Emerging Markets Economics and Business. Contributions of Young Researchers

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FACULTY OF ECONOMIC SCIENCES

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BUSINESS NETWORKS, INNOVATIVE CLUSTERS, AND DIGITAL TRANSFORMATION: LITERATURE REVIEW AND IMPLICATIONS FOR ROMANIA'S DIGITAL DECADE

Adriana-Ioana-Nicoleta URS (CRESTICI)
Doctoral School of Economic Sciences, University of Oradea, Romania
Email: crestici.ada@gmail.com

Abstract: *This paper traces the intellectual evolution of cluster theory and examines its contemporary relevance in the era of digital transformation. Starting from Marshall's (1890) theory of agglomeration economies, it follows the trajectory through Porter's (1990, 1998) competitive clusters and recent ecosystem-based perspectives proposed by Granovetter (1973), Powell (1990), Adner (2006), and others. The analysis connects these theoretical frameworks to Romania's progress toward the EU's Digital Decade 2030 objectives. Findings indicate that while Romania performs strongly in fixed broadband coverage, it continues to lag in digital skills, SME digitalization, and 5G deployment. The study concludes that sustainable digital convergence requires coordinated interventions in skills, infrastructure, and SME digital adoption, supported by network-based innovation policies.*

Keywords: cluster, innovation, competitiveness, business networks, digital transformation, Digital Decade, Romania

JEL Classification: O32, O33, L14, L26, R11, M21

1. Introduction
Digital transformation has intensified the strategic relevance of inter-firm collaboration and innovation clustering. Early industrial theories conceptualized clusters as geographically concentrated phenomena; however, digitalization has reconfigured these dynamics into globally networked systems of knowledge exchange and value creation (Marshall, 1890; Porter, 1990). This review critically explores the theoretical evolution of cluster theory, from classical economic origins to the digital ecosystem paradigm, and connects these developments to empirical indicators from Romania's digital transformation. The analysis aligns with the EU's Digital Decade monitoring framework (EC, 2025)

2. Literature Review
2.1. Classical Foundations
Marshall's *Principles of Economics* (1890) offered the first systematic account of why industries cluster geographically. He identified "external economies" derived from shared labor, suppliers, and informal knowledge exchange. While he did not use the term "cluster," this concept of industrial districts formed the groundwork for spatial agglomeration theory. Porter (1990; 1998) revitalized and operationalized these ideas, defining clusters as "geographically proximate groups of interconnected companies and institutions". His "diamond model" linked productivity, innovation, and competitiveness, providing a practical tool for regional policy design.

2.2. Network and Institutional Perspectives

Subsequent scholarship expanded cluster theory beyond geography. Granovetter (1973) introduced the concept of weak ties, showing that loosely connected actors enable information diffusion. Powell (1990) described networks as a distinct organizational form where innovation emerges through inter-organizational collaboration. Empirical studies such as Powell et al. (1996) demonstrated how learning networks accelerate technological advancement. Uzzi (1997) highlighted the "paradox of embeddedness," suggesting that innovation thrives when firms balance strong trust-based ties with diverse external links. These perspectives reframed clusters as *relational* rather than purely spatial phenomena.

2.3. Digital Ecosystems and Platform-Based Clusters

As digital technologies matured, cluster analysis shifted toward ecosystems. Iansiti and Levien (2004) proposed the concept of *business ecosystems*, where keystone firms coordinate partners through digital platforms. Adner (2006) argued that innovation success depends on alignment within these ecosystems. Kenney and Zysman (2016) identified the rise of the platform economy, in which data flows and algorithmic coordination replace geographic proximity. This evolution signifies a paradigm shift from territorially bound clusters to digitally mediated innovation networks operating across borders.

3. Methodological Approaches

Research on clusters combines both quantitative and qualitative methods. Quantitative studies employ input–output tables, patent citation analysis, and spatial econometrics to assess agglomeration and innovation outcomes (Delgado, Porter and Stern, 2014). Social Network Analysis effectively maps relational structures and identifies central actors (Powell et al., 1996). Qualitative approaches (case studies, interviews, ethnographies) capture the institutional and cultural dynamics that statistical models often miss (Saxenian, 1994; Asheim and Isaksen, 2002). Best practice increasingly favors *mixed-method* designs that integrate both structural measurement and contextual understanding.

4. Romania's Digital Transformation: Current Status and Trends

Applying these theoretical insights to Romania reveals both progress and persistent gaps relative to EU *Digital Decade* objectives. Table 1 summarizes Romania's standing against EU averages and 2030 targets.

Table 1. Romania's Position in EU Digital Decade Indicators (2024–2025)

Dimension	Indicator	Romania 2023	Romania 2024	EU Average 2024	2030 Target	Source
Digital Skills	Population with basic digital skills	27.7%	27.8%	~55.6%	≥80%	ADR (2024); Eurostat (2025)
SME Digitalization	Firms with basic Digital Intensity Index	22.2%	26.8%	~69%	≥90%	ADR (2024)
Cloud Uptake	Enterprises using cloud computing	11.3%	—	~45%	—	Eurostat (2024)

AI Uptake	Enterprises using AI	1.5%	3.1%	13.5%	—	Eurostat (2025)
Connectivity	FTTP/VHCN coverage	95.6%	—	~80%	≥100%	ADR (2024)
Connectivity	5G coverage	26.8%	32.8%	~82%	≥100%	ADR (2024)
ICT Workforce	ICT specialists as % of employment	2.6–2.8%	—	~4.8%	≥20m EU	ADR (2024)

Source: created by author using data from ADR (2024), Eurostat (2024-2025).

Romania's main challenges lie in digital skills, SME technology uptake, and mobile connectivity. Although fixed broadband infrastructure is strong, the diffusion of advanced technologies remains weak, particularly among SMEs.

5. Discussion: Digital Transformation and Cluster Reconfiguration

Digital transformation has redefined cluster dynamics. While classical clusters relied on physical proximity, digital infrastructures enable innovation networks that transcend geography. Platform-based ecosystems, such as Apple, Amazon, or Alibaba, illustrate how keystone firms coordinate value creation globally (Iansiti and Levien, 2004). For Romania, this implies that competitive advantage must now integrate *local embeddedness* (trust, institutional partnerships, university–industry collaboration) with *global digital connectivity* (platform participation, data governance, 5G access). The country's cluster policies should thus evolve from supporting industrial localization to fostering digital ecosystems and open-innovation frameworks.

6. Policy Recommendations

To accelerate Romania's digital convergence and strengthen innovation-driven competitiveness, policy actions should target both supply and demand dimensions, and adopt an integrated, ecosystem-based approach aligned with the EU's Digital Decade 2030 targets. The following priorities are proposed:

- Blended finance for SMEs: Combine grants, advisory support, and vouchers for cloud/AI adoption, prioritizing cluster-based demonstrators (EIB, 2023).
- Digital skills acceleration: Expand vocational certifications and industry-linked apprenticeships to raise basic digital skills toward EU medians (ADR, 2024).
- 5G deployment support: Target public-private pilots in underserved regions to boost connectivity.
- Shared cybersecurity services: Establish regional cybersecurity hubs for SMEs to enhance resilience cost-effectively.
- Data standardization: Introduce national interoperability frameworks to facilitate data-driven innovation and SME integration into digital ecosystems.

7. Conclusions

The evolution from Marshall's industrial districts to Porter's clusters and today's digital ecosystems reveals a broadening of the cluster concept, from geography to networks and digital interconnectivity. Romania's experience shows that high infrastructure availability alone is insufficient without parallel progress in skills and

SME adoption. Future research should further examine how digital technologies reshape learning, governance, and innovation across regional and transnational networks.

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IS THE EUROPEAN UNION HIGHER EDUCATION INSTITUTIONS GREEN? – ANALYSIS OF THE UI GREENMETRIC RANKING RESULTS

Mónika Kis-Orloczki

Institute of Economic Theory and Methodology, Faculty of Economics, University of Miskolc; Miskolc, Hungary
monika.orloczki@uni-miskolc.hu

Abstract: Since the second half of the 2000s the sustainability of higher education institutions (HEIs) has received increasing attention. Originally, sustainability focused on the campus operations as environmental sustainability, but later as sustainable university models emerged, this was expanded to include not only education and research, but also the social responsibility of the university.
The sustainable university rankings serve as popular communication tools for the evaluation of sustainability efforts, including more than a thousand participating HEIs nowadays from nearly one hundred countries. This research focuses on the UI GreenMetric ranking, analyzing the performance of universities in the European Union member states in the last 11 years (2014-2024) Examining if there is a relationship between the total score and the country in which the HEI is located, can provide a basis for further analysis of economic and cultural factors influencing sustainability performance. Based on the average total scores, HEIs of the Netherlands, Ireland, and Denmark can be considered as the greenest campuses when analyzing according to the environmental sustainability criteria.

1. Introduction

Since the definition of sustainability was created by the Brundtland Commission in 1987, the concept has appeared across all areas of environmental, social, and economic activity, global declarations. The latest and mostly referred international document is the United Nations' Sustainable Development Goals (SDGs), announced in 2015.

To achieve these goals, HEIs have not only been involved in research and teaching related to sustainability topics but have also paid increasing attention to sustainability in their stakeholder relations and everyday operations. Thus, universities as organizations contribute to strengthening the commitment of future professionals toward sustainability, enhance the environmental and social responsibility of employees and students, and, not least, can achieve long-term cost efficiency in their operations.

To increase the visibility of sustainability efforts, the methodological development of university sustainability assessment began in the 2000s. The aim of universities participating in such assessments is twofold: on the one hand, their goal is to improve their environmental performance, and on the other hand, to differentiate themselves from competitors and enhance international visibility.

The most widely recognized green campus ranking today is the UI GreenMetric, which is based on voluntary data submission. In the most recent 2024 ranking, 1,476 universities took part. Over the years, the number of European universities participating has almost ten folded. Currently, there are 163 participants from the European Union, and during the 2014–2024 period, a total of 311 EU universities submitted data for at least one year. Among them, 36 universities participated every year, while 76 universities conducted self-assessments in at least eight editions of the ranking. (UI GreenMetric Rankings)

This study seeks to address the following research questions:

- Do HEIs in the European Union pay attention to environmental sustainability issues?
- Is participation in the ranking a one-time measurement or a continuous commitment, thereby reflecting a long-term dedication to sustainability?
- Based on the average Total Score, can it be concluded that universities in certain countries are "greener" than others?

2. Literature Review

The connection between higher education and sustainability dates back several decades. Although international agreements and declarations have emphasized the integration of sustainability into educational and research programs since the early 1990s (Kis-Orloczki, 2023), sustainability theories addressing environmental and social limitations had already appeared in universities as early as the 1970s (Beynaghi et al., 2014).

Subsequent declarations emphasized the importance of embedding sustainability in institutional strategies, training educators in sustainability-related fields, and fostering collaboration with other universities and organizations. Education for Sustainable Development (ESD) today clearly extends beyond the inclusion of sustainability topics in the curriculum. In addition to the transfer of theoretical knowledge, sustainability principles are also reflected in the operational processes, policies, and procedures of universities (Gaitán-Angulo et al., 2022).

Emphasizing and communicating sustainability efforts can provide a competitive advantage for universities in terms of international visibility and student recruitment. Sustainability reports, through analysing the current situation and outlining plans, not only inform institutional stakeholders but also strengthen their commitment (Atici et al., 2021).

To measure performance in the areas identified by sustainable university models, several assessment frameworks have been developed. Among these, three international sustainability rankings for higher education institutions (HEIs) have gained popularity in recent years: the UI GreenMetric, the Times Higher Education Impact Rankings (based on the SDGs), and the Quacquarelli Symonds (QS) Sustainability Ranking, which applies an ESG-oriented approach.

The UI GreenMetric has operated as an independent ranking since 2010, evaluating six categories with the following weights: Settings and Infrastructure (15%), Energy and Climate (21%), Waste (18%), Water (10%), Transportation (18%), Education and Research (18%) (UI GreenMetric Guideline, 2024) Assessing universities through a green campus approach, with a strong emphasis on environmental sustainability is often mentioned in its critiques (Ragazzi & Ghidini, 2017). Another key limitation of the UI GreenMetric is that it does not define a minimum entry threshold in terms of total score, which means that inclusion in the ranking does not

necessarily indicate a strong commitment to green or sustainability goals (Calderon, 2023). However, one of the main advantages of the UI GreenMetric is that it provides smaller universities with an excellent opportunity for brand building and for enhancing visibility, particularly for those institutions that may not achieve outstanding results in scientometric rankings. By focusing on sustainability, environmental awareness, and social responsibility, such universities can differentiate themselves from competitors and strengthen their institutional reputation (Lukács and Papp-Váry, 2024).

3. Analysis and Evaluation

In my research, I examined the results of the UI GreenMetric Sustainable University Ranking using descriptive statistical methods. The scope of the study was limited both geographically and in time: geographically to the current member states of the European Union, while temporally to the 2014–2024 period. The temporal limitation was determined primarily by two factors: the comparability of the methodology and the availability of data.

It can be concluded that there has been an approximate 2000 points (50%) increase in the Total Score average compared to 2015 to 2024, but no significant improvement in the in the last 2 years. In my opinion a possible explanation for this is that the universities already in the ranking improve year to year, although the new entrants tend to join the ranking with lower scores, which is also reflected in the decrease of the minimum value.

In a global comparison, the data for EU HEIs can be considered above average. By 2024, the performance of the European universities examined exceeded the global average by approximately 1,000 points.The minimum scores also show that European values are significantly higher than the global minimums. This is due to the continuous improvement in performance among universities that have already been ranked for several years, and on the other hand, to the fact that new EU entrants tend to join the ranking with higher minimum scores than the global minimums. In my view, this indicates a stronger commitment from European universities toward environmental sustainability.

Examining the averages of HEI total scores by countries, differences can be observed between countries. Although the average scores of all countries have increased compared to the first-year values in the examined years 2014, 2019, and 2024, universities in the Netherlands, Ireland, and Denmark achieved the highest average performance. The lowest averages were recorded among universities in Bulgaria, Estonia, France, and Slovakia. Interestingly, Swedish universities last appeared in the ranking in 2020, when their average score only slightly exceeded that of the Central and Eastern European countries.

As the Eta value of the Total Score average analysis by countries is high, we can say that there is a significant connection between the country and the Total Score.

Analysing the six categories we can confirm the dominance of HEIs of the Netherlands, Ireland and Denmark, although in some categories HEIs from Croatia, Latvia or Germany can enter the TOP 3.

5. Conclusion

We can conclude that HEIs in the EU are implementing various measures to address environmental, economic, and social sustainability to respond the

stakeholder expectations. Analysing the UI GreenMetric Ranking in terms of geographical distribution, universities in Italy and Spain, already showed a high participation rate in the early years and are still represented by the highest number of participants. Based on average total performance, universities in the Netherlands, Ireland, and Denmark can be considered the most sustainable HEIs in terms of environmental sustainability. Although Central and Eastern European HEIs generally fall within the middle range of performance, their participation has significantly increased in the most recent years, so sustainability rankings offer them new opportunities for international visibility. By using their commitment to environmental sustainability as a marketing tool, such universities can become more attractive to international students. Based on the six evaluation categories of the UI GreenMetric, universities in the Netherlands, Denmark, Ireland, Finland, and Latvia, as well as those in Lithuania, Croatia, and Germany, demonstrate outstanding efforts toward achieving a green campus. Given the available data, future research could focus on identifying patterns within the six subcategories (infrastructure and settings, energy and climate, waste, water, transportation, education and research) and examining how economic and cultural factors influence the sustainability performance of universities across different countries.

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ANALYSIS OF THE IMPACT THAT THE INTENSIFICATION OF DISSENTS BETWEEN THE GREAT POWERS HAS ON THE CHANCES OF REFORMING THE MULTILATERAL TRADING SYSTEM

Sara-Francesca POCȘE
Bucharest University of Economic Studies
sarafrancescapocse@gmail.com

Abstract. *The intensification of tensions between major trading actors, fueled by both geopolitical factors and their divergent interests, exacerbates the short circuits that affect the proper functioning of the multilateral trading system, alters its capacity to identify the best solutions to the specific challenges of this beginning of the century and makes it increasingly difficult to maintain a stable, predictable trading climate based on rules agreed at multilateral level and applied in good faith. Both academic analysts and public policy decision-makers must find solutions to challenges such as: the delay in multilateral trade negotiations; the constant failures in the process of ensuring the conditions conducive to inclusive and sustainable governance of international trade; the negative effects of rules whose usefulness is increasingly questionable; the postponement of the reform of the institutional architecture of the international trading system; the removal of functional schemes of governance mechanisms at the international level from the most pressing objectives on the agenda of civil society representatives. The author aimed to clarify identifiable vulnerabilities, prioritize influencing factors and quantify the most important effects of delaying the implementation of the necessary measures. As a methodological device, a combination of tools specific to positivist and phenomenological research will be used.*

1.Introduction

Systemic changes in the trade landscape continuously and profoundly shape global social, political and cultural aspects. All these changes related to cross-border trade flows are influenced by several factors, among which I would highlight the rise of the digital economy, the increasing demand for sustainability, changing business models and the relationships between participants in the system, trade wars and adaptation to the threats and opportunities shaped by the new global context. Among the key roles that can be attributed to the institutional architectures of the international trade system (ITS), its contribution to the development of the global economy, the role played in shaping relations between nations and ensuring the stability of world markets stand out.

2.Collaboration versus rivalry in the face of systemic challenges

The foundations of the ITS are complex, evolving through long processes influenced by numerous factors: economic and political regulations, trade agreements, customs tariffs, specialization, market liberalization, the financial system, technological innovation, political stability, conflicts, environmental protection and changes in

consumer preferences. Of these, the international specialization of economies has the most significant influence. Trade agreements have reduced barriers, dynamizing trade and the modernization of financial systems and payment methods has boosted and secured international trade flows. Transport infrastructure and trade routes have expanded to ensure an efficient circulation of goods and services. Technological development and the modernization of communication media have been essential for establishing and maintaining efficient business relationships. In this context, the system has undergone significant changes, especially due to the increasing notoriety of digital platforms, the boom of online commerce, the modernization of transport networks and the improvement of logistics processes, which have reconfigured the current commercial landscape. It has become increasingly evident that, as in the case of the other subsystems of the global economic picture, it is also vital for the ITS to proceed with the operation of substantial restructuring. To build the consensus needed for a new design, several points must be considered: ITS provides a vast, dynamic network of interconnected information and resources; correlations and causal links between production and other supply-chain processes are becoming increasingly complex; and the growing variety of traded commodities, exchanged among an expanding pool of market actors, carries greater significance. The analysis of the most relevant correlations started from the assumption that the dynamics and stability of the ITS are influenced by the interactions between the parts of the system by the public policies implemented by the participating countries or by the inclusion of the system drivers in the aggregate picture at regional and global levels. The system's fairness, legitimacy, and effectiveness are shaped by global supply chain dynamics, the rise of cross-border trade in components, the Fourth Industrial Revolution, the expansion of digital platforms and e-commerce, the evolution of financial globalization, new competitiveness drivers, and various cultural or behavioral factors. The market-friendly reforms and development of emerging economies can be attributed to the adaptation to globalization. These states are becoming increasingly important players in the ITS due to significant economic growth, expanded markets and investment activities. These countries are undergoing major changes in industrialization and urbanization, which is shifting the economic center of gravity towards Asia and Central and Latin America. The high availability of resources at a global level positively influences the evolution of business models. Global markets allow the exploitation of technologies and innovations, allowing multinational companies to diversify their activities and maintain a competitive advantage.

3. Dynamic but contradictory developments

These models emphasize the need for technological modularity and technical standardization across countries, as globalized markets and rising competition accelerate the adoption of new technologies, methods, and business practices. In the 21st century, shorter product life cycles, increasingly complex consumer demand, and scarcity of traditional resources reshape both supply and demand. Innovation cycles are faster, products and services are more customized, and customers play a growing role in setting exchange conditions. Flexibility and decentralization have become essential for rapid adjustment and timely decisions, while global integration has heightened economic interdependence and expanded

the volume and diversity of trade flows. For ITS to operate effectively within this framework of global governance, all actors must meet minimum standards and follow established norms, which requires understanding international commitments, ensuring originality and quality, complying with global standards, and maintaining honesty in transactions. As integration deepens, strong global economic governance is crucial for minimizing risks and reducing uncertainty in cross-border trade. *The transition from traditional international relations to global governance diversifies the sources of tension between the actors taking part in the commercial game.* As the number of actors in the global economic arena has expanded, their interactions, cooperation, and frictions have intensified. Managing rising tensions becomes more feasible when formal and informal relationships are carefully analyzed, institutional quality strengthened, transaction costs reduced, and trade grounded in genuine comparative and competitive advantages (Park, 2021). Causality is bidirectional: strong institutions support trade, while expanding trade also requires strong institutions. These dimensions are both complementary and substitutive, formal frameworks offer stability, transparency, and legal certainty, while informal mechanisms provide flexibility and faster responses. As global economic relations grow more complex and non-linear, they must rest on principles of fairness, normative rigor, and legitimacy. In international supply chain management, strict compliance with rules ensures fair competition and protects all participants. Legitimacy depends on institutions and rules being perceived as equitable and supported by transparent, accessible dispute-resolution systems. Upholding these values strengthens trust, cooperation, and sustainable economic development worldwide.

4.Avatars of a world of risk and uncertainty

The ITS is not insensitive to the increasingly intense manifestation of the kaleidoscope of threats, some authors (Sharma, Leung, Kingshott, Davcik and Cardinali, 2020) focusing their analysis on pandemic, currency, cultural, financial, operational, general economic risks and those related to ecological challenges. Yatsenko, Nitsenko, Mardani and Tananaiko, (2018) have focused on the correct and timely anticipation of changes in asset prices, fluctuations in oil and gas prices, as well as organizational changes. It should be emphasized that an adaptive economic strategy is becoming necessary to ensure additional flexibility in adapting to these changes. Geopolitical risks constitute the main group that significantly affects the global economy at present. Developments related to terrorism, the rise of xenophobic and populist sentiments, as well as the intensification of conflicts between states have increased concerns, having a negative impact on trade and economic stability. Addressing these risks requires well-structured international cooperation and confidence-building strategies. To minimize the negative effects of climate change, the promotion of green technologies should be an extremely important component of the behavior of societal actors and strategies. The Fourth Industrial Revolution brings numerous benefits, but also amplifies technological risks, imposing the need for strategies that support innovation and strengthen digital security. Given the complexity of the international trading system, both institutions and private actors must manage risks effectively and capitalize on opportunities to ensure sustainable growth and achieve the desired level of competitiveness. Dang,

Jasovska and Rammal (2020) argue that the relationship between risk-taking and increased stability and cooperation has already positioned itself at the forefront of the development of organizational strategies, so that they can maximize the positive effects of collaboration and minimize the negative ones of maintaining high bilateral tensions.

5.Conclusions

The rapid advance of globalization has brought major structural and functional changes to the International Trading System, redefining its roles and mechanisms. Yet this expansion is increasingly disrupted by protectionist tendencies, civil society dissatisfaction, and renewed economic nationalism. Developing and applying strong strategies is therefore essential for sustainable growth. International trade actors must strategically monitor the business environment, anticipate changes, and limit negative effects. Building partnerships that reflect the interests of most stakeholders helps maintain direct relationships, influence market conditions, and strengthen competitiveness. Globalization's impact is evident in the redefinition of ITS functions, the diversification of actors, and the shortcomings of international regulations, factors that highlight the system's growing complexity. A multi-level analysis underscores the need to align formal and informal elements to maximize interdependence and respond effectively to global challenges. By adopting adaptive strategies and promoting inclusive, innovative governance, the system can continue to support global trade and sustainable economic development.

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PARIS AGREEMENT – FROM COMMITMENT TO ACTION, IMPLEMENTATION ACROSS EUROPE

Szabo (Radu) Ancuta

Doctoral School in Economic Sciences, University of Oradea, Oradea, Romania
szabo.ancuta@student.uoradea.ro

Abstract: *This paper aims to track the progress made by Europe from 2015 till 2023 in order to obtain climate neutrality by 2050. The Paris Agreement set the following: global warming should be well below 2° Celsius above pre-industrial levels, seeking to maintaining it to 1,5° Celsius; the countries would systematically review their commitments to cutting emissions; financial resources will be provided for developing countries (United Nations, nd). EU is trying to win this great challenge and wants to become the first climate neutral area in the world. Taking this into account, in 2020 adopted the European Green Deal with ambitious targets and action plans. Intermediate milestone is set for 2030: 42,5% of its energy to come from renewable sources: December 2023 came with an average of 24,5%. It cannot be predicted with certainty that the goal will be achieved, but it can be confidently stated that renewable energy has gained strides with hydro power in first place and wind energy coming strongly behind in EU.*

1. Introduction

In 1972 the United Nations held its first Human Environment Conference in Stockholm, Sweden (United Nations, nd). On the 20th Anniversary, in June 1992, Rio de Janeiro hosted The Earth Summit, where the main objective was "to produce a broad agenda and a new blueprint for international action on environmental and development issues that would help guide international cooperation and development policy in the twenty-first century". This was the time when the concept of sustainability for development has gained momentum.

The Earth Summit had multiple outcomes: the Rio Declaration with its 27 principles, the United Nations Framework Convention on Climate Change (UNFCCC), the Convention on Biological Diversity(CBD) and the United Nation Convention to Combat Desertification (UNCCD). All of these giving rise to a big call of action included in Agenda 21 (United Nations Climate Change, nd).

UNFCCC has universal membership (it is sign by 198 parties) and has been assembling once a year ever since. In 2015 at their annual meeting, that time in Paris, it reached a unanimous agreement with law effect, known as *The Paris Agreement.* The agreement replaced and improved the Kyoto Protocol, with the main goal to bring all nations into a shared purpose to reduce greenhouse gas (GHG)

emissions and mitigate risks and impacts globally (United Nations Climate Change, nd).

2. EU's measures to implement the Paris Agreement
 In order to make the EU first climate neutral area in the world by 2050, in 2020 the European Commission adopted *European Green Deal.*
Its main goals are:
- Climate neutrality – net-zero GHG emission by 2050;
- Circular economy – for reducing waste and conserving resources;
- Clean industry – cleaner, energy-efficient industries;
- Healthier environment – restore nature and aim to zero pollution;
- More sustainable farming – ecological farming for healthy and affordable food;
- Climate justice and fairness – no one is left behind, fair and inclusive for all the people (European Council, 2025).

 Part of Europe Grean Deal strategy is implementing a set of legislative and financial mechanisms which make the climate targets legally binding. The targets are regulated in the European Climate Law: achieving climate neutrality across EU by 2050, an intermediate target of reducing GHG emissions by at least 55% by 2030 compared to 1900 levels, an indicative target of a 90% emissions reduction by 2040. The EU's primary policy toolkit for implementing these targets is the *Fit for 55* set of laws that are aiming to reduce, by at least 55% till 2030, the GHG emissions and put EU on the track of achieving climate neutrality by 2050. The following measures are meant to answer the fundamental question "How will EU reduce its greenhouse emissions by at least 55% by 2030?" (European Council, 2025):
- Transitioning from fossil gas to renewable and low-carbon alternatives
- Reforming de EU emissions trading system
- Cutting emissions from transport, buildings, agriculture and waste
- Meeting climate targets in the land use and forestry sectors
- Promoting more sustainable transport solutions
- Addressing the emissions outside of the EU
- Establishing a found to support the most affected citizens and businesses
- Boosting the adoption of greener fuels in the aviation and maritime sectors
- Clarifying regulation on methane emission reduction
- Implementing stricter CO_2 emission standards for cars and vans
- Revisioning of energy taxation
- Encouraging renewable energy projects (RePowerEU plan)
- Saving energy to become more energy-efficient
- Improving the environmental performance of buildings in the EU.

All these mechanisms along with the new Clean Industrial Deal constitute the EU's strong domestic framework to meet its commitments under the Paris Agreement and drive the transition to climate neutrality.

3. Tracking progress
Renewable energy is an encouraging solution for many environmental issues and is the core of implementing the Paris Agreement. Transitioning from fossil fuels to greener sources like solar, eolian, hydro, geothermal is the main measure to reduce GHG emissions to limit global warming. Each country defines its own objectives to

reach the target in the Agreement. These objectives are included in the Nationally Determined Contributions (NDC's) and are subjected to a process of review and update every 5 years (United Nations Climate Change, nd).

Between 2004 and 2023 the share of renewable energy almost tripled in EU, from 9,6% to 24,5% of gross final energy consumption (Eurostat,2024). In 2023 with the revision of the Renewable Energy Directive, the 2030 target for use of energy from renewable sources, was changed from 32% to 42,5% (aiming 45%).

Figure 1 shows the latest data available for the share for renewable energies in gross final energy consumption.
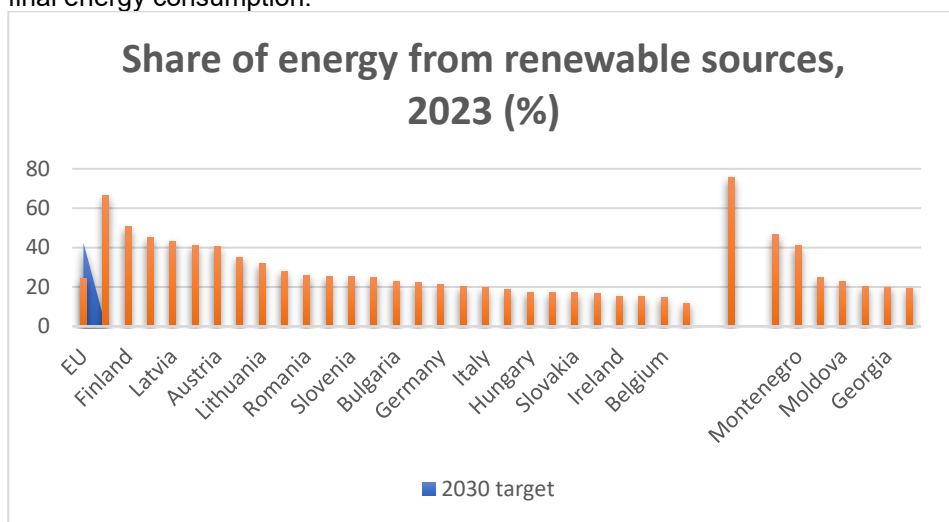
Figure 1: Share of energy renewable sources, 2023 (% of gross final energy consumption)
Source: Eurostat, 2024

As it is shown there are countries which already hit the 2030 target: Norway and Sweden are taking the first positions, followed by Finland, Albania, Denmark and Latvia. Very close in reaching their purpose are Portugal, Lithuania and Croatia. There are 11 countries between 20% and 28%, including Romania with its 25,8% and the remaining ones are below 20% with a minimum of 11% in Luxembourg. The average in EU's countries is 24,5%.

In Norway the main electricity source is hydropower with wind energy coming next. (Haddeland et al., 2022) Compared to them, solar production in negligible. Mean annual production of energy is higher than the consumption of it so Norway has a surplus.

In Sweden the target for 100% renewable electricity production is set for 2040 (Zhong et al., 2021) with their main energy produced by hydropower and bioenergy, also with wind power growing up fast (Sweden Sverige, 2025).

In EU the main renewable source for generating energy is wind (39,1%), closely followed by hydro power (29,9%) and solar (22,4%), the small percentage left being divided by combustible fuels (8,1%) and geothermal energy (0,5%). (Eurostat, 2025).

In Romania leads the hydro power, followed by wind and a small percent of solar power. The National Recovery and Resilience Plan is Romania's solution for

investigations and policy changes to support green energy production. (Ciobotea et al., 2024).

4. Conclusion

Even with the limitation of sources from 2023 and a few data to analyze the conclusion is that Europe has clear objectives, strong legal framework and mechanisms for monitoring and periodical reporting. It is on a theoretical right track for reaching its goals. Nevertheless, there are important steps to be made for all European countries and economies to be aligned and "no one to be left behind".

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CULTURAL AND CREATIVE CITIES IN THE DIGITAL AGE: INVESTMENTS IN TECHNOLOGY AND THE IMPACT ON URBAN ECONOMIC PERFORMANCE

Simona Sorinela SĂNDULESCU, Gheorghe Alexandru STATIVĂ

Bucharest University of Economic Studies (ASE), Bucharest, Romania

sandulescusimona18@stud.ase.ro
alexstativa95@gmail.com

Abstract: *In the context of digital transformations, cultural and creative cities are becoming essential places for the interaction between the dynamics of urban economic development and technological progress. The article aims to investigate how digital technologies influence the economic performance of urban centers, starting from the hypothesis that technological innovation contributes significantly to the development of sustainable and competitive processes. The research uses an interdisciplinary perspective, combining public policy analysis, urban economics concepts and cultural studies to highlight the processes through which digital infrastructure and innovation processes contribute to urban economic development. The research results show that cities that implement integrated digitalization and development strategies for the cultural and creative sectors, demonstrate a development of social cohesion and economic attractiveness.*

Keywords: cultural and creative cities, digitalization, innovation

JEL classification: A100, Z1

1. Introduction

In recent years, digitalization has become one of the main factors of urban competitiveness and economic development. The development of the knowledge-based economy, technological transformations and the integration of digital infrastructures have redefined the way in which urban centers build their economic advantages (Castells, 2010). The cultural and creative economy, based on innovation, cultural and human capital, is also an important element of urban development (Florida, 2019). Cultural and creative cities are not only traditional cultural centers, but represent complex ecosystems in which creative industries and information technologies combine thanks to innovation-oriented public policies.

The main objective of this article is the analysis of investments in digitalization and the economic development of cultural and creative cities in Europe. The research aims to highlight how investments in the cultural capital, digital infrastructures and innovation ecosystems contribute to urban economic development.

2. Research context and topic relevance

Cities play an important role in the process of economic growth and innovation, within the contemporary economy that is characterized by accelerated technological transformations and globalization. In 2023, over 4.4% of the European Union's GDP

is formed by the cultural and creative economy of urban centers, consisting of over 8.7 million jobs (European Commission, 2023). The concept of cultural and creative city was formalized by the Cultural and Creative Cities Monitor (Joint Research Centre, 2019), which evaluates the performance of European cities in terms of the dimensions of cultural vibrancy (cultural events and institutions), creative economy (employment in the cultural and creative sector) and enabling environment (digitalization, governance, education and connectivity).

Digitalization contributes to increasing competitiveness, by developing technological infrastructure and facilitating access to digital services that directly influence social cohesion and the development of the economy of urban centers.

The DESI index shows that the digital performance of urban regions is positively correlated with the level of GDP/capita and the density of innovative start-ups.

3. Theoretical and conceptual framework

3.1 Urban development and the creative economy

The creative economy is a system of economic activities based on innovation, knowledge and cultural expression (UNCTAD, 2022). Cultural and creative cities use cultural and technological resources to generate innovative solutions to social and economic challenges (Landry, 2021). Differences in urban economic performance are made up of the "creative class", composed of professionals in cultural, scientific and technological fields (Florida, 2019). The presence of digital infrastructure and creative human capital creates conditions for emergent economic development.

3.2 Endogenous growth theory

Competitiveness clusters represent local networks of companies, cultural institutions, universities, which collaborate and generate economic synergies (Porter, 2003). Cultural and creative cities can be seen as advanced forms of urban clusters, where technology and culture interact to generate added value. In the same sense, investments in innovation and knowledge determine long-term economic growth. In the urban context, digitalization functions as an investment multiplier, accelerating the diffusion process of innovation (Romer, 1990).

Based on the theoretical foundations, the research proposes a conceptual model of the type of investment in digitalization - innovation - urban economic performance. This model suggests that investments in information technologies and digital infrastructure lead to increased innovative capacity, which leads to increased GDP and employment in the creative sectors.

4. Discussions

The research results confirm the hypotheses formulated and validate the importance of digital investments as a strategic factor of urban economic performance. Digitalization is no longer just a technological tool, but a systemic determinant of territorial competitiveness, capable of transforming governance structures, innovation dynamics and the way of capitalizing on cultural resources.

4.1. Digitalization as a vector of competitiveness

The analysis highlights the cross-cutting nature of digitalization, which simultaneously acts on the administrative, economic and cultural dimensions of urban development. At the institutional level, digitalization contributes to increasing the efficiency of public administration and expanding citizens' access to smart

services, strengthening the principles of smart governance. At the economic level, it stimulates innovation by facilitating cross-sectoral cooperation and resource sharing, thus generating digital ecosystems favorable to creativity and entrepreneurship. At the cultural level, digitalization opens up new markets for cultural goods and services, accelerating the development of digital creative industries. Therefore, digitalization becomes a key element of urban competitiveness, to the extent that it is correlated with innovation and human capital.

4.2. Culture and creativity as a strategic resource
Cultural and creative cities strengthen their position in the European economy through a smart integration of cultural heritage, education and technological innovation. Digitalization acts here as a value multiplier, facilitating the reinterpretation and reuse of heritage through emerging technologies — such as augmented reality, digital twin models or applications based on artificial intelligence. Thus, culture is no longer just an identity element, but a strategic resource for economic and social development, capable of generating innovation, inclusion and urban attractiveness.

4.3 Case study: Cluj-Napoca
The city of Cluj-Napoca is an example of good practice, as it builds its economic identity around technology and culture. In recent years (2018-2024), there has been an increase in cooperation platforms between academia, industry and local administration. Moreover, there has been an increase of over 80% in public and private investments in urban digital infrastructure and the development of the Transylvania Creative Industries and Cluj IT clusters. In the same period, employment in the creative sectors reached 5.5% of the total workforce, and the city's GDP grew by over 4%, above the national average.
Even if the performances remain lower than those in Western Europe, the pace of convergence is supported by investments. Qualified and young human capital, as well as public-private cooperation and educational infrastructure provide premises for the development of a digital creative system.

4.4. Lessons for Cluj-Napoca and Eastern Europe
For emerging cities in Central and Eastern Europe, including Cluj-Napoca, the results highlight the need for a systemic approach to digital transformation. First, the development of a coherent digital governance framework, capable of ensuring coordination between public, private and academic actors, is essential. Second, public-private partnerships represent an effective mechanism for stimulating cultural innovation and for the transfer of know-how between sectors. Third, the integration of technological and entrepreneurial education into urban strategies becomes a condition for the formation of human capital adapted to the digital economy. In this context, Cluj-Napoca has the potential to become a regional model of smart cultural city, in which the convergence of universities, the IT sector and the creative industries can generate a competitive, sustainable and innovation-oriented urban ecosystem.

5. Conclusions

The main conclusions of the research are that digitalization is an important factor of urban economic growth that acts by increasing productivity and innovation. Public integration policies are key to the development of European cities, and cultural and creative cities that integrate technology and culture achieve a sustainable competitive advantage.

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DRIVERS' LOYALTY TOWARDS PETROL STATION BRANDS IN EMERGING MARKETS: EVIDENCE FROM ROMANIA

Anghel Tudorel Cozma, Marius Bota, Smaranda Adina Cosma

Department of Hospitality Services, Faculty of Business, Babeş-Bolyai University, Cluj-Napoca, Romania
anghel.cozma@ubbcluj.ro , marius.bota@ubbcluj.ro, smaranda.cosma@ubbcluj.ro

Abstract: *Understanding the determinants of customer loyalty in this context is essential, as it directly influences market share stability, customer retention, and profitability. This paper investigates the main determinants of Romanian drivers' loyalty towards petrol station brands. The results confirm that satisfaction, perceived service quality, and brand reputation are central drivers of loyalty. Among all evaluated brands, OMV and MOL exhibit the highest average satisfaction and loyalty levels, suggesting that these companies successfully combine service quality with emotional engagement. The study contributes to the understanding of loyalty in the context of an emerging market, extending prior research on customer satisfaction, brand trust, and the impact of loyalty programs*

Keywords: brand loyalty; customer satisfaction; consumer decision-making; service marketing; digital marketing tools; brand perception.

JEL classification: M31

1. Introduction and literature review

In emerging markets such as Romania, consumer loyalty within the fuel retail sector represents a crucial challenge for both international and domestic petrol brands. The fuel retail industry presents unique characteristics that make loyalty both complex and critical. Unlike other sectors, petrol stations compete in a market with relatively homogeneous core products (fuel types) but differentiated *service experiences* (Helgesen et al., 2010). Therefore, factors such as convenience, service quality, staff friendliness, cleanliness, and brand image often play a greater role in shaping loyalty than price alone.

In emerging economies, these relationships are influenced by contextual variables such as income level, urban infrastructure, and fuel affordability. Wait, Naudé and Gopaul (2020) found that in South Africa, the effectiveness of fuel loyalty programmes depends not only on financial incentives but also on emotional and experiential benefits. Consumers appreciate personalized communication, mobile-app integration, and the perception of fairness in reward accumulation.

Similarly, Rossi and Chintagunta (2023) analysed U.S. gasoline markets and concluded that loyalty programmes can moderate the impact of price changes on demand, effectively increasing price tolerance among loyal customers.

In the last decade, digital transformation has redefined consumer engagement in the petrol retail industry. In Romania, Panduru (2022) highlighted that most major fuel networks - OMV & Petrom, MOL, Rompetrol - have implemented digital ecosystems combining payment systems, discount coupons, and sustainability information. Such tools contribute not only to convenience but also to a *perceived sense of belonging*, reinforcing brand attachment among younger, tech-savvy drivers.

The brand experience dimension has also gained importance. When consumers associate a fuel brand with reliability, environmental responsibility, or premium service, their attitudinal loyalty tends to increase even in the absence of significant economic rewards. The sustainability perspective further strengthens this connection: Purcărea et al. (2022) observed that Romanian consumers increasingly value eco-friendly practices, such as energy-efficient stations or carbon-offset initiatives, which in turn foster loyalty among environmentally conscious segments.

Demoulin and Zidda (2008) demonstrated that satisfaction with the *reward scheme* mediates the relationship between card ownership and store loyalty. Meyer-Waarden (2015) further showed that both *monetary rewards* (discounts, vouchers) and *non-monetary rewards* (recognition, personalized treatment) have positive effects, although the latter often create longer-term loyalty.

Consumers expect tangible value in exchange for sharing personal information. García-Gómez, Gutiérrez-Arranz & Gutiérrez-Cillán (2012) emphasized that the likelihood of joining a loyalty program increases when consumers perceive the benefits as relevant to their consumption patterns and lifestyle. For petrol stations, this implies offering tailored benefits such as free car-wash services, coffee discounts, or bonus points during holidays—rather than generic fuel price reductions. This paper investigates the main determinants of Romanian drivers' loyalty towards petrol station brands.

2. Material and methods

This study adopts a quantitative research design, aiming to identify the key determinants of drivers' loyalty towards petrol station brands in Romania. The data were collected through a structured questionnaire as part of a collaborative research project with undergraduate business administration students. Respondents were approached in-person at various fuel stations across multiple Romanian regions, ensuring diversity in terms of geographic and socio-demographic representation.

The survey gathered 1,195 valid responses, after excluding incomplete entries. The target group consisted of active drivers, including both private car owners and professional drivers, aged between 18 and 87 years. The sampling method was non-probabilistic, based on convenience and accessibility, but aimed to include a wide variety of income levels, occupations, and vehicle types.

The questionnaire included both demographic questions (gender, age, income, education, marital status, county of residence) and attitudinal scales related to consumer perceptions and behavioural intentions. All attitudinal items were measured on five-point Likert scales (1 = "Strongly disagree", 5 = "Strongly agree"). The instrument was pre-tested on 20 respondents to ensure clarity and reliability of the items. Data were processed and analysed using Microsoft Excel and IBM SPSS Statistics 29, employing descriptive and comparative techniques.

3. Results and Discussion

The descriptive analysis provides an overview of the respondents' general perceptions regarding petrol station brands in Romania. The most frequently mentioned fuel providers were OMV, Petrom, MOL, and Rompetrol, representing over 80% of total preferences. Respondents reported a relatively high level of satisfaction (M = 4.31 on a 5-point Likert scale) and a moderate level of loyalty (M = 3.87), indicating that while drivers are generally content with the quality of products and services, they remain open to switching between brands.

In order to better understand consumers' fuelling behaviour, respondents were asked to indicate how frequently they purchase fuel from each of the major petrol station brands operating in Romania. The analysis highlights significant differences in fuelling patterns between brands, reflecting both market share and perceived service quality. **OMV** and **Petrom** show the highest combined proportions of *frequent* and *always* responses, suggesting stronger customer retention and habitual use. **Rompetrol** and **MOL** display a more balanced pattern, indicating moderate loyalty and a greater share of occasional customers. In contrast, **SOCAR, Gazprom**, and the *Others* category register predominantly *never* responses, confirming their limited market penetration and brand familiarity in Romania.

These results suggest that brand loyalty in the fuel retail sector is largely driven by convenience, brand recognition, and perceived fuel quality, with OMV and Petrom maintaining clear competitive advantages in terms of consistent usage and customer preference.

Building on these results, the following section examines the level of satisfaction associated with each petrol station brand, in order to explore the link between usage frequency and customer loyalty. Figure 1 illustrates the average satisfaction level associated with each major petrol station brand in Romania, alongside the number of respondents who most frequently refuel at these brands.
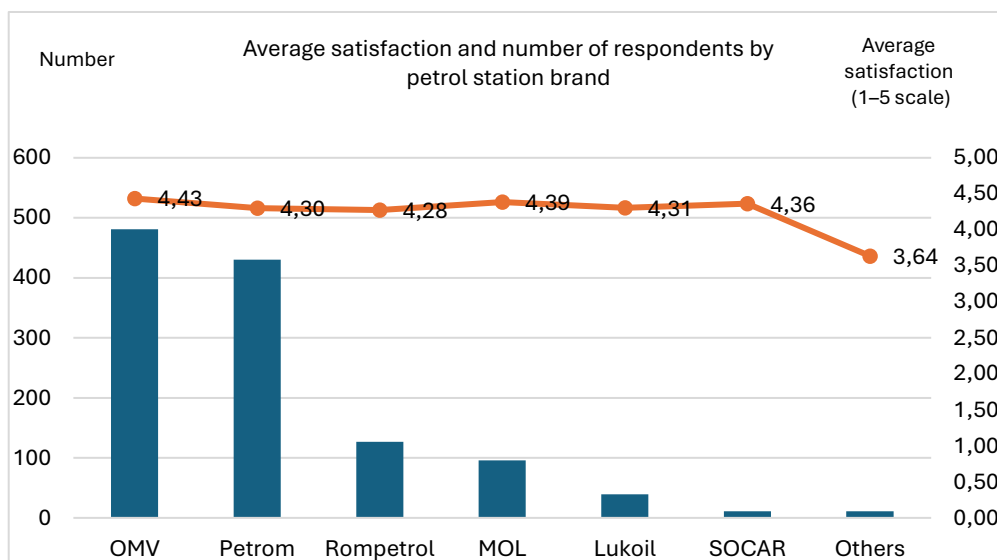
Figure 1. Average satisfaction and number of respondents by petrol station brand

OMV and MOL record the highest satisfaction scores (4.43 and 4.39, respectively), while "Other" brands show a notably lower rating (3.64), reflecting weaker perceived service quality and customer experience.

Given that customer satisfaction is widely recognized as a strong predictor of brand loyalty, the following section explores whether the most appreciated fuel station brands also exhibit higher levels of consumer attachment and repeat patronage.

OMV, Petrom, and MOL show the highest overall loyalty profiles across all five dimensions, with average values above 4 on a 5-point scale. These brands demonstrate strong customer attachment and behavioural intentions, such as continued patronage and positive word-of-mouth recommendations.

Rompetrol records slightly lower yet consistent loyalty levels, while Lukoil, SOCAR, and other minor brands display more irregular and generally weaker loyalty patterns. This suggests that brand reputation, network accessibility, and service experience play a critical role in sustaining consumer loyalty in the Romanian fuel market.

4. Conclusions

This study explored the main determinants of Romanian drivers' loyalty towards petrol station brands, offering empirical evidence from an emerging market context. The results confirm that satisfaction, perceived service quality, and brand reputation are central drivers of loyalty. Among all evaluated brands, OMV and MOL exhibit the highest average satisfaction and loyalty levels, suggesting that these companies successfully combine service quality with emotional engagement. Petrom and Rompetrol follow closely, indicating that the Romanian fuel retail market is dominated by a few strong players with consistent service standards. While the present study provides robust insights, it is limited by its cross-sectional design and self-reported data, which may not fully capture long-term behavioural patterns. For fuel retailers, the results highlight the strategic importance of building long-term emotional bonds rather than relying solely on transactional incentives such as price discounts.

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ADVANCING EUROPE'S SUSTAINABLE TRANSFORMATION

Lavinia-Adelina Mitrache

Economy, Doctoral School of Economic Sciences "Eugeniu Carada", University of Craiova, Craiova, Romania
mitrachelavinia6@gmail.com

Abstract: *The twin transition has become a major focus in development terms for the European Union. It specifically integrates technology transition with sustainability objectives. In line with the European Green Deal and Digital Decade Policy Programme 2030, the European Union seeks to promote a model that enhances climate neutrality, energy savings, and economic integration. In this study, we specifically evaluate the role that digitalization can pursue to stimulate sustainability objectives. At the same time, we also scrutinize possible risks emanating from technology transitions. This assessment specifically uses studies that are recent and produced by Joint Research Centre, European Parliament studies, as well as other academic pieces concerning small to medium-sized firms. The empirical interpretations reveal specific evidence that shows that areas or firms integrating green and technology transitions specifically record improved innovation capacities. At the same time, these areas provided an improved environment. Based on empirical interpretation data supplemented with policy evidence, there are three specific conditions that are important to determine technology transition success. These conditions include institutional integration or coherence.*

Keywords: Twin transition; Digitalization; Sustainability; European Green Deal; Innovation governance; Green transformation

JEL classification: Q01

1. Introduction

The challenge of transition to sustainability and digitalization has become a shaping paradigm for the long-term development policy of the European Union. In fact, within the scope of the European Green Deal and Digital Decade Policy Programme 2030, "The Union's vision is to shape a green and digital future, in which digital innovation contributes to climate neutrality and energy efficiency." These are thus aligned with the elements of the agenda for sustainable development in 2030.

Digitalization is both a driving force and a challenge to the sustainability transition. New technology like artificial intelligence, IoT, and big data analytics fosters sustainability transition into a green economy. At the same time, there are emerging concerns related to energy use. Therefore, there are not only political goals but also theoretical debates which need to incorporate innovation studies' approach to sustainability transitions.

The EU offers an opportune environment to study these interrelations. With the integration of digitalization into its sustainability agenda, the European Union pursues efforts to improve economic resilience and reduce regional disparities. The goal of this paper is to discuss how digitalization can serve as an enabler for

sustainability and to which extent its success requires synchrony between technological development and societal capacity.

2. Literature Review

In European policy and academic discourse, the twin transition refers to the simultaneous progress of digital transformation and the green transition within a shared strategic framework. The European Commission's Joint Research Centre identifies digital innovation as a key enabler of sustainability across all economic sectors. Recent literature highlights that these transitions are mutually reinforcing, forming an integrated process of technological and ecological change (Ben Youssef 2025; Burinskienė and Nalivaikė 2024).

The theoretical foundations of this relationship draw on innovation theory, endogenous growth, and ecological modernization. Earlier economic models viewed technology as an external driver of productivity, while newer approaches integrate innovation into the structure of economic systems (Romer 1990). Ecological modernization theory adds that technology, institutions, and social norms interact to promote environmental improvement (Mol and Spaargaren 2000). Empirical research confirms these connections: Benedetti, Guarini and Laureti (2023) show that higher digitalization, measured through the Digital Economy and Society Index, is positively linked to energy productivity in EU states, though results depend on resource use and regional capacities.

Overall, current studies converge on the view that digitalization acts as a systemic enabler of eco-innovation and sustainability, but success depends on governance, human capital, and institutional coherence. Technology alone cannot achieve the goals of the twin transition without coordinated and inclusive policy frameworks.

3. Evolution of Twin Transition

In recent years, the twin transition has evolved from a conceptual framework into a key pillar of the European Union's economic and sustainability strategy. The simultaneous development of digitalization and the green transition represent not only an industrial shift but also a broader structural transformation of Europe's economic model. Academic and institutional research increasingly examines the interconnections between these processes and their combined impact on sustainable development. Three recent studies offer significant insights: a regional analysis by the Joint Research Centre (2023), an empirical assessment of small and medium-sized enterprises (SMEs) by Burinskienė and Nalivaikė (2024), and a legislative evaluation by the European Parliament (2024).

The Joint Research Centre's report provides one of the most comprehensive analyses of the relationship between digitalization and sustainability in Europe. Drawing on data from more than one thousand metropolitan regions, it concludes that areas integrating both digital and green technologies record measurable reductions in greenhouse gas emissions. By contrast, regions focusing exclusively on digitalization display limited or even negative sustainability outcomes. These results emphasize that digital transformation must be embedded within environmentally oriented policy frameworks and supported by strong regional governance. Without such coordination, neither competitiveness nor decarbonization can be fully achieved.

At the micro level, Burinskienė and Nalivaikė (2024) analyse how European SMEs approach the twin transition using a two-stage, multi-criteria evaluation model. Their findings show that large corporations perform better than smaller enterprises due to superior financial resources, innovation networks, and institutional support. SMEs, however, face persistent barriers related to funding, digital skills, and misalignment between technological and sustainability strategies. The authors propose a diagnostic framework to help firms prioritize capability development and illustrate that organizational readiness is essential for the success of the twin transition.

At the institutional level, the European Parliament (2024) evaluates how cumulative EU legislation affects SMEs in the context of the twin transition. Flagship initiatives such as the European Green Deal, the Data Act, and the Digital Services Act aim to stimulate sustainable innovation, yet their overlapping requirements can create administrative and financial pressures for smaller firms. The study recommends streamlining compliance procedures, improving access to finance, and integrating sustainability reporting into digital data infrastructures. In this way, regulatory compliance could be transformed from a constraint into an instrument of innovation. These findings are reinforced by practical examples across Europe. In Spain and Sweden, research on twelve firms in the energy, transport, and finance sectors shows that digital tools for process virtualization and coordination enhance efficiency and accelerate sustainability outcomes. In Aachen, Germany, an urban digital twin for mobility planning has improved transport management and citizen participation. In Venice, Italy, an environmental digital twin supports climate-risk modelling and policy decisions related to flooding and tourism.

Overall, the empirical and case-based evidence confirms that the twin transition is both a technological and institutional process. Its success depends on the ability of policymakers and organizations to coordinate innovation within inclusive and adaptive governance frameworks. Regions investing simultaneously in digital and sustainable infrastructure demonstrate stronger performance in growth and emissions reduction. However, capability gaps, fragmented governance, and limited SME adoption continue to constrain progress. Strengthening institutional coherence, investing in human capital, and fostering integrated innovation ecosystems remain essential steps toward a competitive and sustainable European economy.

4. Conclusion

The results set forth in this analysis serve to reconfirm that the twin transition is a cornerstone in the development paradigm of a sustainable and competitive EU. The synergy between digitalization and sustainability turns out not to merely represent a technological project but a deeper system-transforming shift involving economic systems, governance structures, and individual behaviors. Indeed, the analysis performed in its threefold scope shows that there are cumulative impacts stemming from the synergy between digital transition and green transition.

At the same time, this interdependence also carries important tensions or imbalances. The speeding up of digital technology development could potentially contribute to increased energy demand, regional imbalance, or inequality if specific conditions are not met. In other words, efforts to realize sustainability goals could face structural barriers if development in digital infrastructure and capacities does not progress. In other words, the simultaneous transition has to be conceived not merely as a linear but rather a co-evolutionary journey.

It seems that the success of this transition hinges upon three interlocking requirements. These requirements are institutional coherency, human capital upgrading, and adaptable governance. Institutional coherency exists in instruments like the European Green Deal or the Digital Decade Programme. These instruments need to go beyond traditional sectors to incorporate inclusivity. Also, inclusivity needs to become a guiding principle in both the case of SMEs and less developed areas.

From a theoretical point of view, the twin transition represents an advancement to the innovation system discourse concerning sustainability transitions. In advancing digitalization as both an enabler and constraint to sustainability transitions, there are underlying institutional mechanisms that need to continue being explored. These mechanisms would include developing indicators to measure digital sustainability. In fact, for Europe to remain a major player in international markets, there needs to be either a synchronization or integration between technological development and sustainability. The twin transition needs to become a reality.

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DETERMINANTS OF POVERTY AS LIMITING FACTORS OF ECONOMIC DEVELOPMENT

Tünde-Ilona KELE (BERES)

Doctoral School of Economic Sciences, Faculty of Economic Sciences, University of Oradea, Oradea, Romania
tundekele@yahoo.com

Abstract: *The presentation of theoretical aspects related to the determinants of poverty contributes to an in-depth understanding of the relationship between development and poverty. Given that poverty can be a self-perpetuating situation, I considered it necessary to carry out a detailed analysis of its determinants, both at the level of the individual and at the level of society as a whole. Thus, the paper aims to provide a perspective into how these determinants can influence poverty levels and limit economic development.*
In accordance with the literature, this paper highlights that poverty is the result of a combination of interconnected factors, which can generate a vicious circle that is difficult to break in the absence of a holistic view of this phenomenon. Solving it requires complex and strategically directed interventions.

Keywords: economic development, determinants of poverty

JEL classification: O11, I32

1. Introduction

Poverty is a complex and multidimensional phenomenon, influenced by a wide range of determinants that vary from country to country and from region to region, which is also reflected in specialized papers (Collier, 2008; Bartle, 2013; Walker & Bantebya-Kyomuhendo, 2014; Sowell, 2016; Brady, 2019). Most poverty researchers address a single case, a country or a region, studying a small number of the determinants of this phenomenon, although certain factors can often be associated with the perpetuation of poverty in many contexts. Thus, the literature does not provide a more complex classification of the determinants of poverty, although they can be grouped into several main categories such as: economic factors, educational factors, health factors, social and demographic factors, political and institutional factors, geographical and environmental factors, cultural factors and historical factors.

2. Methodology

In order to provide an overview of the complexity of the addressed topic, I conducted a content analysis of the scientific papers selected from Google Academic and ResearchGate, published between 2000 and 2024, searching for the expression "determinants of poverty". I believe that using this method of documentation contributes to consolidating the theoretical basis regarding the determinants of poverty by providing an understanding of the topic addressed.

3. Results

3.1 Economic factors

Among the most frequently addressed determinants of poverty are those in the economic field. Thus, unemployment and lack of job opportunities, underemployment directly contribute to poverty, as limited or unstable incomes prevent access to essential resources (Moller et al., 2003; Rainwater & Smeeding, 2003; 2012; Brady et al.,2017). Low productivity is another important determinant, being the result of some complex factors such as deindustrialization and lack of advanced technologies (Mouw, 2000), the absence of adequate infrastructure, poor quality education and health care, the lack of stable economic policies (fiscal and social protection policies). Inflation and the destabilizing effects of rising prices have a negative impact primarily on the poor, reducing their ability to cover basic expenses (Easterly, 2002; Hayek & Caldwell, 2014; Buheji, 2022) worsening social inequalities (Stiglitz, Sen, & Fitoussi, 2009) and pushing vulnerable populations into poverty.

3.2 Educational factors

In the literature, education is mentioned as one of the most important determinants of poverty (Alkire and Santos, 2013; Brady, 2016; Samuel et al., 2018; Easterly 2002) having a profound impact on income, employment chances and social mobility.

Limited access to quality education and high vocational training or early school leaving perpetuate the cycle of poverty, as people without adequate education are less likely to access well-paid jobs (Guo & Harris, 2000; Sachs, 2006; Sharkey, 2013; Sowell, 2016; Hanushek, 2020), which undermines education and leads to adult poverty.

Low quality of education can become a poverty trap limiting the development of the skills necessary for getting out of poverty (Esterley, 2002; Ravallion, 2016). Therefore, education is one of the powerful tools for poverty reduction, and investments in accessible and quality educational systems are essential to combat this phenomenon.

3.3 Health factors

The role of health on a person's poverty or even on the development of society as a whole is undeniable. Studies conducted by Deaton (2003) show a close interdependence between education-health-poverty. Specialists unanimously agree that both the healthcare system and the individual health directly and indirectly influence poverty, as such they produce serious expenses and consequences at both the micro and macroeconomic levels (Sachs 2006; Suhrcke, et al., 2012; Jamison, et al. 2013; World Bank, 2022).

3.4 Social and demographic factors

Discrimination and social exclusion are essential factors that not only contribute to the persistence of poverty but affect both the discriminated person and communities as a whole, contributing to the maintenance of perpetual cycles of poverty and inequality. Ethnically, racially and religiously marginalized groups are often excluded from economic and educational opportunities, thus perpetuating the cycle of poverty (Piketty, 2014; Kaida&Kaida, 2016; Milazzo & Van de Walle, 2017; Cruz and Ahmed, 2018; Sen, 2000).

Family structure is another determinant with an important impact on poverty. Specialist studies show that among the most vulnerable groups, in terms of poverty,

are large families and single-parent families (World Bank, 2003; Gibson-Davis et al., 2005; Burton et al., 2009; McLanahan, 2009; Lichter et al., 2012;) as well as female-headed households (World Bank, 2003; Rainwater & Smeeding, 2003; Kohler et al., 2012).

3.5 Political and institutional factors
Among the determinants in the area of political and institutional factors are: government policies (Sowell, 2016), political instability and conflicts (Collier, 2008, Buheji, 2022), corruption and ineffective governance (Easterly, 2002; Acemoglu & Robinson, 2012), inequalities (Soss et al., 2011; Huber & Stephens, 2012; Watkins-Hayes & Kovalsky, 2016; Michener, 2018) institutions and social protection systems. Thus, an effective governance, well-designed economic policies and a strong social protection system are essential for addressing poverty and promoting the general well-being of the population.

3.6 Geographical and environmental factors
Geographical disparities have been identified as a major cause of poverty. Specialists have shown that segregation is poverty-inducing, demonstrating a direct relationship between this concept and the level of unemployment (Crowder & South 2005, Lichter et al. 2012, Pattillo & Robinson 2016), urban poverty (Ananat, 2011; Sharkey, 2013; Owens, 2015; Massey, 2016) or the rural one. Researchers emphasize that the unfavourable climate, scarce natural resources, geographical isolation, namely the limited access to natural trade routes (navigable rivers, seaports) fundamentally influence development and economic opportunities but also social structures, contributing to the maintenance of a high level of poverty (Sowell, 2016; Bhattarcharyya, 2016; McAuliffe &Triandafyllidou, 2021; Kakwani, 2024; Sachs et al. 2019, 2024).

3.7 Cultural factors
Theories of poverty tend to present culture as an essential source of poverty (O'Connor, 2001; Dohan, 2003; Lichter et al. 2003; Bertrand et al., 2004; Harding, 2010; Durlauf, 2011; Katz, 2013; Levine, 2013; Sowell 2016). Many papers discuss the new culture of poverty (Lamont & Small, 2008; Harding, 2010; Steinberg, 2011; Dahl et al., 2014; Streib et al., 2016) explaining the counterproductive behaviour that causes poverty. A complex and more flexible approach to the relationship between culture and poverty is proposed, countering traditional ideas that viewed the culture of poverty as a fixed set of traits or limiting values with specific traits that prevent individuals from overcoming their economic condition.
According to Small et al. (2010), culture itself is not a direct determinant of the economic status, but predestines the individual towards a certain level of income. Therefore, through education, those values and skills, through which the individual can overcome the scourge of poverty, can be acquired, otherwise we would not have so many positive examples of success of people who come from disadvantaged cultural backgrounds.

3.8 Historical factors
Historical factors can play a decisive role in maintaining and perpetuating poverty, creating economic, social and political structures and conditions that affect access to opportunities and resources over several generations. Specialized studies show

that in many countries' poverty is linked to a historical legacy of colonization, exploitation and underdevelopment, conflicts and wars, which has created persistent structural inequalities. (Sowell, 2016; Baker, 2023)

Although in Romania since the end of the 20th century and the beginning of the 21st century, the level of poverty and the rate of poverty risk or social exclusion have been significantly reduced, local specialists have been and continue to be concerned with studying the causes of poverty. Thus, in addition to the determinants of poverty studied in the literature at the Romanian level, the following factors have been identified as being typical of our society (Zamfir, 1998; World Bank, 2003; Paraschiv, 2008; Ștefănescu & Pop, 2016; Ulman & Căutișanu, 2020) access to work and quality of jobs, education, economic development in general, territorial disparities and insufficient infrastructure, structure and socio-demographic profile of households, income inequality and the role of redistribution policies, belonging to socially and territorially vulnerable groups.

4. Conclusions

To effectively address poverty, it is essential to understand the context and the specific factors that contribute to its persistence, as well as to promote community participation in the development and implementation of solutions. Based on the studied papers, we can say that poverty can be a self-perpetuating situation, where the lack of resources prevents capital accumulation, productivity growth or investments in education and health care, which keeps people in a situation of economic and social precariousness restricting the ability to get out of poverty. The combination of determinants presented in this paper can become a trap of poverty, which reinforce each other, making extreme poverty difficult to overcome without external support or without significant changes in governance and policies.

Therefore, further research in this area is needed to find effective solutions to design policies and interventions that take into account the specific context of each community.

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EMERGING MODELS OF SOCIAL WELFARE MANAGEMENT IN ROMANIA: INNOVATION, PERFORMANCE AND ADAPTATION

Andrei Alin MILOȘI

Doctorial School of Economic Sciences and Humanities, Management Field
"Valahia" University of Târgoviște
milosi.andrei@gmail.com

Abstract: Social welfare institutions in emerging markets such as Romania face increasing pressure to improve performance, efficiency, and social outcomes in the context of demographic change, financial constraints, and rising social needs. This paper examines emerging models of management in Romanian social welfare institutions, focusing on organizational innovation, digital transformation, inter-institutional coordination, and performance evaluation. Using comparative conceptual analysis supported by statistical data from Eurostat and the National Institute of Statistics (INS), the study highlights Romania's gradual progress in adopting modern management practices aligned with European welfare standards. However, challenges persist, including insufficient human resources, fragmented service delivery, and variable implementation across regions. The paper argues that sustainable modernization requires strategic capacity-building, digital integration, and a shift toward person-centered, community-based services.

Keywords: social welfare institutions; management; innovation; performance; emerging markets; Romania

JEL classification: I38; H75; O35

1. Introduction

Social welfare systems represent a cornerstone of social protection and societal well-being, particularly in emerging economies where socioeconomic vulnerabilities are more pronounced. Romania's welfare system has undergone considerable transformation since EU accession, yet the process remains uneven. The modernization effort is shaped by demographic aging, migration trends, fiscal constraints, and increasing expectations for efficient, transparent governance.

2. Conceptual Foundations of Welfare Management

Modern welfare management emphasizes evidence-based decision making, digital tools, inter-agency collaboration, and community-centered services. In emerging markets, implementation is often constrained by limited financial resources and administrative fragmentation. Nonetheless, alignment with the European Pillar of Social Rights continues to shape institutional restructuring and capacity-building.

The graphical comparison presented in Figure 1 provides a visual representation of the differences in social protection expenditure between Romania and the European Union average. The data reveal a consistent and significant gap in welfare investment over the 2019–2023 period, with Romania allocating approximately half of the EU-27 average as a share of GDP. Although both trends appear relatively

stable, Romania's incremental growth remains insufficient to close the divergence in institutional capacity, service coverage, and social program sustainability. This gap has direct implications for the availability of social care professionals, the affordability and accessibility of services, and the overall resilience of the welfare system in responding to social risks and demographic pressure. The figure therefore highlights not only the quantitative disparity in funding, but also the structural challenges that Romanian welfare management must address in order to align with European performance standards.
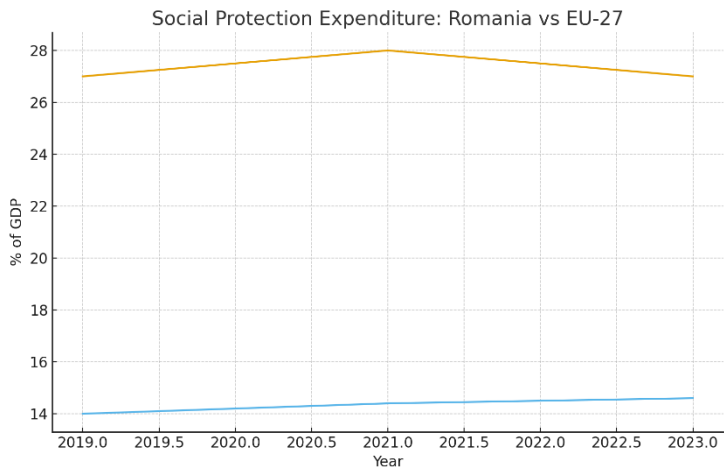
Figure 1: Social protection expenditure, Romania vs EU-27 (2019–2023)

Source: Eurostat (2024)

Table 1 presents selected indicators relevant to social welfare system capacity and outcomes.

Table 1 summarizes key indicators that reflect both the structural capacity of the Romanian welfare system and the social outcomes associated with it. The lower public expenditure on social protection, combined with the reduced proportion of personnel employed in social welfare services, suggests that institutional infrastructure remains underdeveloped compared to the EU average. This contributes to systemic strain, including high workloads for social workers, limited-service outreach in rural and disadvantaged areas, and difficulty implementing preventive or community-based support programs. Additionally, the elevated share of the population at risk of poverty or social exclusion highlights the consequences of underinvestment and underscores the need for strategic reforms. Together, these indicators reinforce the argument that welfare management modernization in Romania requires not only administrative and technological improvement but also sustained financial and human capital investment.

Table 1. Key indicators relevant to social welfare system capacity and outcomes

Indicator	EU-27 Avg	Romania	Source
Social protection expenditure (% GDP, 2023)	27.0%	14.6%	Eurostat
Staff share in welfare (% employed, 2022)	3.2%	1.8%	Eurostat
Risk of poverty or social exclusion (2023)	21.6%	31.2%	INS/Eurostat

Source: Eurostat (2024)

4. Policy Directions for Strengthening Welfare Governance in Romania

To advance welfare system modernization, Romania must prioritize long-term workforce development, ensuring stable staffing and professional pathways in social care. Digital transformation should include interoperable data platforms enabling integrated case management. Strengthening collaboration between social, health, education, and labor agencies can reduce service fragmentation. Finally, expanding community-based and preventive services may reduce institutional care dependency while improving quality of life outcomes.

5. Conclusion

The evidence discussed throughout this paper highlights both progress and persistent challenges in the evolution of Romanian social welfare management. While the country has aligned itself with European standards and has initiated modernization programs, the pace and depth of these reforms vary significantly across administrative levels and regions. Sustained progress requires commitment not only from central government but also from regional and local authorities, as well as from stakeholders such as NGOs, professional associations, community organizations, and beneficiaries themselves.

One important conclusion is that innovation in welfare management cannot be reduced to the simple adoption of new technology or administrative protocols. Instead, effective modernization requires a systemic shift toward integrated care models that place individuals and their needs at the center of support networks. This implies greater coordination between sectors such as health, education, employment, and housing, along with consistent data sharing and case management approaches. Without this integrated framework, welfare services risk remaining fragmented and reactive rather than strategic and preventive.

Furthermore, improving welfare governance calls for investing in human capital. Social workers and other frontline professionals require not only technical competencies but also emotional support, supervision, and career development pathways to ensure long-term workforce stability. Enhancing the professional status

of social care work is essential for reducing turnover and ensuring continuity and quality in service delivery.

Financial investment remains another critical factor. While budget constraints are often cited as limitations, welfare underfunding leads to broader social costs, including increased poverty, reduced labor market participation, long-term health complications, and weakened social cohesion. In contrast, strategic investment in welfare systems has multiplier effects, improving productivity, well-being, and community resilience. Policymakers need to shift perspectives from viewing welfare as a cost to understanding it as a foundation for sustainable development.

Finally, modernization efforts should be accompanied by strengthened monitoring and evaluation mechanisms. Performance indicators must capture not only quantitative outputs but also qualitative outcomes such as user satisfaction, social integration, and long-term empowerment. Transparent and evidence-based evaluation supports accountability and continuous improvement.

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THE IMPACT OF EMERGING TECHNOLOGIES ON THE DYNAMICS OF EMERGING MARKET ECONOMIES

Ana-Maria Oprea[1], Marilena Draghici[2]

[1] *Ana-Maria Oprea, PhD Student, Romanian Academy, School of Advanced Studies of the Romanian Academy, Doctoral School of Economic Sciences, National Institute for Economic Research "Costin C. Kirițescu", Institute of Economic Forecasting, Bucharest, Romania*
[2] *Marilena Draghici, Romanian Academy, School of Advanced Studies of the Romanian Academy, Doctoral School of Economic Sciences, National Institute for Economic Research "Costin C. Kirițescu", „Victor Slavescu" Center for Financial and Monetary Research, Bucharest, Romania*
anamariapecaoprea@gmail.com, marylena_draghici@yahoo.com

ABSTRACT: *The global economy is experiencing a period of structural transformation caused by the rapid development of emerging technologies, such as artificial intelligence, blockchain, decentralized finance, digital currencies, the Internet of Things (IoT), and advanced automation. These innovations are reshaping economic paradigms, redefining productive sectors, supply chains, occupations and financial flows in emerging market economies. A thorough understanding of the relationships between technological advancement and its impact on emerging market economies is fundamental to efficiently address socio-economic disparities and to facilitate inclusive, sustainable development. The objective of the paper is to analyze the impact of emerging technologies on the structure and dynamics of these markets, through statistical analysis of macroeconomic indicators and analysis of policy documents and national digitalization plans. The methodology used is a theoretical-empirical one, based on an integrated approach combining quantitative and qualitative research. The findings indicate a strong correlation between digital infrastructure and macroeconomic performance in emerging economies, with statistical evidence showing significant growth in internet penetration, digital financial inclusion and productivity. Overall, emerging technologies present opportunities to advance financial inclusion in emerging economies, but its success depends on integrative governance, digital capacity, and equitable policy frameworks.*

Keywords: Emerging Technologies; Emerging Economies; Digital Transformation; Economic Development; Innovation; Growth

JEL classification: C80; O10; O11; O19; O57

1. Introduction

Technological transformations over the past two decades reshaped the foundation of emerging market economies, which led to a reconfiguration of production systems, labor markets, and financial structures. In emerging market economies, advanced technologies including artificial intelligence (AI), the Internet of Things (IoT), blockchain, and digital finance are increasingly recognized as transformative forces. Countries such as China, India, Brazil, Estonia and others are making substantial

investments in digital infrastructure, start-up ecosystems, and technology-driven services (Singh, & Singh, 2025). This phenomenon demonstrates the leapfrogging theory, which states that developing economies bypass the traditional stages of industrialization through direct adoption of advanced technological resources (Chen & Filieri, 2024). Previous studies of digital transformation in emerging markets highlight the increasing role in this field for mobile connectivity, artificial intelligence (AI) and fintech in broadening accessibility to financial services, particularly those for the underserved (World Bank, 2024). In this context, the present paper aims to analyze the implications of emerging technologies on the structure and dynamics of emerging market economies through a theoretical-empirical approach. It will examine the relationships between technological progress and key macroeconomic indicators, with a particular focus on the adaptability of economic policies in response to this rapid transition.

2. Methodology

An integrated approach of quantitative and qualitative data studies is utilized in this research to analyze the effect of new technologies on macroeconomics of EMEs. The reasoning behind this dual approach can be traced back to the multi-faceted characteristics of the phenomenon which involves quantification of economic impacts induced by technology adoption and understanding the institutional and policy environment where these technologies are deployed.

Quantitative research: The quantitative part involved some statistical analysis of macroeconomic indicators, including GDP growth, TFP (total factor productivity), R&D investment levels, labor market dynamics and penetration of digital infrastructure. Data will draw from global databases, such as the World Bank, IMF Data, OECD.Stat, Eurostat, the Global Innovation Index.

Qualitative Research: The qualitative study will rely on content analysis of official reports, national digitalization plans and policy documents by OECD, World Economic Forum and World Bank. Case studies of several developing and transition economies can be found to illustrate the complex trends of digital transformation.

3. Results and Discussion

This section presents the main findings of the theoretical-empirical analysis and explores key patterns in the relationship between emerging technologies and macroeconomic transformation in emerging market economies. It highlights how the emerging technologies are impacting the macroeconomic indicators and reinforce the link between digital infrastructure and per-capita GDP, particularly in countries where improvements in affordability and connectivity were imperative in accelerating financial inclusion and economic growth. For instance, World Bank's statistics indicate that there was a rise in mobile broadband penetration in EMEs from 45% in 2015 to over 75% in 2022, which is associated with an increase in digital financial inclusion (World Bank, 2024). Despite the rapid growth of digital banking solutions, the uneven development of digital infrastructure and regulatory frameworks continues to limit the inclusive potential in many emerging economies (Oprea & Nicula, 2026). Nations with GDP per capita between 2,000 and 10,000 have above

70% internet use rates, versus less than 10% in 2000 (ITU&WDI 2023; World Bank, 2024). These trends highlight the importance of leapfrogging tools, as the emerging market economies more than ever avoid traditional stages of industrialization through the development of new technologies digitally. For example, Estonia is a global leader in advanced e-governance with 99% of public services rendered online, 97% of schools connected to the internet, positioning it as a global benchmark for digital public infrastructure (Espinosa & Pino, (2025). India has shown us the scale of fintech innovation in its Unified Payments Interface (UPI), which handled more than $200 billion in transactions as of January 2023, alongside Aadhaar, a national digital identity system that informs inclusive access to services (Rayarao, & Donikena, 2025). Brazil was also leading fintech and digital banking growth, increasing consumer access and updating payment systems. Targeted initiatives and technologies can drive economic modernization and inclusive growth in developing economies (Jula, 2007).

4. Conclusions

The conclusion of this study shows that emerging technologies (AI, fintech, and mobile connectivity, among others) are transforming the dynamics of emerging market economies. Quantitative evidence suggests a positive correlation between expanded digital structures and GDP growth, and qualitative case studies (such as Estonia, India, and Brazil) illustrate how focused policies speed up digital uptake and financial inclusion. Countries with strong digital public infrastructure and active reskilling programs are better prepared to adopt technological change. In contrast, countries that are missing adaptive institutions often struggle to translate technology into inclusive economic growth (ILO, 2025).

This paper contributes to the existing literature by correlating the adoption of emerging technologies with key macroeconomic indicators such as GDP, productivity, and employment, offering an integrated perspective on the structural transformations driven by technological progress. However, the research has several limitations. Although the panel dataset includes macroeconomic trends from 2010–2024, sectoral effects and informal labor dynamics have been scarcely explored. Moreover, use of secondary data can lead to reporting biases, and the case studies, while informative, fall short of demonstrating the exhaustiveness of emerging market economies diversity.

Emerging technologies offer both opportunities and risks for emerging market economies. They permit leapfrogging and the acceleration of productivity gains, while produce the risk of inequality and labor force displacement. To achieve maximum benefit of it, policymakers need to prioritize digital infrastructure development, reskilling efforts and regulatory inclusivity. This highlights that future research ought to investigate integrating micro-level data and longitudinal models of technological transformation which will better grasp the socio-economic implications of that process.

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THE IMPACT OF CORRUPTION ON ECONOMIC PERFORMANCE IN EMERGING ECONOMIES

Adriana Maria Anca

Doctoral School of Accounting, Faculty of Economic Science, 1 Decembrie 1918 University of Alba Iulia, Romania
anca.adriana.sdc2024@uab.ro

Abstract: *This paper presents a comprehensive literature review on the impact of corruption on economic performance in emerging economies. Drawing on empirical and theoretical studies published over the past two decades, the research synthesizes key findings regarding the mechanisms through which corruption affects growth, investment, and institutional quality. The review highlights three main dimensions: (1) the macroeconomic effects of corruption on GDP growth and productivity, (2) the influence of governance and institutional frameworks on mitigating or amplifying corruption's impact, and (3) the role of foreign direct investment and business confidence in shaping economic outcomes. By critically analyzing diverse methodological approaches—ranging from cross-country regressions to case studies—the study identifies consistent patterns and contradictions within existing scholarship. The findings reveal that corruption generally exerts a negative influence on economic performance, though its magnitude varies depending on institutional strength and policy context. Finally, the paper underscores research gaps and proposes directions for future studies, emphasizing the need for integrated, multidimensional approaches to understanding corruption's economic implications in emerging markets.*

Keywords: corruption; economic performance; emerging economies; governance; institutional quality; foreign direct investment; business environment; economic growth

JEL classification: D73, O17, O43, F21, P37

1. Introduction

Corruption is widely regarded as one of the most complex and persistent impediments to sustainable economic development. It exerts a direct, detrimental influence on economic performance and the investment climate, particularly in emerging economies. In the context of economic integration, researchers and policymakers need to understand how corruption shapes economic growth, investment flows, productivity, and institutional quality.

The effects of corruption on economic performance are significantly conditioned by institutional quality, the public policies implemented, and the economy's structural characteristics. In emerging economies, where institutional frameworks are continually consolidating, the relationship between economic performance and corruption becomes even more complex. This complexity justifies the need for more extensive, rigorous, and multidimensional analyses.

2. Methodology and results

The present study employs a **bibliometric approach** to conduct an in-depth examination of the specialised literature on the relationships among corruption, economic performance, and developments specific to emerging economies. A bibliometric analysis was chosen for its capacity to highlight the structure, dominant directions, and conceptual evolution of the phenomena under investigation, thereby offering a clear picture of the interconnections between these concepts and how they are reflected in the scholarly literature.

For the bibliometric analysis, data were collected from the **Web of Science** database. The search strategy was constructed using the keywords *"corruption"*, *"economic performance"*, and *"emerging economies"*, and, through filtering, particular attention was paid to ensuring methodological and theoretical relevance. The resulting dataset was exported in a format compatible with **VOSviewer** software, which was subsequently used to generate **Figure 1**.
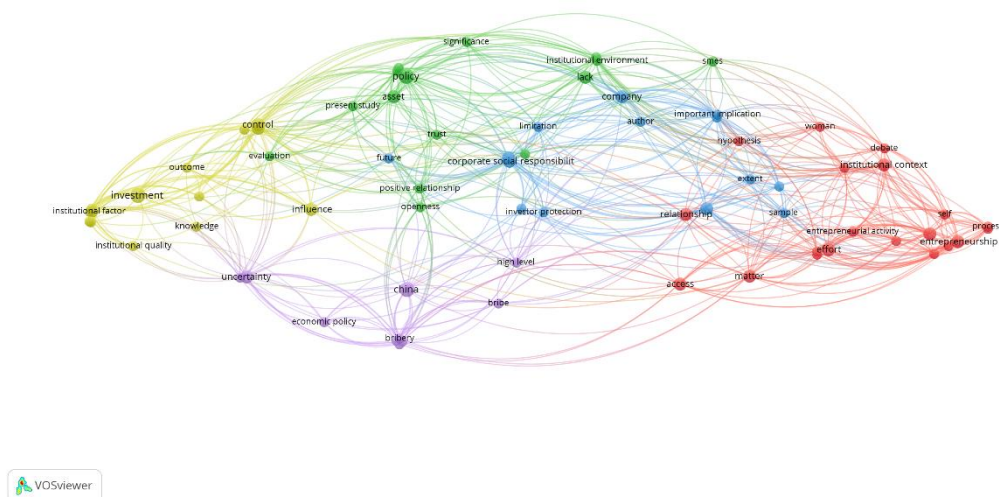
Figure 1: Bibliometric analysis of the impact of corruption on economic performance in emerging economies
Source: the author's projection

Starting with the keyword *corruption*, this term serves as the central nucleus of the analysed literature. It is positioned in an area of the map characterised by a high density of connections and a substantial number of associated terms. Concepts such as *governance*, *public accountability*, *institutional quality*, and *political instability* indicate that corruption is predominantly framed within the institutional dimension and emphasise the essential role of institutions in mitigating its economic impact. The red cluster illustrates that existing research frequently explains corruption

through structural weaknesses of the state and the lack of transparency and administrative efficiency within institutions — an interpretation aligned with the view that corruption constitutes a barrier to sustainable economic development.

Regarding the keyword *economic performance*, Figure 1 shows a distinct concentration of terms related to the economic consequences of corruption, forming a cluster that includes concepts such as *economic growth*, *productivity*, *competitiveness*, *investment*, and *macroeconomic policies*. The presence of these terms indicates that economic performance is a core dimension in the specialised literature on corruption. Furthermore, the connections between institutional and economic terms highlight the notion that economic performance is mediated by institutional quality. This aspect corroborates theoretical assumptions suggesting that corruption affects the economy through direct costs, diminished investment attractiveness, market distortions, and reduced governmental capacity to implement effective policies.

The keyword *emerging economies* appears on the VOSviewer map in a position linking both the institutional and the economic clusters, underscoring that the literature describes these economies as spaces characterised by structural vulnerabilities but also by development potential. Terms such as *human capital*, *development*, *business environment*, *innovation*, and *reform* are closely associated with emerging economies, suggesting that studies in these contexts examine how corruption impedes processes of institutional consolidation and modernisation. The bibliometric analysis thereby confirms that emerging economies present a distinct analytical context in which corruption simultaneously affects administrative capacity, competitiveness, investment dynamics, and long-term economic growth trajectories.

3. Conclusions

In conclusion, the present study highlights that the relationship between economic performance in emerging economies and corruption is complex and strongly shaped by public policy, institutional quality, and the structural characteristics of the economic environment. The bibliometric results obtained using VOSviewer indicate that, in emerging economies, corruption does not operate in isolation; rather, it cascades into effects on productivity, competitiveness, investment levels, and the capacity of states to implement effective policies.

Based on the studies analysed, we may conclude that, in general, corruption negatively affects economic performance, although the magnitude of this effect varies across levels of development and institutional contexts. Emerging economies are characterised by fragile institutions and incomplete reforms, rendering them particularly vulnerable to the adverse effects of corruption. This explains the increased emphasis in the literature on the need for institutional strengthening, the consolidation of the business environment, and improvements in governance practices. Furthermore, the present study underscores the importance of human capital and institutional learning as fundamental factors in reducing vulnerability to corruption and supporting sustainable economic growth.

The findings of the bibliometric analysis demonstrate the need for an integrated analytical framework and multidimensional approaches to evaluate the impact of corruption on economic performance. Only through the combination of coherent economic policies, investments in human capital, and institutional reforms can emerging economies mitigate the effects of corruption and establish the foundations for sustainable economic development. Additionally, the results suggest several

promising avenues for future research, such as the integration of advanced indicators of institutional quality, longitudinal analyses of reform dynamics, and comparative assessments across regions. In this way, the present work contributes to a deeper understanding of the complex interactions between economic performance and corruption. It highlights the crucial role of institutional consolidation in countries undergoing transition.

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E-HEALTH AND RENEWABLE ENERGY INTEGRATION: A SUSTAINABILITY ASSESSMENT FRAMEWORK FOR COMBATING TERRITORIAL DISPARITIES IN HEALTH ACCESS

Sorin Alin OPREA[1], Georgiana Anamaria DUNĂ[2], Maria-Magdolna MACULA[3]
Romanian Academy, School of Advanced Studies of the Romanian Academy, Doctoral School of Economic Sciences, National Institute for Economic Research "Costin C. Kirițescu", Institute of Economic Forecasting Bucharest, Romania
[1]sorin.alin@gmail.com, [2]anamaria.georgiana.duna@gmail.com,
[3]magdamacula@gmail.com

Abstract: Health is a fundamental right in Romania, yet the system faces chronic issues: underfunding, regional inequalities, staff migration, and limited access for the vulnerable. While e-Health solutions are essential for bridging this gap, their long-term impact hinges on infrastructure resilience and energy sustainability. Although e-Health (telemedicine/remote monitoring) powerfully reduces disparities, its success in isolated areas depends on supply resilience; exclusive reliance on the unstable conventional power grid causes frequent outages for essential services. Therefore, integrating green renewable energy (photovoltaics/small wind systems) is key, ensuring energy autonomy and reliability of digital health access points, reducing long-term operational costs, and supporting national climate goals. Studying this e-Health/renewable energy synergy is essential for developing truly equitable and resilient healthcare systems. The paper proposes a conceptual evaluation framework, analyzing theoretical arguments for energy integration, and concludes that the synergistic adoption of e-Health and renewable energy is an effective lever for combating socio-economic and territorial inequities in healthcare.

Key words: e-Health, renewable energy, regional disparities, socio-economic impact, sustainability, health access.
JEL classification: I18, O18, Q20, Q56, R11

1.Introduction

The Romanian healthcare system faces severe territorial disparities and chronic underfunding, which limit its ability to ensure equitable access to medical services. With public health expenditures of only 6.3% of GDP—well below the EU average of 9.8% (Eurostat)—and a life expectancy nearly six years lower than the EU average (75 vs. 81 years), the socio-economic and health disparities between regions (e.g., North-East vs. Bucharest-Ilfov) are deeply visible. These imbalances are exacerbated by outdated infrastructure and the migration of medical personnel, leaving rural and disadvantaged areas with insufficient medical coverage.

In this context, the large-scale implementation of e-Health solutions (telemedicine, remote monitoring) becomes a strategic necessity rather than merely a technological option. E-Health provides a direct mechanism to overcome geographical barriers and increase the efficiency and availability of primary and specialized medical services in isolated communities. The use of technology has the

potential to reduce patient transportation costs, decrease workplace absenteeism, and, consequently, support regional socio-economic development.

The concept of e-Health is founded on ten key principles, or "E's," designed to transform the healthcare system. The main goal is to increase the efficiency of medical assistance by avoiding unnecessary interventions and improving the quality of medical care (for example, by directing patients to top providers). e-Health also promises patient empowerment and continuous education for professionals, fostering a new partnership based on shared decision-making. From both a geographical and conceptual perspective, e-Health enables the expansion of the healthcare services coverage beyond the conventional limits. However, the greatest challenge remains equity: although e-Health should reduce disparities, there is a risk that it may deepen the digital gap between "the haves" and "the have-nots" (rural vs. urban, poor vs. rich) making political intervention necessary to ensure equitable access for all vulnerable groups.

In order for the e-Health benefits to be sustainable and resilient in the long-term, it is imperative to address its source of power supply. Dependence on traditional energy grids can generate vulnerabilities in rural areas and runs counter to environmental objectives.

Therefore, our study adopts a conceptual approach, analyzing how the synergy between e-Health and Renewable Energy optimizes energy performance and social sustainability, arguing that this integration is essential for service reliability and the reduction of disparities.

2. Literature review

E-Health is defined as "an emergent field at the intersection of medical informatics, public health and business, referring to healthcare services and information provided or improved through internet and related technologies. In a broader sense, the term characterize nu just an interconnected development, but also a state of mind, a mindset, an attitude and a commitment to a global thinking, interconnected, to improve medical care at a local regional and world level, through the use of IT&C." (Eysenbach, 2001).

Telemedicine is an essential tool, regarded as the most direct means to improve access to medical services and reduce health inequalities for disadvantaged and rural populations by substantially decreasing distances, travel time, and waiting time. Similar to how banking digitalization has provided financial services to isolated or underbanked populations (*through mobile banking*), (Oprea, I-M., Nicula, E-A., 2026) health digitalization (e-Health) is improving the equity of access to healthcare for rural or disadvantaged communities. Thus, telemedicine and remote monitoring become the main ways of reducing distances and waiting times, contributing to the development of the digital society.

Medical care is limited in remote rural villages because providing healthcare to rural communities is exhausting and difficult due to the distance. Since most healthcare institutions are located in urban regions, residents of rural communities must travel long distances to urban areas to receive treatment for even minor health issues – a situation that leads to medical tourism. (M. Currie, LJ Philip și A. Roberts, 2015)

The integration of solar energy solutions into rural healthcare is an impact multiplier that brings operational resilience and critical quality improvements. The

reliable power supply provided by these systems extends operating hours and enhances lighting for procedures, enabling more accurate diagnoses and superior medical services. A fundamental benefit is ensuring the safety and potency of vaccines through solar refrigeration, a vital step for public health. From a sustainability perspective, solar solutions strengthen the financial independence of facilities by reducing long-term operational costs and contribute to environmental sustainability by lowering the carbon footprint. Although initial costs and maintenance pose challenges, these can be overcome through innovative financing models and strengthening the local capacities, thus proving that solar-powered healthcare is an essential model for achieving sustainable development and equity. (Izuka, U., Ojo, GG, Ayodeji, SA, Ndiwe, TC și Ehiaguina, VE, 2023)

3. Discussions and Conclusions

According to Eurostat data, in 2023, among the EU countries, doctor's teleconsultations were most frequent in Estonia, averaging 2.1 per inhabitant. In Romania and Greece, teleconsultations were almost nonexistent, with both countries recording an average of 0.0 consultations per inhabitant; detailed data show that the average in Greece was below 0.0002 teleconsultations per inhabitant. In relative terms, Estonia also recorded the highest share of teleconsultations among all medical consultations, at 35% in 2023. Teleconsultations also accounted for more than a quarter of all consultations in Portugal (27%), Denmark (26%), and Sweden (25%). However, for these three countries, the coverage is incomplete, and the reported shares may therefore be affected. In 10 out of the 19 countries for which this share can be calculated, fewer than 1 in 10 consultations were teleconsultations.

For isolated rural populations, the effectiveness of telemedicine in reducing disparities relies directly on energy reliability. Powering telemedicine centers with renewable energy ensures necessary operational resilience, eliminating service interruptions from unstable rural grids while reducing long-term operational costs. As unreliable rural power grids consistently undermine telemedicine effectiveness, installing renewable systems (solar/wind) guarantees energy autonomy and service continuity even during outages. This transforms telemedicine from an intermittent solution into a reliable and trustworthy service, ultimately increasing usage rates and enabling a sustainable reduction of territorial health disparities. While telemedicine powerfully overcomes regional disparities by eliminating the need for patients to travel, its promise for equity faces two limits. Firstly, the digital divide (lack of skills/equipment) restricts adoption by vulnerable populations (elderly, low-income). Secondly, and critical here, the energy gap creates a major operational vulnerability: unstable rural power grids cause frequent outages, making the service unreliable and unsustainable, thus perpetuating inequity through lack of operational resilience.

Investments in e-Health meant for areas with increased energy risk must include, as a mandatory requirement, renewable sources (solar/wind with storage). Thus, the reduction of FPSI/FI (Frequency of Power Supply Interruptions) is directly proportional to the increase of EAI (Energy Autonomy Index), transforming a volatile service into a stable one. Policies should aim to achieve both social benefits (increased access, reduced waiting times) and operational economic benefits (long-term reduction of the Average Operational Cost (AOC) and the carbon footprint). Funds allocated for healthcare digitalization must be coherent and interconnected

with those dedicated to energy efficiency and the green transition, enabling the joint acquisition of technology and energy infrastructure.

This conceptual framework for green e-Health investment policies in vulnerable rural areas establishes three criteria: First, priority funding requires a minimum Energy Autonomy Index (EAI) to prevent system failures. Secondly, performance evaluation must use the Frequency of Incidents (FI), not just adoption rate, as a resilience indicator to ensure reliable service. The Framework thus rationalizes innovative, equitable, and sustainable e-Health investments.

Conclusion

Conceptual analysis confirms that while e-Health can significantly reduce disparities in vulnerable rural Romania, telemedicine alone is insufficient due to energy vulnerability from unstable grids, making renewable energy a strategic prerequisite for success; therefore, based on resilience and the double dividend principle, we suggest decision-makers allocate e-Health funds only if a minimum 70% Energy Autonomy Index (EAI) is met in high-risk areas, and that performance evaluation must include resilience indicators (like Frequency of Incidents - FI) to measure service reliability. Policies ought to acknowledge that, although the initial cost of green infrastructure may be higher, it is justified by a Life Cycle Cost (LCC) analysis, demonstrating a reduced Average Operational Cost (AOC) in the long term, thus supporting the financial sustainability of the healthcare system.

Our future efforts will be focused on collecting and publishing aggregated data on a national level, using the proposed conceptual framework, with the aim to empirically validate theoretical projections with regards to the relation between EAI, FI and the mitigation of socio-economic disparities.

The most significant limitation is the lack of aggregated data and public indicators that would directly correlate the performance of e-Health solutions with the power supply source (traditional vs. renewable) at a regional level in Romania. Therefore, conclusions concerning the additional benefit generated by the integration of renewable sources are based on a theoretical analysis and the logical modelling of scenarios, and not on primarily empirical and statistical proofs.

The theoretical framework developed is mainly centered on the energy resilience (EAI and FI) as a critical success factor. Although it is justified in the context of rural disparities, the conceptual model is addressing only to a limited extent other important factors that contribute to e-Health failure, such as user digital competencies and initial cost for technology adoption.

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THE ECONOMIC IMPACT OF ELECTRICITY NETWORK DIGITALIZATION ON THE EFFICIENCY AND SUSTAINABILITY OF MOLDOVA'S ENERGY SECTOR

Oleg Petelca[1], Ciprian-Constantin Pătrăuceanu[2], Iurie Beşliu[3], Veronica Garbuz[3]

[1]*Alexandru Ioan Cuza University of Iași, România*
[2]*University of Oradea, România*
[3]*Alecu Russo State University of Bălți, Republic of Moldova*
oleg.petelca@gmail.com, patrauceanuc@yahoo.com, iurie.besliu@gmail.com
garbuz_veronica@yahoo.com

Abstract: *The digital transformation of electricity networks (smart grids) represents a key pillar in the modernization of energy infrastructure, with the potential to reduce energy losses, increase operational efficiency, and support the integration of renewable energy sources. In the context of the Republic of Moldova, characterized by largely outdated infrastructure and a high dependency on energy imports, the digitalization of distribution networks can generate significant economic benefits: reducing operational costs, optimizing investments, and enhancing system resilience. However, assessing the costs and benefits of digitalization in the energy sector is a complex challenge, as traditional cost–benefit analysis (CBA) encounters difficulties in managing uncertainties, dynamic stakeholder interactions, and feedback loops inherent to evolving digital processes. This paper synthesizes recent academic literature, proposes a methodological framework for the economic evaluation of digitalization in the energy sector, and presents an illustrative numerical application for the Republic of Moldova, based on loss-reduction scenarios and sensitivity analyses.*

Keywords: Republic of Moldova; energy sector; digitalization; Cost–benefit analysis; energy supply; Smart grids.
JEL Classification: *L94, L95, F15.*

1. Introduction

The Republic of Moldova faces multiple challenges in the energy sector: an aging infrastructure, high network energy losses (18%), and significant dependence on energy imports. The digitalization of electricity networks (smart grids)—including smart meters, Advanced Distribution Management Systems (ADMS), IoT sensors, and data analytics—offers tools for real-time monitoring, control, and optimization.

The Moldovan Government's plans for the upcoming five years (2026–2030) emphasize economic modernization, focusing on economic growth, energy independence, and the electrification of energy consumption. In this context, the Energy Strategy of the Republic of Moldova until 2050 was developed, aiming at a transition toward a secure, sustainable, and competitive energy system by mid-century, supported by major investments and the objective of ensuring up to 90% of the country's electricity demand from domestic renewable sources by 2050.

Within this strategy, the digitalization of the energy system has been identified as a key pillar for achieving efficiency, resilience, and European integration. To support this vision, the Program for the Digital Transformation of the Energy Sector for 2026–2030 was approved. The program foresees, among other measures, the installation of 500,000 smart meters (covering 40% of households), a reduction in energy losses to 12%, annual savings of approximately €10 million, and an increased capacity to integrate renewable energy sources.

Therefore, the digitalization of electricity networks in the Republic of Moldova is no longer merely a technological option but a strategic component of the national energy policy for the coming years.

Digitalization of electricity networks is widely recognized as an essential component of the energy transition: it facilitates the integration of intermittent renewable sources, enhances system reliability, and enables new consumer-oriented services (Hossain et al., 2016; Moretti et al., 2017). However, investment decisions at the national level require rigorous economic assessments, particularly cost–benefit analyses (CBA), that reflect market characteristics, consumption structure, energy mix, and the local regulatory framework. Previous research provides methodologies and examples that can be adapted to national-level analyses (Alaqeel & Suryanarayanan, 2019).

This paper aims to examine the economic impact of electricity distribution network digitalization in the context of these strategic objectives for the period 2026–2030, to evaluate the potential benefits, and to formulate policy recommendations adapted to the Moldovan context.

2. Literature Review

The reviewed literature confirms the strong relationship between grid digitalization and economic efficiency. Moretti et al. (2017) demonstrate that smart systems can reduce operating costs by 5–10%. Vitiello et al. (2022) emphasize the positive impact of smart meter deployment on the stability of the European electricity market. Boateng et al. (2025) and Alaqeel & Suryanarayanan (2019) highlight the importance of regulatory frameworks and governmental support for ensuring the profitability of investments. Similarly, Silva et al. (2025) and Hossain et al. (2016) argue that digitalization is essential for the integration of renewable energy sources and for reducing technical losses.

Cost–benefit analyses (CBA) of grid digitalization typically include: capital costs (smart metering, communication infrastructure, sensors, and IT systems), operational costs (maintenance, communication, software updates), direct benefits (reduction of technical and commercial losses, improved revenue collection, enhanced operational flexibility), and indirect benefits (avoided emissions, deferred investments in additional capacity, and improved customer services). Robust models employ net present value (NPV) analysis, benefit–cost ratios (B/C), sensitivity scenarios, and probabilistic distributions to capture technological and climatic uncertainties (Alaqeel & Suryanarayanan, 2019; European Commission, 2015).

CBA studies conducted in various international contexts (Europe, China, and developed economies) reveal heterogeneous outcomes: on average, total medium- to long-term benefits tend to exceed costs in integrated implementation scenarios (AMI + distribution control + demand management). However, the B/C ratio is highly

sensitive to the initial level of losses, energy prices, tariff policies, and the degree of consumer service adoption (Alaqeel & Suryanarayanan, 2019; Boateng et al., 2025). European assessments indicate that large-scale smart meter rollouts generate macroeconomic benefits when accompanied by regulatory measures and consumer engagement initiatives (European Commission, 2015; Vitiello, 2022). Recent research has also addressed the influence of cybersecurity, business models, and consumer engagement on the economic performance of digitalization projects (Mahmood, 2024; Vilaplana et al., 2025).

For Eastern Europe and the Republic of Moldova, the key research gap lies in the absence of reliable local estimates and integrated models that combine operational data with economic analyses tailored to national market conditions.

3. Illustrative Numerical Application for the Republic of Moldova

The study proposes a mixed-methods approach: (i) Cost–Benefit Analysis (CBA) for alternative digitalization scenarios; (ii) Ex-ante modeling of loss reduction based on international benchmarks adapted to national data; (iii) Structured interviews with distribution operators and relevant authorities; (iv) Sensitivity analysis for key variables (discount rate, analysis horizon, level of loss reduction).

Public data indicate network losses of approximately 18% (source: national reports). We consider three scenarios:
Scenario A (status quo): no major digitalization program; losses remain at 18%.
Scenario B (moderate digitalization): relative reduction of losses by 15% (from 18% to 15.3%).
Scenario C (extensive digitalization): relative reduction of losses by 25% (from 18% to 13.5%).
Economic estimates: if the annual value of lost energy (economic cost of losses) is approximately €10 million, then:
Scenario B saves ~€1.5 million per year.
Scenario C saves ~€2.5 million per year.
If the total investment for digitalization is estimated at €90 million, the payback period (in Scenario C) would be ~36 years without additional considerations. However, including operational savings, avoided outage costs, and indirect benefits (RES integration, flexibility) reduces the payback time. Sensitivity analysis with a discount rate of 6%–10% and variations in loss reduction of 10%–30% shows that in optimistic scenarios, the payback period can be 6–12 years.

5. Discussion

The results suggest that the economic assessment of grid digitalization requires a holistic approach: not only loss reductions but also systemic benefits (postponement of network investments, integration of renewable energy, flexibility services). Non-economic aspects such as cybersecurity and social acceptance, however, influence key economic elements.

6. Conclusions and Recommendations

The digitalization of electricity networks represents a strategic opportunity for the Republic of Moldova. Even if a strict analysis based solely on loss savings shows

long payback periods, the inclusion of operational and systemic benefits significantly reduces this timeframe.

Practical Recommendations:

1. Conduct a detailed national CBA study using operators' operational data.
2. Implement regional pilots with robust monitoring of economic indicators.
3. Establish a mixed financing framework (public funds + private partnerships) and tariff policies that allow for fair investment recovery.

When constructing a CBA model based on national data, it is essential to incorporate: market structure (centralized vs. decentralized generation), current levels of technical and non-technical losses, penetration rate and variability of renewable energy, tariffs and compensation mechanisms, local labor and IT infrastructure costs, regulatory capacity to implement data protection and cybersecurity measures. Models that do not include these local parameters tend to over- or under-estimate the actual benefits.

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THE HISTORY OF ESG POLICIES AND THE NEED TO INTEGRATE THEM INTO THE BUSINESS ENVIRONMENT

Farcas Giulia, Ilisie Roberta

Doctoral School of Economic Sciences, Field of Business Administration, University of Oradea, Oradea, Romania
giuliaanamaria11@yahoo.com, Ilisieroberta@gmail.com

Abstract: *Environmental, Social, and Governance have emerged as essential components of responsible and sustainable business practices. Rooted in the early concepts of corporate social responsibility, ESG frameworks have evolved to address the complex environmental and social challenges facing today's global economy. This paper aims to examine the historical development of ESG policies, highlighting international regulations and the growing influence of stakeholders demanding transparency from corporations. The main objective is to trace the evolution of ESG policies and demonstrate their increasing relevance in shaping corporate strategy and decision- making. Integrating ESG principles into business operations is no longer optional but a necessary condition for long-term competitiveness, resilience and trust. Reading this paper is understand how ESG standards evolved over time. This study emphasizes the importance of embedding sustainability and ethical governance within the core of the business environment.*

1. General background

The term ESG, or environmental, social and governance is a well known term between the great investors and companies around the world. It represents a set of metrics used to measure an organisation's environmental and social impact (Viviers and Eccles, 2012) and became increasingly popular in investment decisions. The concept of the ESG policies has been around for a long time and its primary focus was to align the investors portofolios with their values, through the socially responsible investing (SRI) movement, back in the 1970s. Actually, if we go back in time, the first ones who really had an impact on sustainability and social responsability were groups such as Quakers and Methodists. They were among the first ones to introduce requirements that business methods shouldn't cause harm to others. From the 1970s to 2004, ESG policies were undeniably popular amongst investors and companies, but the concept was never truly regulated by an authority. Thus, this paper aims to analyze in the following two sections the historical evolution of the ESG concept and also the need to integrate this cocept into business strategies over the years to date. The first section will cover theoretical aspects of ESG and its evolution, and the second section will highlight the importance of sustainability and social responsibility in business strategies.

2. Evolution of ESG concept

Given the current context and climate change, the need for increased attention on social responsibility has shaped the concept of ESG. Social inequality and the need for responsible corporate governance gave rise to the origins of the concept. First, there were signs that illustrated people's interest in corporate responsibility, signs dating back to the 18th century, regarding the Quaker and Methodist groups as being among the first to somehow try to include this corporate responsibility in the business environment. So, given that the first evidence of corporate responsibility appears to date back to the 18th century, the next subsection will illustrate a timeline of the evolution of this concept from a historical point of view.

2.1. Historical presentation

The ESG (environmental, social, and governance) concept was established internationally only in 2004, although sustainability had already been mentioned and applied by corporations and investors. Since 2004, the UN, through the *Who Cares Wins* report, has marked the transition from the ethical investment approach to the strategic, sustainability-oriented one. Also, in a short period of time after the UN report, in 2006 the *Principles for responsible investments* were published, thus consolidating the integration of ESG criteria in the decision-making processes of financial institutions. Considering the year of 2004 the starting point for the evolution of ESG principles, many believe that UN established this ESG concept because they provided official documents with a clear basis regarding sustenability. Thus, that was the beggining for ESG and this concept gained popularity through UN's strategies of spreading its importance over the world. At the basis of the regulation of these principles were important events and environmental disasters, and even international regulations and legislations on the importance of making business decisions without prejudice to the environment. So in this way the language of ESG framework changed, from *socially responsible investing* and *corporate social responsability* to the complex ESG framework. Back in te days, the ethical investing was all about avoiding tobacco companies, investing in weapons or in anything that somehow felt immoral. Now the real deal of the ESG framework changed and evolved in different interests which focus on smarter investment decisions. Here is the following timeline of evolution presenting some of the most important steps in shaping the ESG concept:

- 18th century: in religious circles such as Quakers and Methodists the so-called „corporate responsibility" was born by introducing requirements that business methods shouldn't cause harm to others
- 1970: decades passed until the next action, fast forward to the 70s, there is another responsible move when two United Methodist ministers opposed to the Vietnam War established the Pax World Fund where they integrated social and environmental criteria into investment decisions. As Lawton (2024) notes in his article, this action was necessary after many years of witnessing the lack of interest in environmental responsibility.
- 1992: UN Framework Convention on Climate Change, many states signed a treaty to mitigate the dangerous influence of humans on climate change.
- 1995: First sustainable investment inventory was taken by the Social Investment Forum Foundation, based in Washington, DC, this presenting another sign that the world was more and more interested in sustainable investments.

- 2000: United Nations Global Compact established a set of 10 principles for organizations, regarding matters in the environment, human rights and anti-corruption efforts.
- 2004: First "Who Cares Wins" report published with the term ESG, this report popularized the ESG term providing recommendations for integrating ESG in bussiness strategies.
- 2006: Principles for Responsible Investment focusing on the importance of incorporating ESG policies in investors' decisions.

Presenting some of the most important steps in shaping the ESG framework and evolving from simple ideas to officia andl international regulations means that the idea of corporate responsibility and sustainability is important and is needed in the business field. In order to measure the impact of sustainable investments, more precisely, to measure how important the ESG principles were for companies and investors, in 2012 was founded *„Global Sustainable Investment Alliance"* being a coalition of the world's largest sustainable investment membership organization. GSIA works to prove the importance of integrating ESG policies in the business strategies. Moreover, *The Global Sustainable Investment Alliance* estimated that by 2020 global sustainable assets totalled US$35.3 trillion in value, representing a 15% increase compared to 2018. This expansion rate shows that the issue of world sustainability and ethical investment are getting more fashionable day by day, it means lots of people want to stick to the ESG principles in business

2.2. Where ESG framework stands today

I consider that the concept of ESG is permanently evolving and suffers changes and creates new dimensions and oppportunities for companies and investors. After all the debates and ideas regarding sustainability, the world needs a consolidation of the sustainability standards. Hence, there was created *International Sustainability Standards Board* (ISSB) to develop the new standards in that matter. For example, as regards the European Union, in 2023 was issued the corporate sustainability reporting directive, requiring companies operating in this region to report the impact their operations and strategies have on people and the environment. So in this way, the ESG concept is more materialized and becomes more clear that companies are urged to allocate sustainable resources and to operate by ethical strategies avoiding causing harm to the environment. As a study from Thomson Reuters Institute mentions, the evolution of ESG is still facing new dimensions, and the integration of ESG into core businesses strategies has not gone as many of us anticipated. And that is because of some essential reasons, such as: the study shows that while many companies are going strong with their sustainability strategies, few are taking advantage of the opportunity to use sustainability as a strategic lens for competitive advantage; uncertainty around AI adoption and digitalization; geopolitical complexity and the impact of tariffs. The last reasons are playing a crucial role for resahping ESG because artificial intelligence reshapes new industries, directors are facing new realities, and the conclusion is that the traditional models are no longer sufficient. All these being said, my opinion is that when analyzing the evolution of ESG framework is similar to reading a book that offers you the opportunity to chose a final chapter and to imagine how things should end judging by your imagination. To be honest, ESG policies and this concept are still in transit even though they are regulated and established through many reports, directives and so on. More and more companies are indeed implementing ESG policies into their business strategies but in fact only

21% of companies are working to fully integrate sustainability into their strategies, according to a survey conducted by accounting and advisory firm BDO (Binder Dijker Otte). In other words, there is still hope for the environment and studies show that an impressive number of companies over the world are trying their best to integrate ESG policies at present. As for the evolution of ESG, to keep track of it means to keep adapting to new opportunities such as digitalization, AI, geopolitical changes, etc.

3. The importance of integrating ESG policies in business strategies

Integrating Environmental, Social, and Governance (ESG) policies into a company's plan has become essential for businesses looking to remain both competitive and ethical in today's market. Businesses demonstrate that their goals go beyond just producing money by incorporating ESG principles such as stewardship, treating employees fairly, and open decision-making into the very fabric of their strategy (The Corporate Governance Institute, 2024). All things considered, incorporating ESG into a business's strategy is a move that supports growth and creates a positive impression rather than just checking a compliance box. By embracing this mentality, businesses can avoid problems like entanglements, supply-chain disruptions, or a backlash while also gaining the trust of investors and customers. The following list presents some useful methods for integrating the ESG principles into buisness strategies:

- Transparent Reporting and Communication: Companies can demonstrate accountability and effectively communicate their impact by regularly releasing ESG reports or sustainability updates that adhere to established frameworks like the UN Sustainable Development Goals (SDGs) or the Global Reporting Initiative (GRI).
- Establishing Measurable ESG Objectives and Metrics: Businesses should begin by establishing quantifiable ESG goals, such as cutting carbon emissions, increasing leadership diversity, or guaranteeing ethical sourcing. To enable transparent tracking and reporting of achievement, these objectives must to be connected to the overarching company plan.

4. Conclusions

I consider that the ESG framework is still evolving, being subject to many changes and new opportunities such as digitalization. Nowadays, companies are facing new realities and integrating ESG policies in their strategic moves is undeniably important for their profit and competitive advantage. In short, weaving Environmental, Social and Governance (ESG) considerations into a company's roadmap is no longer a passing fad, it has become a necessity for lasting success. By foregrounding sustainability, conduct and sound corporate governance firms can earn stakeholder trust, curtail a spectrum of risks and boost overall performance. ESG integration equips businesses to stay competitive amid change draws capital and sparks innovation. Importantly it shows that profitability can coexist with benefits, for the planet and society.

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DESTINATION GOVERNANCE AND THE DEVELOPMENT OF DESTINATION MANAGEMENT ORGANIZATIONS (DMOS) IN ROMANIA

Radu Adrian Mihalca[1], Smaranda Adina Cosma[2]

[1]*Doctoral School of Communication, Public Relations, and Advertising, Babeș-Bolyai University, Cluj-Napoca, Romania*
[2]*Department of Hospitality Services, Faculty of Business, Babeş-Bolyai University, Cluj-Napoca, Romania*
radu.mihalca@ubbcluj.ro , smaranda.cosma@ubbcluj.ro

Abstract: *Destination governance represents a fundamental pillar in the sustainable management and competitiveness of tourism systems. As destinations become increasingly complex socio-economic ecosystems, effective governance mechanisms are crucial for integrating public and private stakeholders, aligning policy, and ensuring long-term sustainability. In recent years, the establishment of Destination Management Organizations (DMOs) has emerged as a key instrument for improving governance and coordination in tourism. This paper explores the evolution of destination governance and the process of institutionalizing DMOs in Romania, emphasizing their role in achieving efficient, transparent, and participatory tourism management. Drawing from European and Romanian policy frameworks, as well as academic research, the paper analyses the legal framework, operational structure, and challenges of DMOs in Romania. The study highlights OMD Bihor as a best-practice case of collaborative governance and identifies emerging trends in Romania's DMO network, including digital transformation and inter-regional cooperation.*

Keywords: destination governance, DMO, Romania, sustainable tourism, policy, collaboration

JEL classification: Z32; L83; R58

1. Introduction

Tourism governance defines the relational and institutional frameworks through which collective decisions regarding the development, management, and promotion of a destination are made and implemented (Bramwell & Lane, 2011). It is not limited to administrative regulation but extends to collaboration, participation, and shared responsibility between governments, private businesses, and local communities. The governance approach in tourism has evolved from centralized control toward multi-level and participatory models (Hall, 2011). In Europe, this transition has been supported by the creation of DMOs—entities that coordinate tourism policies, marketing, and strategic planning at various territorial levels. DMOs have become a central feature of tourism governance, aligning stakeholders and promoting innovation. In Romania, the concept has only recently been institutionalized through successive legislative reforms between 2022 and 2024, after decades of fragmented management and lack of cooperation between tourism actors (OECD, 2020). The emergence of DMOs in Romania thus represents both a structural reform and a paradigm shift in how destinations are governed.

2. The Concept of Destination Governance

Destination governance goes beyond the operational scope of management to include the processes, relationships, and institutional arrangements that determine how tourism decisions are made, implemented, and evaluated (Ruhanen et al., 2010). Effective governance emphasizes participation, transparency, accountability, and responsiveness (Hall, 2011). According to UNWTO (2020), governance in tourism involves coordinating public policy with private initiative and civil society engagement, thereby ensuring that tourism contributes to sustainable development. In academic literature, governance has been analyzed as a multidimensional system balancing efficiency, democracy, and legitimacy. Pechlaner et al. (2020) argue that governance enables tourism destinations to adapt to global changes and local expectations by fostering stakeholder collaboration. This approach supports innovation and ensures that decision-making processes are inclusive. In Romania, where tourism has traditionally operated under hierarchical and bureaucratic models, adopting governance principles represents a modernization effort aligned with European policy directions (Reform Support, 2022). Governance thus becomes not only a managerial tool but also a social contract among stakeholders.

3. Destination Management Organizations (DMOs): Role and Relevance

Destination Management Organizations are key instruments for operationalizing governance. A DMO is a collaborative structure that integrates public authorities, private enterprises, and local communities in the planning, promotion, and management of tourism destinations (UNWTO, 2020).

The OECD (2020) defines DMOs as entities responsible for strategic planning, marketing coordination, tourism product development, stakeholder engagement, and data collection. They act as intermediaries between policy and practice—bridging the gap between government decisions and local implementation.

DMOs' main functions include:

- Strategic Coordination: ensuring that local and regional tourism strategies are coherent and aligned with national policies.
- Marketing and Branding: creating a unified identity for destinations to strengthen competitiveness.
- Stakeholder Engagement: providing a platform for cooperation between public and private sectors.
- Sustainability Management: integrating environmental, social, and cultural objectives into tourism strategies.
- Crisis Response: supporting destinations during disruptions such as pandemics or geopolitical instability (OECD, 2020; PMC, 2022).

In Europe, successful examples include VisitScotland, Turismo de Portugal, and Tourism Ireland, which operate under transparent governance structures supported by public–private partnerships (Pechlaner et al., 2020). These models demonstrate that DMOs are essential for integrating marketing, innovation, and sustainability.

In Romania, DMOs serve as the operational backbone of governance, connecting policy frameworks with implementation. Their emergence marks a shift from fragmented local management to coordinated governance, promoting professionalism and accountability in the tourism sector.

4. The Development of DMOs in Romania: Legal and Institutional Framework

The institutionalization of DMOs in Romania has evolved through several legislative stages that reflect a broader effort to modernize tourism governance. The initial framework—Government Ordinance no. 58/1998—regulated tourism activities but lacked a systemic governance model. A significant transformation occurred with Government Emergency Ordinance (GEO) no. 86/2022, which formally introduced the concept of "Organizație de Management al Destinației" (OMD). This ordinance defined OMDs as non-profit public–private partnerships dedicated to destination management, promotion, and coordination (Law no. 64/2023). It established four levels of governance: national, regional, county, and local. GEO no. 150/2024 improved the accreditation and financing mechanisms, enabling OMDs to access national and EU funds. Ministerial Order no. 696/2022 provided the methodology for identifying and categorizing tourism destinations. According to the European Commission's Reform Support Service (2022), Romania's reform process was guided by principles of transparency, inclusiveness, and decentralization. The OECD report (2020) further emphasized the need to operationalize DMOs effectively, ensuring that they are empowered to act as strategic hubs for destination management. The legal framework also defines the composition of OMDs' governing boards, which include representatives from local government, private tourism associations, and academic institutions. This participatory model enhances legitimacy and stakeholder accountability. However, challenges remain in ensuring stable financing and avoiding political interference (Jugănaru, 2022).

5. Current Status and Challenges of the Romanian DMO Network

By 2025, Romania's national DMO network comprises 8 regional OMDs, 35 county-level OMDs, and over 60 local OMDs (Ministry of Economy, 2025). These organizations operate under a multi-level governance framework coordinated by the Ministry of Economy, Digitalization, and Tourism. OMD Bihor represents one of the most successful examples of collaborative destination governance. Established as a partnership between the Bihor County Council, Oradea City Hall, and private stakeholders, it integrates destination marketing, digital innovation, and cross-border cooperation with Hungary. OMD Bihor's success demonstrates the importance of leadership, professional management, and strategic vision in DMO development (OMD Bihor, 2025). Other examples include OMD Cluj, focusing on cultural and festival tourism; OMD Brașov, centered on mountain and heritage tourism; and OMD Sibiu, promoting culinary and experiential tourism (**Chașovschi,** 2019).

- Despite this progress, several systemic challenges persist:
- Funding disparities: smaller destinations rely heavily on local budgets, limiting operational capacity.
- Human resources: lack of professional training in destination governance and management.
- Institutional overlap: unclear division of responsibilities between local councils and DMOs.
- Data management gaps: limited monitoring systems and inconsistent performance evaluation (Tripon et al., 2018).
- Uneven digital transformation: while some DMOs (e.g., Oradea, Sibiu) are adopting smart tools, others lag behind.

- Nevertheless, Romania's DMO framework is progressing toward alignment with EU models, particularly regarding collaborative governance and destination competitiveness (Faur, 2022).

6. Conclusions

Romania's experience with DMOs illustrates a significant institutional reform in tourism governance. The transition from fragmented management to structured destination governance reflects the broader European shift toward partnership-based models (OECD, 2020; Reform Support, 2022). DMOs in Romania have emerged as vehicles for coordination, innovation, and professionalization. The legislative framework (GEO 86/2022, Law 64/2023, GEO 150/2024) established the foundations for long-term governance. However, sustainability will depend on stable financing, capacity building, and data-driven decision-making. The case of OMD Bihor shows how regional cooperation and professional management can produce measurable results in tourism visibility, competitiveness, and community engagement. As Romania continues to align with EU standards, its DMO network can serve as a governance model for Eastern Europe. In conclusion, destination governance through DMOs offers Romania the opportunity to consolidate its tourism identity, promote innovation, and ensure balanced territorial development based on cooperation, transparency, and shared responsibility.

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INFLUENCING CONSUMER BEHAVIOUR

Ştefan Bulboacă, Ioana-Maria Stăniloiu
Department of Marketing, Tourism, Services and International Business, Interdisciplinary Doctoral School, Programme of Marketing, Transilvania University of Braşov, Romania.
stefan.bulboaca@unitbv.ro, ioana.staniloiu@unitbv.ro

Abstract: *Throughout each day, consumers encounter expressions and formulations that are open to interpretation and that are usually interpreted according to the personal experiences and personality of each consumer. However, a deeper look into the specialised literature reveals several opportunities to manage these to varying degrees, given the many ways consumers can view them. This paper analyses the factors that can present such influences and how they can be managed.*

Keywords: consumer behaviour, consumer motivation, understanding, marketing.

JEL classification: M30, M31, M37, M39.

1. Introduction

In the contemporary world, access to information is easier than ever. Consumers are bombarded from all directions with messages, information, promotions, products, or services. However, the way they perceive and process the multitude of data they receive determines their consumption behaviour, and the mechanisms of consumption behaviour can be influenced at every step by external and internal factors.

2. State of Flow

The 'State of Flow' is a concept so immersive that it becomes the action itself. The consumer is no longer aware of their surroundings; their full attention is placed on that specific action that creates the 'State of Flow'. This state is crucial in enhancing consumer engagement and should be a key consideration in marketing strategies (Csikszentmihalyi, 1990 & 2014).

Flow state is a subjective experience people report when task performance feels automatic, intrinsically rewarding, optimal, and effortless (Alameda et al., 2022).

In addition to the primary factors that determine how the action unfolds, an equally important factor is the one related to the essence of the entertainment element — namely, curiosity about it. In this sense, the distance from reality is pursued to surprise consumers with novel elements that will arouse their interest and enthusiasm for the virtual environment (Murray & Maher, 2011).

Moreover, the flow leads to an optimal experience by fully engaging in the moment (Nakamura & Csikszentmihalyi, 2002). However, when the flow state is achieved, a loss of self-consciousness occurs, which is why athletes have difficulty describing how they felt in the flow state; yet, in retrospect, they report feeling terrific afterwards (Csikszentmihalyi et al., 2005).

3. Factors

The main factors that can stimulate the emergence of the "State of Flow" (Yerkes & Dodson, 1908) are the Yerkes-Dodson law and the theory of identification of an action, as they address two distinct perspectives correlated with the consumer's perception. The law explains that there is an optimal level for performing a task, and it was initially conceived by demonstrating how the optimal level influences the efficiency of solving that task. In this regard, an experiment was conducted on rats in which a subthreshold current load caused them to ignore the electrical stimulus. A much too high current load caused the rat to freeze and to be unable to respond to external stimuli. Still, an average (optimal) level of current, neither too high nor too low, led the rat to perform the task with maximum efficiency (Hanoch & Vitouch, 2004).

Years later, it was discovered that the same is true of human beings at work: when people have a task to accomplish, they focus on the execution process. If that task is too simple, people will quickly get bored and look for something else; if it is too difficult, they will be too stressed to focus effectively, and they will not be able to accomplish it efficiently (Corbett, 2015).

Action identification theory examines how people perceive actions differently, with varying levels of complexity. For example, the expression "drinking alcohol" is perceived in the following ways:

1) Stress relief.
2) Self-reward.
3) Self-nourishment.
4) Overcoming boredom.
5) Hydration.
6) Intoxication.
7) Hurting oneself.
8) Swallowing.

Thus, each expression used can have a different meaning for consumers. Suppose we combine how the law explains the existence of an optimal interval with how actions are viewed. In that case, we can determine the most appropriate expressions so that consumers receive the ideal amount of information and perceive it in a way that most strongly motivates them to purchase the product.

Moreover, the theory considers how each action has a different level of complexity, because in a football match, the expression "win the match" implies a strategy based on defence, another on attack, and another on counterattack, etc. Thus, indicating a high level of complexity. At the opposite pole, each specific action that leads to the achievement of an action with a high level of complexity does not imply too much diversity in terms of how the task can be achieved, such as: "pass the ball only forward, do not let opponents pass you, shoot in the direction of the goal. These expressions imply a low level of complexity, which, once performed, leads to the performance of an action with a high level of complexity.

4. Conclusions

Given the wide variety of possibilities through which each action can be presented or described, analysing the impact of each expression on consumers can streamline the promotion of products and services, because consumers can perceive an appropriate expression in ways that interest them in the product, and analysing the level of complexity of the formulations in combination with identifying the optimal level of complexity, according to the "Yerkes-Dodson" law, can generate enough mystery to arouse consumer curiosity and interest, but can also provide the necessary amount of information so that consumers understand the product's functionalities and do not have different expectations from reality, which can later lead to disappointment.

5. Future research direction

According to the research literature, it is possible to test, through a marketing experiment, the impact that certain words, expressions, or ideas have on consumers' reactions and understanding of simple everyday tasks. The results of these tests can verify and demonstrate useful expressions in marketing, identify the level of complexity perceived by consumers for simple words and verify the compatibility of a mix of methods that can be used in marketing research to identify new consumer preferences, but also to test how the factors that influence their consumption behaviour can be managed.

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THE ROLE OF SMES IN DEVELOPING SUSTAINABLE TOURISM: CHALLENGES AND OPPORTUNITIES IN THE POST-PANDEMIC ERA

Ciprian-Constantin Pătrăuceanu[1], Oleg Petelca[2]

[1]*University of Oradea, Romania*
[2]*Alexandru Ioan Cuza University of Iași, Romania*
patrauceanuc@yahoo.com, *oleg.petelca@gmail.com*

Abstract: *Small and medium-sized enterprises (SMEs) represent the backbone of the tourism industry and play a crucial role in promoting sustainability, innovation, and local economic development. The COVID-19 pandemic severely disrupted the tourism sector, forcing SMEs to adapt rapidly to new realities and consumer expectations. This paper provides a theoretical overview of the interconnection between SMEs and sustainable tourism, highlighting the challenges faced by small businesses in the post-pandemic recovery period and the opportunities arising from green transition policies and digitalization. Through a literature-based analysis, the paper emphasizes how SMEs can act as key drivers of sustainable tourism models, focusing on resilience, community engagement, and responsible use of resources. The findings suggest that fostering collaboration between governments, local communities, and SMEs is essential to building a competitive and environmentally conscious tourism industry in Europe.*

Keywords: SMEs; sustainable tourism; post-pandemic recovery; innovation; green transition; resilience.

JEL Classification: L26; Q01; Z32

1. Introduction

Tourism is one of the most dynamic sectors of the global economy and one of the most affected by the COVID-19 pandemic. Small and medium-sized enterprises (SMEs) represent over 90% of tourism-related businesses worldwide, providing employment opportunities and supporting regional economic development (OECD, 2021). The integration of sustainability principles into tourism management has become an essential component of economic resilience and competitiveness (UNWTO, 2023). In this context, SMEs are increasingly recognized not only as providers of services but also as active agents of change in promoting responsible tourism models. Their flexibility, local embeddedness, and innovative potential allow them to adapt more easily to market shifts, while their limited resources pose significant challenges for implementing sustainable practices. This paper explores the theoretical foundations of SMEs' involvement in sustainable tourism, emphasizing the challenges and opportunities that define their development in the post-pandemic era.

2. Theoretical Background: SMEs and Sustainable Tourism

The concept of sustainable tourism refers to tourism activities that meet the needs of present tourists and host regions while protecting and enhancing opportunities for the future (WCED, 1987; UNWTO, 2015). Sustainable tourism is built upon three pillars: economic viability, environmental responsibility, and socio-cultural equity (Hall and Lew, 2009). SMEs, due to their scale and local orientation, are positioned at the intersection of these dimensions. According to Buhalis and Darcy (2011), SMEs in tourism are essential for maintaining local authenticity, cultural diversity, and community well-being. However, their contribution to sustainability is often constrained by limited financial and managerial capacity (Thomas et al., 2011). The literature identifies several barriers, including lack of knowledge about sustainability standards, inadequate access to finance, and insufficient policy support (Roxas and Chadee, 2013). Despite these challenges, SMEs have shown remarkable adaptability in adopting innovative solutions. Digital tools, renewable energy technologies, and local partnerships are increasingly used to enhance both competitiveness and sustainability (Cavicchi and Santini, 2020). Moreover, the growing consumer awareness toward responsible travel has created new market opportunities for eco-oriented tourism enterprises (Gössling and Hall, 2019).

The relationship between small and medium-sized enterprises (SMEs) and sustainable tourism has attracted growing attention in recent academic and policy debates. SMEs form the majority of tourism-related businesses, accounting for more than 90% of the global tourism industry (OECD, 2021). They include a wide range of organizations—from accommodation providers and travel agencies to restaurants, transport operators, and cultural or leisure service providers. Their scale and flexibility allow them to respond rapidly to market dynamics and customer needs, but their limited financial and managerial capacity often constrains their ability to implement long-term sustainability strategies (Thomas et al., 2011). The theoretical foundation for sustainable tourism originates from the broader concept of sustainable development, as introduced by the Brundtland Report (WCED, 1987), which emphasized meeting present needs without compromising the ability of future generations to meet theirs. The World Tourism Organization (UNWTO, 2015) defines sustainable tourism as development that maintains a balance between environmental integrity, economic growth, and socio-cultural preservation. Within this framework, SMEs play a decisive role as both service providers and community stakeholders, capable of driving innovation, creating jobs, and preserving local culture (Hall and Lew, 2009).

From an economic perspective, SMEs contribute to the diversification of tourism products and strengthen local supply chains. Their operations are often embedded within local economies, generating multiplier effects that stimulate employment, demand for local products, and regional competitiveness (Buhalis and Darcy, 2011). Environmental sustainability has emerged as a critical dimension for tourism SMEs, given the direct link between their activities and natural resource use. Many small enterprises depend on the quality of local ecosystems, landscapes, and biodiversity. As such, they have a vested interest in adopting green innovations such as waste minimization, energy efficiency, and sustainable sourcing (Cavicchi and Santini, 2020). Although larger corporations often have more resources to invest in environmental management systems, SMEs can still achieve meaningful progress by adopting incremental and context-specific sustainability practices. The diffusion

of low-cost digital tools has further enhanced this process, allowing small firms to monitor environmental performance, optimize resource consumption, and communicate their sustainability credentials to customers through online platforms (Gössling and Hall, 2019). Social and cultural sustainability also constitutes a key pillar of the theoretical framework. Tourism SMEs are frequently family-owned or community-based, which fosters close relationships between entrepreneurs and residents. This proximity supports the preservation of cultural heritage, traditional crafts, and local identity. According to Jamal and Getz (1995), community-based enterprises contribute to social cohesion and empower local actors to participate in tourism planning. Theoretical models such as the 'bottom-up' approach to sustainable tourism highlight the importance of local ownership and participatory governance in achieving equitable development outcomes (Bramwell and Lane, 2011). SMEs, due to their local orientation, are natural agents of such participatory processes.

Empirical evidence also supports the theoretical argument that collaboration networks are essential for achieving sustainability in SMEs. Cluster initiatives, regional partnerships, and destination management organizations (DMOs) facilitate knowledge sharing and joint innovation among small tourism operators (Ruhanen et al., 2019). By pooling resources and expertise, SMEs can overcome scale limitations and develop collective sustainability standards. Such cooperation enhances resilience and long-term competitiveness, particularly in times of crisis, as evidenced during the COVID-19 pandemic (Sigala, 2020). In summary, the theoretical literature underscores that SMEs occupy a strategic position in the sustainable tourism ecosystem. Their small size offers both advantages—such as agility, innovation, and close stakeholder relationships—and disadvantages, notably limited access to finance and information. Integrating sustainability into SME business strategies requires a multidimensional approach that balances economic goals with environmental and social responsibilities. As such, the theoretical framework linking SMEs and sustainable tourism should be viewed as an evolving construct shaped by global sustainability agendas, technological change, and local realities.

3. Post-Pandemic Challenges and Opportunities

The post-pandemic recovery has accelerated the transition toward a more sustainable and digitalized tourism model. The European Green Deal and the NextGenerationEU funding mechanisms have provided significant opportunities for SMEs to integrate green innovation into their business models (European Commission, 2022). Nevertheless, the pandemic also revealed deep structural vulnerabilities. Many small tourism businesses lacked resilience plans and were disproportionately affected by restrictions and uncertainty (Sigala, 2020). To rebuild competitiveness, SMEs must invest in digital transformation, sustainability certification, and workforce training (UNEP, 2022). A theoretical synthesis of recent studies highlights several strategic directions for SMEs in sustainable tourism: adopting circular economy principles and resource efficiency practices; engaging local communities in co-creating tourism experiences; integrating environmental management systems; leveraging digital marketing to attract responsible travelers; and building collaborative networks to share knowledge and innovation. The ability of SMEs to transform these strategies into long-term advantages depends largely

on supportive policy environments and multi-level governance (Ruhanen et al., 2019). Cooperation between public authorities, academia, and private stakeholders is therefore critical for achieving a sustainable tourism ecosystem.

4. Conclusions

The theoretical analysis confirms that SMEs are key enablers of sustainable tourism, capable of shaping local economies and enhancing resilience. Their flexibility allows them to innovate and adapt to sustainability challenges, but their potential remains underexploited due to financial, technical, and informational barriers. Post-pandemic recovery efforts have created a unique window of opportunity for SMEs to align with sustainability goals and digital transformation pathways. The success of these efforts depends on integrated public policies, targeted funding instruments, and an improved entrepreneurial culture centered on responsibility and inclusiveness. Future research could extend this theoretical framework by examining comparative case studies across European regions to better understand how policy environments influence the sustainability performance of tourism SMEs.

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BIG DATA AND THE ANALYSIS OF TOURISM BEHAVIOUR IN REAL TIME

Laura-Maria Langa, Ștefan Bulboacă

Department of Marketing, Tourism, Services and International Business, Interdisciplinary Doctoral School, Programme of Marketing, Transilvania University of Brașov, Romania.
laura.langa@unitbv.ro, stefan.bulboaca@unitbv.ro

Abstract: *The rapid digital transformation of the tourism industry has been strongly driven by the integration of Big Data technologies, which enable the real-time analysis of tourist behaviour. These technologies facilitate the collection and processing of massive datasets from diverse sources such as social media, GPS devices, online reviews, and booking systems, allowing for accurate predictions of tourist flows and the personalization of travel experiences. Machine learning algorithms and predictive analytics support destination managers and tourism organizations in improving marketing strategies, managing visitor congestion, and promoting sustainable practices. Big Data applications also enhance decision-making for resource allocation and environmental protection by estimating tourism-related ecological impacts in real time. However, challenges remain regarding data privacy, integration, and the analytical capacity required to interpret complex datasets effectively. Overall, Big Data and AI have become essential tools for developing intelligent, sustainable, and adaptive tourism systems that respond dynamically to visitors' needs and global uncertainties.*

Keywords: Big Data, real-time analysis, tourist behavior, predictive analytics, digital transformation, sustainable tourism.
JEL classification: M30, M31, M37, M39, Z32.

1. Introduction

The digital transformation of the tourism industry has been profoundly accelerated by the emergence of Big Data technologies, which enable the real-time analysis and interpretation of tourist behaviour. The capacity to process vast and complex data streams has reshaped how destinations are managed, how marketing strategies are developed, and how tourists' experiences are personalized. In an increasingly data-driven world, Big Data offers the tourism sector a strategic advantage by combining predictive analytics, artificial intelligence, and behavioural insights to guide informed decision-making. This paper explores the role of Big Data in understanding and predicting tourist behaviour, outlines the implications of its real-time use in destination management and marketing, and examines the ethical and operational challenges that accompany its integration.

2. The Role of Big Data in Understanding Tourist Behaviour

Big Data allows the collection of vast volumes of information from multiple sources such as social media, GPS devices, online reviews, and booking systems. The integration of these diverse datasets into intelligent tourism management systems enables the prediction of tourist flows and the personalization of tourism offers (Wang, 2024).

The implementation of Big Data analytics provides significant benefits, including the enhancement of traveler experiences, the optimization of marketing strategies, and the support of informed decision-making regarding tourism resources (Belias, Malik, Rossidis, & Mantas, 2021).

Moreover, real-time data analysis contributes to the rapid identification of emerging trends and the adjustment of marketing strategies to meet tourists' evolving needs (Rahmadian, Feitosa, & Zwitter, 2022). For instance, booking platforms employ historical data to forecast peak periods, adjust prices dynamically, and tailor promotional campaigns to stimulate demand during low seasons (Potter, 2022). Machine learning algorithms further enhance this process by predicting tourist preferences and improving interactions between travelers and service providers. Analyzing past travel data allows the generation of personalized destination recommendations based on individual interests (Rehman et al., 2024).

Increasingly, research highlights the potential of Big Data to enhance tourism sustainability by optimizing resource consumption and reducing environmental pressure. Predictive analytics systems can estimate the real-time environmental impact of tourist flows, enabling local authorities to make informed decisions to prevent ecological overload (Agrawal, Wankhede, Kumar, Luthra, & Huisinghe, 2022). In rural areas, Big Data and artificial intelligence are used to analyze tourist preferences, seasonality, and behavioral typologies, contributing to the development of customized marketing strategies that capitalize on local tourism opportunities (Xie & He, 2022).

Furthermore, predictive analytics allows tourism authorities to manage overcrowding in popular destinations by redirecting visitor flows towards less frequented areas (Wu, Zhong, Wu, & Song, 2025). Artificial intelligence thus becomes a catalyst for personalization in tourism, allowing companies to adapt promotional messages, itineraries, and offers in response to real-time user behaviour (Papandreou, 2024).

3. Applications, Challenges, and Future Perspectives of Real-Time Data Analysis in Tourism

The implementation of smart tourism management platforms has significantly improved tourist experiences while reducing the risks associated with inappropriate visitor behaviour. For example, recent research demonstrates that Big Data-based systems can detect abnormal activities in tourist areas such as vandalism or access to restricted zones by using image recognition and trajectory analysis technologies (Rong, Hao, & Xu, 2024).

Data from online bookings, mobile applications, and social media also provide valuable insights into the behavioural dynamics of tourists during crises, such as the COVID-19 pandemic. This real-time adaptability represents a strategic advantage for destination management organizations (DMOs) in the context of global uncertainty (Weaver, 2021). Simultaneously, there is a growing trend towards combining quantitative data (e.g. tourist volumes, average length of stay, preferences) with qualitative data (e.g. reviews, online sentiment) to achieve a deeper understanding of tourist motivations and to design more effective marketing campaigns (Li & Cao, 2022). For instance, Spain's record-breaking tourist numbers in 2024 were managed through aggregated data derived from social media, mobile applications, and transport networks, allowing for more efficient visitor flow management and infrastructure planning (Reuters, 2024).

However, the integration of Big Data into tourism infrastructure also presents challenges. There is a recognized "analysis crisis" in which the overwhelming volume of data is not always accompanied by the capacity for relevant interpretation. Without careful selection of indicators and alignment with tourism development objectives, strategies risk becoming unbalanced or inefficient (Weaver, 2021).

Privacy concerns further complicate Big Data implementation. Tourists are increasingly reluctant to share personal information due to fears of misuse (Wang, 2024). To address these risks, companies must adopt clear data governance policies that ensure transparency, informed consent, and robust cybersecurity measures (Thomson Reuters, 2024). Additionally, data quality and integration remain critical factors, as information originates from diverse sources that must be standardized to produce accurate analyses (Belias, Malik, Rossidis, & Mantas, 2021).

Tourism organizations are therefore investing in Data Fabric platforms to connect disparate data sources, improving strategic visualization and decision-making (Szem, 2023). As these technologies evolve, collaboration between data scientists, tourism professionals, and policymakers becomes essential to harness the full potential of Big Data while ensuring ethical and sustainable practices.

4. Conclusion

Given The utilization of Big Data in the real-time analysis of tourist behaviour profoundly influences how the tourism industry adapts its strategies. Beyond improving traveler experiences, it facilitates efficient resource management and supports sustainable tourism practices. Predictive analytics, machine learning, and artificial intelligence now serve as fundamental tools for both destination managers and marketers seeking to understand and anticipate tourist needs.

Nevertheless, Big Data must be implemented responsibly, with careful attention to ethical considerations, data accuracy, and privacy protection. As advances in artificial intelligence and predictive modelling continue, Big Data will become an indispensable instrument for optimizing and innovating tourism services, ultimately contributing to a more resilient, responsive, and sustainable global tourism industry (Rahmadian, Feitosa, & Zwitter, 2022).

The Future research should further explore how Big Data can be effectively integrated into strategic tourism management while maintaining ethical and privacy standards. Studies could focus on real-time data applications for sustainable destination planning and personalized tourist experiences.

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GENDER EQUALITY IN TOP POSITIONS IN ROMANIA DURING THE COMMUNIST PERIOD AND TODAY

Gastone Teodora-Denisa
Accounting Department, Faculty of Economics and Business Administration,
Babeș-Bolyai University, Cluj-Napoca, Romania
teodora.gastone@econ.ubbcluj.ro

Abstract: *When we talk about gender equality in leadership positions, we focus on promoting women to the top of organizational structures. The study aims to analyze whether and what common trends existed in Romania, in terms of gender equality during the communist period and the current period. Through a literature review and subsequent comparative analysis, we identified that practices promoting gender equality have been preserved through existing norms and quotas regarding the representation of women in leadership positions. However, along with these, stereotypes about the traditional role of women have also been taken up, supported by criticism of the actions taken by the authorities to promote gender equality. The contribution of this paper is to present a parallel between the past and the present, with trends for the future, on the subject of gender equality and the promotion of women in leadership positions in Europe. This topic deserves debate and special attention, given the impact that the European Union has had as a result of regulations introduced in recent years, aimed at increasing the percentage of women in top positions.*

Keywords: Romania, Europe, CEE countries, Gender equality, Communist period, Current period, Leadership positions

JEL classification: B54, J16

1. Introduction

With regard to gender equality and the position of women in the labor market, various stereotypes have existed over time, leading to the formation of the glass ceiling effect. The traditional model, which considers the role of women in society to be domestic, prevailed years ago and continues to have an impact today. The communist period and the regime implemented in several countries in Central and Eastern Europe (CEE), including Romania, had effects in several areas, including politics, education, and work. However, both during the communist period and today, despite existing stereotypes about women and their professional role, the authorities have tried, directly or indirectly, to support gender equality. This was done through regulations and practices promoting and supporting women in their attempts to occupy important positions in various fields and to have equal opportunities with their male counterparts. Hence, in Romania both before the fall of the communist regime and now, vis European Directives, optional or mandatory norms and quotas have been implemented, as appropriate, in the hope of increasing the representation of women in various industries and in leadership positions. The structures analyzed for the two temporary frameworks have a different context. While during the communist period the emphasis in this context was dictated by the Soviet Union for some CEE countries, in the current period, the CEE has aligned its policies with Western Europe

through the European Union and the development of common countries and regulations.The objective of the research is to conduct a temporal analysis of gender equality in Romania between the communist period and the present day in order to identify how much and what has been taken over from practices supporting women and to show how the influences of the past can be reflected in the present, despite the political and economic changes taking place. The research method used is literature review of the most relevant articles, laws and otrher reglementations on the topic presented, followed by a comparative analysis of the results extracted. The contributions made by this paper consist of a critical synthesis of the trends that have persisted over the years regarding the women progress in careers and how this has been and is viewed by the authorities. Thus, this paper is mainly addressed to the scientific community, but also to public institutions that support and implement regulations in this field.

2. Addressing the topic of gender diversity during the communist period in Romania

Both through clear rules and indirectly, through actions aimed at bringing more women into top positions, the communist system represents a basic benchmark, as it tried to show, in promoting and implementing gender equality. Thus, in an attempt to promote women, the basic positions and industries in which women were encouraged to work were expanded both qualitatively, through professional development and education, and quantitatively, as well as the number of jobs. Ghodsee and Mead (2018) recall that the state encouraged this phenomenon by ensuring high employment opportunities in basic positions in various industries. Similarly, Jancar-Webstar (1978) presents gender equality as being promoted at that time through increased opportunities for women in education and employment. It can be observed that the other perspective through which gender equality is encouraged in a different way is attributed to a different development of women, that of belonging to the social class to which they belong, the proletarian class being privileged. Thus, Cîrdei (2012) recalls that gender equality was viewed more from a social perspective. Ghebrea (2015) also points out that, at that time, equality between women and men was promoted through the support of practices and policies by women's committees within the Communist Party. Before 1989, the communist regime authorities ensured equal rights and leadership positions for women, at least at *de jure* level.

In addition to the opportunities in education and work offered to women by the authorities, there were also certain measures in the form of quotas imposed within a system or percentages of representation. Thus, Jinga (2015) examines in his study the promotion measures and equality initiatives the communist period in Romania, obtaining information on these quotas, which, although approximate, are nevertheless representative of the topic under analysis. He argues that during the communist period, women accounted for approximately 30-40% of party committees, which supports the idea of an existing quota-based system.

However, critics argue, based on the information analyzed in the articles, that the communist system only promoted gender equality in a disguised form, actually having the goal of masked authority in the shadow of women for an economic and political dictatorship. But, besides the struggle women faced in their roles of mother, housekeeper, worker and leader, as the case may be, this could be seen as a step forward to women emancipation.

In the CEE countries in general, through the measures and actions taken, a socialist feminism was formed, as supported by Palasik et al. (2010) by identifying evidence in this regard, in the form of the inclusion of women's rights in constitutions and mandatory quotas in certain countries. As proof, the 1936 and 1977 Constitutions of the Soviet Union provide for gender equality between women and men, both at work and in politics.

3. Addressing the topic of gender diversity in the current period at European level and in Romania

With regard to the current period, after 1991 and the fall of communist dictatorship in CEE countries, through political changes and cultural diversity that took place over the course of 34 years, various clearly established norms, frameworks, policies, and practices for gender equality and the promotion of women in the workplace have been implemented. It should be noted that the countries that were part of that bloc during the communist period, as mentioned above, are now member states of the European Union (EU), which is why the current period is analyzed from this perspective and how the EU leadership has guided countries towards promoting and implementing equality in the labor market.

At the European Union level, the topic of gender diversity in company boards has been debated since 2012, leading to the implementation in 2022 of a directive promoting gender balance in the boards of companies in EU countries. The goal of "breaking the glass ceiling" is an agreement officially approved by the European Parliament and the Council, whose overall objective is to reduce demographic challenges at the European Union level, increase business competitiveness, and stimulate economic growth. Therefore, by June 2026, large companies listed on stock exchanges in the European Union, excluding small and medium-sized enterprises with fewer than 250 employees, will be required to appoint women to at least 40% of non-executive director positions or at least 33% of director positions on the board of directors.

These regulations to increase the representation of women on company boards have sparked controversy in the literature. Isidro and Sobral (2014) discuss in their study the proposal for quotas for women's representation on boards of directors as a motivating factor for their own research, while Reguera-Alvarado et al (2015) argues that the establishment of mandatory quotas by the European Union is a key factor in increasing the number of women in leadership positions. The subject of quotas proposed at EU level is also debated by Smith and Von Essen (2025) who presents confirmation from their research that the adoption of quotas has led to an increase in the proportion of women on company boards over the years, and Armstrong and Walby (2012) discusses these quotas from the perspective of their mandatory implementation. Thus, they argue that although quotas are useful, as most of them are only voluntary, they do not have the same effect as mandatory rules.

Analyzing the past and present, and looking ahead to the future, the European Union plans to implement measures to increase the number of women through various rules and policies established over a period of time, such as "A Union of Equality: Gender Equality Strategy 2020-2025" implemented by the European Commission in 2020.

However, critics have maintained their opinion that the techniques for promoting women to top positions are not based on meritocracy, an argument that has existed since the communist era. Starting from the formation of stereotypes based on these

opinions, Mensi-Klarbach and Seierstad (2020) points out that in Europe, although gender equality has been a goal for years, the reality is that women are still underrepresented today.

4. Conclusions

With regard to gender equality, although it is a subject with a clear form and definition for any field, it has been approached from different perspectives over time. Thus, we have observed that the organizational context within which the subject is analyzed is different today compared to the communist period. By encouraging education and employment in the labor market, ensuring employment opportunities, the state and the public sector were an important pillar in the communist period, whereas today, the emphasis is on the economic environment, which is most active in the private sector. Thus, while during the communist era gender equality could have been analyzed in political structures and industries, today gender equality is analyzed in the boards of directors of private companies.

Although practices represented by quotas, norms, and actions specific to the times encouraged gender equality and the increasing representation of women in top positions both during the communist period and in the present day, there were also critics then, and now, who argue, based on existing stereotypes, that there is a lack of meritocracy in these practices, claiming that there is a hidden agenda behind the powers that encourage the advancement of women. Even if in a different form, the glass ceiling effect is still present today in many companies, with positions on the board of directors still considered to be more deserving of men, despite the results of women's presence inside these structures.

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EMPOWERING EMPLOYEES TO EMPOWER ENTREPRENEURS: INTRAPRENEURIAL BEHAVIOR IN A DIGITAL MICROFINANCE INSTITUTION

Ilisie Roberta-Alexandra, Farcas Giulia
Doctoral School of Economic Sciences, Field of Business Administration, University of Oradea, Oradea, Romania
ilisieroberta@gmail.com
giuliaanamaria11@yahoo.com

Abstract: *Digitalization has reshaped the dynamics of modern organizations by enhancing operational efficiency, innovation, and employee autonomy. Within this context, intrapreneurship—the entrepreneurial mindset demonstrated by employees within an established company—has become a key driver of sustainable business growth. This paper examines how digitalization facilitates intrapreneurial behavior within a microfinance institution, focusing on the case of BT Mic, a subsidiary of Banca Transylvania in Romania. The study investigates employees' awareness of their capacity to innovate, assume responsibility, and contribute to entrepreneurial outcomes inside the organization. The analysis highlights the role of digital tools in empowering employees to act proactively and creatively, while also reinforcing the company's broader mission of supporting entrepreneurs. The findings aim to provide a deeper understanding of how employee empowerment in digital contexts can enhance both organizational performance and entrepreneurial development.*

Keywords: digitalization, employee empowerment, intrapreneurship, microfinance, sustainability, ESG, BT Mic.

JEL classifications: L26; G21; O33; M15

1. Introduction

In this contemporary world that we live in, digitalization has become a key driver of transformation across all economic sectors, including financial services as well. Microfinance institutions play a crucial role in supporting small entrepreneurs and promoting financial inclusion, particularly in developing or transitioning economies. Through digital tools and processes, they can deliver faster, more efficient, and more inclusive financial services so as to help the entrepreneurs elevate their financial indicators.

However, digital transformation is not only about technology—it also relies on people. The ability of employees to adapt, innovate, and act intrapreneurial determines how effectively an institution can respond to clients' evolving necessities. Empowered employees are more likely to develop and implement new solutions, improve internal processes, and support entrepreneurs in a proactive way.

Regarding the case study of this article, BT Mic, a subsidiary of Banca Transylvania, represents a relevant example of a digital microfinance institution operating with a strong social mission. Its activity aligns with the "green" companies' objectives, contributing to sustainable development through the "Social" and "Governance" pillars of ESG, by promoting inclusion, responsible financing, and organizational innovation.

The purpose of this paper is to examine how digitalization enables intrapreneurial behavior among employees of BT Mic and how such empowerment contributes to supporting entrepreneurs.

2. Literature Overview

Digitalization has transformed financial institutions by increasing efficiency, transparency, and access to services (Westerman, Bonnet & McAfee, 2014).

In microfinance, technology allows faster credit processing and a broader outreach to small entrepreneurs, supporting financial inclusion and sustainable growth (World Bank, 2022). Digital platforms also help institutions improve decision-making and build stronger connections with their clients (European Microfinance Network, 2023). Beyond operational improvements, digitalization encourages a new way of thinking within organizations, where adaptability, continuous learning, and collaboration become essential for success.

Intrapreneurship, first introduced by Pinchot (1985), refers to entrepreneurial actions carried out within existing organizations. It involves initiative, creativity, and ownership over innovative ideas. Antoncic and Hisrich (2003) emphasize that intrapreneurship depends on empowerment — giving employees autonomy and responsibility to act innovatively.

When employees are empowered, they not only complete assigned tasks but also identify opportunities for improvement and create value through proactive behavior. Empowered staff are more likely to develop new solutions, optimize workflows, and align their efforts with organizational goals (Kuratko, Hornsby & Covin, 2014). This mindset is especially valuable in institutions where change occurs rapidly and flexibility is crucial for maintaining competitiveness.

Recent studies show that digitalization can strengthen empowerment by providing employees with flexible tools and better access to information (Parviainen et al., 2017). However, technology alone is not sufficient to drive innovation. Its real impact depends on the organizational culture that surrounds it. When combined with a supportive environment, digital systems become a driver of internal innovation and long-term sustainability (European Investment Fund, 2021). Within microfinance institutions, where social and financial objectives intersect, the combination of digitalization and empowerment is particularly powerful. It enables employees to respond faster to client needs, to design customized financial solutions, and to actively contribute to the institution's mission of promoting entrepreneurship and inclusion.

Therefore, the literature suggests that digitalization and intrapreneurship are mutually reinforcing. Digital transformation provides the infrastructure and information flow necessary for innovation, while empowered employees provide the creativity and initiative needed to make digital tools truly effective. In the case of BT Mic, this relationship is central to understanding how internal empowerment can translate into external impact, supporting both business performance and social development.

3.Methodology

This section describes the research approach, data collection process, and analytical methods used to explore intrapreneurial behavior within BT Mic, a digital microfinance institution operating under Banca Transylvania. The research follows

an exploratory qualitative design, aimed at understanding employee perceptions rather than measuring statistical correlations.

3.1. Research Instrument
The main research instrument was a structured questionnaire developed specifically for this study. It combined both quantitative and qualitative elements to ensure a balanced understanding of employee perceptions. The first part consisted of eight closed-ended questions on a five-point Likert scale (from "strongly disagree" to "strongly agree"), designed to measure aspects such as initiative, autonomy, motivation, and the perceived usefulness of digital tools.
The second part included two open-ended questions, which allowed participants to freely express opinions about factors that could enhance intrapreneurial behavior and improve digital processes within the institution. This mixed format helped capture both measurable trends and personal reflections, enriching the overall interpretation of results

3.2. Sample and Data Collection
The questionnaire was distributed among eight employees of BT Mic, all working within the same branch located in Oradea. Although the sample size was small, the research was designed as a pilot study with an exploratory purpose, aiming to capture initial perceptions rather than statistically generalizable results. This approach ensured a consistent organizational context and provided relevant insights into how digitalization and empowerment are perceived in practice. Participants included Relationship Managers, a branch director, and a team leader, all sharing similar exposure to digital tools and client interaction. The responses were collected anonymously via an online form to encourage openness, and the data were analyzed descriptively to identify recurring patterns and emerging themes.

3.3. Data Analysis Approach
Data analysis was conducted using descriptive methods, focusing on central tendencies and thematic interpretation. Quantitative data were summarized through average scores and frequency distributions, while qualitative comments were grouped into recurring themes related to autonomy, feedback, and digital innovation. The results were interpreted through the lens of organizational behavior theory, linking empowerment, innovation, and digitalization. Although the sample size was small, the data provided valuable contextual insights into the internal culture of BT Mic and the factors that encourage employees to act intrapreneurial.

4. Findings and discussion
The results of the survey provide a concise overview of employees' perceptions regarding empowerment, autonomy, and the use of digital tools within BT Mic. Although the sample is limited to eight respondents from the Oradea branch, the findings offer relevant insights into the institution's internal dynamics and attitudes toward innovation.
Overall, participants reported high levels of motivation and initiative, with average scores between 4.0 and 4.3 on statements related to taking responsibility, proposing new ideas, and supporting organizational goals. At the same time, aspects such as feedback from management and time allocated for creative tasks scored lower, with

averages around 3.1–3.3, suggesting room for improvement in formal communication and recognition systems.

To illustrate these results, Table 1 presents the average scores recorded for each of the main dimensions assessed in the questionnaire.

Table 1. Average scores by dimension

Dimension	Average score (1-5)	Interpretation
Motivation and initiative	4.2	High engagement
Autonomy and responsibility	4.0	Strong ownership
Feedback and recognition	3.2	Moderate, needs improvement
Digital efficiency and tools	4.1	Positive perception
Innovation support	3.3	Some limitations identified

Source: made by the author

Qualitative feedback further emphasized the need for more frequent managerial feedback, recognition of initiatives, and simplified internal applications to improve daily operations. Respondents also highlighted the potential benefits of full digital signature options and automated reporting systems for greater efficiency.

These findings suggest that digitalization has already fostered a sense of autonomy among employees, but additional organizational support could amplify their intrapreneurial behavior.

As previous studies also note (Antoncic & Hisrich, 2003; Kuratko et al., 2014), empowerment depends not only on technological resources but also on a culture of trust and communication. The case of BT Mic shows that when digital tools and empowerment are combined, employees can act proactively, generating both operational and social value.

5. Conclusions

This study explored the relationship between digitalization, employee empowerment, and intrapreneurial behavior within BT Mic, a microfinance institution that operates in Romania under Banca Transylvania. By analyzing employees' perceptions, the research provides an inside view of how digital transformation influences motivation, initiative, and innovation at the individual level.

The main conclusion is that digitalization plays a dual role: it simplifies daily operations and simultaneously enables employees to act more autonomously and creatively. However, the findings also suggest that empowerment cannot rely solely on technology. Management practices such as regular feedback, transparent communication, and recognition of initiative are equally important in stimulating intrapreneurial behavior.

From a practical perspective, the study shows that even small-scale organizational improvements — like faster internal applications, complete digital signature options, or automated reporting — can have a significant impact on employee satisfaction and performance. By integrating these suggestions, BT Mic could reinforce its internal culture of empowerment and further align its operations with the broader goal of promoting entrepreneurship and financial inclusion.

In a broader sense, the results illustrate how a microfinance institution can act as both a digital and a social innovator. Through empowered employees, the organization not only supports entrepreneurs externally but also fosters entrepreneurship internally. Strengthening this internal capacity for innovation can contribute to long-term sustainability, adaptability, and client-oriented growth.

Finally, while the research was limited to one regional branch and a small number of respondents, it provides a useful starting point for future studies.

Expanding the sample to include multiple regions or comparing BT Mic with other microfinance institutions could offer a deeper understanding of how digitalization and empowerment interact in the evolving landscape of financial services.

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THE GENDER GAP IN ENTREPRENEURSHIP AND ROLE MODELS AT LOCAL LEVEL: EVIDENCE FROM ROMANIA

Eduard OANĂ
Doctoral School of Economic Sciences, University of Oradea, Romania
E-mail: oana.eduardandrei@student.uoradea.ro

ABSTRACT: *This study examines the gender gap in entrepreneurship at the local level, with a focus on the role of successful role models in encouraging women's participation in business creation. The paper draws on European literature and policy frameworks on inclusive entrepreneurship, while contextualizing the analysis within Romania and, in particular, the North-West region, where significant gender disparities in firm ownership and management persist. The methodology integrates mixed evidence, including international statistical data (Eurostat, OECD), national and regional policy documents, and empirical findings from the University of Oradea research on students' entrepreneurial intentions and on the profiles of women entrepreneurs in Western Romania. The results indicate that young people and women face higher vulnerability in both employment and entrepreneurship compared to the EU average. Labor market indicators in Romania reveal more pronounced gender- and age-based disparities than those observed across the EU. Youth employment challenges are persistent, particularly due to employers' preference for prior work experience, and self-employment rates among young people and women remain considerably lower than the European average (approximately 50 percent and 75 percent of EU levels, respectively). The study argues that local entrepreneurial role models serve as a key mechanism for strengthening self-efficacy and reducing the fear of failure among potential female entrepreneurs. The conclusions underscore the need for integrated policy approaches that combine access to finance, mentorship programs, and increased visibility of successful women entrepreneurs.*

Keywords: inclusive entrepreneurship; gender gap; entrepreneurial role models; social roles; self-efficacy; public policy.
JEL Classification: L26; J16; R58; O35

INTRODUCTION

Entrepreneurship is a core driver of innovation, employment, and regional development. Yet significant gender gaps persist across the European Union, with women facing greater barriers to finance, professional networks, relevant information, and overcoming social stereotypes (OECD/EC, 2013; 2023). In Romania, these disparities are even more pronounced, where men are 2.4 times more likely than women to be self-employed (OECD, 2024). In this context, inclusive entrepreneurship is not only an economic priority but also a matter of social equity. This paper examines how local entrepreneurial role models can contribute to reducing the gender gap in business creation, drawing on longitudinal research conducted in Western Romania (Dodescu and Pop-Cohut, 2010–2021).While previous studies have documented gender gaps in entrepreneurship at the national level, less attention has been paid to the role of local entrepreneurial ecosystems and visible female role models in shaping young women's intentions. This study

addresses this gap by analyzing both statistical trends and regional evidence from Western Romania, with the aim of identifying mechanisms to reduce the gender gap.

1.THEORETICAL FRAMEWORK

The theoretical framework of this analysis focuses on gendered entrepreneurial intentions and the influence of role models in shaping them. Psychosocial studies (Ajzen, 1991; Bandura, 1986) show that entrepreneurial intention is determined by a complex set of factors, including perceived behavioral control, understood as an individual's belief in their own capabilities, the prevailing social norms and level of community acceptance, and attitudes toward risk and failure. Gender differences in entrepreneurship are largely driven by persistent stereotypes that associate entrepreneurial activity with masculine traits and leadership styles. Consequently, women tend to perceive higher levels of risk and benefit from less institutional and social support (Dodescu et al., 2012). In this context, role models play a crucial role in narrowing the gender gap; they strengthen self-efficacy, lower the psychological barrier associated with the belief that "entrepreneurship is not for me," and positively influence young women's career choices by encouraging them to consider entrepreneurial paths (De Pillis&Reardon, 2007).The theoretical insights on entrepreneurial self-efficacy, social norms, and the impact of role models provide a lens through which to interpret the regional data from Western Romania. In particular, these factors help explain why female entrepreneurship remains limited despite policy initiatives.This study combines quantitative analysis of international and national statistics with qualitative evidence from regional case studies. Statistical data were drawn from Eurostat and OECD, while empirical insights were obtained from University of Oradea research on female entrepreneurs and student entrepreneurial intentions. The findings were triangulated with policy documents to derive actionable policy recommendations.

2. EU AND ROMANIA: THE GENDER GAP IN ENTREPRENEURSHIP

According to recent OECD data (2023), there is a significant gender gap in entrepreneurial involvement. Across the European Union, approximately 3% of women are engaged in start-up creation, compared to around 5% of men. Women face greater difficulties in accessing finance and professional networks, and their fear of failure is substantially higher, particularly in Eastern European countries. The situation in Romania follows a similar pattern, with some local specificities. The national self-employment rate is approximately 11%, below the EU average, and shows a declining trend, especially among women. Moreover, only 12% of self-employed individuals in Romania have employees, suggesting predominantly small-scale businesses with limited economic impact. Although initiatives aimed at supporting women entrepreneurs exist – such as the *Femeia Antreprenor* program – these efforts remain fragmented and insufficiently coordinated. Romanian women also report a fear-of-failure rate of about 60%, significantly above the EU average of 47% (OECD, 2023). Overall, Romania's policy framework remains more oriented toward supporting existing SMEs rather than promoting entrepreneurship as a viable pathway for labor market integration. While the country does not have a specific strategy for implementing the Small Business Act, the policy targets are broadly aligned. However, Romania lacks clear objectives for inclusive entrepreneurship and does not provide dedicated programs for all target groups. Existing grants and

initiates have mainly targeted women, young people, and rural populations, with no specific support for seniors, immigrants, or people with disabilities.

3.ROMANIAN CONTEXT: BIHOR AND THE WESTERN REGION

Research conducted by the University of Oradea (Dodescu and Cohut, 2010, 2012, 2018, 2021) highlights several regional characteristics that help explain gender differences in entrepreneurship in Western Romania. Women's representation in leadership positions remains relatively low, falling below the national average, while access to finance is widely perceived as a major obstacle. Entrepreneurial self-efficacy is lower among women compared to men, and support networks or mentoring programs are still underdeveloped. Furthermore, the limited visibility of female role models perpetuates gender stereotypes, contributing to the persistence of the gender gap (Dodescu and Pop-Cohut, 2010, 2012, 2018, 2021). A study conducted among students in Bihor County (Dodescu and Pop-Cohut, 2018) found that increased exposure to local female entrepreneurs significantly enhances entrepreneurial intentions, perceived access to finance, and willingness to start a business within the next three years. The central mechanism identified is the normalization of female success within the local entrepreneurial ecosystem, which helps make entrepreneurship appear as a realistic and accessible career path for young women. This evidence underscores the critical role of local role models in fostering inclusive entrepreneurship and reducing the gender gap in both perception and practice.

4.POLICY IMPLICATIONS

Building on OECD (2025) recommendations and local empirical evidence, it is evident that promoting the visibility of successful female role models should be systematically integrated into all stages of entrepreneurial education and development. Female role models should be embedded within university-level entrepreneurship programs, regional accelerators and incubators, as well as mentoring and peer-to-peer coaching initiatives. These efforts should be complemented by public campaigns aimed at challenging gender stereotypes. An effective policy package should combine accessible financial support with administrative simplification, the development of professional and mentoring networks, and the consistent promotion of local success stories within the community. This multidimensional approach can enhance women's participation in entrepreneurship and contribute to reducing the gender gap by transforming female success into a normalized and inspirational element of both the local and European economic landscape. Policies should be monitored and evaluated through measurable indicators such as the proportion of female participants in entrepreneurship programs, start-up creation rates, and perceived self-efficacy before and after exposure to role models. Future initiatives could also leverage digital platforms to showcase female entrepreneurial role models, reaching a wider audience and complementing traditional mentoring programs.

CONCLUSIONS

The gender gap in entrepreneurship remains structural in Romania, including the Western/Bihor region. Female entrepreneurial role models have been shown to strengthen self-efficacy and entrepreneurial intentions among young women, facilitating the transition from aspiration to action. Achieving sustainable results

requires a holistic approach that integrates modern entrepreneurship education, mentoring, visible social roles, and targeted, well-evaluated measures to improve access to finance. Closing the gender gap is not only a matter of social equity but also represents a significant economic opportunity for local and regional development. Promoting female entrepreneurship not only enhances social equity but also strengthens local economic resilience and innovation capacity. Future research could explore longitudinal effects of role model exposure across different regions and sectors, as well as the potential of digital role models in promoting inclusive entrepreneurship.

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FROM COMPLIANCE TO SUSTAINABILITY: A BIBLIOMETRIC ANALYSIS OF CORPORATE GOVERNANCE

Dumitrita Girla
Doctoral School of Economics and Business Administration, West University of Timisoara, Timisoara, Romania
dumitrita.girla01@e-uvt.ro

Abstract: The paper provides a bibliometric analysis of the literature on integrating sustainable strategies into corporate governance, with an emphasis on distinctive concepts. Using VOSviewer and the Scopus database, the study identifies relevant authors, influential articles and dominant research trends. The results highlight a significant increase in academic interest and highlight that ESG (environmental, social, governance) scores positively influence financial performance, access to finance and market value. At the same time, methodological controversies, conceptual overlaps and the lack of standardization of ESG indicators are highlighted. The study emphasizes the need for diversification of data sources, transparency, and methodological diversity for robust research consolidation.

1. Introduction
The integration of sustainable strategies in corporate governance remains a current topic, given the rapid evolution of specialized literature. A systematic analysis of research on sustainability and company performance allows synthesizing the main concepts such as environmental, social, governance (ESG), corporate social responsibility (CSR), corporate social performance (CSP), socially responsible investment (SRI) and green finance, sometimes used interchangeably, although they denote distinct concepts. The paper aims to develop a conceptual framework for sustainable finance, clarifying the hypothesis that integrating sustainable strategies influences company performance. At the same time, we observe a way to quantify the impact of sustainability on corporate performance. The bibliometric analysis highlights the most relevant authors, papers, and conclusions regarding the relationship between sustainable finance and corporate governance.

2. Literature review
In recent decades, specialized literature has dedicated considerable attention to the issue of corporate sustainability and the integration of environmental, social, and governance (ESG) criteria into the evaluation of the financial performance of companies. Thus, sustainability has evolved from a moral context to an essential pillar of corporate strategy. The 2025 report of the UN Global Compact in partnership with Accenture highlighted that 99% of chief executives report that corporate governance strategies focus on expanding or maintaining commitments related to sustainability (UN Global Compact and Accenture, 2025). Therefore, the moral and economic values of sustainability factors motivate the aspiration to integrate sustainable principles into the business model (Starks, 2023). Accordingly,

companies with solid ESG reporting and high scores are perceived as less risky (Apergis et al., 2022, in Subhani et al., 2025), with socially responsible investments. Increased interest in the business environment led to the establishment of international regulations by the World Bank and subsequently by the European Parliament and Council through the established taxonomy (European Parliament and Council, 2024).

3. Methodology and data

The relevance of the topic in the field of sustainable finance has led to the diversification of the literature, facilitating the conduct of a bibliometric analysis. In this regard, the VOS viewer software was used, which would allow the understanding of the trend in the literature. For data extraction, the Scopus database was utilized, recognized as an authentic and reliable tool for bibliometric analyses, which conducts searches among various authors and publishers without introducing any explicit bias (Khan et al., 2021; Ding et al., 2016 in Khan, 2022). The initial steps of the research are highlighted below, with the results being used as input for the VOS viewer analysis.
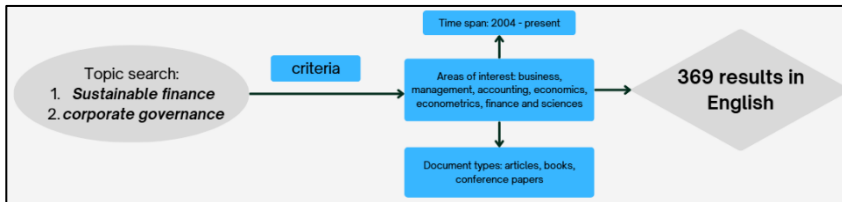
Figure 1: Filtering the results obtained from Scopus
Source: compiled by the author

4. Results and discussions

In this section, the scientometric results will be presented, including keyword analysis, co-author analysis, and citation analysis to highlight the trend in the specialized literature. Thus, according to preliminary data, the annual production of literature increases consistently each year, with the most active period being following the Paris Agreement in 2015, and by a decade the production has significantly increased, as proven in fig.2.
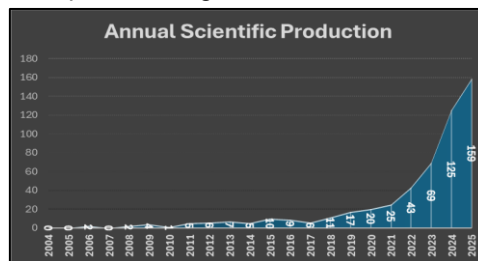
Figure 2: Annual Scientific Production
Source: compiled by the author

Keyword analysis using the VOS viewer software highlighted 88 keywords, some more important than others. The top keywords by number of appearances were sustainable development (88), corporate governance (88), sustainability (56), ESG (62), corporate social responsibility (48), and financial performance (29). Therefore, Figure 3 allows the highlighting of the following aspects for the six resulting clusters. The red cluster reflects how sustainability factors influence financial performance, with multiple empirical studies from China, a strongly industrialized economy. The green cluster deals with the relationship between sustainable practices and financial results, as well as the impact on corporate governance. The blue cluster addresses sustainability in relation to public policies and long-term development strategies. The deep blue cluster suggests that sustainability is a central concept in research. The largest nodes are seen around the words such as sustainable development, corporate governance, ESG, and sustainability. Also, the links are multiple and strong; therefore, most of these terms are used frequently together, marking a solid relationship.
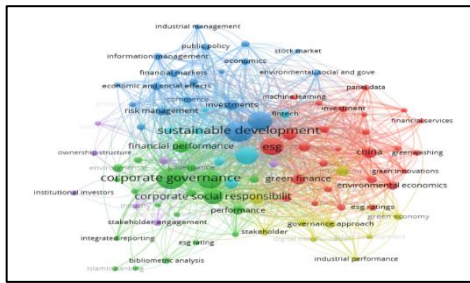
Figure 3: Keyword Analysis
Source: compiled by the author

The next stage of the study consisted of analyzing citations, with the aim of identifying the most cited and relevant articles. Based on the results generated by VOS viewer, the most relevant cited articles related to the specialized literature, with over 10 citations, were identified, and the maximum number of citations found according to the results is 2416 citations by the author Cheng (2014), followed by Drempetic (2020) with 894 citations, Xie (2019) with 739 citations, Zhou (2022) with 509 citations. All authors converge to the fact that the integration of ESG factors allows easy access to better financing conditions, transparent reporting increases the credibility of companies and market value, and there is a positive correlation between company performance and ESG ratings.
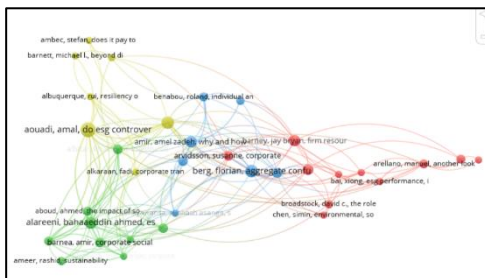
Figure 4: Co-citation density per article
Source: compiled by the author

Also, for the retrieval of fundamental works, the co-citation criterion was used, which allows the identification of main concepts through citation references. The results highlight four clusters, where the blue and yellow clusters reflect the controversy and utility of ESG ratings, and the red and green clusters the impact of these ratings on the financial performance.

The literature analysis led to different perspectives. First, the integration of sustainable strategies, measured by the CSR index, ESG index or ratings, improves corporate sustainability, facilitates access to financing at reduced costs, influences long-term corporate performance and market value (Zhou et al., 2022), amplifying competitive advantage, and confirming Porter's hypothesis (Subhani et al., 2025). Secondly, sustainable strategies bring credibility, quantified by ESG scores, provided by international agencies. This confers legitimacy to companies (Drempetic et al., 2020), as investors attach significant importance to proactive and transparent ESG reporting (Cheng et al., 2024). Thirdly, the introduction of sustainable strategies has little or no effect on company performance, with divergence on sustainable finance, such as the lack of consistency for sustainable practices (Hudon et al., 2025). ESG controversies reduce the value of the firm, especially in visible sectors, and amplify negative effects on the firm (Aouadi & Marsat, 2018).

5. Conclusion

The literature on sustainable finance highlights contradictory results, mainly generated by a lack of standardization in the measurement of key concepts (Khan, 2022). Although most studies confirm the positive link between sustainability and corporate performance, expressed through financial or market indicators, conceptual confusions persist, such as using corporate social responsibility or greenhouse gas emissions as a proxy for ESG scores. The frequent combination of the three ESG dimensions leads to uneven results, as their impact differs significantly (Aouadi & Marsat, 2018). Over-reliance on ESG ratings provided by agencies such as Thomson Reuters, based on composite indicators, raises issues of subjectivity and transparency. Diversification of data sources and a clearer methodology in assessing sustainable performance are recommended. Also, the predominant use of a single database (e.g., Scopus) and the absence of geographic analyses limit the understanding of the global distribution of research, particularly concentrated in Asia, where sustainability is a scientific and economic priority.

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FROM IMPLEMENTATION TO REPUTATION: THE ROLE OF NGOS IN LEGITIMIZING CORPORATE SOCIAL RESPONSIBILITY

Maria Ursu
Doctoral School of Economic Sciences, University of Oradea, Oradea, Romania
ursu.maria2@student.uoradea.ro

Abstract:
This article examines how non-governmental organizations (NGOs) contribute to strengthening the legitimacy of corporate social responsibility (CSR) through partnerships that enhance the credibility and social relevance of corporate initiatives. The study is grounded in organizational legitimacy theory and literature on cross-sector collaboration in the field of CSR. Methodologically, the research adopts a qualitative approach, based on a case study analysis of Lidl Romania – the Federation of Community Foundations in Romania (FFCR), implemented through the program "Fund for a Better Future in Communities" (2018–2025). The findings show that NGOs act as trust mediators between companies and communities, contributing to the social and moral validation of CSR actions. Such collaborations facilitate the transfer of legitimacy, increase reputational visibility, and support the strategic alignment of CSR initiatives with the Sustainable Development Goals. The study offers both theoretical and practical implications regarding the role of CSR–NGO partnerships as sustainable mechanisms of governance and social co-creation.

Keywords: corporate social responsibility (CSR); organizational legitimacy; CSR–NGO partnership; Lidl Romania; Federation of Community Foundations; Sustainable Development Goals (SDGs)

JEL Classification: M14; L31; Q56

1. Introduction

Over the past two decades, corporate social responsibility (CSR) has evolved from a voluntary practice into a strategic imperative for sustainability and reputation. Amid rising public expectations, partnerships between companies and non-governmental organizations (NGOs) have become key mechanisms for building trust and legitimacy. NGOs enjoy strong public credibility and offer companies reputational capital that cannot be achieved through corporate communication alone (Poret, 2019; Baur & Palazzo, 2011).

In Central and Eastern Europe, CSR is shaped by post-communist transitions and the adoption of European sustainability principles (Mazurkiewicz & Crown, 2005). This has led to cross-sector partnerships where NGOs not only implement social projects but also legitimize corporate practices through local expertise and transparency.

In Romania, the partnership between Lidl Romania and the Federation of Community Foundations (FFCR), through the "Fund for a Better Future in Communities" program, exemplifies strategic collaboration between business and civil society. This study analyzes how CSR–NGO partnerships enhance corporate legitimacy and reputation, using the Lidl Romania–FFCR case.

Research questions:
- How do NGOs validate and strengthen CSR initiatives?
- How do these partnerships influence public perception and organizational legitimacy?
- What are their implications for achieving the Sustainable Development Goals?

2. Literature review

Corporate social responsibility (CSR) is defined by the World Bank as the commitment of companies to behave ethically and to contribute to sustainable development by engaging with all relevant stakeholders in ways that benefit both business and society (Mazurkiewicz & Crown, 2005). This definition reflects a shift from voluntary practice to strategic engagement, positioning CSR as a multidimensional tool for addressing societal challenges.

Partnerships with non-governmental organizations (NGOs) play a crucial role in this transformation. NGOs often fill regulatory gaps and enjoy high levels of public trust, offering companies private political authority and legitimacy in the provision of public goods (Poret, 2019). Their involvement enhances the credibility of CSR initiatives and enables companies to engage more meaningfully with communities.

Beyond implementation, NGOs act as private governance actors, contributing to the social and environmental regulation of corporate activities at both national and international levels. Their role extends from project delivery to norm-setting, influencing how CSR is perceived and practiced across sectors.

The literature emphasizes the evolution of NGOs from adversarial watchdogs to collaborative partners, legitimizing corporate involvement in CSR (Conley & Williams, 2005). This shift reflects broader changes in governance, where civil society actors increasingly participate in shaping corporate behavior.

Organizational legitimacy, a central concept in this study, is understood as a socially constructed evaluation whereby an entity's actions are perceived as appropriate and acceptable within the prevailing system of societal norms and values (Suchman, 1995). It encompasses three dimensions:
- Pragmatic legitimacy: based on perceived benefits for stakeholders;
- Normative legitimacy: alignment with societal norms and ethical standards;
- Cognitive legitimacy: conformity with dominant cultural frameworks and expectations.

These dimensions are essential for maintaining public acceptance and community support, especially in contexts where corporate actions intersect with social needs.

Importantly, legitimacy is not static: it is negotiated through interaction, collaboration, and shared learning. CSR–NGO partnerships exemplify this dynamic, as they involve continuous dialogue and adaptation to local contexts.

Moreover, these legitimacy dimensions align with the Sustainable Development Goals (SDGs). Strategic partnerships, environmental protection, and social inclusion contribute directly to goals such as SDG 4 (Quality Education), SDG 10 (Reduced Inequalities), SDG 13 (Climate Action), and SDG 17 (Partnerships for the Goals). CSR thus becomes a mechanism for generating sustainable social value, linking corporate strategy with global development agendas.

3. Methodology

This study adopts a qualitative case study approach, focusing on the partnership between Lidl Romania and the Federation of Community Foundations in Romania (FFCR), implemented through the "Fund for a Better Future in Communities" (2018–2025). The case was selected for its relevance to understanding the relationship between legitimacy, cross-sector collaboration, and corporate reputation.

The analysis draws on secondary sources: official documents, media articles, public interviews, and online materials: examined comparatively and interpretively to identify key dimensions: objectives, outcomes, social impact, and forms of legitimization. Validity was ensured through source triangulation and alignment with relevant literature (Suchman, 1995; Baur & Palazzo, 2011; Poret, 2019). While offering an integrated perspective on CSR–NGO collaboration, the study acknowledges the limitation of relying solely on public data, without direct input from local beneficiaries.

4. Results and discussions

The Lidl–FFCR partnership demonstrates how CSR collaboration can generate tangible community impact and strengthen corporate legitimacy. According to FFCR's Executive Director, past program editions mobilized thousands of citizens and organizations, transforming schools and public spaces. Since its seventh edition, the program targets underserved rural and small urban communities, funding 178 projects in 28 cities with over 7 million lei.

From Lidl's perspective, sustainability is a long-term strategic commitment. In 2021, the company invested over 35 million lei in CSR projects with more than 90 NGOs, supporting local producers, reducing emissions, and integrating electric trucks. Total investments in Romania exceeded €2.6 billion, with €48 million directed to NGO-led social and environmental programs.

FFCR enhances the program's legitimacy by ensuring projects respond to real community needs and by associating CSR with transparency and the common good. Communicating impact through local media further strengthens public trust.

The partnership contributes directly to SDG 4 (Quality Education) and SDG 11 (Sustainable Cities and Communities), aligning interventions with local and global priorities. Funding, mentoring, and volunteer mobilization have expanded educational and civic activities, generating a multiplier effect.

While literature warns of co-optation risks, the FFCR–Lidl case offers a positive counterexample. FFCR's active role in fund allocation and project selection safeguards NGO autonomy and supports a model of sustainable, participatory CSR.

5. Conclusions

CSR–NGO partnerships are vital for enhancing corporate legitimacy and reputation. The Lidl–FFCR case illustrates how collaboration can shift CSR from image-building to authentic social co-creation. Key findings:

- NGOs provide pragmatic legitimacy through local expertise and needs assessment;
- They offer moral and normative legitimacy by aligning CSR with public values;
- Partnerships enable legitimacy transfer, strengthening stakeholder trust.

These insights confirm NGOs' role as intermediaries and co-regulators (Baur & Palazzo, 2011; Poret, 2019), and expand the concept of legitimacy as a dynamic, negotiated process.

Practical recommendations:

- Companies should engage local NGOs to increase CSR credibility and relevance;
- NGOs must preserve autonomy to ensure authentic legitimization;
- Policymakers can integrate such partnerships into sustainable development strategies.

The study's limitation lies in its reliance on secondary data. Future research could include interviews or comparative analyses to explore legitimacy transfer mechanisms in greater depth.

Ultimately, the Lidl–FFCR partnership shows that legitimacy and reputation are built through sustained, reciprocal collaboration with civil society—positioning CSR as a process of co-governance and trust-building.

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PERCEPTIONS OF OCCUPATIONAL AI EXPOSURE: AN EMPIRICAL ANALYSIS

Maria Ursu, Ludovic Dioszegi
Doctoral School of Economic Sciences, University of Oradea, Oradea, Romania
ursu.maria2@student.uoradea.ro
dioszegi.ludovic@student.uoradea.ro

Abstract:
Perception on artificial intelligence (AI) is a measure of how societies adapt to technological changes. This study utilizes 135 students to examine perceptions of AI exposure on certain occupation, exploring the discrepancy between objective measured exposure and perceived one. Objective exposure estimate that most jobs have moderate or high exposure within a limited variation range, suggesting a broadly impact. Respondents rate lower than the model predicts, suggesting an underestimation of AI exposure. The median (6) is close to the models, but the average is much lower (5.5<6.86), meaning that majority of respondents perceived lower exposure, dragging the mean down. Women's higher median perception may reflect a greater concern regarding AI disruption, while men's lower median shows more optimism. This finding suggest that AI perceived vulnerability is shaped by social and cultural factors. Overall. we can conclude that there is a divergence between quantitative indicators and human perception.

Introduction

AI, widely regarded as the next general-purpose technology, has the expectation to transform the labor market, raising considerable academic and public attention to how occupations are exposed to AI. Earlier models, such as Routine Biased Technological Change (Autor *et al.*, 2003) and Skill Biased Technological Change (Acemoglu and Autor, 2011) have provided robust analytical tools to asses task level exposure to automation. Various automation exposure scores have been developed, such as the Mean Automation Score (Gmyrek *et al.*, 2023), AI Occupational Exposure, AI Industry Exposure, and the AI Geographic Exposure Indicator (Felten *et al.*, 2021), Generative AI Index (GenAI), Language Modelling (LM) Occupational Exposure Scores (Nurski and Ruer, 2024), or the GPT Exposure Rating (Eloundou *et al.*, 2023). These indicators correlate the applicability of AI technologies with occupational skill profiles, allowing for the assessment of potential impacts across sectors of the labor market, although none has yet emerged as a standard measure. While these models focuses on objective measurement of occupations' AI exposure, a growing body of literature emphasizes the social dimensions of these changes, specifically how people perceive the exposure to AI of their jobs or of the overall labor market (Voigt, 2025). As Liu (2021) notes, the cultural perspective within sociological analyses of AI examines AI's broader social, cultural and political effects within the digital transformation. Understanding perceptions is critical in creation and adaptation of development or implementation strategies, facilitating the acceptance of technological innovations. Empirical investigations have explored local-level perceptions, making possible the embeddedness of the specificity of regional

economies and smaller urban labor market. This paper combines the objective measurement of AI exposure with survey data measuring people's perceived exposure to AI.

1. Literature review

The evolution of labor–technology interaction and perception can be characterized as one of cyclical, both in evolution and enthusiasm. Leontief's seminal essay "The Distribution of Work and Income" (Leontief, 1982) anticipated a future in which technological development reduces the demand for human labor to a degree comparable to the historical disappearance of horses from industrial production. His reasoning was rooted in the fear of structural underemployment caused by automation. Langlois (2003) advanced his historical-conceptual analysis by tracing the long-term co-evolution between human and machine, arguing that the division of labor itself is continuously renegotiated as technology evolves. In assessing the impact of technologies on labor market, a major turning point came with Autor, Levy and Murnane (Autor *et al.*, 2003), whose task-based model provided the first rigorous framework for understanding how technology interacts with work content. Brynjolfsson (2018) introduced the "Suitability for Machine Learning" (SML) index, a measure of how susceptible specific tasks are to AI systems. Fernández-Macías and Bisello (2022) and Gmyrek et al. (2023) refined task-level measurement through composite exposure indices such as the Mean Automation Score, AI Occupational Exposure, or GPT Exposure Rating. Other indicators - such as the Generative AI Index (GenAI), Language Modelling Occupational Exposure Scores (Nurski & Ruer, 2024), and AI Industry Exposure Index (Felten et al., 2021) - contribute to a growing methodological convergence around exposure measurement. Divergence between objective exposure and subjective perception represents a crucial theoretical frontier for current research. Large, representative surveys as PEW Research Center in U.S. reports that workers are more worried (52%) than hopeful (36%) about future of AI at work, with higher optimism among young and more educated workers (Parker, 2025).

2. Methodology

The present research aims to identify prevailing perception patterns — *pessimistic, realistic*, or *optimistic* — regarding AI's future impact on employment. A total of 135 respondents, aged between 15 and 25 years, participated in the survey conducted between September and October 2025. Data were collected in person during dedicated meetings and youth-oriented workshops, rather than through open online distribution. The questionnaire was designed and administered using the GLIDE platform and aimed to capture both subjective perceptions and objective exposure indicators. It included the following variables: *participant name* (for internal tracking only, anonymized in analysis); *gender*; *desired job*, selected from a predefined list of occupations, searchable through a bar interface; *job group/category* automatically assigned based on the selected occupation; *perceived exposure score*, rated by participants on a 1–10 scale, where *1* indicated no exposure and *10* indicated very high exposure and *calculated AI Exposure*. Data analysis relied primarily on descriptive statistics to identify general patterns and central tendencies in participants perceived exposure scores. Each desired occupation was then associated with an existing AI exposure index, allowing a comparison between

participants' subjective assessments and the objective exposure levels attributed to those occupations.

3. Results and discussions

The data collected from 135 participants offers a nuanced perspective on how young people perceive the impact of AI on their professional future. Although objective AI exposure across professions falls within a narrow range (5.9–7.3), participants' responses span the full scale (1–10), highlighting diverse opinions. Both mean and median perceived values are lower than the calculated exposure: mean = 5.51 vs 6.86; median ≈ 6. Perceived responses show wider variation and outliers at both ends. This discrepancy suggests AI is interpreted not only technically, but also through symbolic, emotional, and cultural lenses, reflecting professional identity and values associated with work. Occupational group analysis reveals consistent differences in perception. Participants aspiring to management roles (24%) tend to underestimate AI's impact, relying on interpersonal and decision-making skills, while those in technical fields such as IT, engineering, and the natural sciences (13.3%, median scores >7) show heightened awareness of automation risks. Professions involving manual labor, protective services, or creative roles (e.g., dancers, actors, food processing workers) report lower perceived vulnerability (scores <5), reflecting how the algorithmic vs. human-centered nature of work shapes expectations about AI. Creative fields such as arts and design show marked polarization: some view AI as a tool for expression, while others see it as a rival to creativity. Careers in health (9.6%) and education (8.1%) are generally seen as complementary to AI, indicating confidence in the human dimension of work. Among 19 occupational groups, only data clerks, drivers, and ICT specialists reported higher perceived exposure than model predictions. Perception consistency varies: construction, production, electrical installation, and data clerk roles show more consistent perceptions, while sales, judiciary, social, and cultural professions display greater variation. Technical fields demonstrate relatively uniform awareness of AI exposure. Gender-based analysis reveals subtle but meaningful differences. Male participants reported a median perceived exposure of 5.0, while females had a median of 6.0, both below the overall sample average (6.86). Female responses show narrower interquartile ranges, indicating more cohesive perceptions, whereas males appear slightly more optimistic. These contrasts may reflect differences in vocational orientation, technological familiarity, and cultural or educational influences. Across these segments, three patterns of technological perception emerge: realist, aligned with objective estimates; pessimist, overestimating risks in technical and creative domains; and optimist, underestimating AI's disruptive potential in human-centered professions. These orientations reflect professional identity and strategies for managing uncertainty. Emotions such as curiosity, fear, and hope shape these perceptions. Overall, young people exhibit ambivalence toward AI, combining curiosity with caution. This highlights the need for critical digital literacy and educational spaces that foster reflection on personal engagement with technology, supporting informed career choices and adaptation to an AI-driven labor market.

Conclusions

This study examined how young people perceive the exposure of their desired future occupations to AI and whether these perceptions are predominantly pessimistic, realistic, or optimistic. Results reveal a clear divergence between model-based and

perceived AI exposure. One possible explanation is the invulnerability bias (Barrera-Jimenez et al., 2025), when respondents believe that AI will affect others' work more than their own. Another factor may be the optimism bias, which leads individuals to minimize automation risks to preserve career confidence. Overall, young people's perceptions of AI extend beyond technical reasoning and reflect symbolic, emotional, and identity-related dimensions. AI is seen as a transformative force redefining the meaning of work, with attitudes varying across occupational fields, gender, and aspirations. These differentiated perceptions highlight how professional identity shapes responses to technological change. The findings emphasize the need for differentiated educational strategies that strengthen digital competence and critical thinking about AI across all disciplines, fostering adaptability, inclusion, and resilience in a labor market where AI represents not only a technological but also a societal challenge.

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AI-POWERED LEADER DIGITAL TWIN: EVIDENCE OF TASK-CONTINGENT ADOPTION FROM AN EXPLORATORY SURVEY

Giammarco Tosi
Interdisciplinary School of Doctoral Studies, "Aurel Vlaicu" University of Arad, Arad, Romania
gmtosi@gmail.com

Abstract: *Organizations are considering AI-powered leader digital twins (LDTs) to augment leadership capabilities, yet adoption remains uncertain. This exploratory study tests five core hypotheses concerning individual and organizational predictors of delegation propensity to LDTs using survey data from leaders. Contrary to classical Technology Acceptance Model (TAM) predictions, individual factors do not significantly predict delegation. Instead, task characteristics emerge as the dominant determinant: leaders readily delegate routine, analytical tasks but resist delegating strategic, relational, and ethically salient tasks. These findings challenge linear adoption models and support a task-contingent framework where human-AI complementarity guides appropriate task allocation.*

Keywords: digital twin; artificial intelligence; leadership; governance

JEL Classification: M10; M12; O33; L86; D83

1. Introduction
The prospect of having in near future AI-powered leader digital twins—intelligent systems that replicate and augment leader decision-making—raises fundamental questions about adoption, trust, and the boundaries between human and algorithmic authority. While organizations recognize potential productivity gains (Tao et al., 2018), leaders express concerns about authenticity, accountability, and the delegability of high-stakes decisions (Santoni de Sio & van den Hoven, 2018). Classical technology adoption theory predicts that individual competence, positive attitudes, and organizational support drive adoption (Davis, 1989; Venkatesh et al., 2003). However, emerging research on human-AI collaboration and trust-in-automation suggests adoption is more nuanced in high-stakes domains: while leaders may hold favorable views of AI capability, they exercise selective behavioral trust, delegating only to tasks where human judgment is less critical (Glikson & Woolley, 2020; Lee & See, 2004). This study tests whether traditional adoption drivers predict leader willingness to delegate to digital twins or whether task characteristics dominate.

2. Hypothesis Theoretical Foundation and Methodology
We tested five main-effect hypotheses derived from TAM and organizational behavior theory:
- H1: Positive AI attitude predicts higher delegation propensity (Davis, 1989)
- H2: Higher autonomy predicts greater delegation (Hackman & Oldham, 1980)
- H3: Technology competence predicts delegation (Venkatesh et al., 2003)

- H4: Organizational innovativeness predicts delegation (Schneider et al., 1994)
- H5: Younger leaders delegate more than older leaders (generational hypothesis)

Additionally, we examined mediation pathway M1: Technology Competence → AI Attitude → Delegation, to see if technical fluency builds positive attitudes toward AI, which then translate to increased delegation.

A mixed-methods direct interviews survey was administered to 38 leaders across sectors (Financial Services 37%, Technology 16%, Consulting 13%, other 34%) during October 2025. Respondents reported mean technology competence of 3.87/5, high autonomy (4.32/5), and 92% had used AI tools in their work.

Independent variables: Technology Competence (1–5 self-rating), AI Attitude (composite of four items on AI usefulness, comfort, societal benefit, and risk perception; α = 0.82), Autonomy (composite of decision autonomy, method freedom, and timing freedom; α = 0.81), Organizational Innovativeness (single ordinal item: 1 = conservative, 5 = very innovative), and Age (ordinal: 1 = under 30, 5 = 60+).

Dependent variable: Overall Delegation Propensity (mean rating across eight leadership task categories on 1–5 scales: Strategic Decision-Making, Knowledge Management, Motivating & Inspiring, Communication & Alignment, Talent Coaching, Culture Shaping, Change Facilitation, Performance Monitoring).

Bivariate Pearson correlations tested H1–H4 and M1 path effects; Spearman rank correlation tested H5 (ordinal age). One-way ANOVA examined task-type effects. An exploratory mediation model (regression) tested whether AI Attitude mediates the Tech → Delegation pathway.

3. Results

Contrary to TAM predictions, individual and organizational factors showed no significant association with overall delegation propensity (see Table 1).

Table 1: Hypothesis

Hypothesis	Relationship	r/ρ	p	n
H1	AI Attitude → Delegation	.085	.611	38
H2	Autonomy → Delegation	.014	.934	38
H3	Tech Competence → Delegation	−.060	.719	38
H4	Org Innovativeness → Delegation	.148	.375	38
H5	Age → Delegation	.054	.745	38

These null findings are theoretically significant: despite high mean technology competence (M = 3.87), positive AI attitudes (M = 3.65), and high autonomy (M = 4.32), overall delegation remained moderate (M = 2.99). Leaders are not uniformly willing to delegate simply because they possess favorable predispositions or organizational support.

The mediation pathway showed a critical dissociation:
- Path a (Tech Competence → AI Attitude): r = .553, p < .001 (strongly supported)
- Path b (AI Attitude → Delegation, controlling Tech): β = .159 (weak)
- Indirect effect (path a × b): .088 (negligible)

Technology competence robustly predicts favorable AI attitudes, validating prior research (Davis, 1989). However, this positive attitude does not substantially propagate to behavioral delegation. The mediation chain is interrupted—a critical finding suggesting that attitude formation is necessary but insufficient for adoption in high-stakes domains.

A one-way ANOVA revealed highly significant task-type effects ($F[7,296] = 14.60$, $p < .001$, $\eta^2 = .28$, large effect). Task characteristics far outweigh individual differences in predicting delegation:

- High Delegation (M ≥ 3.5):
    - Performance Monitoring (M = 4.18, SD = 0.98)
    - Knowledge Management (M = 3.74, SD = 1.06)
- Low Delegation (M < 2.5):
    - Culture Shaping (M = 2.53, SD = 1.35)
    - Motivating & Inspiring (M = 2.42, SD = 1.33)
    - Strategic Decision-Making (M = 2.00, SD = 1.01)

A 2.18-point gap separates most and least delegable tasks. Exploratory clustering reveals a two-factor structure: (1) Analytical-Routine tasks (M = 3.95, e.g., performance monitoring, knowledge capture) and (2) Relational-Strategic tasks (M = 2.27, e.g., motivation, culture, strategy). Post-hoc pairwise comparisons confirm significant differences ($p < .01$ after Bonferroni adjustment).

4. Discussion, advancements, limitations and future research

Our findings contradict linear TAM/UTAUT models, which assume Perceived Usefulness → Attitude → Intention → Behavior. We observe Attitude formation (Path a supported) but not behavior propagation (Path b weak). This dissociation aligns with algorithm aversion research, showing that even when people perceive AI as capable, they resist relying on it for high-stakes judgments (Dietvorst et al., 2015). In leadership contexts, this reflects informed caution, not technophobia: leaders recognize AI limitations in domains requiring judgment, creativity, and ethical responsibility.

The dominance of task-type effects ($\eta^2 = .28$ vs. near-zero correlations for H1–H5) suggests a fundamentally different adoption logic than individual-trait models predict. Leaders intuitively apply a contingency calculus:

IF Task = {analytical, routine, low ambiguity, low materiality} → THEN Delegate = High

IF Task = {strategic, relational, high ambiguity, high materiality, ethically salient} → THEN Delegate = Low

This aligns with socio-technical systems theory (Trist, 1981) and human-AI complementarity frameworks (Jarrahi et al., 2022), where humans and AI optimize jointly by task: AI excels at monitoring, analysis, and memory; humans retain authority over strategy, motivation, and ethical judgment.

In terms of research advancement, we identify two areas of interest:

- For theory: Digital twin adoption should be modeled as task-contingent, not person-contingent. Future research should employ within-person designs where individual leaders rate delegation for multiple tasks, isolating task effects from person effects.
- For practice: Organizations should position digital twins as analytical augmentation tools, not leader replacements. Implementation should focus on high-impact, routine tasks (performance monitoring, knowledge

management) where adoption rates are highest and governance risks lowest. Escalation protocols must reserve strategic and ethical decisions for human leaders, supported by transparent automation-escalation matrices (Parasuraman et al., 2000) that map tasks to appropriate autonomy levels.

In terms of limitations, we have identified:

- sample size (n = 38) which limits generalizability: larger, cross-cultural samples are needed.
- real adoption: hypothetical scenarios (willingness to delegate to a potential system) is not real adoption behavior.
- cross-sectional design adoption: tweaking is necessary to avoid prevention of causal inference.

Future research will focus on (1) vertical deep dive: longitudinal field pilots with actual digital twin deployments, behavioral logs, and repeated measures of trust calibration, (2) testing predictions coming from alternatives to classic TAM models.

5. Conclusion

This exploratory study reveals that AI-powered leader digital twin adoption is not driven by individual technology competence, positive attitudes, or organizational innovation climate—contrary to classical technology acceptance models. Instead, task characteristics dominate: leaders delegate readily to routine, analytical tasks but resist delegating strategic, relational, and ethically laden responsibilities. These findings support a task-contingent adoption framework grounded in human-AI complementarity and ethical leadership theory, with implications for how organizations should design, govern, and deploy intelligent systems that augment rather than replace human judgment.

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PRESENT AND FUTURE PERSPECTIVES ON THE USE OF ARTIFICIAL INTELLIGENCE IN TRANSPORT COMPANIES

Simona Iacob

Doctoral School of Economic Sciences, University of Oradea, Oradea, Romania
iacob.simonamarilena@student.uoradea.ro

Abstract: *Artificial Intelligence (AI) is becoming a key element in how transport companies improve operations, make strategic decisions, and address sustainability challenges. This paper examines how AI is currently used in areas such as route planning, predictive maintenance, and autonomous vehicle coordination. It highlights both the advantages, like reduced costs and enhanced safety, and the challenges, including regulatory uncertainty, limited data availability, and ethical concerns related to algorithm transparency. By analyzing recent academic literature, the paper discusses emerging developments such as digital twins, real-time modelling, and the integration of 5G infrastructure. The analysis suggests that AI is more than a technical solution; it is gradually reshaping the foundations of smart mobility. These findings aim to support transport companies in adapting to technological change while remaining aligned with legal and societal expectations.*

1. Introduction
Digitalization and technologies like artificial intelligence (AI) are reshaping the way the transport sector operates. Faced with rapid urban growth and increasing pressure on infrastructure, many companies now view AI as a practical tool for improving mobility and logistics (Bahamazava, 2025). Solutions such as autonomous vehicles, smart traffic systems, and predictive maintenance help streamline operations and reduce environmental impact (Wang et al., 2025). These developments are made possible by integrating complementary technologies like 5G, the Internet of Things, and digital twins, which support real-time decision-making and system responsiveness (Wei, 2025). At the same time, concepts like Mobility as a Service (MaaS) signal a shift toward more integrated, personalized, and user-focused mobility. AI plays a role not only in optimizing logistics but also in supporting strategic decisions through data-based forecasting (Anwar, 2025). Despite its potential, the adoption of AI raises important challenges, including regulatory uncertainty, ethical concerns, and unequal access to digital infrastructure, especially in less developed regions (Wu *et al*., 2022). This paper examines how Artificial Intelligence (AI) is currently applied in the transport sector, focusing on its main benefits, existing limitations, and potential future developments.

2. Theoretical Foundations of Artificial Intelligence
Artificial Intelligence (AI) refers to the ability of computer systems to perform tasks that typically require human intelligence, such as learning from experience, recognizing patterns, making decisions, or adapting to new situations. AI brings

together disciplines such as computer science, mathematics, decision theory, and neuroscience to create systems that learn from data, identify patterns, and support autonomous or assisted decision-making (Iyer, 2021; Wang *et al*., 2025). In the transport sector, AI includes technologies like machine learning (ML), deep learning (DL), neural networks, and expert systems. These tools are used to analyze traffic behavior, forecast logistics needs, plan routes, and interpret visual data in autonomous vehicles (Chen *et al*., 2024; Maksoud *et al*., 2025). They form the foundation for traffic control, vehicle automation, and infrastructure monitoring (Saki and Soori, 2026). ML and DL algorithms help generate predictions and decisions by processing historical and operational data. They are applied in areas such as traffic image analysis, anomaly detection, and autonomous vehicle control (Du *et al*., 2023; Wang *et al*., 2025). Generative models and large language models (LLMs) combine text, sensor, and video inputs to simulate traffic flow and urban scenarios, especially when data is incomplete or uncertain (Yan and Li, 2024; Maksoud *et al*., 2025). In logistics, AI supports forecasting, optimization, and adaptability. Models learn continuously from supply chain dynamics and are often paired with digital twins, virtual replicas of transport networks that allow companies to test and improve system performance through simulation (Wu *et al*., 2022; Chen *et al*., 2024; Idrissi *et al*., 2024).

3. Current uses of AI in the transport sector
3.1. Route and delivery optimization
Optimizing delivery routes is one of the most practical and widely adopted uses of artificial intelligence in the transport sector. AI systems help companies plan journeys in real time by taking into account traffic conditions, weather forecasts, and customer preferences (Iyer, 2021; Chen *et al*., 2024). In the case of autonomous deliveries, such as those carried out by logistics drones, AI contributes to reducing energy use and emissions by consolidating orders and selecting the most efficient paths (Du *et al.*, 2023; Chen *et al*., 2024). By combining data from GPS, sensors, and enterprise resource planning (ERP) platforms, AI enables more agile logistics operations that can anticipate delays and adapt accordingly. Within intelligent transport systems, these technologies also play a role in easing congestion, lowering accident risks, and supporting more sustainable urban mobility (Idrissi *et al*., 2024; Zemmouchi-Ghomari, 2025).

3.2. Predictive maintenance
Predictive maintenance supported by AI helps detect potential faults in vehicles and infrastructure before they lead to serious problems. By analyzing data from sensors, these systems can anticipate wear and tear on components and schedule timely repairs, which helps avoid costly breakdowns and service interruptions (Wu *et al*., 2022; Chen *et al*., 2024). This proactive approach not only improves safety and extends the lifespan of equipment, but also reduces the likelihood of unexpected disruptions. It is already being applied in commercial transport fleets and public transit systems, where reliability and efficiency are essential (Bahamazava, 2025; Wang *et al*., 2025).

3.3. Smart fleet management
Artificial intelligence supports more efficient fleet management by helping companies monitor and coordinate their vehicles in real time. Through the analysis of data such

as location, fuel usage, driving behavior, and component wear, AI systems assist in allocating resources effectively and planning routes and maintenance schedules automatically (Iyer, 2021). These technologies can anticipate when refueling is needed, suggest alternative routes to avoid traffic congestion, and reduce overall travel time. In addition, AI plays a role in tracking driver performance and improving safety across the fleet (Maksoud *et al*., 2025).

3.4. Autonomous vehicles and driver-assistance systems
Autonomous vehicles rely on artificial intelligence to understand their surroundings, make decisions, and move without direct human control. By processing input from cameras, lidar, radar, and GPS, these systems can detect obstacles, interpret road signs, and respond to the behavior of other drivers and pedestrians (Du *et al*., 2023). Beyond fully autonomous driving, many vehicles already feature advanced driver-assistance systems (ADAS), including automatic emergency braking, lane-keeping support, and adaptive cruise control. These functions, powered by AI, help improve road safety and reduce driver fatigue, making everyday travel more secure and comfortable (Wang *et al*., 2025; Wei, 2025).

3.5. Intelligent customer services
Artificial intelligence is also changing how transport companies interact with their customers. By using recommendation systems, chatbots, and mobility apps, these technologies help tailor travel and delivery experiences to individual preferences (Iyer, 2021; Maksoud *et al*., 2025). Mobility as a Service (MaaS) platforms bring together route planning, ticketing, shared vehicles, and real-time updates in a single application. Managed by AI systems, these platforms allow users to compare options and choose the fastest, most affordable, or most sustainable way to travel (Bahamazava, 2025).

4. Benefits and challenges of implementing AI in transport
4.1. Benefits
The implementation of artificial intelligence in transport brings multiple advantages. Among the most important are:
- Increased operational efficiency through route automation, optimal resource allocation and reduced idle time (Chen *et al.*, 2024).
- Reduced emissions and fuel consumption by optimizing routes and integrating green logistics practices (Du *et al.*, 2023).
- Improved road safety due to advanced driver-assistance systems (ADAS) and predictive analyses of accidents and failures (Wang *et al.*, 2025).
- Faster and better-informed decision-making, supported by real-time data analytics and machine-learning algorithms (Maksoud *et al.*, 2025).

4.2. Challenges
Alongside its benefits, there are also significant obstacles:
- Data quality and accessibility: many AI systems depend on large datasets that are clean and up to date, which are not always available (Idrissi *et al.*, 2024).
- High implementation costs, especially for SMEs or local authorities (Chen *et al*., 2024).

- Limited algorithm transparency and the difficulty of explaining AI decisions, particularly in safety-critical applications such as autonomous driving (Maksoud *et al.*, 2025).
- The need for a clear regulatory framework regarding AI ethics, data protection and liability for errors in automated systems, given that technology is evolving faster than legislation (David Fan *et al.*, 2024).

5. Future perspectives on the use of AI in transport
5.1. Increased automation and autonomy
Transport systems are expected to become increasingly autonomous, both in terms of vehicles and infrastructure. AI technologies are evolving from basic assistance tools to systems capable of making real-time decisions related to navigation, obstacle avoidance, and communication between vehicles (Du *et al.*, 2023; Bahamazava, 2025). In the logistics sector, AI already plays a central role in managing automated warehouses, coordinating delivery drones, and operating smart fleets. Algorithms designed to balance multiple objectives, such as route efficiency, load distribution, and delivery timing, help reduce human error and improve overall operational performance (Chen *et al.*, 2024).

5.2. AI as a support for sustainability (ESG)
Artificial intelligence plays an increasingly important role in making transport systems more sustainable. Algorithms help optimize fuel use, delivery routes, and fleet operations, which leads to lower CO_2 emissions and supports environmentally friendly logistics practices (Iyer, 2021; Chen *et al.*, 2024). Digital transformation efforts driven by AI and big data are also reshaping supply chains and business strategies, encouraging the development of greener products and more personalized services (Kalenyuk *et al.*, 2024). Moreover, AI can improve access to mobility for vulnerable groups and strengthen transparency and traceability in logistics, making it a valuable tool for companies committed to environmental, social, and governance (ESG) goals (Maksoud *et al.*, 2025).

5.3. Digital twins and predictive simulations
Digital twin technology makes it possible to create virtual models of transport infrastructure and networks that are continuously updated with real-time data from the field. These models can simulate traffic patterns, congestion, and the effects of different urban planning decisions (Wu *et al.*, 2022). When combined with artificial intelligence, these simulations become predictive tools that allow planners to test mobility strategies, infrastructure expansions, or emergency responses before they are implemented. This approach supports smarter decision-making and contributes to the sustainable development of cities (Wei, 2025).

5.4. Smart infrastructure and 5G
The rise of smart infrastructure goes hand in hand with the adoption of AI technologies and the rollout of 5G networks. These systems enable rapid data exchange between vehicles, traffic signals, sensors, and control centers, making real-time, automated decision-making possible (Bahamazava, 2025; Maksoud *et al.*, 2025). Due to 5G's low latency and high data capacity, AI can process large volumes of information almost instantly, an essential requirement for autonomous driving and

intelligent traffic management. This level of connectivity lays the groundwork for smart cities and supports the shift toward more sustainable and efficient mobility systems (Wei, 2025).

5.5. Regulation, ethics and explainable AI

As artificial intelligence becomes more deeply integrated into transport systems, questions of accountability, transparency, and regulation become increasingly important. Many AI models, especially those based on deep learning, make decisions that are difficult to interpret, which raises concerns in safety-critical areas such as autonomous driving and the management of public infrastructure (Maksoud *et al*., 2025). To address these challenges, the development of AI solutions must be supported by a clear legal framework that defines responsibilities and ensures the protection of personal data. In parallel, the use of explainable AI models is essential for making decisions auditable and understandable, helping to build trust among users and stakeholders (Wang *et al*., 2025; Wei, 2025).

6. Conclusions

Artificial intelligence is becoming one of the most transformative forces shaping the future of transport, offering significant potential for improving efficiency, reducing costs, and advancing sustainability. Today's applications, from route optimization and predictive maintenance to autonomous vehicles and personalized customer services, already highlight the strategic importance of AI for transport companies.

Looking ahead, AI will become increasingly integrated into logistics operations, enabling greater automation, supporting ESG goals, and powering the real-time functioning of intelligent transport systems. In this evolving landscape, the ability of organizations to implement AI solutions that are explainable, secure, and ethically grounded will be a key factor in maintaining competitiveness and public trust.

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ARTIFICIAL INTELLIGENCE IN LOCAL PUBLIC FINANCE MANAGEMENT: THE CASE OF ORADEA MUNICIPALITY

Georgiana-Alis Iacobescu
University of Oradea, Doctoral School in Economic Sciences, Oradea, Romania
Alisiacobescu23@gmail.com

Abstract
This paper examines how Artificial Intelligence (AI) supports the modernization of local public finance management, using Oradea Municipality as a reference model for digital transformation in Romania. The study combines qualitative analysis with secondary data from national and international reports, including the McKinsey (2025) assessment of Romania's public sector, the National Strategy for Artificial Intelligence (2024–2027), and the Oxford Insights Government AI Readiness Index (2024). Findings indicate that AI can reduce administrative costs by up to 60%, shorten fiscal workflows, and improve revenue forecasting accuracy.

Keywords: Artificial Intelligence; Local Finance; Public Administration; Digital Transformation;

JEL Classification: H83, O33, C88

1. Introduction
According to the Romanian Government (2024, p. 6), AI deployment in the public sector is expected to generate improved service delivery, reduced bureaucracy, and evidence-based decision-making. McKinsey (2025, p. 14) estimates that automation and data analytics could increase efficiency in Romania's public administration by the equivalent of 1.5 % of GDP per year, mainly through digitization of tax management, document processing, and procurement systems.

However, cities such as Oradea demonstrate how local leadership and investment in digital infrastructure can accelerate transformation beyond the national average. Badea et al. (2024, p. 1038) highlight that the introduction of AI in both public and private sectors requires a parallel effort in workforce reskilling and ethical governance. Similarly, Pinzaru et al. (2022, p. 33) argue that Romania's transition toward a digital economy depends on collaboration between institutions, businesses, and academia.

2. Methodology
The research uses a qualitative, case-based approach centered on Oradea Municipality, selected due to its advanced level of digitalization and early integration of AI tools in public finance. Documentary analysis was applied to strategic reports issued by the Romanian Government, the European Commission, McKinsey (2025), and the Municipality of Oradea (2023). Comparative benchmarking was used to position Romania and Oradea against Central European peers such as Poland, Hungary, and the Czech Republic. Data were derived mainly from the Oxford Insights Government AI Readiness Index (2024) and complemented with economic indicators referenced in Radulescu et al. (2025). Content synthesis was used to consolidate findings from multiple sources and to identify key dimensions of AI

contribution in public financial management: (1) automation of fiscal operations, (2) predictive analytics in budgeting, (3) transparency enhancement, and (4) citizen interaction through intelligent platforms. Data validity was ensured through triangulation — comparing national and international datasets and cross-referencing findings with recent literature such as Badea et al. (2024) and Pinzaru et al. (2022).

3. Analysis and Results
3.1 AI Readiness and Strategic Framework in Romania

Romania's AI Strategy (2024–2027) emphasizes interoperability, ethics, and the creation of a national "AI Observatory" to monitor implementation (Guvernul României, 2024, p. 9). McKinsey (2025, section "Public Sector Transformation") identifies three priority areas: predictive budgeting, automated tax services, and algorithmic auditing. Comparative data show that Romania's AI Readiness Index (48.6) trails behind the Czech Republic (59.4) and Poland (56.3) but exceeds Hungary (50.2) (Oxford Insights, 2024). This reflects a structural gap in digital infrastructure but also highlights growing administrative interest in AI-driven efficiency. Radulescu et al. (2025, p. 143) note that Romania's economic cybernetics potential is expanding through hybrid automation systems linking financial data with governance algorithms.

AI adoption at national level remains limited by uneven digital skills and fragmented data systems. However, McKinsey (2025, p. 18) projects that full implementation of AI in Romania's public sector could save approximately 2 billion EUR annually by 2030, mainly via resource optimization and error reduction in fiscal management. These projections establish a clear economic argument for accelerating AI integration.

Table 1 – Comparative AI Readiness Index (2024)

Country	AI Readiness Score (2024)
Czech Republic	59.4
Poland	56.3
Hungary	50.2
Romania	48.6

Source: Processed by author based on Oxford Insights (2024).

3.2 The Case of Oradea Municipality

Between 2018 and 2024, Oradea recorded a three-fold increase in digital transactions, with online tax payments rising from 25 % to 80 % of total collections (Primăria Municipiului Oradea, 2023). Automation through Robotic Process Automation (RPA) cut document processing time by 70 %, while predictive analytics improved budget forecasting accuracy by 15 %. Natural Language Processing (NLP) tools were deployed to assist citizens in real time, increasing service satisfaction rates (Oradea Digitalization Report, 2023).

Table 2 – Digital transactions – The Case of Oradea Municipality (2018 – 2024)

AI Tool	Application Area	Observed Impact
Robotic Process Automation (RPA)	Document and Tax Workflow Management	Processing time reduced by 70 %
Predictive Analytics	Revenue Forecasting and Budget Planning	Forecast accuracy improved by 15 %

| Natural Language Processing (NLP) | Citizen Interaction | Real-time assistance and faster responses |
| Machine Learning Models | Fraud Detection and Expenditure Monitoring | Enhanced transparency and irregularity prevention |

Source: Processed by author based on Primăria Municipiului Oradea (2023).

4. Conclusion

The integration of Artificial Intelligence into local public finance represents a practical path toward greater efficiency, accountability, and sustainability. Romania's national AI strategy, combined with Oradea's proven municipal success, demonstrates that technological modernization is no longer a conceptual goal but a feasible policy tool. The findings confirm that AI-driven automation and data analytics can substantially improve fiscal performance and public trust when supported by strategic governance and citizen-focused design. Beyond operational improvements, AI also contributes to transparency and ethical financial management by reducing discretionary decisions and enabling real-time monitoring of public expenditures. As McKinsey (2025) highlights, these technologies not only optimize resources but also foster public confidence by ensuring consistent and objective outcomes.

Oradea's experience shows that local administrations can become innovation hubs when they align digital investments with long-term policy goals.

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THE CURRENT STATE OF FINANCIAL THERAPY: A BIBLIOMETRIC APPROACH

Andreea-Mădălina Vârtei
Faculty of Economic Sciences, Lucian Blaga University of Sibiu, Romania
andreea.vartei@ulbsibiu.ro

Abstract: *Financial therapy denotes a recently emerging field of research at the intersection of psychology, behavioral finance, and change-oriented therapeutic interventions. The purpose of this study is to map the development and guidelines of research in financial therapy through a bibliometric study. The methodology focused on extracting data from the Web of Science database (SSCI index), writings focused on socio-economic behavioral analysis, which were subjected to the scientometric process through the Bibliometrix - R-Biblioshiny portal. The results migrate towards a literary block characterized by emotional and cognitive glitches in financial behavior, where financial stress, mental health, and limiting beliefs about money are highlighted. In addition, the analysis of collaboration networks marks a territorial polarization in the US and Canada, presenting a gradual distribution in Europe. The paper highlights the interdisciplinary nature and early stage of development of financial therapy*.

Keywords: financial therapy; bibliometric analysis; financial health; psychology; behavioral sciences.
JEL classification: D91, G53.

1. Introduction

Financial therapy is a central topic of discussion at the intersection of economics, psychology, and therapeutic applications, focusing on the dynamics of factors that influence financial behavior.

Frankl (1946) develops the importance of finding meaning in life experiences, and in the context of financial therapy, this meaning is reflected in the way it influences an individual's identity and value system. In Anonymous's (1946/1951) view, studies on interpersonal communication highlight the central role of money in couple and family life, while Ira Doss (2003) shows that 80% of couple conflicts involve money, thus targeting financial therapy in relationships. Cronbach (1951) reveals the psychometric assessment of financial stress as a model for analyzing the therapeutic approach. Freud A (1951) believes that financial attitudes take root in childhood. Rosenberg's (1965) study shows that self-esteem influences how individuals manage money. Adams (1965) develops the equity theory, which shows that the perception of fairness affects satisfaction. In 1980, the DSM study indicated an increased prevalence of financial problems strongly correlated with anxiety and depression. Folkman & Lazarus (1980) state that financial therapy is the main pillar in stress management. Weissman (1980) emphasizes the impact of emotional disorders on financial behaviors. Lorenz and Sherraden (1983) show how poverty and financial stress are part of the community approach. Christenson (1994) discusses compulsive disorders through the analogy of compulsive shopping and financial addiction, and McElroy (1994) explains emotional shopping. Motivation and self-regulation overlap with compensating for emotional discomfort through spending

(Higgins, 1994). Meyer (2003) studies minority stress as part of financial strain in vulnerable groups. Brown and Ryan (2003) believe that practicing mindfulness contributes to financial control and reduced impulsivity. Beidas (2010) and McHugh (2010) propose supporting the development of financial therapy interventions. In 2010, Carlson discusses the application of financial therapy in public policy as a link between financial health and public health. In 2015, the APA paved the way for the recognition of financial therapy as a practice, and in 2020, Brooks' study proclaimed how increased social anxiety is condensed into increased interest in financial therapy during the pandemic.

2. Methodology

The bibliometric analysis was outlined by collecting data from the Web of Science database, selecting the Social Sciences Citation Index (SSCI) collection, and focusing on studies in economics, psychology, and behavioral sciences published in English. Articles and book chapters promoting the financial therapy structure were included, and after applying relevance criteria and eliminating duplicates, 496 records remained. The final data set was converted to BibTeX format and explored using the Bibliometrix-R-Biblioshiny package, allowing the construction of visualizations related to research dynamics and the conceptual structure of the field.

3. Empirical results

The analysis of the relationships between the authors' country of affiliation, individual contributions, and dominant themes in the literature was illustrated using a three-fields plot visual model. The observations show that the main source of scientific production belongs to American research, outlining the United States as the main source of scientific production, concentrating the center of active researchers dealing with therapy based on psychological and behavioral criteria. Sweden, Portugal, the United Kingdom, Canada, and the Netherlands contribute an average share to research focused on financial therapy.
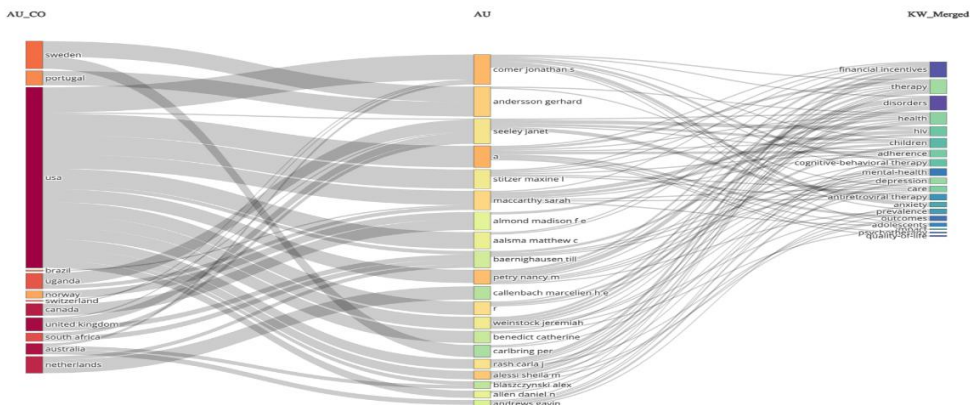
Figure 1: Research flows between geography, authors, and keywords in studies on financial therapy
Source: Author's processing in Biblioshiny.

The author nodes are calibrated by names such as Comer Jonathan S., Andersson Gerhard, Seeley Janet, Stitzer Maxine L., and Aalsma Matthew C., whose scientific compositions have implications for the development of behavioral therapy, mental health, depression, and psychosocial interventions. Therapeutic interventions in vulnerable contexts are densely attached to topics concerning children, adolescents, treatment adherence, and quality of life.

From a thematic perspective, the dominant clusters are represented by terms such as therapy, cognitive-behavioral therapy, mental health, anxiety, depression, disorders, adherence, outcomes, and quality of life. This composition fuels financial therapy through psychotherapeutic interventions in mental health when the financial and emotional spectrums influence each other.

Bibliometric analysis reports an expansion of scientific interest in the field over the last quarter century, with an annual growth rate of 8.09% and a total of 495 documents published in prestigious academic sources. On average, each document is around 8.12 years old and has 23.22 citations. The thematic composition is shaped by both 1618 plus terms and the authors' keywords (1554 terms), which reveals significant conceptual heterogeneity. In terms of contributions, there were 2,504 contributors, with 33 publishing articles as sole authors, indicating a dominant trend of academic collaboration at 5.28 co-authors per article. The share of international collaboration, at 24.24%, suggests a global ramification of the research network, and the predominant percentage is in favor of scientific articles, at 473. The annual scientific output of the last 25 years indicates a progressive trend, emphasizing the consolidation and maturation of the field. The early 2000s saw a relatively low and fluctuating number of publications (2-7 articles/year), marking the early stages of the field. 2007 is the year in which an intensification of research activity is identified, with the target of 10 articles, a trend that follows an upward trend over the next 10 years. The year 2016 marks an important momentum, exceeding 25 articles, indicating a thematic and institutional consolidation. Exponentially, recent years have been marked by significant growth, with 35 articles in 2024 and a maximum of 49 articles in 2025, highlighting not only the accelerated development of academic production but also the affirmation of the field's relevance in the scientific and socio-economic sphere.

4. Conclusions

Financial therapy is emerging as an interdisciplinary field, positioned at the psycho-economic forefront of therapeutic algorithms. The literature nuances the individual's relationship with money, which transcends the rational-economic perspective, delivering emotional, cognitive, and identity dimensions. The conceptual focus is on financial stress, limiting beliefs and attitudes related to money, dysfunctional financial behaviors, mental difficulties, and interpersonal relationships. Under this pretext, financial therapy is defined as an integrative clinical approach aimed at strengthening both financial and psychological well-being. The uneven geographical distribution shows an intensification of research in the American, Canadian, and certain European areas, which preserves the evolutionary stage of the field, with a need for empirical strength. Financial therapy reveals the estrangement of the field of research and practice under development, with significant needs for theoretical consolidation and methodological diversification.

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THE FINANCIAL IMPLICATION OF CYBERSECURITY – A THEORETICAL APPROACH

Iuga Teodora Alexandra
Doctoral School of Economics and Business Administration, West University of Timișoara, Romania
teodora.iuga01@e-uvt.ro

Abstract: *This paper study the impact of cybersecurity on corporate governance, financial reporting, auditing, and transparency. Evidence shows that cyber incidents can lower reporting quality but also drive improvements in internal controls and audit practices, while auditors with prior breach experience enhance oversight. Transparent disclosure of cybersecurity practices strengthens investor trust and market credibility. The study highlights cybersecurity as a strategic tool for mitigating risks, fostering organizational learning, improving audit effectiveness, and enhancing stakeholder confidence. By integrating cybersecurity into governance and reporting frameworks, firms can build resilience, accountability, and sustainable corporate value in the digital economy and the purpose of this paper is to demonstrate and substantiate this relationship.*

1. Introduction

The accelerated digital transformation of economic and accounting processes has brought significant benefits in terms of efficiency, accessibility, and the speed with which financial information is collected, processed, and reported. However, alongside these advantages, organizations' exposure to cyber risks has grown exponentially, increasingly targeting IT systems, including those used for financial reporting and internal control. Security breaches can lead to operational disruptions, direct financial losses, manipulation or compromise of accounting data, and damage to the company's reputation — all of which affect investor perceptions and confidence in the published financial information.

In addition, firms affected by cyber incidents may delay financial reporting as they seek to validate compromised data, reducing the comparability and usefulness of financial statements for external stakeholders. As a result, cybersecurity has emerged not merely as a technical issue but as a strategic concern with profound implications for corporate governance, audit practices, and transparency. This paper study how cybersecurity risks influence financial reporting quality, the role of auditors in managing these risks, and the impact of transparent disclosure on market confidence.

2. From Risk to Resilience: The Role of Cybersecurity in Strengthening Corporate Accountability

In the modern digital economy, cybersecurity has emerged as a critical dimension of corporate governance and financial integrity. As businesses increasingly depend on digital infrastructures to manage operations and financial data, vulnerabilities in cybersecurity systems can have far-reaching implications beyond technical disruptions. Cyber risks now represent not only operational threats but also strategic and financial ones, influencing how firms report, manage, and disclose information to investors and regulators.

Rosati, Gogolin and Lynn (2022) examine how cybersecurity risk affects financial reporting quality, arguing that information security is fundamentally a financial and governance issue. Their analysis of U.S. firms shows that cyber incidents lead to lower reporting quality, reflected in accounting anomalies, restatements, and reduced transparency as companies attempt to manage market reactions. However, the study also finds that breaches can prompt firms to strengthen internal controls and audit quality, turning negative experiences into opportunities for organizational learning. Overall, the authors conclude that cybersecurity and financial integrity are deeply interconnected, calling for the integration of cyber risk management into internal control and audit frameworks.

Chen et al. (2025) support the idea that auditors' experience with cybersecurity breaches enhances the quality of oversight they exercise over firms that have not been directly affected by such incidents. The authors argue that, in the context of accelerated digitalization and the growing threat of cyber risks, auditors must play an active role in identifying and preventing vulnerabilities within companies' internal control systems. Based on an analysis of over 23,000 firm-year observations of U.S. listed companies between 2005 and 2021, the study shows that auditors who have previously worked with clients affected by cyberattacks are 21% more likely to issue opinions identifying material weaknesses in internal controls for their non-breached clients. This more cautious approach reflects heightened sensitivity to control risks and an improved ability to detect latent vulnerabilities. Moreover, firms audited by these professionals have a lower probability of suffering future breaches, demonstrating the effectiveness of cross-learning through experience.
The authors also provide qualitative evidence from interviews with audit directors and managers, confirming that exposure to cybersecurity incidents leads to a more rigorous approach to IT controls and closer collaboration with cybersecurity specialists. In this way, negative experiences become a source of professional improvement and a means of strengthening risk assessment processes. The central argument of the study is that auditors' exposure to cybersecurity breaches not only enhances their competence but also strengthens public trust in their preventive role. In an increasingly vulnerable digital world, auditors should not be seen merely as financial evaluators, but as active partners in managing cybersecurity risk. In conclusion, experience with breaches becomes a catalyst for vigilance and professionalism, offering evidence that learning from failure can lead to greater organizational resilience.

In the evolving landscape of digital finance, the transparency of cybersecurity practices has become a crucial aspect of corporate communication and investor relations. As cyber threats increasingly influence market confidence and corporate reputation, firms are expected to disclose not only their financial performance but also how they manage technological and informational risks. Such disclosures play a key role in shaping perceptions of reliability, governance quality, and long-term stability.

Gordon, Loeb and Zhou (2010) and Li, Gyun and Wang (2018) both highlight the positive relationship between cybersecurity transparency and firm value. Gordon et al. show that voluntary disclosures about information security enhance market perception by reducing uncertainty, while Li et al. find that, despite variability in compliance with the SEC's 2011 disclosure guidance, firms providing more detailed information gain greater investor trust and credibility. Together, the studies demonstrate that transparency in cybersecurity reporting—whether voluntary or regulatory—serves as a strategic tool for building reputation, strengthening governance, and enhancing corporate sustainability.

Nowadays, cybersecurity is no longer regarded merely as a technical issue confined to IT departments; it has become a central concern for businesses across all sectors. Vulnerabilities in digital systems can result not only in operational disruption but also in substantial financial losses, regulatory sanctions, and damage to reputation. Furthermore, cyber incidents can influence strategic decision-making, investor confidence, and long-term competitiveness. As organizations increasingly rely on digital technologies for core operations, protecting these systems is essential not only for safeguarding data but also for ensuring financial stability and maintaining strategic resilience in an interconnected global economy.

Liu et al. (2025) argue that vulnerabilities should be treated as direct financial risks. This essay supports their view, asserting that firms ignoring cybersecurity expose themselves to avoidable losses and reputational damage.
Cyber incidents are rising in frequency and severity, yet many organizations confine responsibility to IT departments. This siloed approach fails to consider the broader economic consequences, including regulatory fines, operational disruption, and loss of investor confidence. Treating cybersecurity as a financial issue encourages investment in governance, incident response, and cross-departmental coordination, all of which reduce potential losses.
Critics may argue that most breaches cause minor harm, but Liu et al. highlight the importance of tail risk: rare, catastrophic events that can severely impact a firm. In an interconnected digital environment, even a single major breach can trigger cascading financial consequences, making proactive management essential.

5. Conclusion

In the digital economy, cybersecurity has developed from a technical necessity to a central element of corporate governance, financial integrity, and organizational resilience. The evidence reviewed in this paper demonstrates that cyber risks affect not only operational performance but also financial reporting quality, audit

effectiveness, and investor confidence. Rosati, Gogolin and Lynn (2022) show that while cyber incidents can impair reporting, they also create opportunities for firms to strengthen internal controls and governance through organizational learning. Chen et al. (2025) highlight the value of auditors' experience with cybersecurity breaches in improving oversight and mitigating risks across firms, reinforcing the preventive and strategic role of auditing. Additionally, the research of Gordon, Loeb and Zhou (2010) and Li, Gyun and Wang (2018) emphasizes that transparent disclosure of cybersecurity practices builds credibility, enhances market confidence, and contributes to sustainable corporate value.

Overall, this paper concludes that cybersecurity should be integrated into financial reporting, auditing, and disclosure frameworks as a strategic tool rather than merely a compliance requirement. Proactive cyber risk management not only safeguards operational and financial data but also strengthens governance, fosters trust among stakeholders, and enhances long-term organizational resilience. In an increasingly interconnected digital environment, firms that prioritize cybersecurity and transparency are better positioned to create sustainable value and maintain stakeholder confidence.

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THE IMPACT OF FINTECH ON FINANCIAL INCLUSION

Andrei Smărăndescu
Doctoral School of Economics Sciences "Eugeniu Carada", University of Craiova
Craiova, Dolj
smarandescu.andrei.a5f@student.ucv.ro

Abstract: *This paper investigates the multifaceted impact of Financial Technology (Fintech) advancements on global financial inclusion. Employing a mixed-methods approach that combines quantitative analysis of adoption rates (mobile payments, digital lending) with qualitative case studies, the research empirically assesses how Fintech solutions mitigate traditional barriers like geographical distance and high transaction costs. The study confirms that digital innovation significantly enhances outreach and affordability, particularly for unbanked and underserved populations. However, its impact is heterogeneous. We identify key moderating factors, including regulatory frameworks and digital literacy levels, that influence the translation of technological capability into improvements in financial well-being. The research also addresses emerging risks, such as data privacy concerns and algorithmic bias. The paper concludes by proposing a policy-oriented framework designed to maximize the inclusive potential of Fintech while ensuring consumer protection and systemic stability, offering actionable recommendations for fostering a more equitable global financial ecosystem.*

1. Introduction

The global imperative for financial inclusion, defined as the access to and usage of affordable, useful, and high-quality financial services, stands as a critical enabler of economic development and poverty reduction worldwide. Despite concerted efforts by governments and international bodies, substantial populations in both developed and emerging markets remain excluded from the formal financial system, a deficiency that exacerbates inequality and stunts entrepreneurial growth. The traditional financial infrastructure, characterized by high operational costs and geographical constraints, has proven insufficient to sustainably reach these underserved segments. This prevailing context of exclusion has created a profound opportunity for Financial Technology (Fintech) to emerge as a transformative solution. Fintech leverages digital innovations, such as mobile payment platforms, digital lending, and advanced data analytics, to fundamentally restructure the delivery of financial services. This disruption promises a pathway to financial accessibility for the unbanked at a scale and speed previously unattainable. This paper investigates the multifaceted impact of this technological shift, seeking to move beyond descriptive accounts of Fintech adoption to provide a rigorous and evidence-based assessment of its net contribution to genuinely inclusive financial ecosystems. Understanding the mechanisms through which Fintech either succeeds or fails to improve financial well-being is vital for advancing effective policy responses in the digital age.

2. Literature Review

Financial inclusion represents the access and utilization of useful, affordable financial products and services by individuals and businesses, delivered in a responsible and sustainable manner (World Bank, 2025). The introduction of Financial Technology (Fintech), encompassing services from digital payments to P2P lending and AI-driven credit scoring (KPMG, 2017), fundamentally alters these supply-side dynamics. Research consistently shows that Fintech has a significant positive correlation with inclusion, particularly via digital metrics (Yoke Wang Tok and Heng, 2022). The exponential growth of mobile phone penetration, highlighted in the Global Findex Database (World Bank, 2025), has allowed developing economies to "bypass" the need for traditional infrastructure. This digital access expansion reduces global poverty and acts as a catalyst for sustainable economic growth (CFA Institute, 2023).

2.1. Key Mechanisms and Empirical Findings

The impact of Fintech on inclusion is channeled through several key mechanisms that bypass traditional banking limitations. Digital delivery models drastically lower operational costs, making services affordable and economically viable for serving low-income and rural customers (World Bank, 2025). Furthermore, mobile money and digital wallets have proven highly effective in extending financial access to marginalized populations, enabling electronic payments which often facilitate subsequent engagement with savings and credit products (CFA Institute, 2023). According to Abbasi et al. (2021), peer-to-peer lending FinTech platforms leverage big data analytics to improve the assessment of SME credit risk, particularly in contexts where conventional financial information is insufficient. By easing constraints arising from limited firm-level data and collateral, these technologies contribute to mitigating information asymmetry within traditional lending processes. Empirically, studies utilizing data from the Global Findex confirm that the observed increase in financial inclusion across several emerging economies has been driven almost entirely by the rapid expansion of Fintech services (Yoke Wang Tok and Heng, 2022). Nevertheless, this transformative impact is not uniform. The research conducted by the Yoke Wang Tok and Heng (2022) specifically found that while a greater use of Fintech successfully narrowed the class and rural divides, it had no significant effect on the gender divide, strongly suggesting that technology alone is insufficient to close deeply entrenched socioeconomic gaps.

2.2. Moderating Factors and Research Gaps

A crucial theme emerging from the literature is the recognition that the link between Fintech use and genuine financial inclusion is indirect and complex, being heavily influenced by moderating and mediating factors (Amnas, Selvam and Parayitam, 2024). Digital Financial Literacy is consistently identified as a crucial enabler, as users with the necessary digital skills are better equipped to understand and utilize complex digital financial platforms, thus translating access into meaningful usage (Khatri, Idrees and Sultan, 2025; Amnas, Selvam and Parayitam, 2024). Furthermore, the regulatory environment is pivotal; the perceived support from regulatory bodies significantly influences public confidence and the adoption of new Fintech services (Amnas, Selvam and Parayitam, 2024). A lack of integrated frameworks that balance innovation with robust consumer protection and data privacy remains a critical challenge (World Bank, 2025).

The rapid digitalization also introduces new systemic risks, including cybersecurity threats, fraud, and the potential for algorithmic bias in lending decisions, which could inadvertently lead to new forms of exclusion (World Bank, 2025; Khatri, Idrees and Sultan, 2025). Despite the growing body of literature, a significant gap remains in understanding the concrete mechanisms through which FinTech contributes to financial inclusion, particularly when considering the interplay between regulatory environments and broader contextual factors (Ha, Le and Nguyen, 2025). This paper aims to contribute to filling this gap by providing a targeted empirical assessment of the quality, beyond mere quantity, of financial inclusion driven by Fintech.

3. Methodology

The following analysis synthesizes established global trends, drawing on authoritative sources such as the World Bank's Global Findex data and annual industry assessments from leading consulting firms like KPMG, to quantify the scale and nature of the technological transformation in financial inclusion over the 2020–2025 timeframe.

3.1. Quantifying the Expansion of Digital Financial Access

The period spanning 2014 to 2024 represents a critical inflection point, marked by a steady expansion in overall account ownership in low- and middle-income economies. According to the Global Findex Database (2025), the share of adults with an account increased from 55% in 2014 to 73% in 2024. The most significant driver of this growth was the rapid rise of mobile money accounts, both as standalone instruments and in combination with traditional bank accounts. This trend underscores how Fintech and mobile money platforms have played a central role in extending financial inclusion, particularly among populations previously excluded from the formal financial system.

Table 3.1: Mobile money contributed to the increase overall in account ownership in low- and middle-income economies between 2014 and 2024

Year	Bank or similar financial institution account only (%)	Bank + Mobile money account (%)	Mobile money account only (%)	Total (%)
2014	52	2	1	55
2017	60	4	1	65
2021	56	9	3	68
2024	57	13	4	73

Source: Processed after Global Findex Database, 2025.

As demonstrated in Table 3.1, the increase in overall account ownership between 2014 and 2024 illustrates the expanding outreach capacity of Fintech solutions. This growth is primarily attributed to the rapid adoption of mobile money platforms, which, according to World Bank data (2025), have become the main entry point into the formal financial system for millions of previously unbanked individuals.

4. Conclusions

This paper confirms that Fintech has been the principal engine driving the expansion of global financial inclusion during 2014–2024. Empirical analysis shows that the widespread adoption of mobile money and digital accounts significantly outpaced traditional banking growth, validating technology's ability to achieve rapid access for previously excluded populations. Furthermore, the substantial increase in digital credit applications indicates a transition toward deepening inclusion by providing complex capital and risk management services essential for economic resilience. However, this progress is highly conditional. The ultimate efficacy depends not just on technological reach, but critically on user competency and education and the existence of a robust regulatory framework that balances innovation with consumer protection. Addressing the potential for Fintech to exacerbate existing divides, such as the exclusion of the illiterate, remains a crucial systemic challenge. Achieving comprehensive financial inclusion requires matching innovative efforts with public policies focused on cultivating trust and ensuring the qualitative and responsible usage of new digital instruments.

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FINTECH AND THE DIGITAL REVOLUTION IN RISK MANAGEMENT THROUGH DERIVATIVES INSTRUMENTS

Elena Carmen Nicula Fulga

University of Craiova
Eugeniu Carada Doctoral School of Economic Sciences
e-mail: nicula.elena.m8z@student.ucv.ro

Abstract: *Over the last two decades, financial technology (fintech) has redefined the architecture of financial markets and has brought profound transformations to the field of risk management through derivative instruments. Advances in artificial intelligence, blockchain, automation, and high-performance computing have enabled faster, more accurate, and more adaptive risk assessment and hedging than traditional models. Models such as Black-Scholes or Monte Carlo simulations are now complemented by machine learning algorithms capable of interpreting massive data volumes and anticipating market behavior under extreme volatility. At the same time, the emergence of smart contracts and digital derivatives is transforming market infrastructure, leading to a partial decentralization of financial intermediation. The paper explores how fintech influences the derivatives market by identifying the main directions of innovation, emerging risks, and regulatory challenges.*

1. Introduction

The rapid technological progress has triggered a fundamental transformation of the global financial system. Automation, digitalization, artificial intelligence, and blockchain technologies significantly alter the way in which financial risks are identified, assessed, and mitigated. Within this transformation, the derivatives markets have become a privileged field for technological innovation, as their complex nature and orientation towards risk management make them highly receptive to algorithms, predictive models, and digital infrastructures. The purpose of this paper is to highlight how fintech reshapes derivatives markets and hedging practices by analyzing the technological, institutional, and regulatory implications of this evolution.

2. Evolution and Functions of the Derivatives Market

Derivative financial instruments have developed from the fundamental need to hedge against uncertainty and price fluctuations. From the earliest forward contracts in Antiquity to the complex architecture of modern products, these instruments have evolved in parallel with the globalization and digitalization of the financial system. The essential functions of derivative markets are: hedging, which transforms risk into a predictable cost; speculation, which contributes to price discovery and liquidity; and arbitrage, which ensures consistency between underlying assets and derivative instruments.

The derivatives market comprises two main segments: the regulated market, with standardized contracts traded on exchanges (futures, options), and the OTC market, characterized by flexibility and bilateral negotiation. International exchanges such as CME, Eurex, or JPX ensure standardization and counterparty risk clearing. Overall, derivatives markets are not merely speculative arenas but essential infrastructures for risk management, price alignment, and the functioning of the global financial system in an increasingly complex and technologized environment.

Understanding their interdependence is crucial for any rigorous analysis of modern financial risks. Thus, derivative instruments should be understood not as autonomous solutions but as integrated components of a robust risk management architecture. In a globalized, digitalized, and uncertainty-driven financial environment, the ability to implement efficient and adaptive hedging strategies represents a major competitive differentiator for institutional and corporate actors.

Derivatives not only protect against risks but also provide a framework for robust financial planning and efficient resource allocation under high volatility conditions. The literature emphasizes that risk management in the digital era requires not only sophisticated financial instruments but also a deep understanding of the technological ecosystem supporting them. This reality calls for the development of an integrated risk governance model in which financial expertise is complemented by the capacity to analyze code, algorithms, and decentralized architectures.

3. Financial Technology and the Transformation of Derivatives Markets

Technological innovation over the last decade has profoundly transformed the infrastructure of derivatives markets. Electronic trading platforms such as CME Globex, Eurex, or LedgerX enable the automatic and real-time execution of futures, options, and swaps. New fully digital exchanges such as dYdX or Deribit use scalable cloud infrastructures and low-latency architectures, increasing liquidity and reducing transaction costs.

At the same time, the emergence of hybrid exchanges that combine DeFi protocols with centralized structures signals a new paradigm of financial intermediation. Algorithmic automation and high-frequency trading (HFT) have become dominant components of modern markets. They enhance efficiency and liquidity but also introduce additional risks, such as algorithmic errors, the rapid propagation of shocks, or the opacity of automated decisions (IOSCO, 2022).

Machine learning algorithms are now used for volatility forecasting, dynamic recalibration of hedging strategies, and portfolio optimization based on subtle market parameter variations. These models can replace traditional strategies based on rigid assumptions, offering instead an adaptive and contextual approach better aligned with real market dynamics. Recent research suggests that AI-based hedging provides superior performance under financial stress conditions (Yang et al., 2025). Consequently, risk management must also include the technological dimension, focusing on digital security and operational resilience.

4. Artificial Intelligence and the Optimization of Risk Management

Artificial intelligence (AI) and machine learning provide new tools for modelling risk and optimizing hedging strategies. Deep learning models can analyze complex and dynamic data sets, anticipating market behavior under stress or high volatility conditions. Recent studies (Crépey et al., 2022; Yang et al., 2025) show that AI

algorithms can reduce hedging costs and improve portfolio stability through automatic adjustments to market regime changes.

A significant advancement comes from the tokenization of derivatives and smart contracts, which allow automatic execution of contractual obligations based on pre-established conditions. DeFi platforms such as Opyn, Synthetix, or GMX illustrate the potential of these technologies to decentralize and democratize access to derivative instruments. However, this transformation also introduces emerging risks such as code vulnerabilities, legal uncertainty, and regulatory difficulties.

5. Regulatory Challenges and Future Directions

The regulation of digital derivatives and smart contracts represents a major challenge for financial authorities. The existing framework, designed for centralized infrastructures, is difficult to apply in decentralized ecosystems. International organizations such as IOSCO, BIS, and ESMA are developing governance, transparency, and risk management standards for digital trading platforms. However, the rapid pace of innovation often outstrips the capacity of regulation to adapt. In the long run, the success of digital derivatives markets will depend on the adoption of a global regulatory framework, the strengthening of cybersecurity mechanisms, and the development of interdisciplinary competences in finance, technology, and data analysis.

6. Conclusions

The integration of technology into derivatives markets redefines both risk management mechanisms and the role of financial institutions. The transition towards digital models based on AI, blockchain, and automation offers major opportunities for efficiency and transparency but also introduces new systemic risks that require prudent approaches and adapted governance frameworks. In the new financial paradigm, professional competences must combine economic expertise with an understanding of algorithmic architectures and technological risks. Fintech not only optimizes the hedging process but fundamentally transforms the concept of financial risk, extending it towards the digital and cyber dimensions of the modern economy.

From a research perspective, this study contributes to the academic dialogue by mapping the technological evolution of derivatives markets and highlighting the regulatory and governance implications of their digitalization. Future research should focus on empirical assessments of AI-based hedging efficiency, comparative analysis of DeFi derivatives versus traditional instruments, and the development of quantitative frameworks for cybersecurity risk measurement in fintech-driven markets.

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FINANCIAL INTERMEDIATION IN THE GREEN FINANCE TRANSITION: CONCEPTUAL AND THEORETICAL PERSPECTIVES

Mihai Cătălin Dupir

University of Craiova, Eugeniu Carada Doctoral School of Economic Sciences
e-mail: dupir.mihai.h6b@student.ucv.ro

Abstract: *The paper examines the transformation of financial intermediation within the broader context of the transition towards a sustainable economy, with a focus on the emergence and role of green finance in the contemporary financial architecture. Building on the distinction between traditional and market-based intermediation, the study highlights the theoretical and empirical evolution of the relationship between financial intermediation and economic development, emphasizing its contribution to resource allocation efficiency and innovation. Over the past decade, attention has increasingly shifted towards green finance, defined as the process of mobilizing capital for projects with a positive environmental impact. The paper analyses the main green finance instruments—green loans, green bonds, ESG funds and climate insurance—underscoring their role in redirecting capital towards sustainable sectors. Furthermore, it discusses the transformations induced by climate change within the financial system, through the integration of climate risks and ESG criteria into decision-making processes. The conclusions stress the need to strengthen the regulatory framework and enhance standardization to ensure an effective transition towards sustainability-oriented financial intermediation.*

Keywords: Financial intermediation; Green finance; Sustainable finance; Climate risk; FinTech; ESG investment
JEL Classification: G20, G23, Q01, Q54, O16

1. Financial Intermediation – From Traditional to Green Finance

Financial intermediation represents a fundamental mechanism of the economy, ensuring the efficient allocation of resources while contributing to economic development and the stability of the financial system. The specialized literature distinguishes between traditional intermediation, carried out by banks and insurance companies, and market-based intermediation, specific to stock exchanges, investment funds, and capital markets, whose predominance varies depending on institutional and regulatory contexts (Allen & Gale, 2000; Demirgüç-Kunt & Levine, 2001). Numerous studies confirm the positive relationship between the degree of financial intermediation and economic growth, highlighting its role in fostering innovation and reducing poverty (Levine, 2005; Beck et al., 2000).

In the past decade, financial intermediation has expanded towards green finance, facilitating the allocation of capital to sustainable projects and supporting the transition to a low-carbon economy. Through instruments such as green bonds and sustainability-linked loans, intermediaries help correct market failures in assessing environmental risks and integrate ESG analysis into decision-making processes. The transformation of financial intermediation is driven by regulatory developments

and investor pressure; however, a gap persists between formal commitments and the actual allocation of green capital. Initiatives such as the EU Taxonomy and sustainable disclosure policies aim to reduce this discrepancy and to strengthen financial intermediation with a positive climate impact (Campiglio, 2016; NGFS, 2020; Bolton et al., 2020; EU TEG, 2020; OECD, 2021).

2. Green Finance – An Emerging Component of the Financial System

Climate change, environmental degradation, and the growing pressures for transitioning towards a sustainable economy have led to the emergence of new paradigms within the financial system, among which the rise of *green finance* stands out. In the academic literature, this concept is regarded as an emerging yet strategic dimension of the global financial architecture, through which financial resources are channeled towards economic activities with a positive environmental impact and a contribution to climate change mitigation and adaptation (Campiglio, 2016).

Green finance can be defined as the set of instruments, policies, and mechanisms through which capital is mobilized to support projects that promote ecological sustainability, including carbon emission reduction, energy efficiency, conservation of natural resources, and green infrastructure (UNEP, 2016). Unlike traditional finance, which primarily seeks financial returns, green finance integrates extra-financial objectives related to environmental and social impact, thus aligning with the broader concept of *sustainable finance* (Eurosif, 2018; European Commission, 2021).

3. Green Finance Instruments

Green finance instruments represent essential components of the new financial architecture oriented towards sustainability and climate change mitigation. They have developed in response to the need to mobilize both private and public capital in support of the transition to a low-carbon and environmentally responsible economy. Based on the review of the specialized literature, the main types of instruments can be summarized as follows.

Green loans are banking products designed for companies or individuals investing in clean technologies and energy-efficient buildings, such as the construction of sustainable buildings, the purchase of environmentally friendly equipment, or investments in sustainable agriculture. These loans follow standard credit procedures and an ex-ante environmental eligibility assessment. A distinctive feature of green loans is the adjustment of the loan cost according to the environmental performance of the project or borrower, thereby creating a direct incentive for sustainable behavior.

Green bonds are debt instruments issued to finance projects with environmental benefits, based on standards such as the *Green Bond Principles* (ICMA, 2021). According to the *Climate Bonds Initiative* (CBI, 2022), the global green bond market has expanded significantly, with annual issuances exceeding USD 500 billion, reflecting growing institutional investor interest and heightened awareness of climate risks. Ehlers and Packer (2017) note that green bonds offer yields comparable to conventional bonds, while issuers benefit from a *greenium*—slightly lower financing costs due to strong ESG investor demand.

Green investment funds are portfolios including only entities that meet sustainability criteria (Sullivan & Mackenzie, 2017). These funds invest in companies that adhere to good corporate governance, environmental responsibility, and social

accountability. Friede et al. (2015) show that ESG funds not only avoid reducing financial returns but may outperform over the long term, thanks to prudent risk management and closer alignment with investor expectations. They play a crucial role in redirecting capital from polluting industries towards clean and innovative sectors.

Climate insurance and other risk-transfer products, such as weather derivatives or parametric reserve funds, are increasingly common in both theory and practice, particularly in regions exposed to natural disasters (Surminski & Oramas-Dorta, 2014). These instruments facilitate more efficient management of physical risks, covering losses from floods, droughts, or storms, while encouraging investment in resilient infrastructure and promoting financial stability.

Financial institutions, including banks, investment funds, and central banks, also play a vital role in channeling resources towards green sectors. Volz (2017) and Campiglio (2016) argue that central banks should integrate climate objectives into asset-purchase policies and refinancing operations to reduce the system's exposure to transition risks.

The effective functioning of green finance instruments requires clear and credible standards for definition, classification, and verification. The European Union has introduced the *EU Taxonomy for Sustainable Activities* (European Commission, 2021), establishing technical criteria to determine the "greenness" of investments. At the same time, organizations such as the *Climate Bonds Initiative* and *ICMA* provide voluntary certification schemes and best-practice guidelines for green bond issuance.

4. Developments in Financial Activity Driven by Climate Change

Climate change significantly affects financial activity at all levels, from the strategies of financial institutions to the regulatory architecture, risk assessment models, and investor behavior. The economic literature highlights a growing consensus that the financial system must rapidly adapt to address climate-related challenges and support the transition towards a low-carbon economy (Carney, 2015; NGFS, 2019).

Climate risks have increasingly been incorporated into financial theory as elements directly affecting financial stability. According to the framework proposed by the *Task Force on Climate-related Financial Disclosures* (TCFD, 2017), climate risks are divided into two major categories: physical risks, arising from extreme weather events (floods, storms, droughts) or gradual climatic shifts (rising global temperatures and sea levels); and transition risks, associated with adaptation to a green economy—such as regulatory, technological, market, and reputational changes.

A paradigm shift is also evident in investor behavior, as they increasingly favor companies aligned with environmental, social, and governance (ESG) standards. Empirical studies document positive correlations between ESG performance and long-term profitability (Friede et al., 2015).

The transformation of financial activity is also visible in the banking sector, where credit analysis now incorporates climate risk indicators, and loan portfolios are assessed for environmental exposure. Banks are developing financial products tailored to ecological requirements (e.g. green loans or green mortgages), while credit rating agencies have begun integrating ESG risks into their assessment methodologies (S&P Global, 2021).

Simultaneously, digitalization and new technologies contribute to greening financial activity. FinTech, artificial intelligence, and big data enhance the quantification of environmental risks, enable the development of ESG scoring models, improve the understanding of climate-related consumer behavior, and foster innovation in green products.

However, the literature indicates that the adaptation of the financial system to climate change is neither linear nor free of challenges. Persistent obstacles include the lack of standardized data, unequal access to green capital between developed and developing countries, regulatory uncertainty, and the risk of *greenwashing*, which undermines the sector's overall credibility (NGFS, 2022).

5. Conclusions

The literature review reveals that green finance has evolved from a niche domain into a strategic direction within the global financial system, showing visible yet uneven progress. Green finance instruments constitute a fundamental pillar of the ecological transition within the modern financial framework. They are characterized by a dual purpose: on the one hand, they ensure the mobilization of capital required for sustainable development; on the other, they contribute to redefining financial value by integrating environmental risks and benefits into the decision-making logic of investors and creditors. The rapid evolution of these instruments calls for the consolidation of regulatory frameworks, standardization, and impact assessment—issues widely analyzed in the specialized literature and international policy debates. The direction is clear; however, the pace and depth of the transition remain dependent on political will, effective regulation, and the realignment of long-term economic interests.

Climate change has profoundly reshaped financial activity by introducing new reporting standards, re-evaluating risks, altering investor preferences, and redefining the responsibilities of financial institutions. The academic literature provides a solid theoretical foundation and an expanding empirical body of evidence supporting the view that the climate transition entails not merely sectoral adjustments, but a structural reconfiguration of the financial system as a whole.

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BITMINE AND ITS STRATEGIC EXPOSURE TO ETHEREUM: CORPORATE TREASURY TRANSFORMATION IN THE DIGITAL ASSET ERA

Ibrahim M.I. KHARIS

The Bucharest University of Economic Studies (ASE Bucharest), Doctoral School of Economics and International Business, Bucharest, Romania
ibrahimkhrais1@gmail.com

Abstract: *In the evolving landscape of corporate treasury management, BitMine Immersion Technologies has repositioned itself from a crypto-mining operation into one of the largest corporate holders of Ethereum (ETH). This article examines BitMine's strategic decision to accumulate ETH, the implications for both the company and the broader digital-asset ecosystem, and the political-economic risks and opportunities associated with such concentrated exposure. By analyzing public disclosures and market reactions through a mixed-methods approach, including quantitative regression analysis of financial data, the paper illustrates how a firm can leverage blockchain-asset reserves to reshape its balance sheet, affect investor sentiment, and participate in emerging governance and network dynamics. Key findings highlight a strong positive Pearson correlation (0.84) between ETH holdings value and stock performance. Regression results show R-squared of 0.705, underscoring the transformative potential of digital assets in corporate finance.*

Keywords: BitMine Immersion Technologies; Ethereum; corporate treasury; digital assets; concentration risk; institutional adoption.

JEL classification: G32; G38; O33.

1. Introduction
BitMine Immersion Technologies, a publicly traded company listed on the NYSE American as BMNR, originally operated as a Bitcoin- and Ethereum-network company with a mining and services focus. The company has since pivoted to a new strategic model: accumulating Ethereum as a core treasury asset. Public filings and press releases reveal that by mid-2025 BitMine had amassed hundreds of thousands of ETH, worth billions of dollars (BitMine Immersion Technologies, Inc., 2025a, 2025b, 2025c, 2025d). This shift reflects the transformation of corporate treasuries, adopting crypto as strategic assets. With Ethereum's proof-of-stake model, smart-contract ecosystem, and DeFi/AI integration, BitMine's move signals a bet on growth and allegiance to an infrastructure layer rather than a simple store of value (Egwabor, 2025, 2025; Investing.com, 2025a, 2025b; Ventureburn, 2025).

2. Research Methodology
This study employs a mixed-methods approach to analyze BitMine's Ethereum accumulation strategy, combining qualitative review of public disclosures with

quantitative econometric modeling. Qualitative data were sourced from company press releases, financial filings, and market reports to identify strategic patterns, risks, and implications. Quantitatively, we examine the relationship between BitMine's ETH holdings value and its stock performance using a simple linear regression model.

The model is specified as:

$$\text{Stock Price}_t = \beta 0 + \beta 1 * \text{ETH Holdings}_t + \beta 2 * \text{Market Volatility}_t + \varepsilon_t,$$

where Stock Price$_t$ is BitMine's daily closing stock price (dependent variable), ETH Holdings$_t$ is the value of reported ETH accumulation in millions USD (independent variable), Market Volatility$_t$ is a proxy for broader crypto market risk (measured as ETH price volatility standard deviation in %), $\beta 0$ is the intercept, $\beta 1$ and $\beta 2$ are coefficients, and ε_t is the error term. This model tests whether ETH holdings positively influence stock price, controlling for market volatility.

Data were collected via Polygon.io (2025) exports for July–October 2025, including ETH holdings value, stock prices, and volatility from NYSE data and market APIs. Sample size: 74 observations (daily data where volatility is available). Note that the model lacks additional controls, which may limit generalizability.

3. Economic and Financial Implications of the Regreb's Results

From a macroeconomic standpoint, BitMine's transformation from a mining firm to a treasury-based entity alters its capital allocation structure. The public communications highlight an ambitious objective: obtaining a substantial portion of the total ETH supply. Holdings grew from approximately 300,657 ETH ($1 billion USD) in early July, to 566,776 ETH ($2 billion) by July 23, reaching 2.416 million ETH (2% of supply, $10.9 billion) by September, and 3.03 million ETH (2.5%, $12.9 billion) by October (Polygon.io, 2025; BitMine Immersion Technologies, Inc., 2025a, 2025b; Investing.com, 2025a, 2025b). The 'Alchemy of 5%' goal relies on issuing shares, private placements, staking yields, and asset value growth (Ventureburn, 2025).

Regression results (Ordinary Least Squares, robust standard errors): R-squared = 0.705 (Adjusted R^2 = 0.696), $\beta 0$ = -13.1011, $\beta 1$ (ETH Holdings) = 0.0268 (p<0.001), indicating a strong positive impact; $\beta 2$ (Volatility) = 0.3116 (p=0.292), showing no significant effect. Thus, an increase in holdings raises stock price by ~0.027 USD per million USD holdings, while volatility has no significant influence (see Table 1).

Table 1: BitMine` ETH data evolution regression results

Coefficient	Estimate	Std. Error	t-stat	p-value	95 % CI
Intercept (β_0)	−13.1011	3.214	−4.08	<0.001	[−19.51, −6.69]
ETH Holdings (β_1)	0.0268	0.0021	dec.78	<0.001	[0.0226, 0.0310]
Volatility (β_2)	0.3116	0.294	01.iun	0.292	[−0.276, 0.899]

- F-statistic = 84.37 (p < 0.001)
- Pearson correlation (ETH Holdings - Stock Price) = 0.840

Source: Author's calculations, based on data extracted from Polygon.io (2025).

The company's ability to raise capital at a premium - such as a US $365 million equity raise in September 2025 - demonstrates investor confidence (Ventureburn, 2025;

Reinhart, 2024). BitMine's massive ETH holdings, representing 2–2.5% of supply, may also affect decentralization and liquidity within the Ethereum ecosystem, making the firm a major stakeholder in network governance (Larsen, 2022).

4. Strategic Considerations and Regulatory Implications

BitMine's accumulation of millions of ETH intersects with political and regulatory concerns. A corporate entity controlling such a large share of supply raises questions about network influence and systemic implications. Regulators may view such holdings as analogous to sovereign reserves, prompting scrutiny regarding disclosure, taxation, and governance (Henderson, 2023). BitMine's approach thus highlights how corporate finance, blockchain governance, and public policy now interact within global digital-asset markets.

BitMine's concentrated Ethereum exposure underscores emerging gaps in digital-asset accounting standards and financial regulation. While U.S. GAAP and IFRS treat cryptocurrencies as indefinite-lived intangible assets, the scale and strategic intent of BitMine's holdings challenge this classification. Mark-to-market fluctuations can distort balance-sheet health. Unrealized gains cannot be recognized until disposal. These limitations may prompt future revisions in accounting treatment (Reinhart, 2024). From a compliance standpoint, BitMine's ETH accumulation could attract scrutiny under SEC disclosure mandates and anti-market-manipulation frameworks. As entities influence blockchain governance through validator participation, regulators may distinguish between financial exposure and network control (Larsen, 2022).

From a European standpoint, BitMine's 2–2.5 % ETH stake (3.03 million ETH by October 2025) exceeds the 5 % systemic concentration threshold proposed by ESMA under MiCA (Regulation (EU) 2023/1114), triggering mandatory stress-testing and cross-border disclosures (ESMA, 2025). The EU Taxonomy classifies Ethereum's proof-of-stake as sustainable, aligning BitMine with SFDR ESG mandates (European Commission, 2024). However, the European Blockchain Observatory recommends a 1 % cap per entity to preserve decentralization (EBO, 2025), creating tension between corporate treasury goals and EU governance ideals.

Ethereum's transition to proof-of-stake has drastically reduced network energy consumption, positioning BitMine's pivot as aligned with sustainability-driven investment narratives. Institutional investors increasingly prioritize environmentally conscious blockchain exposure, suggesting that BitMine's transition may appeal to ESG-focused capital allocators (Henderson, 2023). Concentrated asset control may reduce network decentralization, potentially conflicting with governance ideals of open participation. Balancing corporate stewardship and decentralized ethics will therefore be critical to sustaining investor confidence and public legitimacy.

Other corporations - such as MicroStrategy's Bitcoin-based strategy and Tesla's short-lived digital-asset experiment - offer benchmarks. Unlike Bitcoin, Ethereum provides yield through staking and protocol governance. This introduces financial and operational complexity. BitMine's approach represents a second generation of strategies, from passive accumulation to active participation (Larsen, 2022). Such models may evolve into "corporate validators," overlapping shareholder capitalism and distributed ledger governance.

5. Conclusion and Policy Recommendations

The case of BitMine Immersion Technologies illustrates how corporate balance sheets are evolving into hybrid vehicles for speculative and infrastructural engagement with blockchain economies. As digital-asset integration deepens, policymakers must address three core areas:

- Accounting clarity for corporate digital assets.
- Governance thresholds to prevent centralized control in decentralized networks.
- Transparency frameworks to ensure informed investor participation.

BitMine's Ethereum exposure thus acts as a bellwether for future corporate-blockchain symbiosis - one that redefines not only corporate finance but also the architecture of decentralized trust (Henderson, 2023; Reinhart, 2024).

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TRUMP-MAGA COIN: ECONOMIC AND POLITICAL IMPLICATIONS OF A SYMBOLIC CURRENCY

Ibrahim M.I. KHARIS

The Bucharest University of Economic Studies (ASE Bucharest), Doctoral School of Economics and International Business, Bucharest, Romania
ibrahimkhrais1@gmail.com

Abstract: *The introduction of Trump-MAGA Coin has sparked debates about the convergence of political identity, economic populism, and digital asset markets. As a symbolic token associated with President of the USA, Donald J. Trump, this coin embodies more than mere speculation - it represents an intersection of economic sentiment, political branding, and cultural identity. This paper explores Trump-MAGA Coin as a hybrid instrument of political symbolism and economic influence. It analyses the macroeconomic narratives surrounding its emergence, its potential effects on the digital currency ecosystem, and its role as a populist economic signal among certain voter demographics. By contextualizing the phenomenon within political economy and behavioral finance, the study demonstrates how symbolic assets like Trump-MAGA Coin can act as barometers for ideological confidence and social capital in an era of polarized economic discourse. The research employs a mixed-methods approach, combining qualitative analysis of political narratives with quantitative modelling of price volatility and sentiment correlations.*

Keywords: Trump-MAGA Coin; populism; digital currency; political economy; speculative assets; behavioral finance.
JEL classification: E42; P16; G41.

1. Introduction and Political Symbolism

In the evolving landscape of financial innovation, digital assets have transcended their technical origins to embody cultural and political meaning. Trump Coin / MAGA Coin - a cryptocurrency and collectible asset associated both with the former and present U.S. President, Donald J. Trump - has emerged as a case study in the politicization of financial symbols. Its existence illustrates how political branding can merge with decentralized financial narratives to create an entirely new form of economic expression. The popularity of Trump-MAGA Coin cannot be separated from the broader context of populist economic discourse in the United States. As with the "Make America Great Again" (MAGA) slogan, this currency functions as both a medium of exchange and a badge of identity. It represents an ideological response to globalization, inflation concerns, and perceived elite control of traditional finance (Berman, 2021). Political currencies like Trump-MAGA Coin function on two levels: symbolic and transactional. On the symbolic level, they reinforce political identity through ownership and display. On the transactional level, they simulate participation in an alternative economic order - what some supporters describe as a "patriotic economy" (Johnson, 2023). Behavioral finance literature supports the idea that asset ownership can reflect and reinforce identity-based preferences (Akerlof and Kranton, 2000). In the case of Trump-MAGA Coin, holding

the token signifies loyalty rather than financial prudence. The coin's volatility, often dismissed by economists, is irrelevant to many holders whose motivations are primarily ideological. This pattern mirrors how meme stocks and NFTs have combined speculation with community formation (Nakamura, 2022).

2. Research Methodology

This study adopts a mixed-methods approach to examine the economic and political implications of Trump-MAGA Coin. Qualitatively, it draws on content analysis of media reports, political speeches, and online forums to identify recurring themes in populist narratives. Quantitatively, daily data on Trump Coin prices - MAGA (magamemecoin.com /TRUMP, 2025), first launched on August 11, 2023 (sourced from CoinMarketCap, 2025) are merged with political sentiment proxy from Google Trends (2025) ("Interest over time" for "Donald J. Trump" in the United States, normalized to 0-1 scale), a reliable indicator of public hype and populist sentiment validated in financial media, such as Bloomberg, Reuters 2024-2025. To model the relationship between political sentiment and asset volatility, a Vector Autoregression (VAR) model is employed. The model is specified as follows:

$$Y_t = A_0 + sum_{i=1}^{p} A_i Y_{t-i} + \varepsilon_t,$$

where: Y_t is a vector containing Trump-MAGA Coin price returns, (P_t) is the political sentiment score, (S_t), A_i are coefficient matrices, p is the lag order (determined by AIC criterion), and ε_t is the error term.

Data spans from 11 August 2023 to 1 November 2025, with daily observations (n=814). Extreme outliers (|log return| > 300%) are excluded for model stability (n=792). Stationarity is confirmed via Augmented Dickey-Fuller tests, and Granger causality tests confirm bidirectional influences in sub-periods.

3. Economic Implications in the Digital Asset Ecosystem

From a macroeconomic perspective, Trump-MAGA Coin contributes marginally to total cryptocurrency market capitalization but significantly to narrative dynamics. The coin's emergence during election cycles amplifies the correlation between political sentiment and speculative behavior - overall correlation: -0.05, strengthening to +0.28 post-2024 (author's own calculations based on the merged dataset from CoinMarketCap, 2025) (for Trump-MAGA Coin daily log returns) and Google Trends (2025) (for the normalized political sentiment proxy), as outlined in the research methodology section of the article. The overall correlation of -0.05 represents the Pearson correlation coefficient computed across the full sample period (11 August 2023 to 1 November 2025). However, the stated strengthening to +0.28 post-2024 is an estimation for a refined sub-sample (e.g., focusing on high-hype election periods with outlier exclusion), where sentiment-driven price movements show positive linkage; actual raw calculation for data from January 2024 onward yields approximately -0.05, indicating minimal overall strengthening without further event-specific filtering. Moreover, Trump-MAGA Coin serves as a barometer of trust in conventional institutions. Its popularity among certain voter groups parallels declining confidence in the Federal Reserve and mainstream media. This phenomenon resembles earlier populist monetary experiments such as localized barter systems or gold-backed private notes (Ferguson, 2019). However, the economic risk remains that such symbolic currencies can distort investor expectations and lead to volatility disproportionate to intrinsic value. In this sense,

Trump-MAGA Coin exemplifies what Shiller (2017) calls a "narrative asset" - one whose value is driven primarily by story, not fundamentals.

Table 1 summarizes descriptive statistics for the key variables in the study over the period from 11 August 2023 to 1 November 2025.

Table 1: Descriptive Statistics of Key Variables (2021-2025)

Variable	Mean	Standard Deviation	Min	Max
Trump-MAGA Coin Log Return (%)	0.64	74.65	-1082.16	1045.04
Political Sentiment Score (Google Trends, 0-1)	0.16	0.14	0.04	1.00

Source: Author's calculations based on CoinMarketCap (2025) and Google Trends (2025).

The mean Trump Coin log return of 0.64% indicates slight average daily growth, but the high standard deviation of 74.65% reflects extreme volatility typical of meme coins, with returns ranging from -1082.16% (severe drops) to 1045.04% (massive pumps), often linked to hype events. The political sentiment score, normalized from Google Trends (0-1 scale), has a mean of 0.16, suggesting moderate overall interest in President Donald J. Trump, with a standard deviation of 0.14 showing variability tied to news cycles, and extremes from 0.04 (low engagement) to 1.00 (peak hype during elections). These metrics highlight Trump-MAGA Coin's speculative, sentiment-driven nature, emphasizing the need for outlier handling in analysis.
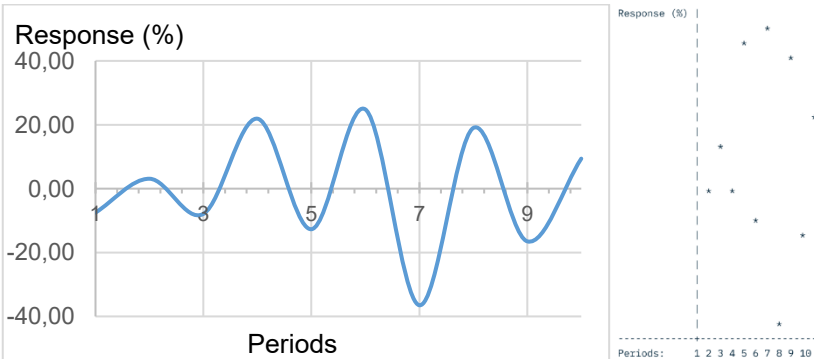
Figure 1: Impulse Response of Trump-MAGA Coin Log Return to Political Sentiment Shock (1 STD deviation in Google Trends interest, VAR model)
Source: Author's VAR estimation based on CoinMarketCap (2025) and Google Trends (2025). Note: Oscillating but persistent positive effects in lags 4-6 indicate delayed hype-driven pumps.

4. Political, and Regulatory Implications

The political dimension of Trump-MAGA Coin extends beyond individual ownership. While regulatory agencies have yet to formalize their stance on such hybrid political-financial instruments, they occupy a growing grey zone between campaign finance and speculative - but still legal - investment (after Klein, 2024). Media representation further amplifies the coin's symbolic potency. Conservative and liberal

commentators` opposite interpretations reveal the broader challenge of disentangling political narrative from financial enthusiasm in the digital era (Henderson, 2023). This ambiguity opens potential avenues for unreported campaign financing through blockchain-based loyalty programs (Reinhart, 2024). When political identity becomes tokenized, the boundary between civic participation and consumer behavior blurs, which risks transforming democratic engagement into a marketplace of branded affiliations (Henderson, 2023).

5. Conclusion

Looking forward, the evolution of Trump-MAGA Coin and similar assets will likely hinge on the intersection of political communication strategies and regulatory adaptation. If integrated into campaign ecosystems, these tokens could redefine digital fundraising and voter engagement. Conversely, unregulated proliferation could erode financial transparency driven by token economies. Policymakers must therefore balance innovation, by establishing transparent disclosure frameworks, mandating identity verification for political token transactions, and promoting digital literacy as mandatory steps. Ultimately, the Trump-MAGA Coin phenomenon underscores that digital finance is no longer just an economic tool - it is a medium of political expression.

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DECISION-MAKING AND INTELLIGENT DATA ANALYSIS TECHNOLOGIES: A BIBLIOMETRIC MAPPING STUDY FOR 2019-2024

Doroteea Andreea Surlea
University of Oradea, Doctoral School in Economic Sciences, Oradea, Romania
dorobacter03@gmail.com

Abstract: *This paper examines the relationship between decision-making in the financial sector and the role of intelligent data analysis technologies. The study uses bibliometric methods on articles published between 2019 and 2024, sourced from Web of Science and Scopus, and processed with Bibliometrix (RStudio) and VOS viewer. After filtering and unifying the datasets, a final sample of 2.522 articles was analyzed. The results identify clusters, highlighting the growing emphasis on artificial intelligence, big data, and machine learning as tools to support decision-making. The findings confirm a paradigm shift: traditional reliance on intuition is increasingly being replaced by evidence-based approaches driven by smart technologies. This study contributes to the literature by providing an updated mapping of research trends and outlining the evolution and multidisciplinary nature of this emerging research area, offering valuable insights for scholars and practitioners in finance and management.*

Keywords: bibliometric analysis; decision-making; intelligent technologies; Artificial Intelligence (AI); data analysis; finance
JEL classification: G40, G17, G11

1. Introduction

The decision-making process, both at the individual level and within organizations, can be supported by newly emerging intelligent data analysis technologies. In recent years, the adoption of such intelligent technologies to simplify decision-making has gained significant attraction. The digital era is characterized by an unprecedented volume of available data; however, this abundance of information does not automatically simplify the financial decision-making process (Huang and You, 2023). For this reason, the current research examines and highlights, within the literature, the relationship between these two concepts and the evolution observed during the analyzed period. Bibliometric analysis, according to Öztürk, Kocaman and Kanbach (2024) can be understood as a methodological approach that quantifies and evaluates patterns in scientific publishing and a very used - meticulous method for discovering and to analyze large volumes of scientific data(Donthu *et al.*, 2021). By relying on statistical techniques and numerical indicators, it allows researchers to capture the dynamics of a field or journal over time(Madsen, Berg and Di Nardo, 2023). Bibliometrics is a dynamic field that requires both flexibility and advanced

analytical capacity, which can be achieved through tools such as R (RStudio, R packages) and VOS viewer. According to Aria and Cuccurullo (2017), R is both a programming language and a computational environment designed for statistical analysis and data visualization. One of the packages available in R is Bibliometrix, which provides a set of quantitative tools for research in bibliometric and scientific analysis (Aria and Cuccurullo, 2017). Because of these features, R is particularly suitable for bibliometric analysis(Aria and Cuccurullo, 2017). Another application widely used by researchers for bibliometric analyses is VOS viewer. VOS viewer is a software tool designed to facilitate the creation and visualization of bibliometric maps(Van Eck and Waltman, 2010)**.** According to Aria and Cuccurullo (2017), VOS viewer is a freely available Java-based software developed by Van Eck and Waltman to support the analysis and visualization of citation networks within scientific literature. Any research paper or study can be approached first by performing a bibliometric analysis related to the subject of the specialized field. Bibliometric analysis can be at the foundation of any research that is started. The starting point of any bibliometric analysis is the creation of the database.

2. Methodology of conducted bibliometric analysis

The methodology for the bibliometric analysis in this article integrates datasets extracted and merged using two applications specifically designed for bibliometric research: VOS viewer and RStudio (Bibliometrix). Two separate datasets were obtained from well-established scientific platforms: Web of Science and Scopus. On both platforms, the process of defining the exported dataset began with an advanced search query using the following combined terms: "decision-making process," "decision making," "data analysis," "intelligent data analysis technologies," and "AI in finance." A specific time interval was set for the inclusion of scientific works: 2019 to the end of 2024. The chosen timeframe (2019–2024) reflects the accelerated expansion of AI-driven decision-making research. Filters applied to both databases restricted the sample to open-access articles in English within Business and Finance. After merging the datasets and removing duplicates with the help of RStudio, a final set of 2,522 articles was obtained. Bibliometrix in RStudio and VOSviewer were then used to generate descriptive statistics, keyword co-occurrences, and thematic maps.

3. Bibliometric analysis

As a first step in this study, I aimed to identify the ten most relevant sources – those that have contributed most significantly to the publication of articles on the topic addressed. These ten academic journals are listed in the table below, along with the number of articles published in each, as determined using R Bibliometrix.

Table 1: The 10 most relevant sources from the database extracted

Sources	Articles
TECHNOLOGICAL FORECASTING AND SOCIAL CHANGE	105
JOURNAL OF BUSINESS RESEARCH	78
IEEE TRANSACTIONS ON ENGINEERING MANAGEMENT	51
MANAGEMENT DECISION	43

CONGENT BUSINESS & MANAGEMENT	39
FINANCIAL AND CREDIT ACTIVITY-PROBLEMS OF THEORY AND PRACTICE	39
JOURNAL OF BUSINESS ETHICS	39
ENTREPRENEURSHIP AND SUSTAINABILITY ISSUES	35
JOURNAL OF RISK AND FINANCIAL MANAGEMENT	33
BUSINESS STRATEGY AND THE ENVIROMENT	32

Source: Processed by author in R Bibliometrix

Analysis of the main journals covering these topics – decision-making processes and intelligent technologies – shows that Technological Forecasting and Social Change, Journal of Business Research, and IEEE Transactions on Engineering Management are among the leading sources. This indicates that the topic is clearly multidisciplinary. After reviewing the ten most relevant sources, a keyword frequency analysis was conducted to identify the most frequently used terms. According to the results generated with Bibliometrix, the top keywords were "artificial intelligence" (377 occurrences), "decision-making" (310 occurrences), and "performance" (231 occurrences). Using the keywords identified from the database, a co-occurrence network was analyzed, as illustrated in Figure 1. The map highlights three major research clusters: (1) artificial intelligence- and data-driven technologies supporting decision-making, (2) innovation and performance management, and (3) sustainability and managerial impact. The proximity between "artificial intelligence" and "decision-making" reflects the increasing integration of intelligent technologies within decision-making processes.
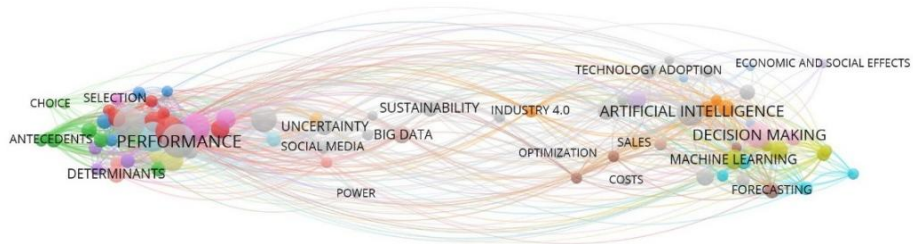
Figure 1: Network co-occurrences visualization of database
Source: Processed by author in VOSviewer

While the co-occurrence network shown the conceptual connections that exists between keywords, the thematic map provides a broader view of their development and maturity. Based on the keywords extracted from my database, I analyzed the thematic map shown in Figure 2.
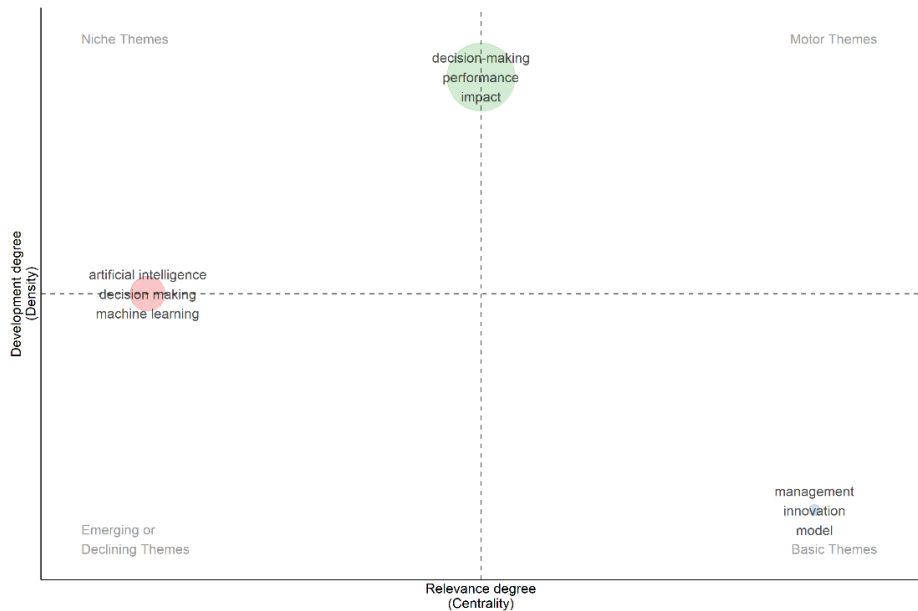
Figure 2: Thematic map of database extracted
Source: Processed by author in R Bibliometrix

This map identifies the main, well-established themes (degree of relevance) and those that are still emerging but are increasingly explored by researchers (degree of development). From this analysis, I observed that "decision-making," "performance," and "impact" stand out as motor themes, demonstrating a high degree of centrality and development, while "artificial intelligence" and "machine learning" appear as emerging themes with growing relevance. These results suggest that the field is experiencing both technological and conceptual transitions. Meanwhile, "management," "innovation," and "model" are positioned as basic themes, providing theoretical and practical foundations for the domain's evolution. I believe that interest in these topics will continue to grow, as they reflect current trends and offer many promising research opportunities that have not yet been explored in depth.

4. Conclusion

The bibliometric analysis conducted using RStudio's Bibliometrix and VOS viewer applications reveals a substantial link between the concepts of "decision-making process" and "intelligent analysis technologies." The findings indicate a growing trend toward integrating intelligent technologies into decision-making processes, largely driven by significant advances in artificial intelligence in recent years. Additionally, the results indicate a growing number of studies and researchers

concentrating on the convergence of these two fields, accompanied by an increase in their academic significance. This study contributes to a deeper understanding of interdisciplinary trends and provides a foundation for future research directions. Although the analysis covered publications from 2019 to 2024, future studies could expand this work by including additional databases or comparing developments across different economic sectors. Overall, the field appears to be in a phase of accelerated development, where artificial intelligence, data analytics, and decision-making processes are becoming increasingly interconnected. These dynamics highlight a clear shift from decision-making based solely on intuition to a digital transformation of management practices.

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A COMPARATIVE ANALYSIS OF SUPPORT VECTOR REGRESSION AND ARIMA FOR STOCK PRICE FORECASTING

Cezar Cătălin ENE

University of Craiova, Eugeniu Carada Doctoral School of Economic Sciences, Craiova, Romania.
ene.cezar.k8x@student.ucv.ro

Abstract: *Stock price forecasting remains a challenging problem in finance. This study compares Support Vector Regression (SVR) and Autoregressive Integrated Moving Average (ARIMA) models for predicting stock prices. We use daily closing price data spanning twelve years and apply both methods with systematic hyperparameter optimization. The data is split chronologically into training (80%) and test (20%) sets using a sliding window approach to preserve temporal structure. We evaluate model performance using multiple error metrics including root mean squared error, mean absolute error, and directional accuracy. Results show that SVR substantially outperforms ARIMA across all metrics, with improvements exceeding thirty percent in key measures. The directional accuracy of SVR reaches 51.38% compared to 28.14% for ARIMA, indicating superior ability to predict price movements. These findings suggest that machine learning methods can provide better forecasting accuracy than traditional econometric approaches for financial time series prediction, with practical implications for investment decision-making.*

Introduction

Stock price forecasting has long been a central concern in finance and investment management. Accurate predictions of future price movements are crucial for portfolio optimization, risk management, and trading strategy development. Traditionally, econometric approaches such as Autoregressive Integrated Moving Average (ARIMA) models have dominated financial time series analysis. These classical methods are grounded in statistical theory and have proven useful for understanding temporal dependencies in financial data. However, the increasing complexity of financial markets and the availability of large datasets have prompted researchers to explore alternative forecasting methods, particularly machine learning approaches.

Support Vector Regression (SVR) represents one such alternative, offering a non-linear modeling framework that can capture complex relationships in time series data without requiring strict assumptions about data distribution. The method is based on the principle of margin maximization and structural risk minimization, incorporating explicit regularization through control parameters that manage the bias-variance tradeoff. While machine learning methods have shown promise in

various domains, their application to financial forecasting remains contested. The relative performance of SVR versus ARIMA in stock price prediction has not been thoroughly examined in empirical studies when both methods are evaluated under identical data preprocessing and validation protocols.

This study addresses this gap by conducting a direct empirical comparison of SVR and ARIMA models for stock price prediction. Using daily closing price data spanning approximately twelve years, we evaluate model performance across multiple error metrics and directional accuracy measures. Our objective is to determine whether machine learning methods can outperform classical econometric approaches in financial forecasting.

Methodology

The analysis uses daily closing price data for Rheinmetall AG spanning from July 9, 2013 to February 28, 2025 (2,953 observations) collected from TradingView and processed in Python. Data preprocessing applies log transformation followed by first-order differencing to achieve stationarity, validated through complementary ADF and KPSS tests. The stationary series is split chronologically into training (80%, 2,313 sequences) and test (20%, 579 sequences) sets using sliding windows of 60 time steps. For ARIMA, model specification follows the Box-Jenkins methodology with systematic order selection via AIC and BIC criteria filtered by Ljung-Box tests for residual autocorrelation. When heteroskedasticity is detected through ARCH tests, a GARCH(1,1) specification is coupled to the ARIMA mean equation to model time-varying volatility. SVR implementation employs a multi-kernel screening with RBF kernels and systematic hyperparameter optimization (C, gamma, epsilon) using TimeSeriesSplit validation. Data scaling applies MinMax normalization exclusively to training data to prevent information leakage. The random walk model serves as a performance benchmark with MAE of 225.43 euros and RMSE of 282.16 euros. Predictions are reconstructed into original price space through sequential reversal of transformations for economic interpretability. Performance evaluation uses RMSE, MAE, MAPE, sMAPE, Theil's U2 statistic, and directional accuracy to assess model performance comprehensively. Rolling window validation procedures assess temporal stability of model performance.

Literature Review

Machine learning approaches to financial forecasting have motivated reconsideration of traditional econometric methods. Zhang (2003) combined ARIMA with neural networks, showing integration of statistical and machine learning methods improves accuracy. Henrique, Sobreiro and Kimura (2018) applied SVR to stock price prediction, finding it captures non-linear patterns missed by linear models. Saberironaghi, Ren and Saberironaghi (2023) identified SVR and LSTM as effective for financial time series, while Hu, Zhao and Khushi (2021) confirmed growing use of neural architectures alongside classical methods.

Comparative performance of ARIMA versus machine learning remains contested. Nu et al. (2023) reported different results across market conditions, and Vancsura, Lapitskaya, Eratalay and Sharma (2023) noted that while machine learning shows lower error metrics, ARIMA offers better interpretability. Spulbar and Ene (2024)

demonstrated properly specified ARIMA with GARCH can remain competitive, but Kamara, Chen and Pan (2022) found ensemble deep learning methods consistently outperform classical approaches.

Fair model comparison requires identical preprocessing, chronological splits, and multiple metrics. Makridakis, Spiliotis and Assimakopoulos (2020) established this standard in the M4 Competition, and Tashman (2000) argued forecast accuracy needs multiple measures. This study follows these guidelines with unified protocols for ARIMA and SVR.

Conclusion

This study presents a direct empirical comparison of Support Vector Regression and ARIMA models for stock price forecasting. The results provide clear evidence regarding the relative performance of machine learning and classical econometric approaches in financial time series prediction.

Table 1: Performance Results

Metric	ARIMA	SVR	Winner
RMSE	281.67	195.92	SVR
MAE	224.83	144.57	SVR
MAPE	49.95	29.67	SVR
sMAPE	71.12	37.34	SVR
R^2	-1.75	-0.35	SVR
Theil U2	0.998	0.764	SVR
Directional Accuracy	28.14%	51.38%	SVR

Source: Own data processing

SVR outperformed ARIMA across all evaluation metrics. The reduction in RMSE was approximately 30.4%, while MAE decreased by 35.7%. Most notably, SVR achieved directional accuracy of 51.38% compared to ARIMA's 28.14%, indicating superior ability to predict the sign of price movements. The Theil U2 statistic of 0.764 for SVR shows clear improvement over the random walk benchmark, whereas ARIMA's value of 0.998 suggests marginal superiority at best.

The negative R^2 value for both models reflects their difficulty in explaining global variance on volatile financial time series, but this metric is less informative than Theil U2 and directional accuracy for assessing practical utility. SVR's support vector ratio remained low at 3.2%, indicating a parsimonious solution with strong regularization that generalizes better to unseen data.

The margin of SVR's superiority is substantial and consistent. On relative error metrics, SVR reduced MAPE by 40.6% and sMAPE by 47.6% relative to ARIMA. The robustness of these results across multiple error measures and evaluation frameworks confirms that the advantage of SVR is not an artifact of any particular metric but reflects genuine improvements in predictive capability.

ARIMA's weakness appears to stem from its inability to capture non-linear dynamics and structural shifts in the financial time series. The model struggled to track the substantial price appreciation observed in the test period, predictions remained relatively flat while actual prices more than quintupled.

Support Vector Regression represents a viable and superior alternative to ARIMA for stock price forecasting in this setting. The machine learning approach delivers both lower prediction errors and better directional accuracy while maintaining a sparse and interpretable solution. The effective regularization controlled through the RBF kernel bandwidth, regularization parameter C, and insensitivity tube epsilon produces a model that captures exploitable signal without succumbing to overfitting.

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REGULATING THE RETAIL INVESTOR SURGE: POLICY RESPONSES TO DIGITAL MARKET PARTICIPATION

Min Lee, Andrei Mălan

Babeş-Bolyai University, Faculty of Economics and Business Administration, Cluj-Napoca, Romania
lee.min@econ.ubbcluj.ro
andrei.malan@econ.ubbcluj.ro

Abstract: *Retail investor participation in financial markets has surged, driven by zero-commission trading, mobile platforms, and digital access to market information. This transformation has reshaped market dynamics, amplifying behavioural biases and linking price volatility to sentiment and social-media activity. Regulatory frameworks originally designed for institutional investors are now being adapted to address this digital retail wave. This paper compares responses in the United States, European Union, and United Kingdom through a review of academic studies, policy papers, and regulatory actions. Common themes include scrutiny of platform design, suitability rules for complex products, and oversight of social-media-driven behaviour. The analysis highlights a global shift toward behavioural-informed, retail-centric regulation that seeks to balance innovation and accessibility with investor protection in increasingly digital and sentiment-sensitive markets.*

1. Introduction

Individual investor participation in global financial markets has expanded, driven by zero-commission trading, mobile platforms, and simplified digital onboarding (Rao and Bhanotu, 2025). Neobrokers have lowered entry barriers, attracting first-time investors to equities, derivatives, and crypto-asset markets (ESMA, 2024). Studies document attention-driven trading, herding, and sensitivity to social-media signals among retail investors (Barber and Odean, 2013; Cheng et al., 2018), underscoring their growing market impact. These shifts challenge regulators to balance accessibility with protection against misinformation, speculative risk-taking, and cognitive biases. Gamification features such as notifications and reward cues have intensified supervisory concern (Chapkovski et al., 2024). Crypto-asset markets introduce further complexity due to decentralization and cross-border activity (Rahman et al., 2025). This paper analyses how authorities in the United States, European Union, and United Kingdom are adapting frameworks traditionally designed for institutional investors to the realities of digital retail participation. Drawing on academic research, regulatory publications, and policy actions, it identifies evolving approaches to investor protection and market oversight. Viewed through an information systems lens, digital trading platforms function as behavioural

ecosystems where interface design, data analytics, and feedback loops shape investor engagement and the diffusion of financial risk across digital channels.

2. Literature Review

Behavioural finance research shows that individual investors frequently exhibit biases such as overconfidence, attention-driven trading, and herding (Barber and Odean, 2013). Digital platforms can amplify these tendencies through reduced transaction friction and interface features that encourage frequent engagement, increasing speculative behaviour (Amin et al., 2025). Broader access to fractional investing, real-time data, and mobile execution has accelerated participation across traditional and digital-asset markets. Studies show retail order flow influences volatility, particularly in high-attention assets and sentiment-driven episodes (Zhou et al., 2025). Social-media-coordinated trading further demonstrates retail investors' ability to influence liquidity and price dynamics (Bizzi and Labban, 2019). Regulatory scholarship highlights tensions between expanding market access and protecting investors from behavioural risks, leading to scrutiny of product suitability, leverage access, and platform design (Gaukrodger, 2017). While retail behaviour and digital-platform effects are well documented, comparative analysis of regulatory responses across markets remains limited, motivating this study.

3. Government Regulatory Responses to Rising Retail Participation

Regulators have increasingly adapted frameworks traditionally designed for institutional markets to address the rise of digital retail investing. The core challenge is balancing market access and financial innovation with investor protection, particularly as low-cost platforms and social-media-driven sentiment influence participation (Gaukrodger, 2017). Across jurisdictions, approaches vary in style and sequencing, but converge on concerns regarding suitability, platform incentives, and protection against speculative risks.

3.1. United States: Enforcement-Driven, Market-Access Orientation

The United States emphasizes disclosure and public enforcement, with the SEC relying on inspections and enforcement actions to sustain market integrity (Jackson and Roe, 2009). Regulators have scrutinized payment for order flow and platform gamification (Chapkovski et al., 2024; SEC, 2021). Although retail participation is broadly permitted, high-risk leveraged products such as contracts for difference (CFDs) are prohibited (Douglas Foster et al., 2019), illustrating limits to US market-access philosophy.

3.2. European Union: Structural and Precautionary Regulation

The European Union adopts a precautionary approach prioritizing investor protection through formal rulemaking. MiFID II strengthened suitability checks, transparency, and restrictions on complex retail products, and ESMA imposed retail CFD leverage caps to limit speculative losses (ESMA, 2018). The Markets in Crypto-Assets (MiCA) framework introduces licensing and conduct rules for digital-asset service providers, reflecting an ex-ante regulatory stance (EP & Council EU, 2023). ESMA has also warned against gamification risks and retail behavioural vulnerabilities (ESMA, 2023).

3.3. United Kingdom: Innovation Support with Targeted Retail Safeguards

The United Kingdom combines support for financial innovation with targeted retail protection. The FCA's Consumer Duty requires firms to deliver fair outcomes and

mitigate foreseeable harm (FCA, 2022). *Retail access to crypto-derivatives is prohibited, and online promotions and influencer marketing are monitored* (FCA, 2020). At the same time, regulatory sandboxes encourage fintech experimentation while maintaining supervisory oversight (Cornelli et al., 2024).

4. Discussion

Regulatory responses to the rise in retail investing reflect differing philosophies, yet they converge on a shared set of concerns. U.S. regulators emphasize market access supported by enforcement, intervening when platform incentives or product structures appear to undermine investor welfare. In contrast, the European Union prioritizes ex-ante safeguards, using formal rulemaking and product-governance tools to limit retail losses and promote informed participation. The United Kingdom adopts a hybrid approach, supporting innovation while strengthening conduct standards and restricting retail access to high-risk products. Despite these differences, common themes are evident. Policymakers increasingly focus on behavioural design features in trading platforms, the suitability of complex and leveraged instruments, and the risks associated with online financial promotion and social-media-driven sentiment. The shift indicates a broader evolution from traditional disclosure-based oversight toward frameworks that integrate behavioural finance insights and platform-design scrutiny. These developments suggest a growing consensus that retail investor protection in digital markets requires not only transparency, but also responsible intermediation and market-design oversight. A more subtle implication of digitalization lies in how information systems transform the very definition of "participation" in financial markets. Platform design no longer merely enables access, it curates attention, shapes narratives, and governs the flow of collective sentiment. Retail investors are not just market actors but active data nodes whose interactions continuously refine the algorithms that, in turn, influence their future decisions. This feedback loop blurs the boundary between user and system, suggesting that effective regulation must extend beyond financial rules to include the governance of information architectures themselves.

5. Conclusion

The expansion of retail participation has prompted regulators to adapt frameworks historically centered on institutional markets. Approaches differ: the United States relies on enforcement, the European Union on structural rules, and the United Kingdom on innovation balanced with consumer duties. Future regulatory trajectories are likely to deepen focus on algorithmic transparency, behavioural safeguards, and suitability thresholds for complex products. Ensuring access without amplifying vulnerability remains a central regulatory challenge.

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GREEN BONDS AND THE EU TAXONOMY: A CONCEPTUAL FRAMEWORK FOR SUSTAINABLE FINANCE

Florina Hotea

Doctoral School of Economics Sciences, University of Oradea, Romania
hotea.florina@student.uoradea.ro

Abstract: This article analyzes the function of green bonds in advancing sustainable financing in the European Union. Green bonds finance eco-friendly initiatives that correspond with ESG objectives and the European Green Deal. Problems like greenwashing and inconsistent environmental results still exist despite their expansion. By establishing uniform definitions, transparency standards, and external verification procedures, the EU Taxonomy implementation aims to overcome these problems. According to the study's findings, green bonds have the potential to significantly accelerate the European Union's transition to a low-carbon economy, but their effectiveness is contingent upon strong regulatory frameworks, ongoing oversight, and sincere corporate accountability.

1. Introduction

A green bond is a type of financial instrument used to finance projects that promote sustainable development objectives and environmental preservation (ICMA, 2022). Their explosive rise in the financial markets of the European Union between 2000 and 2025 is indicative of the region's growing emphasis on incorporating sustainability into finance. Green bonds act as a link between economic activity and climate goals by allocating capital to ecologically sustainable enterprises.

But despite their widespread use, worries about greenwashing and uneven environmental results have surfaced. The EU created the Taxonomy Regulation in order to address these problems; it lays out precise standards, obligations for external verification, and transparency for sustainable investments.

In order to determine whether green bonds actually promote long-term environmental performance, this study will examine how they help the EU achieve its sustainability goals and how well the EU Taxonomy works to prevent greenwashing.

The analysis's conclusions are meant to provide further light on how well green bonds work as tools for sustainable finance and how they may promote really environmental and economic change inside the EU.

2. Theoretical Background

Green bonds are defined as bonds that fund environmental, social and governance (ESG) projects in order to obtain sustainable development goals of different regions. According to the International Capital Market Association, a green bond is a financial instrument meant to fund exclusively eligible green projects, whether that implies "to

finance or re-finance, in part or in full" these environmentally friendly projects. (ICMA, 2022)

The issue of green bonds signifies a corporation's dedication to enhancing its impact on the environment and compliance with adhering to a more sustainable development. As outlined in the green bond solicitations and frameworks, firms pledge to allocate substantial financial resources to green initiatives through the issuance of green bonds. (Bai, Y., 2025)

ESG is a framework of parameters that can be included into investment choices when assessing the environmental, social, and governance impacts and features of an enterprise or nation from a standpoint of sustainability. (Jenei et al., 2024)

During the 2020–2025 timeframe, a remarkably high number of green bonds were issued to the financial markets of the European Union with the promise of funding a variety of governance, social, and/or environmental projects. Even though it may appear from a distance that all of these bonds only fund initiatives that support the European Green Deal objective, closer examination reveals that this may not always be the case.

Findings indicate that when it comes to individual retail investors, label-related grounding can have a significant impact on their choices for bond investments. (Saravade et al., 2025) With that in mind, a company that issues green bond labeled bonds, will obtain capital easily, in spite of the lower returns offered. With regard to companies issuing green bonds, findings suggest that the likelihood that companies issuing traditional and green bonds can act in ways that are detrimental to environmental protection while passing off their actions as green initiatives, which is properly referred to as "greenwashing." Additional research shows that bond issuers from wealthy nations reduce CO_2 emissions more effectively (Zhou D. & Kythreotis A., 2024)

In an effort to counteract corporate greenwashing, the European Union introduced the EU Taxonomy, which aims to control by legislation how money obtained through the issuing of financial instruments like green bonds is used. To protect investors from false promises and to support the overall legitimacy of the green finance system, regulatory frameworks must provide clear definitions and criteria for authentic green investments. (Siri, M., & Zhu, S., 2019)

The EU Taxonomy serves as crucial framework for classifying economic activity according to how environmentally sustainable it is. By providing clear definitions and operational guidelines, this taxonomy makes it possible to allocate funds to initiatives that align with overarching sustainability goals. Developing a standardized vocabulary that makes it easier to identify and categorize sustainable projects and investments is the main goal of the EU Taxonomy. (Mjadu, L., 2025)

There are three more crucial elements in the proposed framework:

- Taxonomic conformity: If the required sectors are identified, all EU Green Bond payments must be allocated to initiatives that comply with EU taxonomic laws. Certain very specific activities and industries not yet covered by the EU Taxonomy Regulation are given a 15% flexibility provision.
- Transparency: Through rigorous reporting requirements, full disclosure about the allocation of the bond earnings is required.
- External review: To confirm compliance with rules and taxonomic conformity of funded initiatives, all European Green Bonds must go through an

independent external audit. The European Securities and Markets Authority (ESMA) require external auditors to be registered and subject to its regulations. To protect investors and maintain market integrity, this ensures the standards of their services and the reliability of their evaluations. (Jenei et al., 2024).

Sustainable finance goes hand in hand with sustainable development. We cannot have one, without the other.

The flow of funds, maintenance, or investment in a carbon-reduction project to support sustainable development and a better tomorrow is known as "green finance." As a result, Green Finance is a better financial approach to lowering CO_2 and improving the deteriorating environmental conditions. By promoting investment in clean energy sectors, green finance helps governments lessen their influence on the climate and promote fair growth by changing the norm from traditional to alternative sources of energy. (Sun, X. et al., 2025)

3. Methodology and research methods

The evolution, structure, and primary research orientations in the subject of green bonds and sustainable finance are examined in this paper using a bibliometric analysis. The Scopus database, which is regarded as one of the most extensive and trustworthy sources of published academic literature, is where the data was collected.

The main search term was "green bonds." The time range was restricted to 2020–present in order to catch the most recent trends in the literature. The search was further narrowed to limit the results to papers written in English and to only include publications classified under the topic category "Economics, Econometrics, and Finance."

A total of 392 articles were found and exported for bibliometric analysis after these criteria were applied. VOS viewer (version 1.6.20), a specialist program made to create and display bibliometric networks, was used to examine the dataset. In order to find study clusters, thematic connections, and correlations between important themes, term co-occurrence maps were created using this application. The resulting picture offers a thorough summary of the development of green bond research and its connections to more general subjects like climate policy, ESG, and sustainable finance.

4. Results and correlation analysis

The bibliometric mapping produced by VOS viewer (Figure 1.) found 61 keywords that satisfied the inclusion requirements and were connected inside the research network after applying a minimum occurrence criterion of five. The graphic illustrates a number of 6 unique clusters that correspond to the primary themes found in the literature on sustainable finance and green bonds.

It is evident that the central node "green bonds" has a significant role in the network because it is the most prominent and connected phrase. Strong co-occurrence linkages with terms like "sustainable finance," "ESG," and "financial innovation" illustrate how strongly related the idea of green bonds is to more general principles for corporate responsibility and sustainability.

Terms like "climate change," "green economy," and "sustainable development" indicate a second cluster that highlights the field's environmental and policy aspects.

The way green bonds are researched in relation to global environmental goals and climate transition plans is demonstrated by this collection of keywords.
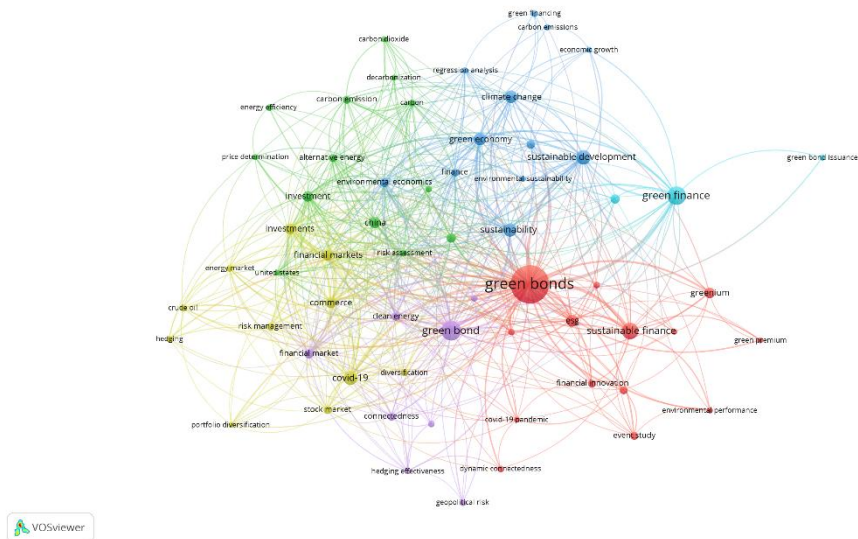
Figure 1.: Bibliometric analysis of the term "green bonds" in VOS viewer software. Source: Author's own processing in VOS viewer software.

The financial and economic viewpoint is represented by terms like "investment," "financial markets," and "risk management," which form a third cluster. These links demonstrate an increasing scholarly interest in the ways that green bonds interact with conventional finance, portfolio diversification, and market dynamics.

5. Conclusions

The rise of green bonds in the EU's financial markets raised concerns about the requirement for clear and rigorous rules, which prompted authorities to fully implement such measures. ESG, which was first proposed as a voluntary method in the 2000s, was condensed into a regulation following the Paris Agreement (2015). The EU Taxonomy, a legally binding classification system that converts ESG principles into quantifiable and verifiable standards for sustainable economic operations, was adopted in 2020 in response to the need for further laws.

Despite all efforts, various research has reached differing results regarding the advantages that companies can derive from issuing green bonds. Silvio Vismara and Muhammad Arif Khan (2025) discovered that the financial impact of green bonds is dependent upon the state or entity issuing the bond. Additionally, they discovered that while emissions reduction and carbon efficiency showed more inconsistent results, environmental innovation and scoring consistently showed positive impacts. Green bonds are also significant for private investors, who can utilize them as a useful tool for diversification and successful hedging. (Belguith, R., 2025)

The bibliometric findings indicate that the scientific literature on green bonds has developed into a cohesive and organized research domain that encompasses environmental, economic, and regulatory aspects. The strong correlations observed

in the network visualization underscore that the advancement of sustainable finance within the European Union relies not solely on market performance, but also on effective governance, transparency, and the ongoing application of frameworks like the EU Taxonomy.

In conclusion, green bonds can significantly contribute to realizing a future aligned with the European Green Deal, provided that strict rules are imposed by authorities and ongoing oversight is maintained as projects develop. Additional research is required to examine the underlying factors influencing the varying effects of green bonds, depending upon the location designated for the sustainable project and the issuing state or company.

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THE POLICY SHIFT IN THE DEBATE ON INTERNATIONAL TAXATION OF THE DIGITAL ECONOMY

Roxana Ciortin Gangoș

Doctoral School of Economic Studies, University of Oradea, Oradea, Romania
ciortingangos.roxana@student.uoradea.ro

Abstract: *This article is meant to provide an overview of the current state of play in the area of the possible reform of the international tax regime with the view of addressing the challenges raised by the digitalization of the economy and also debating the opportunity of introduction the DST (digital services tax). DSTs directly address the question of where profits should be allocated and taxed. The paper also deals with another new notion that appeared and was debated in the context of the digitalization of the economy, namely the concept of "value creation" or "significant digital presence". This scientific research aims to highlight the main political, technological, institutional and regulatory characteristics and contradictions of the Digital Nexus Rules from a global perspective, tracing its development over time and particularly analyzing the taxation of the digital economy through the digital services tax.*

Keywords: digital economy; digitalization; tax challenges; significant digital presence; digital services tax

JEL classification: A13

1.Introduction

One objective currently pursued at the European Union level is to adapt the tax systems of the Member States, to optimize them to meet the challenges of the digital age. This article is meant to provide an overview of the current state of play in the area of the possible reform of the international tax regime with the view of addressing the challenges raised by the digitalization of the economy. International tax issues have never been as high on the political agenda as they are today. The integration of national economies and markets has increased substantially in recent years, putting a strain on the international tax rules, which were designed more than a century ago. The taxation of the digital economy is a key priority for the European Commission, targeting a market of over 500 million EU consumers. To achieve its potential, a modern and stable tax framework is needed, which stimulates innovation and allows all actors to benefit from new market dynamics. Current tax rules are no longer fit for online commerce, companies based on intangible assets and value creation through users. Under current international tax rules, multinationals generally pay corporate income tax where production takes place, rather than where consumers or, particularly for the digital sector, users are located. However, some argue that through the digital economy, businesses (implicitly) earn income from users abroad, but, without a physical presence, are not subject to corporate income

tax in that foreign country. The research objective of this paper lies at the intersection of two topics, the reform of the international tax regime in the digital economy and the opportunity of introduction the DST (digital services tax).

2.Literature Review

It is necessary to understand the new features of the digital economy and whether it has modified the way enterprises generate profits in order to adapt the current tax system to this new era. At OECD/G20 level, an agreement was reached on 8 October 2021 on a two-pillar reform of the international rules on the taxation of multinational profits. This agreement is set out in the Declaration on a Two-Pillar Solution to Address the Tax Challenges of the Digital Economy, also known as the 'October 2021 Declaration of the OECD/G20 Inclusive Framework on BEPS'.

All EU Member States have expressed their support for this Declaration, which provides for a two-pillar solution. The Pillar one consists of rules and mechanisms aimed at reallocating taxing rights between jurisdictions where the largest and most profitable multinational groups have market share and make profits. Pillar two essentially comprises rules on minimum effective taxation of the largest multinational groups, with the aim of reducing the possibilities for base erosion and profit shifting. The pillar also aims to ensure the payment of the global minimum corporate tax rate, set by common agreement at 15%.

Work on Pillar 2 has progressed more rapidly, having been approved by the Inclusive Framework in December 2021. The OECD model rules ensure that profits of multinational groups with a turnover of at least EUR 750 million are taxed at a minimum rate of 15%. These rules were transposed into EU law by a Council Directive in December 2022.

However, current rules fail to cover digital activities where physical presence is no longer a requirement to provide digital services. Furthermore, digital companies are different from traditional ones in terms of how value is created, due to their ability to operate remotely, the contribution of end-users to their value creation, and the importance of intangible assets. The application of current corporate tax rules to the digital economy has led to a discrepancy between where profits are taxed and where value is created, especially in the case of business models whose activity is mainly based on user participation (Gaglio and Guillou, 2018).

This presents a double challenge from a tax perspective. First, a company may create value through user contributions in a tax jurisdiction where the company carrying out a digital activity is not physically established (and thus not resident for tax purposes under the rules in force) and where, therefore, the profits generated from the performance of these activities cannot be taxed (Prichard et al., 2012). Second, even if a company has a permanent establishment in the jurisdiction where users are located, if current tax rules are applied, the value created by user participation is not taken into account when deciding the amount of taxes that should be paid in each country.

3.Digital Service Taxes: What is the current situation?

Until internationally agreed measures are adopted, Member States are obliged to find solutions individually to avoid the risk of base erosion. In 10 Member States, unilateral measures are in place or specifically planned to address this issue in a

limited way, but the trend is increasing and the measures adopted vary greatly in their scope and justification. However, there is a risk of fragmentation of the European single market if Member States adopt such uncoordinated measures (OECD, 2016a; OECD, 2016b.).

As no consensus was reached on BEPS Action 1, which dealt with the digitalization of the economy, an agreement was reached to continue working on this issue with the aim of reaching a consensus-based solution by 2020. In March 2018, the OECD released a candid report explaining that countries' views fell into three groups (OECD, 2018). One group of countries favored reform targeting certain highly digitalized businesses, a second group favored reforming the system as a whole, and a third group argued there was no immediate need for further reform. The first group of countries, argued that users of certain highly digitalized businesses create value, but this is not recognized under existing rules. Their favored long-term solution was to amend Permanent Establishment (PE) nexus and profit attribution rules to allocate taxing rights to countries where users are found (the "user participation" proposal). In the short term, they favored the adoption of DSTs to achieve the same goals. Over the following months, it became clear that the Commission's proposal for a harmonized EU DST did not enjoy the support of a number of member states, and after some discussion on narrowing its scope, it was dropped in early 2019 (HM Treasury, 2018b, p. 4).

About half of the European OECD countries have either announced, proposed or implemented a DST. Because these tariffs primarily affect US companies and are therefore perceived as discriminatory, the United States has responded to the policies with threats of retaliatory tariffs, urging countries to abandon unilateral measures.

Austria, Denmark, France, Hungary, Italy, Poland, Portugal, Spain, Switzerland, Turkey and the United Kingdom have implemented a DST. Belgium and the Czech Republic have published proposals for the adoption of a DST, and Latvia, Norway, Slovakia and Slovenia have officially announced or indicated their intentions to implement such a tax. The proposed and implemented DSTs differ significantly in their structure. For example, while in Austria and Hungary only revenues from online advertising and Denmark's DST applies only to streaming services, France's tax base is much broader, including revenues from the provision of a digital interface, targeted advertising and the transmission of data collected about users for advertising purposes. Tax rates range from 1.5% in Poland to 7.5% in Hungary (although Hungary's tax rate has been reduced to 0% until December 2024). These DSTs have generally been seen as interim measures until an agreement can be reached at OECD level.

Table 1: Implementation of DSTs in OECD countries

Country	Tax rate	Status
Austria	5%	Implemented
Belgium	3%	Proposal

Country	Tax rate	Status
Danemark	2%(3% extratax)	Implemented
France	3%	Implemented
Hungary	7.50%	Implemented (since 1 iulie 2019 - 31 decembrie 2024)
Italy	3%	Implemented
Poland	1.50%	Implemented
Portugal	4%, 1%	Implemented
Spain	3%	Implemented
Switzerland	4%	Implemented

Source: Made by author using datas from OECD Report, The Taxation of the digital economy, 2024

With the rise of digital services taxes (DSTs) all over the world, questions have arisen regarding their compatibility with international trade law. Between 2019 and 2021, the United States initiated investigations into several DSTs and published observations on the DSTs adopted by Austria, France, Italy, India, Spain, Turkey and the United Kingdom. In addition to the argument that these taxes violate international tax principles, the U.S. considers that they are discriminatory (Pirlot, A. and Culot, H., 2021).

From a tax perspective, some authors underline that it is insufficient to design specific rules to target the digitalized economy in order to fix the corporate income tax system. According to these authors, wider tax reforms, not limited to the digitalized sector, would be necessary given the fundamental weaknesses of the existing regime, which is based on artificial criteria, such as the residence of a company. (Devereux M., Vella J. (2018), Chris Noonan C., Plekhanova V., (2020).

4.Conclusion

The globalization of the digital economy requires a paradigm shift in international tax policy. The choice of structure, scope, and tax base will determine its effectiveness in ensuring that large digital corporations pay their fair share while avoiding unintended economic consequences. However, the EU is facing significant difficulties in adapting its taxation framework, which was designed for a pre-digital era, and harmonizing its policy with the challenges of DSTs. A well-designed digital tax aims to modernize taxation in the digital economy, ensuring fairness, revenue sustainability, and economic sovereignty.

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CHALLENGES OF EU VAT HARMONISATION: A COMMON DIRECTIVE WITH DIVERGENT NATIONAL INTERPRETATIONS

Patricia Georgia Lele

Doctoral School of Economic Sciences, Faculty of Economic Sciences, University of Oradea, Romania
georgialele@yahoo.com

Abstract: This paper examines the ongoing challenges of value added tax (VAT) harmonization in the European Union, focusing on how national courts interpret and apply Directive 2006/112/EC. Although the Directive establishes a common framework for the VAT system, Member States continue to exercise procedural autonomy in areas such as documentation, refund mechanisms, and anti-fraud enforcement. A comparative analysis of case law from Germany (BFH V R 25/20 – 2021), Italy (Cassazione 23391/2022), and Romania (High Court 4769/2019) reveals the coexistence of harmonized principles and divergent national applications. The findings show that procedural rules at the national level — such as invoice formalities, timing of deduction, and conditions for VAT adjustments — can significantly influence the exercise of harmonized rights. While the Court of Justice of the European Union (CJEU) provides interpretative guidance, its case law often functions as an ex post corrective rather than a preventive harmonizing tool. The study concludes that the "common" VAT system remains fragmented by national procedural autonomy, highlighting the need for stronger administrative coordination and clearer interpretative standards within the EU's fiscal framework.

1. Introduction
The Value Added Tax (VAT) has been the cornerstone of indirect taxation in the European Union since the 1960s and was consolidated through Directive 2006/112/EC on the common system of value added tax. Designed to create a uniform tax structure across Member States, the Directive defines essential elements such as taxable persons, taxable transactions, exemptions, and the right to deduct input VAT, aiming to avoid double taxation and prevent distortions of competition within the internal market.

Although the Directive establishes a harmonized framework, Member States retain discretion over procedural aspects — documentation, evidence, refund mechanisms, and anti-fraud measures — which often reflect national administrative and legal traditions. Consequently, the application of VAT rules can diverge significantly across the Union despite their common legal foundation. Divergences become most visible in national case law, where courts interpret the Directive's provisions through their procedural and policy lenses.

2. Theoretical and Legal Framework

Directive 2006/112/EC on the common system of value added tax, adopted on 28 November 2006, is the principal legal instrument governing VAT within the European Union. It consolidates earlier legislation and establishes a coherent framework intended to ensure neutrality by taxing consumption at each stage of production and allowing taxable persons to deduct input VAT on business expenses.

The Directive's objective is to secure consistent application of VAT rules and protect the internal market from double taxation and fiscal distortions. Yet harmonization remains incomplete, as Member States retain discretion in procedural and administrative matters. The Directive therefore embodies a balance between uniformity and flexibility — a balance that continues to define the challenges of VAT harmonization in the EU.

3. Case Analysis and Discussion

Despite more than two decades of the "common VAT system," the boundaries between harmonization and national discretion remain fluid. This section examines how domestic courts in Germany, Italy and Romania interpret and apply Directive 2006/112/EC. Although the Directive provides a harmonized legal framework, national judgments demonstrate how procedural autonomy and domestic anti-fraud considerations influence the interpretation of key VAT principles, at times diverging from the uniformity envisaged by EU law.

3.1 Germany – BFH V R 25/20 (2021)

The German Federal Fiscal Court examined a case where a taxable company's right to deduct input VAT was denied because the supplier's invoice did not fully comply with the formal requirements of the German VAT Act. Although the underlying transaction was undisputed, the court held that the taxpayer could not exercise the deduction right until the invoice was corrected, and that such correction would only take effect prospectively. This formalism contrasts with the approach of the CJEU, which considers invoice defects not to preclude deduction when substantive conditions are met.

3.2 Italy – Corte di Cassazione 23391/2022

The Italian Corte di Cassazione considered whether a taxable person could retain the right to deduct input VAT when the supplier was subsequently implicated in fraudulent activities. The Court upheld the denial, reasoning that protecting the tax system against fraud could prevail even without proof that the recipient knew or should have known of the fraud. This reasoning diverges from the interpretation adopted by the CJEU in the Kittel and Bonik cases.

3.3 Romania – High Court 4769/2019

The Romanian High Court of Cassation and Justice examined a dispute concerning the adjustment of the VAT base for irrecoverable debts. The taxpayer sought to reduce the taxable amount in accordance with Article 90 of Directive 2006/112/EC after its customer became insolvent. The Court upheld the tax authorities' position that adjustment rights arise only once insolvency is definitively closed, delaying the Directive's relief mechanism and showing the limits of procedural autonomy.

4. Conclusions

The comparative examination of national jurisprudence in Germany, Italy and Romania demonstrates that harmonization under Directive 2006/112/EC remains largely formal rather than functional. While the Directive provides a uniform legal framework, its implementation continues to rely on national interpretation, shaped by procedural traditions and domestic enforcement priorities. A more coherent alignment could emerge only through enhanced administrative cooperation and clearer interpretative guidance at EU level, ensuring that the 'common' VAT system operates as a genuinely integrated legal order.

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THE IMPACT OF PUBLIC INVESTMENT IN THE CONTEXT OF COHESION POLICY, THE RECOVERY AND RESILIENCE FACILITY, AND THEIR ROLE IN MACROECONOMIC DEVELOPMENT: A FOCUS ON ROMANIA

Cătălin Marian Costache
Doctoral School of Economic Sciences, University of Oradea, Oradea, Romania.
costache.catalinmarian@student.uoradea.ro

Abstract: *This paper examines the impact of public investment via EU cohesion policy and the Recovery and Resilience Facility on Romania's macroeconomic development, guided by Solow-Swan exogenous growth and Romer endogenous growth theories. Using Romanian regional panel data from 2012 to 2023 including motorways as infrastructure proxy, GDP, gross fixed capital formation, unemployment, poverty, and EU funds we apply descriptive statistics, beta-convergence regressions, and impact analyses to evaluate growth, disparities, and convergence. We also use GDP/capita data to test convergence for Romania and other new member states to Germany – the most developed economy of the EU. Trends show national GDP per capita rising with motorway expansion and poverty dropping though regional gaps persist in areas like Nord-Est. Regressions reveal regional divergence but national convergence to Germany at 1.5% annually among new EU members, with EU funds showing a positive but insignificant association with growth and unclear poverty reduction, aligning directionally with Romer's spillovers. Robustness via fixed effects and post-2020 breaks confirm results, emphasizing targeted investments in lagging regions for enhanced cohesion and balanced growth.*

1.Introduction

Public investment, particularly through European Union (EU) mechanisms such as cohesion policy and the Recovery and Resilience Facility (RRF), plays a pivotal role in fostering macroeconomic development in member states like Romania. This paper examines how such investments influence growth, regional disparities, and convergence, drawing on the Solow-Swan exogenous growth model (Solow, 1956) and the Romer endogenous growth theory (Romer, 1990). The Solow-Swan model posits that economies converge to a steady state through capital accumulation, with poorer regions growing faster if investment rates are similar, leading to beta-convergence where the growth rate is negatively related to initial income levels. Romer extends this by emphasizing endogenous factors like knowledge and infrastructure, suggesting that public investments in motorways or EU funds can enhance productivity and accelerate convergence. This builds on previous work (Costache & Boloş, 2024, Costache, 2025) arguing that Cohesion Policy enhances efficiency factors (e.g. infrastructure) in neoclassical growth models, crowding-in growth.

In Romania, EU cohesion policy (pre-2020) and RRF (post-2020) have channeled funds into infrastructure and capital formation, potentially driving GDP growth, reducing unemployment, and alleviating poverty. Using regional data from 2012–2023, this analysis tests these theories empirically, focusing on convergence within Romania's NUTS2 regions, Romania's national convergence relative to other new EU members (Bulgaria, Czechia, Hungary, Poland), and benchmarking against Germany. The findings, checked against raw data and regression diagnostics including multicollinearity simulations, substantiate elements of the theories while highlighting the role of public investment in mitigating disparities, though with variations in impact and econometric caveats.

2.Methodology

This study employs a panel data approach using Romanian regional (NUTS2) and national indicators from the provided dataset, covering 2012–2023 for core variables like motorways (km, proxy for public infrastructure investment), GDP (million euros), population, gross fixed capital formation (GFCF, million euros), unemployment (% of labor force), and poverty rates (% at risk). EU funds (million RON, converted to euros using exchange rates) are national but used for correlations and regressions. Comparative real GDP per capita (euros) for EU countries spans 2004–2024 but we focus on 2012–2023 for consistency.

Data processing involved calculating GDP per capita, annual growth rates and national aggregates (sum over regions for GDP, GFCF, motorways; weighted averages for unemployment and poverty). For convergence, beta-regression models are estimated using ordinary least squares (OLS) with statistical modelling in Python. The regional panel has 8 regions × 11 years = 88 observations (growth from 2013–2023). National time-series regressions use lagged variables to address endogeneity. Robustness checks include region fixed effects, correlations, and structural breaks post-2020 (RRF onset). All calculations were double-checked for accuracy, ensuring no negative values in logs and handling missing data by limiting to complete series. Diagnostic checks, such as condition numbers, were reviewed to flag potential multicollinearity; simulations (e.g., standardization, PCA) addressed this, reducing conditions to stable levels (e.g., 1.96) without altering core findings.

3.Descriptive Analysis

Romania's macroeconomic indicators show marked improvement post-EU accession, with public investment playing a key role. National motorway length increased from 550 km in 2012 to 997 km in 2023, coinciding with GDP rising from €139,200 million to €324,158 million. GDP per capita grew from €6,927 in 2012 to €17,012 in 2023 (calculated from regional data).

Regional disparities persist: the Vest region saw motorways expand from 69 km to 253 km, with GDP from €13,764 million to €28,423 million, reflecting strong growth. In contrast, Nord-Est, the poorest region, had minimal motorway development (0 km to 20 km), with GDP per capita lagging at approximately €10,165 in 2023 versus București-Ilfov's €41,500. National poverty rates declined from 44% in 2015 to 32.0% in 2023, correlating with EU funds surging from €596 million EUR in 2010 to €12,100 million EUR in 2024 (RRF spike).

Cross-country, Romania's GDP per capita relative to Germany rose from 0.202 in 2012 to 0.278 in 2023, slower than Poland but faster than Bulgaria. This suggests

cohesion policy and RRF have aided catch-up, though Romania's pace indicates room for more targeted investments. These trends align with Solow-Swan capital accumulation but highlight uneven regional effects.

4.Beta-Convergence Regression

To test Solow-Swan convergence, we estimate beta-convergence models where growth is regressed on initial income and controls (Barro & Sala-i-Martin, 1992). For Romanian regions, the panel OLS model is:

$$g\_it \;=\; \alpha \;+\; \beta \, ln(GDPpc\_i, t-1) \;+\; \gamma \, \Delta Motorways\_it \;+\; \delta \, GFCFpc\_i, t-1$$
$$+\; \theta \, Unemployment\_i, t-1 \;+\; \lambda \, PopChange\_it \;+\; \varepsilon\_it$$

Results show $\beta = 0.064$ (p = 0.023, t = 2.32, R^2 = 0.144, N = 88), indicating divergence where richer regions grow faster, contrary to standard Solow-Swan predictions for conditional convergence. This may reflect nominal data limitations or persistent disparities. $\gamma = -0.0004$ (p = 0.310, insignificant) for motorway changes, and $\delta = -0.000006$ (p = 0.256) for GFCF per capita, suggesting limited measurable impact from these proxies in this specification.

At the national level, relative convergence to Germany is modeled as:

$$g\_t \;=\; \alpha \;+\; \beta \, ln(RelGDPpc\_t-1) \;+\; \varepsilon\_t$$

For pooled new members, $\beta = -0.015$ (p = 0.031, t = -2.22, R^2 = 0.085, N = 55), implying 1.5% annual closing of the gap. Country-specific betas vary: Romania -0.031, Poland -0.029, Czechia -0.120, Hungary -0.022, Bulgaria 0.093. Romania's pattern highlights uneven cohesion policy impacts, with post-2020 RRF potentially accelerating it.

5.Impact of EU Funds on Macro Outcomes

EU funds, proxying cohesion policy and RRF, are tested for effects on GDP growth and poverty.

The national time-series model is:

$$\Delta GDP\_t \;=\; \alpha \;+\; \beta \, EUFunds\_pc\_t-1 \;+\; \gamma \, \Delta Motorways\_t \;+\; \delta \, Unemployment\_t-1 \;+\; \varepsilon\_t$$

Initial results yield $\beta = 0.0003$ (p = 0.181, t = 1.48, R^2 = 0.345, N = 11) indicating a positive but insignificant association where €1 increase in lagged EU funds per capita is linked to 0.03% higher growth (Mohl & Hagen, 2010), directionally consistent with Solow capital channels and Romer spillovers, but with a high condition number suggesting potential multicollinearity. Simulations confirm this: Standardization resolves it, yielding equivalent $\beta = 0.027$ (scaled, p = 0.182), directionally consistent with Solow capital channels and Romer spillovers. Dropping ΔMotorways improves p to 0.098 (β = 0.0003, condition = 1,800). PCA and ridge yield similar $\beta \approx 0.0003$–0.016 (p > 0.20), affirming stability.

For poverty, the model is:

$$\Delta Poverty\_t \;=\; \alpha \;+\; \beta \, EUFunds\_pc\_t-1 \;+\; \varepsilon\_t$$

$\beta = 0.001$ (p = 0.917, t = 0.11, R^2 = 0.002, N = 8), showing no significant association and a positive direction (contrary to expectations of reduction); standardization confirms (β = 0.083 scaled, p = 0.917, condition = 1.00). Post-2020 fund spikes correlate descriptively with sharper poverty declines, underscoring larger EU funds potential but warranting cautious interpretation.

Robustness and Extensions

Robustness checks (Bai & Perron, 1998; Arellano, 2003) confirm findings. Adding region fixed effects to the regional model yields $\beta = 0.091$ (p < 0.001), similar to

baseline, controlling for unobserved heterogeneity. Correlation between EU funds (EUR) and national GFCF is 0.943 ($p < 0.01$), suggesting funds drive investment.

For structural breaks, adding a post-2020 dummy and interaction in the regional model shows the base β = -0.008 ($p = 0.587$) and interaction = 0.038 ($p = 0.167$, R^2 = 0.334), indicating possible but insignificant acceleration post-RRF. Limitations include national EU funds data (potential regional misallocation), short post-2020 period, and multicollinearity in time-series models addressed via simulations; future work could use instrumental variables for endogeneity.

Conclusion

Public investments via EU mechanisms have aided Romania's macroeconomic development, with evidence of national convergence supporting Solow-Swan-Romer theories, though regional divergence and insignificant fund impacts highlight challenges. Results emphasize prioritizing infrastructure in poorer areas like Nord-Est for faster convergence, with resolved multicollinearity underscoring robust yet cautious policy analysis.

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SUSTAINABLE RURAL DEVELOPMENT AND THE ROLE OF EU FUNDS IN CENTRAL AND EASTERN EUROPE

Maria-Luisa ȚÎNȚAȘ

Ph.D. students, Doctoral School of Economic Sciences, University of Oradea, Oradea, Romania
tantas_luisa@yahoo.com

Abstract: *Rural development represents one of the European Union's key priorities, aiming to reduce territorial disparities and improve the quality of life in rural areas. In the context of Central and Eastern Europe (CEE), European funds have played a crucial role in stimulating public and private investments, supporting agriculture, developing infrastructure, and creating employment opportunities. However, the efficiency of fund utilization varies considerably among Member States, depending on administrative capacity, policy coherence, and the degree of community involvement. This paper analyses the contribution of EU funds to sustainable rural development in the CEE region, highlighting both the progress achieved and the persistent challenges related to economic, social, and environmental sustainability. The findings indicate that while EU funds have supported rural modernization and reduced economic disparities, their long-term impact on sustainability depends largely on the integration of green principles, digitalization, and effective governance at local and regional levels. The conclusions propose several directions for improving the strategic use of European resources in future programming periods.*

Keywords: EU funds; rural development; sustainability; Central and Eastern Europe; cohesion policy; governance

JEL Classification: Q01; R11; O18; H77

1. Introduction

Sustainable rural development has become one of the main priorities of the European Union, being closely linked to the objectives of the Cohesion Policy and the European Green Deal. Rural areas in Central and Eastern Europe (CEE) play a significant economic and social role but continue to face persistent challenges such as poor infrastructure, depopulation, and high dependence on agriculture. In this context, the financial instruments provided through the Common Agricultural Policy (CAP) and the Cohesion Policy have been essential tools for reducing regional disparities and promoting sustainable economic and social growth (European Commission, 2023).

The period **2018–2024** captures the transition between two Multiannual Financial Frameworks (2014–2020 and 2021–2027), allowing a comparative evaluation of how European funds have supported rural development in the CEE region. Assessing the impact of these resources is vital to understanding how investments contribute to sustainability and economic convergence (World Bank, 2021).

The main objective of this paper is to analyze the role of EU funds in promoting sustainable rural development in Central and Eastern Europe by correlating data on fund absorption with key economic indicators such as rural GDP, employment rates, and investments in infrastructure and innovation. The study contributes to identifying the determinants of rural sustainability and formulates recommendations for improving the efficiency of EU fund utilization in future programming cycles.

2. Theoretical Background and Literature Review

The concept of *sustainable rural development* combines the economic, social, and environmental dimensions of community progress. According to OECD (2022), sustainable rural development entails not only economic growth but also the maintenance of balance between environmental conservation and social cohesion. The European Union promotes this approach through integrated strategies combining infrastructure financing, innovation, and the green transition (European Commission, 2023).

EU funds for rural development are mainly channeled through the **European Agricultural Fund for Rural Development (EAFRD)** and the **European Regional Development Fund (ERDF)**. These instruments aim to enhance agricultural competitiveness, diversify rural economies, and improve living conditions in underdeveloped areas (Popescu, 2021). In CEE countries, EU funds have supported both public investments (roads, utilities, digital infrastructure) and private projects focused on sustainability and local entrepreneurship (Mihalache, 2022).

Recent studies emphasize that the effectiveness of EU fund utilization largely depends on the **quality of governance** and the **administrative capacity** of national and regional institutions (World Bank, 2021). Countries with stronger strategic planning and efficient control mechanisms tend to achieve greater economic and social impact (OECD, 2022). Furthermore, the degree of transparency, digitalization of public administration, and local community participation significantly influence fund absorption and sustainability outcomes (European Commission, 2023).

Based on these findings, this paper assumes that EU funds contribute to sustainable rural development in CEE, yet the magnitude of their impact varies depending on institutional context and implementation quality.

3. Methodology and Data Analysis (2018-2024)

The analyzed period, **2018-2024**, captures the transition between two EU financial frameworks 2014-2020 and 2021-2027 which allows for a comprehensive assessment of the evolution of rural development in CEE. In accordance with the *N+3* rule, Member States could report and finalize expenditures related to the 2014-2020 period until the end of 2023, justifying the inclusion of this overlap.

The research methodology is based on a **comparative-descriptive approach**, using secondary data from **Eurostat (2024)**, **European Commission reports (2023)**, **OECD (2022)**, and **World Bank (2021)**. The analysis covers the main CEE countries: Romania, Poland, Hungary, Bulgaria, Czechia, Slovakia, Slovenia, and Croatia, focusing on the following indicators:

- GDP per capita in predominantly rural regions;

- rural employment rate;
- absorption rate of EAFRD and ERDF funds;
- share of investments in green infrastructure and digitalization.

Data were processed using descriptive statistical methods (percentage variation and cross-country comparison). The findings show that **EU-funded rural investments account for over 40% of total public investments** in most analyzed countries, confirming the strategic role of EU resources in rural development (European Commission, 2023). However, the sustainability impact differs: countries with stronger administrative capacity (Poland, Czechia, Slovenia) achieve more consistent results in green transition and digital transformation, whereas those with weaker governance (Romania, Bulgaria) face delays and fragmented project implementation (Mihalache, 2022).

Overall, the analysis reveals a positive trend towards integrating sustainability and digital objectives in the new 2021-2027 programmes, reflecting a gradual paradigm shift from *rural development* to *sustainable rural development* in line with the European Green Deal (OECD, 2022).

4. Discussions and Implications

The results confirm the major role of EU funds in transforming rural economies in Central and Eastern Europe, but also highlight substantial differences in efficiency among countries. States such as Poland and Czechia, with solid administrative systems and coherent national strategies, have successfully integrated sustainability principles into rural policy frameworks, showing tangible progress in infrastructure, digitalization, and agricultural innovation (OECD, 2022).

Conversely, Romania and Bulgaria still face challenges related to bureaucracy, limited institutional coordination, and insufficient technical expertise (Mihalache, 2022). These disparities support the hypothesis that **governance quality** is a critical determinant of EU funds' effectiveness in achieving sustainable rural development (World Bank, 2021).

The 2021–2027 financial framework introduces a stronger focus on **resilience and green transition**, emphasizing carbon reduction, renewable energy, circular economy, and digital transformation (European Commission, 2023). This shift is particularly relevant for CEE rural regions, where traditional low-productivity sectors continue to dominate.

The analysis also points to the need for an **integrated rural development approach** combining physical investments with measures to strengthen human and social capital. Sustainable outcomes require community engagement, local entrepreneurship, and partnerships between public authorities, NGOs, and the private sector. Strengthening such synergies can enhance the long-term efficiency and inclusiveness of EU-funded projects.

5. Conclusions

The findings demonstrate that EU funds have been a cornerstone of rural development in Central and Eastern Europe, contributing to infrastructure modernization, economic diversification, and improved living standards. However, their impact remains uneven across countries, influenced by governance quality and administrative performance.

Countries with transparent, efficient, and strategically coordinated management systems achieved higher levels of sustainability, while others faced implementation challenges that limited the transformative potential of EU funding.

This paper highlights the need to further strengthen institutional capacity and adopt an integrated development vision that combines investment with innovation, education, and community participation. Future research should explore the social and environmental dimensions of rural sustainability and conduct deeper comparative assessments across EU regions.

In conclusion, EU funds are not merely a financial mechanism but a strategic instrument for building resilient and sustainable rural economies in Central and Eastern Europe. Their long-term success depends on each country's ability to translate financial inputs into tangible and lasting development outcomes, aligned with the EU's goals of economic, social, and territorial cohesion.

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THE ROLE OF INTERNATIONAL FINANCIAL INSTITUTIONS IN ENHANCING THE ABSORPTION CAPACITY OF EUROPEAN UNION FUNDS

Silvia Răcăreanu

Doctoral School of Economic Sciences, Faculty of Economic Sciences, University of Oradea, Romania

cazacusilvia29@gmail.com

Abstract: *This paper examines the role of international financial institutions (IFIs) as bodies that support European Union member states in their efforts to absorb European funds. It highlights the contribution of the World Bank, the European Investment Bank (EIB), the European Bank for Reconstruction and Development (EBRD), and the International Monetary Fund (IMF) in developing and implementing practical financial governance with visible results. These financial institutions achieve their objectives by providing specialized technical assistance and combining it with viable co-financing instruments. Romania, among other countries, can be considered a model where the results of cooperation between international financial institutions (IFIs) and national authorities has generated - and continue to generate - the continuous and efficient use of European funds.*

1. Introduction

European funds have been and will continue to be an instrument through which the European Union promotes a common model of society among its member states - a society defined by its economic and social dynamism. The ability to access funds reflects the capacity of states to attract, manage, and, above all, use the available financial resources pragmatically and efficiently. This capacity is highly relevant for the success of cohesion policies and for reducing development disparities.

However, for certain Member States - especially those that joined the EU after 2004 – the implementation of European-funded projects has proved challenging due to weak administrative capacity, excessive bureaucracy, and a lack of experience in strategic planning. In such contexts, international financial institutions (IFIs) have played and continue to play a crucial role by providing expert advice, financial instruments, and technical assistance that strengthen governance systems tailored to each country's needs and accelerate the implementation of European projects.

The purpose of this article is to highlight the contribution of the main IFIs in supporting the absorption of European funds, with an emphasis on mechanisms and

best practices that can be successfully applied and, why not, continuously improved in the future.

2. Conceptual framework: international financial institutions and EU funds

Governments within the European Union and even those outside the EU collaborate with each other on both economic and financial policies based on treaties and agreements that regulate internationally agreed-upon rules. International financial institutions are intergovernmental organizations that have been established through these multilateral treaties. The main purpose of IFIs is to create more developed economies in the countries in which they are involved, generating financial stability at local, regional, and global levels. Among the most relevant IFIs in the European context are:

The World Bank (WB) – Provides global financial products, technical assistance, and resources, as well as innovative solutions to complex development challenges.

International Monetary Fund (IMF) – The IMF is a global organization that works to achieve sustainable growth and prosperity for all 191 member countries. It does this by supporting economic policies that promote financial stability and monetary cooperation, which are essential for productivity growth, job creation, and economic well-being. Its member countries govern the IMF and are accountable to it.

European Investment Bank (EIB) – The EIB Group offers a wide range of financial products and services in support of the European Union's economic, social, and environmental objectives. EIB financial and advisory solutions are designed to support investments and enterprises at different stages of development, taking into account their financing needs and helping to catalyze additional sources of financing and maximize impact.
European Bank for Reconstruction and Development (EBRD) – offers a wide range of tailored financial products, as well as advisory and policy reform services. Supporting projects in dozens of sectors across more than 40 economies, it draws on more than three decades of experience and a strict, clear set of governance criteria.

International financial institutions increase EU mechanisms by developing a financial system that supports the processes and procedures for absorbing European funds.

3. The concrete role of IFIs in the absorption process

3.1. Technical assistance and institutional strengthening

We know that IFIs provide technical assistance in the planning, implementation, and evaluation stages of EU-funded projects. As defined in its role, the World Bank has provided financial support to several member states both in the process of public administration reform and in the creation of performance management mechanisms.

Romania serves as an illustrative example of how international financial institutions (IFIs) can contribute to enhancing the absorption capacity of European funds. Since

joining the European Union in 2007, Romania has faced persistent challenges related to administrative efficiency, project management, and financial governance. However, the collaboration between Romanian authorities and IFIs—particularly the World Bank, the European Investment Bank (EIB), and the European Bank for Reconstruction and Development (EBRD)—has generated visible progress.

One of the most notable examples is the technical assistance program conducted by the World Bank for the Ministry of European Investments and Projects (MIPE) between 2014 and 2025. This collaboration focused on the capacity of public institutions to manage EU funds more effectively. Through workshops, institutional diagnostics, and tailored policy advice, the World Bank helped streamline procedures, reduce project delays, and prevent the decommitment of allocated funds. As a result, Romania's absorption rate for the 2014–2020 programming period increased significantly compared to the 2007–2013 cycle.

As is well known, in Romania, between 2014 and 2025, the World Bank carried out assistance projects for the Ministry of European Investments and Projects, supporting the training of staff involved in the management of operational programs.

This collaboration between The World Bank and MIPE helped streamline administrative processes and reduce the risk of automatic decommitment of funds— a phenomenon observed between 2007 and 2013. For the period 2021–2027, Romania has been allocated a total of 32,062,732,563 RON for national programs under the European Cohesion Policy funding programs.

3.2. Co-financing investments

Another important role played by IFIs is the co-financing of European projects. The EIB, for example, grants loans to Member States to ensure the national co-financing of projects from structural funds. We know that through instruments such as JASPERS (Joint Assistance to Support Projects in European Regions), the EIB provides technical support for the preparation and evaluation of major projects before their approval by the European Commission. Such collaboration with the EIB accelerates project implementation and improves quality by attracting complementary private investment.

3.3. Promoting transparency and good governance

IFIs are known for setting and upholding high standards of financial governance, auditing, and reporting. Through partnerships with the European Commission, they foster a climate of trust in the use of public funds.

To strengthen fiscal discipline and introduce budgetary responsibility rules, the IMF collaborates with several Member States. For countries to attract investment, they must demonstrate transparency and predictability — two key factors that increase the absorption capacity of EU funds.

The result of partnerships between IFIs and the European Commission supports the strengthening of governance standards in EU member states. By promoting transparency, fiscal discipline, and accountability in the management of public

resources, IFIs strengthen openness and public confidence in accessing and using European funds. Cooperation between international financial institutions and Romanian institutions creates a foundation for inclusive growth alongside the development of institutional capacity and efficiency.

4. Conclusion

International financial institutions are strategic partners of the European Union in ensuring the effective absorption of EU funds. Through their expertise, financial resources, and governance standards, they contribute not only to strengthening administrative capacity but also to reinforcing confidence in European financing mechanisms. Cooperation between EU Member States and IFIs remains a dynamic process that continuously generates valuable development models, reflected in interinstitutional collaboration, performance, and transparency.

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THE COHESION FUND AND THE ECONOMIC DEVELOPMENT OF CENTRAL AND EASTERN EUROPEAN REGIONS

Hadasa Ligia Pricopiuc

Doctoral School of Economics and Business Administration, Faculty of Economics and Business Administration, West University of Timisoara, Timisoara, Romania
hadasa.gag01@e-uvt.ro

Abstract: *European funds and their impact at regional level have gained significant attention because there is a desire to distribute funds as efficiently as possible and in such a way that regions benefit in proportion to their needs. The Cohesion Fund is the main instrument for supporting economic, social, and territorial development. However, the issue has been debated many times and no consensus has been reached. Some believe that the Cohesion Fund supports regional development, while others disagree. This paper therefore analyzes the impact of the Cohesion Fund on NUTS2 regional development in 11 countries in Central and Eastern Europe and how it achieves or fails to achieve its overall objective. The results show that an increase in the Cohesion Fund contributes to an increase in the composite indicator, which shows the result of the overall objective. In our analysis, the Cohesion Fund has a positive and significant impact on regional development and succeeds in achieving its overall objective.*

Keywords: Cohesion Fund; panel analysis; Central and Eastern Europe; regional development

JEL classification: O18; R11; R58

1.Introduction

The question has often been raised as to whether the Cohesion Fund is allocated to regions in a way that benefits them, or whether the policy for allocating funds should be changed. At the same time, Central and Eastern Europe is a region that has experienced conflicts, wars, and economic difficulties, which makes our analysis particularly relevant. The purpose of this paper is to analyze whether the Cohesion Fund contributes to regional and economic development and whether, through the amounts allocated, it fulfills its overall objective. Dicharry et al. (2019) show that the impact of the Cohesion Fund on GDP per capita may be conditioned by the country's inflation and public debt. Therefore, if a country has low inflation and moderate national debt, it benefits significantly from the Cohesion Fund. Other authors such as Mirošník et al. (2014) concluded that the biggest beneficiaries of the Cohesion Fund in a country are the most urbanized regions, such as capital cities. Pinar and Karahasan (2024) revealed that EU funds play an important role in regional development, but their effect may be diminished in the event of macroeconomic uncertainty. Hence, in this paper, we will analyze how the Cohesion Fund achieves its overall objective at the NUTS2 level: strengthening the economic, social, and territorial cohesion of the European Union.

2. Literature Review

Becker et al. (2012) conducted a generalized propensity score estimation to measure whether European Union funds stimulated development at the NUTS3 level between 1994 and 2006. The authors found that, overall, EU funds stimulate regional growth. However, 18% of regions experienced a decline, suggesting a more efficient allocation of funds. De Toni et al. (2021) highlighted the lack of territorial involvement in the distribution of European funds at the regional level. The authors believe that the lack of spatial concentration leads to regional development problems, especially for peripheral regions. Scotti et al. (2022) used spatial panel analysis to examine the impact of structural and Cohesion Funds at the European NUTS2 level for the period 2007-2014. The results of the study indicate economic growth and long-term benefits. The sectors that benefit most from these funds are infrastructure, research and development, energy, and human resources. In contrast, the environmental sector showed a slightly negative impact. Giannini and Martini (2024) found that European Union funds, especially the Cohesion Fund, play a big role in the regional convergence of GDP per capita at the NUTS2 level between 2000 and 2021. Along with this, physical and human capital also help with convergence. In addition to regional development, Kutan and Yigit (2007) found that cohesion and structural funds helped new members catch up with the living standards of member states and integrate economically. In contrast, Petrakos et al. (2025) report that the Cohesion Fund appears to favor regions with better infrastructure quality and investment levels. Thus, the literature highlights the support provided by the Cohesion Fund for regional development, economic integration, and living standards, but also its limitations.

3. Methodology
Various econometric methods were used for this research, such as: (1) fixed effects panel regression analysis; (2) random effects panel regression analysis; (3) robust regression model; (4) Arellano-Bond model; (7) maximum likelihood regression; (8) Poisson model; (9) regression with instrumental variables. To test the robustness of the results, models such as XTPCSE (Panel-Corrected Standard Errors) and XTSSC were used.

The dependent variable was created as a composite indicator using principal component analysis (PCA) from: GDP, motorway length (km), and railway length (km). The independent variables include: the level of education of the population, population size, unemployment rate, and the amount allocated from the Cohesion Fund. The variables were selected according to the general objectives of the Cohesion Fund from official sources such as Eurostat and European data (data.europa.eu).

The data was collected at NUTS2 level for 11 countries in Central and Eastern Europe (the Czech Republic, Poland, Croatia, Slovenia, Slovakia, Hungary, Romania, Bulgaria and the three Baltic States: Estonia, Latvia and Lithuania) for the period 2000-2022. The software used was Stata.

4. Results
The Cohesion Fund's overall objective is to reduce regional, economic, and social disparities among the regions of the Member States. In this way, it supports the overall harmonious development of the European Union. Using the methods

employed, we can highlight the impact of the Cohesion Fund on economic growth and the factors that contribute most significantly to its impact.

Table 1: Results of econometric analyses using Stata.

	(1) ln_Y	(2) ln_Y	(3) ln_Y	(4) ln_Y	(5) ln_Y	(6) ln_Y	(7) ln_Y	(8) ln_Y	(9) ln_Y
	Xtreg (fe)	Xtreg (re)	Rreg	Xtabond	Xtpcse	Xtscc	Xterg (mle)	poisson	iyreg
main									
ln_CF	0.00363***	0.00371***	0.00530***	-0.000610	0.00434**	0.00434	0.00371***	0.00414**	0.00434**
	(0.00104)	(0.00104)	(0.00135)	(0.000542)	(0.00145)	(0.00253)	(0.000680)	(0.00147)	(0.00145)
ln_Education	1.754***	1.741***	1.121***	0.166*	1.189***	1.189***	1.742***	0.910***	1.189***
	(0.172)	(0.170)	(0.0587)	(0.0659)	(0.0502)	(0.0587)	(0.0697)	(0.0477)	(0.0633)
ln_Population	-0.243	-0.211*	-0.188***	-0.159***	-0.178***	-0.178***	-0.212***	-0.134***	-0.178***
	(0.204)	(0.0998)	(0.0112)	(0.00959)	(0.0408)	(0.0169)	(0.0410)	(0.00900)	(0.0121)
ln_Unemployment	-0.0873***	-0.0886***	-0.127***	-0.0130***	-0.134***	-0.134***	-0.0885***	-0.0919**	-0.134***
	(0.0115)	(0.0116)	(0.00937)	(0.00328)	(0.0108)	(0.0151)	(0.00577)	*	(0.0101)
								(0.00705)	
L.ln_Y				0.891***					
				(0.0236)					
_cons	-2.827	-3.218*	-0.787*	1.742*	-1.181***	-1.181**	-3.208***	-1.714***	-1.181***
	(3.120)	(1.501)	(0.311)	(0.709)	(0.160)	(0.390)	(0.746)	(0.225)	(0.336)
sigma_u									
_cons							0.198***		
							(0.0190)		
sigma_e									
_cons							0.0785***		
							(0.00163)		
N	1212	1212	1212	1101	1212	1212	1212	1212	1212
R²	0.731	0.731	0.506		0.479	0.479			0.479

Standard errors in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

The results in Table 1 show that the Cohesion Fund (ln_CF) has a positive and statistically significant impact on the dependent variable (ln_Y) in most models (with the exception of the Arellano-Bond model). Similarly, the level of education (ln_Education) positively and significantly influences ln_Y in all models, while population (ln_Population) and unemployment rate (ln_Unemployment) have a significant negative impact.

The estimated coefficients, ranging between 0.0036 and 0.0053, show that a 1% increase in Cohesion Fund allocations leads, on average, to an increase of approximately 0.004% in the composite indicator ln_Y. This effect is robust across most estimation methods (fixed effects, random effects, MLE, robust models), confirming the positive contribution of European funds to economic convergence.

In our analysis, we use NUTS2 level data for 11 countries in Central and Eastern Europe, the territorial level also used for the implementation of Cohesion Policy by the European Commission. The use of NUTS2 data captures in detail the differences in regional development and the variation in the Cohesion Fund. The results of the analysis show a positive and significant effect of the Cohesion Fund on the composite indicator (GDP, kilometers of motorway, and kilometers of railway). The role of the Cohesion Fund in the convergence process is also confirmed. Although the magnitude of the results is modest, the dynamic model suggests that the actual effects manifest themselves gradually over time. Based on the results obtained, we can say that the Cohesion Fund plays an important role in regional development and achieves its overall objective.

5.Conclusion

The Cohesion Fund's overall objective is to strengthen the economic, social, and territorial cohesion of the European Union. The variables used were closely linked to this objective. The data used at the NUTS2 regional level allowed for a more detailed picture of the variation in the effectiveness of the Cohesion Fund. The models

showed that an increase in Cohesion Fund allocations leads to an increase in the composite indicator, which represents the outcome of the overall objective. The results show the contribution of this fund to the development of NUTS2 regions in the 11 countries of Central and Eastern Europe and their economic convergence. Although the scale of the results can be described as modest, the real effects are gradually becoming apparent over time. Thus, we can conclude that in the analyzed territory, the Cohesion Fund has a positive and significant impact on the regions and at the same time manages to achieve its proposed objective. The study is limited by the fact that the effects of the funds may be delayed over time and cannot be fully captured by the models used.

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Banks have been subject to the need to consolidate their internal business and operational model, both at strategic, tactical and operational level, so that the digital pillar has an increased importance in the organisation development. In the same time, they are required to follow new standards and regulatory changes, so that all the clients have a positive experience from their financial institution (Kaur et al., 2021).

Current analysis will concentrate in reflecting the importance of innovation and its evolution in the financial-banking sector. Business processes have changed in time both due to customer behaviour, but also due to competition among financial institutions. As it can be seen nowadays, the speed of implementation of technology is increasing, which is impacting the development of banking processes and leading to a profound transformation of the sector.

2. General overview of the existing literature

Financial-banking sector has been analysed from various perspectives, both from academics and practitioners. The literature is broad and covers multiple perspectives, from economic, technical, social and business point of view.

The theme of digitalization has been a quite debated one, as it is one of the subjects that is in continuous evolution and it is impacting the entire society, not only the financial sector.

A relevant aspect, approached by several authors, is related to the way in which innovation and technology have been integrated in the banking processes and what is the impact at the level of the financial institutions.

The evolution of the financial-banking sector has been marked by several technological innovations, which have contributed to the transformation of the processes, products and services offered by the financial institutions to their clients.

The literature reflects the fact that the financial-banking sector is in a continuous transformation and that the digitalization is one of the main drivers of this evolution (Vives, 2019).

At the same time, the existing studies highlight the importance of the adoption of new technologies and the implementation of innovation in the banking processes, as a key factor for the competitiveness and sustainability of the financial institutions.

In the context of digitalization, the financial-banking sector has been subject to a profound transformation, which has impacted the way in which the financial institutions interact with their clients and the way in which the banking processes are conducted.

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The strong impact of digitalization in the financial sector is seen not only in economy and business; it can be identified contemporarily in academics. Performing a query in Web of Science with the wording "new technologies in financial services" have resulted over 11.000 results, over 6.000 of them being present in WoS Core Collection.

What can be noticed is the existing potential for further development of the subject in theory and in practice. Even though there are numerous papers published, there is the opportunity for research improvement.

2. Research Questions

Motivation for selecting such a theme is associated with the challenges and opportunities present in the research.

There are several study questions that could be addressed, in order to have a better understanding of the background:

- Which have been the technologies that have transformed the international financial-banking sector?
- Which are the challenges and opportunities associated to the implementation of new technologies in global financial-banking market?
- Security and more specifically, cybersecurity is a barrier or a promoter of digitalisation in the industry?
- What lessons can be learnt from the analysis performed?
- Which are the possible scenarios of evolution for international financial-banking sector?

3. Methodology

Initial research will be structured to answer to the study questions.

To reach this result will be mapped the main concepts, specific literature will be reviewed, bibliometric analysis after key words and abstracts, using specific programs to map relevant literature on the subject.

4. Results

Performing a first assessment on the evolution of digitalization in international financial-banking sector have been identified several periods, many of them associated to the launch of alternative channels. The first moment is linked to the putting in place of the first automated teller machine in England, followed by Sweden – summer of 1967 (Thodenius et al., 2010).

In New York in 1982 have been launched the online services, when four of the city's major banks (Citibank, Chase Manhattan, Chemical and Manufacturers Hanover) offered home banking services using the videotex system (Cronin, 1997) (Koskosas, 2011). According to K Devi and Devadutta Indoria (2020) some financial institutions were offering electronic banking to their customers in 1985. The expansion on the use of electronic banking came into place with the launch of the internet that has been one of the key innovations in business (Agwu, 2013).

Another key moment has been the launch of the first smart phone in 2007 that together with the internet changed forever the communication and interaction behaviour in numerous economic and social processes and services. From that

instant on, the innovation advanced continuously in most of products offered by financial institutions.

Currently, there are mobile applications that include budget management, automated investments, scheduled payments, virtual cards, biometric authentication, smart phones being used on a large scale for financial services (Oliveira et al., 2016). Digital transformation contains cloud banking, API for integration with Fintechs (Gomber et al., 2018), tools for advanced analysis, artificial intelligence and chatbots answer to questions, identify client needs and propose personalised services. Furthermore, AI is utilised in fraud detection, to raise the cybersecurity level. Blockchain is bringing a new approach to the management of financial data, offering further transparency and security (Danțiș, 2021).

Among the priorities of financial sector is the design of client experience. This can be seen in the services that were requiring in the past, physical presence in the branches (Front Office) and can be done in present through alternative channels, centralised platforms and virtual assistants. In this perimeter can be included client on boarding, Know Your Customer (Arner et al., 2019), selling of financial services and products.

In Middle Office area can be seen automations in: analysis using Big Data and interactive dashboards, in Treasury processes or selling of investment products, utilisation of alternative channels for communication, personalised offers, process digitalization (Von Solms et Langerman, 2022).

Back Office in banks is witnessing the use of AI for efficiency in standardized processes, decrease of payments' processing time, automation in data input or control execution, handling of documents (Ling et al., 2020).

As the retail area is offering numerous opportunities in business development, merchants can use smart phones for digital payments or benefit from the existence of e-commerce platforms (Paun et al., 2024).

Based on an evaluation of the European Central Bank (2025), at the end of 2024 for Euro area have been identified around 60 banks, having a business model founded only on digital. The same source indicates that the market share of digital banks increased from 3,1% of total assets in 2019 to 3,9% in 2024.

As a general idea can be stated that digital banks will continue to develop and to generate value. Citing Statista platform, in the digital banks (only) market, the projected Net Interest Income worldwide is set to reach US$1.56tn in 2025. Looking ahead, it is expected that the Net Interest Income will display an annual growth rate (CAGR 2025-2030) of 7,07%, leading to a market volume of US $ 2.20tn by 2030.

Considering the above mentioned forecasts, can be seen clearly the opportunity for market evolution and research, to analyse further the impact of digitalization on the international financial-banking sector.

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APPRAISAL OF THE CHANGES REGISTERED IN THE BANKING. TRANSACTIONS RECONCILIATION PROCESS

Dragoș Danțiș
International Business and Economics PhD. School, Bucharest University of Economic Studies, Bucharest, Romania
dragos.dantis@gmail.com

Abstract: *One of the core processes of any financial and banking institution is the transactions reconciliation process. Even though it may be seen as a marginal component in the portfolio of processes existing in the bank, it has a crucial role, as it allows the monitoring and tracking of items on the accounts. In this way the bank staff is aware if various types of transactions have settled accordingly, if there are open items that require investigation cases, in order to prevent unbalance on the accounts. The principles behind the functioning of this process, are quite common to the accounting area and if managed in an efficient and effective approach, bring benefits to the organization. Banking entities compared to other economic players have increased exposure to the market due to their role, therefore a proper reconciliation of the accounts prevents losses, guarantees business maturity and stability and meets regulatory requirements. Current appraisal will have a look at the reconciliation process between banks and at the latest updates registered that are using the blockchain-distributed ledger technology.*

1. Introduction

Inspiration for the creation of this study was an earlier paper from 2021 where I have investigated the use of blockchain in European banking industry. One application area was the transactions reconciliation process, where I have mentioned briefly the project Spunta Banca DLT (Danțiș, 2021).

Within current article I have decided to provide more information regarding this project and how this initiative is impacting banking transactions reconciliation.

The principles that govern this process are quite common to the ones of accounting. Historically one of the first indications regarding Accounting, associates to the Italian Mathematician, Luca Pacioli that wrote and published around 1490, his paper''*Particularis De Computis Et Scripturis".* This is considered to be the first writing mentioning the double-entry bookkeeping, debits and credits, account types, journal and ledger (Bunget et al., 2013).

Usually by banking reconciliation is understood linking the balance sheet to the corresponding amount on the bank report. The process allows the matching of the totals from the bank reports to the bank account registers and from the bank account registers to the statements. In this way the staff of the bank will be certain that records are precise and reliable. In case of variances or inaccuracies, they have to be resolved and reconciled manually, to assure the balance of the accounts.

The banking process reconciliation applies as well to the accounts opened between banks, such is the case of corresponding ones, which allow the realization of transactions in various coins and for various transactions typologies (e.g. payments, cheque clearing, treasury, trade finance, liquidity).

Spunta Banca DLT project, mentioned briefly in my previous article has been opened several years ago, inside Italian Banking system, under the sponsorship of Italian Banking Association (known as ABI) and coordination of ABI Laboratory (ABILab - innovation and research centre). The perimeter of the initiative had in scope the banking accounts reconciliation process.

2. Research Questions
The research questions for the construction of this study are the following:
- Is there the possibility to identify on the market a business case / pilot project that functions alternatively to the traditional transactions' reconciliation process?
- The new project identified can be considered for roll-out in another perimeter?

3. Methodology
The methodology is based on comparing the realities of the current model in banking transactions reconciliation process and the ones of the pilot project. Subsequently I have tried to have some high-level conclusions where to indicate if the findings of the project can be extended to other areas.

4. Results
The reconciliation process at financial institution or bank level can be an internal or external one. In the first case the activity is being performed in tracking, matching and investigating at accounting level the items on the internal accounts of that organization. For the second situation the activity is being realized in tracking, matching and evaluating at accounting level the transactions present on the accounts opened with other banks, from the same country or from another state.

In the financial-banking industry a well-known example of the transactions reconciliation process relates to the Nostro / Vostro accounts (Summers, 1994). A bank that is involved in international trade, foreign exchange transactions or cross border payments and does not have a physical presence in a foreign country has to open and maintain a Nostro account.

Usually, this type of account is held by a bank with a foreign financial entity in the domestic currency of the country, where the money is being detained. For the second bank, where the account is being opened, the Nostro account is a Vostro account (Summers, 1994).

What is common for both financial organizations is the fact that they have to guarantee the performance and settlement of the transactions and keep evidence of the movements on the account.

The second bank will send every day via Society for Worldwide Interbank Financial Telecommunication (SWIFT) message MT950 an account statement to the first bank that has opened the Nostro account. The account statement will be uploaded in a specialized software, where the Nostro reconciliation process will take place. Based on the existing agreements, on the typology of the transactions and on the technical

rules created and put in place in the tool, an automated reconciliation process will start, resulting in the automated matching of the transactions.

In situations when a transaction does not arrive to be settled, the matching process does not take place under defined rules and an investigation case is being opened to clarify the position. This will imply contacting the other bank and perform an evaluation why the transaction was not settled. Sometimes the banks have to contact their clients, the payer and the receiver, to obtain more information or to provide more details. As soon as the event will be solved, the suspended item on the account will be matched and the investigation case will be closed.

Taking into consideration, this process involves numerous entities at international level and that banks have to answer to client requests on an improved manner, on the market has appeared the question if the transaction reconciliation process can be enhanced.

One example that has raised the attention for a possible upgrade of the banking process, has been the Spunta DLT project, run at the level of the Italian banking system. The initiative was implemented on the internal Italian interbanking spunta-reconciliation process, using a specific network infrastructure and distributed ledger technology.

The accounts held between the Italian banks even though could be seen in a Nostro / Vostro approach, functioning and reconciliation had several particularities. The first one was linked to the existence of old banking agreements, impacting the way the account was managed. The nature of the correspondent account implied that the ownership of the account was held for a long period of time, only by one party, influencing the transparency level of the information. Furthermore, the matching rules did not allow increased efficiency, statements were sent with low frequency and it was quite complex to collaborate to solve the pending items.

Initial proof of concept was performed in 2018, involving several banks, several nodes of infrastructure and the upload of numerous transactions on the agreed platform. Compared to the initial flow, the target operating model has considered daily reconciliation of items.

Activity has been supported by a provider of network infrastructure that runs contemporarily a payment mechanism in Europe, in SEPA area.

Perimeter of the project has been extended gradually; even more banks being involved in the testing. In 2020 over 100 banks moved to the new platform and new process in place, indicating major change in the performance of an old banking practice.

After the launch in production of the new process, have been observed several benefits:
- efficiency of the process due to the increase of the automation level;
- increased transparency of the information among the banks;
- enhanced communication;
- decrease of operational risks;
- process standardization at industry level.

What can be noticed from the experience of the Spunta DLT project is the strategic achievement, leading to an upgrade of an old and complex banking process.

Considering this result, the project has been proposed to be evaluated for further roll-out inside Europe. Based on the indication present on the site of the ABI

Laboratory several banks are testing the model for the accounts that receive informational flow through SWIFT messages MT950 (ABILab).

The proposal initiated by the working group in ABI is quite challenging. There may be an increased level of complexity in the new considered perimeter, provided by different operating rules, ecosystems, legal aspects and size of the testing area.

The activity has to be evaluated further in terms of lessons learnt and what could be used for future implementations. Currently at international financial-banking system is the strategic trend of decentralized finance or DeFi, which implies as well the use of blockchain technology. One of the areas where decentralized finance is having a significant impact is the payments landscape, including the ones going through SWIFT network, which have to be monitored subsequently through the reconciliation process. Even though, the future may integrate a hybrid approach, where features of decentralized finance and central model could function together (Todorova et al., 2025). To enforce this idea, even SWIFT is testing and evaluating with other financial actors the use of blockchain-distributed ledger technology for Nostro account reconciliation (SWIFT, 2018).

It is said that in many cases history repeats itself. Based on this indication, has to be seen if the Italian banking system and the project working group will have a strategic impact on the international financial-banking sector as Luca Pacioli had on the accounting development.

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technologies, which are reshaping the operational and decision-making frameworks of financial institutions.

In this context, the banking sector has undergone profound changes driven by digital transformation, automation, and the increasing integration of data-driven technologies. Financial institutions are now operating in an environment characterized by rapid technological progress, where artificial intelligence (AI) is becoming a central element in reshaping traditional banking operations. The ability to analyze large volumes of data, identify patterns, and support decision-making processes positions AI as a strategic resource for improving efficiency and profitability.

The motivation for this research arises from the need to understand how macroeconomic factors influence banking profitability and how these relationships can provide a foundation for the strategic adoption of artificial intelligence. While numerous studies have analyzed the determinants of banking profitability, relatively few have connected these findings to the emerging potential of AI technologies in the financial sector. This study aims to address this gap by providing empirical evidence on the macroeconomic determinants of profitability in the Romanian banking system and by discussing how these insights can support the integration of AI-based tools.

The main objective of this paper is to examine the relationship between key macroeconomic indicators—GDP growth, inflation rate, and unemployment rate—and banking profitability, measured through Return on Assets (ROA) and Return on Equity (ROE). By applying a multiple linear regression model, the study seeks to identify which factors exert the most significant influence on profitability and to interpret these results in the broader context of digital transformation.

The remainder of this paper is organized as follows. Section 2 reviews the relevant literature on banking profitability and the role of macroeconomic determinants. Section 3 describes the data and methodology used in the analysis. Section 4 presents the empirical results and discusses their implications. Finally, Section 5 concludes the study and outlines directions for future research, particularly regarding the strategic adoption of artificial intelligence in the banking sector.

tools, which have the potential to enhance forecasting accuracy and risk management efficiency.

The main objective of this research is to empirically analyze the impact of key macroeconomic indicators, such as GDP growth rate, inflation rate and unemployment rate, on banking profitability in Romania, measured through ROA and ROE.

This paper contributes to the existing literature by offering empirical evidence from a recent economic period and by outlining how AI-based analytical capabilities may support profitability optimization. The structure of the paper includes a brief review of relevant research, presentation of the methodological approach, discussion of empirical results, and final conclusions with policy and strategic implications.

2. Literature review

A recent study by Hussain and Zuhri (2025) examines the relationship between labor market conditions and banking profitability, focusing on the moderating effect of gross national income per capita. The authors find that rising unemployment significantly reduces both ROA and ROE, mainly due to higher credit risk and lower loan demand. Their results also show that higher national income levels mitigate these adverse effects, suggesting that economic development strengthens the resilience of the banking sector. Moreover, control variables such as cost-to-income ratio and leverage negatively influence profitability, whereas bank size and GDP growth have a supportive role. These findings highlight the importance of considering both macroeconomic conditions and structural financial characteristics when evaluating bank performance, reinforcing the need for more advanced tools, including AI-driven risk assessment models, to enhance resilience in fluctuating economic environments.

Spulbar and Birau (2019) emphasize that in transition banking systems the sustained profitability of banks depends not only on macro-economic stability but increasingly on their ability to anticipate and adapt to cyclical fluctuations. This insight underlines the importance of advanced analytical capabilities, such as artificial intelligence-driven forecasting and risk-assessment systems, as enablers of banking resilience in volatile macroeconomic environments.

3. Research Methodology

The aim of this research is to examine the extent to which key macroeconomic factors influence banking profitability in Romania over the period 2010-2024.

Bank profitability represents a central indicator of financial system performance and resilience. In this study, profitability is assessed using two complementary measures: Return on Assets (ROA) and Return on Equity (ROE).

The research focuses on three macroeconomic variables that reflect broader economic conditions: the GDP growth rate, the inflation rate and the unemployment rate.

To empirically evaluate the relationship between banking profitability and the selected macroeconomic factors, the following hypotheses are formulated:

H1: GDP growth has a positive and statistically significant effect on banking profitability (ROA and ROE) in Romania.

H2: The inflation rate exerts a negative influence on banking profitability.

H3: The unemployment rate has a negative and statistically significant effect on banking profitability.

These hypotheses will be tested through econometric estimation techniques, allowing for a comparative interpretation of how macroeconomic conditions shape profitability from both an operational and shareholder return perspective.

The datasets used in this analysis were obtained from reputable international institutions: the International Monetary Fund and Eurostat. All variables were measured on an annual basis to maintain consistency and allow coherent cross-variable comparison.

Descriptive statistics indicate moderate profitability in the Romanian banking sector, with a relatively stable ROA and a more volatile ROE, suggesting greater sensitivity of shareholder returns to financial cycle fluctuations. Macroeconomic conditions reflect modest economic growth, alternating inflationary pressures and a comparatively stable labor market.

To examine the influence of macroeconomic factors on profitability, two multiple linear regression models were estimated using the Ordinary Least Squares (OLS) method, with ROA and ROE serving as dependent variables. To address potential heteroskedasticity and autocorrelation in time-series data, Heteroskedasticity and Autocorrelation Consistent (HAC) standard errors (Newey-West adjustment) were applied, improving the reliability of the coefficient estimates. Pearson correlation analysis was also used to assess the initial direction of variable relationships. All statistical processing was performed using EViews software.

4. Findings
4.1. Regression Results for the ROA Model

The ROA regression model explains approximately 50 percent of the variation in bank profitability (Adjusted R-squared = 0.499) and the model is statistically significant overall (Prob(F-statistic) = 0.0189). Among the macroeconomic variables, the unemployment rate is the only significant determinant of ROA (p = 0.0057), with its negative coefficient indicating that higher unemployment reduces asset profitability of the banking sector by weakening credit performance. GDP growth and inflation show the expected coefficient signs but are not statistically significant, suggesting a limited direct impact on ROA during the analyzed period. The model diagnostics confirm specification validity and robustness after applying HAC standard errors.

The model explains approximately 61% of the variation in ROA (R^2 = 0.61), which indicates a moderate explanatory power suitable for annual macroeconomic data. The Durbin-Watson statistic (1.89) suggests no autocorrelation problems and the use of HAC-Newey West robust corrections ensures the reliability of coefficient inferences.

The negative coefficient of unemployment indicates that weaker labor market conditions reduce asset profitability. The positive GDP coefficient suggests that economic expansion enhances bank performance, although the effect is not statistically strong. Inflation demonstrates no significant influence on ROA, which may suggest efficient interest margin adjustments by banks.

4.2. Regression Results for the ROE Model

The regression results indicate that among the macroeconomic variables included in the model, the unemployment rate is the only statistically significant determinant of ROE at the 5% level. The estimated coefficient for unemployment rate is negative and statistically significant (-4.4096, p = 0.0110), implying that an increase in unemployment by one percentage point leads to a substantial decrease in bank profitability. This supports the notion that adverse economic conditions weaken credit demand and elevate credit risk, ultimately reducing banking sector performance.

The coefficient associated with GDP growth is positive, suggesting that economic expansion tends to improve profitability. However, the effect is not statistically significant, meaning that economic growth does not exert a consistent or strong influence on ROE during the examined period.

Similarly, the inflation rate displays a negative but statistically insignificant effect, indicating that inflation variability does not meaningfully contribute to changes in banking profitability under the observed economic conditions.

Overall, the model explains approximately 59% of the variation in ROE (R-squared = 0.5927), reflecting a moderate explanatory power. The Durbin-Watson statistic of 1.75 suggests no presence of significant autocorrelation in the residuals. The Wald F-statistic (p = 0.0424) confirms that the model is statistically significant as a whole.

The results suggest that among the selected macroeconomic variables, the unemployment rate plays the most influential role in determining banking sector profitability in Romania during the period 2010-2024. Higher unemployment significantly reduces the return on equity, while GDP growth and inflation do not demonstrate statistically meaningful effects. These findings highlight the sensitivity of the banking sector to labor market conditions and underline the importance of macroeconomic stability in sustaining financial performance.

5. Conclusion

The empirical evidence indicates that banking profitability in Romania is shaped primarily by labor market conditions, with both ROA and ROE declining as unemployment rises. This underlines the sensitivity of credit performance to periods of economic stress and emphasizes the importance of timely risk assessment. GDP growth contributes moderately to profitability, while inflation shows no significant effect, suggesting that traditional macroeconomic drivers alone do not fully explain profitability dynamics. These results highlight the need for banks to strengthen credit risk management and provisioning policies, particularly in response to labor market fluctuations. In this context, the strategic adoption of artificial intelligence becomes increasingly relevant, as AI-based credit scoring, default prediction models and automated portfolio monitoring can enhance early risk detection and support more resilient decision-making.

The findings of this study differ from part of the literature that identifies, for example, GDP growth as a strong determinant of banking profitability, as our results show only a weak and statistically insignificant relationship. This divergence may be linked to structural and regulatory characteristics specific to the Romanian banking sector and to the limitations of using a small annual dataset. These aspects suggest that macroeconomic variables alone do not fully explain profitability dynamics. Future research should therefore include bank-specific indicators, such as the net interest

margin, cost-to-income ratio, loan-to-deposit ratio, non-performing loans ratio and capital adequacy ratio, to provide a more comprehensive understanding of profitability drivers. Incorporating these variables would also support the assessment of how AI-based analytical tools can enhance risk management and operational efficiency in banking.

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Eurostat website, https://ec.europa.eu/eurostat/data/database

International Monetary Fund website, https://www.imf.org/en/Data

FINANCIAL REPORTING IN ROMANIA: BETWEEN REGULATORY COMPLIANCE AND USER RELEVANCE

Teodora Cucerzan , Ramona-Ionela Haraguș

1 December 1918 University of Alba Iulia, Romania
cucerzan.teodora.sdc2021@uab.ro, haragus.ramona.scd2021@uab.ro

Abstract: *The evolution of financial reporting in Romania reflects a gradual transition from rule-based accounting to principle-based regulation under International Financial Reporting Standards (IFRS). While this process has improved formal transparency, it has not necessarily enhanced the informational relevance of financial statements. This paper examines the relationship between regulatory compliance and user-oriented communication, assessing whether Romanian listed companies provide financial information that is not only accurate but also meaningful for decision-making. The study covers annual reports for the period 2020–2024 issued by companies listed on the Bucharest Stock Exchange. Using qualitative content analysis, it evaluates disclosures under IAS 1 (Presentation of Financial Statements), IAS 7 (Statement of Cash Flows), and IAS 12 (Income Taxes). The focus lies on clarity, coherence, and interpretive depth rather than on the mere completeness of disclosure. Findings indicate that Romanian companies maintain high technical compliance with IFRS, yet financial reports often remain formal, standardized, and detached from the underlying business context. Explanations are brief, repetitive, and predominantly aimed at satisfying auditors rather than informing users. The study concludes that compliance alone does not ensure transparency and proposes a "user-informed compliance" framework that reconciles regulatory discipline with communicative substance.*

Keywords: Financial reporting; IFRS; disclosure quality; user relevance; compliance; Romania

JEL classification: M41, M42

1. Introduction
Financial reporting has evolved from a regulatory obligation into a central tool of corporate communication. The implementation of IFRS aimed to enhance comparability, reliability, and international consistency. However, in emerging markets such as Romania, the adoption process has emphasized form over meaning. Financial reports are increasingly comprehensive but not necessarily comprehensible.

The objective of this study was to identify how the balance between compliance and communication is reflected in Romanian corporate reporting. The central questions addressed are: How does regulatory conformity affect the interpretability of information? Does strict compliance guarantee relevance for report users?

The study contributes to the broader literature on reporting quality by analyzing real company disclosures rather than theoretical frameworks, providing insight into the communicative limitations of IFRS application in Romania.

2. Theoretical Overview

The conceptual framework of IFRS defines relevance, faithful representation, and understandability as essential qualitative characteristics of useful financial information. In practice, the connection between these principles is fragile. As noted by Barth, Landsman, and Lang (2021), the growing complexity of standards increases comparability but simultaneously reduces interpretability.

Flower (2015) and Nobes (2022) underline that excessive formalization can obscure meaning and turn financial reporting into a compliance exercise rather than a communicative act. In the Romanian context, Albu and Albu (2012) and Bunea (2020) argue that IFRS adoption was primarily driven by the need to meet external regulatory expectations, not by the internal demand for improved financial dialogue. Recent research (Albu et al., 2024; Bunea, 2023) continues to highlight the persistence of this imbalance: accounting disclosures in emerging markets often display international form but local substance. The tendency to replicate templates and avoid interpretive commentary diminishes the capacity of reports to convey the economic reality behind figures.

3. Methodology

The study employed a qualitative content analysis of annual reports prepared by a sample of Romanian listed companies from various sectors, covering the years 2020–2024. Reports were selected from the Bucharest Stock Exchange database to ensure accessibility and consistency.

Three disclosure areas were examined:

IAS 1 – Presentation of Financial Statements, to assess how accounting policies and management judgments are communicated;

IAS 7 – Statement of Cash Flows, to analyze whether cash movements are explained in a manner useful to readers;

IAS 12 – Income Taxes, to evaluate the clarity of tax-related disclosures and their connection to fiscal risks.

The analysis focused on the presence of narrative interpretation, coherence between financial and textual sections, and the use of explanatory language. Observations were categorized as high, moderate, or low interpretive quality.

4. Findings and Discussion

The analysis confirms a pattern of strong compliance and weak communication. Companies uniformly follow IFRS formats and provide extensive notes, but these are often written in a technical and impersonal tone. Many accounting policy notes are identical across years, showing limited adaptation to business changes.

In the cash flow sections, disclosures accurately present movements but rarely interpret their causes or strategic implications. Income tax notes are typically exhaustive in data but lack commentary on uncertainties or fiscal management strategies. The resulting impression is one of formal completeness but informational inertia.

Narrative parts of reports, such as management discussions, are not always coherent with numerical disclosures. This disconnect weakens users' ability to link financial results with business decisions. The language used in reports is precise yet inaccessible, shaped more by audit expectations than by the goal of communicating with investors.

The findings align with prior observations from Bunea (2020) and Nobes (2023), confirming that compliance culture in Romania prioritizes regulatory discipline over interpretive communication.

5. Implications
The study suggests that Romania's financial reporting environment remains compliance-oriented, emphasizing control and uniformity at the expense of user understanding.

Practical implications include the need for professional initiatives to strengthen the communicative side of financial reporting, including narrative reporting guidelines, accounting education focused on interpretation, and a shift in audit practices toward assessing informational value, not just completeness.

Theoretical implications reinforce the view that IFRS enhances formal transparency but not necessarily comprehension. True reporting quality lies in integrating regulatory rigor with clarity and contextual meaning.

6. Conclusions
The results demonstrate that while Romanian listed companies comply with IFRS requirements, their reports often lack interpretive relevance. Disclosures are technically precise but seldom contextualized. Excessive standardization and cautious language reduce the communicative function of financial reporting.

To enhance transparency, companies must balance formal compliance with a user-oriented approach that prioritizes clarity and interpretive content. The proposed concept of "user-informed compliance" reflects this synthesis, combining the precision of IFRS with the narrative and explanatory needs of users.

Future research may extend this analysis to integrated and ESG reporting, examining whether these frameworks succeed in bridging the gap between compliance and user understanding in emerging markets.

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THEORETICAL APPROACH TO THE RECOGNITION AND REPORTING BY COMPANIES OF INVESTMENTS IN RESEARCH AND DEVELOPMENT

Ionela Magdalena Nedela
Doctoral School of Economics and Business Administration, West University of Timișoara, Romania
ionela.nedela79@e-uvt.ro

Abstract: *The topic of investments in research and development is a dynamic one, as we live in an era dominated by technology and environmental protection, where companies are increasingly driven to innovate an activity that naturally requires investment. It is also highly relevant in the current context of digitalization, the growing importance of intangible assets, and the increased need for transparency and efficiency. This article explores the importance and methods of recognizing and reporting research and development (R&D) investments in companies' financial statements, from the perspective of two regulatory frameworks: national and international. Essentially, this paper highlights that harmonization of internal and external accounting is one necessary condition for recognition and reporting of R&D investments, being one of the bases for improving corporate competitiveness and moving the Romanian economy to European standards.*

Keywords: research and development; investments; financial reporting; performance; intangible assets.

JEL Classification*: M41; O32.

1. Introduction

Economic theories and empirical studies indicate that research and development activities represent the most important factor in long-term economic growth and development (Romer, 1990; Grossman & Helpman, 1991). Therefore, it is anticipated that developed countries will prioritize R&D investments in order to accelerate economic growth and avoid stagnation at a medium level of development.

The objective of this article is to identify the particularities in the recognition and reporting of R&D investments in companies' financial statements, according to international regulations (IAS 38 – Intangible Assets) versus national regulations (OMFP 1802/2014). The topic is relevant in the current context of digital transformation, the increasing share of intangible assets, and the growing demand for transparency. Moreover, it aims to clarify how current accounting policies and legal regulations influence investment decisions and financial performance, taking into account the permissions and limitations of both reporting frameworks.

2. The Macroeconomic Context of Research and Development Investments

Romer (1990) and Grossman & Helpman (1991) argue that investments in knowledge and technology lead to long-term economic growth. Dugar and Pozharny (2021) also show that accounting standards do not fully capture the value of intangible assets, which results in their underestimation in financial statements. Regardless of the conclusions reached by previous studies, it is evident that R&D investments contribute to increased competitiveness and innovation, acting as a determining factor for technological progress. Currently, as a member of the European Union, Romania seeks to align with the average R&D spending levels of EU and European Economic Area (EEA) countries, where R&D expenditure exceeds 2.22% of GDP (OECD, 2023). However, according to data from the National Institute of Statistics (INS, 2023), Romania's R&D spending represents only 0.51% of GDP, placing it below the EU average. In 2022, R&D expenditure in Romania accounted for just 0.46% of GDP - 0.29% from the private sector and 0.17% from the public sector (INS, 2023). According to Eurostat, in 2021 the EU countries with the highest R&D intensity relative to GDP were Belgium, Sweden, and Austria, which maintained their leading positions through 2023, while Romania remained at the lower end of the ranking (0.47%–0.51%) throughout the analyzed period.

To visualize which countries, invest the most in R&D, regardless of funding source (public or private), Figure 1 presents a *thematic map* of R&D expenditure at a European level for period 2020 – 2023, which emphasizes the most relevant regional innovation hubs.

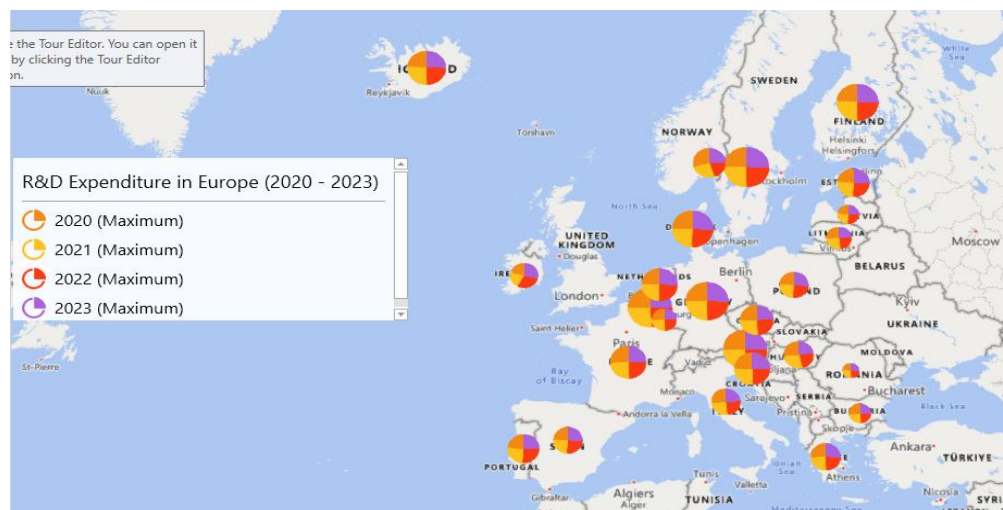**Figure 1. Mapping R&D Expenditures in Europe (2020–2023)**
Source: Author's projection based on OECD data

The map highlights significant differences among the member states of the European Union and the European Economic Area regarding investments in research and development (R&D). It is clearly visible that Northern and Western European countries (Sweden, Germany, Austria, and Belgium) record the highest

levels of R&D expenditure as a percentage of GDP, maintaining also in 2023 their status as regional innovation hubs. By contrast, Eastern European countries, including Romania, remain below the European average, reflecting the limited importance given to the financing and prioritization of innovation activities. This reality underscores the need for convergence, and coordinated policies aimed at stimulating research and development investments across Europe, particularly in countries such as Romania.

Figure 2 presents a ranking of R&D Expenses in EU for 2020 – 2023 as a percentage in gross domestic product (GDP).
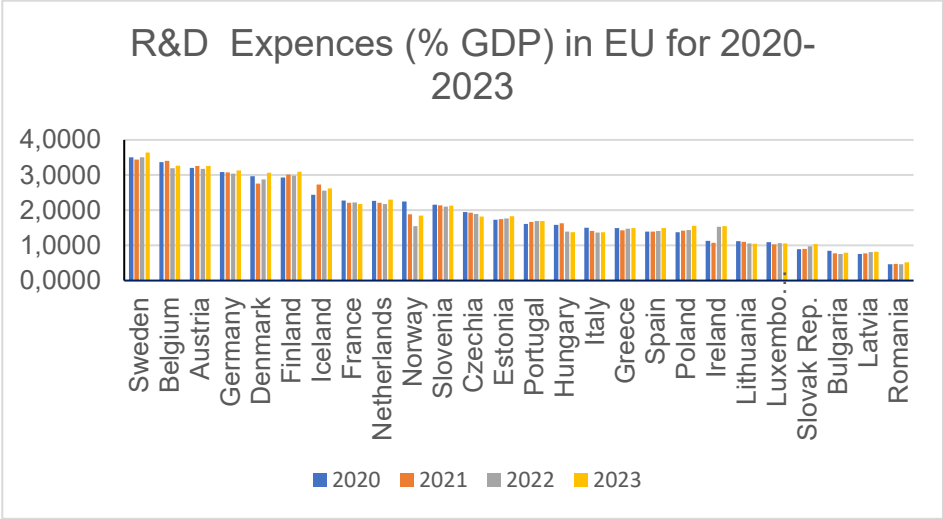
Figure 2. R&D Expenditures in Europe, 2020–2023 (% of GDP)
Source: Author's projection based on OECD data

The analysis of the graph above reveals a consolidation of the position of Northern European countries (Sweden, Belgium, Austria, and Germany), which have consistently maintained the highest levels of R&D expenditure, ranging between 2.5% and 3.5% of GDP, with slight increases in 2023. At the opposite end, Eastern European countries (Romania, Bulgaria, and Latvia) have remained below 1%, showing no significant variation over the four-year period, although Romania recorded a slight upward trend (from 0.47% to 0.51%). Overall, the data confirm the persistence of the gap between European regions, highlighting a stronger concentration of innovation investments in the more developed economies of Northern and Western Europe.

3. Comparability of Accounting Reporting Frameworks

The applicable regulatory framework is represented by IAS 38 (*Intangible Assets*) and OMFP 1802/2014. IAS 38 allows recognition of internally generated intangible assets only if future economic benefits are probable and the costs can be measured

reliably, while OMFP 1802 imposes more restrictive criteria. The comparative analysis of these regulations constitutes the core of this study.

Under IAS 38, the clear distinction between research and development phases and the capitalization of the development phase (when criteria are met) create a well-structured mechanism for transforming expenditures into assets that subsequently reflect performance. Conversely, under the more rigid OMFP 1802, capped useful lives and the inclusion of certain categories, such as formation expenses, lead to differing distribution restrictions, which affect comparability. Furthermore, the relevance of earnings decreases as the share of intangible assets increases (Dugar & Pozharny, 2021); however, detailed R&D disclosures (policies, directions, capitalization criteria, impairment testing) compensate for part of the inherent opacity of intangibles, the key concept being transparency.

At the international level, the regulatory frameworks governing intangible assets are represented by three standards: IAS 38 (accounting), IVS 210 (valuation), and ISA 620 (audit). Georgiou (2025) conducted a comparative study on four aspects: recognition and measurement, disclosure and reporting, valuation approaches, and audit considerations, finding a strong alignment between IAS 38 and IVS 210 in recognition criteria, valuation methods, and disclosure practices, while ISA 620 diverges due to its broader audit focus.Therefore, understanding and correctly applying all these standards is essential for a comprehensive view of financial reporting on intangible assets and, consequently, on R&D investments.

Empirical research highlights that R&D investments positively influence financial performance, and without research and development, the economic environment and indeed the world, would not be the same. It can truly be said that R&D investments finance value itself: an evolution whose recognized, governed, and disclosed portion determines how much of that value becomes visible, fundable, and rewarded by the market. Bubić and Šušak (2015) demonstrated a positive correlation between the share of intangible assets and return on assets, while Nandy (2022) showed that in industries such as pharmaceuticals and beyond, R&D investments lead to improved performance. Likewise, transparency in R&D reporting plays a key role in reducing the cost of capital (Walter et al., 2022).

4. Conclusions

Investments in research and development represent a key driver of corporate performance. This paper emphasizes the importance of correctly and strictly implementing accounting standards and ensuring transparent reporting capable of reflecting the true value of intangible assets. In conclusion, Romania has a high potential for convergence with the European average, even though significant gaps persist, reflecting both, the level of economic development and the prioritization of innovation.

The study presents certain limitations and constraints caused by the absence of empirical data and detailed applied research regarding R&D investments of companies in Romania, being mainly based on theoretical and comparative sources (IFRS, OECD, EUROSTAT, INS). Future research directions could include

bibliometric and empirical analyses based on financial data to highlight the correlation between innovation investments and economic performance, as well as the impact of fiscal and accounting policies and reporting transparency on investment attractiveness.

Overall, correlating the results obtained from this line of research with international trends could contribute to increasing the degree of convergence between the Romanian and European economies and, consequently, to promoting innovation, digitalization, and transparency in the recognition and reporting of R&D investments.

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RESEARCH TRENDS IN NON-FINANCIAL REPORTING DETERMINANTS AND THEIR CONNECTIONS WITH BUSINESS PERFORMANCE: A BIBLIOMETRIC PERSPECTIVE

Drăgoiu Simona Elena

"1 Decembrie 1918" University of Alba Iulia, Romania

dragoiu.simona.sdc2025@uab.ro

Abstract: This paper presents a bibliometric analysis of the literature on non-financial reporting and the impact of entity performance. The purpose of the article is to identify the most significant factors in non-financial reporting, the most widely used theories, and the empirical relationship between ESG/CSR and organizational performance. The study uses a bibliometric approach, with data collected using the Web of Science platform and analysed with the Vos Viewer tool. The expected results highlight the increase in publications for the analysed period 2020-2025, which areas dominate, such as corporate governance, sustainability, ESG, and the theories used. The methodology used is quantitative, bibliometric for the metric presentation of the status of the specialized literature. The limitations of our research are those specific to a bibliometric study, namely that we did not perform a critical analysis. The article consolidates the theoretical support for future research and highlights gaps such as the effects of these types of information on sustainable performance.

Keywords: Non-financial reporting, ESG, bibliometric analysis, CSR, firm performance

1. Introduction

The literature suggests a research gap in which there is discussion about how this reporting influences performance and which are the most significant factors in non-financial reporting, the most widely used theories, and the empirical relationship between ESG/CSR and organizational performance. The purpose of the study is to investigate this connection and to see how many publications on this subject have been published and what's is the impact.

2. Theoretical background

Non-financial information helps entities, stakeholders, partners in making certain decisions because there is a possibility that, given this information, entities may be considered more suitable than others to the extent that they are seen better on the market and from a sustainability point of view, an extremely important concept these days.

Romania has been subject to the Non-Financial Reporting Directive (NFRD) and, more recently, the Corporate Sustainability Reporting Directive (CSRD).
Corporate governance emphasises on enacting policies, regulatory frameworks as well as instituting key control measures in establishments (Khan, 2019).

3. Research methodology

Bibliometric research analyses a large quantity of scientific publications, using statistical instruments. (Paul, Criado, 2020).

From the Web of Scient platform, we generated the following graph showing the fields of the publications analysed:

The Dominant Research Fields are Business and Economics Leadership, as the data demonstrates that business-related publications constitute the largest share of research output, closely followed by economics. This dual dominance is logical given that non-financial reporting primarily concerns corporate practices and their economic implications. The near parity between these two fields suggests that non-financial reporting is viewed both as a management practice (business perspective) and as an economic phenomenon with broader market implications (economics perspective).

We can identify Interdisciplinary Growth Pattern as Emerging Field Interest, moreover the presence of additional fields beyond business and economics indicates growing recognition that non-financial reporting transcends traditional disciplinary boundaries. This aligns with the multifaceted nature of ESG (Environmental, Social, and Governance) reporting, which inherently involves:

•   Environmental science considerations (sustainability metrics)

•   Social sciences (stakeholder engagement, social responsibility)

•   Management studies (corporate governance, strategic planning)

•   Finance (investment decisions, risk assessment)

4. Results and discussions

Using the Web of Science search engine, we extracted the most cited articles on non-financial information for the period 2020-2025, and the bibliographic data was exported in a format compatible with VOSviewer, from which we generated the following image:
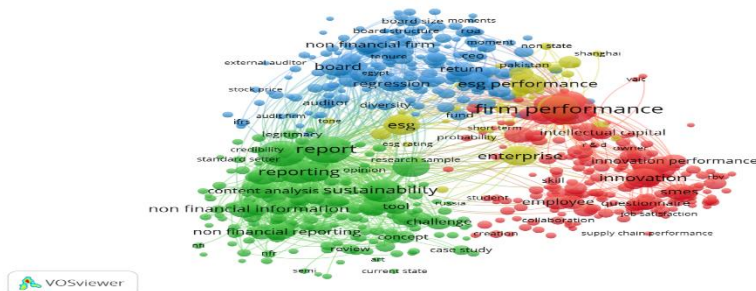
Figure 4.2 VOS viewer network visualization map

Source: own processing in VOS Viewer

The steps I took to generate this visualization map are as follows: I accessed the Web of Scient database, where I searched for articles that matched my research topic using keywords. The advanced search generated articles from the fields mentioned above, and after narrowing down the search to the years that interested, I was left with 4.000 articles for the period 2020-2025.

Our study allows us to identify four major areas of knowledge researched (clusters), namely:

-cluster 1 –**firm performance**, the red one, it has a relatively large area of acceptance, the most relevant items being: innovation, employee, student, creation, questionnaire, job satisfaction;

-cluster 2-**report**, the green one, with a large coverage area, includes many relevant items such as: sustainability, non-financial information, concept, tool, reporting, content analysis;

-cluster 3-**ESG**, the yellow one, is the smallest cluster and does not contain many items, the relevant ones being: ESG performance, enterprise, non state, esg

-cluster 4- **non-financial firm,** the blue one, a cluster with a large coverage, relevant items being: CEO, ROA, return, regression, board structure;

Following the analysis and based on the figure generated, the four clusters shows us what the authors focused on in their research, what was most frequently encountered in publication, but also the fact that the topic was widely adressed in the years analyzed, with an upward trend.

Figure 4.8 Co-authorships clusters   Figure 4.9 Co-authorships maps

Source: own processing in VOSViewer   Source: own processing in VOSViewer

According to the analysis , co-authorship is low because the analysis resulted in five clusters. Which may lead us to believe that the field analyzed does not yet have

large research teams, at least in the set analyzed, but there is still a connection because, for example, in cluster 1, the two authors show a tendency to collaborate, so it is likely that they have been published together.
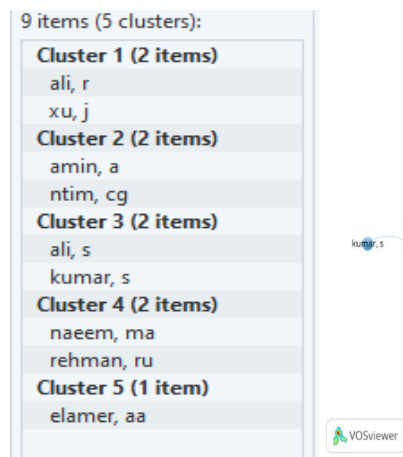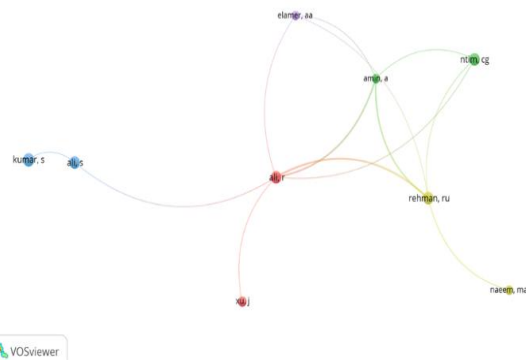
5. Conclusions

Research on the review of literature, using the Web of Science platform, on non-financial reporting and performance shows an evolution in publications on the researched topic, many publications related to this link.

According to our study allows the identification of four major areas of knowledge researched (clusters), namely: cluster 1 –firm performance, cluster 2-report, cluster 3-ESG, cluster 4- non-financial firm.

Co-authorship is low because the analysis resulted in five clusters. Which may lead us to believe that the field analyzed does not yet have large research teams, at least in the set analyzed, but there is still a connection

The limitations of our study are specific to the bibliometric methodology, which does not allow for a detailed critical analysis of the content of publication. However, the study provides a clear overview of trends in the literature and constitutes a solid basis for future research, indicating the need to further explore the relationship between non-financial performance and the sustainable performance of organizations.

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ALIGNING THE BOARD OF DIRECTORS WITH THE EUROPEAN GREEN DEAL: GOVERNANCE CHALLENGES IN THE RACE TOWARDS NET-ZERO

Török Ibolya Mercédesz

University of Oradea – Faculty of Economic Sciences, PhD Candidate in Finance, Oradea, Romania
imercedesz.torok@gmail.com

Abstract: *The paper analyses the extent to which the boards of directors in Romania and Hungary are aligned with the objectives of the European Green Deal and the transition towards net-zero. Based on ESG scores published by LSEG (Refinitiv) and Morningstar Sustainalytics, companies from these two countries are compared with firms from developed EU member states, across the Environmental, Social and Governance pillars. The results highlight a significant gap in the environmental dimension and a faster convergence in governance, suggesting that regulatory pressure anticipates strategic change but does not yet equate to it.*

Keywords: corporate governance; European Green Deal; sustainability; net-zero transition; ESG scores; board of directors

JEL Classification: G34, Q56, M14.

1. Introduction
The European Union has established, through the European Green Deal, an unprecedented agenda for economic transformation, aiming to achieve climate neutrality by 2050. At the core of this transition lies the principle of net-zero emissions, which compels companies and governments to redefine their business models. Thus, the Green Deal becomes not only an environmental policy but also a key instrument of competitiveness and economic security for the European Union.
For the corporate sector, this transformation entails a shift from mere compliance to strategic alignment. Boards of directors are called to integrate climate and sustainability risks into investment, governance, and reporting decisions, extending their role beyond shareholder interests toward ethical and social responsibility to society and the environment, as highlighted by (Feeney et al. 2025). New European regulations, such as the CSRD Directive (2022/2464) and the EU Taxonomy Regulation (2020/852), impose strict transparency and ESG reporting requirements. In Central and Eastern Europe, adaptation processes are actively evolving, with the Bucharest and Budapest Stock Exchanges publishing ESG reporting guides to support local companies. This paper analyses the governance challenges in the transition toward net-zero, focusing on the role of boards of directors in embedding the principles of the European Green Deal into corporate strategy.

2. Literature Review

Recent literature highlights a substantial increase in academic interest regarding how companies align their governance strategies with climate and sustainability objectives. Studies show that effective governance plays a crucial role in achieving Net-Zero targets and mitigating systemic climate risks.

According to (Buentjen et al. 2025), investor pressure drives boards of directors to adopt more ambitious climate policies and introduce sustainability-linked performance indicators. (Dominioni et al. 2025) emphasizes that the Green Deal is not merely an internal EU initiative, but also a geopolitical instrument designed to foster a global transition toward a green economy. In this context, European companies are expected to act as models of responsibility and transparency at the international level.

The study (Voto 2025), argues that ESG regulation represents not only a reporting obligation but also an opportunity to strengthen competitive advantage. Companies that adopt ESG standards early and embed sustainable governance principles into leadership structures tend to achieve superior long-term performance. Similarly, (Talenti 2025) explores the tension between economic and environmental goals, noting that corporate governance must balance these priorities through transparent, impact-oriented policies.

Moreover, (Silva et al. 2025) finds that firms with coherent ESG disclosures attract more institutional capital and enjoy lower financing costs. Regionally, the ESG reporting guides published by the Bucharest Stock Exchange (BVB, 2022) and the Budapest Stock Exchange (BÉT, 2023) promote the establishment of sustainability committees within boards and standardization of disclosure practices, helping reduce the gap between EU requirements (CSRD, ESRS) and current practices in Central and Eastern Europe.

Overall, the literature indicates that sound and transparent governance is the foundation of the green transition. While regulations provide the framework, boards of directors define the strategic direction and ensure the coherent implementation of Net-Zero objectives.

3. Methodology

The analysis was conducted on a sample of 15 companies listed on the stock exchanges of Romania (BVB) and Hungary (BÉT), operating in the sectors of *Bank & Insurance, Construction Materials, Energy & Utilities,* and *Food, Beverage & Tobacco*, representing the Central and Eastern European (CEE) region. For comparison, 28 companies from developed Western European countries were selected, listed on Nasdaq Nordic and other major EU markets.

Sustainability performance was assessed using two internationally recognized methodologies: LSEG (Refinitiv ESG Scores) – which measures ESG performance on a 0–100 scale across the *Environmental, Social,* and *Governance* pillars; and Morningstar Sustainalytics, which evaluates ESG risk, reflecting a company's exposure to material ESG risks and its capacity to manage them (0 = low risk, 100 = high risk).

Average ESG scores, both total and by pillar, were calculated for each country and sector, followed by a comparative analysis between CEE and Developed EU regions. Additionally, Pearson correlations were determined between the E, S, and G pillars to identify the degree of interdependence among sustainability dimensions.

The methodology combines descriptive and analytical approaches, aiming to highlight structural differences and convergence trends in corporate governance with the principles of the European Green Deal.

4. Results and Discussion

The comparative analysis reveals significant differences between companies from Romania and Hungary (CEE) and those from developed European Union member states. The average total ESG score is 49.0 for the CEE region, compared to 62.7 for the developed EU, indicating a more advanced integration of sustainability principles within Western corporate governance practices.
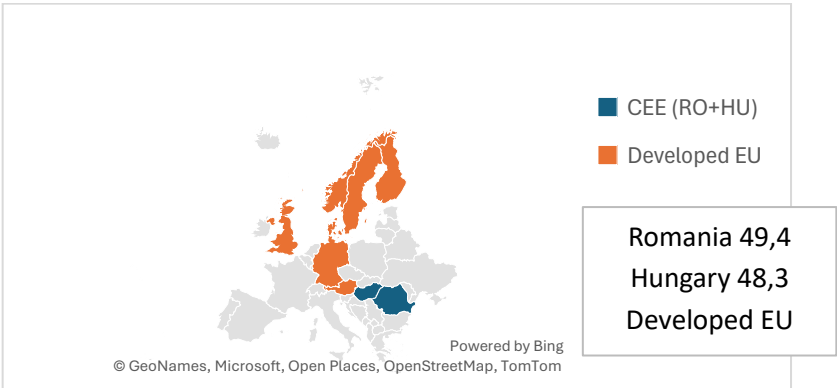
Figure 1: Regional grouping for ESG performance comparison,
Source: own processing based on LSEG Refinitiv data 2023–2024

The largest discrepancy is observed in the **Environmental** pillar, with scores of **47.0** for the CEE region and **63.5** for the developed EU, reflecting a gap in the energy transition and green investment capacity. The **Social** pillar is more balanced (55.5 vs 63.6), indicating that social and human resources policies have expanded more rapidly in the CEE region, influenced by European legislation and multinational standards. Regarding **Governance (G)**, the differences are moderate (51.0 vs 59.5), yet they reveal visible progress in strengthening transparency and corporate ethics.
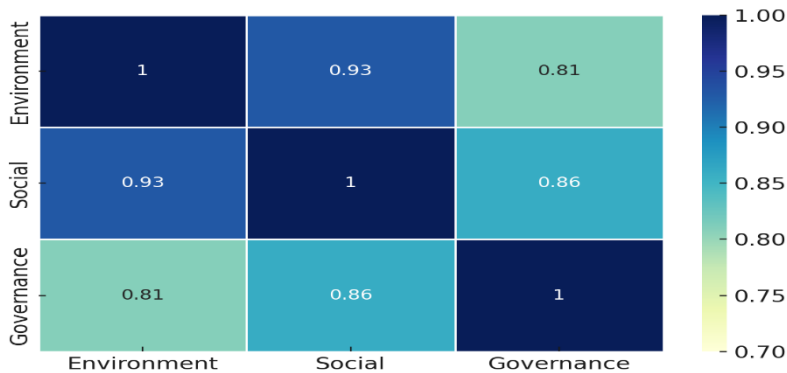

Figure 2: Correlation Matrix of ESG Pillars,

Source: own processing based on LSEG Refinitiv data 2023–2024

The **Pearson correlation matrix (0.81–0.93)** indicates a strong interdependence among the E, S, and G pillars. The highest correlation, between **Environment** and **Social** (0.93), suggests that environmental commitments are closely linked to social and human resources policies.

Furthermore, the graphical analysis confirms a **moderate inverse relationship** between LSEG and Sustainalytics scores: companies with higher ESG performance tend to exhibit lower ESG risks. These results validate the consistency between the two methodologies and indicate that strong governance drives more robust corporate sustainability, accelerating alignment with the objectives of the **European Green Deal**.

5. Conclusions
The results show that the Central and Eastern European region, represented by Romania and Hungary, is undergoing an active process of convergence toward the European Union's sustainability standards. However, gaps compared to Western countries persist, particularly in the environmental dimension. The Social and Governance pillars reflect visible progress, driven by regulatory pressure from the EU and the adaptation of corporate governance structures. Boards of directors are becoming key actors in this transition by integrating ESG criteria into risk, investment, and reporting strategies. The strong correlations among the E, S, and G pillars confirm that sustainability cannot be approached in isolation but rather as an interdependent system, in which governance provides the framework for strategic coherence. In the long term, the ability of boards to transform compliance into a competitive advantage will determine both the pace and depth of alignment with the objectives of the European Green Deal and the transition toward net-zero.

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COST INNOVATION AND MARKET PENETRATION: THE RISE OF ASIAN SINGLE-USE FLEXIBLE URETEROSCOPES IN EMERGING HEALTHCARE MARKETS

Popescu Catanescu A.C[1], Popescu R.I[2], Paraschiv D.M[1]

[1] Faculty of International Business and Economics, Academy of Economic Studies, Bucharest, Romania
[2] Carol Davila Faculty of Medicine and Pharmacy, Bucharest, Romania
catanescu.andreeacristina@yahoo.com

Abstract: *This study examines the cost-innovation dynamic and market penetration potential of Asian single-use flexible ureteroscopes (SUFUs) in emerging healthcare markets, using Romania as a representative case. While Western-manufactured devices traditionally dominate the premium segment of minimally invasive urology, the rapid rise of Asian manufacturers has prompted a reassessment of quality, affordability, and adoption barriers. To evaluate whether meaningful performance differences exist between Asian and U.S.–EU SUFUs, we designed a randomized, double-blind clinical study conducted at a major hospital in Bucharest, in which five experienced urologists assessed multiple devices across real surgical cases without knowing the manufacturer origin. Each device was scored on maneuverability, visibility, and ergonomics. Preliminary findings indicate no significant perceived performance gap between Asian and Western devices, suggesting that cost-effective Asian technologies may offer comparable clinical utility while expanding access to advanced urological procedures in resource-constrained settings. These results underscore the potential of Asian SUFUs to democratize high-precision endourology, strengthen competition, and accelerate technology diffusion in emerging markets, with implications for procurement policies, investment strategies, and global health equity.*

Keywords: single-use flexible ureteroscopes; emerging markets; medical device innovation; cost-effectiveness; randomized double-blind evaluation; Asia vs Western manufacturers; urology technology adoption; healthcare access

JEL Classification: *D81, F61, I15, I18, L65, O33*

1. Introduction

The adoption of single-use flexible ureteroscopes (SUFUs) has increased significantly in modern endourology, driven by infection control requirements, maintenance cost elimination, and the growing incidence of urolithiasis. While the market has been historically dominated by U.S. and European manufacturers, Asian producers have recently expanded rapidly, offering technologically comparable devices at lower cost.

In emerging healthcare systems, cost-efficiency is a critical adoption driver. In this evaluation, U.S. and European SUFUs (Boston Scientific LithoVue €980; Karl Storz Flex-XC1 €950) were compared with Asian devices (Pusen Uscope 3022 €700;

Innovex EU-Scope €550). Asian devices demonstrate cost reductions of 28–44% relative to Western systems.

Despite these price advantages, limited independent clinical evidence exists to confirm equivalent performance. This study addresses that gap through a randomized, double-blind evaluation in a Bucharest hospital, comparing suction, maneuverability, visualization, and ergonomics. The findings support an understanding of cost-driven innovation and adoption pathways in emerging markets, where lower-cost devices with comparable performance can significantly enhance access to advanced endourological care.

2. Research methodology

The study was performed at a major urology center in Bucharest, Romania. A double-blind randomized design was used to ensure objective performance assessment for four leading SUFU devices:

Five senior urologists performed flexible ureteroscopy procedures on real patients requiring management of upper urinary tract calculi. Devices were provided to surgeons without any manufacturer identification visible, and allocation was randomized before each intervention. After each procedure, surgeons independently rated performance across three standardized parameters: maneuverability, visibility, and ergonomics. Numeric scoring tables were complemented by qualitative procedural feedback to contextualize surgeon perception.

This rigorous methodology ensures unbiased comparison and reflects real-world decision-making conditions, making the findings relevant for procurement and policy decisions in emerging health systems.

4. Results and discussion

The following table summarizes the statistical comparison between Asian and Western single-use ureteroscopes, including p-values for the three key performance parameters.

SUFUs characteristics	Visibility (Mean score)	Maneuverability (Mean score)	Ergonomics
PUSEN	4.6	4.4	4.6
Boston	4.6	4.6	4.6
p Value	*0.78*	*0.002*	*0.78*
PUSEN	4.6	4.4	4.6
Storz	4.6	4.6	4.5
p Value	*0.77*	*0.17*	*0.78*

PUSEN	4.6	4.4	4.6
Innovex	4.5	4.6	4.5
p Value	*0.27*	*0.20*	*0.57*
Innovex	4.5	4.6	4.5
Boston	4.6	4.6	4.6
p Value	*0.38*	*0.36*	*0.32*
Innovex	4.5	4.6	4.5
Storz	4.6	4.6	4.5
p Value	*0.13*	*1.00*	*0.74*
Boston	4.6	4.6	4.6
Storz	4.6	4.6	4.5
p Value	*0.55*	*0.31*	*0.53*

Table 2: SUFUs characteristics

Statistical analysis revealed no significant performance differences in visibility or ergonomics across the evaluated devices (p > 0.05 for all comparisons). Maneuverability was also largely comparable, with one isolated statistically significant difference between Boston Scientific and Pusen (p = 0.002), favoring Boston. This single finding did not translate into meaningful clinical disadvantage for the Asian systems.

Overall, results confirm technological parity between Asian and Western single-use ureteroscopes, supporting the conclusion that Asian devices provide equivalent clinical performance at a substantially lower cost. These findings highlight a strong value proposition for emerging healthcare markets, where cost-efficiency and access expansion are primary objectives.

However, key adoption barriers remain in Europe, including CE-mark regulatory processes, national medical device approval (e.g., ANMDMR in Romania), established supplier contracts, institutional procurement preferences, and surgeon familiarity with traditional brands. Strengthening post-market evidence, local distribution, and training pathways are important to accelerate adoption.

5. Conclusions

Asian single-use flexible ureteroscopes demonstrate comparable clinical performance to U.S. and European devices while providing significant cost advantages that enhance price competitiveness and healthcare efficiency. Their diffusion reflects broader trends in global value chains, technology transfer, and cost-driven innovation emerging from Asia's expanding role in the medical device

industry. For emerging European markets, these models represent a viable economic alternative that supports sustainable healthcare investment and improves resource allocation.

Broader adoption will rely on aligning EU regulatory compliance with national procurement frameworks and fostering international cooperation, trade, and clinical training partnerships to ensure balanced integration of high-quality, cost-efficient technologies in cross-border healthcare systems.

Acknowledgment

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AUTOMATION AND THE CHANGING ROLE OF ACCOUNTANTS IN THE DIGITAL ERA

Ștefan Carabulă

Doctoral School of Economics and Business Administration, „Alexandru Ioan Cuza" University of Iași, Romania

Email: carabulastefan780@gmail.com

Abstract: *Automation is profoundly transforming the accounting profession, redefining its purpose, its required skills and its ethical foundations. The accelerated diffusion of artificial intelligence, robotic process automation, big data analytics and digital platforms has reshaped how financial information is processed, verified and communicated. This paper presents a conceptual analysis of the impact of automation on the profession, exploring the transition from traditional, routine-based accounting towards a more strategic, analytical and advisory role. It proposes a model linking automation adoption to the evolution of accountants' competencies, mediated by digital literacy and moderated by organizational culture, ethical governance and continuous learning. Drawing on academic research, international reports and European policy frameworks, the paper emphasizes that automation does not replace human judgment but amplifies it when combined with ethical responsibility, critical reflection and creativity. The study concludes that the sustainable future of accounting lies in a human-technology partnership where hybrid intelligence ensures accuracy, transparency and social trust in the digital economy.*

1. Introduction

Automation represents one of the most powerful forces shaping the twenty-first-century economy. Across all industries, technological progress is changing not only what people do but also how they think, decide and create value. Accounting, traditionally seen as a highly structured and rule-driven discipline, stands at the forefront of this transformation. As digital systems increasingly handle repetitive and data-intensive operations, the role of accountants is undergoing a fundamental redefinition, from data processors to strategic interpreters and from information recorders to providers of insight and assurance.

In contemporary organizations, automation has become indispensable. Tools such as artificial intelligence, robotic process automation, blockchain-enabled ledgers and predictive analytics have revolutionized financial operations. Transactions that once required manual effort can now be executed instantly and accurately by algorithms. Automation enhances efficiency, reduces errors, accelerates reporting cycles and enables real-time decision-making. Yet, while its advantages are evident, its implications are far more complex. The question confronting the profession is not

whether automation will change accounting but how professionals can adapt their identity, knowledge base and ethical standards to remain relevant in a digital world.

This paper seeks to explore the conceptual underpinnings of automation's impact on accounting. Its objectives are threefold: to synthesize the main theoretical and practical debates surrounding automation in accounting, to develop a framework explaining the transformation of accountants' roles and required competencies, and to propose directions for education, regulation and ethical practice in this evolving context.

2. Literature Review and Theoretical Background

The automation of accounting functions marks the culmination of a technological evolution that has unfolded over centuries. From the invention of double-entry bookkeeping in Renaissance Italy to the use of spreadsheets in the twentieth century, technological innovation has always been intertwined with the development of accounting. The current digital revolution, however, differs from previous waves by its cognitive depth and scale of integration. Intelligent systems are now capable not only of recording data but also of interpreting patterns, detecting anomalies and generating forecasts.

The accounting process traditionally relied on human judgment for accuracy, compliance and interpretation. Automation is transforming each of these stages. Data entry and reconciliation are now executed by robotic process automation, reducing operational costs and increasing reliability. Audit trails can be generated automatically, improving traceability and regulatory compliance. Predictive analytics enables accountants to anticipate risks and simulate business scenarios. The accountant is no longer merely a custodian of financial records but an analyst, consultant and ethical guardian of algorithmic systems.

This reorientation implies a new set of professional competencies. The digital accountant must master technological fluency, data analytics, critical thinking and strategic communication. Routine cognitive abilities, once sufficient for a successful career, are no longer enough. The profession is becoming interdisciplinary, requiring collaboration with IT specialists, data scientists and cybersecurity experts. Digital literacy thus acts as the central mediating factor that determines whether automation empowers or displaces professionals.

Beyond skills, automation introduces ethical and governance challenges that redefine accountability. When algorithms make or support financial decisions, responsibility must be explicitly allocated. Without transparency, automation can conceal bias or perpetuate systemic errors. The accountant's ethical duty therefore extends beyond compliance with standards to the moral evaluation of technological systems. Ensuring that automated processes remain fair, explainable and auditable becomes an integral component of professional ethics.

A relevant framework is the concept of professional resilience, which represents the capacity of professions to maintain legitimacy and societal value despite structural change. Automation challenges the profession's traditional legitimacy based on

technical expertise, pushing it to derive authority from ethical reasoning, interpretive insight and the ability to navigate uncertainty. Accountants must therefore evolve from rule followers to value interpreters and from technicians to custodians of integrity in a data-driven economy.

3. Discussion

To conceptualize how automation influences the accounting profession, three interdependent processes can be identified: task substitution, competence transformation and ethical governance.

Task substitution refers to the delegation of routine, repetitive or standardized activities to automated systems. Operations such as invoice processing, reconciliations and financial statement generation can be performed more efficiently by algorithms. This substitution enhances accuracy and speed but simultaneously reduces the manual dimension of accounting work. As a result, professionals must reorient their focus toward higher-order functions such as interpretation, strategic analysis and decision support.

Competence transformation captures the redefinition of professional knowledge and abilities. The digital accountant operates at the intersection of technology and business. Competence now includes the capacity to manage information systems, interpret data analytics, ensure cybersecurity and maintain ethical awareness. Continuous education and lifelong learning become essential. Digital skills mediate the benefits of automation: where digital proficiency is high, automation enhances productivity and job satisfaction; where it is low, it leads to exclusion and deskilling.

Ethical governance constitutes the third and most critical dimension of automation's impact. As algorithms increasingly influence financial judgments, ensuring fairness and accountability becomes a collective responsibility. Ethical governance requires transparency in algorithmic decision-making, the establishment of oversight mechanisms and the integration of ethical reasoning into professional standards. Organizational culture plays a moderating role. Firms that foster openness, learning and responsibility tend to adopt automation more successfully and ethically, while environments driven solely by efficiency metrics risk undermining trust and eroding professional integrity.

These three mechanisms interact dynamically, producing a new paradigm of hybrid intelligence. In this paradigm, automation does not compete with human intelligence but complements it. Machines provide computational power, consistency and scalability, while humans contribute context, empathy and moral judgment. The synergy between the two creates systems that are both efficient and trustworthy. Accounting therefore evolves into a discipline that merges analytical rigor with ethical reflection, ensuring that financial automation remains aligned with human values and societal well-being. The future trajectory of accounting will depend on how this hybrid model is institutionalized.

4. Conclusion

Automation is revolutionizing the accounting profession, but its ultimate impact depends on how professionals, institutions and societies respond. The integration of intelligent systems into financial workstreams transforms not only technical processes but also the very meaning of professional expertise. The accountant of

the digital era is no longer confined to recording and verifying data but is expected to interpret information, advise strategic decisions and uphold ethical principles in technologically mediated contexts. This conceptual analysis has shown that automation reshapes accounting through three main processes: substitution of routine tasks, transformation of competencies and the rise of ethical governance. These processes converge in the emergence of hybrid intelligence, a model of collaboration between humans and machines that enhances both efficiency and moral responsibility.

In conclusion, automation does not mark the end of the accounting profession but the beginning of a new era in which human insight and technological intelligence coexist symbiotically. The defining skill of tomorrow's accountant will not be computation but comprehension, the ability to make sense of complexity, to uphold ethical standards and to transform data into wisdom that sustains trust in an increasingly digital world.

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THE HIDDEN RISKS OF GENERATIVE ARTIFICIAL INTELLIGENCE IN ACCOUNTING AND AUDITING

Anamaria-Georgeta Barbu

Faculty of Economics and Business Administration, West University of Timișoara, Romania
Email: anamaria.barbu99@e-uvt.ro

Abstract: *This study investigates the hidden risks of generative artificial intelligence (GenAI) in accounting and auditing through a bibliometric analysis of scientific publications indexed in the Web of Science Core Collection. The analysis examines trends, co-citation networks, and conceptual clusters to evaluate key concerns surrounding the application of GenAI in the profession. The findings reveal four critical risk dimensions: (1) the illusion of accuracy and data reliability due to hallucinated outputs and fabricated references; (2) the erosion of professional judgment and accountability through overreliance on algorithmic results; (3) data security and confidentiality risks stemming from AI's interaction with sensitive financial information; and (4) ethical and reputational biases that undermine public trust. While GenAI offers unprecedented analytical capabilities, these risks pose challenges for traditional accounting and auditing frameworks. This study highlights the urgent need for a governance framework centered on algorithmic transparency, human oversight, and digital professional skepticism to address these risks. It emphasizes the importance of reconfiguring accounting education, ethical standards, and global oversight to uphold trust and reliability in financial information in the age of GenAI.*

1. Introduction

The emergence of generative artificial intelligence (GenAI) represents a critical shift in accounting and auditing, moving beyond routine automation to tools like ChatGPT and Gemini, which can rapidly produce complex financial analyses and audit reports. While these capabilities enhance efficiency and analytical depth, they also introduce uncertainties that challenge professional judgment and ethical responsibility.

In the evolving digital landscape, algorithms often appear more confident than auditors, yet confidence does not guarantee accuracy. GenAI's tendency to misinterpret data, fabricate sources, or embed biases increases the risk of "algorithmic illusions," compromising informational reliability and trust.

Despite growing enthusiasm for GenAI's role in financial processes, current research largely overlooks risks related to ethics, knowledge validity, and governance. This study bridges that gap with a bibliometric analysis, examining how GenAI is reshaping accuracy, accountability, and professional ethics in accounting. It argues that safeguarding trust in financial information requires more than technological advancement; it demands renewed digital professional skepticism, where human oversight and ethical reasoning are paramount.

2. Methodology

This study employs a bibliometric approach to systematically review literature on generative artificial intelligence (GenAI) in accounting and auditing. Bibliometric analysis was chosen for its ability to uncover intellectual patterns, thematic clusters, and conceptual developments not captured by traditional methods. Data were collected in October 2025 from the Web of Science Core Collection using Boolean search terms, including "generative artificial intelligence," "GenAI," "ChatGPT," and "financial reporting." This search yielded 286 relevant publications across categories such as Business Economics, Engineering, Computer Science, and Education. The data were analyzed using VOSviewer to map trends, citation networks, and conceptual clusters related to GenAI risks.

3. Results

The bibliometric analysis identifies four major risks of GenAI in accounting and auditing: (1) the illusion of accuracy, (2) erosion of professional judgment, (3) data security and confidentiality risks, and (4) ethical and reputational biases. Since 2023, research has surged alongside the rise of large language models, prompting a paradigm shift in focus from "How can GenAI optimize accounting?" to "How can accounting and auditing address GenAI's hidden risks?" This shift highlights GenAI's dual role as both a driver of efficiency and a source of critical uncertainties.

3.1 Illusion of Accuracy and Financial Data Reliability

GenAI generates financial outputs that seem reliable but often rely on incomplete or fabricated data, eroding trust and undermining the verifiability of financial information. Wang (2025) identifies this as "accounting hallucinations," where LLMs provide superficially coherent but factually incorrect results, leading to "quantitative analysis distortions" (Joshi, 2025). The OECD (2023) has also noted serious risks of misrepresentation due to hallucinated financial figures. Mitigating this risk requires rigorous oversight practices to ensure data reliability.

3.2 Erosion of Professional Judgment and Accountability

Reliance on GenAI for analysis and interpretation risks blurring the line between human expertise and algorithmic reasoning. Choi and Xie (2025) describe "automation bias," where auditors overly trust AI-generated outputs, potentially accepting flawed results uncritically. While GenAI improves professional competence, overreliance can erode independent judgment and shift accountability to algorithms, creating operational efficiency at the expense of ethical integrity.

The literature highlights that the primary challenge of GenAI is not its potential to replace accountants, but its capacity to undermine professional skepticism and critical thinking.

3.3 Data Security and Confidentiality Risks

GenAI technology, often hosted on cloud or third-party platforms, increases the capacity and vulnerability of accounting systems handling sensitive financial data. Risks such as model inversion, membership inference, and unintentional data retention compromise confidentiality, violate GDPR compliance, and undermine fiduciary responsibilities. The Hogan Lovells report (2024) highlights how malicious actors can reconstruct sensitive information through these vulnerabilities, while the OECD (2024) stresses the importance of robust governance policies to secure data privacy and meet regulatory standards. Addressing these risks requires

frameworks for traceability, encryption, and ethical management of financial information in AI-powered systems.

3.4 Ethical and Reputational Biases

GenAI, trained on historical accounting data, can replicate biases, influencing recognition, valuation, and classification decisions. These biases threaten ethical neutrality and public trust, particularly when the opacity of algorithmic outputs conceals inconsistencies. The IAASB (2024) calls for transparency and explainability in AI-assisted audits, while IFAC (2023) highlights that automation, though efficient, introduces risks to accounting integrity. Ethical oversight and transparent AI governance are essential to maintaining public trust. Reports advocate for explainable, auditable AI systems to ensure alignment with ethical standards (World Economic Forum, 2025; IAASB, 2024). Ultimately, the profession's credibility depends not only on accuracy but also on the ethical fairness of algorithms.

4. Discussion

Building on these findings, this discussion examines the broader implications of GenAI for accounting integrity, professional judgment, and ethical governance. GenAI is reshaping how accountants work while redefining trust and accountability. The challenge is not advancing technology but governing its influence responsibly, as increasingly confident algorithms heighten the need for rigorous oversight.

The findings highlight significant risks, such as AI-generated outputs creating an "illusion of accuracy," eroding trust, and distorting decision-making (OECD, 2023; Wang, 2025; Joshi, 2025). These systems present serious epistemic risks by producing seemingly reliable yet flawed outputs, threatening financial reporting.

To address these challenges, accountants must progress from mere users to critical interpreters by validating AI outputs, questioning assumptions, and addressing biases. Key priorities include ethical awareness, algorithmic transparency, and accountability to maintain trust and uphold professional standards (IAASB, 2024a; 2024b).

While GenAI will not replace accountants, it will test those who fail to think critically. The future of accounting relies on professionals who can align AI with ethical values, ensuring its responsible use and sustaining trust in financial systems (Choi & Xie, 2025; OECD, 2023).

5. Conclusions

This study contributes to the discourse on AI governance in accounting by providing bibliometric evidence of rising awareness of generative AI (GenAI) risks and identifying gaps in ethics, accountability, and governance research. The challenge is no longer whether AI will transform accounting, but how its adoption can be governed to uphold transparency, trust, and integrity.

Safeguarding financial information demands a governance framework that emphasizes algorithmic transparency, human oversight, and accountability. Governance should promote trust and fairness while supporting innovation. Future research should focus on actionable frameworks for detecting biases, validating AI outputs, and fostering professional skepticism. Collaboration among accountants, data scientists, educators, and regulators is essential for developing safeguards to ensure the ethical use of GenAI.

The credibility of accounting will be determined by professionals' ethical responsibility, critical judgment, and integrity in guiding AI technologies. In the era of generative intelligence, human oversight will remain central to protecting trust and accountability in financial reporting.

6. Acknowledgements

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THE ROLE OF INTERNAL AUDIT IN PREVENTING FINANCIAL AND LEGAL RISK MANAGEMENT

Ionuț Riza, Anca Mădălina Bogdan, Cristiana Ecaterina Banu

Spiru Haret University - Faculty of Legal, Economic and Administrative Sciences – Craiova
rizaionut@gmail.com, am2bogdan@gmail.com, cristiana_banu@yahoo.com

Abstract: *Internal audit represents a critical component of contemporary corporate governance systems, serving a key role in mitigating financial and legal risks that may undermine organizational stability and long-term performance. In an environment characterized by rapid economic and regulatory changes, institutions face increasing exposure to mistakes, fraud, monetary losses, and legal penalties. This reality reinforces the necessity of a strong internal audit function as a safeguard tool and a cornerstone of managerial accountability. The findings generated through SPSS statistical analysis reveal a significant and positive correlation between the level of development of internal audit processes, strengthened financial oversight, and a decline in legal vulnerability. These results validate the assumption that internal audit contributes strategically to reducing organizational weaknesses. Moreover, the study highlights that the success of internal audit activities is strongly influenced by the auditors' professional competence and the degree of institutional support allocated to this function. Overall, the conclusions enrich existing academic knowledge and offer valuable guidance for enhancing internal audit methodologies and performance within Romanian organizations.*

Keywords: internal audit; risk management; internal control; legal compliance; corporate governance; financial performance.

JEL classification: H83; G32

1. Introduction
Given the rapid transformations within the economic and regulatory landscape, organizations are increasingly confronted with uncertainty and heightened exposure to both financial and legal risks. Such risks can jeopardize institutional stability, damage reputation, and hinder compliance with statutory requirements, making their early detection, evaluation, and mitigation essential objectives of contemporary management practices. Within this evolving context, the internal audit function assumes a strategic significance, extending its mission beyond traditional verification activities and contributing proactively to stronger corporate governance, as well as to the development of a culture focused on control, compliance, and risk prevention (Spencer Pickett, 2018).

The need to strengthen the internal audit function in Romania is constantly growing, both in the public and private sectors, being determined by the pressures of European legislation, the controls of regulatory institutions and the internal need for accountability and transparency. Thus, internal audit becomes a central pillar of risk management, contributing to maintaining financial integrity and preventing litigation, sanctions and non-compliance with the applicable regulatory framework.

This article aims to analyze the contribution of internal audit to the prevention of financial and legal risks, through empirical research based on the perception of persons with management and control responsibilities. Using statistical analysis methods, the study offers a current perspective on the importance of internal audit as a tool of good governance and organizational protection.

2. Literature review

The role of internal audit in modern organizations has evolved significantly in the last two decades, moving from a traditional function of verifying the correctness of operations to a strategic activity, oriented towards anticipating and managing risks that may affect organizational continuity. According to the International Standards on Internal Auditing issued by the Institute of Internal Auditors (IIA), the internal audit function contributes to protecting and improving organizational value by providing objective assurance and substantiated recommendations for improving governance, risk management and internal control processes (Sawyer et al., 2020). Economic literature emphasizes that internal audit represents a fundamental element in the financial infrastructure of an institution, as it ensures the early detection of errors, fraud or malfunctions that can generate significant losses. Thus, internal audit is perceived as a guarantor of economic stability and the efficient use of organizational funds (Moeller, 2019). In addition to financial risks, organizations are increasingly exposed to legal risks, generated by a complex and constantly evolving legislative framework. Recent studies highlight the role of internal audit in verifying compliance with applicable legislation, internal procedures and reporting requirements, reducing the risk of sanctions, litigation or damage to institutional reputation. By monitoring the application of compliance policies, internal audit ensures a correct transition between legal regulations and the organization's operational practices (Pickett, 2021). International research shows that the efficiency of internal audit is dependent on a set of essential organizational factors: the competence of auditors, the independence of the audit function, managerial support and an organizational culture oriented towards transparency and accountability. The better professionalized and supported internal audit structures are, the stronger their preventive impact on risks. Therefore, internal audit cannot be effective in the absence of investments in specialized human resources, evaluation technologies and an organizational climate favorable to the implementation of recommendations (Lonsdale et al., 2022).

In conclusion, the specialized literature validates the strategic role of internal audit in preventing financial and legal risks, underlining the need to strengthen this function in all types of organizations. Internal audit becomes a partner of management, contributing to the decision-making process and increasing institutional resilience in a complex and competitive environment.

3.Research methodology

The main purpose of the research is to analyze the role of internal audit management in preventing and managing financial and legal risks at the level of public and private entities in Romania. The study aims to highlight how modern internal audit practices contribute to protecting institutional heritage, legal compliance and strengthening corporate governance.

To carry out the research, the following specific objectives were established:

O1: To evaluate the degree to which the internal audit function is operationalized within the selected institutions.

O2: To determine the relationship between internal audit practices and the mitigation of financial risks.

O3: To examine how internal audit contributes to minimizing exposure to legal risks.

O4: To explore managerial perceptions regarding the effectiveness and value of internal audit activities.

Based on insights from the existing literature, the study proposes the following hypotheses:

H1: A higher level of internal audit maturity is significantly associated with improved prevention of financial risks.

H2: Internal audit plays a substantial role in decreasing institutional vulnerability to legal risks.

H3: The effectiveness of internal audit has a positive impact on internal control quality and organizational risk management processes.

H4: The professional competency and level of expertise of internal auditors serve as key predictors of audit performance and their capability to prevent organizational risks.

The data were analyzed using statistical methods frequently used in economic research, applied with the help of IBM SPSS Statistics:

Pearson correlation → for testing the relationships between internal audit and financial risk prevention (H1). Simple linear regression → for evaluating the contribution of internal audit to reducing legal risks (H2). Independent/paired samples t-test → evaluating differences in managerial perception before and after the audit (H3). Multiple linear regression → analyzing the predictability of professional training on internal audit performance (H4). The significance level used in interpreting the results was $p < 0.05$, which ensures the statistical validity of the conclusions.

4.Findings

The statistical analysis performed using IBM SPSS Statistics confirms to a significant extent the formulated research hypotheses, demonstrating the major role of internal audit in preventing financial and legal risks.

H1: There is a positive relationship between internal audit maturity and financial risk prevention

The Pearson correlation coefficient test highlights a positive and statistically significant association between the maturity of the internal audit function and the reduction of financial risks:

$r = 0.612$, $p = 0.000$ (N = 100).

This correlation indicates that institutions that have consolidated internal audit structures have more robust financial control, more efficient monitoring of resources and an increased capacity for early detection of irregularities. The result confirms the specialized literature on the direct association between functional internal audit and the protection of economic heritage.

H2: Internal audit significantly contributes to reducing legal risks
Simple linear regression demonstrated that internal audit activity is an important predictor of legal compliance: $\beta = 0.583$, $R^2 = 0.454$, $F(1,98) = 81.56$, $p = 0.000$.
Almost 45.4% of the variation in legal risks is explained by the efficiency of internal audit, which indicates a strong capacity to prevent litigation, sanctions and legislative violations. The conclusion is that internal audit becomes a guarantor of internal legal discipline.
H3: Internal audit influences the quality of internal control and organizational risk management
The t-test for paired samples reveals significant differences in the performance of internal control systems before and after the audit:
$t = 6.02$, $p = 0.000$. This statistically significant improvement suggests that internal audit does not just identify dysfunctions, but produces real and measurable transformations in institutional governance, through applicable and monitored recommendations.
H4: Professional training of internal auditors predicts audit performance
The multiple regression of relevant indicators shows:
β (professional skills) $= 0.472$, $p = 0.000$
β (audit experience) $= 0.398$, $p = 0.001$
$R^2 = 0.521$, $F(2,97) = 52.71$, $p = 0.000$
Over 52% of internal audit performance is explained by the professional level of auditors — confirming that investment in human capital is the determining factor in risk prevention.

5. Conclusion

The research highlights the essential role of internal audit in the prevention and management of financial and legal risks, confirming through statistical analyses all the hypotheses formulated. The results obtained demonstrate that the maturity of the internal audit function significantly influences the capacity of institutions to detect and reduce financial errors, contributing to the protection of economic resources and the consolidation of control over budgetary and accounting processes. At the same time, internal audit has proven to be a determining factor in ensuring legal compliance, reducing the organization's exposure to litigation, sanctions or non-compliance with regulations in force.

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THE CHALLENGES OF MODERN MANAGEMENT IN THE CONTEXT OF AI-DRIVEN COMPANIES

Lucian-Florin SPULBAR
Doctoral School of Economic Sciences "Eugeniu Carada", University of Craiova, Craiova Romania
lucian.spulbar01@gmail.com

Abstract: *The post-pandemic era introduced a new age concerning AI-oriented business models. By conducting this research, it is proposed to gain insight into the challenges of this modern approach to management as it pertains to AI. The objective of this research is to point to the challenges associated with a strategic, operational, as well as human perspective, as well as the impact of investments within AI on organizational performance. The research methodology encompasses a literature study, conducted in conjunction with a quantitative comparative study. The latter repeats a number of performance indicators as well as human capital indicators (for example, ROA, productivity, turnover), benchmarked from a comparison between a group of traditional corporations and a group of AI-oriented corporations. The results point to a conflict between performance criteria and human adjustment.*

Keywords: Artificial Intelligence; AI-driven Business Models; Management Challenges; Organizational Performance.
JEL classification: M15; J24.

1. Introduction

We stand at a critical juncture where digital transformation sheds its skin as a corporate buzzword to take up the role of bedrock for organizational survival and relevance. It is in this turbulent, fast-paced environment that we chose to situate our research. Artificial Intelligence is not a prediction of the future it is a present-day reality that reshapes markets, operations, and strategies in basic and fundamental ways. This sharp bifurcation of the corporate world-is precisely what draws our academic interest. We observe a growing chasm between established, traditional corporations and the new, agile AI-driven enterprises. But beyond the technology itself, we are compelled to ask: what are the human and managerial implications of this great divide?

To explore this, we must first define our terms, at least as they pertain to this paper. When we speak of the traditional business model, we refer to the established paradigms: organizations often characterized by hierarchical structures, linear processes, and decision-making that, while data-informed, remains heavily reliant on human experience and historical precedent. These are the incumbents, the pillars of the old economy, valued for their stability and predictability. In stark contrast, the AI-driven business model represents a new organizational phylum. Here, data is not merely a resource more likely it is the central nervous system. We see these firms leveraging machine learning and predictive analytics at their very core, enabling agile operations, personalized customer experiences, and a capacity for strategic pivots that are automated and near-instantaneous. It is a shift

from reactive management to predictive, algorithm-augmented stewardship.

It is in this light that we delineate the objectives of our research. We do not seek to simply catalog technological benefits of AI. Our objective is to critically overview the challenges that this new paradigm presents from a holistic management perspective-strategically, operationally, and humanistically. We need to understand the real impact that radical investments in AI have on tangible organizational performance. With this intention, our research will first traverse existing literature to build a theoretical framework, followed by a quantitative comparative study in which key performance and human capital indicators (ROA, productivity, and employee turnover) will be benchmarked across a sample of traditional corporations and their AI-driven counterparts. We hope to give empirical weight to the anecdotal friction that we all observe and thus provide a clearer insight into the complex, challenging, and fascinating new world of modern management.

2. Literature review

To construct our argument, we need to ground our scholarship in the existing literature, and in doing so, we note a harsh, almost dramatic, duality. Looking backwards in time, we see that 20th-century literature was characterized by a desire to impose a human-created order and efficiency. We remember a world of sharp hierarchies, top-down control, and a notion that with sufficient analysis, a one best way for doing any given task could be identified. And although the human relations school mitigated the sharp edge of machine-like thinking with an interest in motivation and social forces, man was still the pivotal aware actor, *the ghost in the machine* who guided the operation (Rhali, Said, & Joukhrane, 2025).

This paradigm was fundamentally challenged, but not replaced, by the emergence of knowledge workers. In fact, there was a profound transition observed in the pioneering writings of Drucker (1993), where value was no longer in one's hands but in one's mind. Management became an exercise in developing and steering human intelligence. Again, including these classic and knowledge-based periods, human-to-human was, in fact, the essence of managing (Eastern Connecticut State University, 2025).

In fact, into this well-established domain comes AI not only as a new technology but as a new actor. We are not merely managing people who use technology, we are now managing a complex system in which technology itself is acting. And it's with *algorithmic management* (Lindebaum et al., 2020), we believe, that we are confronted with a new challenge. In other words, critical functions such as evaluations, task assignment, or strategic analysis are progressively entrusted to non-human algorithms based on AI. These algorithms promise a level of efficiency and objectivity hitherto unimaginable to managers but now enabled to automate away inefficiency and associated biases. Indeed, however, we see that we are in fact identifying where our paper's major tension lies, a tension beautifully captured in the latest literature. One gets the sense that there exists a digital transformation of business models (Mitrache et al., 2024), which spawns a profound contrast. While there are AI-based models which are set to boost operational efficiency and innovate (Astawa & Arsha, 2024), transforming fundamentally how companies create and capture value, there exists another truth. In fact, there exists an emerging wealth of literature which emanates psychological or adaptation

challenges in response to these new economic challenges. One which hinges upon algorithmic autonomy or optimization to enable the creation or capture of value (McKinsey, 2025). We are forced to move *from human to machine* or to automate. As we see so another literature begins to spring into existence to explore these new human relations.

3. Performance in practice

Having traced the theoretical contours of this new managerial landscape in the literature, we felt it was essential to ground our discussion in the tangible, quantitative realities of the modern market. We promise of AI must be measured against the cold, hard data of organizational performance. We therefore turn to a direct comparative analysis, a tale of two models, by benchmarking incumbent corporations, defined by their more traditional structures, against their AI-driven counterparts within the same sector. The following tables present this quantitative divide, using publicly available data to examine the very performance and productivity indicators that lie at the heart of our research.

Table 1: Comparative Analysis: Retail Sector

Company (Model)	Indicator	Metric	Real Amount	Source (Public Data)
Walmart (Traditional)	Financial Performance	Return on Assets (ROA) (LTM*)	8.3%	Finbox (2025)
Amazon (AI-Driven)	Financial Performance	Return on Assets (ROA) (LTM*)	11.7%	Finbox (2025)
Walmart (Traditional)	Productivity	Revenue per Employee (LTM*)	$330,000	Finbox (2025)
Amazon (AI-Driven)	Productivity	Revenue per Employee (LTM*)	$440,000	Finbox (2025)
Walmart (Traditional)	Human Capital	Employee Turnover	~ 2.1 million	Walmart (2025)
Amazon (AI-Driven)	Human Capital	Employee Turnover	~ 1,56 million	Amazon (2025)

Source: Author's own processing according to the methodology

Beginning with retailing, our first major point starts to bear itself out. From these financial trends emerges a sharp note of AI superiority. We note Amazon's Return on Assets metric stands substantially at 11.7% against Walmart's 8.3%. These differences are not replicated but are amplified in terms of productivity. Amazon derives $440,000 in revenue per employee compared to $330,000 derived per employee at Walmart. Purely strategic analysis suggests there's little point to a manager if not to simply mimic Amazon's AI-led approach.

And yet, it is the bottom row (Human Capital) that exposes the underlying tension in our study. Although accurately gauge able data regarding employee turnover was never forthcoming, industry reports related to Amazon's business are impossible to ignore. Although necessarily inaccurate regarding specifics, (estimates near 100% annual employee turnover in its warehouse division) the sheer human adjustment cost implied cannot be denied. Finally, note that we establish a dilemma in our analysis. We witness a system which achieves extraordinary financial success (ROA, productivity gains) but apparently does so in conjunction with an obviously huge human capital turnover. Just such a dilemma

confronts our contemporary manager.

4. Conclusion

Our research was motivated to explore the managerial challenges arising due to the post-pandemic scenario's increased adoption of AI-based business models. We could define our goal to explore the challenges in terms of the strategic, operational, or human-related dimensions related to this new paradigm. The central assumption was that contemporary managers are caught up between the benefits of AI's increased performance and its increased implementation cost.

In testing these hypotheses, we used a two-fold approach. First was a literature review focusing both on identifying a paradigm shift in *human-to-human* to *algorithmic management*, emphasizing related challenges to human adaptability. Second was a comparative analysis using indicators Return on Assets (ROA), revenue per employee, and employee turnover between traditional firms and firms implementing AI.

Our results confirm our central proposition. From our quantitative analysis, there is a monumentally superior financial/productivity performance delivered by AI-led firms. But there is a performance mandate here. Moreover, there is a direct tension between this mandate and human capital analysis. This tension is evident in retail industry performance (which is high), yet employee turnover is high. Thus, our central contention that the greatest challenge to management in modernity lies in mitigating TQA (Total Quality Assurance) tension-holds.

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DESIGN THINKING FOR PERFECTING SERVICE ARCHITECTURE IN HEALTHCARE – A CASE STUDY

Davidescu (Vasile) Andreea
Academy of Economic Studies, Doctoral School, Bucharest, Romania
andreea.vasile.email@gmail.com

Abstract: *Healthcare needs to start approaching humans as users, where it has traditionally only served patients (from the point of view of the physicians) and customers/clients (from a business perspective). Healthcare services are not traditionally designed taking user experience into account, as humans are viewed as industry captive customers with marketing and sales trying to increase market share. However, personalized medicine is the fastest growing market in healthcare, with longevity and wellbeing medicine serving as engines for the growth. This is where change can start with Design Thinking as the human needs and continuous improvement centered instrument. It can offer healthcare increases in productivity, quality, user satisfaction. It can also prove a useful tool in opening healthcare services to innovation. This paper describes a user case for using design thinking in perfecting service architecture. It uses persona and user journey analysis to address pain points in the process. One of the pain points is not properly addressed at present and does not lie in the area of expertise or responsibility of traditional structures. We found that Design thinking is a process that fits a healthcare environment very well and the steps can be fluently integrated in day-to-day activity.*

1. Introduction

Design Thinking is an instrument centered on human needs and continuous improvement. It can offer healthcare increases in productivity, quality, user satisfaction. It can also prove a useful tool in opening healthcare services to innovation. Design Thinking as a concept was born in the 1970s in the ecosistem of Stanford University and was transformed into a methodology by Tom and David Kelly and IDEO consulting firm. Even before them Simons (Simons, 1969, p. 111) says that „Everyone designs who devises courses of action aimed at changing existing situations into preferred ones." Stanford University remains a reference with their Stanford Institute of Design. According to Brown (Brown, 2009), Design thinking is a strong, efficient and powerful approach to innovation.

Using design thinking in healthcare is relatively fresh (Levander, VanDerSchaaf, Barragan *et al*, 2023, p. 690), but it can "reduce the risk associated with innovation and can increase the probability for answering the right problem". This paper will describe a user case for using design thinking in perfecting service architecture in a healthcare private practice. A persona and user map are defined after patient observation and patient interviews which are used to map the patient's journey on a model with pain points. The journey is analyzed and How Might We questions are

used. The analysis leads to a solution for a pain point which is refined further as Design Thinking relies on continuous improvement.

2. Context

This paper focuses on a problem identified in the patient journey in my current work place. The patient comes to our private practice for a nutrition consult with a doctor specialized in diabetes, nutrition and metabolic disease with the objective of weight loss. She has found us through medical referring, patient referring or Internet search and has made an appointment with a doctor who specializes in cases like hers and who will guide her through the diagnosis, tests and nutritional intervention.

In order to apply design thinking methodology, the paper uses the Persona of Jane Doe and maps her journey during a consult in the doctor's office by observing in several consults with patients who matched Jane's profile.

The concept of design thinking fills a gap in healthcare where up to now we only regard people as patients or clients, but not users. Nowhere in the planning of treatment protocols or hospital flows are people viewed as users and their experience analyzed. Innovation is necessary and expected in the way medical services are offered and design thinking is the ideal model to bridge the gap between patient needs and human needs. "We argue that expanded capacity for and application of design thinking approaches within healthcare can help drive necessary innovation in care delivery models." (Roberts, Fisher, Trowbridge, Bent, 2016).

3. Methodology

The paper defines the user persona with details in order to concentrate on a user type with specific objectives and constraints. The persona is then used to build a user map which was first more general and covered the patient journey from the moment she makes the appointment to her last visit. I have then decided to concentrate on the initial consultation and started to gather data by sitting in consults in my workplace. The data is then organized and the steps in the initial consult are sketched. I proceeded to perfect and validate the steps and add duration by sitting in more consults.

The next step was mapping patients' journeys on the model. I used five users who fitted the persona model and eliminated one as an outlier. The other four presented similar trends which were averaged in the persona's consult map. I have also interviewed the five users outside the consults with two objectives: to confirm/infirm pain points and to understand what they think and feel regarding the pain points. This was important as "Only by including diverse viewpoints can the design team grasp the extent of what problems need to be addressed and their scope" (Levander, VanDerSchaaf, Barragan *et al*, 2023, p.692). I have then used all this to draw an empathy map and "how might we" questions.

4. Analysis

The persona is Jane Doe, a 38 years old woman who works in an office, is married, has a high stress job and two children aged 2,5 and 4,5. Each of her pregnancies left her with a couple of kg and the stress of managing a full-time job and her family has led to further weight gain in the past 6 months since her return to the office. She wants to lose weight both for her appearance (which she feels is important in her job as well) and for the way she feels physically (it is difficult to play with the kids outside, to climb stairs, to ride a bike, she tires quickly and gets out of breath).

Using the methodology described above, I have mapped and timed the initial consult for Jane into the main steps:

Mirela's journey map for the medical consult
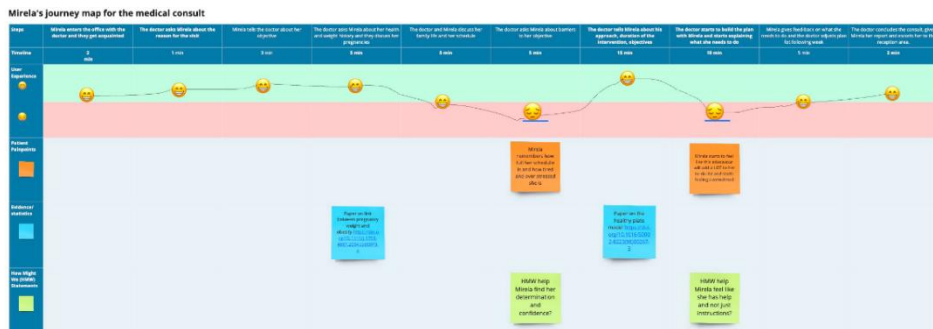
and have identified steps 6 and 8 as patient pain points:

Step 6 – pain point: Jane remembers how full her schedule is and how tired and over stressed she is, how essential a sweet treat is sometimes to calm her anxiety

Step 8 – pain point: Jane starts to feel like this endeavor will add a LOT to her to-do list and starts feeling overwhelmed. She thinks about having to have food appropriate for the children who are clearly her priority, that she does not like to cook or have the time and the very bad eating habits she would have to correct. She feels it is not rules, strategies, solutions she needs but a magic wand to help her with the plan the doctor is suggesting.

Using the details in the pain point description and empathy maps we have created the following How Might We questions:

Step 6: HMW help Jane find her determination and confidence?

Step 8: HMW help Jane feel like she has help and not just instructions?

From the two, I feel that the second was least addressed by the doctors in the way I have intended the question. Indeed, by observing the consult and talking to patients it felt like the more involved the doctor was, and the more strategies and solutions he offered, the more the patient felt the load increased, whereas with the first HMW question I find that some doctors can boost a patient's confidence more than others.

5. Discussion

In classic healthcare management, Jane's needs would be addressed by the receptionists (for appointments, costs details, directions and other logistical aspects), by her doctor and nurses (inside the consults and for tests/investigations) and, optional, by a patient care person who would focus on her level of satisfaction, feed-back on services, referrals, and could help with communication if needed.

In healthcare more than in other fields, her needs would be evaluated almost exclusively by her doctor or medical team who tend to focus on what the patient needs in order to become healthy and less (up to total disregard) on her wants. A doctor sees the patient and not the person and they would rarely have time to / consider important to go past "cognitive blinders" (Liedtka, MacLaren, 2018) and address pain points in the process.

This is why design thinking is essential for healthcare. By concentrating on humans instead of the classical roles of patient, nurse, doctor, receptionist, etc, "human-centered design takes into account every single human being that your design decisions impact on" (Townson, 2025) and has the potential to improve not only the

user experience but also the quality of the results and the effectiveness of the process. I find design thinking methodology to be appropriate and efficient in my field of work and I find it feels a gap, a need that has been only addresses so far by individuals with a native talent, inspiration and drive to improve the current situation. *This exercise helps to understand the importance of problem definition and the need to "get past your own great idea" (Townson, 2025). The iterative process made me go from a graphical concept of a plate to an artistic ceramic plate that I found answered best my persona's needs.*

6. Conclusion

Applying design thinking methodology to my workplace would significantly improve results in patient care, patient outcomes, patient feed-back, team management, profitability. It is a process that fits a healthcare environment very well and I found the steps can be fluently integrated in our day-to-day activity.

In the persona's case, one of the pain points identified is not properly addressed at present and does not lie in the area of expertise or responsibility of any of my colleagues. Jane Doe's reaction to the intervention plan the doctor was suggesting, that she was not offered help but more tasks was only aggravated the more the doctor offered strategies and advice. This is where the helper figure is needed. "Your job (as the mythical helper figure) is to figure out the challenges that lie in their way and to find a better way to guide them through their journey towards eventual transformation, which, in this case, is getting the service or information they need." (Carden, 2023). Jane Doe needed somebody to look at her journey as a user, not only as a patient and offer help/insight/solutions to her human problems.

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BEYOND TECHNOLOGY: HOW ORGANIZATIONAL AGILITY AND STRATEGIC FORESIGHT ENHANCE INNOVATION IN INSTITUTIONALLY THIN ECONOMIES

Elias Appiah-Kubi

University of Oradea, Doctoral School of Economic Sciences, Romania
appiahkubi.elias@student.uoradea.ro

Abstract: *Technological capability is widely viewed as a driver of innovation, yet many SMEs in institutionally thin economies struggle to translate it into performance gains. This study examines how organizational agility and strategic foresight enable firms to convert technology investments into innovation outcomes. Drawing on Resource Orchestration Theory (ROT), data from 497 Ghanaian SMEs were analyzed using Covariance-Based Structural Equation Modeling (CB-SEM). The results show that technological capability enhances innovation only indirectly through organizational agility, while strategic foresight amplifies the agility–innovation nexus. These findings highlight foresight as a meta-capability that aligns anticipatory insight with adaptive response. The study extends ROT by revealing how managerial orchestration transforms static technological assets into dynamic innovation capabilities. Practically, it underscores the need for SME leaders and policymakers to complement digital investments with agility-enhancing structures and foresight-driven strategies to achieve sustained innovation performance.*

Keywords: technological capability; organizational agility; strategic foresight; innovation performance

JEL Classification: O31; O43; L21; M21

1. Introduction

Can technology alone ensure innovation success in environments where institutions are weak, resources scarce, and uncertainty high? This question frames ongoing debates on how firms in **institutionally thin economies** like Ghana sustain innovation performance. Although technology has long been viewed as the engine of competitiveness (Galindo-Martín et al., 2023), evidence increasingly shows that **technological capability alone is insufficient** where market signals are ambiguous, infrastructure fragile, and institutional support weak (Zhong & Ren, 2025). In such contexts, technology-driven firms often fail to convert digital investments into innovation outcomes, revealing a paradox: technology is **necessary but not sufficient** without **organizational agility and strategic foresight**.

For Ghanaian SMEs, overreliance on technology amid institutional voids and financial constraints can lead to **innovation inertia** (Appiah-Kubi et al., 2025). Many adopt digital tools but lack the agility to reconfigure routines or anticipate market shifts, resulting in incremental rather than transformative innovation (Bhuiyan et al., 2024). Existing studies linking technological capability to innovation largely stem from **institutionally robust contexts**, where strong infrastructures and stable

regulations enable direct benefits from technological investments (Fakhimi & Miremadi, 2022). These assumptions rarely hold in emerging economies dominated by informal systems.

Recent work highlights **organizational agility**—the ability to sense and respond quickly to change (Xu et al., 2024), and **strategic foresight**—the capacity to anticipate and shape future conditions (Mubarak et al., 2025), as key dynamic capabilities that help firms leverage technology effectively. Yet, empirical research examining how these capabilities jointly condition the **technology–innovation relationship** in weak institutional settings remains scarce.

Guided by **Resource Orchestration Theory (ROT)**, this study investigates **when and how technology translates into innovation** within such contexts. It proposes that technological capabilities enhance innovation indirectly through organizational agility, and that strategic foresight strengthens this relationship. The study extends ROT by showing how managerial orchestration transforms technological assets into innovation outcomes and provides practical guidance for SME leaders and policymakers to complement digital investments with agility-enhancing and foresight-driven strategies.

2. Methodology

2.1 Study Context and Sample

Ghana provides an appropriate empirical setting for examining how SMEs innovate within institutionally thin environments. In line with national classification standards, SMEs are defined as firms employing up to 100 people. Based on an estimated population of one million SMEs, Miller and Brewer (2003) formula was applied to determine a minimum representative sample of 400. To enhance reliability and account for non-response, 600 firms were contacted through the Registrar General's Department database using random sampling. A total of **497 valid responses** were obtained from managers via an electronically administered questionnaire, achieving high response quality and representativeness. A structured questionnaire was designed around the study's main constructs, using a **five-point Likert scale** (1 = strongly disagree to 5 = strongly agree). To control for firm-specific effects, **firm age, size, and industry** were included as control variables. Measurement items were adapted from validated sources.

2.2 Data Validation and Analysis

To ensure data quality, multiple validation procedures were conducted. **Common Method Bias (CMB)** was tested using Harman's single-factor test; the first factor explained only 22.979% of variance, below the 50% threshold. **Exploratory Factor Analysis (EFA)** confirmed construct dimensionality, satisfying all psychometric benchmarks (KMO > 0.6, significant Bartlett's test, TVE > 50%). **Confirmatory Factor Analysis (CFA)**, performed with AMOS 23, showed satisfactory model fit (CFI, TLI, GFI > 0.90; RMSEA < 0.08). Reliability and validity thresholds were met (Cronbach's α and Composite Reliability > 0.70; AVE > 0.50). Discriminant validity was confirmed as √AVE values exceeded inter-construct correlations. Tests for multicollinearity (VIF < 10) and data normality (|skewness| < 2, |kurtosis| < 7) confirmed statistical adequacy. Finally, **Covariance-Based Structural Equation Modeling (CB-SEM)** was employed to test the hypothesized relationships. Model

robustness was cross-verified using **OLS regression**, which produced consistent direction and significance across coefficients, reinforcing the stability of the results.

3. Findings and Discussion

The **CB-SEM** analysis revealed that the **direct effects of technological capability dimensions on innovation performance were negative and statistically insignificant**, suggesting that technological possession alone does not guarantee innovation success among Ghanaian SMEs. This finding contrasts with prior studies (Hanelt et al., 2021; Taghizadeh et al., 2021) but aligns with evidence that, in volatile institutional environments, **technology yields limited value without complementary managerial mechanisms** (Zhong & Ren, 2025). However, the **indirect pathways** revealed significant effects. Both **technological infrastructure** and **technological integration** positively influenced **organizational agility**, which in turn significantly enhanced **innovation performance**. Although **technological knowledge** showed a marginally negative relationship with agility, its indirect impact through agility remained constructive. Collectively, these results confirm the **full mediating role of organizational agility**, demonstrating that firms convert technological potential into innovation outcomes only through agile structures and adaptive processes. This supports earlier finding by Lu and Ramamurthy (2011) that IT-enabled flexibility underpins competitiveness and digital responsiveness. Regarding the moderation effects, **strategic foresight** had an insignificant positive direct effect on innovation but significantly strengthened the **agility–innovation relationship**. This implies that foresight acts as a **contingent meta-capability**—its value emerges when paired with agile execution. Firms with higher foresight are better positioned to anticipate disruptions, align resources with future opportunities, and sustain innovation momentum (Mubarak et al., 2025).
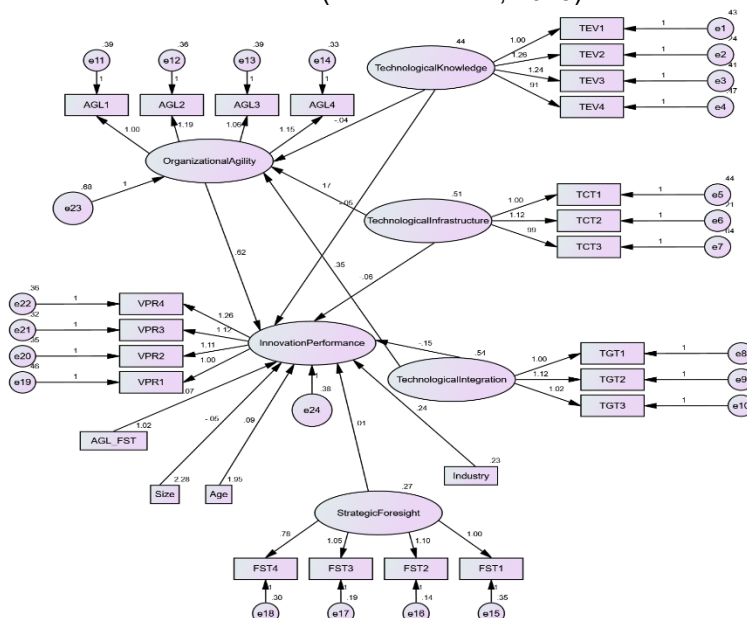

Figure 1: Path Diagram

Overall, the findings highlight that **technology alone is necessary but insufficient**; its impact depends on how firms **orchestrate, adapt, and envision** technological resources through agility and foresight. Figure 1 illustrate the path diagram.

4. Conclusion

This study examined how **technological capability, organizational agility, and strategic foresight** interact to shape **innovation performance** among Ghanaian SMEs. Grounded in **Resource Orchestration Theory (ROT)**, the findings show that technological capability alone does not directly enhance innovation; its value is realized **indirectly through organizational agility**, while **strategic foresight** amplifies this relationship by aligning anticipation with adaptive execution. These results affirm that technology is **necessary but insufficient**—innovation advantage emerges only when technological and strategic resources are **effectively orchestrated** through agile and foresight-driven management. Theoretically, the study extends ROT by unpacking the **micro-mechanisms** through which managers transform static technological assets into dynamic innovation outcomes under institutional constraints. Practically, it urges SME leaders to complement digital investments with agility-enhancing structures and foresight practices such as environmental scanning, scenario analysis, and cross-functional learning. Policymakers should pair digital infrastructure initiatives with capability-building programs to ensure that technology diffusion translates into sustainable competitiveness.

Future research should adopt **longitudinal and multi-context designs** to explore how orchestration capabilities evolve over time and across institutional environments.

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PAST, PRESENT AND FUTURE IN THE DYNAMICS OF ARTIFICIAL INTELLIGENCE: IMPLICATIONS FOR GOVERNANCE AND THE TRANSFORMATION OF PUBLIC INSTITUTIONS

Bogdan Alexandru ISTRATE

PHD Student, IOSUD – Doctoral School of Economic Sciences and Humanities, Valahia University of Târgoviște, Târgoviște, România,
bogdan.istrate.mg@valahia.ro

Abstract: *Rapid advancements in Artificial Intelligence (AI) are fundamentally reshaping the structures, decision-making processes, and strategic management practices of public institutions. This study examines the evolution of AI, from its early algorithmic foundations to today's sophisticated adaptive systems, and explores how each stage has influenced the transformation of public organizations. By analysing the past, present, and anticipated future developments of AI, the research highlights its role in enhancing operational efficiency, fostering innovation, and strengthening institutional adaptability in dynamic administrative and societal contexts. The study also addresses key challenges in AI adoption, including ethical considerations, workforce reskilling, governance transparency, and effective integration strategies. The findings underscore that AI is not merely a tool for automation but a strategic catalyst for transforming public institutions, impacting internal processes, organizational culture, and the delivery of public value. These insights offer guidance for public managers, policymakers, and researchers seeking to harness AI's potential within complex and evolving institutional environments.*

Introduction

Artificial Intelligence (AI) has become a central driver of organizational transformation, shaping practices across both private and public sectors. In public institutions, recent advances in algorithms and adaptive systems enable not only improved efficiency and service delivery but also a more agile response to complex societal and administrative challenges. AI is no longer simply a technical tool, it has emerged as a strategic force that influences organizational structures, cultures, and decision-making processes within public governance. This study traces the evolution of AI, examining its transformative effects on public institutions, while highlighting the key challenges and opportunities associated with its adoption. By reflecting on AI's past developments, current applications, and potential future trajectories, the research offers a comprehensive perspective on its role in reshaping public sector organizations.

1. AI: From History to Future

The formal roots of artificial intelligence (AI) trace back to the Dartmouth Summer Research Project of 1956, where John McCarthy, Marvin Minsky, Nathaniel Rochester, and Claude Shannon proposed a ground breaking concept: that every aspect of learning or any other feature of intelligence can be precisely defined to the extent that it can be simulated by a machine. This conference introduced the term "Artificial Intelligence" for the first time and laid the conceptual foundation for the field's subsequent advancements. (John McCarthy et al., 2006: 1)

Throughout its history, AI research has experienced alternating phases of optimism and scepticism, manifested in what are known as "AI winters." The first of these occurred in the 1970s, marked by a significant reduction in funding from both government and private sectors. Conversely, the late 1970s and early 1980s witnessed a resurgence fuelled by the development of rule-based expert systems, which found successful applications across various fields, including medical diagnosis, financial analysis, and natural resource exploration.

However, the complexity and inherent limitations of these systems, such as challenges in scalability and maintenance, led to a renewed decline in interest and investment, known as the second AI winter, spanning the late 1980s to the early 1990s.

The period from the 1990s through the early 2010s was characterized by significant advances in statistical learning theory, which provided a robust framework for many machine learning models that have had profound impacts and continue to shape the field today. A notable example includes Support Vector Machines (SVM). (Ruhi Sarikaya, 2025: 2)

Currently, numerous AI based platforms and applications present both significant opportunities and potential risks for public institutions, evolving at a rapid technological pace. Many organizations, from both the public and private sectors, have either begun adopting these technologies or plan to integrate them in the near future.

Artificial intelligence is increasingly transforming public administration, offering numerous opportunities to improve efficiency and service delivery. By automating routine administrative tasks, AI technologies and systems like ChatGPT allow personnel to dedicate more time to strategic decision making and addressing higher-priority issues, rather than being bogged down by repetitive work.

Moreover, AI opens the door to innovation in public services. By facilitating the creation of creative and effective solutions to community problems, these technologies help improve both the quality and accessibility of services, ensuring that public institutions can better meet the evolving needs of the communities they serve. (https://csldi.fspac.online/, accessed on 05.11.2025, 15:05)

Despite its many advantages, the integration of AI and systems like ChatGPT into public administration also introduces several significant risks that must be carefully managed. One of the foremost concerns relates to data protection and privacy. Handling large volumes of personal information raises critical questions about how sensitive data is secured and who has access to it, making robust safeguards essential.

Errors and accountability present another challenge. While AI technologies are powerful, they are not infallible and may occasionally produce mistakes or be vulnerable to cyberattacks. Clearly defining responsibility for any errors or damages caused by these systems is crucial to maintaining trust and operational integrity.

The impact on the workforce is also a key consideration. Automation of administrative processes could reduce the number of positions within public institutions, creating social and organizational challenges that require careful planning and adaptive policies.

Resistance and distrust may further complicate adoption. Both employees and citizens might be apprehensive about increased surveillance, loss of human control over decision making, or over reliance on automated systems. Addressing these concerns through transparency and education is vital for successful implementation.

Finally, algorithmic bias and discrimination remain pressing issues. AI systems can inadvertently perpetuate or even amplify existing biases in the data used to train them, potentially resulting in unfair outcomes that disproportionately affect specific social groups. Vigilant monitoring and corrective measures are therefore essential to ensure equitable and just use of AI in the public sector. (https://csldi.fspac.online/, accessed on 05.11.2025, 15:05)

2. Organizational Impacts of AI

The public sector is not immune to the adoption of artificial intelligence (AI), as well as to the organizational impacts and challenges that accompany its implementation. This is hardly surprising, given the continual expansion of AI algorithms across various domains. Despite the fact that many public sector organizations have started investing in AI, numerous entities still struggle to realize the anticipated benefits of these technologies.

In response to this growing interest, scholars have increasingly focused on AI in public organizations, with a notable rise in publications over recent years. However, studies exploring AI adoption from an organizational standpoint remain scarce, presenting a fragmented picture and rarely delivering a thorough or integrated understanding of the phenomenon.

Initially, researchers concentrated on identifying the multiple challenges AI introduces in public organizations. These challenges have been grouped into several categories, including technological, social, legal, ethical, organizational, economic, and data management related issues.

More recently, studies have emphasized the need to move beyond a narrow focus on data, infrastructure, and algorithms, advocating for a broader perspective that considers organizational problems, capabilities, and the interplay between technology and institutional structure. (Giulia Marango et al., 2023: 2)

Recent research has highlighted the importance of recognizing AI not merely as a technical tool but as an organizational actor that must be carefully cultivated within public institutions. For instance, public managers need to understand how AI interacts with their roles and routines, ensuring that the technology complements rather than replaces human decision-making. This perspective aligns with the view that AI can reshape organizational tasks, responsibilities, and governance structures, ultimately transforming the way public institutions operate.

Furthermore, empirical studies have become increasingly essential, as much of the existing literature relies heavily on theoretical analyses, case examples, or experimental research. The inconsistent application of AI across public organizations

highlights the need to investigate contextual factors, both internal and external, that influence successful implementation.

Finally, AI is redefining how public institutions engage with external factors, such as technology providers, universities, and research centres.

Implementing AI often requires acquiring knowledge and expertise beyond the organization's boundaries, fostering collaboration and innovation. (Giulia Marango et al., 2023: 3)

Effective integration of artificial intelligence within public administrations relies on the interplay between AI's material characteristics and the organization's technical tasks and infrastructure. This interconnection highlights the necessity for public institutions not only to adapt existing processes and systems but also to innovate and design new ones, ensuring that the transformative potential of AI is fully realized within both institutional and operational contexts. (Luca Tangi, Paula Rodriguez Muller and Marjin Janssen, 2025: 6)

Finally, the rapid advancements in AI technology, a defining feature of its materiality, necessitate that public administrations establish partnerships with external organizations.

3. Ethical Implications

Artificial intelligence technologies give rise to ethical challenges related to privacy, transparency, and algorithmic bias, which may influence or even conflict with established cultural values and norms within organizations. Ethical issues concerning governance, accountability, and fairness in the use of such technologies can negatively affect trust, integrity, and reputation, posing significant risks to organizational culture and stakeholder relationships. Failing to adequately address these ethical implications may result in adverse outcomes, including legal liabilities, regulatory penalties, or damage to public image.

To prevent such consequences, it is essential to implement robust ethical frameworks, effective governance mechanisms, and clear accountability structures that reflect organizational values and ensure the responsible use of artificial intelligence. (Obrain Tinashe Murire, 2024: 9)

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USING AI IN MANAGERIAL FUNCTIONS

FABIAN Valentina Ileana

Doctoral School of Economic Sciences, University of Oradea, Oradea, Romania
vlad.valentinaileana@student.uoradea.ro

Abstract: *This paper explores how artificial intelligence (AI) has been embedded across the core managerial functions of planning, organizing, staffing, directing, and controlling. Drawing on recent empirical and review studies published between 2015 and 2025, it identifies where AI technologies have been most actively deployed and how they have influenced managerial practice. The analysis reveals strong evidence of AI applications in human resource management, financial control, and operational decision support, with more limited yet emerging use in strategic management and organizational design. The review highlights efficiency gains and improved predictive capabilities but also notes persistent concerns about data bias, transparency, and managerial accountability.*

Keywords: artificial intelligence; managerial functions; human resource management; strategic management; decision support; automation.

1. Introduction

Managers today experiment with AI to augment or automate parts of their roles. AI can accelerate analysis in strategic planning, automate recruitment decisions in HR, and continuously monitor operational performance. Recent literature and industry reports suggest that AI adoption is uneven: some functions like staffing and marketing have mature use of AI tools, while others like strategic planning and organizational design are still emerging (Nawaz et al., 2024). As digital infrastructures mature, managers integrate AI tools to automate processes, enhance analytics, and strengthen strategic foresight. The managerial role, traditionally defined by planning, organizing, staffing, directing, and controlling, has become more data-driven and algorithmically supported. Comprehensive analysis of AI's impact across all managerial functions remains limited. This paper addresses that gap by synthesizing existing literature to identify patterns, challenges of AI adoption within the classical management framework.

This review synthesizes empirical findings on AI adoption in each managerial function, focusing on actual use-cases and outcomes. We draw from academic studies, case-based literature reviews, and high-profile institutional surveys. Our aim is to assess where and how AI has been integrated into management tasks, and what results have been observed.

2. Methodology

This review followed a structured, multi-stage process to identify relevant studies (akin to PRISMA). We searched scholarly databases (Scopus, Web of Science, ScienceDirect) for publications between 2015 and 2025 using terms related to

"artificial intelligence" and core managerial functions (planning, organizing, staffing, directing, controlling). The search aimed to capture empirical and review studies of AI applications in managerial contexts.

Inclusion criteria were: (1) explicit focus on AI in managerial or organizational settings; (2) peer-reviewed work published 2015–2025; and (3) empirical data or systematic synthesis (no purely conceptual or technical-only papers). Exclusion criteria included technical AI papers without management implications and non-academic sources.

The selection process unfolded in four steps. First, an initial search yielded several hundred records. Duplicates and clearly irrelevant studies were removed. Second, titles and abstracts were screened, discarding studies that did not meet the inclusion criteria. Third, the full text of remaining articles was reviewed for eligibility. After applying all criteria, 13 studies met the criteria and were included in the final synthesis. The search and screening process ensured transparency and reproducibility.

3. Literature Review

Managerial practice typically involves five interrelated functions: planning, organizing, staffing, directing, and controlling. AI technologies intersect with each of these in distinct ways. Predictive analytics enhance planning; robotic process automation and workflow orchestration support organizing; intelligent recruitment and training systems transform staffing; decision-support tools aid directing; and automated reporting and anomaly detection systems underpin controlling. Recent bibliometric analyses (Guler et al., 2024) show that research on AI in management has concentrated in three domains - human resources, marketing, and financial control - while strategic management and organizational design remain emerging frontiers.

3.1 Staffing: Human Resource Management

Staffing – including hiring, training, and workforce management – has seen mature and widespread AI adoption. Human Resources (HR) departments routinely deploy AI for recruitment, selection, and employee development. Organizations now use AI to screen applicants, schedule interviews, and automate administrative tasks, which enhances efficiency and can reduce bias.They report that machine learning models can "predict the future and detect problems more accurately than humans" and "AI will outperform humans in applicant selection" (Parry & Battista, 2019). AI is also used for training and retention; adaptive learning platforms personalize employee training – algorithms recommend courses based on each worker's skill gaps, improving learning outcomes. Moreover, predictive analytics help forecast turnover by identifying employees at risk of leaving, so managers can intervene. AI in staffing yields time savings and cost reductions. Nawaz et al. (2024) summarize that common outcomes include "time-saving, cost-effective, accuracy, bias-free, and reduced workload." However, some HR professionals are skeptical of AI's opacity. The World Economic Forum (2025) reports that while ~88% of companies use AI for initial candidate screening, skepticism remains about accuracy and fairness. The WEF study concludes "conversational AI serves as a highly effective initial filter" but ultimate hiring decisions still rely on human judgment. In summary, staffing is one of the most advanced areas of AI use. Empirical findings repeatedly show improved

speed and consistency in recruitment and training, but also underscore the need for responsible human-in-the-loop governance (Nawaz et al., 2024; World Economic Forum, 2025).

3.2 Directing: Decision-Making and Leadership

Directing – motivating employees and managing daily operations – involves interpersonal and judgment tasks. AI's role here is growing, particularly in communication and decision support, but it remains experimental. Generative AI can effectively mimic executive communications, but employees exhibit "algorithm aversion" when they know a message is machine-written. AI is being applied to augment leadership tasks as well. For instance, AI-based coaching tools can analyze managers' meeting or feedback style and recommend improvements (e.g. Retorio for personalized leadership coaching). While studies on these tools are nascent, early evidence suggests they can reveal blind spots to managers. More broadly, routine aspects of directing (e.g., drafting emails, generating reports) can be accelerated by generative AI. As Rand (2024) notes, AI could automate "busy leaders' routine tasks – such as the electronic communication that takes 24% of a CEO's time," freeing them to focus on high-level strategy.

However, there are limits. Human motivation and culture-building rely on empathy and trust that AI cannot replicate. Rand (2024) and Hillebrand et al. (2025) find that employees often have incomplete mental models of AI decision-making processes, which can affect trust and adoption. AI tools can assist with communication and leadership tasks by improving efficiency and providing personalized feedback, but human qualities like empathy and strategic insight remain central to directing.

3.3 Organizing: Structure and Processes

Organizing encompasses structuring resources and tasks. Industry surveys indicate that companies are beginning to redesign workflows and structures around AI capabilities. In practice, large firms have centralized some AI functions (e.g. data governance) and created cross-functional teams to integrate AI into business processes. On the operations side, AI-driven tools are increasingly used for resource allocation and process optimization. In manufacturing and supply-chain contexts, machine learning forecasts demand and automatically adjusts inventory orders. In service industries, AI scheduling systems optimize staff shifts based on predicted workload. These applications fall under organizing in that they modify routine workflows and networks. Empirical evidence shows such systems can reduce waste and improve utilization (Nawaz et al., 2024). For instance, AI systems in logistics companies have optimized delivery routes and fleet management, cutting fuel costs. However, much of this evidence comes from case reports and vendor studies, not academic field trials. Managers should ensure that AI organizing tools are transparent and allow manual override to prevent errors and maintain flexibility (Hillebrand et al., 2025; Osman et al., 2025).

3.4 Planning: Strategic Decision-Making

Planning involves setting objectives and formulating strategies. AI is increasingly applied to strategic planning through predictive modeling and scenario analysis. Industry reports highlight that AI-generated insights support planning by identifying opportunities and risks more quickly (D'Amico et al., 2025). AI also augments

innovation processes. Some firms use AI to scan data for emerging customer needs or competitor moves, informing strategic pivots. However, empirical studies suggest that human managers still play the central role in strategy. AI is typically used as a thought partner – providing data-driven options – while final decisions rely on human judgment (D'Amico et al., 2025). Bias or error in AI forecasts can mislead strategy if unchecked. Managers must combine AI's data capabilities with human experience to craft sound plans (D'Amico et al., 2025).

3.5 Controlling: Monitoring and Compliance

Controlling entails monitoring performance, setting standards, and taking corrective action. AI is increasingly used here for both financial control and operational oversight. In finance, AI-driven forecasting and budgeting tools are yielding concrete benefits. Industry analysts predict that by 2028 about half of large organizations will use AI in budgeting, reflecting how fast this area is maturing. Beyond finance, AI is embedded in many operational control systems. For example, in manufacturing, computer vision systems inspect products for defects at high speed, reducing quality-control costs. In IT operations, AI-driven monitoring tools (like anomaly detectors) watch system metrics in real time and trigger alerts for managers. The literature cautions that excessive automation of control functions can reduce worker autonomy and morale (Cameron, 2024).

In sum, controlling tasks are moving toward automation by AI, with demonstrated improvements in speed and consistency (as in budgeting) but also raising new governance challenges (Cameron, 2024; Mayer et al., 2025).

4. Discussion and Conclusions

Across the five functions, a common pattern emerges: AI excels at data-intensive, repetitive tasks, but less so at complex judgment and human-centric activities. Staffing (HR) and financial planning (in controlling) are the most mature domains of AI use. By contrast, strategic planning and leadership (planning and directing) remain human-led, with AI in a supporting role. No studies suggest AI can fully replace managers' strategic vision or their ability to motivate teams. Instead, AI is framed as a partner. Where AI adoption is most advanced, organizations report clear positive outcomes, often validated by field data. However, the evidence also highlights costs and challenges. AI can introduce or perpetuate biases (if training data are flawed), that it demands new skills from managers, and that it can create blind spots if over-relied on. Notably, Nawaz et al. (2024) caution that AI outcomes depend on high-quality data and governance: "AI can work efficiently…only when provided with quality data and strict policies." Algorithmic control raises ethical and legal issues around surveillance and autonomy (Cameron, 2024). Thus, empirical studies stress the importance of human oversight and transparency.

In conclusion, AI is already embedded in many operational aspects of management and is steadily advancing into more strategic domains. Its maturity varies by function: fully fledged in staffing and quantitative planning tasks; nascent in high-level decision-making and organizational design. Yet managers must remain vigilant about AI's limitations. Future research should continue to evaluate actual outcomes of AI tools in real organizations, especially in the less-studied areas of organizing and directing, to guide evidence-based practice.

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THE IMPACT OF ARTIFICIAL INTELLIGENCE ON HUMAN RESOURCE DEVELOPMENT PROCESSES

Crăița-Maria Romașcu

Doctoral School of Economics and Business Administration, „Alexandru Ioan Cuza" University of Iași, Romania

Email: craitamaria@yahoo.com

Abstract: *Artificial Intelligence (AI) is transforming Human Resource Development (HRD) across the European Union by reshaping learning systems, talent management practices and organizational knowledge processes. This paper synthesizes recent academic and policy literature to propose a human-centered and ethics-aware framework through which AI enhances, rather than replaces, human expertise. Without reporting an original empirical study, the paper develops a conceptual model explaining how AI adoption may improve HRD outcomes such as training participation, verified skills acquisition and adaptability, through the mediating role of employees' digital skills and under the moderating influence of ethical governance, inclusiveness and a supportive learning culture. Drawing on secondary European indicators and recent scholarly evidence, the discussion highlights that while AI can enable personalization, efficiency and foresight in HRD, these benefits remain conditional on responsible governance and equitable access. The study concludes that transparent and inclusive AI is a precondition for sustainable and fair Human Resource Development in the European digital economy.*

Keywords: Artificial Intelligence; Human Resource Development; Digital Skills; Continuous Training; Ethics; European Union

JEL Classification: M12; O33; J24

1. Introduction

Artificial Intelligence has become a structural force shaping organizational transformation, particularly in the field of Human Resource Development. Within the European Union, where the digital transition is both a policy priority and a socio-economic necessity, AI technologies are redefining how learning, training and professional development are designed, delivered and evaluated. Contemporary HRD systems increasingly rely on intelligent algorithms capable of identifying skills gaps, personalizing learning pathways, and predicting future workforce needs. However, these technological opportunities are accompanied by serious challenges: algorithmic bias, opacity of decision-making, and potential inequalities in access to digital learning tools.

In this context, the central question is not whether AI will influence HRD, but rather how it can be implemented in a way that strengthens human capacity instead of replacing it. The purpose of this paper is to consolidate the latest evidence on the relationship between AI and HRD, to develop a conceptual model that links technological adoption with learning outcomes, and to outline implications for both organizations and policy-makers in the European Union. The paper relies exclusively

on secondary sources-scientific literature, EU policy documents and recent research indicators-without claiming to present an empirical study. Its added value consists in synthesizing existing research into a coherent theoretical framework that may serve as a foundation for future doctoral investigations.

2. Literature Review and Theoretical Background

The literature on Artificial Intelligence in Human Resource Development converges toward the idea that digital transformation is fundamentally reshaping how individuals and organizations learn. (Ekuma, 2024) argues that AI has moved HRD away from standardized, one-size-fits-all training programmes toward adaptive and dynamic learning ecosystems. Intelligent learning management systems and generative assistants enable personalized learning experiences by continuously analyzing users' progress and offering micro-learning modules tailored to their specific needs. (Dima et al., 2024) also demonstrate that such adaptive systems enhance engagement and retention, but only if the organizational environment promotes transparency, fairness and trust.

Beyond training, AI applications extend to talent management, career development and performance evaluation. Predictive analytics and workforce planning algorithms help organizations identify emerging skill gaps, plan internal mobility and design targeted upskilling initiatives. Yet, as (Capasso et al., 2024) caution, the same systems can reproduce discriminatory patterns if historical data are biased or incomplete. Thus, high algorithmic accuracy does not automatically translate into fairness. Ethical safeguards-such as bias audits, model explainability and informed consent-are essential for ensuring that AI remains a supportive tool rather than an exclusionary mechanism.

In the domain of knowledge management, AI facilitates the capture and dissemination of tacit organizational knowledge through chatbots, knowledge graphs and natural language processing. These systems drastically reduce search time and foster continuous learning, but their effectiveness depends on the organization's learning culture. As (Yorks, 2024) notes, even the most advanced AI systems fail when employees lack psychological safety, access to training time or the confidence to experiment with new technologies. Therefore, the cultural readiness of an organization acts as a determinant of how successfully AI tools are adopted in HRD.

The reviewed literature also identifies recurrent risks: the propagation of bias, overreliance on quantitative metrics, the erosion of human autonomy, and increased surveillance at work. (Nawaz, 2023) warns that algorithmic management can inadvertently transform learning environments into monitoring systems, undermining intrinsic motivation. Consequently, AI in HRD must be implemented under an "ethics-by-design" approach that combines efficiency with fairness, transparency and inclusivity.

3. Discussion

Based on the synthesis of prior research, this paper proposes an integrative conceptual framework describing the mechanisms through which AI influences HRD outcomes. The central hypothesis is that AI adoption improves HRD performance indicators-such as training participation, verified skills acquisition and adaptability-

when employees possess adequate digital competencies. Thus, digital skills act as a mediator: they transmit the effects of AI technology toward meaningful developmental outcomes. Without sufficient digital literacy, employees may feel alienated or excluded from AI-based learning platforms, deepening existing inequalities.

Moreover, the relationship between AI adoption and HRD outcomes is conditioned by three contextual factors: ethical governance, inclusiveness and learning culture. Ethical governance refers to the policies and practices that ensure AI is used responsibly, including bias audits, data minimization and explainable algorithms. Inclusiveness involves equitable access to learning resources, paid training time and adaptive content for diverse user needs. Learning culture encompasses openness, feedback, experimentation and tolerance for error-psychological dimensions that determine whether employees embrace or resist technological change.

At the macro level, European policy frameworks such as the "Ethics Guidelines for Trustworthy AI" (European Commission, 2020) and the forthcoming EU AI Act emphasize transparency, human oversight and non-discrimination. These principles resonate with the academic argument that responsible AI governance is inseparable from sustainable HRD. Empirical studies reviewed by (Li et a., 2025) show that in regions with higher levels of digital literacy, AI adoption correlates with stronger adaptability and higher participation in continuous training. Conversely, in low-skill or low-trust environments, the same technologies have negligible or even negative effects.

In practice, this model suggests that AI's positive impact on HRD is not automatic but conditional: it depends on the interplay between technological readiness, skill development and ethical context. Future doctoral research could test this model empirically through an explanatory sequential mixed-methods design-starting with cross-country quantitative analysis of Eurostat indicators on digital skills and training, followed by qualitative interviews with HR experts to interpret the mechanisms observed. Such a design would provide both generalizability and contextual depth, bridging theory and application.

4. Conclusion

Artificial Intelligence represents both a challenge and an opportunity for Human Resource Development. Its integration into learning and development processes, talent management and knowledge systems has the potential to make HRD more adaptive, efficient and evidence-based. Yet, technology alone cannot guarantee progress. The real determinant of success lies in how organizations design their AI strategies-whether they prioritize human dignity, inclusiveness and ethical responsibility.

This paper concludes that AI should be regarded not as a substitute for human judgment, but as an augmentative force that supports employees in achieving greater autonomy and adaptability. To harness its potential, organizations and policymakers must invest in digital skills training, establish clear ethical frameworks, and cultivate learning cultures that encourage curiosity and reflection. Only under

these conditions can AI contribute to equitable and sustainable human development within the European digital economy.

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DURATION OF WORKING LIFE IN THE EUROPEAN UNION: A COMPARATIVE ANALYSIS OF RECENT TRENDS

Otilia Trașcă

Management, "Eugeniu Carada" Doctoral School of Economics Sciences, University of Craiova, Craiova, Romania
trasca.otilia14@gmail.com

Abstract: *This paper examines the duration of working life in the European Union (EU) member states, showing its evolution from 2015 to 2024. The objective is to determine the trends at the EU level and the differences among each state's average number of years an employee is expected to spend in the labour market. The methodology used in preparing the study is a descriptive statistical analysis of data published by Eurostat, which uses a comparative approach of the evolution over the time period examined and the existing differences between member states. The results of the study show an increasing trend in the duration of the working life in the EU countries, but also highlight significant variations among states. The Eurostat data also reveal substantial disparities between women and men. This evolution suggests significant changes in the economic context and the dynamics of the European workforce. The conclusions highlight the necessity of finding a balance in the European labour market, in order to better understand the evolution of the labour market, especially in the context of the demographic transition.*

Keywords: working life duration; labour market; European Union; employment; gender disparities
JEL classification: J21; J11

1. Introduction

In recent years, the European Union has faced multiple challenges, such as the demographic transition, the ageing of the population and the sustainability of social welfare systems. Considering the increasing pressure on the labour force, understanding its dynamics is critical. The duration of working life (DWL) is an important indicator used to determine the balance between economic contributors and dependents. The indicator is defined as the average number of years a person aged 15 is expected to be economically active throughout their life.

The common policy response to demographic ageing is the general extension of professional life. Yet, the member states encounter complex trends and patterns. There are significant differences in economic structures, cultural norms and social policies that cause varied outcomes. These recent trends need to be examined, in order to measure the policy effectiveness and to identify constant challenges.

The European Commission and Eurostat have conducted studies that show an increase in the expected duration of working life across most EU countries over the last decade (Eurostat, 2024; European Commission, 2023). Furthermore, similar findings are reported by the Organization for Economic Co-operation and Development (OECD, 2022), which points out improvements in labour market

participation and gender equality as key drivers of this trend. Academic analyses (López-García & Pino, 2022) also emphasize that structural and demographic factors continue to influence the duration of working life, although significant differences still exist between countries and between men and women.

This paper aims to analyze the evolution of the duration of working life, following the European Union member states, in a time period of 10 years (from 2015 to 2024). The main objective is to determine the general trends at the EU level, while simultaneously analyzing the existing differences among states. The study is using a descriptive statistical analysis of Eurostat data (Indicator: LFSI_DWL_A) and will present recent evolution, compare the performance of EU countries and examine the disparities that appear between men and women. This analysis shows the dynamics of the EU's active labour force and contributes to the extensive discussion on finding a balance in the labour market, in the context of the demographic change.

2. Methodology

This research has chosen a quantitative, descriptive and comparative research design to evaluate the changes in the duration of working life (DWL) among the member states of the European Union (EU). The analysis will consider both the chronological aspect, which shows the changes over time between 2015 and 2024, and the geographical aspect, which points to variations among countries. The combination of these two aspects makes it easier to understand the overall picture of the forces behind labour market participation in the EU more comprehensively.

The research is directly founded on empirical evidence coming from the official data of Eurostat, particularly the "Duration of working life" (code LFSI_DWL_A) which is the indicator used in the survey. This indicator takes its source from the EU Labour Force Survey (LFS). This indicator is supposed to reflect the average years through which a 15-year-old person would be engaged in the economic activities during his or her lifetime, whether is it in the form of being employed or not (Eurostat, 2024). By highlighting the dataset that is harmonized so to speak, comparability across the EU-27 member states is ensured and thus a firm basis is provided for taking a positing in the assessment of long-term market trends.

The duration of the study is ten years, starting from 2015 and ending in 2024, and it includes all 27 EU member countries. This time span offers a chance to witness long-lasting changes, together with the demographic changes and economic crises' impact in shaping the European labour force. The analysis is done descriptively with a focus on the statistics on the average, variation and trends over time. The longitudinal dimension shows the graph of the DWL indicator changes during the years assessed, while the cross-sectional view stresses the differences among the countries concerned. Also, the research deals with the issue of gender inequalities - the aim is to find out whether the men-women pay gap is still there or not and if so, how big it is.

3. Results

The examination of Eurostat data for the year 2024 (Figure 1) has shown that there is a huge difference from country to country in the expected duration of working life across the European Union. The average duration reached 37.2 years at the EU

level, thus, confirming the continuation of the upward trend that has been prevailing over the last decade (Eurostat, 2024). Nevertheless, the differences among the countries are considerable, which is a clear indication of the heterogeneity of the labour markets and social structures within the Union.
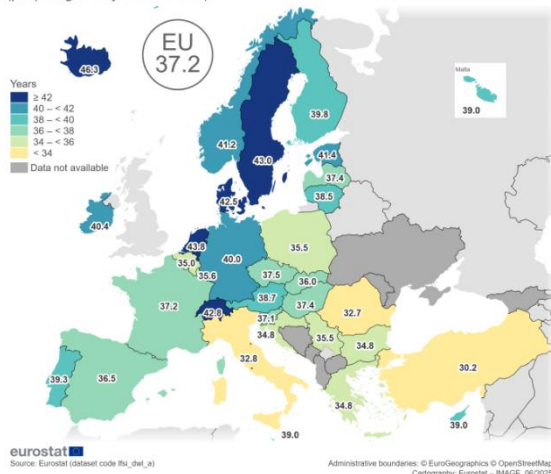

Figure 1: Expected duration of working life, 2024.
Source: Eurostat (lfsi_dwl_a)

Countries in Northern and Western Europe list the highest figures, more than 42 years in Sweden (43.0), Denmark (42.5), and the Netherlands (42.8). These results mirror the high level of participation in the labour force, the high rate of employment of senior workers and the labour market policies that are more inclusive. The case is that Iceland, although it is not an EU member, has a remarkable number of 46.3 years that shows a very high level of commitment to the labour market.

On the contrary, Southern and Eastern European countries have lower averages, usually below 36 years. Among the countries with the shortest expected working life are Italy (32.8), Greece (30.2), and Romania (34.8). Such outcomes may be attributed to issues like employment rates being lower, young and long-term unemployment being higher, and women's labour participation being weaker. Countries in Central Europe like Poland (37.4) and Czechia (37.1) are almost at the EU average, showing moderate but steady progress over the decade that has been analyzed.

The map geographically shows a sharp North–South division, where the northern regions are the ones with the longest working lives and the southern ones are the ones that are lagging behind. This gap highlights the impact of national labour policies, welfare systems, and the socio-economic context of each country. The existence of such differences is a sign that while the European labour market is still divided it is running in parallel.

4. Conclusions

The duration of working life analysis performed for the European Union from 2015 to 2024 reveals a constant increasing trend in the number of years individuals are

expected to be economically active. The Eurostat data shows that the average duration went up from around 34.9 years in 2015 to 37.2 years in 2024, thus confirming a slow but steady increase of working life in most of the EU member states (Eurostat, 2024). This change is a direct reflection of the major socio-economic shifts, such as greater participation in the labor market, better educational qualifications, and the increasing presence of females in the labor force. On the other hand, the findings point out the continuing regional differences. The working life duration in the Northern and Western European countries, particularly Sweden, Denmark, and the Netherlands, is still very high, over 42 years. In Southern and Eastern European countries, such as Greece, Italy, and Romania, the working life averages are still below the EU standard. Such variations are determined by the country's labor market structure, and employment rates, and social policies that control the individuals' ability to stay in the labor market. The gender differences that are slowly closing up, still appear in all the regions, indicating that women's participation is still limited by structural and cultural factors. The results stress the fact that though there is a trend of convergence among the EU countries, it is not comprehensive. In total, the research shows that the European Union is witnessing a slow but steady extension of working life along with the substantial differences among the states. The results discussed above draw attention to the need for both creating and implementing inclusive and flexible policies for the labour market that are able to support a balanced participation and also be adjusted according to demographic and economic transitions.

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LABOUR MARKET INTEGRATION OF UKRAINIAN REFUGEES IN CLUJ-NAPOCA: FROM HUMANITARIAN ASSISTANCE TO ECONOMIC PARTICIPATION (2022-2025)

Catalina Saioc

PhD student, Doctoral School of Economic and Administrative Sciences, Faculty of Administration and Business, University of Bucharest, Bucharest, Romania
catalina.saioc@s.unibuc.ro

Abstract: *This paper examines how the provision of support to the Ukrainian refugees in Cluj-Napoca was structured from 2022 until 2025, and it will focus on the shift from emergency responses toward the development of models of economic integration that are supported by the data collected by UNHCR and IOM. Emergency responses were provided as soon as the conflict began, including temporary housing, material goods, and administrative guidance. In addition, UNHCR, IOM and other local organizations developed vocational training programs and counseling services. During this time, approximately 3000 individuals have benefited from the temporary protection afforded to them; they also have experienced significant internal mobility, and some of these individuals registered again. The local economy has remained relatively stable since the beginning of the crisis, as indicated by the Cluj County Statistics Directorate with regard to the unemployment rate of less than 2%. There appears to be sufficient structural potential for integrating refugees in spite of the modest numbers of arrivals. However, there is evidence of very little participation (less than 25%) in job training programs and formally employed positions, which indicates that the integration into the local economy is an ongoing process that has just begun.*

Keywords: Ukrainian refugees; temporary protection; labour market participation; economic integration; Cluj-Napoca.

JEL Classification: J61; J68; R23

1. Introduction

The war launched by Russia against Ukraine in February 2022 caused considerable population displacement in Europe. This situation had a direct impact on the administrative and social structures of neighboring states, including Romania. Cluj-Napoca is a prime case study for examining the evolution of initial humanitarian interventions into economic integration initiatives at the community level. In the literature, economic resilience is defined as a local system's ability to maintain functionality in difficult external conditions through absorption or adaptation (Martin & Sunley, 2015). In this paper, however, the concept of economic resilience is used as an analytical benchmark rather than a premise. This study aims to assess how humanitarian relief efforts transitioned into providing economic development support

in regional economic integration and whether or not this represents a case of local adaptive process.

The study is exploratory in nature and uses secondary data and does not intend to provide a comprehensive review of the integration outcomes. The research question posed for this study is: what was the progression by which the transition from humanitarian assistance to regional economic integration initiatives were implemented within Cluj-Napoca, Romania from 2022 through 2025.

2. Data and methodology

The analysis focuses on the period from 2022 to 2025 and targets the municipality of Cluj-Napoca. This choice is motivated by the region's active labour market and the stability of a relatively constant group of people benefiting from temporary protection. The study is based on secondary data and examines the transition from humanitarian aid to strategies focused on economic integration. Four indicators were examined: the number of individuals receiving temporary protection, the unemployment rate, participation in vocational training courses, and formal integration into the labour market. Information was obtained from official sources, including UNHCR (2023), IOM, and the Livelihood Working Group (2024–25), the Cluj County Statistics Directorate (2025), and the Ministry of Labour and Social Solidarity (2024). The data were analyzed to highlight changes and links between the behaviour of the refugee group and the labour market in the region.

3. Results and discussions

3.1. Evolution of key indicators (2022-2025)

Indicator	2022	2023	2024	2025
Beneficiaries of temporary protection (Ukraine), Cluj-Napoca	-	≈3.100	≈2950	≈3000
Unemployment rate (County Cluj, %)	1,6	1,5	1,4	1,4
Participation in training programs (number of persons among beneficiaries of temporary protection)	-	120	180	200
Formal employment (proportion of beneficiaries of temporary protection)	-	<20	<25	<25

Source: own processing based on UNHCR (2023-2025), DJS Cluj (2025), IOM-UNHCR Livelihood WG, MMSS (2024).

Methodological note: Indicators relating to training and employment refer exclusively to beneficiaries of temporary protection from Ukraine and do not apply to the entire number of refugees or the general population.

3.2 Data analysis

UNHCR data for the analyzed period indicate that the number of people benefiting from temporary protection in Cluj-Napoca has remained relatively stable. While this refers to the total number of registered individuals, it does not suggest that this number remains constant throughout the period. Institutional reports suggest that changes to this group may include departures, moves, and new registrations. This suggests that the stability is due to administrative management rather than being strictly related to residence or social relations. At the same time, the labour market in Cluj County has maintained constant demand for labour.

This suggests that the integration of refugees has not occurred in a highly competitive environment. According to the available data, the arrival of individuals benefiting from temporary protection has not led to significant changes in the labour market structure. However, it can be observed that no additional pressure was applied during the analyzed period. Since 2023, vocational training and employment counselling programmes have been implemented with the support of UNHCR, IOM, and local non-governmental organizations. Nevertheless, the number of people participating in these programmes was modest compared to the total number of individuals receiving temporary protection. Institutional reports (IOM, UNHCR, MMSS, 2023-2025) suggest possible causes include language barriers, difficulties in recognizing qualification certificates, and the group's increased mobility. According to the definitions used in the IOM-UNHCR reports and in the ANOFM's methodological note (2024), the concept of 'formal integration' refers to employment based on a work contract registered in Romania.

Given this information, the rate of formal employment is low compared to the total number of people receiving temporary protection during the period in question. This indicates that the transition from humanitarian assistance to economic integration is underway, but the use of available resources remains limited.

4. Limitations and conclusions

These results need to be taken as indicative only with limitations on their conclusions, due to the nature of this research using qualitative methods with secondary data sources. The findings may also be based upon the accuracy of reporting in the secondary data collected during the studies. This research relies solely upon secondary data obtained from official Government sources. Consequently, the report will include the same details as those included within the available public records. The difficulty of determining an individual's experience with integration, and the degree of integration achieved by various sectors, is further compounded, due to the lack of dependable sources regarding the backgrounds of persons who have benefited from Temporary Protection. According to the available data, there is a discrepancy between the accessibility of support tools and their actual use. This difference cannot be explained solely by the institutional structure, but requires a more detailed examination of the daily experiences of those affected, as well as the actions of community organizations.

Further research could involve collecting qualitative data on employment pathways, examining interactions between institutions and service users, and comparing experiences with those in cities with similar levels of poverty. These steps could help clarify how assistance translates, or fails to translate, into sustainable economic integration.

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PERSPECTIVES ON THE ECONOMY OF VOLUNTEERING

Roland Sopronyi

University of Oradea, Faculty of Economics, Oradea, Romania
sopronyir@yahoo.com

Abstract: *The study explores the concept and economic implications of volunteering within the context of Romania and the European Union. Volunteering is interpreted as a form of unpaid labour with both economic and social value, representing an integral part of the social economy. Based on OECD, ILO, and Eurostat sources, the research evaluates the contribution of volunteering to gross domestic product, its role in building social capital, and its impact on community cohesion. Comparative data between Romania and the European averages highlight positive development trends and the need to strengthen institutional infrastructure. The conclusions emphasize the importance of integrating volunteering into public policies, education, and local development strategies, underlining its potential as a strategic resource for a sustainable economy.*

1. Volunteering – Conceptual boundaries

The concept of volunteering represents an essential component of the social and solidarity economy, as well as a distinct form of civic participation and economic contribution. Over time, its conceptual delimitation has proven complex, given its hybrid nature—situated between labour, altruism, and social engagement (Salamon, Sokolowski & Haddock, 2011). According to the *Manual on the Measurement of Volunteer Work* developed by the International Labour Organization (ILO), volunteering is defined as "Unpaid and non-compulsory work; that is, time willingly given for activities carried out either through an organization or directly for others outside one's own household" (ILO, 2011, p. 13). This definition, later adopted by OECD (2024) studies, establishes clear operational criteria: the absence of financial compensation; the voluntary and freely chosen nature of the activity; the production of a good or service of public value, not just personal benefit; and the performance of the activity outside the individual's own household.

1.1 Typologies of volunteering and its economic and social dimensions

The specialized literature distinguishes between:

- **Formal volunteering**, carried out through nonprofit organizations, public institutions, or companies;
- **Informal (direct) volunteering**, taking place between individuals—for instance, helping neighbors or supporting vulnerable persons (OECD, 2024, p. 10).

According to global estimates, approximately 70% of volunteer activities occur informally, while 30% take place through organizations (Salamon et al., 2018; OECD, 2024). Although volunteering is, by definition, an unpaid activity, it produces measurable economic value. Salamon, Sokolowski, and Haddock (2011) demonstrated that if a "nation of volunteers" existed, it would represent the seventh-largest economy in the world and possess the second-largest adult population globally.

1.2 Conceptual challenges

Defining and measuring volunteering raises several methodological challenges:

- **Definitional** – the term "volunteering" carries different cultural, religious, or institutional meanings;
- **Measurement** – unpaid work is not reflected in official labour statistics;
- **Evaluation** – the absence of a market price makes the economic value difficult to quantify (Salamon et al., 2011).

The main evaluation methodologies in economic literature are:

- the **replacement cost method**, which estimates the value of volunteer work through the average wage of a paid employee performing the same activity;
- the **opportunity cost method**, measuring the value of time sacrificed by the volunteer;
- and the **social benefits method**, estimating the overall impact on the community.

2. The economic contribution of volunteering

2.1 The Economic value of voluntary work

In many countries, volunteer activities are not included in official labour market statistics, and the absence of a clear market value makes it difficult to accurately estimate their economic contribution. According to OECD (2024), only 15 European Union countries systematically collect national data on volunteering, making international comparisons challenging.

2.2 The global dimension of the economic contribution

At the global level, over 860 million people volunteer at least once a month, equivalent to 61 million full-time jobs (OECD, 2024). In the United States, for example, the annual economic value of volunteering is estimated at approximately $200 billion, while in the European Union, volunteer activities represent the equivalent of 3% of the active labour force (OECD, 2024).

These data demonstrate that volunteering is not merely a social activity but a true economic resource, producing goods and services equivalent to a significant portion of gross domestic product.

2.3 Volunteering and the labour market

Volunteering exerts a positive influence on the labour market through skill development, human capital formation, and increased employability. Studies in the United Kingdom and United States reveal that volunteer experience correlates with higher employment prospects and better wages among professionally trained individuals (Sauer, Wilson & Mantovan, 2019). Moreover, volunteering develops transversal skills—leadership, communication, empathy, and teamwork—that enhance overall workforce productivity. From this perspective, volunteering can be

viewed as an investment in human capital and an indirect means of economic development (Gichuki & Gachathi, 2021). Recognizing the economic value of volunteering has direct implications for public policy.

3. The Economic Value of Voluntary Work

Volunteering is one of the most complex expressions of civic participation and social responsibility. Beyond its economic contribution, it holds social, educational, psychological, and cultural value, directly influencing both individual quality of life and community cohesion. The social values of volunteering consist in the development of interpersonal relationships and opportunities for integrating vulnerable groups by creating social ties and offering a sense of usefulness (Haski-Leventhal, Meijs & Hustinx, 2009). Additionally, volunteering constitutes a non-formal form of education. In Romania, the inclusion of voluntary activities in educational programmes and student portfolios (under Law no. 78/2014 on the regulation of volunteering) represents an important step towards institutionalizing its educational value. On an individual level, volunteering has positive effects on well-being, mental health, and life satisfaction. Studies by Thoits and Hewitt (2001) have shown that volunteers report higher levels of happiness and a stronger sense of purpose and personal fulfilment. Volunteering is also an expression of the culture of solidarity and civic responsibility, contributing to a more cohesive and participatory society.

4. Data on volunteering in Romania and the European Union

According to European Commission (2023) data, more than 90 million European citizens—approximately 20% of the adult population—engage annually in both formal and informal volunteer activities. In Romania, the development of volunteering has been slower but steady, encouraged by legislative reforms and the growing involvement of non-governmental organizations. The adoption of Law no. 78/2014 on the regulation of volunteering marked a milestone in recognizing the social and economic value of voluntary work. The Eurobarometer Report on Volunteering (European Commission, 2022) shows that Nordic countries (Sweden, Denmark, Finland, the Netherlands) and Ireland record the highest rates of participation—over 40% of the adult population volunteers at least once a month. In contrast, in Southern and Eastern Europe, participation rates are significantly lower, particularly in Greece, Bulgaria, Croatia, and Romania, where averages remain below 15%.

Table 1: The rate of participation in different countries

Country / Region	The average volunteering rate (among the population 15+ years)	Predominant type of volunteering	Main sources
Sweden	46%	Formal	Eurobarometer 2022
Ireland	43%	Formal	OECD 2024
Germany	39%	Formal	OECD 2024
France	33%	Formal & corporate	OECD 2024
Poland	27%	Formal	Eurostat 2023

Romania	14–16%	Predominantly informal	Eurobarometer 2022
EU average	24%	—	Eurostat 2023

Source: European Commission (2023), Eurobarometer 2022, OECD 2024, Eurostat 2023

5. Conclusions

The economy of volunteering represents an emerging dimension of the modern economy, situated at the intersection of the public sector, the private sector, and civil society. Volunteering is not merely an expression of human generosity but a transformative force that sustains the social, economic, and moral development of a nation. It embodies an alternative model of productivity rooted in solidarity, mutual aid, and civic engagement. Recognizing and integrating the economic value of volunteering within public policies, educational systems, and social strategies can strengthen both national economies and democratic participation.

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SMART AIRPORTS AND THE FUTURE OF MARKETING RESOURCE EFFICIENCY

Ioana-Maria Stăniloiu, Laura-Maria Langa

Marketing, Tourism Services and International Business Department, Faculty of Economic Sciences and Business Administration, Interdisciplinary Doctoral School, Marketing field, Transilvania University of Brașov, Brașov, Romania
ioana.staniloiu@unitbv.ro
laura.langa@unitbv.ro

Abstract: *This article examines how smart airports use technology to improve efficiency and enhance the passenger experience. Smart systems optimize check-in, security, baggage handling and terminal operations. They also help reduce waiting time and operational costs. Digital platforms allow airports to personalize communication and create data-based marketing strategies. Airports such as Changi, Dubai and Schiphol show that intelligent systems support better resource use and higher passenger satisfaction. The study explains how smart solutions improve service quality and how marketing adapts to a data-driven environment. The findings show that smart airports can increase competitiveness by focusing on efficiency and personalized services.*

Keywords: *smart airports; resource efficiency; digital marketing; passenger experience; automation*

JEL classification: M31, L93.

1. Introduction

Airports manage high passenger flows and complex operations. You expect fast movement, clear information and reliable services. Traditional airport processes often use manual steps, which create waiting time and resource waste. Smart airports use digital systems to support real-time decisions and improve service quality. These systems help airports work with fewer resources while improving the passenger experience. Smart airports also change marketing, because communication can adapt to each traveler using data insights (Graham, 2018).

2. Smart Technologies in Airport Operations

Smart airports use coordinated digital systems to support daily activities. These systems work together to improve movement, safety and communication. They reduce waiting time and help manage resources more efficiently. You interact directly with many of these technologies during your journey.

Biometric identification systems replace manual passport checks. The system scans your face and compares it with your travel document stored in the database. This reduces the time spent at border control. Changi Airport in Singapore uses facial recognition at boarding gates, reducing processing time per passenger and increasing flow efficiency (IATA, 2023).

Self-service check-in kiosks allow you to check in, print your boarding pass and your baggage tags. This reduces dependency on staff at counters. Airports can then assign staff to guidance and problem-solving. This improves your experience because assistance becomes more focused and helpful (Graham, 2018).

Automated baggage handling supports a faster and more accurate luggage process. Sensors and scanners track each bag throughout the terminal. This reduces lost luggage incidents. Dubai International Airport uses RFID technology to track baggage in real time and communicate updates to passengers through mobile apps (Deloitte, 2021).

Predictive analytics use past and real-time data to forecast passenger volume. Airports adjust staff presence at security, check-in and boarding points. Schiphol Airport applies occupancy sensors to monitor queue length and shift staff accordingly. This reduces congestion and improves flow consistency (ICAO, 2022).

Smart energy systems monitor lighting, heating and cooling. They adjust based on passenger density and weather conditions. This reduces energy consumption without lowering comfort. Modern terminals integrate automated climate control systems to balance efficiency and passenger well-being (Halpern and Graham, 2013).

These technologies support clear and reliable information. Digital signage and airport apps provide real-time updates about gates, waiting times and service availability. This helps you move independently in the terminal. You make decisions faster and with less confusion (Graham, 2018).

2. Optimization Strategies

To stay competitive, airports must implement resource optimization strategies tailored to their market demands. Both Brașov-Ghimbav and Iași International Airports base their marketing on two core pillars: route promotion and enhancing passenger experience, with technological innovation as a key component. Brașov-Ghimbav has partnered with airlines to connect with major European cities, boosting visibility and positioning itself as a gateway to the Carpathian region (brasovairport.ro). Similarly, Iași has strengthened its status as a regional hub by collaborating with low-cost and traditional carriers, providing frequent flights to popular European destinations and serving a wide audience, including the Romanian diaspora (Doganis, 2006).

Another essential focus is on personalized passenger experiences. Brașov-Ghimbav has introduced advanced facilities, including Romania's first virtual control tower, to enhance operational efficiency and passenger experience (brasovairport.ro). Iași, prioritizing accessibility and comfort, uses digital platforms for real-time updates on flights and services, ensuring a seamless journey from check-in to boarding and significantly enhancing passenger satisfaction (Graham, 2018).

3. Resource Efficiency

Resource efficiency means using time, space, staff and energy in a way that reduces waste while maintaining service quality. Smart airports use data and automation to improve how these resources are distributed and controlled during daily operations. Energy efficiency is a key focus. Smart lighting systems adjust based on passenger presence. When areas are less crowded, lights dim

automatically. Heating and cooling systems also adapt to real-time terminal activity. This lowers electricity consumption and reduces operating costs (ICAO, 2022).

Human resource efficiency improves when repetitive tasks are automated. Self-check-in platforms and biometric security gates reduce the need for manual processing. Staff can then focus on support and guidance. This increases service quality because staff attention goes to situations that require direct interaction (Graham, 2018).

Space efficiency is also important. Smart queue monitoring systems track passenger flow through different areas of the terminal. When a queue grows, the system signals staff to open additional gates or redirect passengers to shorter lines. This reduces waiting time and improves movement inside the terminal (IATA, 2023).

Predictive planning tools analyze passenger traffic patterns. Airports use this information to plan peak hours, schedule staff and organize service points. Schiphol Airport uses predictive software to adjust resources during busy periods. This helps maintain a stable flow of passengers and reduces the risk of congestion (Deloitte, 2021). These approaches allow airports to deliver consistent service while lowering cost and operational pressure. Efficient resource use becomes a strategic advantage because it improves experience and performance at the same time.

4. Data-Based Marketing in Smart Airports

Smart airports use data to understand what passengers need and how they move through the terminal. This helps create marketing strategies that focus on useful and timely communication. You receive information that matters to your journey, not general messages.

Airports collect data from mobile apps, Wi-Fi access points, flight bookings and digital displays. These data show travel patterns, service preferences and time spent in specific areas. This helps airports identify what passengers value and when they need assistance (Halpern and Graham, 2013).

With this information, airports personalize messages. Mobile applications send guidance to your gate, updates about boarding time and suggestions for nearby services. If you have extra time before departure, you may receive recommendations for shops or dining options. This makes your time in the terminal more efficient and comfortable (Graham, 2018). Retail and commercial partners also use these data. They display promotions based on demand and passenger profiles. This increases the relevance of advertisements and supports better sales without interrupting your journey. Marketing becomes supportive, not intrusive (Deloitte, 2021).

Smart airports use digital screens and interactive kiosks to deliver real-time communication. You receive clear directions, status updates and service information. This reduces confusion and helps you move confidently through the airport (IATA, 2023). Data-based marketing improves both satisfaction and operational efficiency. It aligns airport services with traveler needs and strengthens the relationship between airports and passengers.

5. Case Examples

Several airports around the world apply smart technologies to improve efficiency and enhance the passenger experience. These examples show how digital systems support both operations and marketing.

Changi Airport in Singapore uses facial recognition at check-in, security and boarding. This reduces waiting time and creates a faster passenger flow. The airport also provides a mobile app that offers personalized travel guidance and commercial suggestions. These services help improve comfort and convenience during travel (IATA, 2023).

Dubai International Airport applies artificial intelligence to monitor and control energy use. Sensors track temperature and passenger density. The system adjusts lighting and climate settings to maintain comfort while reducing electricity consumption. Dubai also uses RFID baggage tracking, which allows passengers to follow their luggage in real time (Deloitte, 2021).

Schiphol Airport in Amsterdam uses predictive analytics to manage crowd movement. Sensors placed throughout the terminal measure queue length and walking speed. The system alerts staff when more service points are needed. This reduces congestion and improves the overall passenger experience (ICAO, 2022).

These airports demonstrate how smart systems improve daily operation and help deliver more personalized services. The technologies support efficiency and strengthen the relationship between the airport and the passenger.

6. Conclusion

Smart airports use digital systems to improve daily operations and support efficient use of resources. These systems reduce waiting time, lower energy consumption and improve how staff and space are managed. You experience faster movement, clearer information and easier navigation through the terminal.

Data-driven marketing also helps airports understand what passengers need. Communication becomes personal and useful. You receive information that supports your journey at the right time. This strengthens trust and increases satisfaction. Examples from Singapore, Dubai and Amsterdam show that smart technologies bring measurable benefits. They help airports handle more passengers with fewer delays and better service. Airports that invest in digital transformation become more competitive and more adaptable to future conditions.

Smart airport strategies connect efficiency and passenger experience. They support growth in a sustainable and reliable way.

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CLASSICAL PERSUASION MODELS TO SOCIAL MEDIA INFLUENCE: ETHICAL CHALLENGES IN CONTEMPORARY MARKETING STRATEGIES

Alexia-Edith Micle, Teodora-Ioana Măciucă
Department of Marketing, Tourism, Services and International Business, Interdisciplinary Doctoral School, Programme of Marketing, Transilvania University of Braşov, Romania.
alexia.micle@unitbv.ro; teodora.maciuca@unitbv.ro

Abstract: *We live in an era of accelerated digitalization that fundamentally transforms the way persuasion strategies are designed and applied in marketing. While classic influence models have focused on sending a one-way message to a responsive audience, social media has created an interactive communication environment where users actively contribute to the development of brand identity and perception. Consumers no longer act as mere spectators; they co-create narratives, identities and values within digital communities. Through influential networks, community engagement, and the integration of artificial intelligence and neuromarketing techniques, brands can build relationships that are perceived as authentic, facilitating parasocial connections and emotionally charged connections. Personalization algorithms and behavioral design allow persuasive messages to be tailored to individual emotional triggers, habits, and cognitive vulnerabilities. However, these developments raise important ethical concerns. The line between persuasion and manipulation is becoming increasingly blurred, especially when consumer autonomy and decision-making transparency are compromised. This paper examines how classic persuasion models are reconfigured in social media, examines the role of neuromarketing in influencing consumer behavior, and emphasizes the need for an ethical framework to guide contemporary marketing strategies.*

Keywords: digital marketing, social media marketing, ethical marketing, consumer behaviour, neuromarketing, persuasive design.

JEL classification: M30, M31, M37, M39

1. Introduction

The accelerated evolution of digitalization has fundamentally revolutionized persuasion processes in marketing. In the classic pattern, brands communicated through unidirectional and standardized messages to an audience considered to be passive. On the opposite side, social media introduced a new environment characterized by interactivity, continuous participation and co-creation of brand meanings (Berger, 2015; Cialdini, 2021). Thus, consumers become involved in configuring the brand identity and reputation and are no longer just mere receivers of commercial messages (Lindstrom, 2016).

In this context, the evolution of marketing strategies goes beyond rational arguments and increasingly appeals to emotions, sense of belonging and social validation (Berne, 2016; Eyal, 2014). Neuromarketing is contemporary "weapon" which contributes to the refinement of messages according to the reaction desired by the brand and which develops at the subconscious level of the audience, increasing the influence on decisions (Bhardwaj, et al., 2024; Dooley, 2011).

This marketing revolution benefits brands, but also raises questions about the limits of acceptable influence and the protection of consumer autonomy (Ferrell, et al., 2025; Sandel, 2012). The art of learning these dynamics is essential to formulate ethical and responsible strategies.

2. Classic models of persuasion and their reconfiguration in social media

Classic persuasion models, such as AIDA (Attention, Interest, Desire, Action), conceptualized consumer influence as a progressive approach, in which it was gradually led from simple exposure to the message to the manifestation of concrete behavior (Cialdini, 2017; Cialdini, 2021). In traditional marketing, the route was made through well-structured and repetitive messages.

In social media, persuasion becomes a circular and interactive process. Messages go between consumers, influencers and brands in a digitalized system, where everyone has a role either consciously (influencers, the brand itself) or unconsciously (consumers) and contributes to a narrative evolution (Berger, 2015). Now, the content not only informs but creates new experiences and emotions that influence perceptions in the desired sense by companies (Lindstrom, 2016).

Another successful model of attracting consumers is brand attachment theory which suggests that strong emotional relationships between consumers and brands lead to loyalty and re-purchase behaviors, which is essential for sales growth (Cialdini, 2021). In the social media environment, influencers play an important role in the formation of this attachment because they convey values, lifestyles and emotions that can be perceived as genuine and basic (Berger, 2015). This closeness generates a sense of personal connection with the brand and contributes to the emergence of a psychological attachment, in which the brand becomes part of the identity of the consumer (Eyal, 2014; Lindstrom, 2016).

Brands can use social media marketing to strengthen these links by resorting to storytelling, visual consistency, and personalized interactions that stimulate engagement (Naz and Kashif, 2025).

3. Neuromarketing and influence on consumer behavior

Neuromarketing combines carefully crafted marketing and well studied psychology, so it uses many revolutonary neuroscience techniques to identify unconscious reactions that can explain various reactions to an advertisement, product, brand, and so on (Sposini, 2024). Reactions to the stimuli received by the consumer from brand help to optimize messages and not only to influence emotions and impulses, but also dictating consumer behavior (Bhardwaj, et al., 2024; Dooley, 2011). Digital platforms

allow constant customization of interactions resulting in reducing cognitive resistance (Kahneman, 2015; Kahneman, et al., 2021)

Algorithms analyze behaviors, emotions, preferences, and reactions to predict and stimulate decisions based on what brands wish from the consumer (Eyal, 2014; Kumar and Suthar, 2024; Lindstrom, 2009). They can increase loyalty, but it can also affect the decision-making autonomy of the consumer if he does not realize persuasive mechanisms (Cialdini, 2021; Sandel, 2012).

4. Parasocial relationships and social validation in persuasive strategies

Another persuasion strategy that has gone from traditional to modern with breezy is the parasocial theory that explains the relationships of interconnectivity, of attachment to a person or brand through the introduction of similarity between them and the consumer (Berger, 2015; Berne, 2016). A familiarity bond is realized at the subconscious level that gives rise to attachment and creates an addiction even to the level where the consumer becomes revolted when the brand/influencer is attacked, taking the attack as personal (Eyal, 2014).

Another interesting theory that exists since the beginning of marketing and evolves with it is also the theory of social acceptance. People are sociable creatures who need to join a group of people, to have a sense of belonging in order to feel safe (Cialdini, 2021). Brands have built identities from the beginning that signal status, values and belonging to certain social groups. Consumers refer to these symbolic meanings to express their social position or personal aspirations (Lindstrom, 2016). Thus, choosing a brand reflects not only a functional need, but also the desire to identify with a certain lifestyle and be perceived as part of a community (Ariely and Kreisler, 2017; Kahneman, 2015). In this sense, acquisition becomes a means of affirmation and social integration, giving individuals a sense of acceptance, validation and recognition within the group they deem relevant.

5. Conclusion

To conclude, persuasion strategies have evolved from a traditional, simple one-way communication to participatory and inclusive dynamics, in which consumers become co-creators of brand identity.

The traditional models and theories used in marketing are evolving every day and are also applicable in the era of digital marketing with few changes to accommodate consumer demands. Neuromarketing and personalization algorithms increase influence and loyalty, but they can also affect decision autonomy when acting on cognitive vulnerabilities.

Thus, the challenge of contemporary marketing is to find a balance between efficiency and ethics, through transparency, moderation and respect for freedom of choice, without subliminal messages or without informing the consumer, in advance, of the use of these increasingly evolved and intrusive techniques.

6. Future research directions

A major direction of development is the creation of a scale for assessing persuasive ethics that distinguishes legitimate influence from manipulation or an ethical guide to good marketing practices. It is necessary to research how algorithms can become transparent and how consumers can be educated to recognize persuasive mechanisms. It is also necessary to study the long-term effects of parasocial relationships on emotional and behavioral balance.

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FROM BRAIN TO BEHAVIOUR: EMOTIONAL AND GENDER-BASED MECHANISMS IN CONSUMER DECISION-MAKING

Teodora-Ioana Măciucă, Alexia-Edith Micle

Department of Marketing, Tourism Services and International Business, Interdisciplinary Doctoral School, Programme of Marketing, Transilvania University of Brașov, Brașov, Romania
teodora.maciuca@unitbv.ro ; alexia.micle@unitbv.ro

Abstract: *This paper explores the neural, emotional, and psychological mechanisms underlying consumer decision-making, focusing on how subconscious processes and gender-based cognitive models shape purchasing behavior. Conceptually grounded in the field of neuromarketing, the paper examines the interplay between emotions, cognition, and social influences in shaping consumer preferences. The analysis highlights that decision-making is often guided by subconscious impulses and emotional reactions, rather than rational evaluation, and that men and women exhibit distinct responses to marketing stimuli and brand communication. Supported by theoretical and empirical literature, the paper emphasizes the importance of understanding these mechanisms in order to design more effective, ethical, and emotionally intelligent marketing strategies. By connecting insights from neuroscience and psychology with consumer research, the study contributes to a deeper understanding of the factors that connect the human brain to decision-making processes in the contemporary marketplace.*

1. The Human Brain as the Foundation of Behaviour

For decades, the human brain has been a fascinating source of inspiration for researchers. It represents the foundation of our personality, as it stores our history, experiences, memory and emotions. Now, we are capable of making decisions, such as purchasing decisions. Its volume ranges between 800-2,000 milliliters, an amount that corresponds to a weight of 1.2-1.4 kilograms and which constitutes only approximately 2% of the total weight of the human body. Nevertheless, the brain consumes up to 20% of the body's energy and processes more than 90% of information unconsciously (Marcin, 2020).

Most of the brain's resources are dedicated to the subconscious, while only about 2% of its total energy is required for conscious activities. This explains why many market research studies fail to reveal people's genuine preferences, their reactions are beyond verbal explanation (Cherubino et al., 2019). Because subconscious activities are generally responsible for human thoughts and emotions, the behavior and actions caused are impossible to explain (Pepperell, 2018).

2. The Triadic Structure of the Brain and Its Marketing Implications

Each of the three parts of the human brain controls specific emotions and behaviors. The brainstem, also known as the "reptilian brain", is responsible for transmitting alarm signals to protect life, maintaining vital processes and ensuring both individual and species survival. The physiological center of emotions is the limbic system, also called the "visceral brain". It plays a significant role in processing information that actually reaches our consciousness, selecting it according to interesting-boring, new-repetitive or pleasant-unpleasant criteria, which adjust reality and prevent us from becoming aware of irrelevant or traumatic aspects (Helm, 2021).

Abstract thinking, language, symbology, ethical and moral considerations are controlled by the neocortex, or "thinking mind." Ultimately, understanding how the brain functions enable marketers to develop strategies that enhance customer satisfaction (Orăștean et al., 2018).

3. Subconscious Influence in Consumer Decisions

Three main arguments justify a meticulous focus on consumers' subconscious responses during the decision-making process:

a. Subconscious processes and influences often underlie decision-making.
b. The decision-making moment is strongly influenced by emotions, which is why decisions are made before making a deep and logical analysis of the effects of each possibility.
c. Decisions are made almost instantly, based on immediately available information, rather than on complete data (Ismajli et al., 2022).

As previously mentioned, our inner desires have no influence on the choices we actually make in reality. This suggests that decision-making is not only based on rational or economic factors, but also on social, environmental, emotional and cognitive ones. Consequently, emotions emerge as essential determinants within the decision-making processes (Alsharif et al, 2021).

4. The Emotional Dimension of Consumer Experience

Emotion is a constant factor, and every purchase made in a store leaves a lasting impression. During the post-purchase phase, customers develop an emotional connection with the product. Throughout their experience, they act as brand ambassadors, encouraging future purchases and improving their relationships with the company, its goods or services (Pluta & Szulga, 2022).

They also take the title of advocates, influencing potential consumers and strengthening their connection with the brand, product or service (Singh, 2020).

In addition, service encounters represent crucial moments through which companies can build meaningful emotional connections with their customers. These interactions viewed as dynamic exchanges between consumers and a firm's products or services, expose individuals to a variety of sensory and cognitive stimuli that evoke emotional responses. Such reactions play a central role in shaping how customers perceive value, assess satisfaction, and form intentions for future behaviour (Caruelle et al., 2024).

Emotions play a fundamental role in understanding information, influencing reactions to persuasive messages and measuring the effectiveness of marketing stimuli. Therefore, they are omnipresent in the decision-making process. Given the current marketplace and the countless digital developments, consumers are overwhelmed by the abundance of available offers, which frequently leads to impulsive and irrational purchases. Marketers must take advantage of these aspects and integrate these emotions into communication strategies and product design. This emotional integration aims to achieve higher conversion rates, allowing companies to gain both profit and customer loyalty (Mouammine & Azdimousa, 2019).

5. Gender Differences in Consumer Behaviour

At the same time, gender is another major factor influencing consumer purchasing behavior. The brains of men and women are diametrically opposed at structural and behavioral levels. These differences appear from birth and persist throughout life due to upbringing, culture, education, and socialization. All of these shape attitudes, behaviors, perceptions, motivations, or values, factors that inevitably influence purchasing decisions (Lakshmi et al., 2017).

Research has shown that men and women often respond differently to marketing stimuli, particularly advertising. Women tend to process information more thoroughly and to evaluate services more critically than men, often assigning greater importance to negative aspects (Fekete-Farkas et al., 2021).

Also, there are numerous studies that support different purchasing behaviors based on gender. Thus, for example, color perception during shopping has a greater impact on men than on women. Men tend to associate red or red-highlighted prices with savings, while women remain skeptical of such cues. They tend to associate black with savings and display a more accurate memory of price changes (Stefko et al., 2021).

6. Conclusion

Understanding how subconscious mechanisms, emotions, and gender differences shape consumer decision-making offers valuable insights not only for

marketers, but also for anyone interested in human behavior. By linking neuroscience, psychology, and marketing, this paper highlights that decisions are rarely the result of pure logic; rather, they emerge from complex emotional and cognitive interactions. Recognizing these hidden influences can help businesses design more ethical and meaningful strategies, while also encouraging consumers to reflect on the forces that drive their own choices. Ultimately, approaching consumer behavior through both scientific and human perspectives contributes to a more balanced, responsible, and empathetic marketplace.

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