; Anas and Cahyawati, 2023; Szpor and Hajduk, 2024).

Digitalization is a tool, not an end, for improving public administration's efficiency, transparency, and service quality. Foresight policies can make it a driver of sustainable development, ensuring a balanced, inclusive digital future.

Prospective public policies provide a strategic framework for anticipating technological trends and integrating them into decision-making. This is crucial in the context of digitalization, where rapid changes demand constant adaptability (Monteiro and Dal Borgo, 2023; Vudugula *et al.*, 2023). Using methods like trend analysis, alternative scenarios, and forecasting, these policies help identify priority areas for investment and development, such as digital infrastructure, digital skills education, and cybersecurity. For example, in Romania, prospective policies can assess digitalization's impact on local public administration, pinpointing ways technology can enhance public services and citizen

engagement. They also support the creation of coherent, effective national digitalization strategies to ensure successful digital project implementation.

A key aspect of prospective public policies in the context of digitalization is integrating the citizen's perspective. Digitalizing public administration must focus on citizens' needs and expectations, and prospective policies provide tools to understand these needs. This involves creating continuous feedback mechanisms, actively involving citizens in decision-making about digital public services (Balaji, 2025; Latupeirissa *et al.*, 2024; Di Giulio and Vecchi, 2025). Public consultations, opinion surveys, and qualitative analyses are essential to identify priority areas where digitalization can deliver the greatest benefits. This ensures public administration responds quickly and effectively to citizens' demands, avoiding technological solutions that fail to meet user expectations.

A practical example is developing interactive digital platforms that allow citizens to offer suggestions, report issues, and access real-time information about public services. These platforms enhance interaction between citizens and state institutions, improve administrative transparency, and increase oversight of decision-making processes. By digitalizing bureaucratic processes and using AI to manage requests, document processing times are significantly reduced, providing citizens with more efficient and accessible services.

Foresight policies are vital for managing the shift to a digital society, providing a strategic framework to anticipate changes, seize opportunities, and mitigate risks. They enable a proactive approach to digitalization challenges, preventing delayed responses and poor transition management. Public administration must adopt forecasting and trend analysis to adapt to rapid digital changes.

These policies reduce uncertainty, integrate emerging technologies such as big data, AI, and blockchain into decision-making, and enable efficient adaptation to future demands, all while upholding ethical standards and protecting citizens' rights. Through collaboration between government, academia, and the technology sector, innovative solutions can be developed to support a digitally driven society.

Through these coherent digital strategies, public administration becomes more efficient, transparent, and responsive to a world in digital transformation (Akpobome, 2024; Jain *et al.*, 2024). Digitalization is more than just a technological change – it represents a shift in how citizens engage with government. Foresight policies sustained this transition by incorporating citizen perspectives, anticipating future trends, and promoting collaboration, positioning public administration as a model of efficiency and innovation in an evolving digital society (Balaji, 2025; Swasthaisong *et al.*, 2025).

3. MATERIALS AND METHODS

3.1. Study Design

This study conducts a comparative analysis of Romania's progress in digital transformation within the framework of the European Union's Digital Decade policy programme (2030), with particular attention to structural disparities compared to digitally advanced member states. Covering the period 2021–2025, it draws on data from the Digital Economy and Society Index (DESI) reports. The analysis integrates EU-wide quantitative indicators with qualitative insights from Romania's national digital initiatives to evaluate gaps in digital infrastructure, skills, public services, and innovation.

3.2. Data Sources

Statistical data were collected and recorded from official sources such as:

- *European Commission*: Provided DESI data for period 2021–2025, covering indicators such as fixed very high-capacity networks, 5G coverage, digital skills, ICT specialists, digital public services, cloud adoption, AI integration, and SME digital intensity.

- *European Commission's Digital Decade Reports*: Offered insights into EU-level trajectories, KPIs, and national roadmaps for digital transformation.

- *Romanian National Authorities*: Supplied data on national digital initiatives, including the ROeID platform and other e-government efforts, sourced from government reports and policy documents.

- *Comparative Country Data*: Included case studies of digitally advanced EU countries (e.g., Estonia, Denmark, Finland) from Eurostat and DESI to benchmark Romania's performance.

All data were aggregated at the national level and standardized to allow meaningful comparison across countries with different economic and digital contexts.

3.3. Variables

The study focuses on the following variables:

- *Dependent Variable*: Romania's digital performance, measured through DESI rankings across key indicators (e.g. digital public services, digital skills, connectivity).

- *Independent Variables*:

- Digital infrastructure (e.g., fixed very high-capacity networks, fiber-to-the-premises coverage, 5G coverage).

- Digital skills and ICT specialist availability.

- Digital public services for citizens and businesses.

- SME digital intensity and adoption of emerging technologies (cloud, AI).

3.4. Methodology

The methodology integrates quantitative and qualitative approaches to provide a comprehensive assessment of Romania's digital transformation:

1. **Descriptive Analysis:** we summarized Romania's performance in DESI indicators (2021–2025), highlighting strengths (e.g., fiber coverage) and weaknesses (e.g., 5G, digital skills). Comparative data from top-performing EU countries (e.g., Malta, Netherlands, Finland) were used to contextualize Romania's position.

2. **Trend Analysis:** we analyzed temporal trends in DESI rankings to identify progress or stagnation in Romania's digital metrics, focusing on changes from 2023 to 2025.

3. **Comparative Benchmarking:** we conducted a cross-country comparison of DESI indicators to assess Romania's gaps relative to digitally advanced EU states. Best practices from countries like Estonia (e-ID systems) and Denmark (centralized databases) were analyzed to propose actionable insights.

4. **Qualitative Assessment:** we analyzed Romania's national digital initiatives (e.g., ROeID) through policy document analysis, focusing on challenges like interoperability and fragmentation. Stakeholder perspectives from government reports were incorporated to understand implementation barriers.

5. **Scenario Analysis:** we used qualitative foresight techniques to explore the potential future trajectories of Romania's digital transformation, considering scenarios for enhanced e-government, digital skills training, and technology adoption.

6. **Statistical Software:** we used SPSS for descriptive statistics and trend analysis of DESI data.

4. RESULTS

We conducted a comprehensive statistical analysis for all 12 indicators from the sub-components of DESI, and we obtained the descriptive statistics, rank changes and means. The analysis was based on ordinal ranks (1-27) corresponding to EU member states.

In the Table 1 we presented a summary of Romania's ranks and the top 3 countries for each sub-components of DESI and we can see that Romania excels in digital infrastructure (e.g., ranks 1-5 in high-capacity networks and fiber), but Romania consistently underperforms in advanced digital domains (e.g. ranks 25-27 in AI, unicorns, skills, and public services). Most of top 3 of DESI subcomponents are dominated by Nordic and Baltic countries (e.g., Finland, Denmark, Malta, Sweden), indicating successful digitalization models.

Then we proceeded to a nonparametric analysis of the mean ranks (see Table 2) and this indicate a generally weak position for Romania in the top DESI, who is in generally closer to 27. There is a slight deterioration from 2023

to 2024, followed by a recovery in 2025. The consistent median of 26 suggests most indicators are near the bottom, with exceptions in infrastructure.

Table 1. Performance Indicators DESI Romania

Performance Indicators Romania	DESI 2023	DESI 2024	DESI 2025	Top 3 DESI 202	Top 3 DESI 2025
	(Rank)	(Rank)	(Rank)	Rank 1, 2 and 3	Rank 1, 2 and 3
Fixed very high-capacity networks	4	5	4	Malta, Netherlands, Denmark	Malta, Netherlands, Denmark
Fiber to the premises coverage	1	2	1	Spain, Romania, Portugal	Romania, Spain, Portugal
5G coverage	26	27	27	Cyprus, Denmark, Malta	Cyprus, Denmark, Malta
SMEs with at least a basic level of digital skills	18	23	17	Finland, Italy, Denmark	Netherlands, Italy, Slovenia
Cloud	26	26	NA	Finland, Denmark, Sweden	NA
Artificial Intelligence	27	27	27	Denmark, Finland, Luxembourg	Denmark, Sweden, Belgium
Unicorns	25	25	25	Germany, France, Sweden	Germany, France, Sweden
At least basic digital skills	27	27	27	Netherlands, Finland, Ireland	Netherlands, Finland, Ireland
ICT specialists	26	26	26	Sweden, Luxembourg, Finland	Sweden, Luxembourg, Finland
Digital public services for citizens	27	27	27	Malta, Estonia, Luxembourg	Malta, Luxembourg, Finland
Digital public services for businesses	27	27	27	Finland, Ireland, Malta	Ireland, Luxembourg, Malta
Access to E-health records	23	25	23	Belgium, Denmark, Estonia	Belgium, Estonia, Denmark

Source: SPSS processing, own calculation

In Table 2, we can observe it the value for mean (21.42 in 2023; 22.25 in 2024 and 21.00 in 2025). That reflects for Romania a mid-to-low position, with minor variations. The improvement in 2025 shows certain progress, but not enough to significantly. We also performed a nonparametric test for differences in ranks from one year to another. Thus, a positive variation indicates a deterioration of the respective DESI subcomponent, and a negative variation indicates an improvement of the situation, which can be seen in Table 3.

Table 2. Analysis of the mean ranks

Statistic	Rank 2023	Rank 2024	Rank 2025 (excl. NA)
Number of observations	12	12	11
Mean	21.42	22.25	21.00
Standard Deviation	9.22	8.86	9.64
Minimum	1	2	1
25% (Q1)	21.75	24.50	20.00
Median (50%)	26.00	26.00	26.00
75% (Q3)	27.00	27.00	27.00
Maximum	27	27	27

Source: SPSS processing, own calculation

Table 3. Variation ranks

Indicator	Variation rank	Variation rank	Variation rank
	2024-2023	2025-2024	2025-2023
Fixed very high-capacity networks	1	-1	0
Fiber to the premises coverage	1	-1	0
5G coverage	1	0	1
SMEs with at least a basic level of digital intensity	5	-6	-1
Cloud	0	NA	NA
Artificial Intelligence	0	0	0
Unicorns	0	0	0
At least basic digital skills	0	0	0
ICT specialists	0	0	0
Digital public services for citizens	0	0	0
Digital public services for businesses	0	0	0
Access to E-health records	2	-2	0

Source: SPSS processing, own calculation

We can observe it in the Table 3 that 8 out of 12 sub-components of DESI for Romania shows stagnation. Some minor improvement is in the area of digitalization for SMEs (-1 overall), and one minor deteriorations for 5G coverage (+1). Weaknesses in critical areas such as artificial intelligence, digital public

services, and human capital persist without improvement. That's indicating insufficient targeted investments and policy prioritization to address these gaps.

We analyzed the evolution with non-parametric statistical tests for differences between ranks years:

- Friedman Test (overall differences between years, on 11 indicators excluding NA): Statistic: 7.63, p-value: 0.022 with statistically significant differences ($p < 0.05$), who indicating that rank changes are not random but follow a pattern over the years.

- Wilcoxon Signed-Rank Test (pairwise comparisons):

- 2023 vs. 2024: Statistic: 0.00, p-value: 0.039 shows a significant difference (deterioration).

- 2024 vs. 2025: Statistic: 0.00, p-value: 0.066 with marginal difference who shows a trend toward improvement, but not significant ($p < 0.05$).

- 2023 vs. 2025: Statistic: 1.50, p-value: 1.000 with no significant difference (who indicates overall stability).

In this case, for Romania the analysis shows good positioning in infrastructure (e.g., fiber, networks) but chronic stagnation in human capital and digital services (e.g. digital skills, AI, digitalization of public services). The gap with leaders (e.g. Finland, Malta) is significant, highlighting the need for accelerated policies and the necessity of a coherent digital strategy in Romania in the context of the digital decade and for eliminating structural disparities compared to digitally developed countries. The data for 2025 indicate partial recovery, but no major improvements.

5. DISCUSSION AND CONCLUSIONS

Romania has made measurable progress toward the objectives of the Digital Decade 2030; nevertheless, persistent structural and institutional challenges continue to limit its competitive position within the European Union. Romania's digital performance presents a mixed picture. Its leadership in FTTP coverage and strong ranking in VHCN demonstrate a solid foundation in connectivity infrastructure, rivalling or surpassing many EU countries. However, its low rankings in digital skills, digital public services, cloud, AI, and unicorns place it at the bottom of the EU in these areas. Top performers like Malta, the Netherlands, Denmark and Finland consistently dominate across multiple indicators, highlighting the gap Romania must bridge to compete with Europe's digital leaders.

Thus, for Romania's strength in Fiber connectivity provides a strong platform for advancing digital services, supporting remote work, and fostering innovation. This infrastructure can be utilised to improve digital public services, e-health, and SME digitalization and could generate important benefits. The slight improvement in SME digital intensity by 2025 shows potential for growth if applied by coherent digital strategies. But ranking of the bottom of tops for digital skills, cloud, AI, and digital public services indicate systemic issues, including insufficient investment, educational gaps, and slow adoption of emerging technologies. To resolves these

systemic problems, coordinated efforts are needed in education, workforce training, regulatory reform, and public-private partnerships.

For Romania to advance meaningfully toward the objectives of the Digital Decade and consolidate its position within the European digital landscape, a set of concrete and well-structured measures is required. Accelerating the digitalization of public administration could reduce bureaucratic inefficiencies, streamline procedures, and enhance citizens' access to online services, thereby fostering institutional trust and promoting technology adoption. Expanding digital education at the pre-university level would cultivate a generation of professionals equipped to support the digital economy, helping to address existing skills gaps.

By promoting digital innovation and providing tax and financing incentives for startups, the emergence of unicorns and the development of a dynamic technological system can be supported and encouraged. A better strategy in the field of cybersecurity and AI and greater investment in a specialized infrastructure would support the protection of citizens and businesses, encouraging the adoption of digital technology. The digital divide between urban and rural areas can be reduced through inclusion programs - such as subsidized internet access and free digital literacy training, which would support balanced development and prevent the marginalization of rural areas.

In conclusion, Romania is at a critical point in its digital development. While it has a solid foundation and considerable opportunities, achieving the objectives of the Digital Decade depends on the timely and effective implementation of targeted measures. Without a proactive approach, Romania risks falling behind other European states, limiting both its economic and social potential. However, by strategically leveraging existing resources and prioritizing key interventions, the country can turn current challenges into long-term competitive advantages.

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THE DIGITAL AGE: THE ERA OF THE NEW ENTREPRENEURS?
CASE STUDY OF ENTREPRENEURS IN THE
MORAVIAN-SILESIA REGION

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Abstract

With the development of digitalisation and the arrival of new technologies, people are beginning to see opportunities that were previously unknown to them just a few years ago. The corporate sector is no exception. New opportunities are opening up for businesses to improve their existing market positions, but also new markets where they can penetrate. However, this digital age does not only bring with it a beautiful rosy world, but also threats that some are not prepared for or do not pay due attention to. Business is slowly moving into the digital world and the so-called digital entrepreneurship is coming to the surface of exploration. The research focused on the Visegrad region of the Czech Republic, namely its Moravian-Silesian region. The aim of the paper is to analyse youth entrepreneurs aged 18 to 25 in the Moravian-Silesian region in contrast to the age groups of the rest entrepreneurs. Four hypotheses were established and tested on a sample of 262 entrepreneurs using bivariate statistical analysis methods. The results of the research found a favouring of youth entrepreneurship in this digital age, as well as the need for continuous knowledge enhancement for entrepreneurs of all ages. The research extends the knowledge already gained in this area and offers new possibilities in the direction of future research.

Keywords: *Czech Republic, Digital entrepreneurship, Youth entrepreneurship*

JEL Classification: L26, M21, R10

1. INTRODUCTION

Currently, entrepreneurial activities have experienced frequent volatile situations in recent years. From the Covid-19 pandemic (Garyn-Tal *et al.*, 2025) to the international conflict between Ukraine and the Russian Federation (Lim *et al.*, 2022). It is a challenge to start a business at this time, especially for young people considering this option. Even though the current situation is difficult to be predicted, it can create additional new barriers to entrepreneurship among other challenges, the youth presenting a great human asset, future leaders and hope for the development of the global economy (Ogamba, 2018). Present century has seen youth empowerment issues come to the forefront of global development discussions, with various initiatives and programmes by multilateral agencies, the private sector and the voluntary sector to promote the well-being and development of young people. In this perspective, the policy debate, according to Alam (2025), two different ways were defined in which entrepreneurship can address youth employment, through (1) entrepreneurs of all ages who create and grow businesses that will generate jobs for young people and (2) youth entrepreneurship as a means of gaining productive employment and livelihoods for themselves.

In contrast to that, the research conducted by the Global Entrepreneurship Monitor (GEM, 2025), not all young people will create a significant number of employments, as up to 73% of businesses runned by young people under the age of 24 are single-employee enterprises. According to this research, young people's businesses have survived beyond the first three and a half years, while group in age over 34 are 1.7 times more likely than young people to run mature businesses. Globally, young men are also 1.3 times more succesfull than young women to start businesses and 1.6 times more successful in running mature businesses. They are also twice more better in business size and and employment for more than five people, compared to businesses run by young females (GEM, 2025).

The study by Djordjevic *et al.* (2021) explained that positive attitudes have a negative impact on entrepreneurial intention among young people. Those people may be influenced by differences in the economy over time, cultural differences, or the political environment. In the European Union environment, the drivers for entrepreneurship of seniors and young people are not that different (Rehák *et al.*, 2017) compared to other parts of the world (Aryal *et al.*, 2025; Barry and Cissokho, 2025). In a line with that, in the Visegrad countries (Dryglas and Smith, 2025), among a group of young entrepreneurs (18 to 24 years old) and a group of young adult entrepreneurs (25 to 34 years old), entrepreneurial self-confidence as well as social capital was found to be the most important factor for entrepreneurship of these groups (Holienska *et al.*, 2016). Following research in the Visegrad countries setting, Pilková *et al.* (2017) confirmed the influence of the personality factor, with entrepreneurial self-confidence being the most important factor, but also discovered the influence of

the entrepreneurial opportunity factor and risk aversion. Another significant factor was the variable of age group. According to this study, if a young person thinks about abilities and skills needed for entrepreneurship at a young age then they decide to start entrepreneurship at a young age. Following that, Danns and Danns (2019) in their study also highlighted the need for financial capital of the youngest entrepreneurs, who used their own resources to start their business. In addition to the lack of finance, the lack of education (Sacre *et al.*, 2024) experience as well as political barriers (Egorov *et al.*, 2019) created several challenges for young people to entrepreneurship.

The presented research focused on one selected Visegrad Four group region of the Czech Republic, namely its Moravian-Silesian region. This region is located in the north-eastern part of its historical region of Moravia and in the most of the Czech part of the historical region of Silesia. The region borders with Poland on the north and the Slovakia to the east. The aim of the paper is to analyse youth entrepreneurs aged 18 to 25 in the Moravian-Silesian region in contrast to the age groups of the rest entrepreneurs. This region is characterized by a specific mentality compared to other regions in the Czech Republic (Böhm *et al.*, 2025), as well as by a higher unemployment rate (Falisová and Glova, 2025), and the threat of job transitions due to regional decarbonization (Rueda *et al.*, 2025). To this purpose, the scientific question was set: "*Does the current era favour today's young entrepreneurs?*"

2. CHALLENGES WITHIN DIGITAL AGE ENTREPRENEURSHIP

An entrepreneurial ecosystem of interconnected business players, enterprise organizations, institutions and business processes come together formally and informally to drive performance within the place of creation (Brown and Mason, 2014). This in turn enables productive entrepreneurship (Stam, 2015), which drives resource allocation through the establishment and operation of new ventures (Ács *et al.*, 2014). In Isenberg's study (2010), the entrepreneurial ecosystem consists of five pillars namely policy, finance, culture, support, human capital and markets.

The concept of entrepreneurial ecosystems emerged in the 1980s and 1990s as part of the transition in entrepreneurship studies from individualistic, personality-focused research to a broader community perspective that incorporates the role of social, cultural, and economic forces in the entrepreneurial process (Stam and van den Ven, 2021). Till the present days, there has been a historical development in the entrepreneurial ecosystem (Kollmann *et al.*, 2022). There have been different events in the past that have changed the entrepreneurial ecosystems as well but one of the most significant in the beginning of digital entrepreneurship (Nambisan, 2017), which is characterized by the penetration of digital technologies into entrepreneurship. According to Kollmann *et al.* study (2022), the year 1990 was defined as the

beginning of digital entrepreneurship and identifies the evolution of digital entrepreneurship into three stages as follows.

The first stage is called as “Seed-Era” (1990-2000), which is mainly characterized by the introduction of Internet technologies which led to the use of the term Internet entrepreneurship. In line with Davidsson (2015), the Internet can decrease barriers to entry for new ventures and facilitate access to information and financial instruments that have traditionally been held monopolistic by highly capitalized entities. As a result of that Era, the Internet mitigates information asymmetries between established firms and new entrants, thereby increasing competitive parity across industries. The Internet also provides access to many educational resources and entrepreneurial training programs (Mack *et al.*, 2017) such as online courses, webinars, and virtual mentoring programs provide aspiring entrepreneurs with the knowledge and skills needed to start and grow their businesses (Gentile *et al.*, 2020). When entrepreneurs gain access to best practices and industry leading knowledge, they are better equipped to solve challenges and exploit opportunities, further strengthening the overall entrepreneurial ecosystem (Guo *et al.*, 2024). However, in 2000, the Internet bubble burst (McFedries, 2002), causing investors to lose money that they had gambled on the continued rise in the stock prices of the Internet companies (Zook, 2008).

The “Seed-Era” was followed by “Startup-Era” (2001-2015), which was characterized by a rethinking ideas, but did not bring any clearly dominant term like Internet entrepreneurship compared to the previous one (Kollmann *et al.*, 2022). The main development led to the discovery of many unknown uses of the Internet. This technological innovation has been a key element which had influenced the demand for entrepreneurship activities (Wang *et al.*, 2024). In real business life it helped corporations to reduce transaction costs, improve organizational processes, and also strengthen ties with clients and suppliers, which has fostered a global and more competitive business environment (Alderete, 2017). This situation may have allowed many of the earliest start-ups to evolve into highly successful companies including Amazon, Google, Facebook or Twitter (now X). According to Antonizzi and Smuts (2020) the market in the digital industry was dominated by giant companies, emerging new technologies still offered opportunities for start-ups. As a result, Alderete (2017) believes that these new technologies have been very effective in boosting entrepreneurship in 85 countries during the period between 2007 and 2012. These new technologies developed not only the enterprises itself, but also the national economies (Irtyshcheva *et al.*, 2021). Besides the development of large corporations such as Facebook or Twitter, this era also led to the creation of social media, which not only allowed people all over the world to connect with each other, but entrepreneurs also use social media at different stages of the new product development process (Han *et al.*, 2025).

The recent era identified by Kollmann *et al.* (2022) is “Expansion-Era” (2016-20xx). It is characterized by variation of new digital technologies that change the global markets (Kollmann, 2022) and these technologies bring digitization into all aspects of humans' lives (Lungu *et al.*, 2024). Digitalisation is not just about new trends in entrepreneurship. Digital technologies allow entrepreneurs to modify product development faster and lead to experimentation, more dynamic business models and continuously evolving digital entrepreneurship processes (Kraus *et al.*, 2018). The adoption of digital tools and platforms is supporting a new generation of jobs that are difficult to categorise within traditional employment system, self-employment, freelance work or growth-oriented entrepreneurial activities (Sahut *et al.*, 2021). Furthermore, expected result from the opportunities created by digitalization, existing branches and companies are transforming from offline to online entrepreneurship, making digital entrepreneurship a new way of entrepreneurship (Kraus *et al.*, 2018). Steiniger (2019) noted that technologies such as social media, open-source software and hardware, online reputation assessment, 3D printing, digital imaging, or big data that offer prospective entrepreneurs the potential to reduce the barriers between inventing and founding a new venture considerably. Artificial intelligence (AI) is undoubtedly one of them, offering great potential as a potential accelerator and driver of entrepreneurial activities as an upcoming domain of digital technologies (Kuratko and Covin, 2025). Opposite to that, Erdal's (2025) study conducted in the Turkish environment, discussed, that many entrepreneurs cannot use artificial intelligence in their business activities due to the high cost, as well as the lack of expertise to adopt this technology.

Digital entrepreneurship as significant part of the digital entrepreneurial ecosystem (Bejjani *et al.*, 2023) needs an open transparent and entrepreneur friendly institutional setting that stimulates potential entrepreneurs to enter the market (Sussan and Acs, 2017). Bureaucracy, formalization and routine tend to crowd out entrepreneurial thinking according to Kuratko and Covin (2025) and therefore democratization of entrepreneurship and making the potential benefits of entrepreneurship available to all is essential which requires a better understanding of the interdependencies and interactions between actors and processes in entrepreneurial ecosystems. Today's enterprise challenges require more complex skills than in the past in order to successfully integrate, use and deploy digital technologies towards innovation which is associated with the growth of digital competencies (Bachmann *et al.*, 2024). There is a need for this that already affects every sector of business as far as such agricultural entrepreneurship (Cheng *et al.*, 2024), thus creating a need to support for future entrepreneurship (Kuratko and Audretsch, 2022).

To fulfil the paper's objective 4 hypotheses that would also support the research question were developed:

H1: Beginning business in the current digital age due to the new opportunities of the period does not differ significantly between youth and other age entrepreneurs.

H2: The digital era facilitates the start of entrepreneurship among all age groups.

H3: There is a verifiable relationship between age groups and educational attainment.

H4: There is a positive relationship between educational attainment and receiving support from outside.

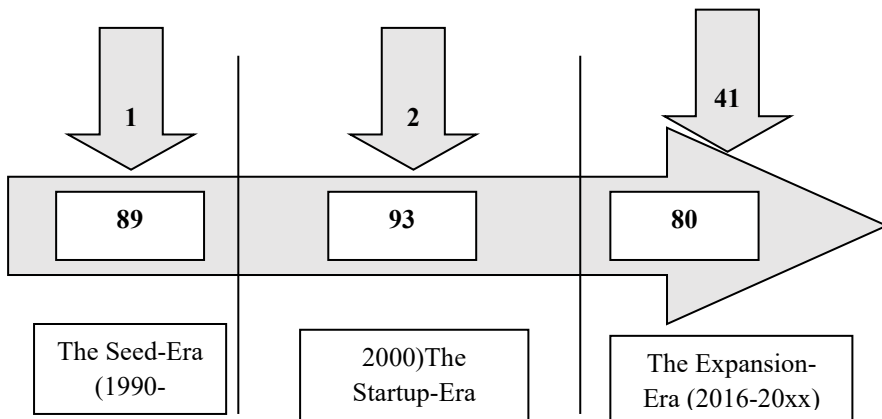
3. RESEARCH METHODOLOGY

The research is based on the analysis of primary data collection. As being mentioned, the regional study was conducted in the Moravian-Silesian region in the Czech Republic. For the purpose of the study, a sample of entrepreneurs operating in this area were selected (1 200 randomly selected from business registry). Data collection was done using Computer-Assisted Web Interviewing (CAWI) method, where respondents finished an electronic questionnaire. After obtaining the responses, a logical check of the data was conducted. After this control, incomplete and illogical answers of the respondents were eliminated. A total of 262 respondents (the response rate is 21.8 %) participated in the survey after this inspection. The data obtained were subjected to descriptive and analytical statistics. To select the appropriate statistical method (parametric or nonparametric), the conditions of their use were tested, which is recommended for example by Rabušic *et al.* (2019).

At first, the normal distribution of the data was examined. For this, the Kolmogorov-Smirnov test was used. This test is used as the basis for the choice of parametric or nonparametric tests. For the use of parametric tests and their correctness of the results also depends on the variances in the groups under study, and therefore the Assumption of homogeneity of variance must be met. Another assumption is the Assumption of Sphericity, which requires that all possible differences in the measurements of each unit in the population are identical. This condition was tested through the Levene's test. Another condition for using parametric tests should be the cardinal variable through which the groups are compared. The last condition should be measurement independence, which assumes that the data measured on one subject are not influenced by the other subject. Depending on whether these conditions are met, it will be determined whether the research will use a parametric test (Independent sample T- Test/ANOVA: Analysis of variance) or a nonparametric test (Mann Whitney test/Kruskal Wallis test). Finally, crosstabulation will be used for the evaluation. The association of the different variables will be tested through Somers' d and Gamma coefficient.

4. RESEARCH RESULTS

Demographically, 31.7 % of females participated in the survey compared to males (68.3 %). The age structure consisted of respondents aged 18 to 25 years (16.8 %), 26 to 40 years (16.8 %), 41 to 55 years (50.8 %), 56 to 65 years (13.4 %) and over 66 years (2.3 %). Thus, the group of youth entrepreneurs (18 to 25 years) was underrepresented compared to the group of entrepreneurs of all other age categories (26 years and above). On the other hand, respondents with secondary education (70.2 %) were the most represented compared to primary education (0.8 %) and university education (29.0 %). Figure 1 illustrates the distribution of entrepreneurship by date of establishment into stages according to Kollmann *et al.* (2022). The upper arrows of the figure pointing downwards show the youth entrepreneur population at the time.



Source: own research, based on Kollman *et al.* (2022)

Figure 1. Counts of new enterprises established by respondents in different periods of digital entrepreneurship (N = 262)

A total of 89 entrepreneurs has started businesses in Seed-Era, but only one person represented youth entrepreneurship. In the next era, there was an increase of 4 persons representing entrepreneurship and one more person representing youth entrepreneurship in the Moravian-Silesian Region. In the last era, the number of newly established entrepreneurs decreased by 13 entrepreneurs compared to the previous one, but there was an increase in the number of youth entrepreneurs. Entrepreneurs with more than 20 years of business experience (39.7 %), less than three years (24.8 %), 11 to 20 years of experience (23.3 %) and finally three to ten years of experience (12.2 %) participated in the findings. For the most part, these are businesses in growth (61.8 %) followed by stagnation (22.9 %), start-ups (11.8 %) or in decline (2.3 %) and liquidation (1.1 %). In legal aspects, 59.9 % are unincorporated entities and 40.1 % are incorporated entities. Self-employed make up 47.7 % of respondents, small and medium-sized enterprises make up 49.6 % and 2.7

% are large enterprises. The most common industries are Services (63.7 %), Trade (19.5 %), Manufacturing (15.3 %) and Agriculture (1.5 %).

Hypothesis evaluation

Beginning business in the current digital age (H1). The first step to confirm or reject the hypothesis was to test the use of the parametric Independent Sample T- Test, through the conditions presented in the Research Methodology section. Kolmogorov-Smirnov test was used to determine the normal distribution of the data. The results of this test were for youth and other age entrepreneurs ($p = 0.000$) and for beginning business ($p = 0.000$). Since these significance levels are less than 0.05 so the results are not statistically significant and the data does not have a normal distribution. Since the first condition for using the Independent sample T- Test is not met there is no need to consider the other conditions. Next, it will be worked to test the hypothesis with nonparametric test (Mann Whitney test). In testing the hypothesis, the significance level was $\alpha = 0.05$ and the Mann Whitney test result was $p = 0.000$ and therefore $p < \alpha$ ($0.00 < 0.05$). **H1 is rejected.** In doing so, it is not so much about young people's search for new opportunities, but about the time in which they were born. This was also confirmed by the respondents in the survey, according to whom young people are more interested in entrepreneurship thanks to new technologies (60.7 %), because their acquired skills can facilitate this activity in some directions.

The start of entrepreneurship among all age groups (H2). Even with the second hypothesis, the Kolmogorov-Smirnov test for beginning business ($p = 0.000$) and for age categories ($p = 0.000$) did not find the data normally distributed. So, the nonparametric Kruskal Wallis test was chosen to test the hypothesis. This test also has not confirmed the hypothesis when $p < \alpha$ ($0.000 < 0.5$) and so the **H2 is rejected.** Table 1 presents the differences between the age categories.

By examining the different age groups, it was found that as age increases, the entrepreneurial group is at a disadvantage and therefore many of them will rethink whether to enter business. The hypothesis H2 builds on the first to outline the tipping point at which a barrier to entrepreneurial activity arises. The questionnaire survey also investigated the issue of starting a business today. As many as 63% of the respondents stated that in earlier times they had better conditions for starting these entrepreneurial activities. However, the results are limited in the number of middle-aged and older respondents who participated in the survey. But they see the need to use and communicate with authorities through computerisation as the biggest challenge in their activities in the digital age. There are often problems associated with data mailbox or electronic identity, which they are forced into by the state and lack better support in this regard.

Table 1. The differences between the age categories

(I) Age	(J) Age	Mean Difference (I-J)
18-25	26-40	5.259*
	41-55	17.667*
	56-65	22.549*
	66+	20.530*
26-40	18-25	-5.259*
	41-55	12.408*
	56-65	17.290*
	66+	15.271*
41-55	18-25	-17.667*
	26-40	-12.408*
	56-65	4.883*
	66+	2.864
56-65	18-25	-22.549*
	26-40	-17.290*
	41-55	-4.883*
	66+	-2.019
66+	18-25	-20.530*
	26-40	-15.271*
	41-55	-2.864
	56-65	2.019

Source: own research, * significance level at 0.05

Relationship between age groups and educational attainment (H3).

Among respondents aged 18 to 25, 90.9% completed secondary education, the highest proportion of any age group. However, more than half of respondents in all age categories have completed secondary education. This is demonstrated in Table 2 below. This table works with row percentages. The highest number of respondents with university education is found among respondents aged 26 to 40 years (41.9 %) and 41 to 55 years (34.1 %). So, it can be argued that as the age of entrepreneurs increases, the need for developing their education, for example through completion of university education is most common among middle aged people.

The relationship between these two variables was also investigated through Somers' d, with age as the independent variable and education as the dependent variable. The result of Somers' d (Somers' d = 0.61) came out statistically significant ($p = 0.143$). To verify this finding, Mann Whitney test was also conducted (again Kolmogorov-Smirnov test did not find normal distribution of data) which came out at a significance level of $\alpha = 0.05$ ($0.374 > 0.05$). **H3 can be confirmed.**

Table 2. Relationship between Age and Education

Age/Education	Primary	Secondary	University
18-25	2.3 %	90.9 %	6.8 %
26-40	0.0 %	58.1 %	41.9 %
41-55	0.8 %	65.2 %	34.1 %
56-65	0.0 %	74.3 %	25.7 %
66+	0.0 %	83.3 %	16.7 %
Youth entrepreneurs	2.3 %	90.9 %	6.8 %
Other age entrepreneurs	0.4 %	66.1 %	33.5 %

Source: own research

Positive relationship between educational attainment and receiving support from outside (H4). With higher educational attainment, respondents' interest in the support they seek for their activities increases. The results are shown in Table 3 (Relationship between Education and Receiving support from outside). This table works with row percentages. Only 23.9 % of respondents with secondary education could not assess the impact of outside support, compared to 10.5 % of respondents with university education. The result Gamma coefficient = 0.22 which represents a small correlation with a statistical significance of 0.26. Although the Gamma coefficient demonstrated a small association the result also achieves a positive relationship and the importance of the intensity of support can increase as education improves. The agreement rate was measured through Kappa and reached a value of 0.014, which corresponds to the random agreement of the observers. Again, Mann Whitney test ($0.060 > 0.05$) at α level of significance was performed to check. **H4 can be confirmed.**

Table 3. Relationship between Education and Receiving support from outside

Education/Support	definitely not	rather not	I don't know	rather yes	absolutely yes
Primary	50.0 %	50.0 %	0.0 %	0.0 %	0.0 %
Secondary	12.5 %	17.4 %	23.9 %	32.1 %	14.1 %
University	10.5 %	17.1 %	10.5 %	36.8 %	25.0 %

Source: own research

According to the survey, up to 96.4 % of respondents turn to others for support when needed. They most often seek help from other entrepreneurs (45.0 %), specific authorities concerned (18.3 %), institutions providing business support (11.1 %), personal and/or psychological development (9.2 %), universities (4.2 %) and secondary schools (3.1 %), maternity or other enterprises (3.1 %) and least often from their own employees (1.5 %).

5. DISCUSSION AND CONCLUSIONS

The results of the research indicated that the current digital age is benefiting from more young entrepreneurs who are engaging more in digital entrepreneurship. *In The Expansion-Era (2016-20xx), the narrow majority of new business start-ups were in favour of youth entrepreneurship in the Moravian-Silesian region. The H1 proved this.* Therefore, for many potential entrepreneurs, a new barrier for this activity may arise, which is more likely to discourage them. *Through the H2, it was found that this group is mostly elderly people. These people have to face new challenges and thus get into uncomfortable situations where there is no other way out.* Young people live and grow up in the digital age (Ensari, 2017) and therefore have a certain advantage compared to other age groups of entrepreneurs. These people are the most knowledgeable and skilled of all (Dolot, 2018). Other age groups have not had this opportunity and therefore they have to develop their digital competencies more (Bachmann *et al.*, 2024) which helps them to facilitate their daily business activities. Some of these entrepreneurs are weak in the use of technology or at a mainstream level (Ensari, 2017) and therefore entrepreneurship education is extremely important (Cheng *et al.*, 2024; Kuratko and Covin, 2025) as well as the development of the sharing economy (Richter *et al.*, 2017).

The hypothesis H3 confirmed the need for learning and acquiring new competences at all ages. Up to 91% of today's young entrepreneurs have completed secondary education. This represents a 25% change compared to other age categories. However, university education is predominant for other age groups. As age increases, the need to acquire new competences increases, but it should be noted that young entrepreneurs at the moment, given their age, can also acquire new competences during this time through university studies that they have not yet completed. *The final hypothesis H4 confirmed that the acquired education positively influences the need for support among entrepreneurs.* The latter are more likely to address their requests for support and are not afraid to approach someone. Yet, it is most often other entrepreneurs. This reinforces the role of the sharing economy (Richter *et al.*, 2017) as knowledge sharing (Serpente *et al.*, 2025) as well as the role of mentoring and coaching (Kuratko and Audretsch, 2022).

This study extends the already acquired knowledge in this topic (Holiienka *et al.*, 2016; Pilková *et al.*, 2017). However, it is necessary to continue this research in the future and bring new findings. The results of the study confirm the role of social capital and the acquisition of new contacts and the expansion of networks of entrepreneurs. Policymakers could also build on this and help networking among entrepreneurs. Courses by entrepreneurs for entrepreneurs could be an option within the municipality, where the region would support courses organised by entrepreneurs for entrepreneurs and these entrepreneurs would have the opportunity to expand their social capital as well as acquire new

competences. Young entrepreneurs would introduce the benefits of digitalization and the use of new technologies in entrepreneurship activities to other age groups of entrepreneurs, and they would have the opportunity to share their knowledge in other entrepreneurial directions. In the future, this could reduce the barriers between different groups of entrepreneurs in digital entrepreneurship. The use of electronic services also appears to be a problem. Here, respondents would like to see more initiative from the state to help them in these matters and to create simplified instructions or to be more involved in training in this line of business. Like other studies, this one did not avoid limits. The study was conducted in only one region of the Czech Republic and with a limited number of respondents. The research could, nevertheless, be replicated and applied to other regions with the same issues. The number of respondents representing the group of young entrepreneurs was also not sufficiently filled in the research. The research avoided examining other factors that affect young people's entrepreneurship.

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MODERNIZING PUBLIC ADMINISTRATION: E-GOVERNMENT AS A TOOL FOR EFFECTIVE GOVERNANCE

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Abstract

Amidst the rapid globalization of digital transformation, e-government represents a strategic and indispensable means for modernizing public administration and deepening the bond between citizens and state institutions. This paper examines the impact of e-government on the effectiveness of the government, specifically how the digitization of public services leads to greater transparency, reduced bureaucratic structures, and enhanced administrative quality. The empirical analysis is based on data from the 27 EU member states, with the Government Effectiveness indicator, provided by the World Bank, as the dependent variable. This research explores the correlations and direct influences between the level of e-government development and institutional performance. The results showed a strong and statistically significant positive correlation between e-government development and the extent of institutional integrity, socio-economic progress, and government effectiveness. This relationship is powerful in countries with a high degree of digital infrastructure and clearly laid public policies in the areas of anti-corruption and ICT. It demonstrates how the strategic use of digital solutions can significantly enhance administrative capacity and governance in the digital era.

Keywords: *Government Effectiveness, Modernizing Public Administration, DESI, Digitalization Policy, e-government.*

JEL Classification: C12; D73; H11; H83; O21; Y10.

1. INTRODUCTION

As the world moves toward digital integration at a rapid pace, reforming public administration has become a key element of government reform. Government effectiveness, transition, and digitalization are crucial aspects in modernizing public administration and enhancing the state's ability to deliver high-quality services to the public. Nonetheless, the consequences of e-Government differ greatly depending on the institutional environment, digital maturity, and technological platforms of each country. The modernization of public administration via e-Government technology is relevant to improving the efficiency, transparency, and participation of society in decision-making. The diffusion of digital technologies not only revolutionizes the delivery of public services but also the way interaction between state institutions and society provides tremendous benefits (higher efficiency, lower costs, transparency, and citizen participation) for the society in which it operates. But also, some intractable challenges (i.e., digital divide, data security, and institutional complexity).

E-government, as an ICT delivery by the public and interactive administration, is now viewed as an important driver of an efficient, transparent, and citizen-oriented agency (Troitiño, Mazur, and Kerikmäe, 2024). That change requires substituting traditional bureaucratic models with system-level embedding systems of integrated digitalization, fostering civic citizen participation and accountability.

Our paper is structured as follows: Section 2 reviews the literature on the proposed topic to identify the main research directions and the existing research gap. In part 3, we presented the research methodology, followed by part 4, which includes the results presentation and discussion section. The final part (Part 5) was reserved for conclusions, including policy recommendations.

This article aims to examine the extent to which e-Government serves its dual purpose in relation to the modernization of public administration, thereby maximizing government effectiveness. It also focuses on emerging trends of Artificial Intelligence (AI), Internet of Things (IoT), blockchain technologies, and the future direction of digital governance.

Based on these premises, our article proposes an empirical analysis of how e-government can facilitate a practical, relevant, and applicable administration in the 21st century.

2. LITERATURE REVIEW

For research purposes, digital transformation in public administration is a matter of great concern. E-government is viewed as a tool to enhance efficiency, facilitate access, increase transparency, and promote citizen participation. In this regard, the current review provides overviews of major themes, pros, challenges, and emerging trends in e-Government. It is also a study of the effects of digitalization on the government's performance and what makes digital

governance successful. The review consists of six broad parts, each focusing on a specific aspect of e-Government.

2.1. E-government: definitions, evolution, and conceptual models

E-Government: Application of ICT in the Public sector towards efficiency, quality of services, and the democratic system. This concept went from the traditional e-Government of e-Government 1.0, which involved basic digitalization (e-Government 1.0), to the use of social networks and Web 2.0 for interaction and collaboration (e-Government 2.0), to e-Government 3.0 (Kim & Robinson, 2012; Terzi *et al.*, 2019; Vrabie, 2023) and, in the present, including emerging technologies (AI, Blockchain, IoT). An integrated approach is now emerging, combining digitalization with institutional and legislative reforms. It is not enough to offer services; it is also necessary to co-create them in collaboration with citizens, thereby making public administration increasingly integrated with the general public (Alakash *et al.*, 2024). This idea encompasses multiple domains, including citizen orientation, communication channels, and technology (Malodia *et al.*, 2021; Zou *et al.*, 2023).

Next, Table 1 summarizes the evolutionary stages of e-Government models.

Table 1. Implementation models and strategies

e-Government	Key technologies	Main characteristics
1.0	Web portals, e-services	Basic digitalization of services
2.0	Social media, Web 2.0	Interaction, Participation, Collaboration
3.0	AI, IoT, blockchain, VR/AR	Automation, service customization, predictive analytics
Integrated approach	Integrating additional tools and technologies	Integrating digitalization and institutional and legislative developments.

Source: authors' own élaboration

2.2. Benefits of e-government

Specialized literature has identified several advantages of e-Government. As stated on the EU portal of the European Commission, the digitalization of public services offers an efficiency advantage, increases citizen participation, and, in turn, reduces the cost to both citizens and businesses. Shaxnoza (2024) notes that ICT enhances organizational processes and reduces bureaucracy. Goloshchapova *et al.* (2023) emphasize the importance of digitalization in improving transparency and combating corruption, both of which contribute to economic progress and also aid in poverty reduction as a complementary effect. Digital technologies encourage citizen involvement, allowing citizens to have some influence on politics (McCarthy *et al.*, 2023; Miselo and Munyenembe, 2025). E-government enhances the quality and accessibility of public services for citizens and corporations (Avianto *et al.*, 2022). In contrast, the quality of electronic services

has a tangible impact on public satisfaction (Taufiqurokhman *et al.*, 2024). Public governments, as the primary service providers, have invested enormous resources in information and communication technologies over the past decade, but have encountered issues with efficiency. Studies have demonstrated that digitalization needs to be supplemented with institutional reform and a user-centered perspective to have a real impact (Peristeras *et al.*, 2009).

2.3. Challenges and limitations

Structural and situational considerations have influenced the E-Government. One significant obstacle is the digital divide - disparities in access to technology and IT skills, which reduce the benefits of digitalization, especially in developing countries (Brown, 2005). E-governance and the digital divide are two interrelated concepts, as citizens often struggle to access or effectively utilize advanced information technologies. At the same time, excluding the user perspective may result in a limited and insufficient understanding of the administrative reforms that follow the introduction of digitalization (Helbig *et al.*, 2009). The “digital divide,” which may impede successful digitalization – particularly in countries with inadequate technological infrastructure or insufficient access to digital capacity – has also been observed (Asgarkhani, 2005; Androniceanu and Georgescu, 2023). User satisfaction and accessibility are significant determinants for e-Government services; thus, without them, adoption and utilization rates are low. Furthermore, a harmonious blend between the technical foundation and user experience is necessary to enhance satisfaction and citizen engagement (Ameen *et al.*, 2024). The adoption of digital technology also requires the restructuring and enhancement of competencies in the public sector (Di Giulio and Vecchi, 2021; Dawes, 2008). Other issues include privacy, data protection, and ethical considerations in artificial intelligence (Hand, 2018; Al-Ansi *et al.*, 2024).

2.4. Key factors in digital governance

Adaptability and digital agility are also essential for supply chain resilience, and good government support is associated with this resilience (Dubey *et al.*, 2023). The evolution from mere digitalization to transformation, engagement, and involvement in contexts and on-the-ground action reflects an increasing complexity that is closer to a sense of alignment with societal needs (Janowski, 2015; Smorgunov, 2021). Governance system performance is dependent on cooperation among the governmental and public sectors, and digitalization facilitates new collaboration and co-governance (Smorgunov, 2021; Kukhareenko, 2024).

2.5. Emerging technologies and future directions

Emerging technologies, such as AI, the Internet of Things (IoT), and blockchain, are rapidly transforming the digital governance landscape. Al-Ansi *et al.* (2024) demonstrate that these technologies enhance process effectiveness and empower citizens, while also posing some fairness and privacy risks. Vrabie (2023) discusses the evolution of e-Government 3.0, a transformation where digitalization serves as an enabler, combining smart innovations for automation, citizen participation, personalized public services, and predictive analytics.

2.6. The relationship of eGovernment with governmental effectiveness

The strong linkage between e-government and the effectiveness of government has been explored in the previous works of several authors (Moreno-Enguix *et al.*, 2019; Nam, 2019; Hodžić *et al.*, 2021; Zou *et al.*, 2023; Krasnykov *et al.*, 2024). Digitalization levels heavily affect the efficiency of governments. More recent studies report that nations with high levels of digital maturity tend to perform well in public service delivery, while the impact is modest in underdeveloped economies (Wandaogo, 2022; Androniceanu and Georgescu, 2023). Additionally, to provide them with the best governance standards, public administrations must adapt the new technology accordingly and react quickly to citizens' needs (Mittal, 2020; Dubey *et al.*, 2023; Smorgunov, 2021).

3. METHODOLOGY

In this study, we employed a combination of research methods: a review and systematization of the relevant literature, as well as a quantitative approach involving the collection, processing, and analysis of statistical data, along with comparative evaluations of the results obtained through empirical validation.

To test the dependency hypothesis (H1): “government effectiveness is positively determined by institutional integrity, the level of e-government, the degree of digitalization, and various socio-economic indicators”, we propose an econometric model expressed through the following multiple regression equation:

$$\text{Gov_Efi} = \beta_0 + \beta_1(\text{E_gov_web})_i + \beta_2(\text{DESI})_i + \beta_3(\text{Transparency})_i + \beta_4(\text{us_int})_i + \beta_5(\text{Control_corrup})_i + \beta_6(\text{Competitivity})_i + \beta_7(\text{ed_tertiary})_i + \varepsilon_i$$

Where:

- The dependent variable (Y) is Government Effectiveness (*Gov_Ef*).
- The independent variables (X1÷X7) included in the analysis are: E-government activities of individuals via websites (*E_gov_web*), Digital Economy and Society Index (*DESI*), Transparency (*Transparency*), Individuals using the Internet (*us_int*), Control of Corruption

(*Control_corrup*), World Competitiveness Ranking (*Competitivity*), and Educational Attainment, at least completed short-cycle tertiary (*ed_tertiary*).

- β_1 – β_7 are the regression coefficients.
- β_0 is the intercept (constant)
- \mathcal{E}_i is the random error term.

The following table defines the variables under investigation (Table 2).

Table 2. Variables selected in the analysis

Dependent variable (Y)	What measures?	Relevance:	Source of data:
Government Effectiveness - Percentile Rank, [0;100], (<i>Gov_Ef</i>)	It measures perceptions of the quality of public services, the degree of independence of public services from political pressures, the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies.	It is a synthetic indicator that captures government performance in a broad sense, being suitable for international comparisons (cross-sectional analyses between states).	World Bank – Worldwide Governance Indicators (WGI)
Independent variable (X)	What measures?	Relevance:	Source of data:
(X1): DESI composite index = Digital Economy and Society Index, Aggregate score, weighted score of the DESI dimension [0;100], (<i>DESI</i>)	It measures the level of digitisation of the economy and society in the EU member states.	A digitized society indirectly supports the efficiency of public administration.	European Commission, Digital Decade (DESI visualization tool).
(X2): E-government activities of individuals via websites, % of people (<i>E_gov_web</i>)	Internet use: obtaining information from the websites of public authorities (last 12 months), % of individuals, out of the total. The indicator measures, in the context presented, a specific behavior of citizens.	Reflects the level of digital interaction between citizens and public administration, having a direct impact on citizens' perception of the reality of government efficiency.	EUROSTAT
(X3): Transparency, all life events, score: [0;100], (<i>Transparency</i>)	Assess the extent to which governments are transparent about: the process of providing public services, their responsibilities and performance, and the personal data involved in providing services and citizens' access to them.	Transparency is an essential institutional factor for effective administration, as it reduces information asymmetries between the state and citizens, increases accountability and institutional control, and contributes to increased public trust in institutions.	E-Gov. Benchmark, European Commission

Independent variable (X)	What measures?	Relevance:	Source of data:
(X4): Individuals using the Internet, % of population, who have used the Internet (from any location) in the last 3 months <i>(us_int)</i>	It measures the percentage of the total population using the internet, providing useful information about the degree of digital literacy.	It is a fundamental indicator of digital access and the level of digital inclusion in a society, being an indirect but facilitating factor of administrative efficiency.	EUROSTAT
(X5): Control of Corruption: Percentile Rank, [0;100], <i>(Control_corrupt)</i>	It measures the perception of how control over corruption is exercised in a country.	It is one of the most important predictors of government effectiveness, as corruption reduces the efficiency of resource allocation, affects the quality of public services, and decreases the trust and participation of citizens.	World Bank – Worldwide Governance Indicators (WGI)
(X6): IMD Competitiveness Index, general score [0;100], <i>(Competitivity)</i>	Measure national competitiveness by combining statistical data from the IMD World Competitiveness Yearbook, IMD World Talent Ranking, and IMD World Digital Competitiveness (2/3) reports with survey results and opinions from executive managers (1/3).	National economic competitiveness is closely linked to the quality and performance of public institutions. Greater competitiveness reflects a more efficient public administration capable of creating conditions conducive to economic and social development.	IMD World Competitiveness
(X7): Educational attainment, at least completed short-cycle tertiary, population 25+, total, % <i>(ed_tertiary)</i>	Percentage of persons aged +25 years or older who have completed at least the form of short-cycle tertiary education.	A well-educated workforce is essential for the effective adoption and use of digital technology and adaptability. It is a control variable that has an indirect influence on government effectiveness.	World Bank

Source: authors' own élaboration

Data collection: The data corresponding to these variables were collected for the EU27 member states over 6 years (2017–2022). Number of observations: 28 (27 EU member states and average).

Data preparation: Missing data were addressed using Python-based predictive models. Linear regression was applied to estimate the 2022 values for the E-government indicator, while EU-level figures were calculated as population-weighted averages where applicable.

Statistical software used in analyses: IBM SPSS Statistics, version 30.

Methods and techniques used in data analysis:

- The Pearson correlation coefficients were used to evaluate the strength of relationships between variables (theoretical range: 0 – 1, preferred range: 0.50 – 0.95).

- Statistical significance testing determines whether observed results reflect true effects or are likely due to chance. In theory, a p -value (Sig.) below 0.05 typically indicates significance at the 95% confidence level. In practice, p -values (Sig.) below 0.1 are sometimes accepted as marginally significant.

‘t-test’ for coefficients: Tests whether individual predictors significantly affect the dependent variable.

$H_0: \beta_1 = 0$ (no effect); $H_1: \beta_1 \neq 0$ (significant effect)

‘F-test’ for model significance:

Assesses whether the regression model as a whole is significant.

H_0 : All coefficients = 0; H_1 : At least one $\neq 0$

In ANOVA (Analysis of Variance), the F statistic compares the variance between groups to the variance within groups. Significance is accepted when Sig. (p -value) < 0.05.

- Factorial analysis: The Kaiser-Meyer-Olkin statistical test (KMO) is applied to assess the internal coherence of selected variables. The KMO should range from 0.5 to 1, indicating adequate sampling.

- Multiple regression analysis. Method: Multiple Linear Least Squares (OLS) linear regression. In regression analysis, the coefficient of determination (R^2) is crucial as it shows the percentage of variation in the dependent variable explained by the independent variables.

Residue analysis:

- Durbin-Watson (DW) Test for Residual Autocorrelation: Interpretation of the Test Results: If $1.5 \leq DW \leq 2.5$, there is no significant autocorrelation (i.e., autocorrelation is not problematic); If $DW \approx 2$, it indicates no autocorrelation of errors (the ideal scenario).

- PRESS (Predicted Residual Sum of Squares) is a validation measure in linear regression that assesses prediction accuracy using leave-one-out cross-validation. Unlike R^2 , which evaluates model fit on the dataset, PRESS measures out-of-sample predictive accuracy, providing a robust alternative for model validation. A low PRESS score – particularly when the PRESS/SST ratio is below 50% (ideal situation) – indicates moderate to strong predictive performance. Conversely, a ratio between 51% and 100% suggests a poor model fit, with prediction accuracy decreasing as the ratio approaches 1.

- ‘-3 / +3 rule’ for standardised residuals. The residual is a measure of the error of the model relative to the actual data. The ‘-3 / +3 rule’ is based on the standard normal distribution (mean = 0, standard deviation = 1). Interpretation: If Standardized Residual = [-2 to +2] → (normal situation), If Standardized

Residual [-2.0 to -3.0 / +2.0 to +3.0] → (potential outlier), and If Standardized Residual = [< -3.0 or $> +3.0$] → (significant outlier).

Relevant Graphical Representations:

- Histogram of Residuals shows the distribution of standardized residuals (differences between observed and predicted values). A bell-shaped, symmetrical histogram suggests normally distributed residuals, supporting model validity. Skewed, flat, or multimodal shapes may indicate model misspecification, outliers, or nonlinearity.

- Normal P-P Plot compares the distribution of standardized residuals to a normal distribution. Residuals closely following the diagonal suggest normality. Deviations may point to poor model fit or non-normal errors.

Both graphs (Histogram and P-P Plot) verify the normality of the residual distribution, but through different diagrams.

- Scatterplots show how EU countries align with the regression trendline (R^2). Those near the top are leading performers relative to the model.

4. FINDINGS AND DISCUSSION

Below, we present the results of the quantitative analysis for the first and last years in the dataset (2017 and 2022). In the bivariate correlation matrix for 2017, we observe medium to strong intensity links between the dependent variable, Government Effectiveness (Gov_Ef), and the other predictors, statistically validated (Table 3).

Table 3. Correlation matrix_2017

2017		(X1)	(X2)	(X3)	(X4)	(X5)	(X6)	(X7)
<i>Gov_Ef</i> (Y)	Pearson Correlation	0.869	0.800	0.501	0.859	0.929	0.831	0.612
	Sig.	<0.001	<0.001	0.007	<0.001	<0.001	<0.001	<0.001
	N.	28	28	28	28	28	28	28
Where: (Y) is the dependent variable and (X1÷X7) are the predictors								

Source: authors' own élaboration

The KMO test indicates good internal consistency of the analyzed factors (86.7% in 2017), suggesting that the factors were chosen correctly, and consequently, the solution obtained is very good (Table 4).

Table 4. KMO & Bartlett's test_2017

KAISER-MEYER-OLKIN Measure of Sampling Adequacy		0.867
Bartlett's Test of Sphericity 2017	Approx. Chi Square	228.779
	Df.	28
	Sig.	< 0.001

Source: authors' own élaboration

Regarding the regression results, we note that $R^2 = 0.925$, which means that the model explains 92.5% of the variation in the Gov_Ef dependent variable. On the other hand, $DW \approx 2.2 \rightarrow$ There is no significant autocorrelation. Also, $PRESS < SST (583 < 3935) \rightarrow$ condition fulfilled; $PRESS / SST = 14,8\% (< 50\%) \rightarrow$ good predictive model (Table 5).

Table 5. Model Summary_2017

2017 Model summary	R	R Square (R²)	Adj. R Square	Std. Error of the Estimate	PRESS	Durbin-Watson
1	0.962	0.925	0.899	3.83860	583.324	2.243

Source: authors' own élaboration

Multifactorial ANOVA certifies the statistical significance of the model as a whole, with a significance level below 0.05. In our case, $Sig. < 0.001$, the condition is met, indicating that the model is statistically significant and that at least one independent variable contributes significantly to explaining the dependent variable (Table 6).

Table 6. ANOVA_2017

2017 Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	3640.116	7	520.017	35.292	< 0.001
	Residual	294.698	20	14.735		
	Total	3934.814	27			

Source: authors' own élaboration

The strongest predictor of government effectiveness is X5, control of corruption. High positive effect ($\beta = 0.758$) and excellent statistical significance ($Sig. < 0.001$). Interpretation: Governments that better control corruption are perceived as more effective. The remaining variables are not statistically significant ($Sig. > 0.05$). Possible causes could be multicollinearity problems; however, since the model as a whole has been validated, we do not intend to conduct further investigations into multicollinearity (Table 7).

Table 7. Regression coefficients_2017 (method: ‘enter’)

2017 Model	Unstandardized B	Coefficients std. error	Standardized coefficients Beta (β)	t	Sig.
(Constant)	29.163	9.765		2.987	0.007
X1	0.423	0.248	0.269	1.708	0.103
X2	0.110	0.080	0.173	1.377	0.184
X3	-0.006	0.062	-0.008	-0.102	0.920
X4	0.049	0.206	0.038	0.236	0.816
X5	0.577	0.126	0.758	4.563	<0.001
X6	-0.142	0.161	-0.138	-0.882	0.388
X7	-0.185	0.157	-0.105	-1.179	0.252

Where: (X1÷X7) are the predictors

Source: authors' own élaboration

Taking into account the above results of the general model (SPSS, method: ‘enter’), several models have been examined by eliminating non-significant variables stepwise (SPSS, method: ‘backward’). Thus, it was noted that the effectiveness of the government in 2017 depended mainly on the control of corruption and, to a lesser extent, on digitisation (DESI). Corruption control is the most significant factor, underscoring the importance of institutional integrity for effective administrative performance. In simpler models, digitalization has a moderate but clear effect. This effect is more visible when less important factors are excluded. E-government web services, competitiveness, tertiary education, internet use, and transparency are not statistically significant. Their weak impact may result from overlap with stronger factors, measurement issues, or the indirect effect of government effectiveness on overall governance. Modernizing technology alone is not enough. Strong control of corruption is crucial because robust institutions support digital reforms, which improve governance.

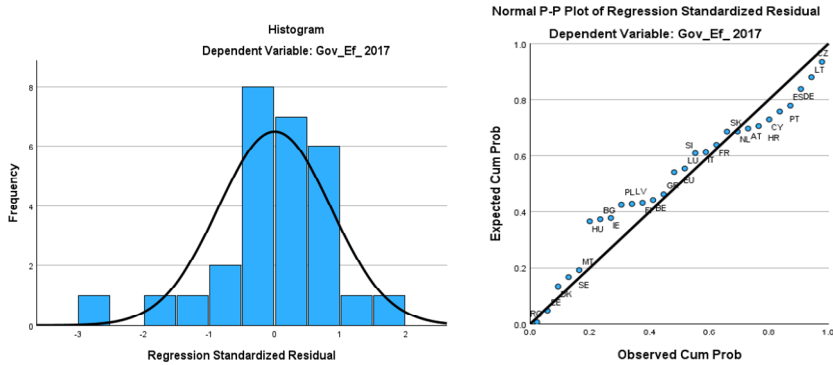
Regarding residues, the model is generally acceptable: errors are distributed symmetrically (average residue ≈ 0) and standardised predicted values are within reasonable limits. A potential negative outlier could exist (gross residual of -9.67 and standardized residual of -2.519), but it is not necessarily a concern if it is only one (Table 8). That is why it would be useful to also check the graphs of the residue (*Histogram*, and *P-P Plot*), to confirm the normality of the residues.

Table 8. Residual Statistics_2017

2017 Residuals Statistics	MIN.	MAX.	MEAN	Std. Deviation (SD)	N
Predicted Value	58.3823	99.9856	80.6174	11.61116	28
Residual	-9.66986	5.80313	0.00000	3.30374	28
Std. Predicted Value	-1.915	1.668	0.000	1.000	28
Std. Residual	-2.519	1.512	0.000	0.861	28

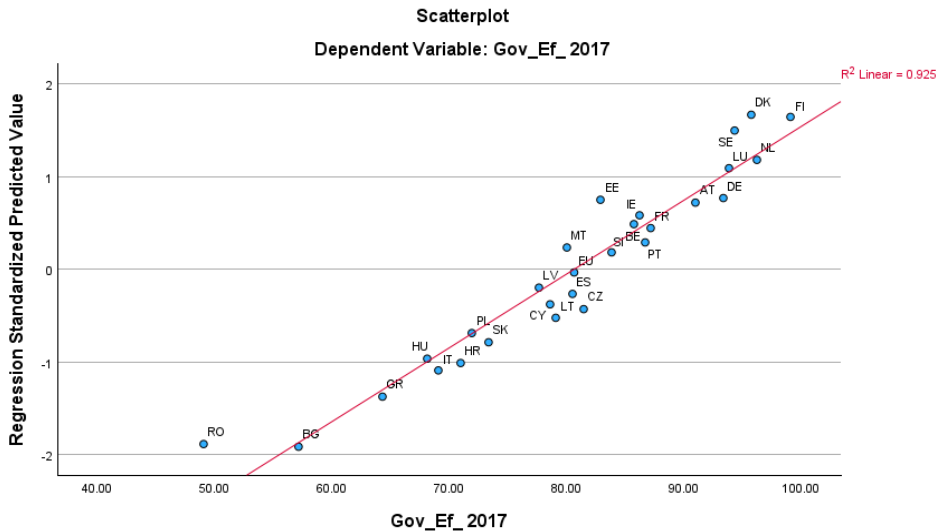
Source: authors' own élaboration

We notice on the graph on the left that the *histogram* has a symmetrical 'bell curve', which means that the residue is distributed approximately normally, a good sign for the chosen model. At the same time, on the right, we note that the *P-P Plot* does not show significant deviations from the diagonal line; we say that the residues are normally distributed (Figure 1).



Source: authors' own élaboration

Figure 1. Residue analysis_Histogram & P-P Plot_2017



Source: authors' own élaboration

Figure 2. Scatterplot_Dependent variable vs. Regression Std Predicted Value_2017

The next figure illustrates the 2017 scatterplot, highlighting a top cluster of countries - Nordic states, the Netherlands, Luxembourg, Germany, and Austria - with outstanding performance on the analyzed dimension. In contrast, at the bottom of the ranking are Romania, Bulgaria, Greece, and Hungary. It should be noted that the data obtained refers strictly to the set of variables taken in the analysis (Figure 2).

In the bivariate correlation matrix, for 2022, we observe medium and strong intensity links between the dependent variable, Government Effectiveness (*Gov_Ef*), and the rest of the predictors, statistically validated (Table 9).

Table 9. Correlation matrix_2022

2022		(X1)	(X2)	(X3)	(X4)	(X5)	(X6)	(X7)
Gov_Ef (Y)	Pearson Correlation	0.770	0.877	0.601	0.780	0.915	0.917	0.624
	Sig.	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	N.	28	28	28	28	28	28	28

Where: (Y) is the dependent variable and (X1÷X7) are the predictors

Source: authors' own élaboration

KMO = 88.3% → This shows that the solution obtained is very good (Table 10).

Table 10. KMO & Bartlett's test_2022

KAISER-MEYER-OLKIN Measure of Sampling Adequacy		0.883
2022	Bartlett's Test of Sphericity	Approx. Chi Square
		Df.
		Sig.

Source: authors' own élaboration

Regarding the regression results, we note that $R^2 = 0.923$, which means that the model explains 92.3% of the variation in the *Gov_Ef* dependent variable. On the other hand, $DW \approx 2$ → There is no autocorrelation of errors. Also, $PRESS < SST$ ($911 < 5187$) → condition fulfilled; $PRESS / SST = 17,6\%$ ($< 50\%$) → good predictive model (Table 11).

Table 11. Model Summary_2022

2022 Model summary	R	R Square (R²)	Adj. R Square	Std. Error of the Estimate	PRESS	Durbin-Watson
1	0.961	0.923	0.896	4.46868	911.477	2.032

Source: authors' own élaboration

Multifactorial ANOVA certifies the statistical significance of the model, Sig. < 0.001 (Table 12).

Table 12. ANOVA_2022

2022 Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	4787.939	7	683.991	34.252	< 0.001
	Residual	399.382	20	19.969		
	Total	5187.321	27			

Source: authors' own élaboration

The strongest predictors of government effectiveness are X5, *Control of corruption* and X2, *E-government activities of individuals via websites (E_gov_web)*. In 2022, the Controlling Corruption predictor had a highly positive standardized effect ($\beta = 0.519$) on the dependent variable, Government Effectiveness, which was statistically significant (Sig.) = 0.002 < 0.05. On the other hand, the predictor E_gov_web_2022 has a moderately positive effect ($\beta = 0.220$) and is close to the theoretical threshold of statistical significance (Sig. = 0.057), which suggests the link between the development of *E_gov_web* and *Government Effectiveness*. All other variables do not show a significant impact in the tested model, a possible explanation being multicollinearity - a point we do not intend to elaborate on, as the overall model has been validated and editorial space is also limited (Table 13).

Table 13. Regression coefficients_2022 (method: 'enter')

2022 Model	Unstandardized B	Coefficients std. error	Standardized coefficients Beta (β)	t	Sig.
(Constant)	-0.200	21.868		-0.009	0.993
X1	0.114	0.231	0.080	0.495	0.626
X2	0.158	0.078	0.220	2.020	0.057
X3	0.064	0.080	0.070	0.802	0.432
X4	0.180	0.306	0.063	0.588	0.563
X5	0.457	0.131	0.519	3.501	0.002
X6	0.158	0.176	0.163	0.894	0.382
X7	-0.081	0.143	-0.051	-0.566	0.578

Where: (X1÷X7) are the predictors

Source: authors' own élaboration

In light of the above results, we conducted an additional investigation. Thus, several models were examined by phasing out insignificant variables (SPSS, method: 'backward'). Interpretation of results: The implementation of strong anti-corruption mechanisms and the development of e-government platforms primarily lead to increased government effectiveness in EU member

states. While economic competitiveness plays a supportive role, its impact is less decisive (marginally significant), and other factors, such as DESI, internet usage, transparency, and tertiary education, do not show a direct significant effect.

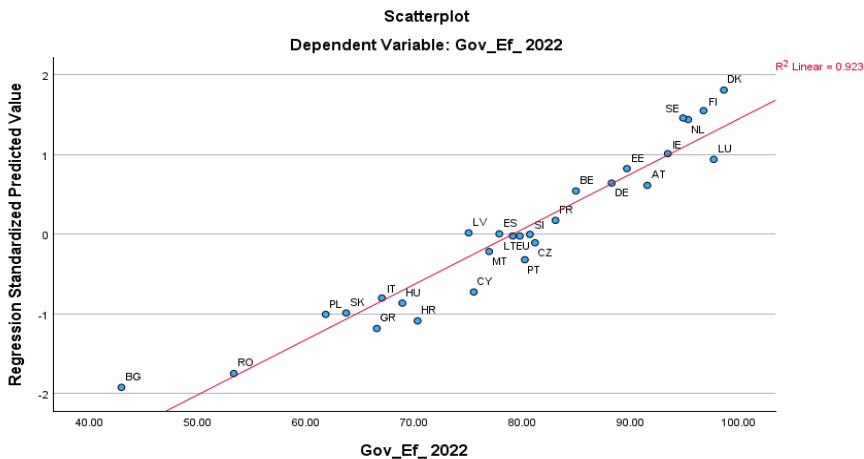
Regarding residues, the model is generally acceptable: errors are distributed symmetrically (average residue ≈ 0 , which indicates that the model does not have a systematic error) and standardised predicted values are within reasonable limits [1.923, +1.809], in the range ± 2 , so there are no extreme values. A residual standard deviation of 3.85 suggests a moderate dispersion of errors. Additionally, the standardized residues fall within the range of [-2.359, +1.358], which is acceptable according to the theory (a potential negative outlier may exist, but it is not a serious issue). $SD = 0.861 < 1$, indicating that most of the errors are relatively small compared to the standard deviation of the data (Table 14).

Table 14. Residual Statistics_2022

2022 Residuals Statistics	MIN.	MAX.	MEAN	Std. Deviation (SD)	N
Predicted Value	53.4598	103.1636	79.0704	13.31657	28
Residual	-10.53983	6.06753	0.00000	3.84603	28
Std. Predicted Value	-1.923	1.809	0.000	1.000	28
Std. Residual	-2.359	1.358	0.000	0.861	28

Source: authors' own élaboration

The next figure illustrates the 2022 scatterplot, highlighting a top cluster of countries - Nordic states, the Netherlands, Luxembourg, Ireland, and Austria - with outstanding performance on the analyzed dimension. In contrast, at the bottom of the ranking are Romania and Bulgaria (Figure 3).



Source: authors' own elaboration

Figure 3. Scatterplot_Dependent variable vs. Regression Std Predicted Value_2022

As a general observation, corruption has the most significant impact on government effectiveness in both 2017 and 2022. Throughout the period analysed, the top countries maintain the gap with the countries at the bottom of the ranking.

5. CONCLUSIONS

Empirical evidence supports the statistical predictions (H1) that institutional integrity, e-government, digitalization, and socio-economic aspects collectively have a positive effect on government effectiveness. The results of the study indicate that these features must be enhanced to improve the performance of government, increase public trust, and accomplish multiple functions that encompass social well-being and sustainable development. The bivariate correlation results indicate medium to strong statistical significance for the two variables under investigation. Government effectiveness has also been found to be positively influenced when digitalization measures are supported by coherent public policies, long-term investments in digital infrastructure and human capital, and a commitment from all stakeholders who gain or contribute to this process. Nevertheless, the benefits of digitalization are not universal and vary by region, but are determined by the level of digitalization in a country and its institutional system. At scale, success depends on an interlinked, accountable, citizen-focused solution. The extent to which e-government can achieve its full potential depends on addressing emerging concerns associated with new technologies, including access, ethics, privacy, cybersecurity, and acceptance, as well as reducing regional and contextual disparities. A correlation of more than 90% was observed between Government Effectiveness and Control of Corruption, as supported by multiple regression analysis. This illustrates the clear, positive, and statistically significant role that corruption control plays in governance effectiveness. Seizing this opportunity, public sector reforms should be connected to efforts to reduce corruption.

However, as highlighted in the literature, digitalization may attenuate the risks of corruption. However, the effectiveness of government remains highly variable among EU Member States. The rankings are primarily dominated by Nordic countries, with Luxembourg and the Netherlands, among others, trailing behind. Romania and Bulgaria are significantly lower than all others, with serious administrative gaps.

At the same time, for the sustainable development of public sector governance, the necessary aspects for soundness in institutions must be emphasized, including transparency and effectiveness of digital technologies, and governments should maintain control at all levels.

Limitations and implications for future work

This study has several limitations.

Future developments may investigate potential issues of multicollinearity, conduct panel analysis, expand the range of indicators or countries included, and further examine the risks associated with digitalization, as well as strategies to mitigate them. New hypotheses and research questions may be formulated to advance progress in this area.

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EXPLOITING INEFFICIENCIES: HEDGE FUND STRATEGIES AND THE EVOLUTION OF MARKET EFFICIENCY

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Abstract

The paper examines how hedge fund strategies exploit persistent market inefficiencies and evaluates the implications for the Efficient Market Hypothesis in both global and European financial markets. While the EMH traditionally asserts that asset prices fully reflect available information, empirical evidence increasingly shows that certain hedge funds consistently achieve abnormal returns, particularly during periods of market stress and dislocation. Using a cross-strategy perspective, spanning long/short equity, relative value, global macro, and event-driven funds, this study investigates how hedge funds identify and arbitrage pricing anomalies arising from behavioral biases, liquidity constraints, and institutional frictions.

Building on theoretical foundations in behavioral finance and the Adaptive Markets Hypothesis, the paper conducts a comparative analysis of hedge fund performance across multiple crisis periods, including the 2008 Global Financial Crisis, the 2011 Eurozone debt crisis, and the COVID-19 shock. Emphasis is placed on the structural characteristics of European markets, such as regulatory asymmetries, capital mobility, and the heterogeneity of investor behavior across EU member states. The results indicate that hedge funds demonstrate enhanced resilience and alpha generation precisely when markets deviate from informational efficiency, particularly in less liquid or segmented environments. These findings suggest that financial markets exhibit dynamic, context-dependent inefficiencies, which challenge the applicability of the Efficient Market Hypothesis in its stronger forms. Hedge funds, rather than being anomalies, may function as essential agents of price discovery in imperfect markets. The study contributes to ongoing debates about market efficiency, alternative asset management, and the evolving role of hedge funds within the European financial architecture.

Keywords: *hedge funds; financial stability; systematic risk; Efficient Market Hypothesis*
JEL Classification: G23.

1. INTRODUCTION

“Hedge funds often make headlines because of spectacular losses or spectacular gains”(Stulz, 2007, p. 175).

This is not the only quote stating the controversy and impact of the hedge fund industry (Asness *et al.*, 2001; Carroters, 2017; Eichengreen and Mathieson, 1999; Kruttli and Monion, 2013). It was found that “hedge funds seemed to be on the front page of every newspaper in the world” (Bloomberg, 2007; Edwards, 1999) stating their potential to “pose a threat to the stability of the entire financial system, once risks materialize” (Bussière *et al.*, 2015, p. 279).

Hedge funds in the European Union have faced unique challenges and recovery patterns compared to traditional asset classes, shaped by regulatory shifts and market dynamics. In the intricate landscape of modern finance, hedge funds represent a significant and often contentious component. The issue is not new (Haldane, 2014), however changing in size and shape. In the 1990s, hedge funds had grown to influence and shape financial markets. Even more influential than governments (Mallaby, 2019), in a world of increasing relations and dependencies. In response to international exposure to risks and policy implications, hedge funds (HFs) “may increase the risks to financial stability (Erede, 2013; King and Maier, 2009). The type of private, largely unregulated, and not supervised pools of capital are managed by competent investment firms, and they use plenty of complex methods to generate high returns for their investors, defined as “qualified purchasers” (Edwards, 1999, p. 190). Individuals who make more than two hundred thousand dollars a year or possess a net worth of more than one million dollars exclusively from their primary residence (Achleitner *et al.*, 2009).

Hedge funds serve several key functions in global financial markets. First, they contribute to market efficiency by identifying and exploiting pricing inefficiencies through sophisticated trading strategies such as arbitrage and event-driven investing (Adenigba, 1954). Thereby, hedge funds influence financial stability due to their growing impact and volatility. Many hedge fund strategies exhibit a low correlation with traditional asset classes such as equities and fixed income, making them an attractive investment for institutional investors and high-net-worth individuals seeking alternative sources of return (Stowell and Stowell, 2024).

The theoretical foundation for evaluating hedge funds’ role in market dynamics is often grounded in the Efficient Market Hypothesis (EMH), which posits that financial markets fully and instantly reflect all available information in asset prices. According to Fama (1970), the EMH exists in three forms: weak, semi-strong, and strong, depending on the degree of information reflected in prices. Under these assumptions, consistent outperformance is considered impossible without taking on excess risk. However, hedge funds directly challenge this notion by persistently identifying pricing anomalies and exploiting

inefficiencies. Their ability to deliver alpha over extended periods, particularly during episodes of high volatility or structural shifts, suggests that markets may not be fully efficient in practice.

Additionally, hedge fund strategies often capitalize on behavioral biases, limited arbitrage, and information asymmetries – areas where the assumptions of EMH may not hold. Studies such as Grossman and Stiglitz (1980) have argued that if markets were perfectly efficient, there would be no incentive to gather costly information, which paradoxically implies that inefficiencies must exist. Hedge funds' outperformance in niche segments such as distressed debt or emerging markets further underlines this critique. Therefore, hedge funds not only test the theoretical boundaries of the EMH but also provide practical evidence of episodic inefficiencies that can be systematically exploited.

Empirical research has examined the validity of the EMH using several statistical and econometric tests. Robert Shiller (1981) famously challenged the EMH by applying the variance bounds test, showing that stock price volatility exceeds what can be justified by fundamentals alone; a result inconsistent with the EMH. Andrew Lo (2004) proposed the Adaptive Markets Hypothesis as a refinement, suggesting that market efficiency is not static but evolves as investors adapt to changing environments. Fama himself contributed to empirical tests of EMH by analyzing abnormal returns in mutual funds and later recognizing that while markets are generally efficient, anomalies such as momentum and size effects persist. Other methods to test EMH include autocorrelation tests (for weak-form efficiency), event studies (for semi-strong form), and portfolio performance evaluations using Sharpe ratios and Jensen's alpha. Hedge funds often pass these tests with positive alpha, particularly in short- to medium-term horizons, suggesting a departure from perfect efficiency in real-world markets.

Overall, an extensive body of literature examines hedge funds from multiple perspectives, including their role in promoting market efficiency, their contribution to liquidity, and their potential to exacerbate financial instability. Scholars have debated whether hedge funds serve as stabilizers or destabilizers within financial markets (Lu *et al.*, 2024). On one hand, proponents argue that hedge funds enhance market efficiency through sophisticated arbitrage strategies, liquidity provision, and the active management of risk (Zhai and Wang, 2023). By capitalizing on misprice and market inefficiencies, hedge funds ostensibly contribute to a more accurate reflection of asset values and, in turn, to overall market stability.

1.1. Importance of hedge funds and financial stability

The importance of hedge funds (the statistical units of the paper at hand) comes from the increasing size of the industry to USD 4.74 trillion in assets under management in the year 2024 with official predictions to grow to USD

5.47 trillion by 2029 (Goldstein, 2025). Other than the financial implications, the importance of the hedge fund industry also depends on its international basis, as the past showed major events that led to imbalances (Orlando, 2023). Thereby, HFs are an important price-setter and “reportedly dominate trading activities in the markets with broader economic importance” (King and Maier, 2009, p. 285). By trading a volume of 40 percent in the leveraged loan market and more than 85 percent of distressed debt, they are the “key players in high yield debt and emerging market debt” (King and Maier, 2009, p. 285). Their operational scope, the magnitude of their financial maneuvers, and their attractive returns raise questions about their implications for the stability of the broader financial system. International financial stability (FS) is a cornerstone of economic health, affecting everything from national economies to individual livelihoods (Clifford, 2008). The continuous functioning of the financial system provides essential lubrication that allows commerce, investment, and day-to-day business activities to proceed without significant disruption (Haldane, 2014). It ensures that economic actors can make financial decisions with a reasonable expectation of stability and security. However, the various instruments and strategies that hedge funds employ can introduce elements of volatility and risk, challenging the resilience of this system (Gregoriou, 2005). Thereby, financial stability is central to be considered as its fundamental precondition to achieve the central bank’s macroeconomic implications, such as price stability and a strong growing nation (Hellwig, 2014). Hence, connectedness to other financial institutions (FI) is an important determinant of financial stability (Bussière *et al.*, 2015).

Thereby, the global dimension of financial stability cannot be ignored, especially in an era of increased financial globalization. Cross-border capital flows, multinational banking operations, and interconnected financial markets mean that financial instability in one country can quickly spread to others. The global financial crisis of 2008 is a stark reminder of how interconnectedness can amplify systemic risk (Orlando, 2023). As such, international cooperation and coordination are vital in addressing global financial stability. Institutions like the Basel Committee on Banking Supervision, which develops global standards for bank regulation, play a crucial role in fostering international regulatory harmonization and cooperation (Basel Committee on Banking Supervision, 2011).

1.2. Research

The Research at hand is structured into different parts, starting with the literature review to provide a comprehensive examination of existing scholarly work, enabling a nuanced understanding of the topic while identifying gaps and areas for further exploration. Thereby, elucidating the current state of knowledge on hedge funds and financial stability, capturing both theoretical insights and empirical evidence. In the third part, there is the methodology of how the research is organized and the research objective as well as the Analysis

addressing the diversity within the hedge fund industry itself. Hedge funds are not a monolithic group, they encompass a wide range of strategies and investment styles, each with distinct implications for financial stability. Strategies such as long/short equity, global macro, and event-driven investing offer different risk profiles and operational dynamics. The heterogeneity within the industry necessitates a granular analysis, recognizing that certain strategies may pose greater systemic risks than others. Research studies frequently employ classification schemes and typologies to dissect the nuanced differences across various hedge fund subcategories, thereby enriching the broader discussion of their impact on financial stability. The Conclusion synthesizes these diverse viewpoints as a discussion part, followed by answering the research question of *how quickly hedge funds recover after major financial crises compared to other asset classes*.

2. LITERATURE REVIEW

Starting to define the terminology concerning financial systems to consider several determinants, measurements, and definitions that influence the relationship as well as the developments within this sector and create a basis for future study. Ultimately, the literature review aims to provide a comprehensive and coherent narrative that situates hedge funds within the broader discourse on financial stability. By bridging theoretical frameworks, empirical evidence, and regulatory considerations, the chapter will offer a robust foundation for understanding the complex dynamics at play. This understanding is essential for informing policy recommendations and regulatory approaches, which will be discussed in the concluding sections of this paper.

So, hedge funds and the so-called hedge fund “industry” are often described as a potential transmission channel in the event of shock (King and Maier, 2009). Thereby, hedge funds are supervised as a limited liability partnership with principals that administer the fund and are also investors (Stowell and Stowell, 2024). Controvert, to define the management of the investment instrument called hedge funds it is more complex than one single definition, described as perusing from “a plethora of investment strategies and have different risk-return profiles” (Walden and Lajbcygier, 2023, p. 152). In general, hedge funding is described as a full array of hedging techniques to reduce portfolio volatility (Bali and Weigert, 2018). With the main goal of a positive return with limited swings in value and capital preservation. However, the method behind the hedging is rapid price discovery, massive mathematical and statistical processing, risk measurement and control techniques, and leverage as well as active trading in corporate equities, bonds, foreign exchange, futures, options, swaps, forwards, and other derivatives (Chattopadhyaya, 2011).

Emerging in the mid-20th century (Adam and Merkel, 2019), hedge funds have grown significantly in both number and influence, attracting significant

sums of capital and becoming influential participants (Achleitner *et al.*, 2009). The strategy of hedge funding differs, and the management has fewer regulations compared to other investment strategies, nevertheless, some have been developed within the time being: The management of HFs is generally located onshore and registered in offshore jurisdictions including the Bahamas, Bermuda, British Virgin Islands, Luxemburg, Dublin, or the Cayman Islands (Edwards, 1999; Carroters, 2017). This is not the case with other mutual funds or regulated private investments. Modeled themselves to fit the US exemption under the Securities Act of 1933, the Securities Exchange Act of 1934, and the Investment Company Act of 1940, bringing little US regulatory oversight for hedge fund industries (Bali and Weigert, 2018). 2010 with the Dodd-Frank Wall Street Reform and Consumer Protection Act hedge funds are officially required registration. One point of the DFA is that investors need to have a net worth above USD one million excluding primary residence. Within private equity, stronger relations exist like the German Securities Act. Improving the creditworthiness of the transaction and thus reducing financial costs (Achleitner *et al.*, 2009). Thereby, hedge fund trading is managed by the Commodities Futures Trading Commission (CFTC) and supervised by the National Futures Association (King and Maier, 2009).

However, modern hedge fund history began with the sociologist and financial journalist Alfred Winslow Jones while writing about market behavior, he developed his Jones Hedge Fund (Ubide, 2006). The main idea was to use the complementary nature of leverage and short selling. Jones thereby used his understanding to create a more risk-averse approach than it sounds like (Zhai and Wang, 2023). When looking at leverage increases in debt-to-equity and short selling isolated from each other it is to be an increased exposure of risk (Ubide, 2006). In comparison to the S&P 500 stock index, the management of Jones Hedge Fund shows fewer negative returns and outperformance of the S&P 500 in the years 1962 until 1968 (Ubide, 2006). The way HFs make money can be laid down for two essential reasons, including diversification and fees (Asness *et al.*, 2001). Diversification consists out of passive market exposure combined with a rather low administrative cost apparatus.

Aspects of financial stability include monetary stability, economic growth, institutions, infrastructure as well as markets and efficiency. One indicator is the “robustness of financial markets and their institutions, the state of expectations, and the reaction of central banks and other authorities” (Garbaravicius and Dierick, 2005, p. 62). The financial system is stable when it is able to promote the productivity of the economy and prevent financial imbalances (Imanov *et al.*, 2017, p. 320). Measuring the level of financial stability is complex since many actors are involved in the process and may change the supposed outcome by single agreements or actions (Agarwal *et al.*, 2009a). Including the fact banks are responsible for stability and have a systematic relevance and political

influence, as “banks are political” (Hellwig, 2014, p. 23). One example is that already simple transactions between countries, political actors, and economically dependent actors create future obligations for all involved parties (Financial Stability Forum, 2002). As a result, dependence is developed and ranges through multilateral networks where many parties interact, mostly even on an international level.

In general, two main functions within the financial system are relevant to the system of action (Sauert, 2014). The first one is the intermediation function to bring “resources accumulated by savers to investors who have identified productive uses for them” (Ubide, 2006). The second one is the payment function providing the most important means for the system to action. Whereby central banks have an essential part in decision-taking and policy implications, especially price changes and rates of exchange, inflation, interest rates, etc. (Hellwig, 2014), which is on purpose flexible to guarantee momentum. “Even though the central bank cannot go bankrupt, risks from the central bank’s assets can affect” (Hellwig, 2014, p. 11) the financial system as a whole. Importantly the clearing arrangements through which banks compensate one another for allegations arising from the payments made by their customers (Garbaravicius and Dierick, 2005). Thereby, many types of shocks increase financial stress and weaken the financial stability of households and businesses. Including systematic risks arising from correlations between counterparty credit risks and underlying risks in a complex and highly interconnected system of risk management through derivatives and other hedges (Erede, 2013). Consequently, the conditions of banks and other financial institutions will be weakened and lead to higher market interest rates as investors look for greater returns due to the perception of greater risk (Garbaravicius and Dierick, 2005). Whereas, central banks give access to financial stability reviews, including “current conditions, describe ongoing legal, regulatory, and institutional developments, and discuss proposals” (Chattopadhyaya, 2011, p. 89) to increase financial stability. Paying attention, to the need for financial institutions including the central banks can create interdependence among them by maintaining the public’s confidence to survive (Imanov *et al.*, 2017).

3. METHODOLOGY AND DATA

The research is to be done on qualitative literature including a historical and comparative analysis. The literature will consist of several divergent sources, including literature from libraries in Germany as well as online-accessible literature such as peer-reviewed articles, books and news articles, interviews, etc. Thereby, the foremost task in crafting a robust methodology is to lay out the research design. This entails a detailed blueprint mapping the journey from problem identification to the drawing of conclusions based on empirical evidence. Reflecting on the complexities associated with hedge funds and their

potential impact on FS, a mixed-methods approach is warranted. By integrating qualitative dimensions, gaining a nuanced understanding that captures both the statistical patterns and the deeper insights into the qualitative facets of financial phenomena. This form of data provides contextual insights, allowing researchers to delve into the social, cultural, and environmental factors that shape human behavior and attitudes (Adam and Merkel, 2019).

3.1. Methods in research design

Given the complexity of the topic at hand, this paper will systematically examine the development and operation of hedge funds, their interactions with the financial system, and their comparison to other asset classes. It will delve into the concept of financial stability, elucidating how hedge funds can impact stability, both positively and negatively. Through a comprehensive coding of qualitative data, this paper will aim to synthesize current knowledge and identify gaps that warrant further research.

Data collection, a cornerstone of the methodology, spans multiple sources to triangulate findings and bolster the study's credibility (Nahmias-Wolinsky, 2004). Secondary data from financial markets, enriched by proprietary datasets from regulatory bodies, provide a robust qualitative foundation. Triangulation is further achieved by integrating findings from academic literature, industry reports, and policy documents. The dynamism inherent in hedge fund operations, underscored by their diverse strategies and investment philosophies, necessitates rigorous statistical examination. A pivotal component of the methodology will be the deployment of econometric models to analyze secondary data sourced from financial databases such as Bloomberg and Thomson Reuters. These models, augmented by time-series analysis and regression techniques, are instrumental in identifying correlations and causal relationships amid variables such as hedge fund leverage, market volatility, and overall financial stability metrics.

3.2. Applied Methodology

A critical analysis of the relationship between EMH and hedge fund performance reveals inherent tensions. While EMH assumes that all available information is reflected in asset prices, hedge funds systematically profit from deviations in market valuation. Their use of short-selling, leverage, and complex derivatives positions them to exploit market frictions that traditional models overlook. Particularly during periods of market stress or dislocation, hedge funds have demonstrated their ability to generate returns that contradict EMH assumptions.

Moreover, hedge funds frequently benefit from market segmentation and information asymmetry – two conditions inconsistent with strong-form efficiency. In illiquid or opaque markets, such as high-yield credit or emerging market debt, hedge funds act as informed traders, exploiting delays in information dissemination. These dynamics illustrate that markets may be

efficient in aggregate but exhibit inefficiencies at the micro-level or within specific asset classes.

From a policy perspective, the hedge fund challenge to EMH underscores the need for refined market models that accommodate heterogeneity in information access, investor behavior, and regulatory arbitrage. This calls into question the adequacy of EMH as a sole explanatory model for modern financial markets and supports a shift toward more adaptive, empirically grounded frameworks such as Lo's Adaptive Markets Hypothesis.

Regression-based empirical studies provide additional insights into the relationship between hedge fund performance and market efficiency. Using panel data regressions and multi-factor models such as the Fama-French 3-Factor or Carhart 4-Factor model, researchers isolate hedge fund alpha by controlling for market risk, size, value, and momentum factors. Statistically significant positive alphas indicate persistent outperformance beyond what can be explained by exposure to systematic risk factors. Furthermore, time-series regressions using hedge fund return data across different volatility regimes demonstrate that hedge funds perform especially well during periods of elevated market stress, indicating their ability to exploit transient inefficiencies.

Cross-sectional regression analyses have also revealed that hedge funds with greater strategy complexity, lower liquidity, and higher manager ownership tend to exhibit stronger deviations from EMH-consistent returns. These findings support the hypothesis that certain hedge fund characteristics are systematically associated with the exploitation of market anomalies, thus challenging the assumptions of perfect information and rational pricing.

4. RESEARCH QUESTION AND OBJECTIVE

Examining how hedge funds recover from financial crises compared to traditional asset classes such as equities, bonds, and mutual funds. The research will evaluate the speed, magnitude, and sustainability of hedge fund rebounds after market downturns, identifying key factors that contribute to their resilience or underperformance. The thesis aims to assess the performance persistence of hedge funds and their relationship with market efficiency. Performance Persistence of Hedge Funds finds statistically significant performance persistence for hedge funds at quarterly, semi-annual, and annual periods (Lo, 2004; Winton, 2003). Investors use a quarterly momentum strategy to achieve superior returns. Thereby, some hedge fund managers consistently outperform others, challenging the idea that hedge fund returns are purely random.

The Market Efficiency applies Shiller's variance bound test to evaluate whether the JSE All Share Index follows the Efficient Market Hypothesis (Winton, 2003). Results violate Shiller's three variance inequalities, suggesting that the market shows inefficiencies. This implies that hedge fund managers may have opportunities to exploit market inefficiencies for excess returns.

Hedge fund strategies are specifically designed to identify and capitalize on **market inefficiencies**, deviations between asset prices and their fundamental values. These inefficiencies arise due to factors that are not adequately accounted for in the traditional forms of the **Efficient Market Hypothesis**:

How do hedge fund strategies exploit market inefficiencies, and what does this imply for the validity of the Efficient Market Hypothesis?

The study accounts for survivorship bias, where poorly performing funds exit databases, potentially skewing results. Backfill bias is also identified, where funds report historical performance only after achieving positive results. Adjusting for these biases ensures that the study provides a more accurate picture of hedge fund performance. So that investors can benefit from momentum-based strategies in hedge funds, particularly at quarterly horizons. The hedge fund industry can provide excess returns, but these are not purely due to manager skill, some come from market inefficiencies. Better benchmarking techniques should be developed to distinguish true alpha from beta-driven returns. Regulators should ensure transparent performance reporting to reduce survivorship and backfill bias.

5. HEDGE FUNDS: VALIDITY OF THE EFFICIENT MARKET HYPOTHESIS

The hedge fund industry has been the subject of various academic studies focusing on performance analysis, regulatory frameworks, and market dynamics. Several key pieces of literature provide insights into these areas. First, the **performance analysis of HFs**, whereby a comprehensive study examined the performance of hedge funds with the validity of the efficient market hypothesis.

Table 1. Efficient Market Hypothesis and Hedge Fund Reality

Efficient Market Hypothesis (EMH)	Hedge Fund Reality
Markets instantly reflect all available information	Markets exhibit temporary inefficiencies and mispricing
Consistent outperformance is impossible	Hedge funds often generate alpha through active strategies
Prices follow a rational and efficient process	Markets are influenced by behavioral biases and shocks
Arbitrage opportunities are rare and quickly disappear	Hedge funds exploit persistent arbitrage opportunities
Crises are absorbed smoothly and efficiently	Hedge funds show adaptive behavior and profit from dislocations
Passive investing is sufficient	Hedge funds rely on active, research-driven management

Source: summarized from: Garbaravicius, T. and Dierick, F. (2005). Hedge Funds and Their Implications for Financial Stability. *SSRN Electronic Journal*.

<https://doi.org/10.2139/ssrn.752094>

Hedge fund strategies are specifically designed to identify and capitalize on market inefficiencies, deviations between asset prices and their fundamental values as summarized in Table 1 (Winton, 2003). These inefficiencies arise due to factors such as information asymmetries, behavioral biases, liquidity constraints, and regulatory frictions, all of which are not adequately accounted for in the traditional forms of the Efficient Market Hypothesis (Fama, 1970; Fama and French, 2010).

The **volatility and Hedge Fund performance (see Tables 1 and 2)** focus on the impact of market volatility on the performance of hedge funds. By incorporating a volatility index into the CAPM, the research aimed to determine how different hedge fund strategies perform under varying volatility conditions (Fieldhouse, 2024). The study highlighted the importance of considering volatility in investment decisions and suggested that certain strategies might be better suited for periods of heightened market fluctuations (Agarwal *et al.*, 2009; De Freitas, 2022). Whereby the **regulatory framework and retail participation** shows the regulation of hedge funds has evolved to balance investor protection with market growth. Research assessing the country's regulatory practices, especially concerning retail participation, indicates that the framework aligns well with international standards (Fieldhouse, 2024). The studies emphasize the need for a regulatory environment that safeguards investors while allowing access to the benefits of hedge fund investments.

Table 2. Historical Recovery Times

Crisis Period	2003 Global Financial Crisis	2020 COVID-19 Crisis
Equity Market Decline	-38% (S&P 500)	Over -20% (Q1 2020)
Average	-18%	Low single digits
Best Performing HF Strategies	Macro, Managed Futures	Multi-strategy, macro
Average HF Recovery Time	3-4 years	Same year (2020)
Equity Market Recovery Time	5-6 years	1-2 years
Notable Features	Risk-adjusted alpha confirmed by regression management	Rapid recovery, strong downside protection in volatile markets

Source: Aragon *et al.* (2024). Hedge Fund Liquidity Management: Insights for Fund Performance and Financial Stability. *U.S. Securities and Exchange Commission, SEC.gov*. [online] Available at: <https://www.sec.gov/about/divisions-offices/division-economic-risk-analysis/staff-papers-analyses/hedge-fund-liquidity-management-insights-fund-performance-financial-stability> [Accessed 02.05.2025].

The consistent ability of hedge funds to generate positive alpha, especially during times of market stress or structural change, presents a challenge to the EMH (see Table 1), particularly in its semi-strong and strong forms (Brunnermeier and Pedersen, 2009). While weak-form efficiency (based on historical price data) may still hold in liquid markets, the real-world success of hedge funds suggests that markets are only partially efficient and prone to temporary dislocations (Lo, 2004).

This leads to several implications. First, markets may be efficient on average, but not always or everywhere. Second, information is not symmetrically distributed, and hedge funds invest heavily in research, networks, and technology to gain an informational edge. Third, behavioral finance and the Adaptive Markets Hypothesis (Lo, 2004) offer better explanatory power than strict EMH assumptions (see Table 1), accounting for periods of irrationality and structural shifts.

Hedge fund performance during financial crises reveals an above-average ability to withstand market turbulence and recover faster than traditional asset classes such as equities and bonds. During the 2008 Global Financial Crisis, the average hedge fund declined by approximately 18%, while the S&P 500 fell by 38 percent. Despite the drawdown, many hedge funds, particularly macro and managed futures strategies, posted positive or near-neutral returns.

Empirical data show that hedge funds, on average, recovered their pre-crisis net asset values within 3 to 4 years, compared to 5 to 6 years for equity markets, as shown in Table 2. Regression analyses using Fama-French and Carhart factor models confirm that hedge funds deliver risk-adjusted returns (alpha) even in turbulent markets. Furthermore, their use of active risk management tools, short positions, and diversified investment universes allows them to mitigate losses and rebalance more rapidly.

In the COVID-19 crisis of 2020, many hedge funds again demonstrated resilience: while global equity indices dropped over 20 percent in Q1 (see Table 2), several hedge fund strategies limited losses to low single digits. Recovery was faster, with many hedge funds achieving full recovery within the same calendar year.

6. DISCUSSION

Alan Greenspan, the former chairman of the Federal Reserve System, mentioned that hedge funds “have become major contributors to the flexibility of the financial system” (Agarwal *et al.*, 2009, p. 123). Thus, hedge funds not only provide an investment with potentially attractive returns but also offer an investment that does not correlate with most traditional portfolios (Asness *et al.*, 2001). As seen in American economics, hedge funds have been used as a financial means to support a stable interest rate beyond history (Mallaby, 2019, p. 213). Thus, hedge funds come with light regulatory oversight, and their

participation in various markets has been proven fundamental. Achleitner et al. propose that the increasing provision of liquidity, made financial markets more efficient and resilient to financial shocks in the past years, including the most recent financial crisis (Achleitner *et al.*, 2009).

Contrary, beginning with the first hedge fund of A. W. Jones uses leverage to have sustainable and substantial capacities for bigger trades, on the other side, being described as risky, especially in times of crisis when investors want their money back (Mallaby, 2019). Claiming that hedge funds are large enough to destabilize markets or even provoke financial crises. Such ongoing concern about the vulnerability, paired with the tremendous development and opaque nature of hedge funds, emphasize their probable threat to financial stability (Erede, 2013) combined with its close relationships with other financial institutions such as prime brokers (Bussière *et al.*, 2015). As stated by Walden and Lajbcygier (2023), there is a “lack of transparency within the hedge fund industry, especially when it comes to pricing, especially fees for the managers” (Walden and Lajbcygier, 2023, p. 154). This makes the process speculative and difficult for regulators and other market participants to assess the potential risks HFs pose to financial stability. The literature on systemic risk provides valuable insights into how interconnectedness and common exposures among financial institutions can propagate shocks throughout the financial system (Aramonte *et al.*, 2023). Studies such as those by Adrian and Brunnermeier (2008) and Acharya *et al.* (2010) highlight the systemic risk posed by institutions that are highly leveraged and interconnected, as is often the case with hedge funds. These risks are further magnified in times of market stress, when forced deleveraging and fire sales can precipitate sharp declines in asset prices, thereby exacerbating market turmoil (Aramonte *et al.*, 2023).

7. CONCLUSION

Hedge funds play a vital role in modern financial markets by enhancing liquidity, improving price efficiency, and providing diversification benefits to investors. Their ability to generate alpha through sophisticated strategies makes them an essential component of institutional portfolios. However, hedge fund volatility is highly dependent on the strategy employed, ranging from low-risk arbitrage approaches to high-risk leveraged trading. While hedge funds can act as stabilizers in financial markets, they can also contribute to volatility, especially when leverage and liquidity risks are involved. Understanding these dynamics is crucial for investors seeking to optimize risk-adjusted returns in hedge fund investments.

In conclusion, hedge funds' exploitation of market inefficiencies does not invalidate EMH entirely but demonstrates its limitations in dynamic, complex, and crisis-prone market environments. Hedge funds recover more quickly after financial crises than traditional asset classes due to their flexible strategies,

dynamic risk management, and ability to exploit market dislocations. This recovery pattern suggests that hedge funds are not only reactive but also adaptive actors within the financial system. Their performance during and after crises challenges the assumptions of the Efficient Market Hypothesis (Lo, 2004), particularly the notion that markets instantly reflect all relevant information.

Instead, the evidence supports a more nuanced view: markets are prone to temporary inefficiencies, and hedge funds are among the best-positioned actors to identify and profit from them. These findings highlight the importance of incorporating alternative asset classes in portfolio diversification and reinforce the need for adaptive market theories that align with empirical realities.

Overall, an extensive body of literature examines hedge funds from multiple perspectives, including their role in promoting market efficiency, their contribution to liquidity, and their potential to exacerbate financial instability. Scholars have debated whether hedge funds serve as stabilizers or destabilizers within financial markets (Lu *et al.*, 2024). On one hand, proponents argue that hedge funds enhance market efficiency through sophisticated arbitrage strategies, liquidity provision, and the active management of risk (Zhai and Wang, 2023). By capitalizing on mispricing and market inefficiencies, hedge funds ostensibly contribute to a more accurate reflection of asset values and, in turn, to overall market stability.

Further studies

Recent studies have delved into the intricate relationship between hedge fund volatility and financial stability, offering nuanced insights into how hedge fund activities can influence market dynamics. The ECB has examined the dual role of hedge funds in financial markets (Ferrara *et al.*, 2024). While hedge funds can enhance market efficiency and liquidity, their significant presence, especially in the euro area government bond markets, raises concerns about potential volatility amplification (European Central Bank, 2007).

The ECB's analysis indicates that although hedge funds contribute to market depth, their rapid withdrawal during periods of stress could exacerbate market volatility. This underscores the importance of monitoring hedge fund activities to maintain financial stability. The U.S. SEC has explored how hedge funds manage liquidity, particularly when holding illiquid assets. Findings suggest that hedge funds with lower-than-expected liquidity buffers may outperform benchmarks under normal conditions. However, during market crises, such as the one experienced in 2020, these funds are more susceptible to forced asset sales, which can trigger broader market disruptions. This highlights a policy trade-off: while lower liquidity buffers can enhance returns in stable markets, they may pose systemic risks during periods of financial stress (Aragon *et al.*, 2024).

Research from the Office of Financial Research delves into the risk-shifting behaviors of hedge funds, particularly following periods of underperformance. The study reveals that hedge funds may adjust their risk profiles by altering portfolio volatility, influenced by factors such as investor redemption terms, ownership concentration, and leverage. Understanding these behaviors is crucial, as they can have significant implications for market stability, especially if multiple funds engage in similar strategies simultaneously (Andrews and Gadgil, 2024).

A study published in the *Review of Finance* examines the relationship between hedge funds' idiosyncratic volatility and their future risk-adjusted returns. The research indicates that hedge funds exhibiting higher idiosyncratic volatility tend to achieve superior future risk-adjusted returns compared to their lower-volatility counterparts. This finding suggests that embracing certain levels of idiosyncratic risk may be a deliberate strategy employed by hedge funds to enhance performance (Bali and Weigert, 2024).

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THE ROMANIAN UNIVERSITIES AND THE DILEMMA OF
SUSTAINABLE DEVELOPMENT: THE CHALLENGES OF
ASSIMETRIC POWER RELATION IN THE COMPLEX
STAKEHOLDER NETWORKS

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Abstract

In the current economic, social, and political context shaped by the global agenda on sustainable development, universities are called upon to redefine their role and recalibrate their mission in relation to the needs of a global society. Thus, universities face the challenge of going beyond their traditional roles of teaching and research and taking on a more active role in achieving the Sustainable Development Goals (SDGs). Collaboration and stakeholder engagement in such initiatives can be affected by asymmetrical power relations and difficulties in harmonizing the objectives, values, and principles of the entities involved in these partnerships. This article analyses how universities and research institutions in Romania can take on a more active role in multi-stakeholder initiatives aimed at achieving the SDGs without compromising their autonomy and core educational mission. The opportunities and risks of university involvement in collaborative networks will be examined, considering that the actors involved have unequal access to resources, divergent interests, and different levels of influence over decision-making. The study is based on qualitative data drawn from institutional reports and public policy documents. It highlights both the opportunities and constraints faced by universities in their efforts to contribute to sustainability. The analysis shows that although Romanian universities clearly express their willingness and readiness to take an active role in the sustainable development of communities, in practice their involvement is often hindered by fragmented policies, dependence on external funding, and limited autonomy in strategic planning. The article proposes a

critical perspective on the involvement of universities in collaborative governance architectures related to sustainability. Only through a re-evaluation of their own role and a firm commitment to equity and responsibility can universities make a real contribution to reducing social inequalities and development gaps, by aligning the principles of equity and efficiency in resource allocation.

Keywords: *university, collaborative networks, sustainable development, power relations.*

JEL Classification: I23, O32.

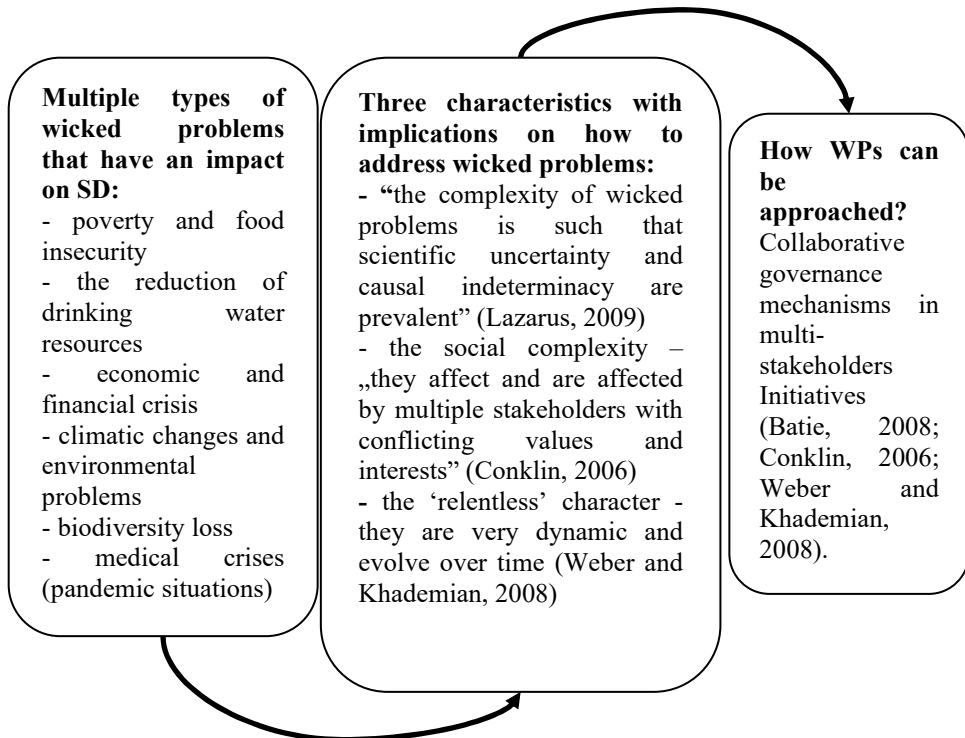
1. INTRODUCTION

The topic of sustainable development is one of wide interest, attracting representatives of the academic world, economic, social and political actors in debates, being seen as "the greatest and most complicated challenge that humanity has ever faced" (UN News, 2015). The growing awareness of the importance of sustainability issues was due to the amplification of the effects of some global problems: the persistence of extreme poverty and social inequalities, climate change and its associated phenomena (biodiversity loss, drought, extreme climate phenomena, etc.), increasing food insecurity, the escalation of political and armed conflicts (global political insecurity), unequal access to the planet's resources and the increasing pressure on them, the risks determined by the reduction of drinking water resources, health crises and the trend of expansion at a global level, social inequities related to access to education, migratory flows that occur to the detriment of poor regions and that can lead to the emergence of conflicts, etc. (Dentoni and Bitzer, 2015).

In the literature, these challenges of sustainable development are generically called "wicked problems" and have the following features: the scientific uncertainty and causal indeterminacy, the dynamism and continuous evolution over time giving them an relentless character and the social complexity determined by the fact that they affect and are affected by numerous stakeholders, with conflicting values and interests (Rittel and Webber, 1973; Conklin, 2006; Dentoni and Bitzer, 2015; Weber and Khademian, 2008). The characteristics of wicked problems have an influence on the way of approach and solution (Figure 1). Thus, the identification of adequate solutions requires the implementation of collaborative governance mechanisms (multistakeholder initiatives - MSI), between different categories of stakeholders: representatives of the business environment, public administration organizations, representatives of civil society, international organizations and representatives of the academic environment.

The universities play a key role in identifying solutions to the challenges that hinder the achievement of the Sustainable Development Goals, due to their role in training the future class of leaders in various fields, through their involvement in research activities of the causes that lead to the emergence of the wicked problems and through their important role in the research, development and innovation activities (Manolescu *et al.*, 2019). The involvement of universities in collaborative mechanisms for sustainable development requires

the alignment of their operational and research-development-innovation strategies with the 17 sustainable development goals formulated by the UN.



Source: own processing

Figure 1. The characteristics and the way to approach the wicked problems

In order to effectively fulfil their important role within the MSI, universities and their stakeholders face numerous challenges (Sachs, 2015):

- the duty/ mission of the University towards the community/society – the need to reduce economic and well-being gaps, to reduce the poverty and the social inequalities, the fair access to education etc.;
- the globalization processes and associated effects – the higher incidence of political crises globally and of terrorist attacks, the accentuation of migratory flows etc.;
- the climate change – the attitude towards polluting agents and about the production of energy based on fossil fuels;
- the increasing incidence of crisis phenomena – economic, financial, sanitary crisis, food crisis etc.;

- the widespread "fear" about what the future holds – cyber threats, the economic and social implications determined by digital transformation;
- the re-emergence of nationalism – attitude towards civil liberties, discrimination, racist and nationalist manifestations;
- the attitude towards countries that adopt inadequate human rights policies.

Achieving the SDGs is possible through the involvement of a complex ecosystem of actors: companies, NGOs, local communities, governments, and international organizations in multi-stakeholder collaborative governance initiatives. In this asymmetric context, universities face a dual challenge: to produce knowledge and provide spaces for critical reflection, while also coping with institutional and economic pressures from more powerful partners (Talmaciu and Manolescu, 2023). The higher education system in Romania provides a relevant case study for analysing how universities engage in such partnerships, in a social and political context marked by institutional reforms, limited resources, and transitional governance cultures.

This article analyses how universities and research institutions can take on a more active role in multi-stakeholder initiatives aimed at achieving the SDGs. The article proposes a critical perspective on the involvement of universities in collaborative governance architectures related to sustainability. The study is based on qualitative data drawn from institutional reports and public policy documents.

2. THEORETICAL BACKGROUND

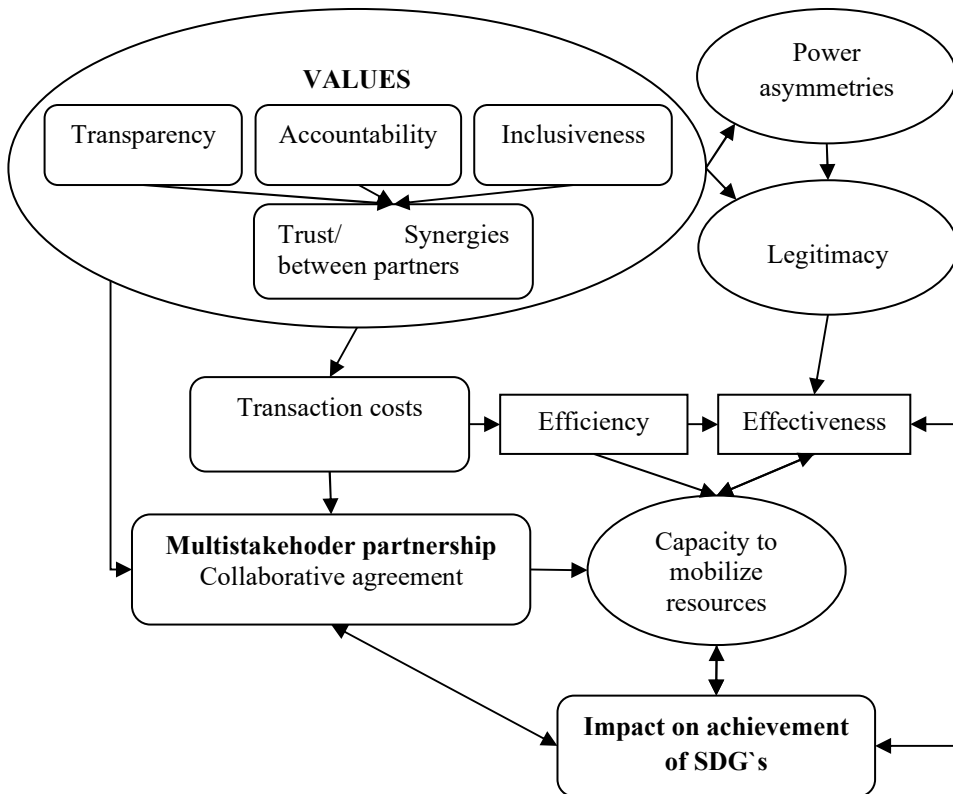
2.1. The multi-stakeholder model - characteristics and importance

The multistakeholder model is an expanded partnership among diverse structural entities, drawing on the complementarity of their skills and strengths, while also inheriting many of the challenges and redundancies inherent to joint initiatives (Dentoni and Bitzer, 2015). MSI are governance arrangements based on the principles of cooperation, in which actors from the business environment, civil society, public administration and academia, “come together to find a common approach to a problem of common interest” (Roloff, 2008, p. 238).

MSIs are institutionalized collaboration platforms, frequently viewed as innovative governance mechanisms that unite actors with complementary resources to tackle issues that none of the participants could resolve on their own (Teegen *et al.*, 2004). They function as private governance mechanisms that engage corporations, civil society organizations, and occasionally other actors - such as governments, academia, or trade unions - in addressing social and environmental challenges affecting economic sectors, local and regional communities, and society at large (Mena and Pallazzo, 2012).

A *sine qua non* condition for the proper functioning of multistakeholder partnerships is the harmonization of the value system of the partner organizations (Figure 2). The values that underlie the relationships between stakeholders are transparency, responsibility, inclusiveness, trust and synergy.

The value conflicts affect the relationships between member organizations, generate conflicts and asymmetric power relations, raising questions about the legitimacy of the partnership. Thus, additional costs arise that negatively influence the efficiency and effectiveness of the joint actions initiated. The synergy and ability of members to mobilize the requested resources to achieve the objectives established by common agreement are affected.



Source: own processing

Figure 2. The link between the value system, power relations and the performance of MSIs

The success of MSI depends on the willingness and ability of the actors involved to align their objectives and priority agendas, to mobilize material, human and financial resources or to share ideas, knowledge, information or relationships (Suiseeya and Zanotti, 2019). Participants in such initiatives have their own agendas (objectives, interests and priorities), which may compete or conflict. Each may consider their own interests to be priority and act accordingly, by directing resources or influencing and manipulating processes

(Krott *et al.*, 2014). Thus, the smooth functioning of the initiative is disrupted, affecting the efficiency and effectiveness of the joint actions initiated. Under these conditions, power relations are constantly present in the activity of an MSI platform, given that stakeholders come from very diverse backgrounds (Bakker, Rasche and Ponte, 2019; Zeyen *et al.*, 2014). The power of participating actors depends largely on the resources they possess (Schusser, 2013) and their ability to mobilize them to intervene in certain social relations (Kähkönen, 2014). The actions of some actors involved in MSI can hinder the others to from achieve their goals (Betsill and Corell, 2001).

Stakeholders' engagement in MSI can be "constrained by agenda setters" (Buckland-Merrett *et al.*, 2017). The elements of power classified into three categories (Krott *et al.*, 2014):

- instruments of constraint and coercion used to influence the behaviour of the other stakeholders. There is a risk that some actors will abandon the MSI (Arenas *et al.*, 2020), or that participants who feel constrained and marginalised will show reduced engagement and restraint in presenting their own positions. Thus, the democratic character of the MSI is affected (Soundararajan *et al.*, 2019).

- the lack of incentives or recourse to disincentives. Thus, some actors make substantial investments to finance the operational budgets of an MSI to execute their programs, ultimately leading to biased agenda selection and to the distortion of decision-making processes in their favour (Lundsgaarde, 2016; Biekart and Fowler, 2018). In addition, the limited access to financial resources may represent a great challenge for certain actors to participate in a MSI (Cheyns, 2014; Moog *et al.*, 2015).

- distorted information or unverifiable information transmitted by certain actors, which can modify the behaviour of the others (Betsill and Corell, 2001). The availability and the ability to verify the information are crucial in the context of transparency. Distorted and asymmetric information is often articulated to shape decisions (Wong, 2014). Therefore, participants with privileged access to information have greater power and can influence the functioning of the multistakeholder partnership (Dentoni and Bitzer, 2015).

The MSI are considered manifestations of a democratic society in which participants have equal rights and obligations. They are seen as key institutional arrangements for strengthening governance in different areas (Muttaqin *et al.*, 2023) and can be formal or informal.

2.2. The roles that academia assumes within MSI

The most common role that academic institutions can play in MSI is that of expertise providers, providing experts from different fields applying knowledge from a specific scientific discipline. This contributes to increasing the legitimacy and credibility of the knowledge exchange.

Another role is that of agenda-setters, thus contributing to building a common vision shared by all stakeholders. In fulfilling this role, universities have a “comparative advantage” over other MSI participants, being seen as participating institutions with a relatively neutral character.

A third role is that of facilitators, coordinating the development and implementation of a common strategy to address a complex problem. In this situation, universities assume the very important role of coordinating how MSI participants can share and combine their resources to achieve their goals.

To successfully fulfil the roles assumed in the partnership, significant changes of values, attitudes, motivations and curricula are needed (Ferrer-Balas *et al.*, 2010). Two structural changes are highlighted in the literature as being necessary in universities:

- orientation towards trans- and inter-disciplinarity, because the complexity of wicked problems requires a research approach from the perspective of different scientific fields. This must also be reflected in the curricula of universities (Manring, 2014).

- in order to create sustainable societal transformations, universities must “practice what they preach” and to be actively involved in identifying appropriate solutions, together with the other stakeholders (Lozano *et al.*, 2013).

Thus, there is a need to address challenges related to power imbalances through inclusive governance practices (Talmaciu *et al.*, 2023), decision-making transparency, and the promotion of authentic partnerships based on trust and mutual respect.

3. THE INVOLVEMENT OF ROMANIAN UNIVERSITIES IN MULTI-STAKEHOLDER PARTNERSHIPS

To identify solutions to the complex problems of common interest regarding the achievement of sustainable development objectives, the universities in Romania are involved in various types of multi-stakeholder partnerships: cluster sectoral partnerships, LAG partnerships specific to the EU rural development policy, national and international university consortia, specific partnerships within certain projects targeting different sustainable development objectives (reducing food waste, reducing pollution, social inclusion and integration of citizens from disadvantaged groups, etc.).

The clusters are partnerships that seek to identify solutions to the problems of different industries and aim to improve their economic performance and competitiveness (Talmaciu, 2022). Romania's experience in establishing collaborative governance networks is more recent. Thus, the first informal cluster-type networks, between companies from certain industrial sectors existing at the regional level, appeared during the period 1990–2000 (Dudian, 2011). The starting point in regulating clusters as instruments of innovation policy and to increase the competitiveness is Government Decision no. 918 of 2006, which approved the

Research, Development and Innovation Stimulation Program (IMPACT). Thus, the first formal cluster associative structures were established in the period 2000-2010. The clustering as a smart specialization strategy has been integrated into national and regional development policies and strategies, and into the National Competitiveness Strategy since 2009. The information on the number and distribution of clusters by regions and activity sectors differs depending on their source. Thus, in the records of the Directorate of Industrial Policies and Competitiveness, of the Ministry of Economy, 78 cluster initiatives are registered (Coșniță *et al.*, 2024). Of these, 55 cluster associative structures are part of the national representative association Clustero (established in 2011), grouped into 6 regional consortia and 6 thematic consortia (Clustero, 2025).

A total of 68 Romanian cluster collaborative networks are registered on the European Cluster Collaboration Platform (ECCP), offering the opportunity to expand collaboration with cluster associations from other European countries. Following the analysis and certification process carried out by the European Secretariat for Cluster Analysis (ESCA), 7 clusters in Romania were classified in the Gold category, 12 in the Silver category and 41 in the Bronze category (Table 1). Their distribution by development regions is uneven, being influenced by several factors: the level of development of the region, the industries from the regional economy, the presence and importance of university centres and research institutes, the size of the region, etc. Thus, the Bucharest Ilfov region has 18 clusters, followed by the North-West region with 12 and the Centre region with 11. At the opposite pole is the South-Muntenia region with a single cluster. This situation can be explained by the positioning of the capital region, which is the largest university and research centre in the country and holds over 50% of research spending, in the centre of the South-Muntenia region.

The Romanian Clusters cover 13 of the 14 industrial ecosystems identified by the European Commission, most of them most of them being in the following ecosystems: Digital/ ITC – 24, Creative & Cultural Industries – 14, Agri-food – 12, Health – 11. Many of these clusters operate in two or more industrial ecosystems. Depending on the sectors in which these regional clusters operate, the most diversified are those from the capital region, which operate in 12 industrial ecosystems, followed by the Central region with 11 ecosystems and the North-West region with 10.

In addition to the 78 clusters mentioned above, other regional and national cluster initiatives were identified, from the investigation of various web sources. Thus, a total of 108 clusters were identified distributed by development regions as follows: Bucharest Ilfov – 28, Centre – 21, North-East – 13, North-West, South-East and South-West – 12 each, South-Muntenia and West – 6 each. The industrial ecosystems in which most clusters operate are: Agri-food – 21, Creative & Cultural Industries – 20, Digital/ ITC – 17, Tourism – 14, Construction, Energy-Renewables and Health – 10 each.

Table 1. The Distribution of clusters by development regions and industrial ecosystems

Region/ Industrial ecosystem	NW	Centre	NE	SE	BI	S	SW	W	Total
Total of which:	12	11	7	7	18	1	6	6	68
Aerospace & Defence	0	0	0	0	2	0	0	0	2
Agri-food	1	3	1	1	5	0	1	0	12
Construction	2	1	0	0	4	0	1	0	8
Creative & Cultural Industries	4	3	2	1	2	1	0	1	14
Digital/ITC	4	4	3	2	6	1	1	3	24
Electronics/ Mecatronics	0	1	0	0	2	0	0	0	3
Energy-Intensive Industries	1	2	0	1	1	0	0	1	6
Energy-Renewables	3	3	0	1	2	0	0	1	10
Health	2	3	3	1	2	0	0	0	11
Mobility-Transport-Automotive	1	1	0	1	0	0	2	1	6
Proximity & Social Economy	0	0	2	0	1	0	0	1	4
Retail	0	0	0	0	0	0	0	0	0
Textile	1	1	1	0	3	0	0	0	6
Tourism	1	3	1	2	1	0	1	0	9
No. of ecosystems	10	11	7	8	12	2	5	6	-

Source: Own processing after European Cluster Collaboration Platform – ECCP (2025)

The membership structure of cluster associations in Romania includes one or more universities or research-development-innovation institutes. Analysing the roles that the universities fulfil in the identified cluster partnerships, it turned out that in most cases the assumed roles are: providers of expertise in research-development-innovation, counselling in setting the agenda (universities can play the role of catalyst of these partnerships, as a result of their relative neutrality) and training/development of human resources activities, the primary role of educational institutions. In very few cases, universities fulfil the role of initiators of cluster partnerships and entities that coordinate the development and implementation of a common strategy. They have experts from different fields and can make a substantial contribution to achieving the established objectives: strengthening cooperation between companies and actors in the field of CDTI, increasing competitiveness and stimulating the expansion of SMEs, encouraging and supporting RDI activities, strengthening innovation ecosystems, supporting excellence and professionalizing cluster management, encouraging entrepreneurship, startups and spinoffs, training and developing human resources with the skills and competencies required on the labour market.

The Local Action Groups (LAGs) are partnerships characteristic of the EU's rural development policy. After Romania's accession to the EU on 1 January 2007, the number of LAGs has continuously increased, currently reaching 239, covering 88.57% of the country's territory and 49.85% of the country's population. The LAG initiatives prioritize to solve structural problems of Romanian rural areas such as the reduced administrative and community capacity, the lack of qualified human resources, the poorly developed infrastructure, the low quality of life and the high incidence of poverty, the population aging and depopulation trends, the low economic attractiveness of rural communities. The implementation of the projects with impact at the micro-regional level is difficult due to the lack of qualified human resources and of expertise in partnership working (Manolescu and Talmaciu, 2021). In general, the universities and the research institutions are not formally members of such structures. The role of universities within LAGs is that of providers of expertise in: conducting studies, providing consultancy, evaluation and training courses; but especially for drafting and implementing local development projects.

Other examples of the involvement of universities and research institutions in MIS are the university consortia. Thus, 11 national and international consortia were identified, in which universities from Romania are involved. Some relevant examples are: the Universitaria Consortium established in 2009 (which includes 9 universities from Romania, the Romanian Academy and the Alliance of Centennial Colleges as strategic partners and the State University of Chisinau as an observer); the European University Association (EUA) established in 2001, the national network RO European Universities (over 20 universities from Romania involved in European alliances), the Coimbra Group formed by 39 universities from 22 European countries, including UAIC. The objectives pursued by these are:

- promoting the internationalization, academic collaboration and the excellence in learning and research;
- getting involved in the formulation of national public policies for education and research;
- creating interdisciplinary research-innovation hubs and carrying out joint projects;
- facilitating the mutual exchange of good practices and know-how, etc.

Universities use these platforms for major projects, internationalization, but also for horizontal objectives (Apostoaie *et al.*, 2019) and increasing visibility (Bulimaga *et al.*, 2023).

4. DISCUSSIONS

Although Romania has experienced significant progress in achieving some of SDGs, numerous challenges remain and should be resolved. Such challenges are related to: the low competitiveness of economic sectors, the poor

performance of the education system and of research-development-innovation activities. Among the problems of the public education and research system, which have an impact on the involvement of universities in multi-stakeholder partnerships, we mention:

- the high level of fragmentation of the research system in Romania, which has determined a weak public scientific base. Thus, the system is composed of four different types of research institutions, which have different funding rules and are subordinated to different ministries.

- the low intensity and underfunding of research and development activities (0.48% of GDP in 2021 compared to the EU average of 2.26%).

- the crisis of human capital involved in research activities, which exerts a negative influence on the competitiveness of various sectors of activity and on achieving the goal of promoting the knowledge-based economy.

- weak collaborative relations between science and industry. Although the percentage of joint public-private scientific publications has increased, it remains below the EU average. Thus, Romanian companies allocate few financial resources for research and development activities, and the public research institutions do not have sufficient internal resources, do not have the entrepreneurial culture to attract collaborators from industry and have a limited capacity to access public funding to support collaborative projects.

The weak performance of the education system represents a key obstacle in providing human resources with the skills required by the labour market. This is due to weak collaborative relationships, lack of transparency and poor communication between universities and companies (Percic and Manolescu, 2021).

The weak efficiency and effectiveness of cluster activity can be explained by the limited activity or inactivity of many cluster initiatives, the lack of transparency demonstrated by the fact that many links to their websites do not work, and in the case of many cluster organizations where websites are functional, is available poor information about their activity and the information is not updated. The weak performance of multistakeholder initiatives in Romania can also be explained by the extremely low levels of trust and social capital that characterize Romanian society.

The efforts to integrate sustainability in universities (started in the 1990s) have materialized through their public commitment to sustainability policies, the inclusion of new research disciplines in the curriculum that address the issue of sustainability, the introduction of study programs and research directions that support the process of sustainable development. The main goal of curriculum development is not only to provide the students with knowledge about sustainable development, but to educate them for sustainable development, to encourage them to be more actively involved in sustainable development initiatives.

With the integration into multi-stakeholder initiatives, Romanian universities have become open systems towards their environment, and they are

more actively involved, together with other stakeholders (municipalities, industry, civil society or development agencies), in solving the complex problems that society and the business environment in Romania face. Thus, „co-creation for sustainability” has become a new academic function. The universities are called to work iteratively with knowledge users, in order to co-produce know-how with practical utility and applicability.

The results of the research illustrate the benefits of the multi-stakeholder approach, but also certain dysfunctional aspects of these partnerships. Thus, the involvement of Romanian universities in regional, national or international multi-stakeholder partnerships have a number of benefits: the mutual learning and knowledge production, the access to alternative sources of funding for research and development, the increased transparency and social responsibility, a better connection the educational system to the realities and specific problems of the economic sectors, the increased awareness of students regarding societal issues, etc.

The implementation of multi-stakeholder governance mechanisms and their proper functioning is in itself a difficult problem and involves numerous challenges. Thus, their members often have different perspectives on the problems, generating conflicts of values and diametrically opposed visions in defining and addressing them. Another challenge is represented by the gaps in scientific knowledge, which can make the decision-making process more difficult. Even if the information were available, the actors involved have cognitive limitations that make it difficult to understand the problems and to identify the appropriate tools to address them. Another problem, related to the national cultural context, is the lack of mutual trust and the short-term orientation, which characterizes Romanian society. This can lead to misunderstandings or conflicts between partner entities, thus, may arise imprudent or bad decisions.

Other obstacles to the integration of universities into multi-stakeholder partnerships are: the rigid institutional structures of universities in Romania, the preponderance of short- and medium-term academic objectives, the cultural resistance of members of the academic community, as well as the lack of incentive and reward systems that would encourage the involvement of researchers who demonstrate their availability and desire in partnerships and collaborations with other stakeholders.

5. CONCLUSIONS

In recent years, the focus on sustainability and the pursuit of the UN SDGs has become a key priority for all types of organizations, including private companies, public institutions, NGOs, and universities. Securing the sustainability of a university within a knowledge-based economy constitutes a major strategic objective, not only for the institution itself but also for society as a whole. The sustainability of a university can be difficult to achieve, as their

stakeholders may have different goals, visions, and values. The representatives of the younger generations are more sensitive to issues of global interest such as: orientation towards sustainability, environmental protection, resource conservation, healthy eating, combating poverty, inclusiveness, etc. A major challenge for universities could be to find the appropriate levers through which younger generations can be driven towards more sustainable behaviour, by promoting examples of good practices in this regard. The analysis shows that although Romanian universities clearly express their willingness and readiness to take an active role in the sustainable development of communities, in practice their involvement is often hindered by fragmented policies, dependence on external funding and limited autonomy in strategic planning.

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GOVERNANCE ON DIGITAL ETHICS AND RESPONSIBLE ONLINE BEHAVIOUR IN EUROPEAN COUNTRIES: A LITERATURE REVIEW

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Abstract

The digital transformation of European societies has reshaped how individuals interact, learn, work, and participate in democratic processes. While digital tools offer numerous benefits, they also raise ethical challenges related to privacy, misinformation, cyberbullying, surveillance, and algorithmic bias. Digital ethics refers to the moral principles guiding behavior in the digital environment, while responsible online behavior involves adhering to norms that promote respectful, secure, and lawful digital interactions. This paper analyses strategies and policies related to digital ethics and responsible online behaviour in selected European countries within the broader context of digital transformation. Using an integrative, qualitative research approach, we synthesize and compare academic literature, policy documents, and governmental reports published between 2014 and 2024. The findings reveal diverse national approaches while highlighting efforts to align with the overarching EU framework. The study identifies best practices, current challenges, and provides policy recommendations for promoting ethical digital behavior in an increasingly digital society.

Keywords: *digital ethics; responsiveness; policy; EU*

JEL Classification: O32; M15; K39.

1. INTRODUCTION

In the context of rapid digital transformation across Europe, which has brought numerous benefits but also many challenges, digital ethics and responsible online behavior have emerged as important issues on both the political and educational agendas. EU Member States are actively developing policy frameworks to promote public awareness, digital competence, and digital citizenship. However, implementation approaches vary significantly across countries, reflecting differences in cultural, institutional, and technological

contexts. This paper aims to evaluate, integrate, and compare these national strategies while assessing their consistency with EU-wide initiatives. The study seeks to identify effective practices and propose recommendations for promoting digital ethics amid rapid global digital expansion and technological transformation.

2. RESEARCH OBJECTIVE

To analyze and synthesize current literature and policy initiatives regarding digital ethics and responsible online behavior across EU member states, highlighting best practices, gaps, and strategies.

3. RESEARCH QUESTIONS

How are digital ethics and responsible online behavior governed in different European countries?

What are the common challenges and gaps in current governance models?

What strategies and policies have proven effective in promoting ethical digital citizenship?

4. METHODOLOGY

This study adopts a qualitative, integrative review approach to explore how digital ethics and responsible online behavior are addressed across various European contexts. The integrative approach enables the consolidation of diverse forms of evidence including academic literature, policy documents, and institutional reports providing a comprehensive understanding of both theoretical perspectives and practical applications (Thomas, J. and Harden, A. 2008).

4.1. Data collection

Sources were selected based on relevance, credibility, and recency, covering the period from 2014 to 2024. The materials included:

- Peer-reviewed journal articles from databases such as Scopus, ERIC, and Google Scholar;
- Official documents and reports from European Union institutions (European Commission, EDPS);
- National policies and initiatives from government agencies in selected EU member states (e.g., France's CNIL, Estonia's e-Estonia program);
- Publications by recognized non-governmental organizations European Schoolnet, UNESCO reports with a European focus).

Keywords guiding the search included: "*digital ethics*," "*responsiveness*," "*policy*" and "*EU*".

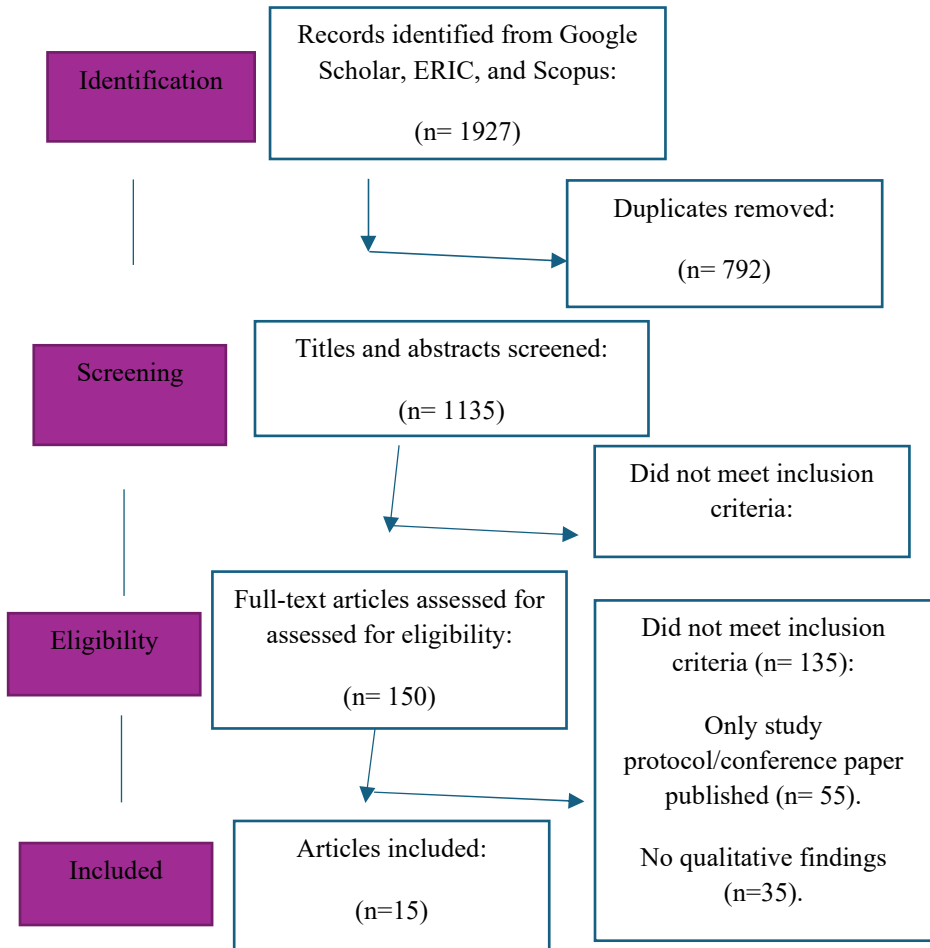
4.2. Data criteria

The inclusion criteria required that documents:

- Address topics related to digital ethics, online behavior, or digital governance;

- Focus on the European context or provide comparative perspectives;
- Be written in English or translated versions by recognized authorities;
- Be accessible through reliable academic or institutional platforms.

Study results according to the following diagram:



Source: Thomas, J. and Harden, A. 2008

Figure 1. Study selection process

4.3. Data analysis

Conduct a systematic content analysis of the 15 selected articles. The analysis focused on synthesizing recurring themes, identifying national approaches, and comparing governance models. Emphasis was placed on the coherence of national strategies with EU-wide frameworks, as well as on highlighting best practices and challenges in implementation.

In recent years, digital ethics and responsible online behavior have emerged as pivotal themes in both academic discourse and policy-making within the European Union. Scholars have increasingly examined the ethical dimensions of digital technologies, addressing concerns such as privacy, algorithmic bias, and digital autonomy (Cath and Floridi, 2017; Taddeo and Floridi, 2021; Schiff, 2022). As digital tools become more embedded in education, communication, and governance, the need for a comprehensive ethical framework to guide digital engagement has grown accordingly.

An expanding body of research highlights the importance of digital citizenship education in cultivating responsible online behavior, especially among youth. The European Commission's Digital Education Action Plan (2021–2027) emphasizes the necessity of equipping citizens with digital literacy, critical thinking, and ethical awareness. National initiatives, such as Estonia's e-Governance model (Espinosa, V.I. and Pino, A. 2024), and France's CNIL-led awareness campaigns (CNIL, 2024), further illustrate how public institutions can effectively foster digital responsibility through education and regulation.

The General Data Protection Regulation (GDPR), implemented in 2018, serves as a cornerstone of data ethics in the EU, mandating transparency, consent, and accountability in digital practices. However, implementation remains uneven across member states. Studies have shown that while countries like Germany and the Netherlands have robust privacy cultures, others still struggle with institutional capacity and public awareness (European Data Protection Supervisor- EDPS, 2022).

Furthermore, the rise of artificial intelligence (AI) and automated decision-making systems has triggered new debates on AI ethics, algorithmic transparency, and accountability. The EU's proposed AI Act represents a proactive attempt to regulate these emerging technologies within a ethics-driven framework grounded in fundamental rights (European Commission, 2023a; European Data Protection Supervisor – EDPS, 2022; Amores *et al.*, 2025).

Despite significant progress, challenges persist, including digital inequality, misinformation, and gaps in online civic engagement. As such, this literature review highlights the need for continued alignment between national policies and EU-wide frameworks, as well as the importance of cross-sector collaboration among educators, policymakers, and civil society actors.

Table 1. Comparative table of main contents of governance models between some European countries and EU level

Nr.	Main contents
1	Main Legal Frameworks
2	Emphasis on Ethics Education
3	Key Focus Areas
4	Alignment with EU Policies
5	Main Challenges

Source: own research

5. RESULTS

5.1. Comparing governance models between some European countries and the EU level

The integrative analysis of academic, institutional, and policy sources across selected European countries yielded the following key findings:

Emphasis on data protection and privacy

Most EU member states have institutionalized data protection measures in line with the General Data Protection Regulation (GDPR). Countries such as Germany and France demonstrate high levels of regulatory enforcement, with active data protection authorities and public awareness initiatives.

Integration of digital ethics in education

Several nations- including Finland, Estonia, and the Netherlands- have embedded digital ethics and online responsibility into national curricula. These programs often emphasize digital literacy, critical thinking, and ethical use of technology, particularly in primary and secondary education.

National variations in strategic implementation

Although EU frameworks provide common goals, national implementation varies:

- Estonia advocates a technology-first, user-centric model of digital citizenship.
- France adopts a regulation-driven approach emphasizing legal compliance and algorithmic transparency.
- Italy and Romania are still in the early stages of institutionalizing digital ethics education and infrastructure.

Table 2. Comparative table of governance models in digital ethics between some European countries and EU level

Criterion	EU Level	Germany	Estonia	Finland	Netherlanss	France	Romania
Main Legal Frameworks	European Data Protection Supervisor (EDPS). 2022						Adaptation of GDPR; eIDAS regulation
Emphasis on Ethics Education	Recommended but implemented nationally	Moderate-more legal control than education	High-Digital ethics as an integral component of state digital services	Very high-Digital ethics is deeply integrated into school curricula	High-Ethics education in artificial intelligence is strongly emphasized	High- CNIL develops youth education programs	Moderate-Ethical topic is present in civic and IT education but limited institutional support remains limited
Key Focus Areas	Core elements encompass data privacy, digital literacy, and responsible online behavior	Hate speech, content regulation, legal enforcement	Transparency, digital public access	Digital literacy, cyberbullying prevention	AI fairness, digital inclusion	Privacy rights, educational outreach	Digital identity, cybersecurity, e-governance integration
Alignment with EU Policies	Sets overall frameworks and guidance	Strong legal alignment; some stricter national rules	Strong alignment and innovation	Highly consistent with EU digital education goals	Contributes to EU-level AI discussions	Harmonized national implementation of EU frameworks	Partial alignment has been achieved; progress in interoperability and digital ID adoption through EU-funded initiatives
Main Challenges	Fragmentation, enforcement across borders	Balancing free speech and regulation	Ensuring cybersecurity and personal data trust	Supporting marginalized groups	Preventing inequality through AI	Measuring the effectiveness of awareness campaigns	Key challenges include bureaucratic delays, low digital literacy in rural areas, fragmented ethics education policies

Source: own research

Table 3. Best practices in digital ethics across Europe

Category	Description	Examples
Robust legal frameworks	The enforcement of the GDPR has established a common foundation for personal data protection across EU member states	EU-wide, esp. Germany, France, Romania: (Law 190/2018 (The Parliament of Romania, 2018) and Law No. 214/2024 (Electronic IDentification, Authentication and trust Services (eIDAS) in Romania, 2024).
Integration of ethics into education	Schools include digital literacy, cyberbullying prevention, AI ethics, and privacy in curricula	Finland, Netherlands, France, Romania: ICT education (Information & Communications Technology (ICT) in Romania, 2024).
Transparent and citizen-friendly digital systems	National Digital ID and transparent e-governance platforms help build trust	Estonia, Romania : ghiseul.ro, e-guvernare.ro platforms
Multi-stakeholder partnerships	The government collaborates with schools, NGOs, and tech companies to develop context-sensitive educational programs	Netherlands, France, Romania: Save the Children & ADR initiatives (Save the Children Romania, 2024)
Ethical and inclusive AI strategies	National AI frameworks emphasize fairness, transparency, and human values	Netherlands, EU initiatives, Romania: AI ethics included in Digital Agenda 2030 (Authority for the Digitalization of Romania, 2022)
Youth and community education programs	Agencies like CNIL lead youth-focused awareness campaigns on privacy and data rights	France, Romania: CyberEthics Romania by Save the Children (Save the Children Romania, 2024)

Source: own research

Table 4. Challenges in digital ethics across Europe

Challenge type	Description	Consequences	Romania-specific notes
Policy fragmentation across member states	The absence of harmonized national approaches impedes coordinated action across the EU	Inconsistent enforcement and legal uncertainty	Moderate alignment; gaps remain between strategy and enforcement
Digital literacy and inclusion gaps persist	Particularly among older adults, rural populations, and disadvantaged groups who often lack access to adequate training and resource	Exclusion from digital society	High concern in rural Romania; national training plans underfunded
Limited cross-border enforcement mechanisms	Global platforms are difficult to regulate using national laws alone	Inability to control harmful content or data misuse	Romania lacks strong data enforcement bodies like CNIL
AI and big data ethical dilemmas	Lack of algorithmic transparency, potential bias, and discrimination	Public mistrust, the risk to equity and justice	National AI ethics are still vague; limited public debate or scrutiny
Measuring the impact of ethics Education	The absence of standardized tools to evaluate outcomes or behavioral change	Weak policy feedback and limited improvement	Romania has pilot tools but lacks a national-scale measurement framework

Source: own research

Emerging Concerns on AI and Algorithmic Governance

With the expansion of artificial intelligence (AI) applications, ethical concerns regarding algorithmic bias, transparency, and accountability are

becoming increasingly salient. Some countries have begun issuing AI ethics guidelines or conducting public consultations, but a consistent regulatory framework across the EU is still under development.

Identified best practices

The study highlights successful national initiatives, including:

- E-Estonia's X-Road system for secure data exchange;
- France's CNIL educational campaigns on digital rights;
- The Netherlands' participatory policy design for emerging technologies.

5.2. Limitations

This literature review has several limitations that should be considered when interpreting its findings:

Scope of sources: The review primarily includes academic publications, EU policy documents, and official reports available in English, potentially overlooking valuable insights published in other languages or gray literature.

Time frame: The focus on sources from approximately 2014 to 2024 may exclude earlier foundational studies or very recent developments not yet published.

Lack of primary data: As a secondary analysis of existing literature, the review does not incorporate empirical data collection or direct stakeholder perspectives, which may limit the depth of contextual understanding.

Variability in national contexts: Differences in political, cultural, and technological environments across European countries can complicate direct comparisons and generalizations.

Rapid technological change: Given the fast pace of digital innovation and policy evolution, some findings may quickly become outdated or require continuous updating.

Despite these limitations, the review offers a comprehensive overview of governance approaches to digital ethics and responsible online behavior in Europe, providing a foundation for further research.

5.3. Recommendations

Based on the literature review, several recommendations emerge to strengthen governance on digital ethics and responsible online behavior across European countries:

Enhance EU-wide coordination: Establish stronger mechanisms for sharing best practices, harmonizing policies, and aligning national strategies with EU digital ethics frameworks to reduce fragmentation.

Invest in inclusive digital education: Develop and support digital literacy programs tailored to diverse populations, including marginalized groups, the elderly, and rural communities, to bridge digital divides.

Promote multi-stakeholder collaboration: Encourage partnerships among governments, educational institutions, civil society, and the private sector to create comprehensive and context-sensitive initiatives.

Focus on emerging ethical issues: Prioritize research and policy development on AI ethics, algorithmic transparency, and digital mental health to anticipate future challenges.

Strengthen enforcement and accountability: Improve monitoring and regulation of online platforms, particularly those operating across borders, to ensure adherence to digital rights and ethical standards.

Develop standardized assessment tools: Create frameworks for evaluating the effectiveness of digital ethics education and public awareness campaigns to inform continuous improvement.

Implementing these recommendations can foster a more coherent, inclusive, and adaptive approach to digital ethics governance, supporting a responsible digital society in Europe.

6. CONCLUSION

The literature review reveals a diverse and evolving landscape of governance on digital ethics and responsible online behavior across European countries. Key findings include:

Strong EU policy frameworks: The GDPR and the Digital Education Action Plan serve as foundational instruments guiding member states in protecting data privacy, fostering digital skills, and promoting ethical online engagement.

National variations in implementation: Countries such as Germany, Estonia, Finland, France, and the Netherlands demonstrate varied approaches reflecting their unique political, cultural, and technological contexts. For instance, Germany's focus on content moderation contrasts with Estonia's emphasis on transparency and digital infrastructure.

Emphasis on education and media literacy: Across member states, integrating digital ethics into education is a priority, with curricula increasingly addressing critical thinking, cyberbullying prevention, and data protection.

Challenges persist: Fragmentation of efforts, digital literacy gaps among vulnerable populations, and enforcement issues in cross-border digital spaces remain significant obstacles.

Emerging ethical concerns: AI governance, algorithmic transparency, and the digital divide are increasingly central to policy and academic discussions.

Collaborative approaches: Successful initiatives often involve multi-stakeholder partnerships, including governments, educational institutions, civil society, and private sector actors.

While progress has been made in embedding digital ethics across Europe, more coordinated, inclusive, and adaptive governance is needed. Cross-border

collaboration, standardized digital education, and accountability mechanisms will be crucial in ensuring a safe and ethical digital environment.

European countries are making meaningful progress in promoting digital ethics and responsible online behavior through robust policy frameworks, educational efforts, and civic engagement. However, ensuring consistency, inclusion, and adaptability remains a key challenge. A coordinated European approach, grounded in shared values and diverse local experiences, is essential for cultivating a responsible and ethical digital future.

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ARTIFICIAL INTELLIGENCE AND DIGITAL GOVERNANCE: THE
IMPACT OF EMERGING POLICIES ON
BUSINESS TRANSFORMATION IN THE ERA OF BIG DATA AND
MACHINE LEARNING

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Abstract

The accelerated digital transformation driven by Artificial Intelligence (AI), Big Data, and Machine Learning (ML) is fundamentally reshaping governance models and the dynamics of the business environment. This paper explores how emerging public policies, adopted at both European and international levels, influence decision-making processes, innovation capacity, and corporate competitiveness in the context of the new digital economy. Focusing on initiatives such as the EU Artificial Intelligence Act, the European Data Strategy, and digital ethics regulations, the study highlights their impact on organizational adaptability and sustainability. Using an interdisciplinary and practice-oriented approach, the research identifies both opportunities and challenges these policies pose for the private sector, especially regarding algorithmic accountability, data protection, and equitable access to technology. The findings offer policy recommendations for inclusive digital governance that supports innovation and business resilience within a regulated yet enabling framework.

Keywords: *digital governance; public policy; Artificial Intelligence; Big Data; Machine Learning; digital transformation; algorithmic ethics; business environment.*

JEL Classification: M21; G28; O33; O38.

1. INTRODUCTION

The digital economy experiences a complete transformation because businesses implement Artificial Intelligence (AI), Big Data, and Machine Learning (ML) systems to manage their operations (Yadav and Dwivedi, 2023). These technologies create operational performance improvements by developing new competitive benefits according to Allam and Rodwal (2023). Organizations that implement them need to manage an expanding number of intricate regulatory requirements. Businesses need to take a forward-thinking stance regarding public policy because technological progress creates essential challenges for businesses to follow governance and compliance rules (Davis, 2014). The EU Artificial Intelligence Act (European Commission, 2023) and European Data Strategy (European Commission, 2020) demonstrate how contemporary regulatory systems require powerful policy frameworks to handle various problems that these technologies create. These programs work to unite innovation goals with requirements for data protection, equal technology access, and responsible use of technology (Davis, 2014). The current regulatory framework creates both chances and difficulties for businesses, which need strategic handling to achieve sustainable development and business stability.

The complete effects of these policies need to be understood by corporate decision-makers, according to Burri and von Bothmer (2021). As organizations adapt to these regulatory changes, they must reevaluate their governance structures and operational strategies to align with new compliance requirements. This research examines how organizations can benefit from regulatory frameworks that support flexibility and tackles the multiple obstacles they encounter in their path. We investigate how new policies affect corporate governance and help businesses succeed during digital transformation. Organizations must adopt frameworks that support innovation development by implementing effective oversight of algorithmic decision systems and data protection protocols. Our research promotes public-private sector dialogue to establish digital governance systems that benefit business operations while protecting social interests. Our goal is to propose digital economy solutions for businesses to maintain their market position within modern technological business operations.

2. METHODOLOGY

We investigate how businesses rely on technologies such as Artificial Intelligence (AI), Big Data, and Machine Learning (ML) adapt to new public policies by conducting an extensive literature review. This review aims to merge research evidence with policy documents and theoretical frameworks to analyze digital governance's impact on corporate strategic planning in contemporary business environments. The literature review evaluates present policies to determine major governance patterns and technological business operational developments in corporate governance.

The research started by conducting a thorough database search of Google Scholar, JSTOR, and Scopus to find peer-reviewed articles, white papers, and policy reports. We used "Artificial Intelligence Act," "European Data Strategy," "digital governance," "algorithmic accountability," and "business transformation" sources to gather comprehensive data about ongoing AI research. We utilized thematic analysis to organize its results and examine how regulations affect innovation potential and the difficulties of algorithmic accountability, data protection, and technology accessibility. The thematic structure enabled us to study how new policies affect corporate decision systems and operational approaches in detail.

The review used a critical evaluation method to combine multiple perspectives from the literature base for an objective assessment. The evaluation process required assessment of some research findings, which demonstrated positive effects of regulatory frameworks, together with studies that exposed adverse effects and constraints these policies create for businesses. The research combines these viewpoints to develop a complete understanding of regulatory system operations through two distinct mechanisms.

3. THE IMPACT OF EMERGING POLICIES ON INNOVATION CAPACITY

The assessment of new policies and innovation capacity has become crucial because governments and regulatory organizations across the world must manage rapid technological progress while maintaining ethical standards and safeguarding public safety. The EU Artificial Intelligence Act and European Data Strategy demonstrate how regulatory frameworks affect the development of innovation.

The European Commission introduced the EU Artificial Intelligence Act to create a complete set of rules for AI system development. The Act establishes a risk-based framework for AI systems through categories, starting from minimal up to unacceptable, to enforce strict transparency, safety, and accountability standards for high-risk applications ("EU's AI Act Proposal Foregrounds Risks and Rights," 2023). The regulatory framework produces various advantages and challenges that affect innovation capacity development. On one hand, the development of AI systems receives more funding because organizations establish specific guidelines that create trust in AI systems. On the other hand, the implementation of excessive regulations restricts innovation by limiting creative freedom and creating obstacles for new businesses and small organizations to handle intricate legal frameworks (Li *et al.*, 2018). The European Data Strategy supports data sharing and interoperability as key factors to boost digital economy innovation, according to Custers and Bachlechner (2017). It aims to create data governance systems and open data programs, which will establish an environment that supports data-driven innovation. The policy framework enables businesses to develop new products and services

through shared data resource utilization, which drives up their innovation capacity. Data sharing systems need privacy and security solutions to overcome current obstacles that threaten future technological development.

Intellectual Property (IP) policies act as fundamental drivers that establish the level of innovation capacity. Strong IP protection can incentivize innovation by ensuring that creators and inventors can reap the financial rewards of their efforts. The implementation of overly restrictive IP laws, however, leads to monopolistic conduct, which prevents market competition and restricts innovation (Sherwood, 1990). The present need for IP policy reform in AI technology development requires policymakers to create an equilibrium between fostering innovation and protecting legal rights (Chesterman, 2025).

Also, national policies that match international standards serve as a crucial factor for obtaining a competitive advantage within the current global economic framework. The implementation of different regulatory frameworks by nations leads to obstacles that prevent international cooperation between businesses and technological advancement. For example, regulatory systems of AI between the EU, the United States, and China create barriers for innovators who want to enter foreign markets, according to Savage (2020). The development of policies requires an assessment of their effects on home-based innovation and their effects on global market position.

New policy development shows that society now understands the ethical implications of technology better. The integration of ethical considerations into policy frameworks – such as those outlined in the EU's Ethics Guidelines for Trustworthy AI – can enhance innovation capacity by ensuring that technological advancements align with societal values and public interest (Green and Clayton, 2021). The method supports sustainable development through its requirement for new technologies to deliver economic value and social advantages.

4. CHALLENGES OF ALGORITHMIC ACCOUNTABILITY AND DATA PROTECTION

As organizations increasingly integrate Artificial Intelligence (AI) and Machine Learning (ML) into their operations, the challenges surrounding algorithmic accountability and data protection have emerged as critical concerns. The complicated nature of these technologies makes it difficult to understand the decision-making processes, which leads to multiple ethical, legal, and operational issues.

The main challenge to achieving algorithmic accountability arises because many AI systems function through unexplained internal processes. The decision-making operations of deep learning models, together with other machine learning models, remain unclear because their functioning operates as a "black box" (Coyle and Weller, 2020). Organizations struggle to verify accountability because algorithmic decision systems produce unexplained results, which makes it impossible for them to

understand their decision-making logic. They encounter problems with their AI systems because they fail to detect the root causes of discriminatory hiring practices, medical misdiagnoses, and unfair lending decisions (Coyle and Weller, 2020). The lack of transparency in AI systems leads to stakeholder distrust because users, including customers and employees, and regulators cannot follow the automated decision-making process (Dinka *et al.*, 2006).

Organizations must address algorithmic bias as one of their main technology problems (Mone, 2016). AI systems learn from historical data that includes biases that stem from social inequalities in society. The absence of bias mitigation systems allows these prejudices to continue and possibly become more severe in employment, financial, and criminal justice systems (Ntoutsis *et al.*, 2020). The technology receives criticism because, for example, facial recognition systems produce more identification errors for people with darker skin tones, which results in discriminatory results (Drozdowski *et al.*, 2020). Organizations face the dual challenge of recognizing and mitigating these biases within their algorithms while also navigating the legal and ethical implications of deploying biased systems. If algorithmic bias is ignored, companies will face major consequences such as damage to their reputation and legal risks under anti-discrimination laws (Ferrer *et al.*, 2021).

The process of collecting and processing large data sets needed for AI model training also creates major problems regarding data protection. Organizations must follow various regulatory requirements such as GDPR in Europe, which requires them to maintain strict data management practices (Li *et al.*, 2019). They must follow three essential principles to implement AI systems: they need to minimize data collection, define and limit specific purposes, and obtain user consent and they need to establish strong data governance systems that will defend their sensitive information from unauthorized access and data breaches. The situation becomes even more difficult because cyber threats have become more complex, which requires organizations to keep investing in cybersecurity protection systems to defend their data (Miryala and Gupta, 2022).

The process of establishing who should be held responsible for AI system decisions remains a difficult problem to solve. The responsibility for harmful algorithm outcomes remains unclear because it can fall on either the organization that created the algorithm, the data provider, or the AI system itself (Baldi and Oliveira, 2022). The lack of defined AI system boundaries leads to major legal problems since numerous jurisdictions lack specific regulations for AI system management (Kumar, 2023). Organizations need to establish particular accountability systems that outline the responsibilities of each role regarding algorithmic decision management. AI systems need auditing and monitoring to verify their compliance with ethical standards and regulatory requirements.

5. STRATEGIES FOR ORGANIZATIONAL ADAPTABILITY AND COMPLIANCE

Organizations encounter a persistent problem because the rules that govern AI systems and data protection continue to shift. Businesses need to stay alert to new policies and guidelines that governments and international bodies continue to develop. Organizations need to take active steps for compliance by providing continuous employee training, using compliance technology systems, and working with legal specialists to handle new regulatory requirements. They need to stay adaptable because AI systems must follow present legal and ethical standards, which change in the regulatory environment.

The regulatory framework for Artificial Intelligence (AI) and data protection undergoes continuous transformation because of rapid technological advancements and evolving public expectations (Spiecker and Döhmman, 2022). Organizations need to take part in compliance and become adaptable because governments and international bodies keep introducing new policies and guidelines. As a result, they require a strong compliance framework to operate successfully in the intricate environment of AI and data protection, according to Villegas-Ch and García-Ortiz (2023). The framework needs to establish specific rules that explain how the organization will follow GDPR and the EU Artificial Intelligence Act regulations. Key components of an effective compliance framework include:

- Full policies that promote data protection while upholding ethical standards and ensuring their AI systems remain accountable. The policies need periodic updates to match new laws and industry standards (Syifa, 2024).
- Performing risk assessments on a regular basis to detect both security vulnerabilities and compliance weaknesses. This proactive method allows organizations to establish preventive measures that reduce the risk of problems growing out of control (Esayas *et al.*, 2015).
- Compliance Audits: Routine compliance audits should be conducted to evaluate the effectiveness of existing policies and procedures. Organizations perform audits to identify areas of improvement and maintain regulatory compliance standards (Wolosz, 2007).

Organizations need to spend their resources on employee training and education programs that establish an ethical workplace culture that follows compliance standards. The training program must encompass all core AI elements, data protection standards, and regulatory compliance requirements:

- The organization needs to provide employees with full details about all applicable laws and regulations that impact their job responsibilities. Organizations can stay compliant with their daily activities through their understanding of these regulations, according to Thomasma (1992).
- The training programs need to teach participants about why ethical practices matter throughout the entire AI development and deployment process. The

education of employees about algorithmic bias, transparency, and accountability issues will help them make better decisions (Kamila and Jasrotia, 2025).

- The handling of sensitive data by employees requires specific training about data protection principles, which must include data minimization, purpose limitation, and consent management. The training program teaches staff members about proper data management techniques and legal requirements (Tahim *et al.*, 2012).

Organizations can achieve better regulatory compliance through the implementation of technological solutions. Businesses need to purchase compliance technology solutions that help manage data through governance systems and enable monitoring and reporting functions. Key technologies include:

- Data Governance Platforms function as organizational tools that enable proper data resource management through standardized collection, storage, and processing operations, which follow regulatory requirements. The tools enable organizations to monitor data origins and establish access restrictions for tracking their data management operations (Mahanti, 2021).

- AI monitoring tools are used to monitor organizations' AI systems' performance and detect algorithmic accountability and bias problems through these systems. These tools help organizations track decision-making activities, which enables them to address problems at their early stages before they escalate into major issues (Brown *et al.*, 2021).

- Compliance Management Software enables organizations to automate their compliance tasks through automated documentation and reporting, and audit management functions. By reducing the administrative burden associated with compliance, organizations can focus on strategic initiatives (Abdullah, 2019).

The implementation of new regulatory requirements requires legal specialists to work together with compliance professionals. Organizations need to form connections with external consultants, legal advisors, and industry associations to receive updates about regulatory changes and industry-leading practices. The following strategies enable teams to reach successful collaboration:

- Participating in industry forums and associations, because they provide access to peer knowledge about dealing with comparable organizational issues. The platforms enable users to exchange information about AI and data protection compliance standards and innovative methods (Chukwurah and Aderemi, 2024).

- Using policy advocacy to shape regulatory frameworks that affect their business activities. Businesses can help establish regulatory systems that protect innovation and fulfill social needs through their partnership with industry groups, according to Davis (2014).

The organizations should establish their core culture based on ethical responsibility because this method supports both regulatory compliance and innovation development. They need to integrate this culture into their core

values, leadership structure, and decision-making framework. Strategies for promoting ethical responsibility include:

- Leaders showing their dedication to ethical conduct and regulatory adherence. Leaders must implement ethical principles into their planning, and they must face consequences when their decisions break compliance rules (Buell, 2009).
- Encouraging Open Dialogue: Organizations should cultivate an environment where employees feel comfortable discussing ethical dilemmas and compliance concerns. Open dialogue enables teams to detect potential problems and establish mutual comprehension of ethical duties (Thomasm, 1992).
- Recognition and incentives for ethical behavior. Those can motivate employees to prioritize compliance and responsible innovation, ultimately enhancing the organization's reputation and fostering trust among stakeholders (Gurzawska *et al.*, 2017).

6. CONCLUSIONS AND RECOMMENDATIONS

Business operations have entered a transformative period because of Artificial Intelligence (AI), Big Data, and Machine Learning (ML), which have evolved at a fast pace. Organizations must study public policy modifications because these changes affect their corporate strategies and determine their capacity to maintain growth and innovation. This research demonstrates how the EU Artificial Intelligence Act and European Data Strategy create substantial effects on corporate governance and innovation capacity, algorithmic accountability, and data protection. We show that these policies work to create an ethical environment for technology development, yet organizations face major obstacles when implementing them. Organizations need to modify their operations because algorithmic decision systems need transparent operations and data privacy safeguards but encounter various difficulties during execution. They need to understand that compliance serves as a strategic business advantage that goes beyond legal requirements.

The following recommendations emerge from these findings to help organizations handle digital economy challenges while following new public policy requirements:

- Organizations need to create an entire compliance system that meets all requirements of AI and data protection regulations. The framework requires detailed policies and procedures that prove the organization follows GDPR and the EU Artificial Intelligence Act requirements. Organizations can identify and reduce compliance gaps by using risk assessments, compliance audits, and policy updates.
- The allocation of funds for employee training and awareness programs leads to a culture of compliance because it provides continuous educational opportunities for staff members. Organizations need to establish training initiatives that teach employees about regulatory compliance, ethical AI methods, and data protection standards. Organizations can enhance their

decision-making abilities while upholding ethical standards through employee training programs that focus on AI and data governance competencies.

- Organizations can improve their regulatory requirement management through the implementation of compliance technologies. They need to purchase data governance platforms, AI monitoring tools, and compliance management software to achieve efficient compliance operations, enhanced data oversight, and legal requirement fulfillment. Administrative work can also be reduced through technology system implementation, which allows them to focus on strategic projects that generate innovation.

- The organizations need outside consultants, legal advisors, and industry associations to develop relationships for acquiring regulatory updates and industry standards. Organizations need continuous legal expert advice to understand new regulations and execute necessary strategic changes. Organizations that participate in industry forums gain access to compliance information, which enables them to build stronger collective abilities for managing regulatory challenges.

- The base for achieving compliance success and innovation requires organizations to establish ethical responsibility and maintain open dialogue. Organizations need to incorporate ethical principles into their core values, leadership methods, and decision-making frameworks. Leadership's dedication to ethical practices drives staff members to work on both regulatory compliance and ethical product development. Organizations can identify problems and create shared understanding about ethical duties through open discussions about ethical challenges and compliance issues.

- Organizations must participate in policy advocacy work to influence the development of regulatory systems that impact their operational activities. Businesses should work with industry organizations to develop fair regulatory systems that promote innovation through dialogue with government officials. This proactive method enables the development of rules that support digital economy innovation and competitive growth.

- Organizations must stay informed about regulatory changes because the environment continues to evolve. Organizations need to create systems that track regulatory changes and evaluate their effects on business activities for a successful, proactive response to new requirements. They must create fast adaptation capabilities because they need to stay compliant with regulations while keeping their AI systems in line with ethical frameworks.

The combination of Artificial Intelligence, Big Data, and Machine Learning systems with new public policies creates dual benefits and obstacles for business organizations. Organizations need to handle digital economy complexities through active compliance methods, employee training programs, technological implementations, team collaboration, ethical standards promotion and policy support. Organizations will enhance their market position and digital innovation capabilities through this method, which will also support the creation of

inclusive digital governance systems that benefit all members of society. As the landscape continues to evolve, organizations that prioritize these strategies will be well-positioned to thrive in an era defined by technological advancement and regulatory scrutiny.

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SPECIFIC LEGAL ENTITIES OF THE EUROPEAN UNION ON COMPANY LAW

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Abstract

In order for the European single market, based on freedom of establishment, to function as efficiently as possible, this paper first addresses the specific regulatory framework regarding uniform corporate entities of the Union, which allow commercial companies to operate in several Member States. Thus, the European Company (SE), the European Economic Interest Grouping (EEIG), the European Cooperative Society (SCE) are analyzed in detail. It also discusses the current legislative proposals regarding the European Private Company (SPE), with a view to simplifying existing European company forms. In order to best support the needs of the existing business environment in the Member States and to promote the fastest possible expansion of cross-border economic activities, proposals are made to amend the legal provisions in force in the Union. Then, the second part of the paper considers the case law of the Court of Justice on the matter, emphasizing the role of the Luxembourg court in interpreting the relevant European legislation. The paper is of particular importance for the most efficient development of the activities carried out by the already established corporate forms of the Union; the article is of real interest also for specialists in the field, but especially for the Member States of the Union, whose legislation must be harmonized with the European legislative framework corresponding to the field studied.

Keywords: *specific corporate entities; European Union; legislation, jurisprudence.*

JEL Classification: N44.

1. INTRODUCTION

Since the legal systems of the Member States of the European Union are very different in terms of the legal regulation of commercial companies, uniform corporate forms have been expressly established at Union level, in order to allow the carrying out of economic activities by a commercial company in several Member States. These European corporate forms, referred to in the paper, are the European Company (SE), the European Economic Interest Grouping (EEIG), the

European Cooperative Society (SCE), whose legal framework will be commented on in detail. Interesting observations will also be made regarding the legislative proposals regarding the European Private Company (SPE).

The most relevant part of the presentation considers the analysis of the judicial practice in the studied field, developed by the Court of Justice of the Union. The particular importance of the commented judicial decisions results, on the one hand, from the fact that they are binding on the Member States in terms of the interpretation of the provisions of the Treaties, being sources of law within the normative system of the European Union. On the other hand, these decisions create a single framework for the application and interpretation of the Union legislation in the matter, thus providing uniform directions of action for the European corporate forms in the Member States.

2. NORMATIVE FRAMEWORK ON THE UNIFORM CORPORATE ENTITIES OF THE UNION

The regulations that we will analyze in this section are directly and immediately applicable in the Member States, enjoying priority over their national legislation.

Unlike regulations, as a general rule, directives are not directly applicable, the States having the obligation to transpose them, within a precisely determined period, by appropriate measures, into national legislation.

The legal regulations that determine the legal framework for the establishment, organization and operation of the European Company (SE), the European Economic Interest Grouping (EEIG) and the European Cooperative Society (SCE) will be examined successively.

Reference will also be made to the legislative proposals aimed at the European Private Company.

2.1. European Company (SE)

The European Company (SE) represents a unique legal structure, which allows companies from the Member States of the Union to carry out activities on a community scale, by carrying out mergers, by creating a holding company or by forming joint subsidiaries, in compliance with the competition rules established by the former Treaty on the European Economic Community - the current Treaty on the Functioning of the European Union (European Union, TFEU, 2012).

The legal status of such a company was established by Council Regulation No 2157/2001 (The Council of the European Communities, Council Regulation No 2157, 2001), which was successively amended in: in 2004, as a result of the accession of the Czech Republic, Estonia, Cyprus, Latvia, Lithuania, Hungary, Malta, Poland, Slovenia and Slovakia; in 2006, by reason of the accession of Bulgaria and Romania; in 2013, as a consequence of the accession of the

Republic of Croatia. In the event of infringement of the provisions of this Regulation, each Member State is obliged to apply the sanctions applicable to joint-stock companies governed by the national law of the Member State concerned. The Regulation contains detailed legal rules determining the establishment, structure, operation of an SE, liquidation, dissolution, insolvency and cessation of payments. There are, however, a number of areas that do not fall under the scope of this regulatory act, such as taxation, competition, intellectual property or insolvency, which are regulated by the legislation of the state in which the SE has its registered office.

The Regulation establishes that an SE may be established within the Union in the form of a public limited liability company, with the Latin name of "Societas Europaea" (SE) and a minimum subscribed capital of EUR 120 000. The maintenance and changes of the capital, together with its shares, bonds and other similar securities shall be governed by the provisions which would apply to a public limited-liability company with a registered office in the Member State in which the SE is registered. An SE may also set up one or more subsidiaries in the form of SEs.

Until the above-mentioned Regulation, groups of companies from several Member States operated on the basis of their national laws, without a uniform legal framework, which created serious economic, legal and administrative obstacles in practice.

Through this legislative act analyzed, companies from at least two Member States may be established, in compliance with precisely determined conditions, as an SE, in several ways: merger; establishment of a holding company; creation of one or more subsidiaries with SE status; transformation into an SE. An SE shall be regarded as a public limited-liability company governed by the law of the Member State in which it has its registered office (art. 3). The registered office and central administration of an SE are located in the same Member State. The transfer of the registered office of an SE may be made to another Member State, in compliance with the established conditions, without this situation determining the dissolution of the SE or the creation of a new legal entity. Every SE shall be registered in the Member State in which it has its registered office in a register designated by the law of that Member State in accordance with Article 3 of the first Council Directive 68/151/EEC, repealed by Directive 2009/101/EC, repealed, in its turn, by Directive (EU) 2017/1132, currently in force (Directive 2017/1132, 2017).

Regarding the structure, an SE shall include: a general meeting of shareholders; either a supervisory body and a management body (two-tier system) or an administrative body (one-tier system) depending on the form adopted in the statutes.

It is also necessary to mention that the legal regime of an SE is established, mainly, by the legal provisions of the examined regulation, by those of the

Member State in which an SE has its registered office and, subsidiary, by the general regulations on commercial companies adopted at Union level and the national ones of the Member States, which transpose the directives in the field, such as: Directive 91/674/EEC (Directive 91/674/EEC), Directive 2009/38/EC (Directive 2009/38/EC, 2009), Directive 2009/102/EC (Directive 2009/102/EC, 2009), Directive 2013/36 (Directive 2013/36), Directive 2017/1132 (Directive 2017/1132).

The involvement of employees in an SE is governed by Council Directive 2001/86/EC (The Council of the European Communities, Council Directive No 86, 2001), which supplemented the SE statute, which cannot be dissociated from the above-mentioned regulation and which applies concurrently with it.

The directive in question aims to ensure the right of employees to benefit from: adequate protection in the event of dismissal or other sanctions; appropriate guarantees; to take part in all decision-making within an SE. Thus, in the case of the creation of an SE, the directive includes standard requirements, which ensure procedures for information, consultation and participation at transnational level. In this sense, "involvement of employees" is defined as "any mechanism, including information, consultation and participation, through which employees' representatives may exercise an influence on decisions to be taken within the company".

In order to achieve the objective of the directive, a representative body is created, composed of employees of the SE and its subsidiaries and establishments elected or appointed from their number by the employees' representatives or, in the absence thereof, by the entire body of employees. The competence of this representative body covers problems concerning the SE and any of its subsidiaries or units situated in another Member State or which go beyond the competence of the decision-making bodies of a single Member State. Also, after drawing up a project for the formation of an SE, the management or administrative organs of the participating companies shall take the necessary measures for starting negotiations with the representatives of the companies' employees, a special negotiating body representative of the employees being created.

The special negotiating body and the competent bodies of the participating companies shall determine, by written agreement, arrangements for the involvement of employees within the SE. Also, an SE may not be registered unless an agreement on arrangements for employee involvement pursuant to Article 4 of Directive 2001/86/EC has been concluded, or a decision pursuant to Article 3(6) of the Directive has been taken, or the period for negotiations pursuant to Article 5 of the Directive has expired without an agreement having been concluded. If the arrangements established under this directive conflict with the statute of an SE, the latter shall be amended accordingly.

2.2. European Economic Interest Grouping (EEIG)

The European Economic Interest Grouping (EEIG) is a distinct legal entity, set up to facilitate cooperation between companies, individuals or other legal entities from different Member States, and is governed by Regulation (EEC) No 2137/85 (Regulation No 2137/85).

The EEIG was created not to make a profit for itself, but to facilitate the economic activities of the entities that compose it. The latter must conclude a contract and register, in compliance with the conditions laid down in the aforementioned Regulation, as well as those laid down in the national legislation of the Member State in which registration takes place. Also, the group's activity must be related to the economic activity of its members and can only have an auxiliary character to this activity.

The GEIE is made up of: companies or firms within the meaning of the second paragraph of Article 58 of the Treaty and other legal bodies governed by public or private law, which have been formed in accordance with the law of a Member State and which have their registered or statutory office and central administration in the Community; natural persons who carry on any industrial, commercial, craft or agricultural activity or who provide professional or other services in the Community. Any Member State may, on grounds of that State's public interest, prohibit or restrict participation in groupings by certain classes of natural persons, companies, firms, or other legal bodies. The organs of a grouping shall be the members acting collectively and the manager or managers.

The members of a GEIE have joint and unlimited liability for all the obligations of the group, regardless of their nature. National law shall determine the consequences of such liability (Article 24 of the Regulation).

Only the manager or, where there are two or more, each of the managers shall represent a grouping in respect of dealings with third parties. The members of the group shall share the profits obtained by the EEIG and contribute to the payment of expenses in the proportions laid down in the contract for the formation of the grouping or, in the absence of any such provision, in equal shares. No grouping may invite investment by the public. The insolvency and cessation of payments of an EEIG shall be subject to specific domestic legislation. The competent national authority of a Member State may prohibit the EEIG from carrying out an activity which is contrary to the public interest of the Member State concerned.

Immediately after the entry into force of the Regulation, in order to ensure its effective application and to advise the European Commission, a Contact Committee has been set up under the auspices of the Commission. This committee is composed of representatives of the Member States and representatives of the Commission. The chairman is a representative of the Commission.

This corporate form thus aimed at the cooperation of its members, not at substituting their activities. Therefore, the establishment of an EEIG does not create an independent legal entity.

2.3. European Cooperative Society (SCE)

The European Cooperative Society (SCE) is governed by Regulation (EC) No 1435/2003 (Regulation No 1435/2003), being a legal structure set up with the aim of supporting cross-border cooperation of cooperatives within a single legal framework similar to that of an SE. A cooperative society may be set up within the Community in the form of a European cooperative society (SCE), having legal personality; the subscribed capital of an SCE is at least EUR 30 000, divided into shares. Unless otherwise provided in the SCE statute, no member shall be liable for more than the amount he/she has subscribed. An SCE shall have as its principal object the satisfaction of its members' needs and/or the development of their economic and social activities, in particular through the conclusion of agreements with them to supply goods or services or to execute work of the kind that the SCE carries out or commissions. An SCE may also have as its object the satisfaction of its members' needs by promoting, in the manner set forth above, their participation in economic activities, in one or more SCEs and/or national cooperatives.

Detailed rules are laid down concerning the statute, formation, capital of the SCE, its registered office and its transfer to another Member State of the Union, registration and disclosure requirements, notice in the Official Journal of the European Union, acquisition and loss of membership, financial entitlements of members in the event of resignation or expulsion, issue of securities other than shares and debentures conferring special advantages, allocation of profits, annual accounts and consolidated accounts, winding up, liquidation, insolvency and cessation of payments.

The legislation applicable to the SCE takes into account the commented regulation, Directive 2003/72/EC (Directive 2003/72/EC) on the involvement of workers in an SCE, the normative acts of the Member States concerning the application of the legal norms of the Union concerning the SCE or those which would apply to a cooperative formed in accordance with the law of the Member State in which the SCE has its registered office. According to the principle of non-discrimination, an SCE shall be treated in every Member State as if it were a cooperative, formed in accordance with the law of the Member State in which it has its registered office.

The ways in which an SCE can be created are: merger; conversion of an existing cooperative into an SCE; establishment of an SCE by natural or legal persons from at least two Member States.

As regards the structure of its organs, an SCE comprises: a general meeting; either a supervisory organ and a management organ (two-tier system) or an

administrative organ (one-tier system) depending on the form adopted in the statutes. The members of the organs of an SCE are liable for loss or damage sustained by the SCE following any breach on their part of the legal, statutory or other obligations inherent in their duties.

The advantages of this corporate form concern several aspects, such as: the existence of democratic control of its members; the distribution of profits according to participation, not capital; the promotion of cross-border cooperation; the encouragement of employee participation in decision-making.

The involvement of workers in an SCE is established by *Directive 2003/72/EC (The Council of the European Union, Council Directive 72, 2003)*. Arrangements for the involvement of employees shall be established in every SCE in accordance with the negotiating procedure or according to the conditions determined by the directive in question. There are detailed provisions related to: participation in the general meeting or section or sectoral meeting; the negotiation procedure, which is applicable to: SCEs established by at least two legal entities or by transformation; SCEs established exclusively by natural persons or by a single legal entity and natural persons; reservation and confidentiality; operation of the representative body and procedure for the information and consultation of employees; protection of employees' representatives; misuse of procedures.

2.4. European Private Company (EPC)

In order to simplify and modernise existing European company forms, the European Commission proposed a European Private Company statute to allow SMEs to expand their business activities in the European Union at the lowest possible cost, including the provision of a minimum capital (*European Commission, COM/2008/0396, 2008*).

This initiative was withdrawn in 2014, as it was considered inconsistent with protecting workers' participation rights.

3. JURISPRUDENCE OF THE COURT OF JUSTICE IN THE EXAMINED FIELD

The case law of the Court of Justice has had and continues to have an essential role in the interpretation and application of Union law in the field examined. Thus, the European court has provided, through its interpretations in various settled cases, rules that must be respected by the Member States in order to implement Union law on European company forms operating on their territory.

The case law on the SE has been extensive, including several cases of major importance in defining the freedom of establishment, such as *Daily Mail*, *Centros*, *Überseering*, *Inspire Art*, *Cartesio*. These have been examined in detail in another study (Verga, 2025, p. 11), and the present work captures only some essential aspects of these cases.

In the *Daily Mail Case (C-81/87)*, the Court stated that, in the absence of uniform European legislation, a Member State has the right to determine that the transfer of a company's registered office to another Member State results in the loss of legal personality of that legal entity. The theory of the real seat was thus established.

Contrary to the previously mentioned case, *the Centros Case (C-212/97)* emphasised the theory of registration, according to which a company is governed by the law of the State of registration. In that case, a company registered in the United Kingdom (which did not establish a minimum share capital) attempted to set up a branch in Denmark. However, the competent Danish authorities refused to register it. The European Court ruled that the refusal to register a branch constitutes a restriction on the freedom of establishment, even in the case of a company that was created to carry out its activity, mainly, in another Member State of the Union, other than that of registration.

In the *Überseering Case (C-208/00)*, the European Court ruled that a Member State (Germany) cannot refuse to recognise a company legally incorporated in another Member State (the Netherlands) on the grounds that its real seat is in Germany. Refusal to recognise the legal personality of a company was qualified as an unjustified restriction of the freedom of establishment.

The *Inspire Art Case (C-167/01)* is also relevant in the field studied. Thus, a Dutch company, a subsidiary of a British company, was obliged by the Dutch authorities to comply with Dutch legislation on minimum capital. The Luxembourg Court concluded that such an obligation infringes the freedom of establishment and cannot be upheld, despite the arguments that such a requirement was intended to protect creditors and avoid fraud. Therefore, if the parent company complies with the legislation of its state of registration, that legislation cannot be imposed on a branch of the parent company, which has been registered in another Member State.

In the *Cartesio Case (C-210/06)*, the company *Cartesio Oktató és Szolgáltató bt.* had its registered office in Hungary and was registered in that State. This company form requested the change of its registered office to Italy, while maintaining its national legal status. In this case, Hungarian law provided for the dissolution of such a company in Hungary, except in cases expressly provided for by European law. In its answer to a preliminary question, the European Court of Justice established that Articles 49 and 54 TFEU guarantee the right of a company to change its real seat from one Member State to another. At the same time, the same legal provisions do not prohibit the Member State of origin (Hungary) from requiring the dissolution and liquidation of the company, if the latter has expressed its intention to change its registered office to another Member State.

The jurisprudence on GEIE is not complex, as in the case of SE, but much less.

In the *Case C-402/96 (C402, 1996)*, on 23 December 1996, the Oberlandesgericht (Higher Regional Court), Frankfurt am Main, referred to the Court for a preliminary ruling under Article 177 of the EC Treaty a question on the interpretation of Article 5(a) of Council Regulation (EEC) No 2137/85 of 25 July 1985 on the European Economic Interest Grouping (EEIG) (OJ 1985 L 199, p. 1, 'the Regulation'). That question was raised in proceedings in which the Amtsgericht (Local Court), Frankfurt am Main, refused to enter European Information Technology Observatory, Europäische Wirtschaftliche Interessenvereinigung ('EITO'), an undertaking in the process of formation, with its official address in Frankfurt am Main, in Part A of the commercial register, on the ground that under German law the name of an Europäische Wirtschaftliche Interessenvereinigung, namely a European Economic Interest Grouping ('EEIG' or 'grouping'), may be derived only from purely personal names or from personal names with further additions, but the EEIG may not be registered if its name is purely descriptive of the object of the undertaking. The Landgericht (Regional Court), Frankfurt am Main, upheld, by order of 21 June 1995, the Amtsgericht's refusal of that registration and EITO appealed to the Oberlandesgericht Frankfurt am Main. Before those courts, EITO claimed that the refusal to register it in the commercial register was contrary to Article 5(a) of the Regulation, according to which a contract for the formation of a grouping is to include either the words 'European Economic Interest Grouping' or 'EEIG', unless those words or initials already form part of the name. The Oberlandesgericht considered that EITO's appeal was not well founded and refer the following question to the Court of Justice for a preliminary ruling: 'Is Article 5(a) of Council Regulation (EEC) No 2137/85 of 25 July 1985 on the European Economic Interest Grouping to be interpreted as meaning that, apart from the additions of "European Economic Interest Grouping" or "EEIG", the name or business name of an EEIG may consist of a purely descriptive designation, even where internal law in principle precludes the use of such a name for the formation of a European Economic Interest Grouping?' The Court ruled that Article 5(a) of Council Regulation (EEC) No 2137/85 is to be interpreted as meaning that the business name of an EEIG must include the words 'European Economic Interest Grouping' or the initials 'EEIG', while the other elements to be included may be imposed by the provisions of internal law applicable in the Member State in which the grouping has its official address.

As regards the SCE, there are no significant decisions that have had an impact on the existing European legislation on the matter. We therefore consider that, in the absence of relevant case law, the rules established by the CJEU on freedom of establishment, which have been established in relation to other European company forms, previously examined, apply, subject to the legislation on the SCE.

4. CONCLUSIONS

The examination of European corporate forms is very important, as it allows knowledge of the mechanisms that favor cross-border mobility and the conduct of business in the community area.

By determining an appropriate legal framework, at the Union level, of several types of distinct legal structures, the aim was to facilitate economic cooperation between legal entities from the Member States of the Union, which carry out commercial activities, with a view to developing the internal market, which is based on the freedom of establishment, expressly enshrined in art. 49-54 TFEU.

According to the legislation examined above, an SE was created in order to enable companies from the Member States to undertake and reorganize their activities at the community level. The establishment of an SE does not determine the removal or diminution of existing practices regarding the involvement of workers, the latter aspect being detailed in Council Directive 2001/86/EC, to which I have referred.

A significant advantage of an SE is that the latter can transfer its registered office to another state, without its dissolution and re-establishment intervening, thus eliminating the obstacles to these latter procedures. However, in addition to this cross-border mobility, the dissolution, liquidation or insolvency of an SE are governed by the national law of the Member State in which the SE has its registered office.

In the same sense, the uniform EU legal framework on the SE aimed to simplify corporate governance and facilitate the conduct of cross-border commercial activities, thus strengthening the position of companies in the internal market.

The creation of the EEIG aimed to develop a harmonious internal market, through efficient cross-border cooperation between individuals, companies or other legal entities in the Member States. The aim was thus to eliminate legal, fiscal and psychological barriers, by establishing a uniform European legislation in the field. Such a corporate form aimed to develop the economic activities of its members, to support them, in order to achieve the highest possible profits.

The number of SCEs registered in the territory of the Member States is much lower compared to that of the existing SEs, which has led to the lack of relevant case law on SCEs.

We also believe that the establishment of the EPC would be very useful for the development of SMEs, given that their number is significant in the Union.

A unitary EU legal framework in this area thus ensures greater consistency in the conduct of commercial activities by specific European legal entities, thus removing legal, administrative or other barriers imposed by national legislation in the Member States.

In the same sense, the case law commented on above has contributed significantly to the efficiency of economic operations, being binding on the Member States of the Union. The latter must, at the same time, maintain much closer cooperation in order to respect and uniformly apply the legislation and case law created at Union level in the area under analysis, thus eliminating different interpretations that might exist at a given time.

The decisions on SEs briefly presented above are significant in this regard.

Also, in case C-402/96, the Court ruled that Member States may not lay down additional requirements or requirements which differ from those laid down in Regulation (EEC) No 2137/85 or which that Regulation leaves to the discretion of the Member States. Furthermore, by this decision, the scope of intervention by Member States is restricted to matters relating to registration or winding-up proceedings.

The case-law of the CJEU has therefore sought to ensure that specific European entities carrying out commercial activities are able to facilitate cross-border cooperation, with Member States being obliged not to create obstacles to this effect through national legislation.

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INVISIBLE FILTERS: HOW DIGITAL AND HUMAN BIAS SHAPE WOMEN'S JOB SEARCH IN HIGH-TECH. EXPLORING ORGANIZATIONAL GATEKEEPING, AI TOOLS, AND THE GENDERED HIRING EXPERIENCE IN THE DIGITAL AGE

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Abstract

Despite the growing emphasis on diversity and inclusion, women continue to face disproportionate challenges in securing leadership and technical roles within the high-tech sector. This study explores the job-seeking phase through an organizational lens, revealing how both human and algorithmic biases perpetuate gender disparities. Drawing on qualitative interviews with women professionals in high-tech – including VPs, HR leaders, and mid-career candidates – this research surfaces patterns of exclusion masked by seemingly neutral recruitment practices. Participants reported being asked inappropriate questions about motherhood and travel commitments, while others described feeling "out of the loop" despite holding senior roles in global firms. The study also examines the unintended consequences of digital hiring platforms and AI-driven applicant tracking systems, which may reinforce rather than reduce bias. By combining empirical insights with contemporary literature on digital governance, algorithmic decision-making, and gender inequality in hiring, the paper calls for more transparent and inclusive recruitment systems. It proposes actionable organizational strategies to ensure equitable access to high-tech careers in the digital age.

Keywords: *digital age; gender bias; high-tech industry; AI recruitment tools; digital discrimination; women in leadership.*

JEL Classification: J16; M5; O33; M14; D83.

1. INTRODUCTION

As artificial intelligence (AI) becomes more common in recruitment, it promises to make hiring faster and more objective. Many companies now use digital tools like applicant tracking systems (ATS), algorithmic shortlisting, and online profile filters to handle large volumes of applications. These systems are promoted as neutral and efficient, but recent research shows they can reproduce

old biases in new ways. For women seeking leadership jobs in high-tech – an industry already known for gender inequality – these tools can quietly reinforce barriers rather than remove them.

This study explores how both human judgment and algorithmic filters shape women’s job-seeking experiences in high-tech. While much attention has been paid to diversity goals and inclusive hiring, there is still little understanding of how bias works in the early stages of recruitment, where many decisions are made invisibly. Digital systems often rely on past hiring data, which reflect male-dominated work histories. As a result, algorithms may prefer linear, jargon-heavy résumés or penalize career breaks and modest self-presentation – patterns that can disadvantage women. At the same time, human recruiters continue to rely on informal networks, “cultural fit,” and sponsorship, creating a complex mix of digital and social exclusion.

The study draws on qualitative interviews with women and senior professionals in Israel’s tech sector, combined with existing research on algorithmic bias, gender stereotypes, and workplace networks. Using theories from organizational sociology, psychology, and digital ethics, the paper shows how bias moves between people and machines. It also offers practical solutions: making hiring systems auditable, removing gendered language in job ads, using structured interviews, and tracking where women drop out of the hiring pipeline.

By understanding where and how bias operates – often silently – this study contributes to building more inclusive and fair recruitment systems in the high-tech industry. Recent studies also note that gender, age, and technological literacy shape how professionals engage with AI systems themselves (Draxler *et al.*, 2023), underscoring that digital adoption is never entirely neutral.

2. THEORETICAL FRAMEWORK

This study combines three well-established lenses to explain why women still face hidden barriers when they look for leadership jobs in high-tech and how those barriers now mix with AI tools.

First, ***Gendered Organization Theory*** argues that firms are built on an “ideal-worker” image that suits a man with no family breaks and a 24/7 schedule (Acker, 1990). Job descriptions, performance metrics and historic hiring data all encode that model. When a résumé-scoring algorithm is trained on such data, it simply learns yesterday’s male-centred pattern and reproduces it. Human managers do the same when they favour candidates who “fit the culture,” which often means fitting that embedded masculine norm. Thus, structural bias is baked into both digital and human gatekeeping long before a woman reaches an interview.

Second, ***Role Congruity and Lack-of-Fit Theory*** explain how individual evaluations add another layer of bias. Leadership in tech is stereotyped as agentic – assertive, decisive and always available – whereas women are stereotyped as communal and family-focused (Heilman, 2001; Eagly and Karau,

2002). When a woman displays the required agentic traits, she may be judged as unlikeable; when she does not, she is seen as under-qualified. This double bind depresses ratings of competence, salary offers and promotion chances, a pattern shown in laboratory experiments and field audits alike. AI systems trained on past promotion data inherit the same distorted signals: fewer historic female promotions teach the model that female applicants are a “riskier” bet, even if gender is not an explicit variable.

Third, *Social Capital Theory* highlights how careers depend on networks and sponsorship. Senior posts in tech still circulate through male-dominant referral chains and informal ties; women gain fewer influential contacts and are less likely to have a sponsor who will push their candidacy (Mickey, 2022; Contreras *et al.*, 2024). Platform algorithms that rank profiles or deliver job ads mirror these network gaps, giving men wider reach and reinforcing what Burt (2005) calls the advantage of “brokers” embedded in rich networks.

Taken together, these theories show a multi-level system of exclusion. Gendered structures feed biased data into algorithms, stereotype mismatch skews human and machine judgments, and unequal networks starve women of critical sponsorship. Understanding this interplay guides our analysis of interview evidence and points to integrated solutions: rewrite role criteria, audit and retrain hiring AI, and build formal sponsorship programmes that widen women’s social capital and break the cycle of invisible filters.

3. LITERATURE REVIEW

This review funnels from the broad strategic role of digital HR to the specific, intersecting biases that impede women’s advancement in high-tech hiring. It integrates seventeen core studies (see References) and is organised around six themes.

3.1. Digital Strategy & Competitive Advantage

AI-enabled recruitment systems are now marketed as engines of speed, scale and “talent intelligence”, aligning HR with digital-transformation agendas (Bogen and Rieke, 2018). Upturn’s audit found that 98 per cent of Fortune 500 firms use an Applicant-Tracking System (ATS), and almost half embed machine-learning models to rank or short-list applicants (Bogen and Rieke, 2018). From a resource-based view, such tools should enhance competitive advantage by securing scarce skills faster.

Yet evidence shows that algorithmic filters can also erode innovation capacity if they replicate historic homogeneity (Raghavan *et al.*, 2020). Amazon’s résumé-scoring pilot learned to demote candidates from women’s colleges because its training data were overwhelmingly male (Dastin, 2022). With the draft EU AI Act classifying recruitment algorithms as “high risk” and

imposing mandatory bias audits (Lütz, 2024), bias-resilient hiring is no longer optional; it is a strategic compliance and reputational imperative.

3.2. Diversity as Strategic Human Capital

A rich stream links gender diversity to market performance and creativity. Firms in the top quartile for female leadership are 25 per cent more likely to exceed industry profitability medians (Ibarra, Carter and Silva, 2010). Conversely, homogenous teams may suffer “diversity debt” that surfaces later as lost innovation (Moss-Racusin *et al.*, 2012). Moss-Racusin’s study showed that science faculty – male and female – rated identical CVs higher when labelled “John”, offered him USD 4,000 more, and promised greater mentoring (Moss-Racusin *et al.*, 2012). When such micro-inequities accumulate, organisations forego the very creativity they seek from digital talent initiatives.

3.3. Leadership Pipelines & Sponsorship

The “leaky pipeline” in tech is widest at the sponsorship stage: women report similar levels of mentoring but are 54 per cent less likely to have a sponsor who actively advocates for them (Ibarra *et al.*, 2010). Hewlett (2013) found that sponsored employees are 30 per cent more likely to obtain stretch assignments – crucial for senior roles – yet only 18 per cent of high-performing women surveyed could name a sponsor. Digital platforms magnify the gap: a large-scale LinkedIn scrape revealed that male executives enjoy denser, higher-status networks, boosting algorithmic visibility in recruiter searches (Contreras *et al.*, 2024). Mickey’s (2022) ethnography in Silicon Valley shows that informal social events (hackathons, gaming nights) serve as gateways to sponsorship, but women are often peripheral to these circles.

3.4. Recruitment & Selection Bias (Human)

Before algorithms, gendered organisations already advantaged men (Acker, 1990). Heilman’s (2001) lack-of-fit model posits that evaluators expect leadership to be agentic and see women as communal; women who display assertiveness face social penalties, while those who do not are deemed weak. Correll *et al.* (2007) quantified the motherhood penalty: mothers were 80 per cent less likely to be recommended for hire and offered 7 per cent lower salaries than identical non-mothers. Rivera (2012) adds that “cultural matching” leads interviewers to choose candidates who share leisure pursuits and class markers, indirectly reinforcing male dominance in elite tech hiring.

3.5. Algorithmic Hiring Systems

Commercial AI tools promise objectivity but often entrench historical patterns (Bogen and Rieke, 2018). In Upturn’s review, eight of ten résumé-parsing vendors filtered out CVs with employment gaps – a proxy that

disproportionately penalises women returning from maternity leave (Bogen and Rieke, 2018). Raghavan *et al.* (2020) identify five common myths (e.g., “removing gender solves bias”) and show that proxy features continually re-emerge. Field experiments paint an ambivalent picture: Avery *et al.* (2024) found that gender-blinding and skills-based scoring raised female short-listing by 12 percentage points, while un-audited tools in the same trials favoured men. Langenkamp *et al.* (2020) outline “fair-by-design” principles – counterfactual testing, balanced data, explainability – that reduce disparate impact but remain exceptions, not the norm.

Table 1. Layers of Gatekeeping in Tech Hiring

Layer	Description	Reference
Stage 1 – Algorithmic Filter	AI résumé-screening tools, trained on male-dominated hiring data, rate women lower or penalize “female” signals (e.g., women’s colleges, career breaks).	Dastin (2022)
Stage 2 – Human Filter	Recruiters apply informal criteria like “cultural fit,” often choosing candidates similar to the current male-dominated team.	Rivera (2012)
Stage 3 – Network Filter	Access to final roles depends on informal sponsorship networks, where women are underrepresented.	Hewlett (2013)

Source: developed by the author

3.6. Synthesis & Leadership Implications

The literature reveals a circular pattern of exclusion: past male-heavy hiring produces biased data; that data trains algorithms to prefer male profiles; human interviewers then validate these “objective” rankings through notions of cultural fit; and the resulting all-male sponsorship networks feed the next hiring round. To disrupt this loop, organisations must combine three levers. First, they should subject all recruiting algorithms to regular bias audits and bring them in line with the EU AI Act’s fairness requirements (Lütz, 2024). Second, hiring decisions should rely on structured interviews and mixed-gender panels, an approach shown to dampen role-incongruity effects (Heilman, 2001). Third, leadership scorecards need explicit metrics for sponsorship and advancement of women, making senior managers accountable for building diverse pipelines (Hewlett, 2013). Firms that integrate these steps transform diversity from a compliance chore into a strategic resource, boosting innovation while satisfying growing regulatory and ESG demands.

4. METHODOLOGY

This study uses a qualitative approach to explore how digital and human biases affect women's job search in high-tech. Data was collected through 19 semi-structured interviews with professionals from the Israeli tech sector. The sample includes 17 women and 2 men, aged 28 to 55, with roles such as development managers, product managers, team leads, founders, VPs of R&D, DEI and HR managers, and a CEO. Interviews were conducted remotely, lasted 45 to 75 minutes, and all participants gave consent for recording and anonymous use of their input.

The conversations focused on personal career experiences, hiring dynamics, and perceived barriers in recruitment. Open-ended questions allowed participants to bring up themes like algorithmic screening, informal networks, motherhood bias, and visibility gaps. Transcripts were analyzed using thematic content analysis, with emerging patterns grouped into categories such as digital gatekeeping, confidence and visibility, and organizational culture.

The findings were then interpreted in light of existing literature on gender and bias in hiring. This helped connect individual stories with broader structural patterns and offered a deeper understanding of how digital tools and workplace culture interact to shape outcomes. The combined use of interviews, content analysis, and literature review supports a multi-layered view of gender inequality during the job-seeking phase in high-tech.

5. FINDINGS AND DISCUSSION: WHERE BIAS HIDES – FROM HUMAN FILTERS TO ALGORITHMS

5.1. Human Filters: A Familiar but Persistent Barrier

While the emphasis of this study is digital bias, interviews reveal that traditional human biases persist. These biases include overt experiences, such as inappropriate questions about family life, and subtler dynamics like confidence gaps and networking exclusions.

“Some women hesitate, thinking, ‘What if I get pregnant quickly and have to announce it a few months into the job? How will it be perceived?’” – Participant 5

Such hesitation reinforces what is commonly referred to as the motherhood penalty (Correll *et al.*, 2007), which penalizes women for their potential caregiving responsibilities.

“I often receive applications from men who don't meet the requirements at all. But women rarely apply unless they meet all the listed criteria.” – Participant 5

This finding aligns with Hewlett *et al.* (2010), who found that women often underestimate their readiness for leadership roles, contributing to underrepresentation at higher levels.

Professional networks also serve as exclusionary filters:

“Many promotions happen through informal connections – alumni networks, military units, or even things like playing soccer with colleagues after work.” – Participant 5

These informal spaces reproduce gendered access to leadership, echoing Acker’s (1990) theory of gendered organizations and Ibarra *et al.* (2010)’s work on network-based advancement.

5.2. Digital Filters: The Rise of Algorithmic Gatekeeping

As hiring processes digitize, participants described new layers of exclusion that feel more neutral but are equally, if not more, discriminatory.

A central concern raised by participants is the role of algorithmic screening tools, particularly applicant tracking systems (ATS), in perpetuating gender bias. These systems often reward linear, jargon-heavy resumes - formats historically aligned with male-dominated career trajectories (Bogen and Rieke, 2018). As one participant noted, “If your CV doesn’t scream ‘developer’ in the first three lines, the system might never surface it.” This structure disproportionately penalizes women whose resumes reflect career breaks due to caregiving or who use more modest language in self-presentation. Both Heilman (2001) and Gaucher *et al.* (2011) highlight the influence of gendered language in shaping perceptions of competence, which can significantly affect algorithmic parsing and ranking of applicants.

Beyond ATS, visibility bias also emerges from the sourcing practices used by platforms such as GitHub and LinkedIn. Recruiters frequently rely on “top contributor” filters or public activity metrics to identify promising candidates. However, this approach tends to favor those who are constantly visible online, a category that often excludes women with greater caregiving responsibilities or less inclination toward public self-promotion. “We use filters like ‘top contributors’ – but that already filters out many women,” remarked one participant. Another observed, “If you’re not always online or visibly ‘out there,’ you just don’t get found.” This aligns with Mengel’s (2020) findings, which demonstrate that women engage less frequently in visible self-promotion on professional platforms, leading to lower algorithmic discoverability.

Finally, the use of AI-driven referral algorithms introduces a feedback loop that reinforces demographic homogeneity. These tools often suggest candidates who resemble prior successful hires, thus replicating existing biases under the guise of data-driven neutrality. As one participant reflected, “Our tools suggest candidates based on who succeeded before. It’s self-fulfilling.” This phenomenon echoes Cowgill and Tucker (2020) research, which showed that algorithmic recommendation systems tend to mirror entrenched organizational preferences, rather than challenge them. Together, these digital filters – while ostensibly neutral – form an opaque gatekeeping system that systematically disadvantages women at multiple stages of the hiring funnel.

5.3. The Human–Machine Loop: Bias Reinforced by Design

Rather than eliminating bias, technology often conceals it. Blind screening efforts, while well-intentioned, are frequently bypassed:

“We removed names on CVs, but the hiring manager Googled them anyway.” – Participant 5

This illustrates the limitations of technical fixes in the absence of cultural change. As Eubanks (2018) and Citron and Pasquale (2014) warn, algorithmic tools can create a false sense of objectivity, making bias harder to detect and address.

5.4. From Black Boxes to Clear Pathways: Rethinking Digital Recruitment

To counteract these layered forms of discrimination, this study recommends the following:

To begin addressing digital hiring bias, one crucial intervention is the implementation of auditable applicant tracking systems (ATS). Rather than treating algorithmic processes as black boxes, these systems should log decisions and provide transparency around when and why candidates are excluded. As Raji *et al.* (2020) argue, such auditability enables organizations to identify where biased outcomes emerge and take corrective action, transforming ATS from passive filters into tools for accountability.

Another vital area for intervention is the language used in job descriptions. Participants noted that overly specific or jargon-heavy listings can unintentionally signal a preference for traditionally male-coded career paths. This aligns with Gaucher *et al.* (2011) findings that gendered language can significantly deter women from applying to roles. By stripping listings down to essential criteria and using neutral, inclusive language, companies can broaden their applicant pool and reduce self-selection out of the process.

Blind screening was also highlighted as a practice with the potential to reduce early-stage bias. By removing identifiers such as names, gender, or alma mater during initial evaluations, organizations can minimize the influence of unconscious stereotypes. However, participants stressed that blind screening should not stand alone. It should be followed by structured interviews that apply the same evaluation criteria to all candidates. Bohnet (2016) found that structured processes greatly improve objectivity and fairness compared to informal, impression-based interviews.

Finally, the systematic collection and analysis of gender-disaggregated data across hiring stages emerged as a key recommendation. By tracking gender ratios at each step – application, shortlisting, interviews, and offers – organizations can detect where attrition or exclusion occurs. This “leakage mapping” allows for targeted intervention and continuous improvement in equitable hiring practices, rather than relying on broad or symbolic diversity goals.

“If you don’t track who gets to the interview stage, you’ll never know where the leak happens.” – Participant 5

This approach encourages ethical AI governance and inclusive hiring practices, aligning technology and human values toward greater equity.

6. CONCLUSION

This study set out to explore how invisible filters – both human and digital – shape women’s job-seeking experiences in high-tech. Through interviews with professionals across development, HR, DEI, and executive roles, a clear pattern emerged: even as hiring becomes more automated, bias has not disappeared – it has only changed form. The findings reveal that applicant tracking systems, visibility algorithms, and referral tools often replicate past inequalities under a neutral interface, while human decision-makers still fall back on informal networks and cultural assumptions.

Three theoretical lenses helped unpack this dynamic. Gendered Organization Theory explained how legacy structures define the “ideal candidate” in ways that exclude those who don’t match a male-centered norm. Role Congruity Theory showed how women face a double bind: seen as either underqualified or unlikeable depending on how they present leadership traits. Social Capital Theory illuminated the network gap – how access to referrals, sponsors, and visibility continues to favor men in subtle, cumulative ways.

Together, the data and theory point to a system that excludes by default, unless deliberately challenged. Bias is not only a matter of bad actors or outdated mindsets – it is embedded in the tools, metrics, and models organizations use every day. But bias is not immutable. This study highlights concrete interventions: audit your ATS, redesign job criteria, blind early screenings, structure interviews, and track leakage points. These actions help shift recruitment from a black box to a transparent system, aligning digital innovation with fairness.

As hiring enters a new algorithmic era, inclusion must not be left behind. If tech companies truly aim to lead in both innovation and equity, they must treat bias not just as a social issue but as a design flaw – one that can and must be fixed.

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MANAGING A CHANGE IN THE IMPLEMENTATION OF AN
ELECTRONIC MEDICAL RECORD IN HOSPITALS: HEAD
NURSES' ROLE AS CHANGE LEADERS –
A NARRATIVE LITERATURE REVIEW

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Abstract

The implementation of an electronic medical record (EMR) in hospitals constitutes a process of complex organizational change, integrating technological, procedural, and cultural aspects. Nursing staffs, particularly head nurses, are at the front of the process, being the largest professional group in the healthcare system and main users of clinical recording systems. Despite their centrality, many head nurses are required to lead the implementation process without any designated training or formal preparation for change management. This narrative review explores head nurses' role in the promotion of EMR systems implementation, with a focus on management challenges and successful action methods. The review has identified recurrent barriers, including: staffs' resistance to change, documentation overload, digital orientation gaps, lack of organizational support, and incompatibility between the system structure and existing work processes. Moreover, the review presents efficient implementation strategies, such as: preliminary involvement of the field, gradual and adapted training, continuous support, open communication, and local adjustment. The paper's main conclusion is that head nurses should be acknowledged not only as clinical leaders, but also as strategic partners and organizational change agents. Hence, they should be offered structured training, practical management tools, and systemic support. Finally, the review recommends promoting future studies that examine the impact of advanced management training on the implementation quality and stability over time.

Keywords: *Electronic Medical Record (EMR); head nurses; organizational change; implementation strategies; change management in nursing.*

JEL Classification: M1; I1; I18.

1. INTRODUCTION

The implementation of an electronic medical record (EMR) in the healthcare system is a complex and challenging organizational process that involves both technological, procedural, and cultural changes (Kabukye *et al.*, 2020). During the last decade, digital information systems have become a cornerstone in the infrastructure of advanced healthcare systems, enhancing the quality and safety of patients' care, increasing procedural efficiency, and making clinical information accessible to medical staffs in real-time (Cresswell *et al.*, 2021; Dhingra and Dabas, 2020). The EMR is not only a system of recording patients' care processes. Rather, it reflects organizational work processes, facilitates a consistent follow-up of patients' condition, and serves as a management and support tool for making clinical and management decisions (Sutton *et al.*, 2020).

Nursing staffs and, especially, head nurses are a key component in the implementation process. Nurses are the largest group among healthcare professions, and they are the main users of the EMR system (Strudwick *et al.*, 2017). Due to their direct and constant involvement in daily patients' care, the use of the EMR system is one of the most comprehensive and meaningful activities. Nevertheless, in spite of their crucial involvement, many head nurses have to lead the implementation processes without any designated training in change management, lacking necessary skills of management, communication, planning, and staff support. Consequently, the main gap resides in the fact that in most cases they have no formal professional tools for performing this management role.

In Israel's state-owned hospitals, head nurses are chosen through a public tender that includes a professional committee of examiners. The job requirements focus on clinical experience, academic training, staff management competences, and extensive professional understanding. Yet, candidates are not required to have a formal training in management. In some organizations, according to the policy of the nurses' manager, head nurses are offered the option of attending designated advanced management courses ("senior management course"). These courses are designed for head nurses and deputy head nurses, but are not mandatory for this position. Hence, many head nurses assume this role without any comprehensive training and tools for managing a change and leading systemic processes.

Due to the centrality of nursing staffs in hospital care processes, the nurses' conduct, particularly that of head nurses, is crucial for a successful implementation. Head nurses play a dual role. On the one hand they are clinical and management leaders who are in charge of the ward and of the staff's functioning. On the other hand, they constitute a connecting link between the hospital management and the field (Strudwick *et al.*, 2019), being responsible for implementing a policy of quality and safety of the patients' care, as well as managing structural and clinical changes. Head nurses' role consists of recruiting the staff, creating motivation, settling conflicts and coping with

resistance to changes (Alqahtani *et al.*, 2017; Cresswell *et al.*, 2021). This role becomes especially vital in an era whereby an extensive conceptual and technological change is required, e.g., EMR system implementation, rendering the topic of this paper very important.

By reviewing the existing literature, this paper aims to provide an insight about change management in the processes of EMR system implementation, while focusing on head nurses' role. The review relates to theoretical models of change management, head nurses' management and leadership functions, common challenges in the implementation process, recommended strategies of change promotion, and contribution of implementation to the quality and safety of patients' care.

Structure of the paper: This paper begins by presenting the theoretical aspects of change management in healthcare organizations, providing a foundation for the understanding of organizational transformation processes. It then explores the role of head nurses as leaders of change, emphasizing their impact on team dynamics and implementation success. Next, the discussion focuses on the challenges and barriers that arise during the implementation of Electronic Medical Record (EMR) systems. This is followed by an examination of the way EMR implementation affects the quality and safety of patients' care. Finally, the paper outlines key management strategies that can support and promote successful implementation of EMR systems in clinical settings.

Definition of Key Terms: In the present paper, by *Electronic Medical Record (EMR)* we refer to a digital version of a patients' paper chart that enables the storage, retrieval, and management of medical information within a healthcare organization. The term *head nurse* refers to the senior nurse responsible for supervising nursing staff, managing departmental operations, and leading changes in clinical practice at the ward level.

2. THEORETICAL ASPECTS OF CHANGE MANAGEMENT IN HEALTHCARE ORGANIZATIONS

The updated empirical literature illustrates that an organizational change in healthcare systems is a complex process. It involves emotional, professional, and cultural challenges, particularly when this concerns implementation of new technologies, such as electronic medical record (EMR). Implementation of clinical information systems is considered today as one of the key tasks of modern healthcare institutions. However, their success depends less on technological developments themselves, and more on the ability of the organization to manage an effective change among both the workers and managers (Cresswell *et al.*, 2021).

A technological change of this kind is perceived as a deep socio-organizational change, since it touches the core of the clinical practice – recording, decision-making, inter-profession communication, and work culture. EMR systems do not only change the work tools, but also affect perceptions and

professional identity of staff members, in particular nurses that constitute their main users. Hence, managing the implementation process requires a theoretical and practical comprehension of the organizational change principles.

Several theoretical models assist in the understanding of change management. One of the common models is the 8-stage model of Kotter (1995). This model proposes a systematic methodology for the implementation of an organizational change that involves, among others, creating a sense of urgency, setting up a coalition of leaders, developing a vision and strategy, communicating the vision, eliminating obstacles, attaining short-term victories, consolidating the achievements, and implementing the change in the organizational culture. Within the framework of the literature review in the field of healthcare, the change model devised by Kotter (1995) has been the most extensively implemented in projects of change, especially in the context of improved quality, clinical change, and technologies implementation, mainly on the ward or unit level (Harrison *et al.*, 2021). Implementation of the model in projects under the leadership of nurse teams illustrated a significant improvement in indices, such as team-based communication, patients' safety, and efficient work processes.

The review of Harrison *et al.* (2021) demonstrates that the strength of Kotter's model does not reside in formal tutoring for action. Rather, it creates a proper framework that leads change agents in the understanding, planning and management of the implementation process over time. The model has helped clinical leaders, among them head nurses, in identifying crucial points of the process, motivating staff members' motivation, and ensuring stable and long-lasting changes. Integrating the model with additional methods of quality and implementation management has been proven efficient for the creation of a change-supporting organizational culture, particularly when the change agents were members of the clinical staffs and not only of the organization's management. Moreover, a complex process such as implementation of a clinical system, requires a strong departmental leadership, in particular by the head nurses, in order to mediate the change vision, break it down into activities in the field, and lead the staff in areas of uncertainty.

The model conceived by Kotter (1995) offers a basic infrastructure for understanding a complex environment in the healthcare system and it has served as a foundation for structuring many change processes in the implementation of medical information systems. In a study of EMR system implementation conducted in a South African hospital, the participants reported that the Kotter model had served as a basis for understanding the complex change and assisted in analyzing the workers' changing conduct while using the system (Msomi *et al.*, 2021).

Another highly valuable model is the Technology Acceptance Model (TAM) devised by Davis (1989). It focuses on psychological factors that motivate users to embrace a new technology. According to this model, two key variables affect the intention of use in practice: perceived usefulness and perceived ease of use. In

other words, workers will adopt the system if they believe it improves their work and can be used rather easily. Studies of nursing have found that when nurse teams understand the clinical contribution of the EMR system – for example: prevention of errors, accessibility of information, improvement of recording, and sufficient training experience – the degree of adoption and commitment to change is considerably higher (Alanazi *et al.*, 2020; Kruse *et al.*, 2016).

In this context, head nurses play an important role of mediating between the technological system and the staff. Head nurses' ability to transmit the message, i.e., what is the usefulness of the system to each and every nurse, or how does its use become easy, directly affects the positive response. From this aspect, the TAM model allows planning and preliminary management of supportive steps: adapting the user's interface, reducing mental overload, enhancing the training, and so on (Holden and Karsh, 2010).

In addition to specific models, a central concept in change management is Organizational Readiness for Change, both on the organization and staff level, and without it, an organizational change might fail. This concept encompasses the staff members' emotional commitment to change, the belief in the collective ability to implement it, and the available organizational resources (Weiner, 2008).

Studies indicate that preliminary assessment of the level of readiness allows identification of crucial gaps even prior to the implementation, cope with them in an initiated manner and, thus, considerably improve the project's chances of success (Kabukye *et al.*, 2020). A study conducted in northern Ethiopia showed that organizations that had performed a readiness assessment, including examination of the staff's positions, technological training, and existing infrastructures, were more successful in workers' recruitment, resistance reduction, and promotion of an effective and meaningful EMR system implementation (Yilma *et al.*, 2023). The researchers underscored that low readiness level could lead to difficulties in the implementation and to the staffs' sense of frustration. Another review (Afrizal *et al.*, 2019) illustrated that organizations that had not performed a regular readiness assessment, tended to face barriers, such as lack of digital competence, negative attitudes towards change, and work overload that rendered the adoption of the technology much more difficult.

To sum up, effective change management in healthcare organizations, e.g., EMR system implementation, is a process that requires leadership, planning, and comprehension of human dynamics. The integration of models such as TAM, Kotter's model (1995), and Organizational Readiness for Change, facilitates a systemic view that supports the planning of the implementation in advance and the optimal response to challenges that emerge during the implementation of the change. In this sense, the understanding that a successful implementation process has both technical and social aspects allows the management and the head nurses to plan proactive steps, design a vision and collaboration, tutor and support the staff, and ascertain that the organization is ready for the change.

3. HEAD NURSES' ROLE AS CHANGE LEADERS

During the last decades, the healthcare system experienced frequent and continuous changes that were sometimes radical: structural, technological, budgetary, and clinical. These changes were not one-time events but rather a continuous organizational situation (Morrison and Jensen, 2022). Within this dynamic reality, the nursing staffs are the first to experience the practical effects of these changes, either in the implementation of an EMR system, organizational mergers, or transition to a new policy of quality. In fact, nurses, and mainly head nurses, manage the field and lead the change implementation from theory to practice.

Updated studies illustrate that head nurses perceive the change as an inseparable part of their work life. Most of them have experienced throughout their career a continuous sequence of re-organization, process improvement, and system upgrading (Salmela *et al.*, 2013). They consider themselves as leaders of a daily change, while adjusting the functioning of the department and the staff to changing needs, even without being formally called “change managers” (Salmela *et al.*, 2013). Moreover, from the head nurses' point of view, a change is also an opportunity for improving patients' care. However, it is always accompanied by uncertainty and a sense of responsibility burden, particularly when they do not have sufficient authority, support, or time to lead the change in an optimal way. As indicated by the participants in the Finnish study conducted by Salmela *et al.* (2013), they described themselves as active yet at the same time “bystander observers”: involved daily but without really having an impact on the shaping of the wide organizational process.

In the case of leading a change and implementing an EMR system, head nurses' role consists of three central layers (Arabi *et al.*, 2022): professional leading in practice – tutoring, supervision, coordination with the IT team and the management; emotional and behavioral support of the staff by providing a response to apprehensions, addressing resistance, making the system accessible; and representing the staff vis-à-vis the management by transferring gaps, barriers, and requests bottom-up.

Arabi *et al.* (2022) conducted a study in Saudi Arabia. Their findings showed that the integration of the local leadership teams, head nurses and super-users, was a crucial component in the successful implementation of an EMR system through a practical collaboration with the hospital management (Arabi *et al.*, 2022). The nurses were trained in advance, served as a source of support for the staff in the field, and organized tutorials that reduced resistance and increased responsiveness, up to a high level of satisfaction among all the teams.

In addition to the practical functioning, the empirical literature engages also in the head nurses' perceptions and personal feelings in times of change. An extensive qualitative study conducted in Denmark (Morrison and Jensen, 2022), found that many head nurses felt “between a rock and a hard place”. On the one hand, the hospital management expected them to accomplish the goals of a rapid

change, and on the other hand, it expected them to demonstrate stability, defense and sensitive leadership (Morrison and Jensen, 2022). The head nurses described an emotional overload, a sense of organizational loneliness, lack of role's clarity and, sometimes, even an undermined management identity. Many felt that they did not have a clear organizational vision, sufficient authority, and no explanations about the expectations from them. This reality entailed a gap between the nurses' values to which they were committed and the operational demands they had to implement. This resulted in burnout, confusion, and even professional anxiety. In other words, whereas in practice they were leading the daily implementation, they were not always involved in the planning, decision-making or support mechanisms of the senior management, namely leading without control.

Hansell (2018) specifies several essential conditions for the success of middle-level managers in change processes: role clarity, active support by the management, a sense of ownership and authority, real involvement in shaping the change, as well as learning and sharing forums. Without these conditions, even committed and experienced managers find it hard to lead a meaningful change. When head nurses feel trust, support, and a sense of belonging to the process, they can propel the staff forward, implement a change in a positive manner, and preserve the value-oriented core of nursing also in times of an organizational change.

In spite of the challenges, head nurses continue demonstrating a deep commitment to the values of nursing also in times of change. They perceive their role not only as managers of a process but also as keepers of the "tradition of concern", namely personal attitude, human care, and value-based professionalism (Salmela *et al.*, 2013). Even when the change is being led from the outside or being dictated by political bodies, head nurses continue seeking ways for translating these values into the new reality, trying to balance between reforms and maintenance of the staff and the patients' well-being.

To sum up this chapter, in an era of constant change in the healthcare system, head nurses' role becomes more crucial than ever. They are the mediators, leaders, and holders of the system between the management and the staff that executes the decisions in practice. A successful implementation of an EMR system or of any other technological change, depends not only on technology or planning, but also on a nursing leadership in the field, a leadership that is connected to the staff and the values, collaborates, and is supported from above. In such a situation, the change process turns from a turmoil into a stimulus of development, from a need to excellence.

4. CHALLENGES AND BARRIERS IN AN EMR SYSTEM IMPLEMENTATION

The transition to the use of EMR in healthcare systems is a strategic move, designed to enhance the quality, safety, and efficiency of patients' care (Sutton *et al.*, 2020). Nevertheless, the process of an EMR system implementation

transpires in a complex environment, characterized by multiple players, systemic pressures, and regulatory demands. The empirical literature indicates that this concerns a multi-layer challenge that comprises technological, organizational, professional and emotional barriers (Alqahtani *et al.*, 2017; Gesulga *et al.*, 2017; Kruse *et al.*, 2016) also among the nursing staff and the head nurses who lead the implementation on the wards' level.

Studies have shown that the resistance of staff members, and particularly of nurses, is not based on technological antagonism but it mostly stems from an entirety of emotions: lack of confidence in personal capabilities, a sense of exclusion from the decision-making process, apprehension of losing control, and a feeling of accumulated burden (Hansell, 2018; Morrison and Jensen, 2022; Salmela *et al.*, 2013). Cho *et al.* (2021) underscore that resistance to change is the main predictor of resistance-oriented behavior in practice, such as partial use, delay in recording information or passive sabotage. The more nurses felt that the system was not useful or encountered difficulties in using it, the stronger was the resistance.

Another key element of the implementation process is burden of documentation in nursing (Gesner *et al.*, 2022). Kruse *et al.* (2016) indicate that one of the phenomena that emerged following the transition to digital documentation is an increased expectation for more detailed documents expressed by management, regulators, and insurance bodies. The system “invites” additional documentation – mandatory fields, automatic alerts, detailed screen representations – expanding the documentation tasks compared to previous systems.

Gesner *et al.* (2022) found a direct relation between burden of documentation and nurses' burnout. Many nurses feel that their daily work focuses more on documentation than on patients' care, leading to fatigue, frustration, and loss of contact with the patients. Documentation is sometimes perceived as a bureaucratic task that has no clinical contribution, especially in the case of dual documentation, unnecessary regulatory demands, and a non-intuitive interface.

A considerable barrier in the implementation process is gaps in the nursing staff's level of digital competence, particularly among older nurses. Tissera *et al.* (2021) describe the lack of confidence, confusion, and fear that older nurses feel more as far as digital systems are concerned. Many of them sense that the computerized system threatens their professional identity and is perceived as a tool that distances them from the patients.

Gesulga *et al.* (2017) emphasize that the lack of effective training and continuous support is one of the highly recurrent barriers in many systems. Head nurses who lead the training in practice, do not always benefit from a comprehensive training themselves, resulting in a dual gap: in their practice as well as in their ability to lead a change.

Studies indicate that one of the main reasons for difficulties in implementation is insufficient organizational support. Hansell (2018) and Salmela *et al.* (2013) argue that head nurses describe a feeling of professional isolation. On

the one hand, the management dictates many demands for leading a change, while on the other hand they do not receive actual backup, formal authority, or involvement in the planning. Kruse *et al.* (2016) identify the lack of technical support, as well as of investment in infrastructures and user interface as one of the barriers that lead to delay, resistance, and dropout from using the system.

Similarly, Arabi *et al.* (2022) indicate that the success of the implementation process depends on the proactive involvement of the field management – with an emphasis on head nurses – in the planning, tutoring and team leading. When this involvement is systematic and is supported by the hospital management, the resistance is reduced and the implementation becomes more successful.

Resistance to the use of an EMR system is not always openly stated. Sometimes, it is manifested by covert behavior, i.e., partial use, delay in documenting the information, or system bypassing. Cho *et al.* (2021) have found that positions of colleagues in the ward directly affect the level of resistance. When there is a supportive atmosphere and positive discourse, the chance of collaboration increases. Head nurses are required to identify these patterns and create a positive and a change-promoting culture among the staff.

To sum up this chapter, the process of an EMR system implementation is not only technological, and is also a deep social, emotional, and organizational process that encompasses aspects of people, organization, and technology. The various barriers reflect the tension between the systemic policy and the clinical field: between regulatory demands and nursing values, between a digital vision and daily burden. Within this arena, head nurses are key figures: they lead, mediate, tutor, and hold the change process. In order to properly accomplish that, a holistic response is required, including: strong organizational support, appropriate training, involvement in planning, emotional and professional support, and flexible mechanisms that facilitate adaptation of the system to the work processes in the ward.

5. IMPACT OF THE EMR SYSTEM IMPLEMENTATION ON THE QUALITY AND SAFETY OF PATIENTS' CARE

The EMR system implementation in hospitals aims to enhance the quality and safety of patients' care. This is achieved by computerized data management, systematic documentation, availability of information in real-time, and support in making clinical decisions. The EMR system is designated to improve dramatically the healthcare service indices. However, the empirical literature depicts a complex picture. On the one hand, evidence-based improvements in a variety of quality indices, while on the other hand operational, technological, and cultural challenges that might delay the materialization of the potential, as well as harm the safety of patients' care (Howe *et al.*, 2018).

Studies illustrate the contribution of the EMR system to the reduction of medication errors, improvement of allergies documentation, identification of drug interaction, and promotion of uniform clinical instructions (Gesulga *et al.*, 2017; Kruse *et al.*, 2016). The integration of a clinical decision support system (CDSS) into the EMR system creates crucial alerts and clinical reminders that enhance the accuracy of patients' care (Sutton *et al.*, 2020).

Many studies showed a decrease in the rates of acquired morbidity, such as infections, pressure ulcers, and post-operative blood clots, mainly when a full medication functionality is applied (Gatiti *et al.*, 2021; Trout *et al.*, 2022). Moreover, studies found shorter clinical reaction times following an improved information accessibility.

The EMR system allows accessibility of multi-disciplinary and accurate data, entailing coordination between nurses, doctors, dieticians, and other professionals (Gatiti *et al.*, 2021). Furthermore, the system enables a systematic monitoring of clinical progress, reduction of documentation duality, and decision-making based on updated information. Studies illustrated a positive relation between the use of the EMR system and the increase in the quality of patients' care regarding chronic diagnoses, discharge efficiency, and patients' satisfaction (Arabi *et al.*, 2022; Gatiti *et al.*, 2021).

In addition to the advantages, studies indicate also errors and operational challenges that might be caused as a result of an unadjusted interface. Howe *et al.* (2018) specify that faults in the EMR system, such as alert fatigue, defective information presentation, or erroneous interface of data documentation have actually caused medical errors that harmed the patients. Bates and Singh (2018) expand the criticism and suggest that together with focused successes, the rate of harms that can be prevented remains high, among others due to documentation overload, erroneous data replication, and lack of tools for active safety monitoring. These findings highlight the importance of developing user-friendly systems, including compliance with the workflow of the caring teams.

The empirical literature indicates that a human factor, particularly head nurses' role, constitutes a key to a successful implementation. When ward managers are involved in the planning, tutoring, and monitoring the use, the staff's satisfaction grows and the likelihood of errors or partial use is decreased (Arabi *et al.*, 2022; Tissera *et al.*, 2021).

To sum up this chapter, the EMR system serves as a major tool for improving the quality and safety of patients' care; yet, it is not a goal by itself. The positive impact depends on the integration of adapted technological design, effective training, supportive organizational culture, and consistent use by all the teams. Head nurses are at a junction where technology, policy and practice converge and, hence, their role in leading a high-quality digital change is essential.

6. MANAGEMENT STRATEGIES FOR PROMOTION OF CHANGE AND SUCCESSFUL IMPLEMENTATION

The EMR system implementation is a wide-range cultural-organizational process that involves a workflow change, documentation processes, decision-making, and coordination between teams. This concerns not only a new technology but also a deep change of the clinical practice. In the past, the documentation and clinical management processes were based on manual records that were many times incomplete, inaccessible in real-time, and frequently suffered from errors in the transmission between teams and in the reading. This work method limited the ability to follow-up the sequence of patients' care, process clinical information rapidly, and coordinate between different position holders, entailing a risk of undermining the quality and safety of the care. The transition to a computerized system aims to enable immediate availability of information, accurate documentation, reduction of errors, and improvement in the process of making clinical and management decisions. The accomplishment of this goal necessitates a setup of management strategies for ensuring that the transition to a computerized system enhances rather than lowers the quality and safety of patients' care.

The empirical literature attributes great importance to a preliminary and meaningful involvement of field staffs, especially head nurses, in the planning stages of the EMR system, the end-users being partners to the design of the interface, the choice of workflows, and procedures writing. The system is perceived more relevant, resistance decreases, and the chances of a successful implementation are rising (Fennelly *et al.*, 2020; Hansell, 2018). Moreover, this involvement assists in the identification of gaps between the system and the clinical reality, facilitating a revision in real-time.

Professional tutoring, offered by stages and according to the needs of different groups (e.g., older nurses, new nurses, or overburdened wards) has been found as an important component in the readiness for implementation (McCarthy and Eastman, 2010; Tissera *et al.*, 2021). In addition to basic technical training, it is important to create an organizational learning culture: simulations and ward practice, short and recurrent tutoring, super-users among the staff, and available continuous support also after the implementation. This approach increases a sense of self-efficacy and decreases uncertainty, particularly during periods of transition.

Effective management communication is a cornerstone of a successful change. Various studies recommend scheduling an open and transparent discourse with the staffs, rendering accessible not only the technical information, but also the logic, aims, and stages of the process (McCarthy and Eastman, 2010). Furthermore, messages should be adapted to the decision-makers in the ward, including a response to questions such as: How will the system improve my patients' care? Where am I likely to encounter difficulties? What is expected

to remain unchanged? (McCarthy and Eastman, 2010). Such communication builds trust, reduces resistance, and enables a professional discourse also in periods of organizational tension.

Side-by-side with the support of the field staffs, it is important to invest in head nurses' training as managers of the implementation process in the ward. Many head nurses fulfil in practice the role of a change manager, but not always have they received tools for that. The empirical literature recommends equipping head nurses with knowledge and tools from the field of change management, among others: models such as the 8-Step Model conceived by Kotter (1995), that focuses on the mobilization of vision, elimination of barriers, and implementation of change in the organizational culture; the Awareness, Desire, Knowledge, Ability, Reinforcement (ADKAR) model, that suggest focusing on the individuals: raising awareness, building a desire, inculcation of knowledge, practice abilities, and reinforcement (Paramitha *et al.*, 2020). Through these models, head nurses can understand where every team member is from the aspect of readiness for change, and build an adapted response, both emotional, professional, and functional.

In order to lead a complex change process, the head nurses' management competences should be expanded. The required tools include: stakeholders' analysis and resistance management, prioritization of overloads and time management, inter-team communication and discourse with the management, formulating procedures and planning a tutoring layout, as well measuring the success of the implementation and monitoring the staff's reactions. In other words, head nurses actually become change project managers and, therefore, they should be offered the appropriate training, authority and backup.

On top of head nurses' activity in the field, it is highly important to provide the systemic conditions that will help them to execute their role successfully. The empirical literature recommends a designated technical support in the wards throughout the implementation period: allocation of designated time for learning and documentation, adapted computerized infrastructures, formal acknowledgement of head nurses as part of the organizational leading team (Fennelly *et al.*, 2020).

To sum up this chapter, leading a successful implementation of an EMR system requires a multi-dimensional management approach: real involvement in the planning, gradual training, adapted communication, technical support and consolidated change management. In their unique capacity as field leaders, head nurses need to be ready not only technically, but be also management-oriented. Investing in their training, consolidating a management identity, and providing practical change management tools are prerequisites for a successful, safe, and high-quality implementation of the transition to a digital era in hospitalization wards.

7. CONCLUSIONS

This literature review discusses the process of an EMR system implementation out of a management perspective that focuses the attention on the complex and vital role of head nurses. The findings illustrate that head nurses play a key role, both in the daily operation of the system and in the leading of the change in the field. However, they sometimes do it without a designated training for change management or sufficient support infrastructure.

The review gave rise to several consistent challenges, among them burden of documentation, staff's resistance to change, lack of organizational readiness, and a gap between the technological policy and its implementation in practice. Moreover, the review presented effective management and operational strategies, comprising staff's involvement in the planning, adapted tutoring, proactive support, clear communication, and building a professional infrastructure for the head nurses' leadership in the department.

The conclusion drawn from the literature review is that we should develop a whole systemic response in the shape of a long-range professional development system that consists of: extending the acknowledgement of head nurses' central role as leaders of digital change processes in nursing; development of designated training pathways that focus on advanced management competences and practical tools for leading a change in healthcare organizations; structured and meaningful involvement of head nurses in the planning, leading, and implementation of technological and organizational change processes on the level of the ward and of the entire organization.


Moreover, another empirical development might contribute to the design of new nursing career pathways that will strengthen head nurses as managers of a clinical-technological change managers, linking the world of nursing with challenges of healthcare management in the 21st century.

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The volume ***EU Digital Strategy: Governance, Innovation and Business. Proceedings of the International Conference EU-PAIR 2025*** is the main output of the conference that was held at the *Alexandru Ioan Cuza University of Iași*, Romania, during 19th–20th of June 2025 through the Jean Monnet Chair. *EU Public Administration Integration and Resilience Studies – EU-PAIR*, Project no. ERASMUS-JMO-2021-HAI-TCH-RSCH-101047526. Among its pages, the volume brings together research that captures the multifaceted transformation generated by Europe’s digital agenda. The contributions examine the expansion of the digital economy in business and public affairs, the profound reconfiguration of businesses through big data and machine learning, and the emergence of smart working models that demand new competencies from modern workers. Authors also address GDPR and the ethical implications of data-driven environments, emphasizing the importance of trust and responsibility. Together, these studies illustrate how digital technologies are reshaping decision-making and governance, offering a comprehensive view of the challenges and opportunities defining the contemporary digital landscape. Readers are invited to explore these contributions, which collectively illuminate the competencies, frameworks, and practices needed to navigate and strengthen Europe’s digital future.

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