

Varazdin Development and Entrepreneurship Agency

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Faculty of Law, Economics and Social Sciences Sale - Mohammed V University in Rabat, Morocco

Faculty of Management University of Warsaw, Poland

Ecole Nationale de Commerce et de Gestion de Tanger - Abdelmalek Essaadi University, Morocco

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Medimurje University of Applied Sciences in Cakovec, Croatia



Book of Proceedings

136th esd Prague 2026

Resilient and Sustainable Economic and Social Development under Geopolitical and Environmental Pressures

Editors:

Mario Konecki, Ivana Miklosevic, Dasa Panjakovic – Senjic, William J. Jones



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DIGITAL PLATFORMS, EMBEDDED FINTECH AND SME COMPETITIVE RESILIENCE: AN INTEGRATED CONCEPTUAL PERSPECTIVE

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ABSTRACT

Small and medium-sized enterprises increasingly compete in markets shaped by platform-based interaction, digital infrastructures and data-driven financial services. For SMEs, digital transformation is therefore not only a question of adopting isolated tools, but of building the capacity to connect with markets, coordinate with partners and manage financial processes in real time. This conference paper develops an integrated conceptual perspective on how participation in digital platforms and embedded FinTech solutions can jointly strengthen SMEs' competitive resilience. The paper reconsiders the relationship between digital ecosystems, FinTech adoption and SME competitiveness by shifting the focus from separate technological effects to the complementarities among connectivity, financial execution and organizational learning. Drawing on recent academic and policy-oriented literature, the study identifies four mechanisms through which the combination of platform engagement and digital finance may support SME performance: broader market reach, faster and more transparent transactions, improved data-based decision-making and greater capacity to adapt to uncertainty. The main contribution of the paper is a revised analytical model that positions embedded FinTech as a functional layer inside digital ecosystems rather than as an independent technological domain. The proposed approach is relevant to SME managers seeking more coherent digitalization strategies and to policymakers designing support measures that connect digital capability-building, platform access, and responsible digital finance.

Keywords: *digital platforms, embedded FinTech, SME competitiveness, competitive resilience, digital transformation, platform economy*

1. INTRODUCTION

The competitive environment of small and medium-sized enterprises has changed substantially as economic activity has moved toward digitally mediated markets. Customers, suppliers, payment providers, logistics firms and data services are increasingly connected through digital platforms and ecosystem infrastructures. This shift has created new opportunities for SMEs, but it has also increased pressure to operate faster, respond to market signals more effectively and integrate financial processes with everyday business activity. For many SMEs, competitiveness is no longer determined only by price, production capacity or local market position. It also depends on the firm's ability to participate in networks, use digital data, access finance and transform interactions with customers and partners into sustainable business outcomes. Digital transformation should therefore be viewed as a strategic and organizational process rather than as a simple technological upgrade (Vial, 2019; Verhoef et al., 2021). Two dimensions are especially important in this process. The first is participation in digital ecosystems, where firms interact through platform-based infrastructures and shared rules. Such ecosystems may expand market visibility, facilitate collaboration and improve access to external knowledge. The second dimension is FinTech adoption, which changes how SMEs make payments, manage liquidity, obtain finance and organize financial information. Digital finance may increase the speed, traceability and flexibility of business operations (Berg et al., 2021; Frost et al., 2019).

Existing research has generated valuable knowledge about digital ecosystems and FinTech, but these themes are often studied separately. Platform-oriented studies tend to concentrate on governance, architecture and value co-creation, while FinTech research focuses mainly on financial intermediation, digital lending, payments and access to capital. This separation makes it difficult to explain how SMEs actually combine platform participation and digital financial tools in practice. The central question of this paper is therefore: how can digital platform participation and embedded FinTech jointly contribute to SME competitive resilience? The paper answers this question by developing a conceptual framework that links ecosystem connectivity, digital financial functionality and competitiveness outcomes. In comparison with a general discussion of digital ecosystems and FinTech integration, the present version places stronger emphasis on resilience, strategic coherence and the operational mechanisms through which digital and financial transformation reinforce each other.

2. CONCEPTUAL BACKGROUND: SMES IN DIGITALLY NETWORKED MARKETS

SMEs are essential contributors to employment, innovation and regional development, yet their growth is frequently limited by structural constraints. These constraints include restricted access to finance, limited managerial resources, weak technological capabilities, fragmented market information and difficulties in scaling beyond local or regional markets. Digitalization can reduce some of these barriers, but its benefits depend on how technologies are integrated into business routines and strategic decision-making. Digital transformation is best understood as a reconfiguration of value creation. It changes how firms communicate with customers, organize resources, cooperate with partners and measure performance. In this sense, it is not enough for SMEs to adopt individual applications or online channels. Competitive value emerges when digital tools become connected to wider organizational processes, such as sales management, customer relations, logistics, accounting, financing and strategic planning (Vial, 2019; Verhoef et al., 2021). The platform economy has intensified this logic. Digital platforms create environments where multiple actors can interact, exchange data, coordinate transactions and co-create value. For SMEs, these environments can lower entry barriers and provide access to customers and complementary services that would otherwise be difficult to reach. At the same time, platform participation may create new dependencies, including dependence on platform rules, fees, algorithms and access to customer data (Gawer & Cusumano, 2014; Madanaguli et al., 2023). FinTech adds another layer to this transformation. Digital payments, online lending, alternative credit assessment, mobile banking, electronic invoicing and cloud-based accounting systems can reshape how SMEs manage money, monitor transactions and build financial credibility. These tools can improve the speed and transparency of financial activity, but they also require digital literacy, reliable infrastructure and appropriate regulation (OECD, 2022; Sanga & Aziakpono, 2023). The interaction between these two developments is the starting point for the present framework. Digital ecosystems create the external network environment in which SMEs can interact and grow. FinTech provides the financial-operational functionality that allows firms to execute, measure and sustain those interactions. When these two dimensions are aligned, SMEs may become more resilient+, more responsive and better prepared for growth.

3. DIGITAL PLATFORM PARTICIPATION AS A SOURCE OF COMPETITIVE POSITIONING

Digital platform participation refers to the involvement of SMEs in online marketplaces, business platforms, sectoral digital ecosystems, service networks or other digitally structured environments where transactions and interactions are mediated by shared infrastructures.

These systems may connect firms with customers, suppliers, service providers, financial institutions and data-based tools. Their importance lies not only in digital presence, but also in the possibility of creating new forms of coordination. One competitive effect of platform participation is market expansion. SMEs can use digital ecosystems to reach customers outside their immediate geographic environment, test demand more quickly and adapt offerings to changing preferences. This is especially important for firms that lack the financial resources to build independent distribution channels or large marketing infrastructures. Platform visibility can therefore function as a substitute for some scale advantages traditionally enjoyed by larger firms. A second effect concerns coordination. Digital ecosystems may reduce search costs, improve communication with partners and standardize certain operational procedures. SMEs can cooperate with logistics providers, payment intermediaries, software vendors and professional service providers through shared digital interfaces. In this way, platform participation may strengthen organizational capacity without requiring the firm to internalize all functions. A third effect is connected to information. Platform environments generate customer feedback, transaction histories, ratings, search behavior and other market signals. If SMEs are able to interpret and use this information, they can improve product design, pricing, customer service and strategic planning. Data visibility can therefore support learning and adaptability, two important components of competitiveness in uncertain markets. However, platform participation also involves risks. SMEs may become dependent on dominant platforms, lose direct control over customer relationships or face unfavorable fee structures and algorithmic visibility rules. Data access may also be asymmetric: platforms may collect and control valuable information while SMEs receive only limited analytical benefits. For this reason, platform engagement should be assessed not only as an opportunity, but also as a governance issue (Marino-Romero et al., 2024; Li et al., 2023).

4. EMBEDDED FINTECH AS FINANCIAL-OPERATIONAL CAPABILITY

FinTech adoption is often discussed as a financial innovation, but for SMEs it should also be understood as an operational capability. Digital payments, online accounting, automated invoicing, lending platforms and alternative credit-scoring systems affect everyday routines, not only access to capital. They influence how firms receive revenue, pay suppliers, manage cash flow, document performance and communicate with financial service providers. The first contribution of FinTech is transactional efficiency. Digital payment systems and automated financial tools can reduce delays, paperwork and coordination costs. Faster transactions are particularly important for SMEs because liquidity constraints can quickly affect purchasing, payroll, inventory management and the ability to respond to market opportunities. In this sense, transaction speed is directly connected to competitive flexibility. The second contribution is transparency. Digital financial tools can make transactions more traceable and records more consistent. This can improve internal control and support relationships with banks, investors, partners and public institutions. Better financial documentation may also reduce information asymmetry and strengthen the credibility of SMEs that previously lacked formalized financial histories. The third contribution concerns access to finance. FinTech solutions may offer alternative channels of credit or financing where traditional bank lending is limited. Digital transaction histories, online sales data and alternative scoring mechanisms can improve the assessment of SMEs that have weak collateral or limited credit records. Nevertheless, such mechanisms do not eliminate structural financing problems and should be understood as complementary to broader financial-sector development (Berg et al., 2021; OECD, 2025). The fourth contribution is decision support. Cloud-based accounting systems, financial dashboards and integrated payment data can help managers observe liquidity, costs and revenues more accurately. For resource-constrained SMEs, this can improve planning and reduce uncertainty.

FinTech therefore contributes not only to financial access, but also to managerial quality and operational discipline.

5. INTEGRATED FRAMEWORK: FROM CONNECTIVITY TO COMPETITIVE RESILIENCE

The main argument of this paper is that digital platforms and FinTech produce stronger competitive effects when they are combined. Digital ecosystems create opportunities for interaction, visibility and scale, while FinTech enables the financial execution and monitoring required to benefit from those opportunities. The concept of embedded FinTech captures this relationship: financial tools increasingly operate inside or alongside platform ecosystems, making financial services part of the wider digital business environment. This integrated view shifts attention from technology adoption to capability alignment. A firm may have access to an online platform but fail to benefit from it if payments, accounting and cash-flow management remain slow or fragmented. Similarly, a firm may use digital financial tools without achieving growth if it lacks access to markets, partners and data-driven demand signals. Competitive resilience emerges when digital connectivity and financial functionality reinforce each other.

5.1. Mechanism 1: Market access and financial execution

Platform participation can increase visibility and generate new sales opportunities, but these opportunities must be supported by reliable payment and settlement processes. Embedded FinTech can help SMEs convert digital market access into actual performance by enabling faster payments, more secure transactions and better management of receivables. The combination of platform reach and financial execution is therefore essential for transforming digital presence into competitiveness.

5.2. Mechanism 2: Data integration and decision quality

Digital ecosystems generate market and customer data, while FinTech systems generate transactional and financial data. When these data streams are connected, SMEs can gain a more complete picture of demand, profitability, customer behavior and liquidity. This improves the quality of managerial decisions and supports faster adaptation to changes in the market environment.

5.3. Mechanism 3: Transparency, trust and formalization

Platform standards and digital financial traceability may increase transparency in relations with customers, suppliers, financial institutions and public authorities. For SMEs, formalized digital records can reduce uncertainty and strengthen trust. This is particularly relevant in economies where small firms may struggle to demonstrate creditworthiness or operational reliability through traditional documentation.

5.4. Mechanism 4: Scalability and resilience

The final mechanism is scalability. Digital ecosystems can help SMEs access larger markets, while FinTech can support the financial routines required for growth. At the same time, both dimensions may increase resilience by improving responsiveness, reducing transaction frictions and allowing firms to adjust more quickly during periods of uncertainty. The value of digitalization therefore lies not only in efficiency, but also in the ability to continue operating and adapting under changing conditions.

Table 1. Integrated mechanisms linking digital platforms, embedded FinTech and SME competitiveness

Mechanism	Platform contribution	FinTech contribution	Competitiveness outcome
Market access and execution	Visibility, customer reach, partner access	Payments, settlement, receivables control	Improved sales conversion and flexibility
Data integration	Market signals, customer feedback, behavioral data	Transactional histories, cash-flow data, financial dashboards	Better planning and faster adaptation
Trust and formalization	Shared standards, ratings, platform rules	Traceable financial records and transparent transactions	Stronger credibility with partners and financiers
Scalability and resilience	Broader ecosystem participation and coordination	Financial routines that support growth and continuity	Higher growth potential and operational resilience

6. RESEARCH PROPOSITIONS

Based on the integrated framework, the following propositions can guide future empirical research. They are not presented as tested hypotheses, but as theoretically grounded relationships that can be examined through quantitative, qualitative or mixed-method designs. Proposition 1: SME participation in digital platforms is positively associated with competitive positioning when platform engagement improves market access, coordination and data visibility. Proposition 2: Embedded FinTech adoption is positively associated with SME competitiveness when it improves financial efficiency, transaction transparency, liquidity management and access to finance. Proposition 3: The combined use of digital platform participation and embedded FinTech generates stronger competitive effects than either dimension alone, because it connects market opportunities with financial execution and data-based decision-making. Proposition 4: The positive relationship between platform-FinTech alignment and SME competitiveness is conditioned by digital capabilities, regulatory quality, financial infrastructure and the governance rules of digital ecosystems.

7. MANAGERIAL AND POLICY IMPLICATIONS

For SME managers, the proposed framework suggests that digitalization should not be implemented in a fragmented way. Joining a platform, adopting an online payment system or using accounting software may provide limited benefits if these tools are not connected to a broader business strategy. Managers should evaluate how platform participation, customer data, payment processes, financial reporting and access to finance can be integrated into one operational model. The framework also highlights the importance of digital capability-building. SMEs need not only access to digital tools, but also the skills to interpret data, manage platform relationships and use financial technologies responsibly. Without managerial understanding, firms may become technologically dependent without achieving meaningful competitiveness gains. For policymakers, the analysis suggests that SME support programs should link three policy areas that are often treated separately: digital transformation, platform access and digital finance. Training programs, innovation support, SME finance initiatives and regulatory frameworks should be coordinated so that firms can develop both market connectivity and financial capability. This is especially important in developing and transition economies, where SMEs may face simultaneous constraints in technology, finance and institutional support.

Policy design should also pay attention to platform governance and data rights. If SMEs depend on platforms but lack access to useful data or face unpredictable fees and rules, ecosystem participation may weaken rather than strengthen competitiveness. Responsible digital finance is equally important, because FinTech expansion should support inclusion and transparency without creating excessive risk or unequal access.

8. LIMITATIONS AND FUTURE RESEARCH AGENDA

This paper is conceptual and does not test the proposed relationships empirically. Its contribution is analytical: it clarifies mechanisms and develops a framework for future research. The applicability of the framework may vary across countries, sectors, firm sizes and regulatory environments. For example, platform-FinTech alignment may operate differently in manufacturing, retail, tourism, agriculture or professional services. Future studies should examine how SMEs combine platform participation and FinTech in real business settings. Quantitative research could test the relationship between platform engagement, FinTech adoption and performance indicators such as sales growth, productivity, export activity or resilience during shocks. Qualitative research could explore managerial decision-making, platform dependency and the practical barriers that prevent SMEs from integrating digital tools effectively. Comparative research would also be valuable. Differences in financial infrastructure, digital literacy, legal frameworks and platform governance may explain why similar technologies produce different outcomes across countries. Such studies would help refine the proposed model and identify the institutional conditions under which embedded FinTech and digital ecosystems most effectively support SME competitiveness.

9. CONCLUSION

The paper developed an integrated conceptual perspective on digital platforms, embedded FinTech and SME competitive resilience. It argued that digital ecosystems and FinTech should not be understood as separate components of digital transformation. Instead, they form complementary elements of a broader process through which SMEs connect to markets, manage financial operations, use data and build adaptive capacity. Digital platform participation can support competitiveness by expanding market access, improving coordination and increasing data visibility. Embedded FinTech can strengthen competitiveness by improving transaction speed, transparency, liquidity management and financial decision-making. Their interaction creates additional value because market opportunities become more useful when supported by reliable financial execution and data-based managerial insight. The proposed framework contributes to the literature by reframing SME competitiveness as an outcome of connectivity, financial functionality and organizational learning. It also provides a basis for future empirical research and offers practical guidance for managers and policymakers seeking to design more coherent digitalization strategies for SMEs in the platform economy.

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GEOECONOMIC RESILIENCE AND COMPETITIVENESS OF THE EU AMID THE ENERGY TRANSITION AND GLOBAL RISKS

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ABSTRACT

This paper examines the transformation of the European Union's economic competitiveness and geopolitical standing under the influence of the European Green Deal (EGD) and the REPowerEU plan. Against a backdrop of pronounced global risks and escalating trade tensions—specifically regarding relations with Russia, the US, and China—we explore how the shift toward renewable energy sources is redefining the very notion of economic sovereignty. The study aims to determine the extent to which decarbonisation and reduced fossil fuel dependence enhance the competitiveness of the EU economy, while identifying emerging geoeconomic vulnerabilities within critical raw material supply chains (such as lithium and rare earth elements) upon which the EU strategically depends. Furthermore, the paper critically assesses the cost asymmetries of decarbonisation that burden energy-intensive industries relative to their global competitors, highlighting the imminent threat of carbon leakage in the absence of adequate protective measures. To mitigate these severe internal and external pressures, the EU is shifting its paradigm from a traditional regulatory actor into a so-called "compensatory state," leveraging substantial public subsidies, the Carbon Border Adjustment Mechanism (CBAM), and just transition instruments. The analysis further indicates that the green transition is far from spatially neutral; rather, it exacerbates socioeconomic disparities, particularly within less-developed brown regions facing structural diversification barriers. Consequently, the successful absorption of available green funds hinges directly on the political, analytical, and operational capacities of public administrations within individual member states. Ultimately, the synthesis of theoretical and empirical insights suggests that the EGD frequently operates primarily as an economic growth strategy, and that preserving Europe's global sovereignty will depend on carefully balancing stringent environmental regulations with industrial financial compensations and the systematic reinforcement of institutional capacities.

Keywords: *globalisation, competitiveness, energy transition, geoeconomics, European Green Deal*

1. INTRODUCTION

Globalisation and the energy transition stand as the pivotal forces shaping the economic competitiveness of the European Union (hereinafter: EU) in the contemporary world. The process of globalisation, characterised by the deepening interconnectedness of economies, has unlocked novel opportunities while simultaneously presenting formidable challenges for the

EU, particularly regarding the preservation of economic stability within a highly polarised global market. Concurrently, the urgency of mitigating climate change has placed the energy transition at the vanguard of European policymaking. In this regard, the European Green Deal (hereinafter: EGD), adopted in 2019, establishes a strategic blueprint aimed at achieving climate neutrality by 2050, positioning the EU as a frontrunner in global sustainability efforts. However, scholarly literature and recent geopolitical events clearly demonstrate that this ambitious agenda extends far beyond a mere ecological initiative; at its core, it operates as a complex, transformative industrial strategy. Consequently, the EGD carries profound geoeconomic and geopolitical implications, directly redefining the EU's role on the global stage. The significance of this topic lies in its pressing relevance and practical applicability, especially in light of ongoing military conflicts, trade frictions with China and the US, and the cost asymmetries currently weighing down European industry. Geoeconomics and geopolitics constitute two foundational concepts that delineate modern international relations, particularly in the realm of energy policy. According to Flint (2006: 216-218), geopolitics examines how geographical factors influence the international politics of states and societies, whereas geoeconomics, as articulated by Luttwak (1990: 17), emphasises power driven by scarce economic resources, innovation, and market penetration rather than military might. Soilen (2012: 8) expands on this, defining geoeconomics as the study of the spatial, cultural, and strategic dimensions of resources aimed at securing a sustainable competitive advantage. These very concepts offer crucial insights for deciphering the contemporary challenges of the energy transition. Crucially, phasing out fossil fuels exposes the EU to novel geopolitical risks, driven primarily by a heavy import reliance on rare earth elements and critical raw materials indispensable for green technologies. Therefore, to secure the strategic objectives of the European Green Deal while safeguarding industrial competitiveness and ensuring equitable regional distribution, the EU is compelled to reshape its institutional approach and cultivate the mechanisms of a so-called "compensatory state."

2. THE EUROPEAN GREEN DEAL AND REPOWEREU AS TOOLS OF ECONOMIC SOVEREIGNTY

The EU's energy policy represents a cornerstone of European integration processes, fundamentally shaping economic development, supply chain security, and the sustainability of both member states and non-EU transition countries acting as its partners. Its foundations were laid even prior to the establishment of the European Economic Community in 1957, evolving under the influence of the economically dominant nations whose energy sectors leveraged an integrated market for regional expansion (Vlahinić-Dizdarević and Žiković, 2011: 79). In the contemporary era, the EU stands as the world's largest net energy importer, rendering energy a critical strategic and security issue. This vulnerability has been repeatedly underscored by geopolitical upheavals, including the oil shocks of 1973 and 1980–1981, the dissolution of the Soviet Union (hereinafter: USSR) in 1989, and the gas crises of 2006 and 2009 (Vlahinić Lenz et al., 2019: 71-72). These disruptive events prompted the formulation of various collective strategies, such as the 2006 Energy Policy for Europe (EPE), which delineated core objectives regarding supply chain security, economic competitiveness, and environmental sustainability (Vlahinić-Dizdarević and Žiković, 2011: 79-80). Subsequently, the 2015 Energy Union Strategy sought to ensure secure, affordable, and sustainable energy for households and businesses, structured around five pillars: energy source diversification, market integration, enhanced energy efficiency, economic decarbonisation, and the promotion of clean technology innovations (Ciucci; European Parliament, 2024). The European Green Deal (hereinafter: EGD), launched in 2019, set forth an ambitious blueprint for achieving climate neutrality across the European continent by 2050, while the *Fit for 55* legislative package and the *REPowerEU* plan, adopted in 2022, further accelerated the transition toward renewable energy sources (RES)

and the reduction of dependence on Russian fossil fuels (European Commission, 2022). Backed by an array of directives and regulations, these frameworks reflect a highly heterogeneous and complex institutional and legal architecture governing EU energy policy. Although the EGD is predominantly perceived as an environmental initiative, it fundamentally operates as a deeply transformative industrial strategy through which the EU seeks to safeguard long-term competitiveness and sustainable growth by decoupling economic expansion from resource consumption (Bosnić, 2025; Stoian et al., 2023). Within this context, the EGD represents a profound paradigm shift that integrates environmental protection into the core of sustainable economic growth, necessitating massive financial resources, robust institutional cooperation, and rapid technological breakthroughs (Nacu and Jercan, 2023).

2.1.The Green Transition Paradox

While transitioning to RES mitigates the reliance on imported oil and gas, it simultaneously introduces novel structural challenges—such as outdated power grids, bureaucratic bottlenecks, and a deficit in energy storage (battery) capacities. Crucially, it engenders a new geopolitical vulnerability: the green transition demands critical raw materials (such as lithium, rare earth elements, gallium, and germanium) for which the EU depends almost entirely (in certain instances up to 98%) on imports from China. Consequently, shifting toward a green economy requires a meticulous balancing act between environmental targets, economic costs, and the preservation of competitiveness, given that the primary apprehensions center on social costs and the potential erosion of European firms' global competitiveness (Stoian et al., 2023). Thus, this transition is far from a straightforward "win-win" scenario. Beyond financial and regulatory hurdles, the energy transition inherently gives rise to novel geopolitical vulnerabilities (Telegina and Khalova, 2022). When analyzing the energy mix, it is vital to distinguish between gross available energy (which encompasses domestic production alongside massive fossil fuel imports) and primary energy production (generated strictly within EU borders). In 2024, the EU produced 43% of its own energy, meaning it relied on external imports for a staggering 57% of its energy needs (Energy in Europe, 2026). Petroleum products and natural gas continue to dominate gross available energy due to their indispensable role in transport and heavy industry. However, when isolating energy produced *internally* within the EU, renewable energy sources (RES) firmly lead the mix, accounting for nearly half (48%) of total domestic production, while internal fossil fuel extraction continues to dwindle.

Table 1: Comparison of energy source shares in EU gross available energy and primary energy production (2024)

Energy Source	Share of Gross (Gross) Available Energy in the EU	Share of Primary Energy Production Within the EU
Oil and petroleum products	38%	3%
Natural gas	21%	5%
Renewable energy sources (RES)	20%	48%
Nuclear energy	12%	28%
Solid fossil fuels (coal)	10%	15%

Sources: authors based on Eurostat, 2026, Energy in Europe – 2026 edition.

While Table 1 illustrates comprehensive energy consumption (including automotive fuels, heating, and heavy industry), the power generation sector alone—specifically electricity—demonstrates even more advanced, greener milestones.

In 2025, a historic milestone was reached across the European Union: wind and solar facilities collectively generated more electricity than all fossil fuels combined (EMBER, 2026). Wind and solar achieved a 30.1% share of European electricity generation, while fossil fuels (coal, gas, and others) contracted to 29.0%. In 2025 alone, solar generation expanded by an extraordinary 20.1% year-on-year, setting a new record. Aggregating wind, solar, and hydropower, renewable sources provided nearly half (47.7%) of all electricity produced within the EU in 2025. The realization of this acute import dependence was starkly brought to the fore by the outbreak of the war in Ukraine in 2022, which compelled the EU to enact the *REPowerEU* strategic plan. This framework has become the foundational mechanism for economic and energy sovereignty, designed to rapidly phase out imports of Russian fossil fuels. Its implementation rests upon three core pillars: energy conservation, the accelerated deployment of clean energy, and the diversification of supply routes (such as sourcing LNG from more reliable partners like Norway and the US).

However, while the broader electricity sector undergoes rapid "greening," the integration of RES within the industrial sector exhibits uneven dynamics, directly impinging upon global economic competitiveness. Scholarly research (Gajdzik et al., 2024) indicates that the EU confronts industry with a monumental decarbonisation challenge to achieve net-zero emissions by 2050, yet the success of this adaptation varies widely across member states. A stark disparity persists between "old" and "new" EU members; while nations in Western and Northern Europe lead the vanguard (such as Sweden, reaching a 42.8% share of RES in industry in 2022; Gajdzik et al., 2024), Central and Eastern European countries, burdened by historical fossil fuel dependencies, grapple with steep technological and financial barriers. As highlighted by Gajdzik et al. (2024), transitioning to renewables within industry demands not only a shift in the energy mix but a drastic reduction in total production energy intensity through technological innovation. Without aggressive energy efficiency measures, the targets mandated by the European Green Deal will remain elusive for the broader European industrial sector.

This mirrors the warnings articulated in the recent Draghi Report on Competitiveness (2024), which emphasizes that EU electricity and gas prices, which are several times higher than those in the US, are suffocating energy-intensive heavy industry. Consequently, mitigating import reliance, building domestic clean technology capacities, and securing supply chains represent the sole viable pathway toward sustaining European economic sovereignty. To holistically evaluate the efficacy of the European Green Deal and the *REPowerEU* strategy, it is imperative to transcend a purely affirmative narrative and critically examine their actual scope. While these strategic documents yield undeniable ecological and geopolitical dividends for the European Union, their execution entails substantial economic and social costs.

To alleviate these projected social burdens and the justified anxieties of business leaders regarding the erosion of global competitiveness, the precise configuration of public policy measures and support instruments becomes imperative to successfully balance the economic, social, and strictly environmental goals of the transition (Stoian et al., 2023). Table 2 systemises the core advantages alongside the pressing drawbacks and challenges of these policies across four primary dimensions: energy-geopolitical, economic, social, and environmental.

Table 2: Overview of advantages and challenges of the European Green Deal and the REPowerEU strategy

Dimension	Opportunities and Prospects	Risks and Threats
Energy Security and Geopolitics	Supply Diversification and Reduced Dependence • REPowerEU enabled a rapid reduction in imports of Russian fossil fuels (gas, oil, coal) and a pivot toward more reliable partners (US, Norway), thereby reinforcing the EU's strategic autonomy (Bosnić, 2025).	New Dependencies and Instability • The accelerated transition creates a novel geoeconomic vulnerability due to import reliance on China for critical raw materials and rare earth elements (up to 98%) indispensable for green technologies (Telegina and Khalova, 2022; Bosnić, 2025).
Economy and Competitiveness	Innovation and Employment • The shift to renewable energy sources (RES) stimulates the development of clean technologies (e.g., green hydrogen) and creates hundreds of thousands of new "green" jobs, while drawing capital through ESG standards (Bosnić, 2025; EU, 2024).	Erosion of Industrial Competitiveness • High decarbonisation costs, costlier energy inputs (such as American LNG), and stringent ESG regulations suffocate energy-intensive industries and threaten "carbon leakage" (Gajdzik et al., 2024; Stoian et al., 2023).
Social Aspect and Cohesion	Compensatory Mechanisms • By establishing the Just Transition Fund and the Social Climate Fund, the EU is transitioning into a "compensatory state" that actively finances the regions and workers most affected by the transition (Fifi and Gao, 2025).	Amplified Social Disparities • The transition entails steep social costs, including rising household energy prices (the risk of energy poverty), and fosters asymmetry as "new" EU member states decarbonise at a harder and slower pace than "old" ones (Gajdzik et al., 2024; Stoian et al., 2023).
Ecology and Sustainability	Climate Leadership • The EU positions itself as a global leader ("soft power") with a legally binding target of achieving climate neutrality by 2050 and decoupling growth from resource consumption (Bosnić, 2025).	Reductive Sustainability • The EGD frequently continues to prioritise economic growth over environmental integrity; it focuses narrowly on carbon neutrality while marginalising broader aspects such as biodiversity loss and the ecological impacts of raw material mining for RES technologies (Hereu-Morales et al., 2024).

Source: Authors' synthesis based on literature review (Bosnić, 2025; Fifi and Gao, 2025; Gajdzik et al., 2024; Hereu-Morales et al., 2024; Stoian et al., 2023; Telegina and Khalova, 2022).

As delineated in Table 2, the advantages of implementing these policies are vividly manifested in the long-term mitigation of fossil fuel reliance, the fostering of technological innovation, and the positioning of the European Union as a vanguard of global climate leadership. However, the accompanying drawbacks and challenges lay bare serious structural bottlenecks.

Studies such as the one conducted by Stoian et al. (2023) clearly demonstrate that while the public and experts alike recognise the environmental dividends, they articulate profound apprehensions regarding the financial burdens, escalating energy prices, and the subsequent erosion of European firms' competitiveness relative to global rivals who are not bound by equally stringent environmental mandates. Furthermore, from an ecological perspective, critics such as Hereu-Morales et al. (2024) warn that the European Green Deal exhibits a reductive tendency when addressing the concept of sustainability. By focusing predominantly on carbon neutrality and economic growth, it frequently sidelines wider environmental repercussions, such as the destructive impact of critical raw material extraction, essential for green technologies, on global biodiversity. Consequently, it can be argued that the ultimate success of both the EGD and the *REPowerEU* strategy hinges entirely upon the capacity of European institutions to counterbalance these systemic flaws with robust protective instruments and targeted support for vulnerable sectors and regions. Ultimately, actualising these strategic milestones and fortifying the Union's overarching economic resilience will depend on the continuous monitoring of Cohesion Policy efficacy and a more aggressive channeling of EU funds into sustainable, innovative, and low-carbon industrial processes (Tijanić and Kersan-Škabić, 2025; Kwilinski et al., 2023).

3. GEOECONOMIC VULNERABILITY AND COST ASYMMETRY IN EUROPEAN INDUSTRY

Although the European Green Deal and the *REPowerEU* strategy long-term position the European Union as a global leader in sustainability, their operational execution exposes severe structural deficiencies and vulnerabilities within the European economy. The energy transition is neither a straightforward nor a cost-free endeavor; rather, it constitutes a radical economic overhaul that introduces novel external supply chain threats alongside intense internal pressures on the industrial sector (Telegina and Khalova, 2022). This shift toward a green economy demands a fundamental revaluation of established growth models, raising the genuine risk that the mandate for emission reductions could inadvertently jeopardize European economic sovereignty (Stoian et al., 2023). Consequently, this chapter examines two pivotal bottlenecks along this path: on the one hand, the emergence of a new geoeconomic vulnerability resulting from the substitution of fossil fuels with imported critical raw materials, and on the other hand, the pronounced cost asymmetry of decarbonisation that directly impairs the competitiveness of European industry (Gajdzik et al., 2024; Telegina and Khalova, 2022). The energy transition is precipitating profound shifts within the EU's strategic supply chains. Following the escalation of the war in Ukraine, the EU drastically curtailed its reliance on Russian gas, whose import share plummeted from 45% in 2021 to 19% in 2024, while imports of Russian oil dropped from 27% to a mere 3% (European Union, n.d. 1). However, this historical dependence was swiftly replaced by a new one, as the US emerged as the dominant supplier, capturing a 48% share of the EU's liquefied natural gas (LNG) imports, thereby exposing Europe to novel price volatility and risks. Beyond energy inputs, a critical vulnerability has surfaced in the procurement of raw materials indispensable for green technologies. In the contemporary era, China heavily monopolizes this market, controlling a striking 98% of the EU's rare earth element imports, 94% of gallium imports, and 83% of germanium imports (Bosnić, 2025). This trajectory is highly contested in scholarly literature. Researchers warn that an accelerated, forced energy transition without viable alternatives—actively promoted by the EU and the US—coupled with a sharp decline in capital investments toward traditional energy sources, generates deep imbalances in the global economy and erodes the predictability of global and regional energy market developments (Telegina and Khalova, 2022). Compounding these external geopolitical risks, the energy transition exerts immense internal pressures on the domestic industrial fabric.

Research indicates that the EU confronts the industrial sector with a monumental decarbonisation challenge to achieve net-zero emissions by 2050, yet the success of this adaptation is highly uneven (Gajdzik et al., 2024; Siksnyte-Butkiene et al., 2022). Analyses confirm that "old" and "new" member states navigate industrial decarbonisation in starkly divergent ways. While Western and Northern European nations lead the vanguard, Central and Eastern European countries (such as Poland or Hungary) remain burdened by their historical fossil fuel path-dependency. Consequently, they grapple with steep technological, social, and financial barriers, placing them within the so-called "brown regions" where green diversification is structurally constrained (Gajdzik et al., 2024; Grashof and Basilico, 2024; Ottomano Palmisano et al., 2025). Furthermore, less-developed member states face severe structural hurdles and a deficit in institutional capacity required to implement this transformation (Tijanić and Kersan-Škabić, 2025). As scholars caution, without aggressive energy efficiency measures and a drastic reduction in total production energy intensity, the targets of the European Green Deal will remain unattainable for many countries; current projections indicate that only a minority of member states will successfully reach the mandated share of renewable energy in their industrial sectors by 2030 (Gajdzik et al., 2024; Salim et al., 2025). To shield its industrial base and mitigate this compounding cost asymmetry, the EU has been compelled to reshape its governance approach toward the green transition.

A visible paradigm shift is underway, as the EU transitions from a traditional "regulatory state" (relying on market and pricing mechanisms) to a so-called "compensatory state" (Fifi and Gao, 2025). The compensatory state represents a system wherein massive public subsidies, protective mechanisms, and redistributive funds are deployed to artificially sustain the competitiveness of European firms and directly compensate the "losers" of the transition—those bearing a disproportionate social and financial burden under climate mandates (Fifi and Gao, 2025; Stoian et al., 2023). Within this context, the EU is deploying instruments such as the Carbon Border Adjustment Mechanism (CBAM), designed to avert "carbon leakage" and protect vulnerable European industries from cheaper imports originating in third countries with laxer environmental standards (Fifi and Gao, 2025; Salim et al., 2025; Stoian et al., 2023), while simultaneously the Just Transition Mechanism (JTM) and the Social Climate Fund seek to mediate these pressures, ensuring that structural realignments do not compromise social cohesion or equitable regional development (Fifi and Gao, 2025; Li, 2025). This hybrid approach, which integrates stringent environmental mandates with redistributive financing, is critical to alleviating the tension between cost efficiency and social justice in practice (Salim et al., 2025). Ultimately, this interventionist pivot underscores that the energy transition is no longer strictly a climate issue, but a pressing geoeconomic challenge (Telegina and Khalova, 2022). Without robust and carefully designed compensatory support, the steep costs of decarbonisation could culminate in a contraction of industrial output, rising unemployment, and a subsequent, irreversible erosion of the global competitiveness of the entire European economy (Stoian et al., 2023).

4. JUST TRANSITION AND EU INSTITUTIONAL CAPACITIES

Research indicates that the green transition is far from spatially neutral and carries the potential to deepen socioeconomic and spatial disparities within the European Union (Niavis et al., 2025). The so-called "brown regions", areas historically specialised in carbon-intensive, polluting industries, are particularly vulnerable, as they possess fewer technological and innovative capabilities to rapidly diversify into green technologies compared to already developed, technologically advanced regions (Grashof and Basilico, 2024).

To mitigate these spatial disparities, EU Cohesion Policy plays a pivotal role, and monitoring its outcomes demonstrates the absolute necessity of continuously evaluating the absorption of European Structural and Investment Funds (ESIF) alongside the targeted allocation of resources from the Just Transition Mechanism (Tijanić and Kersan-Škabić, 2025). However, the mere availability of financial resources is insufficient. The successful absorption of green funds, such as those from the Recovery and Resilience Facility (RRF), hinges directly upon the institutional capacities of individual member states (Raudla et al., 2025). Scholars emphasise that robust political, analytical, and operational capacities within public administration are paramount for the effective channeling of resources. In states with lower analytical capacities, decision-making processes often remain insulated within narrow technocratic circles; consequently, vast green resources are frequently directed toward sustaining "old," traditional corporations and legacy infrastructure projects rather than fostering genuine green innovation (Raudla et al., 2025). Beyond the national level, the effective implementation of the European Green Deal necessitates decisive action at the local level as well. Cities are at the very core of the EU's climate ambitions, and aligning local urban policies with the global Sustainable Development Goals (SDGs) is a critical prerequisite for operationalising the energy transition (Trane et al., 2025). Conversely, rural areas require a specific approach to "greening" local finances, where it is vital to secure food sovereignty and shift from exclusively supporting agricultural producers toward broader financial assistance for the development of entire rural communities (Petrukha, 2021). Table 3 below provides a systematic overview of the key dimensions of this transition. It analyses how specific geoeconomic challenges reflect upon the Union's competitiveness and the ways in which European policies, such as the *REPowerEU* plan, Cohesion Policy, just transition mechanisms, and innovation funds, respond to them institutionally. This synthesis integrates the perspectives of recent scientific research and provides a foundation for understanding the complexities of sustaining European economic sovereignty.

Table ends on following pages

Table 3: Synthetic overview of the impact of the green transition on the geoeconomic resilience and competitiveness of the EU

Key Dimension	Impact on EU Geoeconomic Resilience and Competitiveness	Strategic Response and EU Mechanisms	Key Literature Sources
1. Energy (In)dependence and Geopolitical Risks	• High dependence on Russian fossil fuels triggered severe energy and price shocks that eroded European competitiveness. • Although imports from Russia decreased drastically, the rapid pivot toward US LNG imports introduces novel price risks and threatens a new dependence on a single supplier.	• Swift implementation of the REPowerEU plan across three pillars: diversification of supply routes, energy conservation, and accelerated integration of renewable energy sources (RES) to achieve strategic autonomy.	Bosnić, 2025, EMBER, 2026, Telegina and Khalova, 2022,

2. Supply Security of Critical Raw Materials	• The transition to "green" technologies (solar panels, wind turbines, batteries) creates a novel geoeconomic vulnerability and dependence on imports of rare earth elements. • China heavily monopolises this market, controlling up to 98% of EU imports for certain elements, severely jeopardising the EU's long-term resilience.	• Enactment of the Critical Raw Materials Act and the launching of 47 strategic projects aimed at restoring mining, processing, and recycling of key materials within EU borders to mitigate external reliance.	Gao and Chen, 2025, Geological Survey of Sweden, 2024, Telegina and Khalova, 2022,
3. Industrial Competitiveness and Cost Asymmetry	• The EU imposes a monumental decarbonisation challenge, yet electricity and gas prices that are several times higher than those in the US and China suffocate energy-intensive industries. • High costs of ESG regulations create a risk of "carbon leakage", demonstrating that the transition does not represent a straightforward win-win scenario.	• Development of the "compensatory state" and the reinforcement of public investments through the Clean Industrial Deal, alongside the introduction of the Carbon Border Adjustment Mechanism (CBAM) to shield industry from cheaper, ecologically inadequate goods.	European Commission, 2024, Fifi and Gao, 2025 Gajdzik et al., 2024, Stoian et al., 2023
4. Regional Inequalities and Absorption Capacities	• The transition is not spatially neutral and deepens regional disparities. • Less-developed regions (particularly in Central and Eastern Europe) are burdened by coal dependency and possess weak operational capacities, which slows down the absorption of funds and the execution of green projects.	• Utilisation of EU Cohesion Policy instruments, the Recovery and Resilience Facility (RRF), and the Just Transition Mechanism (JTM) to ensure inclusive growth and counterbalance socioeconomic disparities.	Grashof and Basilico, 2024, Li, 2025, Raudla et al., 2025, Tijanić and Kersan-Škabić, 2025

5. Technological Innovations and Structural Diversification	• A drastic overhaul of the technological base is indispensable. • Successful green diversification hinges upon the existing capabilities of regions, while entrenched "dirty" industries hinder innovative momentum. • The EGD frequently continues to prioritise economic growth over comprehensive environmental sustainability.	• Linking public financing with strategic frameworks (such as Horizon Europe and InvestEU) to achieve rapid commercialisation of clean technologies, while integrating the digital and green twin transitions.	Hereu-Morales et al., 2024, Nacu and Jercan, 2023, Santoalha and Boschma, 2021
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Source: Authors' synthesis based on literature review

As delineated in Table 3, the green transition represents not merely an environmental imperative, but a complex geoeconomic arena where issues of energy security, industrial competitiveness, and balanced regional development intertwine. Although instruments such as the European Green Deal (EGD), Cohesion Policy, and the Recovery and Resilience Facility (RRF) offer a robust institutional framework to stimulate green innovation, the European Union confronts severe asymmetries in their implementation. Crucially, the successful absorption of green funds hinges directly upon the political, analytical, and operational capacities of public administrations within individual member states (Raudla et al., 2025). For instance, less-developed regions, particularly those in Central and Eastern Europe burdened by a historical dependency on coal, face a deficit in institutional capacity; consequently, resources are frequently redirected toward sustaining traditional infrastructure projects rather than fostering genuine green innovation (Raudla et al., 2025). This challenge is further amplified by the phenomenon of so-called "brown regions"—areas historically specialised in polluting industries that possess significantly weaker technological and innovative capabilities for rapid diversification into green technologies compared to already developed, technologically advanced hubs (Grashof and Basilico, 2024; Santoalha and Boschma, 2021). To avert the widening of socioeconomic and spatial inequalities driven by these asymmetries, the EU increasingly relies on instruments such as the Just Transition Mechanism (JTM), whose primary mandate is to mediate between the achievement of stringent environmental targets and the preservation of equitable regional development for the most vulnerable territories (Li, 2025; Tijanić and Kersan-Škabić, 2025).

5. CONCLUSION

The energy transition, spearheaded by the European Green Deal and the *REPowerEU* strategy, has emerged as a pivotal mechanism in redefining the economic competitiveness of the European Union. Nevertheless, while the European Green Deal undoubtedly constitutes the most critical geoeconomic framework of the contemporary European Union, scholarly literature cautions against its inherent deficiencies. Critics point out that the Plan occasionally oversimplifies the complexity of the sustainability concept and operates primarily as a master-plan for economic growth, while relegating comprehensive environmental protection, biodiversity preservation, and resource efficiency to the background.

Furthermore, the development of EU policies regarding the circular economy and environmental protection frequently amounts to so-called "policy layering," a process where new regulations and instruments are merely superimposed onto existing frameworks without triggering genuine, radical institutional transformation or deep structural shifts in production paradigms. As evident from the preceding synthetic overview, the green transition extends far beyond the boundaries of an exclusively ecological policy, profiling itself within the contemporary context as a complex industrial, geopolitical, and geoeconomic "arena." Although mechanisms such as the European Green Deal, Cohesion Policy, and the Recovery and Resilience Facility offer a robust institutional architecture to mitigate regional inequalities and stimulate innovation, the Union continues to confront formidable challenges. The Draghi Report (2024) and recent scientific research explicitly underscore the cost asymmetries currently suffocating energy-intensive sectors, alongside the imminent threat of "carbon leakage" should adequate border adjustment mechanisms fail to materialise. Concurrently, replacing a historical reliance on Russian fossil fuels with a novel, potentially more hazardous dependence on critical raw material imports from China necessitates urgent supply chain diversification and the repatriation of strategic mining and recycling operations to EU territory. Building upon these insights indicates that internal structural pressures within the EU itself are just as potent as external geopolitical risks. Research confirms that the "twin" (green and digital) transition is far from spatially neutral and threatens to exacerbate socioeconomic and spatial disparities, particularly within less-developed "brown regions" that face greater friction when adapting to novel technologies. To alleviate this friction, Cohesion Policy and the Just Transition Mechanism emerge as crucial tools for reconciling climate ambitions with social justice. However, the mere availability of financial resources is insufficient; the successful absorption of green funds hinges directly upon the political, analytical, and operational capacities of public administrations within individual member states. Forecasts already warn that without aggressive measures and institutional realignments, numerous EU countries will miss the mandated targets for renewable energy shares in their industries by 2030. Consequently, the efficacy of Europe's geoeconomic resilience will depend on the continuous alignment of lofty sustainability targets with the imperative of safeguarding industrial competitiveness and ensuring an equitable regional distribution of capital. Therefore, it can be concluded that the energy transition is not merely an environmental process, but primarily a geopolitical and geoeconomic one. For the EU to truly secure long-term economic competitiveness and resilience, while simultaneously preventing the rise of social and regional disparities, it must continue to cultivate the mechanisms of the so-called "compensatory state." Only by balancing stringent green regulations with robust industrial financial compensations and the systematic reinforcement of institutional capacities will the European Union be capable of maintaining its global sovereignty without leaving vulnerable industries and regions on the margins of the transition.

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CYBERSECURITY AS AN ISSUE OF CORPORATE GOVERNANCE: THE HUMAN FACTOR, NIS2, AND DIRECTORS' DUTIES

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ABSTRACT

Cybersecurity incidents in contemporary business are increasingly linked to human error, inadequate security awareness among employees, and various forms of social engineering. As a result, the human factor has emerged as one of the central issues in cybersecurity risk management. This paper examines the role of the human factor within the cybersecurity framework, with particular emphasis on the legal and organisational obligations arising from Directive (EU) 2022/2555 (NIS2). The analysis encompasses empirical evidence on the causes of cybersecurity incidents, the European Union regulatory framework, the responsibility of company directors for managing cybersecurity risks, and the role of compliance culture in preventing social engineering attacks. Particular attention is given to the relationship between the NIS2 Directive, directors' duty of care, and the business judgment rule. The paper argues that NIS2 represents a significant shift in corporate governance by treating cybersecurity not merely as a technical issue of information systems protection, but as an integral component of business risk management and the responsibilities of corporate management bodies. At the same time, the analysis demonstrates that the regulatory framework governing the human factor remains underdeveloped, particularly with regard to social engineering and the promotion of cybersecurity culture. Consequently, the effective implementation of the NIS2 requirements depends not only on technical safeguards but also on organisational measures, effective corporate governance, and a well-established compliance culture.

Keywords: *cybersecurity; human factor; NIS2 Directive; social engineering; directors' liability; corporate governance; compliance culture*

1. INTRODUCTION

The first comprehensive regulatory framework for cybersecurity in the European Union was established by Directive (EU) 2016/1148 concerning measures for a high common level of security of network and information systems across the Union (the NIS Directive)¹ Its primary objective was to strengthen the security of network and information systems in order to safeguard essential services critical to the functioning of the European economy and society. In response to the rapidly evolving cyber threat landscape, the European Commission proposed a revision of the original Directive at the end of 2020. This process resulted in the adoption of Directive (EU) 2022/2555 (NIS2), which entered into force in January 2023.² Member States were required to transpose its provisions into national legislation by 17 October 2024.³

¹ Directive (EU) 2016/1148 of the European Parliament and of the Council of 6 July 2016 concerning measures for a high common level of security of network and information systems across the Union. OJ L 194/1.

² Directive (EU) 2022/2555 of the European Parliament and of the Council of 14 December 2022 on measures for a high common level of cybersecurity across the Union, amending Regulation (EU) No 910/2014 and Directive (EU) 2018/1972, and repealing Directive (EU) 2016/1148 (NIS2 Directive). OJ L 333/80. 30.5.2026.

³ NIS 1 Directive has been repealed as of October 18, 2024.

Compared with its predecessor, NIS2 considerably broadens the scope of regulated entities and introduces a more comprehensive governance framework for cybersecurity risk management. It requires Member States to strengthen national cybersecurity capabilities, implement risk management measures, establish incident reporting obligations across a wider range of sectors, and ensure effective information sharing, cooperation, and regulatory oversight. In addition, Member States are required to adopt national cybersecurity strategies and establish an appropriate institutional framework for their implementation. The scope of the Directive has been significantly expanded beyond the sectors covered by the original NIS Directive. In addition to operators in the fields of energy, transport, healthcare, financial services, water management, and digital infrastructure, NIS2 also applies to providers of public electronic communications services, certain digital service providers, waste and wastewater management entities, manufacturers of critical products, postal and courier service providers, public administration bodies, and organisations operating in the space sector. These entities are required to implement appropriate technical, operational, and organisational measures for managing cybersecurity risks and to report significant cybersecurity incidents to the competent authorities without undue delay. The overarching objective of these obligations is to enhance the resilience of critical sectors and reduce the risk of serious disruptions affecting services essential to society and the economy⁴. An analysis of the NIS2 Directive demonstrates that its regulatory approach primarily focuses on technical, organisational, and governance measures designed to strengthen cybersecurity resilience. However, empirical evidence consistently indicates that most cybersecurity incidents are attributable to human behaviour rather than technological failures. The most common causes include phishing and spear-phishing attacks, business email compromise (BEC), credential theft, negligent handling of sensitive information, the use of weak or reused passwords, and the unauthorised disclosure of business information. These attacks exploit human error, limited security awareness, and behavioural vulnerabilities, making the human factor one of the most significant sources of cybersecurity risk in contemporary organisations. Social engineering is particularly concerning because attackers rely not on technical vulnerabilities but on psychological mechanisms such as trust, authority, urgency, or fear to manipulate individuals into revealing confidential information or performing actions that compromise organisational security. Against this background, the central research question addressed in this paper is whether risks arising from the human factor can be effectively managed through legal and organisational measures and, if so, what obligations this imposes on employers and the management bodies of commercial companies. Accordingly, the paper seeks to examine the human factor as a cybersecurity risk, analyse the European regulatory framework established by the NIS2 Directive, explore the legal responsibilities of employers and corporate management, assess the role of employee training and cybersecurity awareness, and consider the relationship between cybersecurity and corporate governance. The paper argues that cybersecurity can no longer be understood solely as a matter of implementing technical safeguards for information systems. Rather, it has become an integral component of corporate governance. From this perspective, the human factor emerges as a central element of cybersecurity risk management, while responsibility for establishing effective organisational safeguards increasingly rests with the management bodies of commercial companies. Through an analysis of the NIS2 Directive, relevant legal scholarship, and empirical research, the paper demonstrates that effective cybersecurity governance requires the integration of legal, organisational, and managerial mechanisms alongside technical security measures.

⁴ On 20 January 2026, the European Commission proposed targeted amendments to the NIS Directive² as part of the new cybersecurity package.

2. Empirical Evidence on the Role of the Human Factor in Cybersecurity Incidents

The significance of the human factor in cybersecurity is consistently confirmed by empirical research. According to the Verizon⁵ Data Breach Investigations Report (DBIR) 2025⁶, human involvement was identified in approximately 60% of all analysed security breaches. This finding demonstrates that, despite substantial investments in technical security controls, organisations continue to be vulnerable due to human behaviour, operational mistakes, and procedural failures. At the same time, the proportion of breaches involving third parties increased from 15% to 30%⁷, highlighting the growing importance of managing cybersecurity risks arising from relationships with suppliers, service providers, business partners, and other external stakeholders. The report further identifies credential abuse as the most common initial access vector, accounting for 22% of all analysed breaches. In such cases, attackers gain access by using stolen, purchased, or leaked user credentials rather than exploiting technical vulnerabilities. Particularly noteworthy are the findings concerning credential theft through infostealer malware.⁸ Verizon reports that 30% of compromised systems were corporate devices, while 46% of compromised systems containing corporate credentials were unmanaged personal devices, including employees' privately owned computers and other personal endpoints operating outside organisational security controls.⁹ These findings indicate that user behaviour and device management practices represent significant cybersecurity challenges that cannot be addressed through technical safeguards alone. The second most common initial access vector was the exploitation of software vulnerabilities, representing 20% of all analysed breaches. These incidents typically involved attackers exploiting unpatched vulnerabilities in software applications, operating systems, or network services to gain unauthorised access. Phishing attacks, including various forms of email-based deception aimed at persuading users to disclose credentials or execute malicious content, accounted for 16% of the analysed incidents. Collectively, these findings confirm that compromised credentials remain one of the primary mechanisms through which attackers infiltrate organisational systems, underlining the importance of secure credential management, multi-factor authentication, and continuous cybersecurity awareness training. The DBIR 2025 also demonstrates a strong relationship between credential compromise and ransomware attacks. According to the report, 54% of organisations appearing on ransomware leak sites were also identified in databases containing compromised credentials, while 40% of the exposed records included corporate email addresses. These data suggest that credential theft frequently constitutes the initial stage of more sophisticated cyberattacks and remains one of the most significant security challenges facing modern organisations. Social engineering continues to represent a major category of cybersecurity incidents. Verizon recorded 4,009 social engineering incidents, of which 3,405 resulted in confirmed data breaches, indicating a high success rate of attacks targeting human behaviour rather than technological weaknesses. In all analysed cases, the threat actors were external, with financial gain and espionage identified as the predominant motives. Overall, these findings reinforce the conclusion that the human factor remains one of the principal sources of cybersecurity risk.

⁵ The Verizon DBIR is one of the most comprehensive annual reports on cybersecurity incidents, compiled using data contributed by numerous international public and private sector partners.

⁶ Data Breach Investigations Report 2025. <https://www.verizon.com/business/resources/reports/2025-dbir-data-breach-investigations-report.pdf>. 1.6.2026.

⁷ Data Breach Investigations Report 2024. www.verizon.com/business/resources/reports/2024-dbir-data-breach-investigations-report.pdf. 1.6.2026.

⁸ The primary purpose of such software is to steal data from the victim's device, typically by having the victim download an infected file. The infostealer installs itself and sends all stored passwords, including those for business accounts, to the attacker.

⁹ Such devices often belong to the BYOD (Bring Your Own Device) model or are used outside of the organization's official security policies.

Despite continuous advances in security technologies, organisational resilience continues to depend heavily on employees' behaviour, effective credential management, compliance with security policies, and the ability to recognise and respond to cyber threats. The importance of the human factor is equally reflected in the reports published by the European Union Agency for Cybersecurity (ENISA)¹⁰. ENISA consistently identifies social engineering as one of the most significant cybersecurity threats affecting organisations and critical sectors across the European Union. According to the ENISA Threat Landscape 2025¹¹, phishing was involved in approximately 60% of the analysed cybersecurity breaches. These findings indicate that the success of many cyberattacks depends not only on technical weaknesses within information systems but also on attackers' ability to manipulate individuals and exploit limited cybersecurity awareness. Consequently, the human factor can no longer be regarded as a secondary source of cybersecurity risk; rather, it has become a fundamental component of cybersecurity risk management. These empirical findings are further supported by academic research. Heartfield and Loukas (2015) argue that even the most sophisticated technical security mechanisms may be rendered ineffective if attackers successfully manipulate users into revealing passwords, opening malicious email attachments, or accessing compromised websites.¹² Likewise, Parsons et al. (2014) developed the Human Aspects of Information Security Questionnaire (HAIS-Q) to demonstrate the relationship between employees' knowledge, attitudes, and behaviour and organisational cybersecurity risks¹³. Rodriguez et al. (2020) explain how cybercriminals exploit cognitive biases and psychological mechanisms to manipulate users¹⁴, while Furnell et al. (2022) advocate a holistic approach to cybersecurity that integrates technological safeguards with organisational governance and human behaviour, arguing that technical measures alone cannot eliminate risks arising from the human factor¹⁵.

3. THE HUMAN FACTOR AS A REGULATORY SUBJECT WITHIN THE EUROPEAN UNION CYBERSECURITY FRAMEWORK

One of the most significant innovations introduced by the NIS2 Directive is the explicit recognition of the human factor as an element of cybersecurity governance. Rather than treating cybersecurity as the exclusive responsibility of information technology departments, the Directive assigns responsibility to the management bodies of essential and important entities. It requires members of management bodies to undergo cybersecurity training and to ensure that employees receive appropriate education enabling them to identify cybersecurity risks and understand cybersecurity risk management practices.¹⁶ Consequently, the human factor is no longer regarded solely as an operational issue but becomes a matter of corporate governance. In this respect, NIS2 is the first EU legislative instrument to establish an explicit link between cybersecurity and the fiduciary responsibilities of corporate management.¹⁷

¹⁰ The European Union Agency for Cybersecurity, ENISA, is the Union's agency dedicated to achieving a high common level of cybersecurity across Europe. <https://www.enisa.europa.eu/about-enisa/who-we-are>. (1.6.2026).

¹¹ ENISA, ENISA Threat Landscape 2025, European Union Agency for Cybersecurity, 2025, <https://www.enisa.europa.eu/publications/enisa-threat-landscape-2025>, 1.6.2026.

¹² Heartfield, R.; Loukas, G., A Taxonomy of Attacks and a Survey of Defence Mechanisms for Semantic Social Engineering Attacks, ACM Computing Surveys, 2015.

¹³ Parsons, K.; McCormac, A.; Butavicius, M.; Pattinson, M.; Jerram, C., Determining Employee Awareness Using the Human Aspects of Information Security Questionnaire (HAIS-Q), Computers & Security, 2014.

¹⁴ Rodriguez, R. M.; Golob, E.; Xu, S., Human Cognition through the Lens of Social Engineering Cyberattacks 2020.

¹⁵ Furnell, S.; Shah, J.; Papadaki, M. et al., Leveraging Human Factors in Cybersecurity: An Integrated Methodological Approach, Cognition, Technology & Work (2022) 24:371–390.

¹⁶ Article 20 of the NIS2.

¹⁷ NIS1 did not contain such a provision.

The principal provision addressing employees is Article 21 of the NIS2 Directive, which identifies basic cyber hygiene practices and cybersecurity training as mandatory elements of cybersecurity risk management. Through these requirements, the Directive acknowledges that employees' daily behaviour and their ability to recognise cyber threats constitute an integral component of organisational cybersecurity. However, while the Directive establishes a general obligation to provide cybersecurity training, it does not specify the content of such training, its frequency, or any minimum educational standards. Nor does it require organisations to implement practical measures such as phishing simulations or specialised training on recognising and responding to social engineering attacks. Article 21 further includes provisions concerning human resources security, access control policies, and asset management, thereby emphasising the importance of organisational measures within cybersecurity governance. Nevertheless, the concept of human resources security remains only broadly defined. The Directive contains no detailed requirements regarding pre-employment screening, personnel reliability assessments, insider threat management, or the psychological dimensions of cybersecurity. Consequently, although the human factor is recognised within the regulatory framework, its normative treatment remains relatively limited. While the NIS2 Directive identifies the human factor as an important source of cybersecurity risk—particularly through obligations relating to risk management, employee and management training, and the promotion of cyber hygiene—it does not regulate this area with the same degree of specificity as technical and organisational security measures. This imbalance is particularly evident with respect to social engineering, which has become one of the most prevalent attack vectors in the contemporary cyber threat landscape. Despite its practical significance, the Directive neither recognises social engineering as a distinct category of cyber threat nor establishes specific preventive measures addressing psychological manipulation. Instead, it approaches the human factor primarily through general obligations concerning risk management and cybersecurity awareness, leaving the development of detailed behavioural safeguards to organisations themselves, sector-specific guidance, and the practice of competent authorities. This regulatory approach appears to be based on the implicit assumption that cybersecurity awareness and training alone are sufficient to reduce risks associated with human behaviour. However, the empirical studies discussed in the previous section suggest otherwise. Contemporary cyberattacks rarely succeed because users lack knowledge of security rules; rather, they exploit predictable cognitive biases, psychological pressure, stress, trust, and decision-making under uncertainty. Employees frequently understand organisational security policies yet fail to apply them in real-world situations involving urgency, authority, or deception. Consequently, the effectiveness of social engineering derives not from technical sophistication but from its ability to exploit human cognitive processes. In this respect, the NIS2 Directive pays only limited attention to behavioural security, decision-making psychology, organisational culture, and the manipulation techniques commonly employed by cybercriminals. Given the dominant role of the human factor in contemporary cybersecurity incidents, an important question arises as to whether the general obligations concerning cybersecurity training, awareness, and risk management imposed by the NIS2 Directive are sufficient to address increasingly sophisticated forms of social engineering. Since the Directive regulates technical and organisational safeguards in considerable detail while addressing behavioural risks only in general terms, responsibility for developing effective organisational mechanisms is, in practice, transferred to the management bodies of organisations. As a result, the practical effectiveness of the NIS2 framework will largely depend on corporate governance structures, organisational culture, and the ability of management to translate general regulatory obligations into effective behavioural risk management.

4. DIRECTORS' RESPONSIBILITY FOR CYBERSECURITY RISK MANAGEMENT

The NIS2 Directive marks a significant shift in the governance of cybersecurity by transferring responsibility from information technology departments to the management bodies of commercial companies. As a result, cybersecurity risk management becomes an integral component of corporate governance and the fiduciary duties of company directors. Traditionally, cybersecurity was regarded primarily as a technical matter entrusted to information technology specialists responsible for protecting network and information systems. The contemporary European regulatory framework, however, clearly demonstrates that such an approach is no longer sufficient. By introducing explicit governance obligations, the NIS2 Directive places responsibility for approving, implementing, and overseeing cybersecurity measures on the management bodies of legal entities. In this respect, Triplett (2022) argues that organisational culture and employee behaviour are largely shaped by the manner in which management establishes security expectations, organises the working environment, and manages human resources.¹⁸ Consequently, cybersecurity culture should not be understood as a spontaneous outcome of employee behaviour but rather as the product of managerial decisions and organisational leadership. Article 20 of the NIS2 Directive requires management bodies to approve cybersecurity risk management measures, supervise their implementation, and assume responsibility for ensuring compliance with the Directive. Furthermore, members of management bodies are required to undertake regular cybersecurity training to enable them to assess cybersecurity risks and evaluate the effectiveness of organisational security measures. These provisions represent a clear departure from the traditional perception of cybersecurity as merely an operational or technical issue. Instead, cybersecurity governance becomes part of corporate strategy and executive decision-making, reflecting the reality that failures in cybersecurity management may directly affect business continuity, corporate assets, stakeholder confidence, and the long-term sustainability of the undertaking. Consequently, cybersecurity risks must now be regarded as business risks requiring active oversight and management by company directors. From the perspective of Croatian company law, this development raises an important legal question: can the failure to address cybersecurity risks constitute a breach of directors' duty of care? Under the Croatian Companies Act¹⁹, members of the management board shall manage company's business with the due care of a prudent businessman and shall keep company's business secret²⁰ and to act in the best interests of the company when making business decisions. As noted by Horak and Dumančić (2008), the duty of care and the duty of loyalty constitute the traditional fiduciary obligations governing directors' conduct.²¹ Given that cybersecurity incidents may result in substantial financial losses, business interruption, data breaches, regulatory sanctions, and reputational damage, it is increasingly difficult to justify a failure by management to address cybersecurity risks adequately. Accordingly, the absence of appropriate organisational and security measures may amount to a breach of the duty of care, particularly where the resulting damage was reasonably foreseeable and could have been prevented through appropriate risk management practices. Under Croatian law, a breach of these duties may give rise to both civil and criminal liability.²² A particularly important issue concerns the application of the business judgment rule to decisions relating to cybersecurity.

¹⁸ Triplett, W.J. Addressing Human Factors in Cybersecurity Leadership. *J. Cybersecur. Priv.* 2022, 2, 573–586.

¹⁹ Croatian Companies Act (*Zakon o trgovačkim društvima*). 111/1993, 34/1999, 121/1999, 52/2000, 118/2003, 107/2007, 146/2008, 137/2009, 111/2012, 125/2011, 68/2013, 110/2015, 40/2019, 34/2022, 114/2022, 18/2023, 130/2023, 136/2024.

²⁰ *Ibid.*, čl. 252. st. 1.

²¹ Horak, H., Dumančić, K., *Pravilo poslovne prosudbe u Hrvatskom i pravu SAD*, Zbornik Pravnog fakulteta Sveučilišta u Rijeci, v. 29, br. 2, 975-1008 (2008), str. 980.

²² *Amplius infra* Kaleb, Z. (2011). Kazneno djelo povrede dužnosti članova uprava i izvršnih direktora u slučaju insolventnosti i gubitka društava. *Policija i sigurnost*, 20 (4), 510-523.

According to Badawi (2023), the business judgment rule is a legal doctrine preventing courts from reviewing directors' business decisions where those decisions have been made in good faith, on an informed basis, and in the reasonable belief that they serve the best interests of the company. Its purpose is to protect directors from liability for ordinary business mistakes while preserving their ability to make decisions involving legitimate business risk without fear of subsequent judicial interference.²³ Croatian company law reflects this principle in Article 252(1) of the Companies Act, which provides that a member of the management board does not breach the duty of proper management where, on the basis of appropriate information, they could reasonably believe that the decision was made for the benefit of the company.²⁴ The protection afforded by the business judgment rule, however, cannot reasonably extend to situations in which management has failed altogether to assess cybersecurity risks or to establish even the most basic cybersecurity governance mechanisms. While the doctrine protects informed business decisions, including decisions concerning the selection of particular cybersecurity solutions, it cannot shield directors who simply disregard cybersecurity governance as a business risk. If cybersecurity risks are accepted as one of the most significant categories of contemporary corporate risk, their complete neglect can hardly be characterised as a business decision deserving judicial deference under the business judgment rule. This regulatory development also reflects broader changes in corporate governance and the growing significance of Environmental, Social and Governance (ESG) principles. Contemporary scholarship consistently emphasises that effective corporate governance forms the foundation for the successful implementation of ESG principles and contributes significantly to corporate resilience and long-term sustainability.²⁵ Within the governance dimension of ESG, increasing importance is attached to enterprise risk management, internal controls, regulatory compliance, and the accountability of management bodies. Consequently, cybersecurity can no longer be regarded as merely a technical issue but has become an integral component of corporate governance and organisational compliance culture.²⁶ Organisations that foster a strong cybersecurity culture, provide continuous employee training, actively manage social engineering risks, and regularly report cybersecurity indicators to management are better aligned with principles of good corporate governance and are generally more resilient to emerging cyber threats. The NIS2 Directive does not introduce a new category of directors' liability. Rather, it reshapes the content of the existing duty of care within company law. In the contemporary business environment, the diligent management of corporate affairs can no longer be separated from the active management of cybersecurity risks, organisational security culture, and the human factor. Cybersecurity governance therefore becomes an integral element of directors' fiduciary duties. It follows that NIS2 has fundamentally altered the regulatory understanding of cybersecurity governance. Responsibility for cybersecurity is no longer confined to information technology departments but forms part of the broader fiduciary obligations of company directors. This development opens the way for a new interpretation of the duty of care in company law, according to which effective cybersecurity risk management should be regarded as one of the essential components of prudent and conscientious corporate management. Such an interpretation represents a logical consequence of the evolving European regulatory framework, in which cybersecurity risks are increasingly treated in the same manner as other significant business risks requiring active oversight by corporate management.

²³ Badawi, Adam B., (2023), The Business Judgment Rule, <http://dx.doi.org/10.2139/ssrn.4465571>.

²⁴ Zakon o trgovačkim društvima, op. cit. (bilj. 18), čl. 252. st.1.

²⁵ Buchetti, B., Romana Arduino, F., Perdichizzi, S. (2025), A literature review on corporate governance and ESG research: Emerging trends and future directions, *International Review of Financial Analysis*, Volume 97, <https://doi.org/10.1016/j.irfa.2024.103759>.

²⁶ *Amplius infra* chapter 5.

5. COMPLIANCE CULTURE AS A MECHANISM FOR MANAGING HUMAN FACTORS IN CYBERSECURITY

As demonstrated in the preceding sections, the evolution of modern cybersecurity governance has shown that, although indispensable, technical security measures alone cannot provide effective protection against contemporary cyber threats. A substantial proportion of successful cyberattacks exploit human behaviour rather than technological vulnerabilities, making organisational culture and employee conduct as important as technical safeguards. Against this background, increasing attention has been devoted to the development of compliance culture, understood as a system of organisational values, ethical principles, internal rules, and behavioural standards that promote lawful, responsible, and security-conscious conduct throughout the organisation. Unlike formal regulatory compliance, which primarily focuses on adherence to legal requirements, compliance culture reflects the genuine internalisation of security principles and their integration into everyday organisational practice²⁷. Within the field of cybersecurity, compliance culture encompasses a range of mutually reinforcing elements, including continuous training for employees and members of management bodies, the adoption and effective implementation of codes of ethics, whistleblowing mechanisms, the promotion of cybersecurity awareness, and clearly defined managerial responsibility for implementing and supervising security policies. The objective of these measures extends beyond regulatory compliance. Their broader purpose is to create an organisational environment in which every employee understands their individual role in protecting information systems and actively contributes to reducing cybersecurity risks²⁸. Compliance culture is particularly important in addressing threats based on social engineering. Unlike attacks that exploit technical vulnerabilities in information systems, social engineering relies on manipulating human behaviour, trust, cognitive biases, and psychological responses. Consequently, no technological safeguard, even the most sophisticated security infrastructure, can fully compensate for the absence of a well-developed organisational security culture. The effectiveness of cybersecurity therefore depends to a considerable extent on employees' security awareness, their ability to recognise attempts at manipulation, and their willingness to comply with established security policies in everyday business practice²⁹. The significance of compliance culture becomes even more apparent in the context of the NIS2 Directive. Although the Directive requires organisations to provide cybersecurity training and promote cyber hygiene, it does not establish detailed educational standards or prescribe specific measures for preventing social engineering attacks. As a result, the practical achievement of its regulatory objectives largely depends on the organisational mechanisms developed by the entities subject to its requirements. In this respect, compliance culture assumes a central role. While the Directive does not expressly refer to the concept of compliance culture, its provisions clearly imply that effective cybersecurity cannot be achieved solely through technical safeguards. Rather, it depends equally on an organisational culture that encourages responsible behaviour, continuous learning, and the proactive management of human-related cybersecurity risks. Accordingly, compliance culture should be regarded as one of the fundamental prerequisites for the effective implementation of the NIS2 framework. It serves as the link between formal regulatory obligations and the everyday behaviour of employees, ensuring that security policies become an integral part of organisational practice rather than merely a set of formal requirements.

²⁷ Kaptein, M. (2008). Developing and Testing a Measure for the Ethical Culture of Organizations. *Journal of Organizational Behavior*, 29(7), 923–947.

²⁸ ISO 37301:2021 – Compliance Management Systems – Requirements with Guidance for Use.

²⁹ OECD (2023). G20/OECD Principles of Corporate Governance.

https://www.oecd.org/content/dam/oecd/en/publications/reports/2023/09/g20-oecd-principles-of-corporate-governance-2023_60836fcb/ed750b30-en.pdf

At the same time, it provides the organisational mechanism through which management bodies discharge their responsibility for cybersecurity risk management. Compliance culture should therefore be understood not only as an instrument of regulatory compliance but also as one of the most effective means of preventing cybersecurity incidents arising from the human factor and social engineering. In this sense, it constitutes the practical bridge between the governance obligations introduced by the NIS2 Directive and the day-to-day conduct of individuals within the organisation.

6. CONCLUSION

The analysis presented in this paper supports the central argument that cybersecurity can no longer be understood solely as a technical issue concerning the protection of network and information systems. Instead, it has evolved into a broader question of corporate governance, requiring the integration of legal, organisational, and managerial approaches to cybersecurity risk management. The examination of Directive (EU) 2022/2555 (NIS2) demonstrates that the European legislator recognises the importance of the human factor by imposing obligations relating to cybersecurity risk management, cybersecurity training for employees and members of management bodies, and the promotion of basic cyber hygiene practices. Nevertheless, the regulatory treatment of the human factor remains relatively limited. While the Directive establishes general obligations concerning awareness and training, it neither defines minimum educational standards nor provides specific requirements for addressing social engineering or other behavioural aspects of cybersecurity. Consequently, much of the responsibility for developing effective organisational mechanisms remains with the organisations themselves. From the perspective of company law, NIS2 represents a significant development in the allocation of responsibility for cybersecurity governance. Responsibility for managing cybersecurity risks is no longer confined to information technology departments but forms part of the broader governance responsibilities of corporate management. In this context, effective cybersecurity risk management, the development of a strong compliance culture, and the continuous enhancement of employees' cybersecurity awareness should be regarded as essential elements of directors' duty of care and prudent corporate management. The paper therefore suggests that effective cybersecurity cannot be achieved solely through the implementation of advanced technological safeguards. Rather, it depends on the integration of technical measures with appropriate legal frameworks, organisational governance, and a culture of accountability. The human factor constitutes the critical link between technological protection and corporate governance. Future developments of the European cybersecurity framework should therefore place greater emphasis on behavioural aspects of cybersecurity, organisational resilience, and the legal regulation of risks arising from social engineering.

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ECONOMY, GOVERNANCE AND INCLUSIVE SOCIAL DEVELOPMENT: THE ROLE OF CONTEMPORARY CONSTITUTIONAL LAW – THE SERBIAN CASE

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ABSTRACT

While benefits of growing social inclusion are widely shared across the community, these opportunities have become a vision for public policies, and very little has been devoted to analyzing in the context of constitutional rights. Through this research, constitutional law is not something irrelevant in the context of social or economic policies, but it is the active enabler of development. Research is built around connecting constitutional law through a conceptual framework with the economy, quality of governance and social inclusion as key pillars. Analysis has been conducted in Republic of Serbia, through a Delphi study including experts from economics, public administration, constitutional law and civil society, who estimated different factors to inclusive social development. Results show that the rule of law, with transparency and anti corruption has recorded highest level of agreement between experts. Findings show also that further strengthening inclusion in Serbia is less dependent on new policy program adoption, but more on providing a full effect of guarantees provided by the constitution.

Keywords: *inclusive development, constitutional law, social*

1. INTRODUCTION

For the last 120 years, economic progress was observed through aggregated growth, and all other matters were isolated and treated as secondary. Through time, perception has shifted and objectives were no longer focused on growth as such, but also included different social components. In that kind of process, the benefits would be more widely shared and used, leading to an environment where institutions are more capable, accountable and responsive (Sen, 1999; Kanbur & Rauniar, 2010; United Nations, 2015). This concept aligns between economic performance, governance quality into a single vision (Gupta & Vegelin, 2016). Inclusive development is often missing direct accountability given from national constitution (quite often the constitution is treated as a formal document dealing with matters of the state, power and rights in general, being too distant from economy and social policies). This research focuses on observing constitutional political economy (Buchanan & Tullock, 1962; Persson & Tabellini, 2003; Voigt, 2011), while analyzing whether constitutional law is an enabler for inclusive development, and whether social and other guarantees support differentiation between growth and inclusive growth. The analysis has a particular focus on Republic of Serbia, whose existing constitution from 2006 has defined the country as a state based on the rule of law and social justice, and where exist different mechanisms of accountability and local autonomy (Constitution of the Republic of Serbia, 2006; Petrov & Perić, 2019; Pajvančić, 2009;

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Marković, 2014; Petrov & Stanković, 2020). The remainder of the paper is structured as follows. Section 2 sets out a conceptual framework linking economy, governance, inclusive development and constitutional law. Section 3 describes the methodology of a two-round Delphi expert study. Section 4 presents the results, and Section 5 discusses their implications and concludes.

2. CONCEPTUAL FRAMEWORK

The rationale for this paper is that constitutional law connects institutions with economy, quality of governance and vision for social inclusion. Inclusiveness and prosperity in the long term, depends highly on the quality of institutions and application of law – measured through rule of economy and politics, protection of private property and preventing large concentration of wealth in the hands of a minority (North, 1990; Rodrik, Subramanian & Trebbi, 2004; Acemoglu & Robinson, 2012).

2.1. Social inclusion through economic baseline

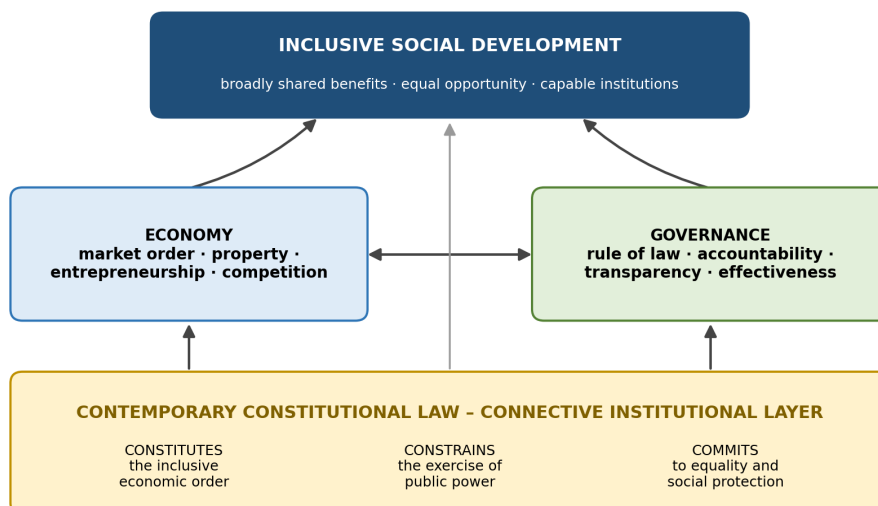
All constitutional laws of all nations have specific, economic constituents, as a set of basic definitions for economic order, that preserves private property and contracting liberties and guaranteeing equal conditions for the competition (Persson & Tabellini, 2003; Voigt, 2011). Monopolistic position is forbidden in the Serbian Constitution, as well as intrusion to private property, and guarantees are made for a free market economy and possibilities for entrepreneurs. Economic constitution matters because it aligns activity with wide accessibility. These broadly distributed rights, freedoms to start and perform a business, effective supports of free competition and market, all of it widens the circle of participants and beneficiaries from an economy. It is important to have in mind that economic constitution and social constitution come in pair, through guarantees of social security, free education, health protection, labor rights and a dignity in living. For all of these guarantees to function in reality, fiscal and governance provisions of the constitution are required (Holmes & Sunstein, 1999). Social inclusion development is connected with both through a productive market and a credible commitment of benefits to the society.

2.2. Social inclusion development through the lens of the constitutional law

Alignment on these entities is provided through the constitution, and it can be seen as an enabler of inclusive development in three ways (Djordjević & Jevtić, 2025; Djordjević, 2022; Djordjević, Jevtić, Dedjanski, 2024; Djordjević, Dedjanski, Jević, 2024). It sets the tone for economic inclusion, it forbids exercise of public power and it enables the state to guarantee for many rights to the people, rather than to the few.

The full approach is displayed in Figure 1.

Figure following on the next page



*Figure 1: Conceptual framework – constitutional law as the connective institutional layer
(Source: authors)*

3. RESEARCH METHODOLOGY

3.1. Research design

This research includes a Delphi method conducted in two rounds, the technique itself is a structured, iterative process where experts consult and combine individual judgment through a statistical framework (Linstone & Turoff, 1975; Okoli & Pawlowski, 2004). The research questions involve developmental contributions that require integration of economic, legal and administrative expertise. It is not intended to generalize something to a population wherever, but to construct a rationale backed up by expert consensus, on the relative importance of constitutional law and governance factors, to inclusive social development, in the case of Serbia.

3.2. Expert panel

The panel of experts included people with current professional activity in Serbia, with a minimum of ten years of experience in constitutional law, economy and development, public administration or social inclusion work. Following the recommendation by Okoli and Pawlowski (2004) „that heterogeneous Delphi panels of roughly fifteen to thirty experts provide reliable results“, the authors have invited 30 experts, and 24 in total completed the first round, with 22 completed the second round. Panel construction is shown in Table 1.

3.3. Instrument and procedure

The study has been performed electronically during the period of six weeks in early 2026. Through round 1, the experts received a structured questionnaire including all factors:

1. rule of law and judicial independence;
2. transparency and anti-corruption;
3. economic freedom guarantees;
4. social rights guarantees;
5. equality and non-discrimination;
6. fiscal and budgetary accountability;
7. decentralisation and local self-government; and
8. citizen participation.

Each factor was rated through a defined process, paraphrased as „using a five-point scale (1 = no contribution, 5 = decisive contribution to inclusive social development), and an open field

invited the experts to justify their ratings and to propose modifications to the factor list⁴. Within round 2, each of the experts found out about feedback from all others, through a statistical median and interquartiles for each factor, and anonymised synthesis of arguments from round 1. All experts were asked to re-evaluate the factors after reviewing this feedback. Additionally, round 2 includes a sum task where all experts gave exactly 100 points through all factors, causing a yielded approach of weights that enables direct prioritization, instead of uniformly and equally high ratings. All responses were analyzed using median value and interquartile ranges (IQR).

4. RESULTS

4.1. Composition of the expert panel

Construction of the Delphi panel in two rounds is summarized in Table 1. This panel combines on the academic expertise in constitutional and public law, ensuring a full reflection of the framework, rather than exercising through single perspectives.

Expert group	Invited (n)	Round 1 (n)	Round 2 (n)
Constitutional and public law scholars	8	6	6
Economists and development researchers	7	7	6
Public administration practitioners	8	5	5
Civil-society and development practitioners	6	6	5
Total	29	24	22

*Table 1: Composition of the Delphi expert group
(Source: authors' Delphi study, 2026)*

4.2. Consensus ratings and relative weights

In table 2, there are reports from round 2, while Figure 2 visualises the convergence of mean ratings between the two rounds.

Constitutional / governance factor	Median (R2)	Weight (%)	Consensus (IQR ≤ 1)
1. Rule of law and judicial independence	5.0	21.6	Yes
2. Transparency and anti-corruption	5.0	18.7	Yes
3. Economic freedom guarantees	4.0	13.4	Yes
4. Social rights guarantees	4.0	12.2	Yes
5. Equality and non-discrimination	4.0	11.3	Yes
6. Fiscal and budgetary accountability	4.0	9.6	Yes
7. Decentralisation and local self-government	3.5	7.0	Yes
8. Citizen participation	3.0	6.2	No

*Table 2: Delphi results – Round 2 medians, interquartile ranges and normalised relative weights (n = 22)
(Source: Authors' Delphi study, 2026)*

Consensus is stable and objective, while rule of law and judicial independence and transparency and anti-corruption stand apart from the remaining factors. An intermediate cluster follows with economic freedom guarantees, social rights guarantees, equality and non-discrimination, and fiscal and budgetary accountability.

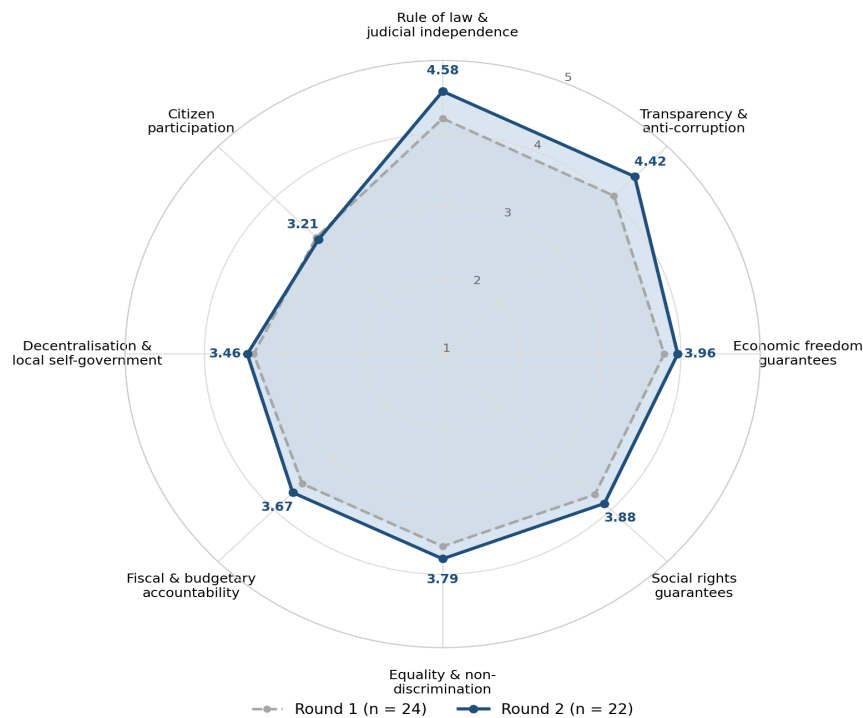


Figure 2: Convergence of mean expert ratings between Delphi rounds
(Source: Authors' Delphi study, 2026)

Figure 2 displays the dynamics of the conducted process between and after rounds. Top ranked dimensions appeared on top, after some experts moved upwards the group position of some dimensions, confirming that feedback mechanism has enabled a sharpened, rather than artificially flattened perceived contribution to the analysis.

5. DISCUSSION AND CONCLUSION

This paper examined that existing constitutional law is not definitely a legal framework but an ongoing provider of development through social inclusion. Based on a Delphi study executed through two rounds with Serbian experts, the study demonstrated that the key constitutional functions are those that connect economic inclusion with governance quality. The expert consensus prioritized rule of law and anti-corruption, confirming that socially inclusive development relies heavy on enforceable rules, partial institutions and limiting the governor will and public power. For Serbia, this directly shows that strengthening the independence of judiciary system, accountability through law and monitoring of institutions is highly more significant than introducing new policies and laws. Also through the experts analysis, their opinion treated economic liberties and human rights as complementing each other, rather than defying constitutional commitments. Having their rankings in mind, an inclusive, constitutional order should prevent any inability for a free market participation and also a direct guarantee of equality and human rights protection. Lastly, decentralisation and citizen participation depend on prior legal and institutional safeguards, therefore it was logical why these factors had recorded lower significance.

Future studies should involve monitoring and new research about Serbia's path toward inclusive development, that could be measured through effective implementation of existing constitutional guarantees.

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THE TRANSITION TO ELECTRIC MOBILITY IN THE EUROPEAN UNION

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ABSTRACT

The transition from internal combustion engine vehicles (ICEVs) to battery electric vehicles (BEVs) is fundamentally reshaping the European automotive market. This paper examines a potential temporary contraction in vehicle demand during this transition, defined as the automotive valley of death. Using historical vehicle registration data from the European Union (EU) and projections based on the Bass diffusion model, the analysis compares the declining trajectory of non-electrified ICEV registrations with the growth in BEV registrations. The results indicate that ICEV registrations may decline faster than BEV registrations increase, resulting in a temporary reduction in aggregate vehicle demand. The paper further discusses potential drivers of this transition gap from both consumer and manufacturer perspectives. The findings highlight the challenges associated with the timing and asymmetry of the transition towards electric mobility in the European automotive market.

Keywords: *battery electric vehicles, automotive valley of death, electric mobility, EU*

1. INTRODUCTION

The transition from internal combustion engine vehicles (ICEVs) to battery electric vehicles (BEVs) represents one of the most significant technological transformations currently affecting the European automotive industry. The share of BEVs in new vehicle registrations has increased substantially in recent years. Previous research on EU countries has identified technological development, policy measures, and charging infrastructure as important factors supporting BEV adoption (Neves et al., 2019). However, the replacement of an established technology by a new one does not necessarily occur smoothly. While demand for conventional vehicles may decline, demand for BEVs may not increase at the same pace, potentially creating a temporary contraction in the overall automotive market.

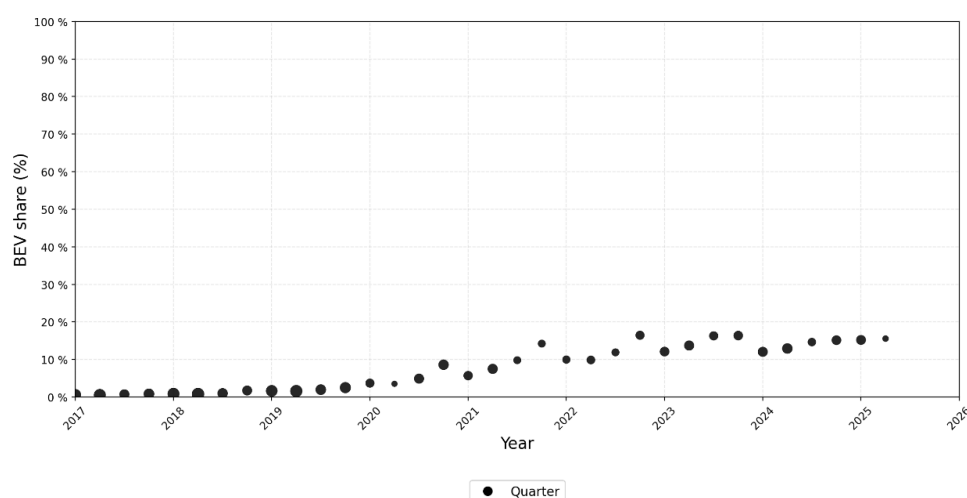
The purpose of this paper is to examine this potential transition gap in the European automotive market, referred to in this study as the automotive valley of death. Using historical vehicle registration data and projections based on the Bass diffusion model, the study examines the relationship between the declining demand for non-electrified ICE vehicles and the increasing adoption of BEVs. Particular attention is given to the potential mismatch between declining ICEV registrations and increasing BEV adoption. These mechanisms are considered from both the consumer and manufacturer perspectives.

The remainder of the paper is structured as follows. Section 2 presents the development of the BEV market in the EU, while Section 3 introduces the automotive valley of death and its projected development. Section 4 discusses the potential drivers of this phenomenon from the consumer and manufacturer perspectives, followed by the conclusions in Section 5.

2. BATTERY ELECTRIC VEHICLE MARKET IN THE EU

The growing presence of BEVs in new vehicle registrations reflects the ongoing transformation of the European automotive market. Figure 1 presents the share of BEVs among newly registered passenger cars in the EU from 2017 to the second quarter of 2025. Expressing BEV registrations as a share of total new vehicle registrations, rather than in absolute numbers, facilitates comparison of market development over time, as absolute registration volumes are influenced by factors such as market size, economic conditions, seasonal fluctuations in vehicle sales, and exceptional events affecting overall market activity, such as the COVID-19 pandemic. Consequently, the BEV market share provides a useful indicator for assessing the development of BEV adoption over time. Market share has also been employed as a key measure of EV adoption in previous research examining the determinants of electric vehicle uptake (Peng et al., 2024).

As shown in Figure 1, the BEV share increased gradually between 2017 and 2019, followed by a pronounced acceleration from 2020 onwards. While BEVs accounted for only a marginal share of new registrations at the beginning of the observed period, their market share increased substantially after 2020 and reached approximately 15% by 2025. The development was not entirely linear, with noticeable quarter-to-quarter fluctuations becoming more pronounced as the BEV market expanded. In particular, several years show stronger BEV shares towards the end of the year, followed by a decline at the beginning of the subsequent year. Such fluctuations may reflect seasonal purchasing patterns, changes in incentive schemes, manufacturers' year-end sales strategies, and efforts to meet annual regulatory and sales targets. Despite these short-term variations, the overall trend indicates a substantial and sustained increase in the penetration of BEVs in the EU over the observed period.



*Figure 1: Share of BEVs among newly registered passenger cars in the EU, 2017–Q2 2025
(Source: Author's own work based on ACEA (2025))*

While Figure 1 demonstrates a clear overall increase in BEV market share across the EU, this aggregate trend masks substantial differences in the pace of BEV adoption among individual Member States. Table 1 therefore provides a more detailed perspective by presenting the five EU Member States with the highest shares of BEVs among newly registered passenger cars in the first half of 2025. In addition to the BEV market share, the table reports the absolute number of newly registered BEVs, thereby providing an indication of both the relative penetration of BEVs and the size of the respective national BEV markets.

Denmark recorded the highest BEV share among EU Member States, with BEVs accounting for 63.85% of new passenger car registrations and 57,178 BEVs registered during the first half of 2025. Sweden ranked second with a BEV share of 35.23% and 49,667 registrations, followed closely by the Netherlands with a 35.00% share and 63,940 registrations. Finland reached a BEV share of 34.16%, corresponding to 12,726 newly registered BEVs, while Belgium ranked fifth with a share of 32.81%. Despite its lower BEV share compared with the other countries in the top five, Belgium recorded the highest absolute number of BEV registrations among them, with 76,980 vehicles.

	Country	BEV Registrations	BEV Share [%]
1	Denmark	57,178	63.85
2	Sweden	49,667	35.23
3	Netherlands	63,940	35.00
4	Finland	12,726	34.16
5	Belgium	76,980	32.81

Table 1: EU Member States with the highest shares of newly registered BEVs in the first half of 2025.

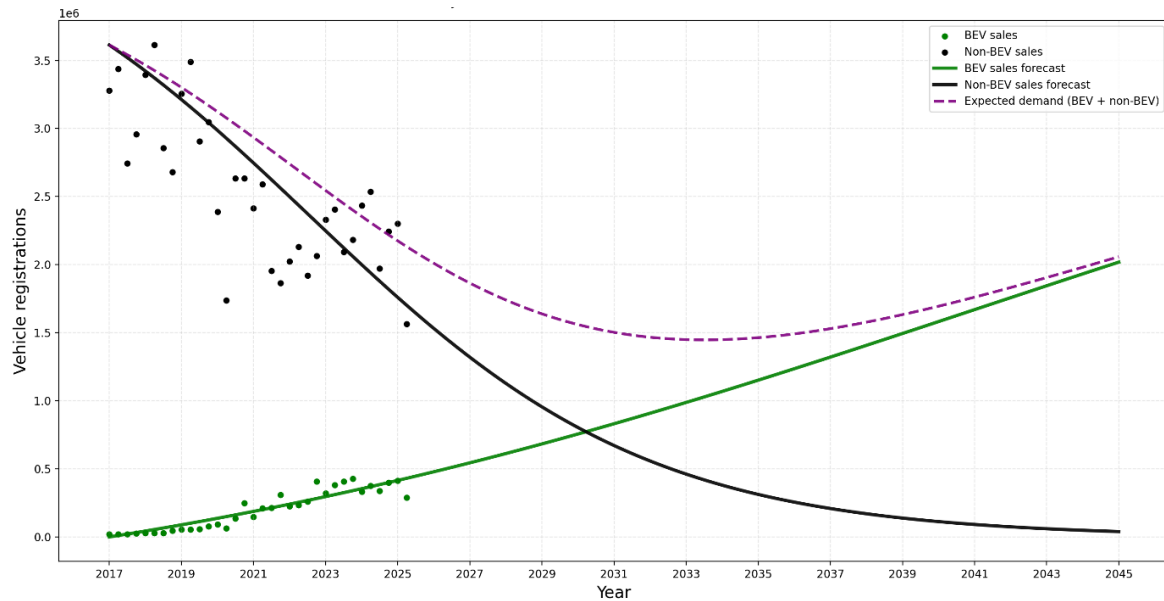
(Source: Author's own work based on ACEA (2025))

At the other end of the spectrum, several EU Member States recorded BEV market shares below 5% in the first half of 2025. These included Poland (4.44%), Bulgaria (4.30%), Slovakia (4.20%), and Croatia (0.97%). The considerable gap between the leading and lowest-ranking Member States highlights the substantial disparities in the pace of BEV adoption across the EU. These results also illustrate the importance of considering both relative and absolute indicators when comparing national BEV markets. A high BEV share indicates a relatively advanced penetration of BEVs within new vehicle registrations, but it does not necessarily correspond to a large number of vehicles sold. Differences in absolute registration volumes therefore also reflect substantial differences in the size of national passenger car markets.

3. THE VALLEY OF DEATH IN THE AUTOMOTIVE MARKET

As demonstrated in the previous section, the European automotive market has experienced a substantial increase in the adoption of BEVs over the past decade. However, the growth of BEVs represents only one side of the ongoing technological transition. An equally important question concerns the development of demand for conventional, non-electrified vehicles powered exclusively by internal combustion engines (ICEVs). As BEVs progressively substitute conventional powertrains, the transition may affect not only the composition of new vehicle registrations but also the total number of vehicles demanded during the transition period. While the previous analysis focused primarily on BEV market shares, the following analysis considers absolute registration volumes. Absolute registrations are inherently more difficult to forecast than market shares, as they are influenced by a wider range of macroeconomic, cyclical, and market-specific factors. Nevertheless, they are essential for examining whether the decline in demand for the incumbent technology is compensated by a corresponding increase in demand for the emerging technology. The concept of the “valley of death” is traditionally used in innovation literature to describe a critical phase between technological development and successful market commercialization. During this phase, an innovation may have demonstrated technical feasibility but still face significant financial, commercial, or institutional barriers that hinder its transition towards large-scale market deployment.

The underlying challenge is therefore not necessarily technological readiness itself, but the gap between technological development and economically sustainable commercialization (Muscio et al., 2023). In the context of the present study, the concept is applied more broadly to the structural transition of the automotive market. Rather than referring exclusively to the commercialization difficulties of an individual technology or start-up, the automotive “valley of death” is defined here as a temporary contraction in total new-vehicle demand that may emerge when registrations of conventional ICE vehicles decline faster than BEV registrations increase. Under such conditions, the expansion of the emerging technology is initially insufficient to fully compensate for the contraction of the incumbent technology, resulting in a temporary decline in aggregate vehicle registrations.



*Figure 2: BEV and ICEV sales: The automotive valley of death
(Source: Author’s own calculations; ACEA 2025)*

Figure 2 illustrates this phenomenon using quarterly new passenger-car registrations in the EU. The observed data distinguish between BEV registrations and registrations of non-electrified vehicles, defined here as vehicles powered exclusively by an internal combustion engine. Future registration trajectories were estimated using the Bass diffusion model, originally developed by Bass (1969) to describe the diffusion and adoption of new consumer durables. In the present analysis, the model is applied to project the growth of BEV registrations and the corresponding decline in registrations of non-electrified vehicles. The green curve represents BEV registrations, while the black curve represents non-electrified vehicle registrations. The dashed purple curve represents expected aggregate demand, calculated as the sum of the two modelled vehicle categories. The projections reveal an important asymmetry between the decline of conventional vehicles and the expansion of BEVs. According to the model, registrations of non-electrified vehicles decline more rapidly than BEV registrations increase. Consequently, the growth of BEV demand does not immediately compensate for the loss of conventional vehicle registrations. The two trajectories are projected to intersect around 2030, indicating the point at which quarterly BEV registrations become comparable to those of non-electrified vehicles. More importantly, the combined trajectory forms a pronounced U-shaped pattern. Aggregate registrations are projected to continue declining after the crossover point and reach a local minimum of approximately 1.4–1.5 million vehicles per quarter around 2033. Thereafter, continued growth in BEV registrations gradually outweighs the remaining decline in conventional vehicle registrations, resulting in a recovery of total market demand.

This temporary contraction constitutes the automotive “valley of death” as defined in this study. The implications of such a transition could be particularly significant for European vehicle manufacturers and their supply chains. During the transition period, manufacturers may simultaneously face declining volumes of conventional vehicles and insufficient BEV volumes to compensate for the resulting loss of scale. The valley therefore represents not merely a technological substitution process but potentially a period of increased economic pressure on production capacity, profitability, employment, and suppliers that remain strongly dependent on conventional powertrain technologies.

4. DRIVERS OF THE AUTOMOTIVE VALLEY OF DEATH

Based on the projections presented in the previous section, the automotive valley of death may emerge during the transition from conventional internal combustion engine vehicles to BEVs. The mechanisms potentially contributing to this temporary contraction in vehicle demand can be considered from two complementary perspectives: that of consumers and that of vehicle manufacturers.

4.1 Consumer perspective

From the consumer perspective, one mechanism that may contribute to the automotive valley of death is the so-called Osborne effect. The phenomenon describes a situation in which the preannouncement of a new or improved product affects demand for products that are already available on the market. Consumers who expect a superior product to become available in the near future may postpone their current purchase, thereby reducing demand for the existing product. Such preannouncements can therefore result in the cannibalization of current sales even before the new product becomes commercially available (Rao & Turut, 2019). Although the Osborne effect is traditionally associated with new-product preannouncements at the firm or product level, a similar mechanism may be relevant to the ongoing transition of the automotive market. This may be particularly important in the case of BEVs, where both technological and market conditions continue to evolve rapidly. Previous research indicates that high purchase prices and risks associated with the relative infancy of the EV market can negatively affect EV market diffusion, while government incentives can positively influence EV adoption (Gerber Machado et al., 2023). In a rapidly evolving market, such uncertainty may also influence the timing of vehicle replacement. A potential buyer may decide against purchasing a new conventional vehicle because of expectations regarding the transition towards electric mobility, while simultaneously postponing the purchase of a BEV in anticipation of more favourable market conditions or further technological development. Instead of immediately replacing an existing ICEV with a new BEV, the consumer may therefore extend the use of the vehicle already owned and postpone the purchase of a new car. At the aggregate market level, such purchase postponement could contribute to an asymmetry in the transition between the two technologies. Demand for new non-electrified vehicles may begin to decline before BEV demand has grown sufficiently to compensate for the lost registrations. In other words, consumers may increasingly move away from purchasing new ICEVs without immediately shifting their demand towards new BEVs. This temporary mismatch between the decline of the incumbent technology and the adoption of the emerging technology provides one possible demand-side explanation for the automotive valley of death identified in the projections presented in Figure 2.

4.2 Manufacturer Perspective

From the manufacturers’ perspective, one mechanism that may contribute to the automotive valley of death can be interpreted through the lens of Christensen’s innovator’s dilemma.

Christensen (1997) argues that established and well-managed companies tend to allocate resources towards products and technologies that satisfy the needs of their existing and most profitable customers. While such behaviour is rational from the perspective of current business performance, it may make established firms less responsive to emerging technologies whose initial markets are smaller, less profitable, or uncertain. This mechanism becomes particularly relevant when an emerging technology initially performs less favourably according to some of the attributes valued by mainstream customers. Under such conditions, incumbent firms have strong incentives to continue improving and investing in established technologies rather than redirecting substantial resources towards an uncertain emerging market. This creates a strategic dilemma: decisions that appear economically rational in the short term may simultaneously reduce a firm's ability to respond effectively to a technological transition in the longer term (Christensen, 1997). BEVs can be regarded as a disruptive technological innovation that challenges the established technological capabilities, production structures, and business models of incumbent automotive manufacturers. However, their market development does not fully correspond to Christensen's classical low-end disruption trajectory, as early BEVs were generally more expensive than conventional vehicles and, in some cases, initially targeted premium market segments. Nevertheless, the transition towards electric mobility represents a fundamental technological shift that requires incumbent manufacturers to adapt capabilities and production structures that have been developed around internal combustion engine technology over several decades. The transition from ICEV to EV production is expected to contribute to the restructuring of the existing European automotive industry. Pavlínek (2023) demonstrates that this transition is closely connected to changes in automotive value chains and production networks and that its pace differs considerably across European regions, with the transition in Eastern Europe progressing more slowly than in Western Europe. For incumbent manufacturers, this creates a strategic challenge, as existing ICEV production capabilities and supply relationships retain economic value, while resources must simultaneously be redirected towards the transition to electric mobility. This creates a strategic conflict for incumbent manufacturers. Maintaining investment in ICEV technologies allows firms to generate revenues from established products and utilise existing production capabilities, whereas the transition towards BEVs requires resources to be redirected towards emerging technologies and new production structures. Manufacturers must therefore balance the short-term economic attractiveness of their established business against the need to develop capabilities required for a potentially transformative technological transition. This tension closely reflects the central logic of the innovator's dilemma described by Christensen (1997). Tesla provides an illustrative example of how a technology-focused new entrant can challenge established structures within the automotive industry. The company entered the market around a fundamentally electric vehicle architecture and initially targeted higher market segments rather than following the classical low-end disruption trajectory. Its development therefore demonstrates that technological disruption in the automotive industry does not necessarily have to originate at the low end of the market. More broadly, the emergence of BEV-focused manufacturers has increased competitive pressure on incumbent firms to accelerate their transition towards electric mobility. In the context of the automotive valley of death identified in this study, the innovator's dilemma provides one possible supply-side explanation for the temporary mismatch between declining ICEV registrations and increasing BEV registrations. If demand for conventional vehicles declines faster than incumbent manufacturers can develop, scale, and profitably market competitive BEVs, the expansion of the emerging technology may initially be insufficient to compensate for the contraction of the established technology. From the manufacturers' perspective, the automotive valley of death can therefore be interpreted as a transition period in which the economic foundations of the incumbent technology weaken before the emerging technology reaches sufficient scale and market maturity to fully replace it.

5. CONCLUSION

The transition from ICEVs to BEVs represents a fundamental transformation of the European automotive market. The results of this study indicate that declining ICEV registrations may not be immediately compensated by the growth of BEV registrations, potentially creating a temporary contraction in overall vehicle demand referred to as the automotive valley of death. Based on the applied Bass diffusion model, this contraction is projected to reach its lowest point around 2033. The analysis suggests that this phenomenon may be influenced by both demand- and supply-side mechanisms. From the consumer perspective, purchase postponement during a period of technological uncertainty may contribute to the transition gap, while manufacturers face the challenge of balancing their established ICEV business with the need to invest in and scale BEV production. The automotive valley of death therefore represents an important potential challenge for the European automotive industry during its transition towards electric mobility.

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BALANCE OF PAYMENTS AND EXCHANGE RATE DYNAMICS IN THE CZECH REPUBLIC: MONTHLY EVIDENCE FROM THE POST-PANDEMIC PERIOD

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ABSTRACT

This paper examines whether short-run movements in the Czech balance of payments help explain monthly changes in the EUR/CZK exchange rate in the post-pandemic period. The empirical setting is intentionally compact and transparent. Monthly data from January 2022 to April 2026 are used because the interval captures a period in which Czech external balances, inflation pressures and monetary conditions changed markedly, while the koruna remained an important signal for exporters and importers. The analysis combines descriptive evidence, normalised balance of payments indicators, Augmented Dickey-Fuller and KPSS stationarity tests, a baseline regression with HAC standard errors, and a small VAR model with Granger-causality tests. The results do not support a simple monthly flow-based explanation of EUR/CZK movements. Current account, goods and services and financial account changes are volatile, but their short lags do not significantly predict monthly exchange rate changes in the examined sample. The main interpretation is therefore not that external balances are irrelevant, but that monthly exchange rate dynamics are shaped by expectations, policy signals and global risk conditions as well as by realised external transactions.

Keywords: *Balance of payments; Czech koruna; Exchange rate; Granger causality; VAR model*

1. INTRODUCTION

The exchange rate is one of the most visible prices in a small open economy. In the Czech Republic, movements of the koruna matter for import prices, exporters margins, household purchasing power and the interpretation of external competitiveness. The balance of payments provides the accounting framework through which transactions with the rest of the world are recorded. It is therefore natural to ask whether changes in the current account, the goods and services balance or the financial account are visible in the exchange rate at a monthly frequency. The theoretical link between external balances and the exchange rate is straightforward in broad terms, but less straightforward in monthly data. Traditional models emphasize goods-market adjustment, monetary conditions, portfolio decisions and expectations [2]-[6]. A current account surplus may coincide with appreciation pressure, but this relationship can be weakened or reversed if it is offset by financial flows, interest rate expectations, central bank communication or changes in global risk appetite. The same accounting balance can therefore have different exchange rate implications in different macroeconomic regimes.

The post-pandemic period is useful for a compact empirical exercise because it combines several sources of variation. Czech external trade was affected by supply-chain disruption, energy prices and changes in European demand. At the same time, the koruna was influenced by a domestic monetary policy cycle and by broader market sentiment toward Central European currencies. In such an environment, a very strong mechanical relationship between monthly balance of payments flows and the exchange rate should not be expected. That is precisely why it is useful to test the relationship rather than merely assume it. The contribution of this paper is modest by design. It does not attempt to estimate a long-run equilibrium exchange rate or to build a structural model of the Czech economy. Instead, it asks a narrower conference-paper question that can be answered transparently with public data: do monthly balance of payments changes help explain monthly EUR/CZK changes after the pandemic? This type of evidence is useful as a first step before moving to richer quarterly models, panel comparisons or structural specifications. The paper proceeds as follows. Section 2 outlines the background and expected relationships. Section 3 describes the data and econometric strategy. Section 4 reports descriptive patterns and formal tests. Section 5 discusses the interpretation of the findings, and Section 6 concludes with implications for further work.

2. RESEARCH BACKGROUND AND EXPECTED RELATIONSHIPS

The balance of payments is not a behavioural model, but it is an important map of external pressures. The current account records trade in goods and services together with income and transfers. The financial account records cross-border investment and other financial transactions. In a floating or managed-float exchange rate environment, the exchange rate helps equilibrate desired international transactions, but the adjustment may take place through prices, quantities, portfolio shifts or expectations. A simple goods-market intuition would suggest that stronger external balances should support the domestic currency. For the Czech Republic, an improvement in the goods and services balance can be interpreted as a sign of stronger net external demand, while a depreciation of the koruna can improve price competitiveness for some exporters. This channel is relevant, but it is also incomplete. Exporters often hedge, import content is high in many export sectors, and exchange rate pass-through differs across products and horizons.

A financial-market view gives more weight to asset prices and forward-looking expectations. Under this view, monthly exchange rate changes may react before external transactions are recorded in the balance of payments. Interest rate differentials, inflation surprises and global risk conditions can move the koruna even when realised external balances change only gradually. The expected empirical relationship is therefore ambiguous at the monthly frequency. This ambiguity is also consistent with the broader empirical exchange rate literature, where exchange-rate movements are notoriously difficult to explain with compact short-horizon models [15], [16]. The paper tests whether the accounting flows contain incremental short-run information rather than assuming a stable sign a priori.

Three empirical expectations guide the analysis. First, the balance of payments components should be much more volatile than the exchange rate level because they are monthly flow variables. Second, normalising external balances by trade turnover should make the indicators more comparable across months. Third, if external flows have short-run exchange rate relevance, lagged changes in normalised balances should help predict the monthly log change in EUR/CZK. Positive EUR/CZK changes are interpreted as depreciation of the koruna.

3. DATA AND METHODOLOGY

3.1. Data and construction of variables

The empirical analysis uses monthly observations for the Czech Republic from January 2022 to April 2026, giving 52 monthly observations before transformations. Balance of payments data are taken from the Czech National Bank monthly balance of payments key items [13]. The exchange rate is the CNB monthly average EUR/CZK fixing [14]. The choice of monthly data is driven by the conference purpose of the study: the frequency is high enough to capture short-run dynamics, but the dataset remains easy to verify and replicate. The dependent variable is the monthly percentage log change in the exchange rate. Because EUR/CZK is expressed as koruna per euro, an increase in the variable means depreciation of the koruna. The current account, goods and services balance and financial account are measured in CZK millions and then scaled by monthly goods trade turnover. The turnover denominator is defined as goods exports plus goods imports. This normalisation reduces the influence of changes in the nominal size of trade over time and gives the balances a more interpretable percentage scale.

Variable	Definition	Use in the analysis
EUR/CZK	Monthly average koruna per euro exchange rate.	Level for plots; Delta $e_t = 100 \times \Delta \ln(\text{EURCZK}_t)$ for models.
Current account	Monthly current account balance, CZK million.	Scaled by goods trade turnover; used in first differences.
Goods and services	Monthly goods and services balance, CZK million.	Scaled by goods trade turnover; proxy for external trade balance.
Financial account	Monthly financial account balance, CZK million.	Scaled by goods trade turnover; captures financial-flow side.
Goods trade turnover	Goods exports plus goods imports, CZK million.	Denominator for normalised balance indicators.
Export/import coverage	Goods exports divided by goods imports, multiplied by 100.	Descriptive indicator of external trade competitiveness.

*Table 1: Construction of empirical variables
(Source: authors' construction based on CNB data)*

3.2. Econometric strategy

The empirical strategy has four steps. First, the paper reports descriptive statistics, time plots and simple correlations. Pearson correlations measure linear association, while Spearman correlations are reported as a robustness check against a small number of influential monthly observations. Second, stationarity is assessed using the Augmented Dickey-Fuller test [9] and the KPSS test [10]. Using both tests is helpful because they reverse the null hypothesis: the ADF test starts from a unit-root null, while the KPSS test starts from stationarity. Third, a baseline regression is estimated in which the dependent variable is the monthly log change in EUR/CZK and the explanatory variables are one-month lagged changes in the normalised current account, goods and services balance and financial account. The regression also includes the lagged dependent variable. Newey-West HAC standard errors are used because residual autocorrelation and heteroskedasticity are plausible in monthly macroeconomic data [11]. The baseline specification is:

$$\Delta e_t = \alpha + \rho \Delta e_{t-1} + \beta_1 \Delta CA^*_{t-1} + \beta_2 \Delta GS^*_{t-1} + \beta_3 \Delta FA^*_{t-1} + \varepsilon_t,$$

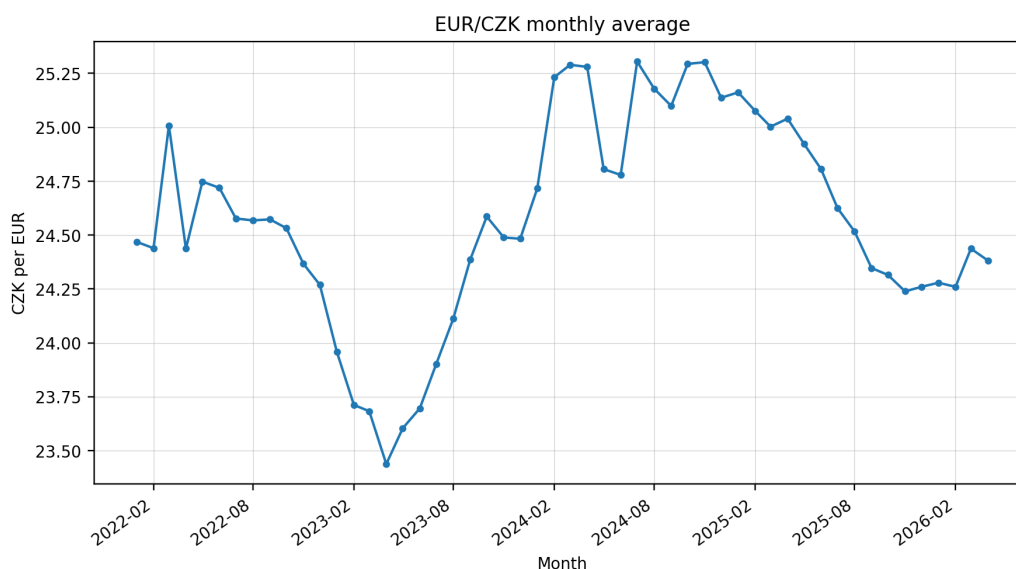
where CA^* , GS^* and FA^* denote the current account, goods and services and financial account ratios to monthly trade turnover. Fourth, a vector autoregression is estimated for the stationary variables.

The VAR approach follows the tradition of treating macroeconomic variables as jointly dynamic [7], and Granger-causality tests are used to evaluate whether lagged external-balance variables improve the prediction of exchange-rate changes [8]. The VAR is intentionally small because the sample contains only 52 monthly observations. Lag selection criteria are consulted, but economic interpretability is also considered. A two-lag specification is retained because it allows short monthly adjustment while still keeping the number of parameters manageable. The resulting evidence should be read as preliminary short-run evidence rather than as a definitive structural statement.

4. RESULTS

4.1. Descriptive evidence

The exchange rate moved within a relatively narrow but economically relevant corridor during the sample. The average EUR/CZK rate was 24.57, with a minimum of 23.44 in April 2023 and a maximum of 25.31 in July 2024. Monthly log changes were centred close to zero, but the standard deviation was almost 0.88 percentage points, which is large enough to matter for firms with unhedged foreign currency exposure.



*Figure 1: EUR/CZK monthly average, January 2022-April 2026
(Source: authors' calculation based on CNB data)*

The external-balance variables were much more volatile than the exchange rate. The average current account was slightly negative relative to trade turnover (-0.16 percent), while the goods and services balance averaged 4.32 percent of trade turnover. Export/import coverage averaged 106.64 percent, which means that goods exports exceeded goods imports on average over the sample. The financial account ratio was positive on average, but it also showed the widest month-to-month swings among the normalised indicators.

Figure following on the next page

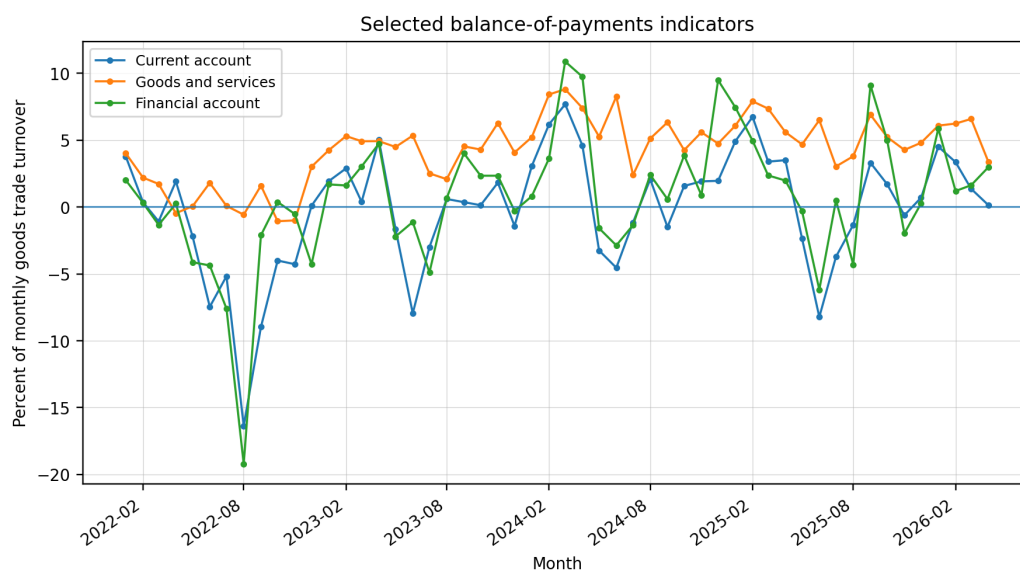


Figure 2: Selected balance-of-payments indicators normalised by monthly goods trade turnover
(Source: authors' calculation based on CNB data)

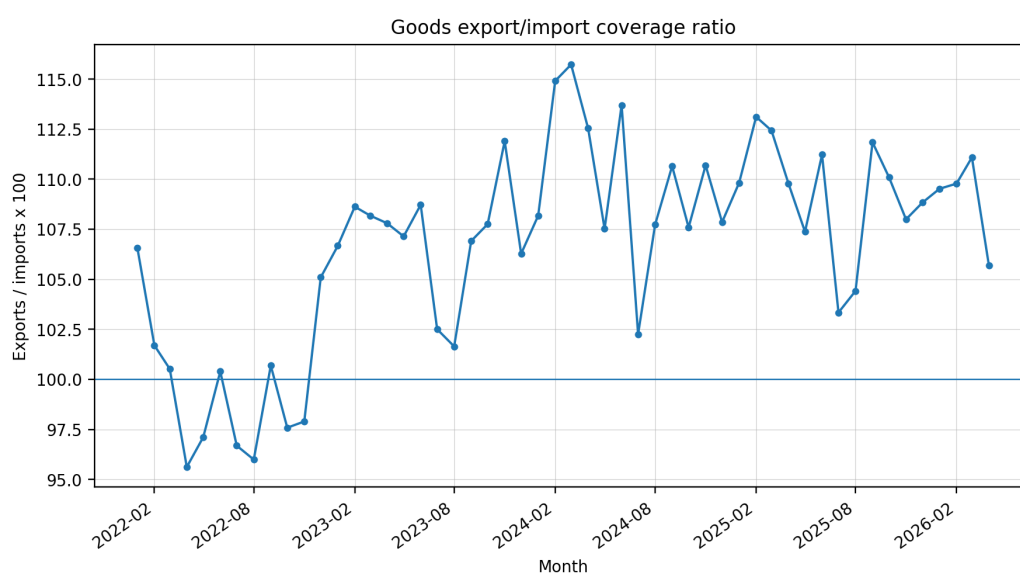


Figure 3: Export/import coverage in goods trade
(Source: authors' calculation based on CNB data)

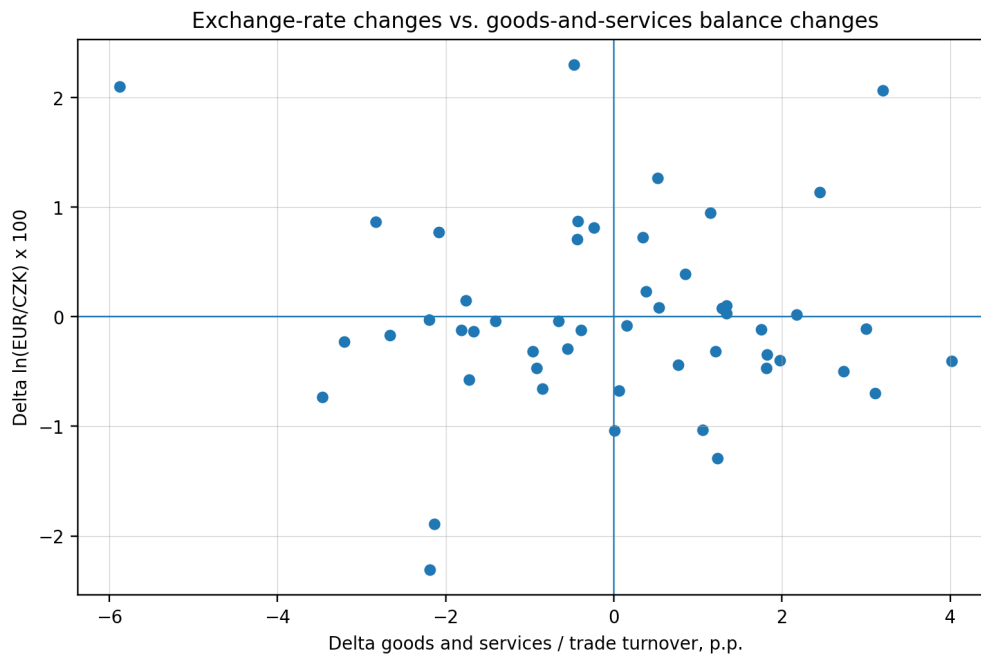
Variable	Mean	Std. dev.	Min	Max
EUR/CZK monthly average	24.57	0.48	23.44	25.30
Monthly Delta ln EUR/CZK (%)	-0.01	0.88	-2.31	2.30
Current account / trade turnover (%)	-0.16	4.46	-16.37	7.68
Goods and services / trade turnover (%)	4.32	2.47	-1.06	8.81
Financial account / trade turnover (%)	0.74	4.89	-19.23	10.88
Export/import coverage (%)	106.64	5.08	95.62	115.72

*Table 2: Descriptive statistics of selected variables
(Source: authors' calculation based on CNB data)*

The descriptive evidence already suggests that the exchange rate link is not mechanical. The contemporaneous Pearson correlations between monthly EUR/CZK changes and the normalised current account, goods and services and financial account indicators are 0.033, 0.032 and -0.029, respectively. These values are close to zero. The Spearman correlations are similarly weak, which reduces the concern that the result is driven by a few extreme months. Figure 4 illustrates the same point for the goods and services ratio: monthly depreciation or appreciation episodes are not lined up along a clear trade-balance gradient.

Indicator	Pearson	Spearman
Current account / trade turnover (%)	0.033	0.027
Goods and services / trade turnover (%)	0.032	0.006
Financial account / trade turnover (%)	-0.029	0.001
Export/import coverage (%)	0.033	0.038

*Table 3: Correlations with monthly EUR/CZK changes
(Source: authors' calculation based on CNB data)*



*Figure 4: Monthly EUR/CZK changes and the goods and services balance
(Source: authors' calculation based on CNB data)*

4.2. Stationarity and baseline regression

The stationarity results support using transformed variables in the dynamic models. The EUR/CZK level does not reject the ADF unit-root null at conventional levels, whereas the monthly log change is clearly stationary. The changes in the normalised balance of payments ratios are also stationary according to the ADF results, and the KPSS tests do not reject stationarity for those differenced series. This supports the use of monthly changes in the OLS and VAR specifications.

Variable	ADF stat.	ADF p-value	KPSS stat.	KPSS p-value
EUR/CZK level	-1.514	0.527	0.227	0.100
Monthly Delta ln EUR/CZK (%)	-7.214	0.000	0.118	0.100
Delta current-account ratio	-5.733	0.000	0.071	0.100
Delta goods-and-services ratio	-7.343	0.000	0.217	0.100
Delta financial-account ratio	-4.405	0.000	0.149	0.100

Table 4: Stationarity tests for selected variables

Notes: ADF null hypothesis is a unit root; KPSS null hypothesis is stationarity. Source: authors' calculation.

The baseline regression is deliberately conservative. It asks whether last month's changes in external-balance indicators help explain this month's exchange rate change. The answer is negative in statistical terms. The adjusted R-squared is -0.087, and none of the lagged balance of payments variables is close to conventional significance levels. The signs are also small in economic terms. The coefficient on the lagged current account ratio is positive but almost zero, the goods and services coefficient is slightly negative, and the financial account coefficient is again very small.

Regressor	Coefficient	HAC std. err.	t-stat.	p-value
Constant	-0.0046	0.1308	-0.035	0.972
Lagged monthly Delta ln EUR/CZK (%)	-0.0417	0.2281	-0.183	0.855
Lagged Delta current-account ratio	0.0006	0.0372	0.016	0.987
Lagged Delta goods-and-services ratio	-0.0019	0.0751	-0.026	0.979
Lagged Delta financial-account ratio	0.0028	0.0211	0.135	0.893

Table 5: Baseline regression with HAC standard errors

Notes: dependent variable is 100 x monthly Delta ln(EUR/CZK). Positive coefficients indicate association with koruna depreciation. Source: authors' calculation.

4.3. VAR and Granger-causality evidence

The VAR model is estimated with two lags. The Akaike and final prediction error criteria favour two lags, while the Bayesian criterion is more parsimonious and favours zero lags. Given the purpose of the paper, two lags are retained in order to allow short monthly dynamics. The estimated VAR is stable, with all roots inside the unit circle, so the impulse-response functions can be interpreted as local dynamic responses within the reduced-form model. The Granger-causality tests lead to the same broad message as the baseline regression. Lagged changes in the current account ratio, goods and services ratio and financial account ratio do not Granger-cause monthly EUR/CZK changes at the five percent level.

The reverse direction is also not significant at five percent, although the test from exchange rate changes to financial account changes is closer to the threshold. This near result is consistent with the idea that exchange rate movements and financial transactions may both respond to broader market conditions.

Tested direction	F-statistic	p-value	Reject at 5%
Current account ratio → EUR/CZK change	0.375	0.688	No
EUR/CZK change → Current account ratio	1.209	0.301	No
Goods and services ratio → EUR/CZK change	0.006	0.994	No
EUR/CZK change → Goods and services ratio	0.053	0.949	No
Financial account ratio → EUR/CZK change	0.997	0.371	No
EUR/CZK change → Financial account ratio	2.510	0.084	No

Table 6: Granger-causality tests from the VAR model

Notes: tests use two VAR lags. Source: authors' calculation

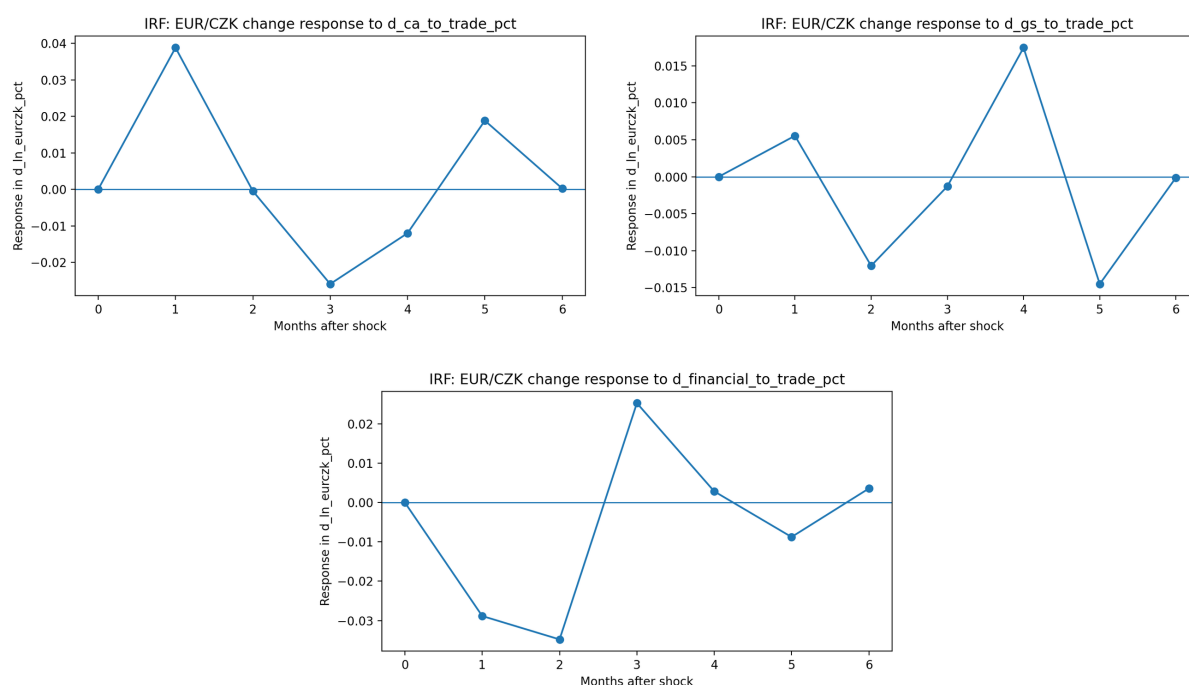


Figure 5: VAR impulse responses of EUR/CZK changes to balance-of-payments shocks (Source: authors' calculation based on CNB data)

5. DISCUSSION

The main result is not that the balance of payments is irrelevant. Rather, it is that monthly accounting flows alone are not enough to explain short-run koruna movements in the examined period. This distinction matters. The balance of payments describes the realised external transactions of the economy, while the exchange rate is a forward-looking financial price. It can react to expected future flows, interest rate expectations, global risk sentiment or policy communication before those expectations become visible in monthly external account data. The Czech post-pandemic experience illustrates this point well. The sample contains large swings in the current account and the financial account, but the exchange rate path is comparatively smoother. The koruna appreciated strongly in 2023, weakened in 2024 and then stabilised again in 2025-2026. This pattern is difficult to explain by a single external account component.

A richer model would need to include interest rate differentials, inflation expectations, energy-price effects, European demand and possibly measures of financial market stress. From a competitiveness perspective, the weak monthly relationship also has a practical interpretation. Firms should not read a one-month improvement in the goods and services balance as a reliable signal of an immediate exchange rate movement. The exchange rate can affect export competitiveness, but competitiveness is broader than the nominal exchange rate. It also depends on productivity, import intensity, margins, hedging behaviour and the destination structure of exports. For policy analysis, the balance of payments is therefore most useful when interpreted together with monetary and real-sector indicators. There are three limitations. First, the sample is short and includes extraordinary shocks. Second, monthly balance of payments data are subject to revisions, especially for the most recent observations. Third, the model is compact in order to keep the conference evidence transparent. These limitations are not a weakness of the exercise as such; they define its scope. The findings should be treated as a disciplined starting point for a broader research article rather than as the final word on the Czech balance of payments/exchange rate nexus. The results also have a methodological message. For a short sample, adding many explanatory variables would make the model look more sophisticated, but not necessarily more reliable. The conservative specification used here keeps the empirical claim narrow: monthly balance-of-payments components are informative about the external position, yet they do not provide a statistically strong short-run signal for the nominal exchange rate in this dataset.

6. CONCLUSION

This paper analysed the relationship between Czech balance of payments components and EUR/CZK exchange rate dynamics using monthly CNB data from January 2022 to April 2026. The focus was on short-run evidence suitable for conference presentation: descriptive statistics, stationarity tests, a baseline regression with HAC standard errors, a compact VAR model and Granger-causality tests. The empirical evidence is consistent across methods. The current account, goods and services balance and financial account were volatile, but their monthly changes did not significantly predict monthly EUR/CZK changes in the post-pandemic sample. The most practical interpretation is that the balance of payments remains important for understanding external sustainability and competitiveness, but its monthly components are not sufficient by themselves to explain short-run exchange rate movements. Future research should test quarterly and annual frequencies, structural breaks, and the role of interest rate differentials, inflation surprises and external risk. A natural next step is to combine the balance of payments indicators used here with monetary policy and external demand variables, and to compare the Czech Republic with other small open economies in Central Europe. Such extensions would link the preliminary evidence reported here more directly to the broader question of external competitiveness.

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STRATEGIC COMMUNICATION AND HOSPITAL MODERNIZATION IN MOROCCO: NAVIGATING ORGANIZATIONAL DECOUPLING AND REBUILDING - A CASE STUDY OF THE RABAT UNIVERSITY HOSPITAL CENTER

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ABSTRACT

The modernization of the Rabat University Hospital (CHU), driven by New Public Management (NPM) reforms, has long prioritized an instrumental approach (digitalization, budgetary efficiency) at the expense of the relational dimension of care. This imbalance has produced an “organizational decoupling” between a modern managerial façade and a patient experience marked by informational opacity and persistent status distance. This article examines the levers for transforming a public management perceived as disembodied into a truly user-centred model. The research adopts a mixed-methods triangulation design, combining a quantitative survey of 450 users, analysed through inferential statistics (Chi-square tests, Cramer’s V), with a qualitative analysis of 25 semi-structured interviews and user life stories. The findings highlight a critical communication deficit (86% dissatisfaction). Statistical tests show that the demand for transparency, digitalization and participation is strongly correlated with gender ($V = .454$), education level ($V = .231$) and age group ($V = .291$). Unanimous support (100%) for strengthening complaint mechanisms confirms the emergence of a “partner-citizen” demanding genuine accountability from the institution. Overall, the results indicate that the success of hospital modernization in Morocco can no longer be purely technical (Hard NPM) but must become fundamentally relational (Soft NPM). Strategic communication and soft-skills training appear as essential pillars for humanizing public management and restoring the legitimacy of the public hospital.

Keywords: *Strategic Communication, New Public Management, Rabat University Hospital, Organizational Decoupling, User Experience, Accountability*

1. INTRODUCTION

In Morocco, the modernization of public hospitals has largely followed the logic of New Public Management (NPM), focusing on efficiency, indicators, and the digitalization of procedures. At the Ibn Sina University Hospital in Rabat, this dynamic has led to visible progress at the technical and organizational levels, but the patient experience remains marked by a lack of information, opaque processes, and a persistent distance in the patient-care relationship. This gap between a proclaimed modernization and a less transparent daily reality illustrates an organizational disconnect: the hospital appears modern in its structures but traditional in its

relational practices. In this context, the central question of this article is the extent to which the shift from a primarily instrumental management style (Hard NPM) to a relational governance style centered on strategic communication (Soft NPM) can bridge the gap between technical modernization and patient experience at Ibn Sina University Hospital. Based on a quantitative survey of 450 users, supplemented by 25 semi-structured interviews, this study analyzes the role of informational transparency, interpersonal skills, and mechanisms for complaint and participation in the emergence of a patient as a "citizen partner" and in restoring the legitimacy of the public hospital. Drawing on theoretical frameworks from New Public Management (NPM), neo-institutionalism, and organizational communication, it proposes considering communication not as a peripheral function, but as the true heart of hospital modernization.

2. THEORETICAL FRAMEWORK: STRATEGIC COMMUNICATION AT THE HEART OF HOSPITAL MODERNIZATION

2.1. From Managerial Modernization to Public Value: Communication as a Strategic Lever

Reforms inspired by New Public Management (NPM) introduced a culture of results, control, and efficiency within public organizations (Hood, 1991). In the hospital sector, this translated into contractualization, standardization of procedures, and, above all, the digitalization of processes (electronic records, appointment systems, and action traceability). However, these technical tools alone are not sufficient to generate public value. Moore (1995) reminds us that public managers create value by combining operational performance, legitimacy, and environmental support, and the satisfaction of citizens' expectations. However, these last two areas rely primarily on communication, understood as the ability to explain choices, provide accountability, and engage in dialogue with users (Bryson, Crosby & Bloomberg, 2014). Recent work on public value governance emphasizes the central role of communication in co-creating value with citizens, going far beyond mere "image communication" (Fohim et al., 2025; Ojasalo & Kauppinen, 2024). From this perspective, strategic communication in a public context is not limited to promoting the institution. It aligns three key elements: actual hospital practices, the hospital's public claims, and users' perceptions and expectations (Bartoli, 1997; Gregory, 2015). Recent research confirms that strategic communication structures public management systems, including in health and crisis contexts (Gani & Harun, 2024; Ajayi & Aloba, 2025). Within this framework, at Ibn Sina University Hospital, digitalization creates genuine public value only when paired with a communication strategy that clarifies, makes accessible, and ensures predictability of users' services (such as reminder SMS messages, transparent information on waiting times, adapted patient interfaces, and mediation tools).

2.2. Organizational Decoupling: Modernization Without Communication

The decoupling between formal structures and actual practices, described by Meyer and Rowan (1977) and widely discussed in contemporary neo-institutionalist literature (Nitschke, 2024; Sandhu, 2026), is manifested at Ibn Sina University Hospital by a marked gap between, on the one hand, a modernizing managerial discourse (NPM, performance, digitalization) and, on the other hand, a patient experience characterized by informational opacity and the absence of clearly identified interlocutors. The hospital adopts the codes of modernity (IT systems, quality procedures) within a logic of institutional isomorphism (DiMaggio & Powell, 1983), extended by the recent analyses of Yorgancıoğlu (2025), in order to appear legitimate in the eyes of supervisory bodies and funders, without any fundamental transformation of the relationship with the user. Brunsson (1989) describes this configuration as an "organization of hypocrisy," where words (managerial facade) are decoupled from actions (actual practices at the counter). More recent work shows that this gap tends to widen in contexts of high legitimacy pressure (Longo, Panebianco & Cannata, 2023; Kieft, 2026).

This decoupling is primarily a communicational one: information circulates internally (files, dashboards) but very little externally, so that patients and their families do not know clearly where to go, how long to wait, who to contact, or how to file a complaint. Modernization thus remains largely intra-administrative and “silent” for the patient. Digitalization becomes a “cold technology”: it structures the organization but does not humanize the relationship, due to a lack of communicational mediation. In other words, the absence of truly user-oriented strategic communication maintains and reinforces organizational disconnect.

2.3. Legitimacy and “Informational Care”: Communication as a Component of Care

The legitimacy of a hospital no longer rests solely on its technical competence, but also on how it informs, listens to, and supports its users. Suchman (1995), recently revisited by Chen (2025), distinguishes pragmatic legitimacy, when the service effectively meets needs; moral legitimacy, based on adherence to values of justice, respect, and equity; and cognitive legitimacy, when the institution is intelligible and understandable to its users. At the Rabat University Hospital, the crisis is primarily cognitive: patients understand neither the “how” nor the “why” of hospital operations (delays, rules, pathways). This lack of understanding fuels distrust and the perception of “organizational inefficiency.” Habermas’s theory of communicative action (1987) offers a relevant framework here: legitimacy is built through interactions oriented towards mutual understanding, in which everyone can ask for and give justifications. Recent work highlights the value of this framework for understanding the challenges of recognition and communication in contemporary institutions (Kacimi, Brik & Naili, 2023; Ahmad, 2025). Applied to the hospital setting, this perspective leads us to consider clinical and administrative communication as an essential dimension of quality of care (Epstein & Street, 2011; Freytag & Street, 2021; Engle et al., 2021). Research on patient-centered care and person-centered approaches converges on the idea that information about the illness, procedures, and expectations constitutes genuine “informational care” (Bujnowska Fedak & Węgierek, 2020; Gyllensten et al., 2025). This informational care helps reduce anxiety, increase feelings of control, and strengthen trust in the healthcare team. Furthermore, the literature on satisfaction and perceived quality confirms that communicational dimensions—clarity of explanations, respect, active listening, and information about timelines—are among the main determinants of patient satisfaction (Ferreira et al., 2023). In this context, for the Ibn Sina University Hospital, the technical modernization inspired by Hard NPM can only be considered complete if it is accompanied by a genuine communicational modernization: proactive information, user-oriented digital tools (online appointment booking, notifications, readable interfaces), but also training of professionals in relational and communication skills.

2.4. Patient Voice, Participation, and Accountability: Communication as Governance

The literature on health democracy and patient engagement shows that patients are increasingly becoming “citizen partners” and co-producers of quality care (Carman et al., 2013; Chartrand et al., 2023). From this perspective, patients are no longer simply beneficiaries of medical decisions but active participants in their development, implementation, and evaluation. Lipsky (1980), with the concept of “street-level bureaucracy,” reminds us that reception staff, nurses, and secretaries concretely embody the state for the citizen. Their manner of welcoming, informing, or conversely ignoring a patient constitutes a communication practice that directly impacts the legitimacy of the institution (Cheema et al., 2026). From this perspective, complaints, grievances, and participatory evaluation are not simply outlets for venting, but rather communication mechanisms for governance. They allow for the reporting of dysfunctions, make users' expectations visible, and compel the institution to respond, justify its actions, and, in doing so, be accountable (Bovens, 2010; Bitonti & Villeneuve, 2024).

Recent work on patient and family engagement shows that organizations that structure formalized communication channels with users (patient committees, panels, feedback systems, digital platforms) improve not only satisfaction, but also the safety of care and the overall performance of institutions (Carman et al., 2013; Chartrand et al., 2023). The theory of Constitutive Communication of Organizations (CCO), developed notably by Taylor and Cooren (1996) and extended by the recent perspectives of Schoeneborn, Vásquez, and Kuhn (2025), reinforces the idea that these mechanisms are not peripheral: by organizing exchanges between the hospital and its users, they contribute to shaping what the hospital is, concretely, as a public organization. Communication is therefore not merely a management tool; it is the very substance of hospital governance. For the Ibn Sina University Hospital, the challenge is thus to move from essentially unidirectional and reactive communication, focused on responding to complaints on an ad hoc basis, to structured, bidirectional, and proactive communication that systematically invites users to express themselves, analyzes their feedback, and integrates their input into the decision-making processes. This research stems from a paradox: Ibn Sina University Hospital has implemented a Hard NPM-type modernization (digitalization, indicators, contracts) which the patient experience remains marked by a significant communication disconnect (information gap, opacity, difficulty in making oneself heard). The central question is therefore: to what extent does the shift from a primarily instrumental management style to relational governance, centered on strategic communication (transparency, information, listening, participation), bridge this gap between technical modernization and patient experience? Two hypotheses emerge: the first posits that digital modernization only creates public value if it is supported by clear, accessible, and empathetic communication; and the second argues that the institutionalization of appeals and participatory evaluation, by making the patient's voice a lever for regulation, transforms the patient into a "citizen partner" and strengthens the hospital's accountability. In other words, making user feedback a structuring element of organizational communication helps reduce the disconnection between modernizing rhetoric and daily practices, by reconfiguring hospital governance around more horizontal, transparent, and co-constructive communication.

3. METHODOLOGY AND SAMPLE PROFILE

3.1. Methodological Approach

This research is based on a quantitative survey administered to 450 users of the Rabat University Hospital. Data processing (descriptive and inferential statistics) was performed using SPSS to identify significant correlations between user profiles and their perception of hospital management.

3.2. Study Site: The Ibn Sina University Hospital of Rabat

The Ibn Sina University Hospital (CHU) of Rabat is the largest hospital complex in the Kingdom and the cradle of Moroccan medical excellence. A public institution with administrative status, possessing legal personality and financial autonomy under the supervision of the Ministry of Health and Social Protection, it brings together ten specialized hospital structures (such as Ibn Sina Hospital, the Children's Hospital, and the National Institute of Oncology). With a human capital of 7,696 professionals and a capacity of 2,206 beds, the CHUIS carries out a fourfold strategic mission: the provision of tertiary care, clinical training, scientific research, and innovation in public health.

3.2. Characteristics of the study population (N = 450)

The sample profile reveals a predominantly urban, active population with high cultural capital, which directly influences expectations of public services.

<i>Variables</i>	<i>Categories</i>	<i>Frequency (n)</i>	<i>Percentage (%)</i>
<i>Gender</i>	<i>Female</i>	252	56%
	<i>Male</i>	198	44%
<i>Age</i>	<i>26 – 35 ans</i>	144	32%
	<i>36 – 45 ans</i>	153	34%
	<i>46 – 55 ans</i>	99	22%
	<i>Over 55 years</i>	54	12%
<i>Place of residence</i>	<i>Rabat-Salé-Témara area</i>	369	82%
	<i>Outside area (Casablanca, Fez, etc.)</i>	81	18%
<i>Professional status</i>	<i>Employees / Civil servants</i>	342	76%
	<i>Others (Students, Homemakers, Retirees)</i>	108	24%
<i>Education level</i>	<i>Higher education (Bachelor +3 years and above)</i>	374	83%
	<i>Secondary</i>	76	17%

Table 1. Sociodemographic profile of the sample

3.3. Profile Analysis: The Emergence of the "Expert User"

This sociodemographic profile is atypical for a traditional public hospital and explains the shift towards New Public Management:

- High cultural capital: With 83% holding a higher education degree, users of the Rabat University Hospital possess the necessary knowledge to evaluate administrative performance. This explains the strong correlation between education and the desire to participate ($V=0.231$).
- A busy, active population: The predominance of salaried employees (76%) justifies the demand for digitalization to reduce waiting times ($V=0.262$). Time is no longer perceived as an inexhaustible resource, but as an opportunity cost.
- Female dominance: Women (56%) act as "guardians" of the system. Their heightened sensitivity to information gaps ($V=0.454$) places communication at the heart of hospital legitimacy.

4. RESULTS AND DISCUSSION

This section combines the inferential statistics results with the semantic analysis of the interviews conducted on-site.

4.1. The Influence of Socio-Professional Profile on the Demand for Modernization

In this initial analysis, we seek to determine whether integration into the labor market influences the expectation of digitalization of services. The underlying hypothesis is that the time constraints of the workforce transform digital technology from a simple technical tool into a necessity for social efficiency. The following chi-square test compares professional status with the priority given to implementing an online appointment system (Tables 2 and 3).

	<i>Value</i>	<i>df</i>	<i>Asymp. Sig. (2-sided)</i>
<i>Pearson Chi-Square</i>	30,780	1	,000
<i>Likelihood Ratio</i>	29,635	1	,000
<i>Linear-by-Linear Association</i>	30,712	1	,000
<i>Number of Valid Cases</i>	450		

*Table 2. Chi-Square Tests (Professional Status * Need for Digitization)*

		<i>Value</i>	<i>Approximate significance</i>
<i>Nominal by nominal</i>	<i>Phi</i>	,262	,000
	<i>Cramer's V</i>	,262	,000
	<i>Contingency coefficient</i>	,253	,000
<i>Number of valid observations</i>		450	

Table 3. Symmetric Measurement

Discussion: The results confirm a significant dependence. For employees, New Public Management should act as a reducer of "opportunity cost." Cramer's V ($p < 0.262$) validates the idea that digital technology is the primary lever for reconciling work life and healthcare pathways. For users, digital technology is perceived as a lever for social productivity. However, the interviews reveal a "cold technology." A patient (45 years old, employee) explains: "We see computers everywhere, staff typing on keyboards, the files seem better organized. But this technology stops at the back of the screen. The staff member doesn't look at you any better than before. It's a superficial modernization: the tool has changed, but not the respect for the patient." This verbatim quote perfectly illustrates the concept of decoupling: the institution adopts the symbols of modernity without transforming its service culture.

4.2. Gender as a predictive variable of communication needs

Communication is identified as the weak link in the hospital relationship. However, this perception is not uniform. By cross-referencing gender with information satisfaction levels, we aim to demonstrate that women, who are central to family health management, have a higher demand for transparency. The following results highlight this significant discrepancy. (Tables 4 and 5)

- *Gender Correlation * Information Satisfaction*

	<i>Value</i>	<i>df</i>	<i>Asymp. Sig. (2-sided)</i>
<i>Pearson Chi-Square</i>	92,863	2	,000
<i>Likelihood Ratio</i>	94,042	2	,000
<i>Linear-by-Linear Association</i>	92,650	1	,000
<i>Number of Valid Cases</i>	450		

Table 4. Chi-Square Tests

		<i>Value</i>	<i>Approximate significance</i>
<i>Nominal by nominal</i>	<i>Phi</i>	,454	,000
	<i>Cramer's V</i>	,454	,000
	<i>Contingency coefficient</i>	,413	,000
<i>Number of valid observations</i>		450	

Table 5. Symmetric Measures

Discussion: Cramer's V of .454 indicates the strongest association in the study. Hospital management must recognize that perceived quality is a gendered construct: institutional opacity is experienced more acutely by women, requiring a redesign of relational communication towards a more empathetic model. Lexical analysis of open-ended responses shows that the terms "vagueness," "disdain," and "loneliness" appear more frequently among female caregivers. One patient testifies: "We are treated as if we don't need to understand. We are given paperwork without being told where to go. For me, modernization isn't about machines; it's about someone talking to me and explaining what my son has." Here, strategic communication is not an option, but an essential "informational care" for creating Public Value. The qualitative analysis highlights the feeling of "organizational mediocrity." Young users compare the hospital to private sector services or banks. "Why can they send us a text message about a bill, but not to tell us that a doctor is two hours late?" a student wondered. This finding underscores the urgent need to shift from "Hard NPM" (hardware) to "Soft NPM" (customer service) to satisfy a "generation of instant gratification" that no longer tolerates the silence of the Street-Level Bureaucracy (Lipsky, 1980).

4.3. The Generational Clash in the Face of Temporal Uncertainty

The perception of time is an indicator of the hospital's logistical performance. We tested the influence of age on tolerance for a lack of explanation regarding waiting times. The objective is to analyze whether younger generations, accustomed to digital immediacy, more severely penalize traditional "bureaucratic silence." (Tables 6 and 7)

- *Coordination: Age Group * Explanations about Delays*)

	<i>Value</i>	<i>df</i>	<i>Asymp. Sig. (2-sided)</i>
<i>Pearson Chi-Square</i>	38,113	1	,000
<i>Likelihood Ratio</i>	38,717	1	,000
<i>Linear-by-Linear Association</i>	38,020	1	,000
<i>Number of Valid Cases</i>	450		

Table 6. Chi-Square Tests

		<i>Value</i>	<i>Approximate significance</i>
<i>Nominal by nominal</i>	<i>Phi</i>	,291	,000
	<i>Cramer's V</i>	,291	,000
	<i>Contingency coefficient</i>	,279	,000
<i>Number of valid observations</i>		450	

Table 7. Symmetric Measures

Discussion: The moderate correlation ($V=0.291$) confirms a generational divide. Public management can no longer simply manage silence; it must provide real-time information to satisfy an increasingly connected patient population. The qualitative analysis highlights a feeling of "organizational mediocrity." Young users compare the hospital to private sector services or banks. "Why can they send us a text message about a bill, but not to tell us that a doctor is two hours late?" asks one student. This result validates the urgent need to move from "Hard NPM" (hardware) to "Soft NPM" (customer service) to satisfy a "generation of instant gratification" that no longer tolerates the silence of the Street-Level Bureaucracy (Lipsky, 1980).

4.4. Towards a Health Democracy: Complaints and Participation.

The final stage of our analysis focuses on user regulation of the system. We cross-reference perceived quality with the for recourse (complaints), and cultural capital (education) with the desire for participation. These tests aim to validate the emergence of a "citizen-evaluator" user. (Tables 8-9 and 10-11)

- *Correlation Perceived Quality * Need for Complaint Mechanisms*

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	19,048	3	,000
Likelihood Ratio	22,380	3	,000
Number of Valid Cases	450		

Table 8. Chi-Square Tests

		Value	Approximate significance
Nominal by nominal	Cramer's V	,206	,000
	Contingency coefficient	,201	,000
Number of valid observations		450	
(Note: The Phi coefficient is not shown here because the table is greater than 2x2, Cramer's V is the reference measure).			

Table 9. Symmetric Measures

- *Correlation with Education Level * Participatory Assessment*

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	24,000	1	,000
Likelihood Ratio	23,380	1	,000
Number of Valid Cases	450		

Table 10. Chi-Square Tests

		Value	Approximate significance
Nominal by nominal	Phi	,231	,000
	Cramer's V	,231	,000
	Contingency coefficient	,225	,000
Number of valid observations		450	

Table 11. Symmetric Measures

Final discussion: The unanimity on the right to appeal and the correlation between education and participation ($V=,231$) prove that the legitimacy of the university hospital no longer rests solely on medical practice, but also on its capacity for accountability. The informed patient becomes a partner in hospital governance. The qualitative dimension reveals a historical break with the culture of "*Hshouma*" (modesty/silence). Previously, complaining about the public hospital was perceived as ingratitude towards the state. Today, semantic analysis shows the emergence of the terms "**Citizen,**" "**Right,**" and "**Respect.**" An informed patient summarizes: "**I'm not asking for the impossible; I'm asking that my complaint serve to prevent others from suffering the same fate.**" This desire for participation transforms the complaint into an "**organizational gift.**" The patient is no longer a passive subject, but a partner-evaluator who demands **accountability.**

5. QUALITATIVE ANALYSIS OF INTERVIEWS: HOSPITAL MODERNIZATION AS SEEN BY THE USER

Beyond these quantitative results, which objectively demonstrate the strength of the links between sociodemographic profile, modernization expectations, and perceptions of communication, it remained to understand how these phenomena are experienced and articulated by the users themselves. A qualitative approach was therefore employed, through the analysis of 25 semi-structured interviews, to give substance to the figures, explore the subjective logics underlying the observed correlations, and capture, in the words of patients and their companions, the daily reality of the communication breakdown within the Ibn Sina University Hospital. The 25 interviews, conducted with patients and their companions recruited upon leaving consultations and inpatient wards, were recorded, fully transcribed, and then subjected to thematic content analysis. The coding, carried out using a grid inspired by the theoretical framework (decoupling, legitimacy, communication, participation) and quantitative results (gender, age, professional status, level of education), brings out four major discursive registers which confirm and enrich the statistical findings.

5.1. Modernization Perceived as "Cold"

A recurring theme is that of a modernization that is essentially internal and "cold." The presence of computers, automated counters, or better-organized files is acknowledged, but rarely associated with an improvement in the service relationship. A 45-year-old employee explains: "You see computers everywhere, staff typing on keyboards, and the files seem better organized. But this technology stops at the back of the screen. The staff member doesn't look at you any better than before. It's a superficial modernization: the tool has changed, but not the respect for the patient." This verbatim quote concretely illustrates the decoupling described by Meyer and Rowan: the formal structure is modernized, but the daily interactions remain unchanged. It also sheds light on the correlation between professional status and the demand for digitalization ($V=0.262$): employed individuals perceive the potential of digital technology as a "reducer of opportunity cost," while emphasizing that, without relational translation, digitalization does not reduce either uncertainty or the feeling of abandonment.

5.2. A Gendered Demand for Information

The interviews strongly confirm the importance of the gender variable in shaping perceived quality. Women, predominantly caregivers (mothers, wives, daughters), see themselves as responsible for coordinating the care pathway and express heightened sensitivity to the lack of information, consistent with the very high Cramer's V (0.454). The terms "vagueness," "disdain," and "loneliness" frequently recur in their accounts. A mother of a hospitalized child testifies: "We are treated as if we don't need to understand. We are given paperwork without being told where to go."

For me, modernization isn't about machines; it's about someone talking to me and explaining what my son has. These remarks empirically validate hypothesis H1: for these "sentinels" of the system, modernization only becomes legitimate when it translates into "informational care"—clear explanations, guidance, listening, and recognition. Communication appears to be at the heart of perceived quality and hospital legitimacy.

5.3. Generational Divide and Intolerance of “Bureaucratic Silence”

A third theme relates to the relationship with time and the “generational clash” in the face of temporal uncertainty. Younger, highly connected users spontaneously compare the university hospital to the communication standards of the private sector:

“For a bill, we get a text message. For a package, I know where it is. For a doctor who is two hours late, nobody tells us anything,” explains a student.

These accounts illustrate the correlation between age and intolerance of a lack of explanation regarding delays ($V=0.291$). Administrative silence is experienced as “bureaucratic silence,” incompatible with a “generation of instant gratification” accustomed to real-time information. The demand is therefore not only technical (online appointment booking), but also communicative (notifications, announcements, updates on delays and cancellations), reinforcing the call for a Soft NPM (New Public Management) focused on public service.

5.5. From “Hshouma” to “Partner Citizen”

Finally, the interviews reveal a profound shift in the relationship to complaints and participation, particularly among the most educated users. Where “Hshouma”—the reluctance to complain about the public hospital—once prevailed, the concepts of “rights,” “respect,” and “citizenship” are now emerging. One interviewee with a degree summarizes this new stance: “I’m not asking for the impossible; I’m asking that my complaint serve to prevent others from suffering the same fate. If no one speaks up, nothing changes.” This type of discourse confirms the quantitative consensus in favor of strengthening appeal mechanisms and the correlation between education level and the desire for participation ($V=0.231$). It illustrates hypothesis H2: complaints are perceived as a regulatory tool, not as an act of ingratitude, and the user positions themselves as an “evaluating citizen,” a co-producer of quality, and a seeker of accountability. In short, this qualitative analysis reinforces the statistical results by showing that the crux of the problem is not the absence of modern tools, but their lack of effective communication. Without information, active listening, and effective recourse mechanisms, modernization remains merely a “facade modernization,” and patients do not recognize themselves in the modernized public hospital. Conversely, once the user's voice is acknowledged and integrated, communication becomes a genuine lever for governance and legitimacy.

6. CONCLUSION

The study shows that the modernization of the Ibn Sina University Hospital, largely driven by Hard NPM (digitalization, indicators, contracts), remains incomplete as long as it does not fully integrate the communication dimension. The quantitative and qualitative results converge: users (especially working adults, women, and young people) do not contest the technical modernization itself, but rather its “cold” and silent nature, marked by a lack of information, opaque procedures, and the absence of readily understandable recourse options. Both hypotheses are confirmed: digitalization only creates public value if it is supported by clear, accessible, and empathetic communication, and the institutionalization of complaint mechanisms and participatory evaluation helps to foster a patient as a “citizen partner” and strengthens the hospital's accountability.

From a managerial perspective, the challenge is to refocus the modernization strategy on strategic communication: proactive information, truly user-oriented digital tools, training in interpersonal skills, and structured feedback mechanisms. From a scientific perspective, the interplay between New Public Management (NPM), neo-institutionalism, communicative action, and Community-Based Organizations (CBOs) proves relevant for analyzing hospital governance in the context of reform. Despite its limitations (a single institution, an urban sample, and a university graduate population), this research suggests that the future of Moroccan public hospitals will depend as much on the quality of their communication as on the sophistication of their tools.

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THE ALLURE OF THE UNATTAINABLE: SCARCITY AND DEPRIVATION MARKETING IN THE LUXURY INDUSTRY

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ABSTRACT

The main focus of this study is to examine how luxury brands employ scarcity and deprivation marketing as key strategic tools. These strategies involve limiting product availability, customer access, and distribution channels, as well as offering products only to selected customer groups in order to create a sense of exclusivity and enhance perceived social status. The paper explores how these strategies influence consumer decision-making, shape customer perceptions of luxury brands, and strengthen brand positioning. It also examines how scarcity and deprivation affect consumer behaviour and increase the symbolic value of luxury goods beyond their functional quality. Furthermore, the study discusses both the positive and negative consequences of these strategies. While they can strengthen customer loyalty, reinforce brand culture, and enhance exclusivity, they may also damage brand image by restricting access and frustrating potential customers. Finally, the paper illustrates these concepts through two case studies of Hermès and Ferrari, two luxury brands that rely heavily on scarcity and deprivation marketing.

Keywords: *scarcity marketing, deprivation marketing, luxury brands, consumer decision-making, exclusivity, buying experience, social status*

1. INTRODUCTION

In modern society, as well as in the past, owning luxury items, whether automobiles, designer bags, clothing, or high-end jewelry, has often been regarded as a symbol of social status. Although many consumers value luxury products for their premium quality, distinctive design, craftsmanship, uniqueness, functionality, and long-term value, they also frequently associate them with wealth, prestige, and social recognition. This is particularly evident in both exclusive offline communities and on social media, where influencers and celebrities, regardless of their popularity, often showcase luxury products as part of their public image. As a result, many followers develop a desire to own the same products.

Luxury items frequently sell out after being featured by well-known public figures, even when consumers simply encounter a photograph online. This growing demand allows many luxury brands to increase prices despite being unable, or sometimes unwilling, to fully satisfy demand. Such practices are closely related to the concepts of scarcity and deprivation marketing. A well-known example occurred a few years ago when Lisa from Blackpink, the globally recognized K-pop group, was photographed carrying a Celine bag. Shortly after the images were released, the bags sold out, and the brand increased their prices several times despite limited product availability. Luxury goods are typically produced using rare or carefully selected materials and require exceptional craftsmanship, making production both time-consuming and costly. Consequently, many luxury brands intentionally rely on scarcity marketing by limiting supply. Maintaining demand above supply helps strengthen brand identity, reinforce exclusivity, and preserve premium positioning. However, while scarcity marketing offers numerous advantages, it may also have negative consequences, even within the luxury industry. This study focuses on scarcity and deprivation marketing and examines how these strategies influence the contemporary luxury market. The topic remains highly relevant today because digital consumers increasingly respond to products promoted as "limited" or "exclusive". Their purchasing decisions are often influenced by celebrities, influencers, family members, friends, and broader online communities. At the same time, the growing culture of FOMO (fear of missing out) has made scarcity one of the most effective marketing strategies in the luxury sector. Why do so many luxury brands intentionally make their products difficult to obtain? Why do customers willingly wait in long lines outside luxury boutiques or remain on waiting lists for months, sometimes without ever receiving the opportunity to purchase the desired product?

Scarcity and deprivation have long been integral elements of the luxury industry. Faced with intense competition, luxury brands continuously seek strategies to preserve their exclusivity and differentiate themselves from competitors. These conditions do not simply occur naturally; they are often deliberately created to stimulate consumer desire and increase demand. In the luxury context, deprivation refers to marketing practices that intentionally restrict access to desirable products, for example by offering limited-edition collections or seasonal luxury items only to selected customers. These psychological strategies strengthen consumers' emotional attachment, perceived social value, and the belief that products which are difficult to obtain are inherently more valuable, ultimately increasing both demand and perceived scarcity. The primary characteristics that distinguish luxury goods from mainstream products are their rarity and limited accessibility. Luxury brands around the world continue to rely heavily on these strategies because consumers often seek to own something that others cannot easily obtain, allowing them to feel unique, special, and socially distinguished. Consequently, scarcity and deprivation become powerful tools for strengthening brand image and influencing consumer behaviour. Furthermore, by deliberately not satisfying total market demand, luxury brands maintain greater control over pricing. Some brands, such as Hermès and Ferrari, even require customers to establish a purchase history before gaining access to limited-edition products. This strategy encourages repeat purchases, strengthens customer loyalty, and reinforces the prestigious brand image these companies seek to maintain. Nevertheless, despite their many advantages, scarcity and deprivation marketing also have negative consequences. Many consumers feel excluded and perceive these practices as intentionally unfair, particularly when they encounter long waiting lists or discover that "money cannot buy" certain products. From an environmental perspective, limited-edition collections may also contribute to excessive resource consumption and increased fashion waste. Looking ahead, luxury brands will need to find an appropriate balance between maintaining exclusivity, satisfying consumer expectations, and fulfilling their broader social and environmental responsibilities.

2. LITERATURE REVIEW

This section reviews the theoretical concepts of scarcity and deprivation marketing. These concepts are widely used in the luxury industry to explain how brands increase consumers' desire for products and enhance the perceived value associated with ownership. This theoretical framework provides the foundation for understanding how luxury brands create the allure of the unattainable.

2.1. Scarcity

Scarcity has long been recognized as a mechanism that increases perceived value and desire (Szabó & Komáromi-Gergely, 2011). According to Cialdini (2009), scarcity is one of the most important principles of persuasion, as people tend to perceive products as more valuable when they are limited in availability. Lynn (1991) demonstrates that scarcity consistently increases product appeal across various contexts, partly because it triggers value inference and psychological reactance. Scarcity marketing refers to strategies that emphasize limited product availability, either in quantity or time, to increase consumers' perceived value and stimulate purchase intentions (Barton, Zlatevska, & Oppewal, 2022). Scarcity marketing functions as an external constraint: consumers perceive scarce products as more desirable because they believe they are available only in limited quantities or for a limited period. In the luxury industry, rarity is a fundamental element of brand positioning, and controlled scarcity represents a deliberate strategy for building and maintaining brand value. Luxury brands therefore use scarcity marketing as a psychologically driven strategy that creates demand and enhances perceived value by restricting product availability in terms of quantity, time, or accessibility. Kapferer and Bastien (2012) likewise argue that restricting supply preserves exclusivity and reinforces the symbolic significance of luxury products. Scarcity can take different forms, including quantity scarcity, where only a limited number of products are produced, and time scarcity, where products are available only for a limited period (Barton et al., 2022). Both forms encourage consumers to act quickly while increasing the perceived value of luxury products.

2.2. Deprivation

Deprivation is a long-term internal state in which individuals feel that they lack sufficient resources, status, or satisfaction, motivating them to compensate through consumption (Shah, Mullainathan, & Shafir, 2012). Unlike scarcity, deprivation operates internally by influencing consumers' motivations and decision-making. Studies indicate that deprivation narrows cognitive focus toward unmet needs and encourages compensatory consumption, particularly of symbolic and status-enhancing products (Sharma & Alter, 2012; Roux, Goldsmith, & Bonezzi, 2015). As a result, consumers become more focused on what they lack, assign greater value to symbolic goods, seek luxury products as a means of self-restoration, and become more motivated to demonstrate their social status. Consequently, consumers are more likely to purchase high-status products to improve their self-image, communicate social status, or satisfy aspirational needs. Deprivation therefore influences consumer behaviour by strengthening the attractiveness of symbolic, status-enhancing products. Individuals experiencing social, psychological, or material deprivation often purchase luxury goods not only for enjoyment but also to enhance self-esteem, reduce the gap between their actual and ideal selves, and signal social belonging or success. Luxury consumption thus becomes a means of self-restoration and social signaling, making prestigious brands effective instruments for coping with feelings of inadequacy or rejection.

2.3. The Difference Between Scarcity and Deprivation

Although the two concepts are sometimes used interchangeably, scarcity and deprivation represent distinct theoretical constructs. Scarcity is an external, situational limitation referring to constrained product availability, restricted access, or temporary inaccessibility (Wang, Sung, & Phau, 2024). Lynn (1991) explains that scarcity operates through two principal mechanisms: value inference, whereby consumers perceive scarce products as more valuable because of their exclusivity or high demand, and psychological reactance, which increases desire when access is restricted. In luxury markets, brands deliberately restrict product availability to strengthen exclusivity and prestige (Debenedetti, Philippe, & Dion, 2024). Scarcity therefore creates immediate, context-dependent desirability. By contrast, deprivation is an internal psychological state reflecting unmet material, emotional, or symbolic needs. Shah, Mullainathan, and Shafir (2012) argue that deprivation directs attention toward these unmet needs. In luxury consumption, deprivation motivates consumers to purchase prestigious products to compensate for perceived personal shortcomings, strengthen their identity, or demonstrate upward social mobility. While scarcity increases perceived value through external constraints, deprivation increases motivation from within. The two constructs therefore differ both in their origin and in their underlying mechanisms. Scarcity operates externally by increasing perceived value and signaling exclusivity, whereas deprivation operates internally by motivating compensatory consumption. Scarcity creates immediate desirability, while deprivation shapes long-term aspirations and identity-related consumption patterns. Distinguishing between these concepts is essential for understanding how external market conditions and internal psychological motivations jointly enhance the appeal of luxury products.

2.4. The Allure of the Unattainable in the Luxury Industry

Luxury marketing derives much of its success from the simultaneous activation of two complementary psychological drivers: external scarcity and internal deprivation. Scarcity is deliberately created through limited editions, controlled distribution, waiting lists, and continuous price increases, practices described as "dream barriers" (Wang et al., 2023). These deliberate restrictions reinforce exclusivity, stimulate psychological reactance, and increase perceived value well beyond the products' functional utility (Kapferer & Bastien, 2012; Lynn, 1991). Deprivation, in contrast, originates within the consumer. It increases the importance attached to status-signaling products that promise to restore self-worth and reduce the gap between the actual and ideal self (Sharma & Alter, 2012; Roux, Goldsmith, & Bonezzi, 2015). Luxury products fulfil this role not merely because they are expensive, but because they possess strong symbolic value that enables consumers to satisfy psychological and social needs. The interaction between these two mechanisms creates a powerful synergy. The more unattainable a product becomes through scarcity, the greater its potential to restore feelings of self-esteem and personal control among consumers experiencing deprivation. This interaction creates what may be described as the allure of the unattainable, sustaining strong consumer desire even when functional needs have already been satisfied and helping explain the enduring appeal of luxury brands across different socioeconomic contexts. Luxury brands employing this dual strategy therefore sell not only products but also emotionally charged access to an aspirational identity that remains intentionally just beyond immediate reach.

3. CASE STUDIES

Scarcity in the luxury sector does not merely restrict supply; it shapes the entire consumer experience. It strengthens desirability, signals exclusivity, and allows brands to maintain control over their cultural meaning.

By setting high thresholds for ownership through waiting lists, customer-selection criteria, or purchase-history requirements, brands cultivate prestige while limiting access to selected customers. This ecosystem strengthens emotional attachment, perceived uniqueness, and brand loyalty. The following two case studies examine how scarcity and deprivation marketing operate in practice. Ferrari and Hermès represent two different applications of the same strategic logic. Ferrari focuses on performance-driven elite membership and carefully controlled customer access, while Hermès builds desirability through cultural symbolism and controlled inaccessibility. Together, the cases demonstrate how scarcity influences brand value, demand, consumer relationships, and managerial decision-making in the ultra-luxury market.

3.1. Ferrari: The Ferrari Formula

Ferrari has become one of the world's most desirable luxury brands through the strategic management of its products, customers, supply, and demand. The company positions Ferrari not merely as an automobile manufacturer, but as a symbol and a distinctive way of thinking. The following sections examine how Ferrari has established scarcity as a core branding mechanism and become a prominent example of controlled product availability and selective customer access. Ferrari applies scarcity and deprivation marketing by limiting production, selecting eligible customers, and managing the brand as a cultural symbol rather than simply as a company. Through these practices, Ferrari has created an aspirational identity that appeals to a broad audience but remains attainable only to a limited number of consumers.

3.1.1. Limited Editions, Special Series, and One-Off Models

Scarcity marketing relies on limiting product availability to increase desirability and justify premium prices. Ferrari practises a form of selective deprivation in which certain limited-edition models are offered only to pre-approved customers with demonstrated loyalty or an established purchase history. As Mirzayev (2020) explains, Ferrari deliberately limits annual production to protect its brand equity and ensure that demand consistently exceeds supply. This restricted availability strengthens the sense of privilege associated with ownership. This approach is consistent with Aggarwal et al. (2020), who found that scarcity based on exclusivity, such as membership or status, can generate stronger emotional responses than scarcity based solely on stock limitations. Deprivation therefore becomes a deliberate strategic tool, as refusing or restricting access reinforces the brand's symbolic hierarchy. Ferrari regularly introduces limited-edition ranges, including LaFerrari, the Monza SP1 and SP2, the Icona series, and individually commissioned one-off models. These vehicles are produced in strictly controlled numbers, often limited to a few hundred or even a few dozen units. They are primarily offered to dedicated clients and collectors and are usually allocated to the brand's most loyal or strategically valuable customers. This strengthens exclusivity while generating media attention and considerable price premiums on the secondary market. This selective allocation is closely connected to Ferrari's approach to client relationship management. Through its Tailor Made programme, factory-produced one-off vehicles, and the concept of the "Ferrari family," the company cultivates close relationships with selected customers and rewards their loyalty with exclusive opportunities. These practices present Ferrari vehicles as products with lasting emotional and financial value. Selective allocation consequently increases the perceived status of ownership and may provide loyal customers with advantages on the secondary market.

3.1.2. Brand Extension

Despite limiting the supply of its automobiles and restricting the number of vehicle owners, Ferrari has expanded into non-automotive markets, including clothing, accessories, and lifestyle products.

Mirzayev (2020) notes that Ferrari has positioned its merchandise as a more accessible symbol of aspiration. Although these products are more widely available than Ferrari vehicles, they remain closely connected to the core brand and retain associations with luxury, performance, and prestige. By entering these markets, Ferrari has created an additional source of revenue while also strengthening the brand's cultural visibility. Its merchandise allows a wider group of consumers to participate symbolically in the Ferrari identity without owning a vehicle. Ferrari also maintains strict control over its colours, visual elements, and symbols. The company's iconic Rosso Corsa red is consistently applied across motor racing, consumer goods, and media content, creating immediate brand recognition (Mirzayev, 2020). This visual consistency enables Ferrari to expand into new product categories without weakening its distinctive identity.

3.1.3. Online and Physical Marketing

As an exclusive and highly desirable brand, Ferrari supports the idea that its vehicles do not require conventional forms of mass advertising. Instead, the company relies heavily on consumer interest, media coverage, motorsport, product launches, and brand communities to maintain visibility and strengthen its reputation. Ferrari frequently presents new vehicles through exclusive physical events, artistic films, and carefully designed brand experiences. Its campaigns often resemble short films or works of visual art rather than conventional automobile advertisements. These forms of communication emphasize performance, heritage, craftsmanship, and exclusivity instead of direct promotional messages. A similar approach is used for Ferrari's brand extensions. Artistic visual content and short films communicate that the products belong to an exclusive cultural world intended for consumers who understand and identify with the brand's values. Ferrari's combined strategies of controlled production, selective customer access, lifestyle extension, and consistent visual branding form a coherent scarcity-driven ecosystem. This approach demonstrates how a limited and highly distinctive product can develop into a powerful cultural symbol. By managing both accessibility and aspiration, Ferrari has extended its influence far beyond the automotive industry.

3.2. Hermès: The Birkin Scarcity Ecosystem

3.2.1. Hermès' Engineered Exclusivity

Hermès represents one of the strongest examples of scarcity and deprivation marketing in the luxury industry. The brand does not rely heavily on traditional advertising or mass visibility. Instead, it creates controlled inaccessibility around its most iconic product, the Birkin bag, to maintain desirability, status symbolism, and cultural prestige. Hermès limits production, restricts distribution, and carefully manages customer access, transforming the Birkin into an object of aspiration rather than merely a consumer product. The company manufactures its bags in small quantities partly because of artisanal production constraints, as each Birkin is handcrafted by a single artisan. However, the brand also deliberately maintains supply below the level of demand. As Godart and Seong (2014) note, Hermès strategically preserves rarity to protect brand prestige and reinforce symbolic value. This intentionally unmet demand represents a clear example of managed scarcity, often resulting in uncertain product allocation, long waiting periods, and high resale values. These conditions further strengthen the product's aura of exclusivity.

3.2.2. Selective Distribution and Deprivation by Design

Hermès customers generally cannot simply enter a store and purchase a Birkin bag on demand. Instead, clients may need to develop a purchase history and establish a relationship with a sales associate. This relatively opaque process has been widely discussed by consumers and examined in luxury retail research.

This strategy represents deprivation caused not only by limited production capacity but also by restricted customer access. Roux, Tafani, and Vigneron (2017) explain that deprivation in luxury consumption can increase the symbolic power of a product by making its acquisition feel like a personal achievement. The perception that customers must earn the opportunity to purchase a Birkin may deepen emotional attachment, encourage brand loyalty, and strengthen social signalling. Hermès therefore uses restricted access as a form of psychological gatekeeping. Customers may be expected to demonstrate loyalty, purchasing capacity, and alignment with the brand before being offered access to its most desirable products.

3.2.3. Secondary-Market Impact and Cultural Mythology

Because demand consistently exceeds supply, Birkin bags frequently sell for prices considerably above their original retail value on the secondary market. Hennigs et al. argue that perceived scarcity in luxury markets can increase cultural and symbolic value, making products more desirable even when they are available through resale channels. The Birkin has consequently become a cultural symbol supported by both scarcity and deprivation. Celebrities display the bags publicly, online communities discuss how customers can increase their chances of being offered one, and resale platforms present the Birkin as an investment asset. Its secondary-market value therefore reflects not only craftsmanship and product quality but also the scarcity carefully maintained by the brand.

3.2.4. Digital FOMO and Contemporary Visibility

Although Hermès avoids aggressive online promotion, digital culture significantly amplifies the desirability of the Birkin. Social media posts, unboxing videos, and content explaining how customers were offered a Birkin intensify FOMO and reinforce the perception of deprivation. The scarcity narrative circulates online more rapidly than it could through formal advertising, making the bag's limited accessibility a central part of its identity. Hermès therefore benefits from both scarcity, created through limited supply and craftsmanship constraints, and deprivation, created through restricted access and an opaque purchasing process. The interaction between these mechanisms strengthens the brand's position in the luxury industry.

3.3. Comparing the Case Studies

Ferrari and Hermès represent prominent examples of deprivation marketing. Both operate through a similar psychological mechanism in which the customer's main challenge is not simply purchasing the product but qualifying for the opportunity to obtain it. Both brands deliberately restrict supply and use limited accessibility to maximize consumer desire. Ferrari follows the principle traditionally associated with Enzo Ferrari of producing one car fewer than the market demands. Hermès relies more heavily on uncertain product allocation, restricted access, and waiting periods that create a fear of missing the opportunity to obtain the desired product. Both companies also establish substantial barriers to ownership. In addition to high prices, customers encounter an informal membership structure based on loyalty, purchase history, personal relationships, and brand status. These gatekeeping practices make acquisition feel more exclusive and personally rewarding. The two brands also attempt to control resale activity in order to protect their symbolic hierarchy and prevent their most exclusive products from becoming ordinary tradable goods. Ferrari may use contractual restrictions and rights of first refusal to discourage immediate resale, while Hermès may limit future access for customers believed to be purchasing products primarily for resale. In both cases, controlling the secondary market helps preserve exclusivity and protect the brand's long-term positioning. Nevertheless, the brands differ in how they create and communicate scarcity. Ferrari primarily follows a strategy of manufactured rarity by deliberately limiting the number of vehicles produced and selectively allocating its most exclusive models.

Hermès combines deliberate scarcity with genuine artisanal production constraints, emphasizing the time and expertise required to produce each bag. Ferrari also seeks relatively high cultural visibility. It aims to make large numbers of consumers dream about the brand and associate it with performance, aspiration, and luxury, even though only a small number can own its vehicles. Hermès relies more strongly on controlled mystery and limited information. Its purchasing process creates the impression that ownership is not simply bought but granted to customers who have been selected by the brand. Therefore, while Ferrari builds aspiration through visibility and elite membership, Hermès builds desire through discretion, uncertainty, and controlled inaccessibility. Both approaches demonstrate how scarcity and deprivation can transform luxury products into symbols of achievement, status, and belonging.

4. CONCLUSION

Luxury brands frequently employ scarcity and deprivation strategies because they enhance the perception of exclusivity, making luxury products appear more valuable than mainstream alternatives. By limiting product availability or restricting customer access, brands encourage consumers to perceive these products as more desirable and valuable. The rarer an item appears, the stronger its appeal becomes, helping to sustain high levels of demand. At the same time, limited production enables luxury brands to maintain greater control over pricing, preventing price reductions while supporting regular price increases. Furthermore, customers are often encouraged to build a purchase history in order to gain access to exclusive products, thereby strengthening brand loyalty. These strategies also generate considerable attention on social media, as limited products that quickly sell out create widespread discussion and increase brand awareness. In addition, scarcity contributes to the development of a strong secondary market, where products frequently command prices above their original retail value. This further reinforces the perception that luxury goods are not merely purchases but also valuable investments. The findings of this paper, supported by the Ferrari and Hermès case studies, demonstrate that scarcity and deprivation marketing have remained fundamental strategies in the luxury industry for many years and continue to play an important role today. Although these strategies may create dissatisfaction among consumers who are unable to obtain highly desirable products or who perceive the purchasing process as unfair, they also generate strong customer loyalty among those who successfully gain access to the brand. At the same time, they help luxury companies maintain their exclusivity, strengthen their brand value, and ensure long-term profitability.

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FOSTERING SUSTAINABLE SOCIAL ENTERPRISES: A QUALITATIVE ANALYSIS OF SPAIN'S ENTREPRENEURSHIP ECOSYSTEM

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ABSTRACT

This study explores Spain's social entrepreneurship ecosystem by examining its structural components, interdependencies, and unique characteristics to identify the key elements necessary for fostering sustainable social enterprises. Built upon Spain's robust social economy tradition, the research aims to provide a replicable model and strategic recommendations for developing countries such as Turkey. The study employs a qualitative case study methodology, utilizing semi-structured in-depth interviews with 19 diverse stakeholders, including NGOs, social enterprises, incubators, academic institutions, and social cooperatives. Participant selection was conducted through snowball sampling, and the data were transcribed and analyzed using hierarchical coding and code co-occurrence models via MaxQDA software. The findings reveal six foundational components that drive the ecosystem: social entrepreneurs, culture, government policies and legislation, human resources, cooperation networks, and finance. Crucially, the legal and regulatory framework acts as a central pillar, rooted in the foundational 2011 Social Economy Law and reflecting ongoing updates such as the newly introduced regulations published in the Official State Gazette (BOE) on April 9, 2026, which further refine the landscape for cooperatives, social integration enterprises, and equality policies. Collaborative networks and education emerge as pivotal cultural factors; particularly, universities play a transformative role through tailored programs and initiatives like the "social transcript" application. Financially, while public support from regional governments, grants, and direct sales are critical enablers, access to early-stage finance remains a significant obstacle. Furthermore, human resource sustainability depends heavily on volunteer networks accessed through digital platforms, alongside competitive career opportunities. Ultimately, the study highlights the complex interdependencies among these components, advocating for a systemic approach where policy reform, financial innovation, and educational development interact to sustain social entrepreneurship. This research, funded by the Scientific and Technological Research Council of Turkiye (TUBITAK) 2219 Postdoctoral Research Fellowship Programme, provides a comprehensive framework to support future studies and policy development for achieving the 2030 Agenda for Sustainable Development Goals (SDGs) through social entrepreneurship.

Keywords: *Ecosystem, Social Economy, Social Entrepreneurship, Spain, Sustainable Development*

1. INTRODUCTION

Social enterprises occupy an increasingly visible position in debates on resilient and inclusive development. They pursue social or environmental missions through market activity, and in doing so they absorb part of the welfare burden that neither the state nor conventional firms

address adequately (Bornstein, 2007; Defourny and Nyssens, 2017). Yet the survival of individual social enterprises is rarely explained by the qualities of their founders alone. Whether a venture endures beyond its start-up phase depends on the environment in which it operates: the legal forms available to it, the finance it can reach, the talent and volunteers it can attract, and the networks that connect it to public administrations, universities, and companies (Roundy, 2017; Bhardwaj et al., 2023). This environment is commonly described as a social entrepreneurship ecosystem. Research on entrepreneurial ecosystems has produced influential frameworks, most notably Isenberg's (2011) six-domain model of policy, finance, culture, supports, human capital, and markets. However, these frameworks were designed with profit-oriented ventures in mind, and applying them mechanically to social enterprises obscures actors and dynamics that matter precisely for sustainability: non-profit distribution constraints, volunteer labour, public procurement, and the dense institutional fabric of the social economy (Roundy, 2017; Pratono and Sutanti, 2016). For countries where social entrepreneurship is growing but lacks legal recognition, such as Turkey, the practical question is not only which components an ecosystem contains, but which configurations of those components keep social enterprises alive over time (British Council, 2019; Isik, 2022). Spain offers an instructive setting for this question. It was the first European country to adopt a framework law on the social economy, Law 5/2011, and it hosts one of the continent's largest populations of cooperatives, insertion enterprises, and special employment centres (CEPES, 2023). More recently, Law 1/2026 of 8 April, the comprehensive law for the promotion of the social economy published in the Official State Gazette (BOE) on 9 April 2026, has updated this architecture by reforming the legislation on cooperatives, insertion enterprises, the social economy, and the fiscal regime of cooperatives (BOE, 2026). The Spanish case therefore allows us to observe a mature ecosystem at the very moment its legal foundations are being renewed. This paper asks which elements of Spain's social entrepreneurship ecosystem are decisive for the sustainability of social enterprises, and what their interdependencies imply for countries seeking to build such ecosystems. It draws on fieldwork conducted in Spain between June and October 2024 under the TUBITAK 2219 International Postdoctoral Research Fellowship Programme, consisting of in-depth interviews with 19 stakeholders. While the broader project maps the ecosystem as a whole, the present paper concentrates on the sustainability dimension in line with the conference theme: the enablers that keep social enterprises operating, the obstacles that threaten them, and the extent to which the 2026 legal reform responds to those obstacles. The paper proceeds as follows. Section 2 situates social enterprise within Spain's social economy and outlines the evolving legal framework. Section 3 describes the method. Section 4 presents the findings on sustainability enablers and obstacles. Section 5 reads these findings against Law 1/2026, and Section 6 concludes with implications for developing countries.

2. SOCIAL ECONOMY AND SOCIAL ENTERPRISE IN SPAIN

In Spain, the vocabulary of "social enterprise" is less established than the vocabulary of the social economy. Organisations that elsewhere would be labelled social enterprises are typically understood as part of a broader family of cooperatives, mutuals, associations, foundations, insertion enterprises, and special employment centres, in line with the perspective of European Union institutions (Chaves Ávila and Monzón Campos, 2018; Díaz et al., 2020). The European Commission's comparative mapping confirms this: Spanish social enterprises draw their legal basis from social economy legislation rather than from a dedicated social enterprise statute (European Commission, 2020). Law 5/2011 of 29 March on the Social Economy defines the sector as the set of economic and business activities carried out by private entities that pursue the collective interest of their members, the general economic or social interest, or both. Its guiding principles, the primacy of people and social purpose over capital, the reinvestment of surpluses, internal solidarity, and independence from public authorities, distinguish social

economy entities from conventional firms and provide the normative ground on which Spanish social entrepreneurship stands (de España, 2011). Quantitatively, the sector is substantial: the representative confederation CEPES reports more than 42,000 enterprises whose turnover approaches one tenth of GDP and which sustain over two million direct and indirect jobs, with social cooperatives and associative forms accounting for roughly four fifths of all entities (CEPES, 2023). Within this family, two work integration forms deserve emphasis because they embody the employment-centred character of Spanish social enterprise. Insertion enterprises (*empresas de inserción*), regulated since Law 44/2007, employ people at risk of exclusion through time-limited insertion itineraries that prepare them for the ordinary labour market. Special employment centres (*centros especiales de empleo*), created under Law 13/1982, must employ a workforce composed of at least seventy per cent persons with disabilities; since 2017, a distinction has been drawn for those of social initiative, promoted and majority-owned by non-profit entities that reinvest all profits (Catalá Estada et al., 2024; Díaz et al., 2020).

2.1. From Law 5/2011 to Law 1/2026: a renewed legal architecture

The legal framework that participants in our fieldwork repeatedly identified as the backbone of the ecosystem has just undergone its most significant overhaul since 2011. Law 1/2026 of 8 April, *integral de impulso de la economía social*, published in the BOE on 9 April 2026 and in force the following day, does not create a new regime from scratch; rather, it reorders and updates four existing statutes: the Law on Cooperatives (27/1999), the Law on Insertion Enterprises (44/2007), the Social Economy Law (5/2011), and the law on the fiscal regime of cooperatives (20/1990) (BOE, 2026). Several of its measures bear directly on the sustainability conditions examined in this paper. First, the reform of the cooperative statute modernises internal governance: it regulates electronic communication and remote participation of members, makes a corporate website compulsory for cooperatives with more than five hundred members within a year of entry into force, and creates an Equality Commission (*Comisión de Igualdad*) responsible for cooperative equality plans. Second, the insertion enterprise regime is updated by broadening the categories of persons in situations of vulnerability or exclusion, clarifying the requirements for promoting entities, and strengthening insertion itineraries and the contract for transition to ordinary employment. Third, special employment centres of social initiative and insertion enterprises are declared providers of services of general economic interest, and the public procurement rules now encourage reserved contracts for these entities, with a voluntary reserve target of at least 0.5 per cent of the previous year's tendering volume and a subsidiary minimum of 15 per cent on certain state-sector supply and service contracts where no reserve agreement is adopted (BOE, 2026). As Section 5 shows, these measures speak with striking precision to the obstacles our interviewees described in 2024.

3. METHOD

The study adopts a qualitative case study design, appropriate where the phenomenon of interest is embedded in a specific institutional context and the aim is depth of understanding rather than statistical generalisation (Creswell and Poth, 2016). The case is the Spanish social entrepreneurship ecosystem, observed primarily from the Valencian Community, one of the regions with a long cooperative tradition and an active regional social economy policy. Fieldwork was carried out between June and October 2024. Prior to the interviews, a desk review of Spanish legislation, official statistics, and institutional reports informed the interview guide, which was organised around the components identified in the entrepreneurial ecosystem literature: leadership and culture, business idea development, government policy, supporting organisations and networks, finance, human resources, and sustainability. Participants were recruited through snowball sampling, beginning with actors identified in the desk review and extending through referrals.

Saturation was observed around the fifteenth interview, and the process closed after nineteen interviews conducted for confirmation purposes. The final sample comprised representatives of associations and foundations (3), incubators and support platforms (4), social cooperatives (3), social enterprises (5), and researchers working on the ecosystem (4). Ten interviews were held face to face and nine online; each lasted between forty and fifty minutes and was audio-recorded with consent. The research design was approved by the Hacettepe University Social and Human Sciences Ethics Committee (decision 2024/09, 07.05.2024). Recordings and observation notes were transcribed and coded in MaxQDA v24. Analysis combined hierarchical code–subcode modelling, which orders themes by frequency, with code co-occurrence modelling, which reveals how often themes are mentioned together and therefore how components of the ecosystem depend on one another. Participant identities were anonymised throughout. Because this paper addresses the sustainability dimension of the project, the presentation of results below is organised around enablers and obstacles rather than around an exhaustive component map; the full mapping, including the visual code models, is reported in a separate study currently under journal review.

4. FINDINGS: WHAT SUSTAINS SOCIAL ENTERPRISES IN SPAIN

4.1. The meaning of social entrepreneurship and the six ecosystem components

Before discussing sustainability, it is worth noting how participants drew the boundaries of the phenomenon itself. Across profiles, an activity qualified as social entrepreneurship when it produced demonstrable social or environmental impact, when it grew out of the social economy and cooperative culture, and when it observed a social profit orientation, that is, a constraint on distributing surpluses to owners or managers. Supporting networks, innovative responses to unmet problems, and democratic decision-making completed the definition, though with lower emphasis. This understanding is markedly more institutional than the Anglo-Saxon one: in Spain, what makes an enterprise “social” is not only its mission but its anchoring in a recognised legal and cultural tradition. From the interviews, six interdependent components of the ecosystem emerged: social entrepreneurs, culture, government policies and legislation, human resources, cooperation networks, and finance. Stakeholder groups weighted these differently. Finance and networks dominated the concerns of NGOs, social enterprises, and cooperatives, the actors who must meet payroll, whereas academics gave more weight to the policy framework and incubators to the entrepreneurs themselves. Table 1 summarises the components together with the subcomponents that participants linked most directly to enterprise survival.

Table ends on the next page

Ecosystem component	Sustainability-critical subcomponents	Main risk reported by participants
Government policies and legislation	National legal framework for the social economy; regional regulation; tax incentives; social clauses in public procurement	No legal figure directly recognising social enterprises; sectoral burdens (e.g. former solar levy)
Finance	Local and regional public support; grants and EU funds; direct sales; partnerships with companies	Scarce early-stage finance; bank caution toward social ventures
Cooperation networks	NGOs and companies (64.7%); universities (58.8%); incubators (52.9%); public administrations	Fragmentation; consensus-building slows decisions

Culture	University collaboration (78.6%); innovation hubs and community platforms; national and international NGO links	Low public awareness of social enterprise as a concept
Human resources	Volunteer outreach via social media and online platforms; competitive wages; career development	Difficulty finding people aligned with the venture's values
Social entrepreneurs	Higher education; degrees related to social entrepreneurship; problem-solving capacity	Skills concentrated in law and business graduates; uneven training supply

*Table 1: Ecosystem components, sustainability-critical subcomponents and reported risks
(Source: Authors' fieldwork, 19 interviews, Spain 2024)*

4.2. Financial enablers: public money, market income, and their interaction

When asked what keeps their organisations running, participants put public financial support at local and regional level in first place (58.8 per cent), followed by grants and EU funding programmes (52.9 per cent), income from direct sales (47.1 per cent), and financial cooperation with companies (41.2 per cent). Micro-loans and membership income mattered least (5.9 per cent each). Two features of this hierarchy deserve attention. The first is the prominence of subnational government: in a decentralised state, the regional administration and municipalities are often the relevant funder, not the central ministry. The second is that market income is not a residual category. The co-occurrence analysis showed the strongest single association in the finance domain between the capacity to sell directly and sustained economic activity: enterprises that earn revenue depend less on donations and survive funding cycles better. Partnerships with companies behaved similarly, linking the finance component to the network component, since corporate sponsorship typically followed from prior collaboration rather than cold solicitation. The reverse side of this picture is the start-up phase. Participants reported that social enterprises suffer from limited access to finance especially at this stage: owing to perceived financial risks, traditional banks remain cautious about lending to social enterprises, and although some impact investment funds are available, the need for increased resources is evident. Diversifying the existing sources of access, in particular by expanding alternative financing mechanisms such as impact investment funds and dedicated financial products for social entrepreneurs, was identified as the way to reduce over-reliance on grants and donations and to foster long-term financial independence.

4.3. Networks, universities, and the cultural infrastructure

Collaboration emerged as the connective tissue of the ecosystem. NGOs and companies were each cited by 64.7 per cent of participants as primary network partners, followed by universities and incubators; trade unions and religious entities played a marginal role. The co-occurrence models indicated a division of labour among partner types: cooperation with NGOs was associated above all with the construction and defence of the national legal framework; cooperation with companies fed the finance component through sponsorship and joint platforms; and cooperation with universities supplied the human capital of the ecosystem, from trained staff to volunteers and entrepreneurial skills. Universities deserve particular emphasis because participants ranked them as the single most important builder of social entrepreneurship culture (78.6 per cent). Beyond degree programmes in fields close to the sector, interviewees highlighted the “social transcript” practice, the systematic recognition and recording of students’ participation in social activities during their studies.

By certifying engagement, the social transcript channels students toward social projects, normalises volunteering, and creates an early pipeline of both founders and employees for social enterprises. Innovation hubs, community platforms, and national and international NGO collaborations completed the cultural infrastructure, each cited by half of participants.

4.4. Human resources: volunteers, wages, and values

Human resource sustainability rested on three pillars: motivation tools, volunteer outreach, and the skills and training needs of the workforce. Although the literature associates motivation in social entrepreneurship primarily with social impact, the findings show that competitive wages, defined by participants as pay levels reflecting employees' skills and experience, and career development opportunities also operate as motivational tools, much as in traditional enterprises. Volunteers constitute one of the most important elements distinguishing social enterprises from traditional firms, and outreach to them runs mainly through social media and online social work platforms such as the REAS network. The co-occurrence analysis showed that reaching volunteers is related to all six main components of the ecosystem: university collaborations, the legal framework and recognition of social entrepreneurship activities, NGO and company collaborations, direct sales platforms, and angel investor resources were the subcomponents most strongly associated with volunteer outreach. On the expectations side, the focus was on identifying talented and passionate individuals: organisations prefer people who have adopted the organisational culture, are inclined to teamwork, and hold an educational background in fields related to social entrepreneurship. To maximise this potential, the findings point to the need to integrate volunteers more fully into the operations of social enterprises so that they remain well utilised and motivated.

4.5. Obstacles to sustainability

Participants identified eight obstacles: limited access to finance, especially at start-up; the absence of a legal framework that directly recognises social enterprises; regulations that increase the tax burden of social entrepreneurs in particular sectors, exemplified by the solar energy levy that respondents in the renewable energy sector described as a struggle between oligopoly and citizens, hindering the development of solar installations; the lack of private sector support; the lack of awareness; the lack of a comprehensive strategy; difficulty in finding people who align with the vision and values of the social enterprise; and constant negotiation and consensus-building, which can slow down decision-making. Participants emphasised that removing these obstacles is a precondition for the growth of social enterprises, and that governments, private sector partners, and civil society must work collaboratively to address these systemic issues and foster a more supportive environment.

5. DISCUSSION: THE PROJECT'S RECOMMENDATIONS AND LAW 1/2026

The final report of the research project, completed in 2024, formulated a set of policy recommendations derived directly from the fieldwork: expanding alternative financing mechanisms such as impact investment funds and dedicated financial products; revising restrictive sectoral regulations and aligning them with the objectives of social entrepreneurship; simplifying bureaucratic processes; offering tax incentives; and facilitating the participation of social enterprises in public procurement. The legal reform adopted in Spain in April 2026 offers an unusual opportunity to assess these recommendations, since several of the measures it introduces correspond closely to them. Table 2 sets the project recommendations against the content of Law 1/2026.

Recommendation in the project final report (2024)	Corresponding measure in Law 1/2026 (BOE 09.04.2026)
Facilitating participation of social enterprises in public procurement	Reserved public contracts for insertion enterprises and social-initiative special employment centres; voluntary reserve target of at least 0.5% of prior-year tendering, subsidiary 15% minimum on certain state supply and service contracts
Revising restrictive regulations and aligning them with the objectives of social entrepreneurship	Coordinated update of the Law on Cooperatives (27/1999), the Law on Insertion Enterprises (44/2007), the Social Economy Law (5/2011) and the cooperative fiscal regime (20/1990)
Strengthening institutional support and legal recognition for organisations employing vulnerable groups	Social-initiative special employment centres and insertion enterprises declared providers of services of general economic interest; broadened categories of persons in vulnerability or exclusion; strengthened insertion itineraries and the contract for transition to ordinary employment
Simplifying bureaucratic processes	Legal recognition of electronic communication and remote member participation in cooperatives; corporate website as a legal channel of corporate publicity
Offering tax incentives	Reform of the cooperative fiscal regime, including extension of the specially protected cooperative status to qualifying housing cooperatives

Table 2: Final report recommendations (2024) and measures adopted in Law 1/2026 (Source: Project final report, TUBITAK 2219, 2024; BOE, 2026)

The correspondence is substantial. The procurement reserve addresses, from the demand side, the recommendation that public procurement participation be facilitated: it converts the public sector into a predictable customer for the organisational forms whose mission is the labour market integration of vulnerable groups. The declaration of these entities as providers of services of general economic interest provides legal cover for the public support they receive, in line with the report's emphasis on institutional support. The digitalisation of cooperative governance responds to the recommendation to simplify processes, and the fiscal reform follows the direction of the recommendation on tax incentives. One recommendation remains only partially answered.

The report identified the expansion of alternative financing mechanisms, impact investment funds and dedicated financial products for social entrepreneurs, as the key to easing limited access to finance in the start-up phase; Law 1/2026 improves the revenue prospects of established entities far more than it eases entry for new ones. In addition, the law consolidates the social economy frame rather than introducing a distinct social enterprise status, so ventures outside the traditional legal forms continue to operate without specific recognition (del Val Talen, 2022; Díaz-Foncea and Marcuello, 2023). For the ecosystem literature, the episode illustrates how the policy component does not merely coexist with finance, culture, and human resources but actively reshapes them (Spigel, 2017; Roy and Hazenberg, 2019).

6. CONCLUSION

This study set out to identify the elements that allow social enterprises to operate sustainably within Spain's social entrepreneurship ecosystem. The evidence from nineteen stakeholder interviews points to six interdependent components, social entrepreneurs, culture, policy and legislation, human resources, networks, and finance, whose interaction, rather than their separate presence, determines outcomes. Sustainability in the Spanish case rests on a specific configuration: a recognised legal framework anchored in the social economy tradition; diversified income that combines regional public support, grants, direct sales, and corporate partnerships; universities that manufacture both culture and talent, including through instruments such as the social transcript; and volunteer pipelines that flow through digital platforms and dense collaboration networks. For developing countries such as Turkey, where interest in social entrepreneurship is rising but the enabling environment is not yet fully developed, the project's recommendations follow the structure of its findings. On financial sustainability, alternative financing mechanisms such as impact investment funds and dedicated financial products should be expanded to diversify income sources and reduce over-reliance on grants and donations. On policy, governments should revise restrictive regulations, simplify bureaucratic processes, offer tax incentives, and facilitate the participation of social enterprises in public procurement; the Spanish reform of 2026 shows what such measures look like in practice. On education and culture, specialised training programmes and curricula in social entrepreneurship, together with instruments such as the social transcript, ensure a qualified workforce and a steady pipeline of founders. On human resources, career development opportunities, competitive compensation, and the fuller integration of volunteers into operations are the strategies that attract and retain talent. These recommendations apply to developing countries in general, since the enabling environment for social enterprises in such contexts is not yet fully formed and existing social enterprises face similar challenges. The study has limitations. It rests on a single country case observed mainly from one region, on a purposive sample, and on a legal reform whose implementation effects cannot yet be assessed. Future research should track how Law 1/2026 changes the behaviour of contracting authorities and the revenue structure of insertion enterprises and special employment centres, and should compare the Spanish configuration with Anglo-Saxon ecosystems in which the social enterprise category, rather than the social economy, organises the field. Such comparisons would refine the systemic approach advocated here, in which policy reform, financial innovation, and educational development interact to sustain social entrepreneurship and to advance the 2030 Agenda for Sustainable Development.

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SELECTION OF GAME DEVELOPMENT TOOLS BASED ON VIDEO GAME GENRE AND ARTIFICIAL INTELLIGENCE REQUIREMENTS: IMPLICATIONS FOR HIGHER EDUCATION AND ENTREPRENEURSHIP

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ABSTRACT

The selection of development tools in video game production plays a central role in determining development efficiency and overall product quality. In this paper, discussion on how video game genres and artificial intelligence requirements influence the selection of development tools is presented, while also exploring implications for higher education curricula and entrepreneurship. A structured dependency model is introduced in which genre defines gameplay mechanics, gameplay defines technical systems, and these systems, including AI components, influence tool selection decisions. The paper integrates theoretical foundations, technical analysis, and educational perspectives. The research results suggest that aligning tools with genre-specific and AI-driven requirements leads to more efficient development processes and more predictable outcomes. At the same time, the paper highlights how this framework can support curriculum design and entrepreneurial decision-making, particularly in environments where resources and time are constrained.

Keywords: *Game development, Game engines, Artificial intelligence, Video game genres, Tool selection, Higher education, Entrepreneurship*

1. INTRODUCTION

The video game industry has gradually evolved into one of the most technically demanding areas within software development, combining real-time rendering, physics simulation, artificial intelligence, and distributed systems. According to Newzoo (2023), the global games market reached approximately \$184 billion, reflecting both its scale and its increasing complexity. As development practices mature, it becomes clear that modern games are not built as isolated systems, but rather as tightly integrated environments where multiple subsystems must function simultaneously and reliably. This level of integration requires careful coordination between design, engineering, and production processes, which further increases the importance of structured development methodologies. Within this context, the selection of development tools, especially game engines, takes a critical role. These tools do not merely support development, they actively shape what is feasible within a project. However, in practice tool selection is often guided by familiarity, community trends, or prior experience rather than a structured evaluation of technical requirements. While this approach can be sufficient in smaller or experimental projects, it becomes problematic as system complexity increases. In larger projects, incorrect tool choices can lead to performance bottlenecks, scalability issues, and increased development costs, making early decision-making particularly important.

A similar pattern can be observed in higher education. Many educational programs emphasize learning specific tools without fully explaining why these tools are appropriate in particular contexts. As a result, students may develop operational skills without gaining the ability to critically assess technical decisions. This gap becomes even more significant in entrepreneurial settings, where incorrect decisions can have direct business consequences. Furthermore, the rapid evolution of development technologies makes it increasingly important for students to develop transferable knowledge rather than tool-specific expertise. This paper addresses these issues by proposing a structured dependency model that connects genre, gameplay, technical systems, artificial intelligence, and tool selection. It further extends this model to include educational and entrepreneurial implications, offering a unified perspective that bridges theory and practice. By explicitly linking design decisions to technical and business outcomes, the paper aims to provide a more systematic approach to tool selection that can be applied across both academic and industry contexts.

2. THEORETICAL FRAMEWORK

2.1. Genre as a Technical Constraint

In video games, genres are primarily defined by gameplay mechanics, rather than narrative themes, which distinguishes them from traditional media classifications (Arsenault, 2009; Adams, 2014). This distinction has important implications, as gameplay mechanics directly influence how systems must operate (Adams & Dormans, 2012). The way players interact with a game determines how frequently systems update, how responsive they must be, and how complex the underlying logic needs to become. For instance, fast-paced genres such as first-person shooters require continuous input processing and immediate feedback. Even minor delays can negatively impact the player's experience. By contrast, slower-paced genres such as role-playing games allow for more deliberate interaction but require more sophisticated data management and persistent world states. These differences are not merely stylistic, they fundamentally shape system design. From this perspective, genre can be understood as a form of technical constraint. It narrows the range of viable architectural solutions and influences which tools are suitable for development. This interpretation is particularly useful in educational contexts, where it encourages students to view genre as both a design choice and a technical commitment. It also provides a clearer framework for understanding how design decisions translate into system requirements.

2.2. Game Engines as Abstraction Layers

Game engines function as abstraction layers that encapsulate complex systems such as rendering, physics, and input handling (Lewis & Jacobson, 2002; Freiknecht et al., 2016; Gregory, 2018). These abstractions simplify development by allowing developers to work at a higher level, focusing on gameplay rather than low-level implementation details. However, this simplification introduces trade-offs that are not always immediately visible. High-level engines tend to support rapid development and reduce the initial learning curve, making them attractive for smaller teams and educational environments. At the same time, they may limit the degree of control available for optimization or customization. Conversely, more flexible or lower-level solutions provide greater control but require additional development effort and expertise. In practice, the suitability of an engine depends on how well its abstractions align with the requirements of the project. An engine that excels in rendering performance may be ideal for visually intensive genres, while another that emphasizes flexibility may be better suited for data-driven systems. These differences also influence team workflows, as some engines support visual scripting while others rely more heavily on programming.

Understanding these trade-offs is essential, particularly in higher education, where students must learn not only how to use tools but also how to evaluate them critically. From an entrepreneurial perspective, these decisions also have business implications, as engine licensing models and development efficiency can significantly affect costs.

2.3. Artificial Intelligence in Games

Artificial intelligence plays a central role in shaping gameplay experiences, although its objectives in games differ from those in other domains. Rather than striving for optimal decision-making, game AI often aims to produce behaviour that is believable and engaging. Traditional techniques such as finite state machines, behaviour trees, and pathfinding algorithms remain widely used because they offer a balance between predictability and performance (Russell & Norvig, 2016; Millington & Funge, 2016), although an adaptive AI variations have also been tested as a potential solution (Bakkes et al., 2009; Szita, 2009). The complexity of AI systems varies significantly across genres. In some cases, simple reactive behaviour is sufficient, while in others, more advanced decision-making systems are required. Strategy and simulation games, for example, often demand more sophisticated AI capable of planning and adaptation. These requirements directly influence tool selection, as not all engines provide the same level of support for AI development. When applied to education, game AI offers a valuable context for teaching algorithms and problem-solving. It allows students to observe how abstract concepts are applied in interactive systems. At the same time, it introduces additional challenges related to performance and scalability. In entrepreneurial contexts, AI can also serve as a differentiating factor, although its implementation must be balanced against resource constraints and development risk.

3. RESEARCH QUESTIONS

This research is guided by a set of research questions that address both technical and applied aspects of game development. The primary question focuses on how video game genres and AI requirements influence the selection of development tools. This question establishes the core relationship explored throughout the paper and provides a basis for further analysis. A secondary question focuses on whether these relationships can be formalized into a structured dependency model. This involves identifying consistent patterns that connect genre, gameplay, systems, and tools. Another important question concerns the role of this model in higher education, specifically how it can be used to improve curriculum design and student understanding. The research also considers entrepreneurial implications. In particular, it explores how startups can use structured reasoning to make more effective tool selection decisions under resource constraints. Finally, research also focuses on how project-based learning can incorporate these principles to better prepare students for real-world challenges. Together, these questions guide the overall structure of the paper and ensure that both theoretical and practical perspectives are addressed.

4. METHODOLOGY

The methodology used in this study is qualitative and analytical, combining literature review, conceptual modeling, and case-based reasoning. The literature review in the domain of game design, engine architecture, and artificial intelligence is used to provide certain conclusions and guidelines. Conceptual modeling is used to develop the dependency framework that connects genre, gameplay, systems, AI, and different tools. Rather than relying on statistical data, the model is derived through logical synthesis of relationships identified in the literature. This approach is appropriate given the conceptual nature of the research problem.

Case-based reasoning is used to illustrate how these relationships manifest in real-world development. Examples from existing games have been used to validate the model and demonstrate its practical relevance. In addition, the methodology incorporates an educational perspective, discussing how the model can be applied in curriculum design. An entrepreneurial perspective is also included, focusing on cost, scalability, and decision-making under constraints. While the methodology does not involve quantitative analysis, it is grounded in established theory and practical examples. This allows for a comprehensive analysis that integrates technical, educational, and business considerations. It also supports the development of practical recommendations for both developers and educators.

5. DEPENDENCY MODEL

5.1. Structure of the Dependency Model

The dependency model proposed in this paper represents a structured way of understanding how different aspects of game development are interconnected. Instead of treating design, systems, and tools as independent elements, the model positions them within a logical sequence where each layer builds upon the previous one. For the purposes of this research, the dependency model is defined as a hierarchical framework in which tool selection is derived from gameplay-driven system requirements and AI constraints. At its core, the model begins with genre, which defines the type of player interaction and the fundamental gameplay loop (Arsenault, 2009; Adams, 2014). Gameplay mechanics then determine which technical systems are required to implement these interactions. This kind of systems introduce constraints related to performance, memory, and synchronization, which in turn shape the requirements for artificial intelligence. Finally, tools are selected based on their functionalities required to support these combined requirements. This structure is particularly useful because it shifts the focus from tools to requirements. Rather than asking which engine is popular or widely used, developers are encouraged to ask what the game actually needs in order to function effectively. This change in perspective reduces the likelihood of making decisions based on incomplete or misleading criteria. It also provides a clearer framework for evaluating trade-offs between different tools. From an educational standpoint, the model helps students understand that development is not a linear process but a layered system of dependencies. Each decision has consequences that propagate through the entire project. One of the possible approaches in educational process is also to use the video games themselves as virtual learning environments (Shaffer et al., 2005; Dondlinger, 2007). This kind of approach combined with the proposed model can make learning even more engaging and practical experience.

5.2. Interpretation and Practical Application

While the structure of the dependency model is conceptually straightforward, its practical application requires careful interpretation. In real-world projects, the boundaries between layers are not always clearly defined. For example, gameplay decisions may evolve during development, which can alter system requirements and, consequently, tool selection. This dynamic nature means that the model should be applied iteratively rather than as a one-time decision-making process. In practice, the model serves as a diagnostic tool. It allows developers to trace problems back to their origin by focusing on how decisions at one level affect outcomes at another. For instance, performance issues may not be caused by the engine itself but by a mismatch between gameplay requirements and system design. By revisiting earlier stages of the model, developers can identify and address these mismatches more effectively. The model also has value in communication. In team environments, it provides a shared framework for discussing design and technical decisions.

This can improve collaboration by ensuring that all team members understand how their work fits into the overall system. In educational contexts, it can be used to structure assignments and projects, helping students connect theoretical concepts with practical implementation.

6. TECHNICAL REQUIREMENTS ACROSS GENRES

6.1. Performance and Real-Time Constraints

Performance requirements vary significantly across different video game genres, and understanding these differences is essential for selecting appropriate tools. Real-time video game genres such as first-person shooters and fighting games require consistent frame rates and minimal latency to maintain responsiveness. These constraints are not merely technical but directly influence player experience. A delay of even a few milliseconds can disrupt gameplay and reduce engagement. To meet these requirements, developers must optimize multiple subsystems simultaneously. Rendering pipelines must be efficient, physics calculations must be predictable, and input handling must be immediate (Cozzi & Bagnell, 2013; Gregory, 2018). These demands often favor engines that provide strong performance optimization features and low-level access to system components. However, achieving high performance is not solely dependent on the engine. It also requires careful system design and resource management. In educational contexts, performance analysis provides an opportunity to introduce students to real-time system concepts. By experimenting with different optimization techniques, students can observe how small changes affect overall performance. This hands-on experience reinforces theoretical knowledge and highlights the importance of efficiency in system design.

6.2. Data Management and System Complexity

Genres such as role-playing and simulation games introduce a different set of challenges related to data management. These games often require persistent world states, complex interactions, and large amounts of stored information. Managing this data efficiently is essential for maintaining performance and ensuring scalability. Unlike performance constraints, which are often visible during gameplay, data management issues may remain hidden until systems become more complex. For example, inefficient data structures or poorly designed storage systems can lead to slow loading times or memory leaks. These problems are often difficult to diagnose and may require significant refactoring. From a development perspective, effective data management requires careful planning and architectural design. Developers must consider how data is stored, accessed, and updated throughout the game. This involves choosing appropriate data structures, implementing caching mechanisms, and ensuring consistency across systems.

6.3. AI System Requirements

Artificial intelligence requirements are closely tied to both genre and gameplay mechanics. In some genres, simple reactive behaviour is sufficient to create engaging experiences. In others, more complex systems are needed to simulate decision-making and adaptation. These differences have a direct impact on tool selection, as not all engines provide the same level of support for AI development. For example, an FPS game may require AI that can navigate environments and respond quickly to player actions. In contrast, a strategy game may require AI that can evaluate multiple variables and plan long-term actions. Overall, creating an artificial intelligence remains one of the biggest challenges of video game developers (Millington & Funge, 2016). AI systems also introduce additional performance considerations. Complex algorithms can consume significant computational resources, which may affect other systems such as rendering. Developers must therefore balance AI complexity with overall system performance.

In an educational ecosystem, AI provides a rich context for learning algorithms and decision-making. This makes it a valuable component of both development and teaching. By combining AI with the video game development solutions educators can get a powerful tool for teaching even some of the most complex and challenging courses and topics, such as programming.

7. DEVELOPMENT TOOLS AND PIPELINES

7.1. Engine Capabilities and Selection Criteria

Selecting a game engine involves evaluating a wide range of factors, including performance, flexibility, scalability, and usability. Each engine has its own strengths and limitations, which makes it suitable for certain types of projects and less appropriate for others. Understanding these differences is essential for making informed decisions. One of the key considerations is how well an engine aligns with the technical requirements of the game. For example, an engine with strong rendering capabilities may be ideal for visually intensive projects, while another that emphasizes flexibility may be better suited for data-driven systems (Unity Technologies, 2023; Epic Games, 2023). In addition, developers must consider practical factors such as learning curve, community support, and available resources. In entrepreneurial contexts, these considerations are often influenced by business constraints. Licensing costs, development time, and team expertise can all affect the choice of engine. This adds another layer of complexity to the decision-making process. In education, exposing students to multiple engines can help them understand these trade-offs and develop critical evaluation skills.

7.2. Development Pipeline Structure

The development pipeline represents the sequence of stages through which a game progresses, from initial concept to the final deployment. Each stage involves specific tasks and requires appropriate tools. An efficient pipeline ensures that these stages are coordinated effectively, reducing development time and improving quality. In practice, pipelines are rarely linear. Iteration is a fundamental part of game development, and teams often revisit earlier stages to refine design and implementation. This iterative nature requires flexible tools that can adapt to changing requirements and AI systems add additional complexity to the pipeline. For example, AI development may require separate testing and validation processes. These processes must be integrated with other stages of development, and this can create coordination challenges. Related to the learning process, understanding pipelines helps students see the broader context of development and the importance of structured workflows, resulting in better development skills.

8. EDUCATIONAL IMPLICATIONS

8.1. Curriculum Design Based on the Dependency Model

The dependency model provides a valuable framework for designing educational programs in game development domain. By aligning courses with the stages of the model, educators can ensure that students develop a comprehensive understanding of the development process. This approach emphasizes connections between concepts rather than treating them as isolated topics. For example, students can begin by studying gameplay design and gradually progress to system implementation and tool selection. This progression mirrors real-world development processes and helps students understand how decisions are made in practice. It also supports interdisciplinary learning by integrating programming, design, and AI. In this way students can gain more comprehensive development skills.

Considering the student learning standpoint, this approach improves conceptual understanding and adaptability. Students learn not only how to use tools but also how to evaluate them critically. This prepares them for both industry and entrepreneurial environments.

8.2. Project-Based Learning and Skill Development

Project-based learning plays a central role in effective education for game development. It allows students to apply theoretical knowledge in practical contexts, bridging the gap between learning and application. Through projects, students can experience the challenges of tool selection, system design, and implementation. Working on projects also helps students develop important soft skills, such as teamwork, communication, and time management. These skills are essential in professional environments and are difficult to teach through traditional lectures. Projects can be structured around different genres, allowing students to explore a variety of technical requirements. This provides a more comprehensive learning experience and helps students understand how different systems interact. It also encourages experimentation and creativity. In addition, project-based learning aligns well with entrepreneurship education by allowing students to test ideas and develop prototypes.

9. EVALUATION

9.1. Evaluation of the Dependency Model

The dependency model proposed in this paper is evaluated through conceptual analysis and practical examples. Rather than relying on statistical validation, the evaluation focuses on consistency with established theories and observed development practices. The model aligns with established literature in game design, engine architecture, and artificial intelligence, which supports its validity (Lewis & Jacobson, 2002; Salen & Zimmerman, 2004; Adams, 2014; Freiknecht et al., 2016; Millington & Funge, 2016; Russell & Norvig, 2016; Fullerton, 2018; Gregory, 2018). One of the key strengths of the model is its ability to explain why certain tools are more suitable for specific genres. By tracing decisions back to gameplay and system requirements, the model provides a clear rationale for tool selection. This reduces reliance on intuition and improves decision-making. The model also demonstrates flexibility, as it can be applied to a wide range of genres and development contexts. This makes it useful for both industry and education. However, its effectiveness depends on accurate identification of requirements, which may vary between projects.

9.2. Evaluation in Educational Contexts

In educational settings, the model provides a structured framework for teaching game development. By emphasizing relationships between concepts, it helps students develop a deeper understanding of the subject. This approach contrasts with tool-centric education, which often focuses on procedural knowledge. Students who learn through this model are better equipped to evaluate tools critically. They can analyze requirements, compare options, and justify their decisions. This improves both learning outcomes and practical skills. In addition, the model supports project-based learning by providing a clear structure for assignments. Students can apply the model to their projects, which reinforces theoretical concepts and improves problem-solving abilities important for entrepreneurial ventures.

9.3. Limitations and Future Work

While the model provides a useful framework, it has certain limitations. It does not account for all possible factors influencing tool selection, such as organizational culture or external constraints. In addition, its qualitative nature means that it cannot provide fully precise predictions.

Future research could address these limitations by incorporating empirical methods. Surveys, experiments, or case studies could be used to validate the model quantitatively. This would strengthen its applicability and provide additional insights. Despite these limitations, the model offers a valuable starting point for understanding the relationship between genre, AI, tools, and education. It provides a good basis for further research and practical applications.

10. ENTREPRENEURSHIP IMPLICATIONS

10.1. Tool Selection as a Strategic Business Decision

In entrepreneurial environments, tool selection is rarely a purely technical matter. Startups typically operate with limited resources, which means that every decision must be carefully considered in terms of both cost and potential return. Choosing a development tool therefore becomes a strategic decision that can influence the entire lifecycle of a project. For example, selecting an engine with a low barrier to entry may allow a team to prototype quickly and test ideas in the market. This can be particularly valuable in early stages, where rapid iteration is often more important than long-term optimization. However, this choice may introduce limitations later on, especially if the project scales beyond initial expectations. On the other hand, choosing a more advanced tool may provide greater flexibility and performance, but at the cost of increased development time and complexity. For small teams, this can create additional pressure, as delays may affect funding and market opportunities. These trade-offs are rarely straightforward, and in many cases, there is no clearly optimal solution. What becomes important, therefore, is not simply the choice itself, but the reasoning behind it. A structured framework such as the dependency model proposed in this paper can help entrepreneurs make more informed decisions by linking technical requirements with business constraints and thus increases the likelihood of achieving a balanced outcome.

10.2. Innovation and Competitive Advantage

Tool selection also influences a startup's ability to innovate and differentiate its products. Advanced tools may enable unique gameplay features or more sophisticated AI systems. These features can enhance player engagement and provide a competitive advantage. However, innovation often comes with increased risk and complexity. Startups must evaluate whether the potential benefits justify the additional investment. In some cases, simpler tools may be sufficient to achieve the desired outcome. This points out the importance of aligning innovation strategies with available resources. In educational contexts, teaching students to evaluate these trade-offs prepares them for entrepreneurial challenges. It also encourages a mindset focused on value creation rather than solely on technology. As a result, tool selection becomes a key factor in both innovation and competitiveness.

11. CONCLUSION

This paper has shown that tool selection in video game development is best understood as the result of a chain of dependencies that begins with genre and extends through gameplay, systems, and artificial intelligence. While this relationship may appear intuitive, it is often overlooked in both practice and education. By making these dependencies explicit, the paper provides a framework that can support more informed decision-making. Developers can use it to align tools with technical requirements, educators can use it to structure curricula, and entrepreneurs can use it to balance innovation with feasibility. At the same time, it is important to acknowledge that real-world development is rarely perfectly structured. Constraints, uncertainties, and unexpected challenges are common.

For this reason, the model should not be viewed as prescriptive, but rather as a guiding framework. It offers a way to reason about decisions, rather than a fixed set of rules. In a field that continues to evolve rapidly, this kind of structured thinking may be more valuable than any specific tool or technology. Ultimately, the integration of genre, artificial intelligence, and educational considerations provides a more comprehensive perspective on game development. It highlights the importance of understanding not only how systems are built, but also why certain choices are made.

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ENHANCING FOOD SUPPLY CHAIN RESILIENCE THROUGH COLD CHAIN MANAGEMENT UNDER CLIMATE AND WEATHER DISRUPTIONS

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ABSTRACT

The cold chain represents a key component in international food logistics by ensuring continuity of quality and availability of perishable food products. Increasingly frequent climate and weather disruptions such as extreme temperatures, weather-related transport disruptions and the cumulative effects of gradual climate change, expose the cold chain to additional risks that threaten the resilience of the entire food supply chain. The paper explores how cold chain management, integrated with strategic weather risk management, contributes to strengthening the resilience of food supply chains in conditions of climate uncertainty. Starting from a review of the existing literature on food security, the European Union regulatory framework and the concept of supply chain resilience, the paper analyses the key vulnerabilities of the cold chain exposed during periods of crisis (COVID-19 pandemic, geopolitical disruptions, extreme weather events) and identifies adaptation mechanisms that enable faster recovery of the system. Based on a secondary case study of the banana cold chain in the European Union, the paper illustrates patterns of vulnerability and resilience in the system. To capture this exposure quantitatively, the paper develops an original composite index of climate and geopolitical risk for three leading EU banana suppliers, combining it with each country's import share to reveal aggregate EU exposure. The findings show that aggregate import exposure remained relatively stable even during major crises, while a growing concentration of imports from the highest-risk supplier emerges as the main structural vulnerability. The paper further links the findings to the broader concept of strategic integration of weather risk management into food supply chains, highlighting the role of trust among supply chain actors as a mechanism that facilitates coordination and collaboration in crisis situations. The paper provides a scientific contribution by introducing an original composite index of climate and geopolitical risk and by linking the operational perspective of the cold chain with the conceptual framework of trust-based resilience, thereby creating an opportunity for the development of integrated risk management strategies. The results can serve as a starting point for formulating practical recommendations for management and policy makers aimed at strengthening the resilience of the food sector in the conditions of increasingly pronounced climate challenges.

Keywords: cold chain, food supply chain, supply chain resilience, weather and climate risk

1. INTRODUCTION

The availability of food products throughout the year, regardless of the season of production or the distance from the source of supply, is now almost a given in developed economies. Behind this seemingly simple fact, however, lies a complex network of international transport flows in which the cold chain - a series of interconnected refrigeration operations from harvest and production to the store shelf - plays a role that is rarely noticed until it fails (Ndraha et al., 2018). It is precisely in recent years that the vulnerability of this network has been demonstrated: the COVID-19 pandemic, the war in Ukraine, the blockade of the Suez Canal and attacks in the Red Sea have exposed vulnerabilities that were previously considered a theoretical risk. In addition to these mostly one-time shocks, another, more gradual pressure is increasingly evident, and that is climate change and the associated frequency of extreme weather events that systematically undermine the reliability of the transport, storage and temperature control of perishable products (IPCC, 2022). Weather and climate risk is not a new phenomenon for agriculture and food trade in this sense, but in the context of the cold chain it takes on a new dimension because it does not only refer to crop loss, but also to the system's ability to deliver goods on time and in satisfactory quality within strictly defined temperature ranges. Heat waves that strain refrigeration equipment, droughts that prevent river traffic, storms that close ports or sudden temperature changes that accelerate the spoilage of goods in transit - all these phenomena are increasingly seen in the literature as an integral, rather than a peripheral, part of food supply chain risk management. The aim of this paper is to investigate how cold chain management, combined with strategic weather risk management, can contribute to strengthening the resilience of food supply chains in conditions of climate uncertainty. To this end, an overview of the theoretical framework of food safety, the cold chain and the concept of logistical resilience is first provided, followed by an analysis of the European Union regulatory framework relevant to food logistics. Special attention is paid to weather risk as a separate category of supply chain risk and to instruments for its strategic management. Crisis situations that have tested the resilience of the cold chain in the last decade are also analyzed, with special emphasis on the role of trust and cooperation among chain stakeholders as a mechanism that facilitates coordination in crisis conditions. Theoretical considerations are illustrated by a secondary case study of the banana cold chain in the European Union, chosen because bananas represent one of the most important and logistically demanding food products in international trade and therefore well illustrate the patterns of vulnerability and adaptation in the system. The paper is structured as following. After the introduction, there is a theoretical framework that combines an overview of the specificities of the cold chain, food supply chain resilience and European Union regulations, with the overview of weather risk and climate resilience in food supply chain. Central section gives a case study of the banana cold chain, followed by a discussion and concluding remarks with recommendations for management and policymakers.

2. THEORETICAL FRAMEWORK

2.1. Food safety, cold chain and food supply chain resilience

The modern understanding of food security has grown out of a series of definitions that have gradually expanded since the 1970s - from an emphasis on the mere physical availability of supplies, through access to food at the household level, to the currently accepted definition from the World Food Summit in 1996, according to which food security exists when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food to meet their dietary needs (FAO, 1996). The Food and Agriculture Organization of the United Nations (FAO) elaborated this definition in 2006 through four dimensions - availability, access, utilization and stability - to which, according to HLPE (2020), the ability of individuals to choose their own diet (agency) and the sustainability of food systems (sustainability) were later added.

The dimension of stability is particularly important for the topic of this paper, as it directly indicates that the availability and access to food must be preserved even in periods of disruption, whether it is economic shocks, geopolitical crises or weather and climate extremes. It is precisely the stability of supply that the cold chain operationally maintains. Without reliable temperature control during transport and storage, the availability of perishable food products would become a seasonal and local category, as it was before the development of industrial refrigeration. The cold chain consists of a series of interconnected steps - cooling immediately after harvest, refrigerated storage, refrigerated transport by land, sea or air, and refrigerated distribution to retail - in which the product must be kept within the prescribed temperature range in order to slow down microbiological and biochemical deterioration and extend its shelf life. The literature emphasizes that even short-term temperature deviations can irreversibly shorten the shelf life of perishable products, which is why the reliability of each individual link in the chain is as important as the reliability of the chain as a whole (Aung & Chang, 2014). This fact makes the cold chain structurally different from the rest of food logistics. While, for example, the late delivery of dry goods is mostly reflected only in the cost, the late or poorly controlled delivery of refrigerated goods results in direct product loss. Precisely because of this sensitivity, the cold chain has recently been increasingly viewed through the prism of sustainability and digitalization - from the use of sensors and IoT solutions for real-time temperature monitoring, through phase-change materials for passive temperature maintenance, to green logistics that seeks to reduce the energy and emission cost of refrigeration (Shi et al., 2024). Such an approach has a dual role: it increases the reliability of delivery, but at the same time reduces the vulnerability of the system to energy disruptions, which are closely related to weather and climate risk. Supply chain resilience is defined as the ability of a system to return to a desired or improved state after a disruption (Christopher & Peck, 2004). The authors who first systematically developed this concept proposed four principles for strengthening resilience - chain reengineering for built-in resilience, partner collaboration for sharing risk information, agility for rapid response, and a risk management culture - which are now recognizable in more modern resilience frameworks based on visibility, flexibility, contingency plans, and collaboration. The dynamic capabilities approach is particularly useful for understanding cold chain resilience, according to which companies must develop the ability to perceive threats, organizational preparedness, and flexibility and the ability to learn from crisis situations in order to mitigate risks in downstream supply chain processes (Nagy & Jámor, 2022). This approach is also relevant to the topic of this paper, as it indicates that resilience is not only a matter of physical infrastructure (cooling capacities, alternative routes), but also the organizational ability to recognize risk - including weather and climate - early enough and incorporate it into planning. International transport of perishable food products is predominantly carried out by sea. Around 80% of food imports into the European Union arrive by sea, while land transport connects ports with the hinterland and ensures distribution to retail outlets. Such spatial organisation makes the system dependent on a small number of large entry points (ports such as Rotterdam, Antwerp, Hamburg and Algeciras) and on a limited number of maritime straits and canals, such as the Suez Canal, through which a significant part of world trade passes. This concentration of flows, although it brings economies of scale, at the same time creates points of high vulnerability. If there is a disruption in one link, the consequences are quickly transmitted to the entire system (Verschuur et al., 2022). The European Union regulatory framework seeks to mitigate this vulnerability through a set of harmonised food quality and safety requirements. The General Food Law (Regulation (EC) No 178/2002) establishes the general principles of food law, including traceability and food safety responsibilities, while the Hygiene Regulation (Regulation (EC) No 853/2004) requires food business operators to implement procedures based on Hazard Analysis and Critical Control Points (HACCP). Furthermore, the Agreement concerning the International Carriage of Perishable Foodstuffs and the Special Equipment to be

Used for such Carriage (ATP) specifies technical requirements for refrigerated vehicles and temperature regimes in international transport (UNECE, 2024). In addition, international standards such as ISO 22000 and ISO 22005 provide widely adopted frameworks for food safety management and traceability within the chain. This layer of regulation acts as a kind of soft resilience infrastructure. It does not prevent disruption itself, but it ensures that all stakeholders speak the same language when it comes to quality requirements, facilitating rapid adaptation of routes and suppliers in crisis conditions. In recent years, the European Commission has further strengthened the institutional level of response to food supply disruptions by establishing the Expert Group on the European Food Security Crisis Preparedness and Response Mechanism (EFSCM), which regularly monitors the supply situation and proposes coordination measures among Member States (European Commission, 2023). Although this mechanism primarily targets geopolitical and market disruptions, its logic is directly applicable to weather and climate risks, as both types of disruptions operate through the same channels: transport delays, capacity shortages and rising energy costs.

2.2. Weather and climate risk in food supply chain

In the risk management literature, it is common to distinguish between catastrophic weather risk, such as hurricanes, floods or hailstorms that cause direct physical damage, and non-catastrophic weather risk, which refers to deviations from normal seasonal values of temperature, precipitation or wind that do not destroy assets but disrupt business through changes in demand, productivity or costs (Štulec, 2017). This distinction is particularly useful for understanding the cold chain because it shows that weather risk does not have to take the form of a catastrophe to cause serious consequences. For example, a prolonged period of unusually high temperatures increases the energy consumption of refrigeration equipment, while at the same time increasing the risk of product deterioration during transshipment when the cold chain may be temporarily interrupted. Empirical research in retail shows that weather conditions directly shape four fundamental purchasing decisions – what, where, when and in what quantity to buy – and that this effect is specific to a particular product, with different sensitivities across months (Štulec et al., 2019). Although this research focuses on consumption, it also suggests that the cold chain must be able to respond quickly to weather-related fluctuations in demand, not only to disruptions on the supply side, making thus weather risk management a two-way challenge. Climate change impacts the cold chain through two complementary channels. The first is the channel of acute physical risks - extreme individual events such as heat waves, floods, droughts or storms - that directly damage infrastructure or disrupt traffic. The second is the channel of chronic risks, or gradual changes in average climate conditions, such as rising average temperatures or changing precipitation patterns, that change the risk profile of individual regions and routes over the long term (Bertrand et al., 2024). Both channels are relevant for the cold chain: acute events cause immediate supply disruptions, while chronic changes increase the baseline energy load on refrigeration systems and change seasonal production patterns in exporting regions. The biggest methodological breakthrough in recent times has been models that attempt to quantify the exposure of individual locations to physical climate risk at the asset level, rather than just at the regional level. This approach distinguishes three dimensions of climate risk – anomaly relative to the historical average, extreme variability and acceleration of the trend – applied to ten of the most common climate hazards, including heat waves, floods, droughts and storms, based on historical and scenario climate data (Bertrand et al., 2024). By transferring such logic to the cold chain, management could identify in advance which links in the chain – ports, distribution centres, key roads – carry above-average and increasing exposure to a particular type of weather risk, rather than reacting to disruptions only when they occur.

Empirical research on agricultural supply chains in China confirms that climate change has a significant and lasting impact on the resilience of the system, and that diversification of products and supply networks, digital transformation (so-called Agriculture 4.0) and proactive climate action are key strategies for strengthening resilience in these conditions (Yuan et al., 2024). Interestingly, the same research shows that managers often react to climate risk only after it materializes, instead of systematically incorporating it into strategic planning. Such pattern is also recognizable in the practice of the European cold chain, where investments in additional cooling capacity or alternative routes are most often initiated only after the crisis, rather than as a preventive measure.

The social dimension of resilience is a special case. A study conducted on a sample of 260 companies in Australian food supply chains shows that climate-related extreme events significantly disrupt business operations, but that the negative impact can be mitigated by developed social capital and an appropriate level of supply chain network complexity (Ali et al., 2023). The authors distinguish between structural, relational and cognitive dimensions of social capital and show that high-quality and frequent communication, open information sharing and deep-rooted trust between the supply chain actors significantly contribute to faster recovery after climate-related disruptions. This finding directly connects the operational dimension of the cold chain with the concept of trust. Unlike catastrophic risks, which are traditionally covered by classic property insurance, non-catastrophic weather risk requires different instruments, such as weather derivatives and index insurance, because the damage is not in the physical destruction of assets, but in the financial loss caused by the deviation of business results from expectations.

Weather derivatives are financial contracts whose payout is based on a predefined weather index (for example, a number of degree-days above or below a certain threshold. They were developed for this very purpose and have proven effective in the food retail sector, where they can compensate for some of the lost sales caused by adverse weather deviations (Štulec, 2017). Similarly, the application of weather derivatives in agriculture has shown that hedging based on temperature, precipitation and wind indices can significantly reduce yield variability, which indirectly reduces the risk of instability in the supply of raw materials for the cold chain (Štulec et al., 2016). A broader review of index insurance instruments shows that most applications to date have focused on the primary production phase, primarily on drought protection in crop production, while the transport, storage and distribution phases, which are the core of the cold chain, are significantly less represented in the literature (Benso et al., 2023).

The authors also warn that risks are most often observed individually, although in reality they are intertwined. For example, a prolonged drought combined with a heat wave can together create a greater total risk than the sum of the individual ones. This finding has a direct implication for the cold chain: the combination of high air temperatures and a lack of precipitation, as occurred on the Rhine in 2018 and 2022, simultaneously increases the energy load on cooling systems and reduces the available transport capacity. Based on the reviewed literature, Table 1 summarizes the main categories of weather and climate risk relevant to the cold chain, their mechanism of action and the management strategies most often proposed in the literature.

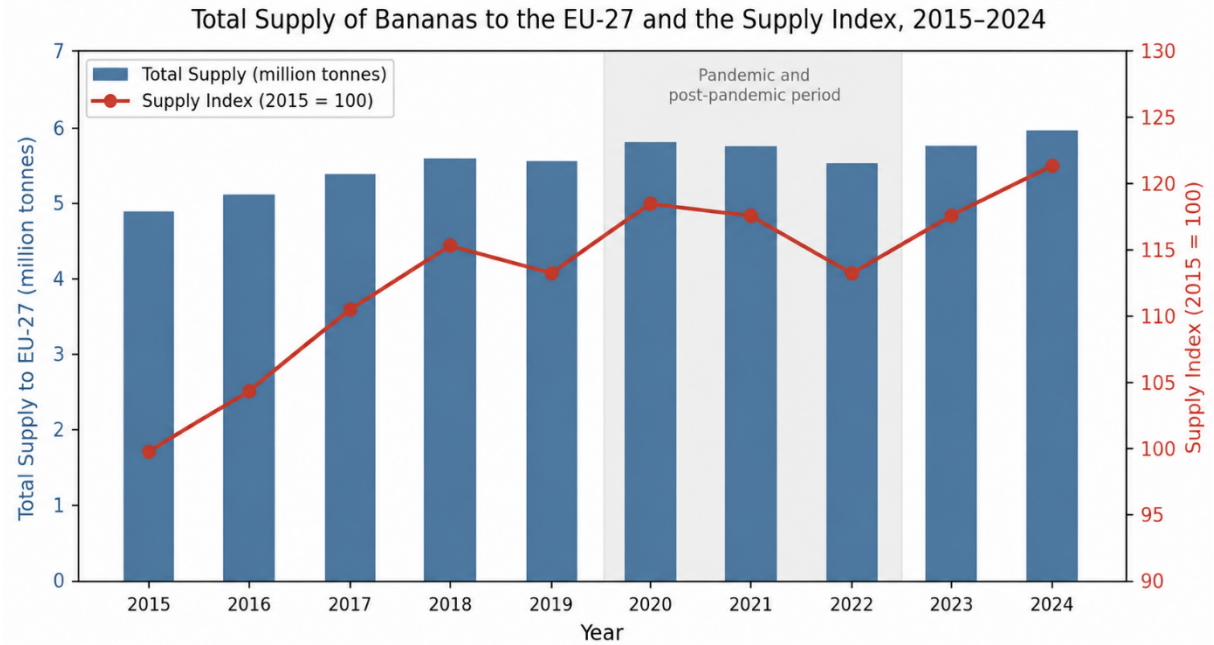
Risk category	Mechanism of action on the cold chain	Management strategies	References
Extreme weather (storms, floods, hail)	Physical damage to infrastructure, interruption of traffic corridors, loss of goods	Route and port diversification, safety stocks at key points, business continuity plans	Bertrand et al. (2024)
Heat waves and high temperatures	Increased energy load of cooling devices, shortening of the shelf life of goods in transit	Investments in more efficient and low-emission refrigeration equipment, real-time digital temperature monitoring	Trendova & Trendov (2025)
Droughts and low water levels in waterways	Reduction of river transport capacity, redirection to more expensive modes	Multimodal transport diversification, advance inventory planning	Jonkeren et al. (2007)
Non-catastrophic weather anomalies (seasonal temperature / precipitation anomalies)	Mismatch between supply and demand, financial loss without physical destruction of goods	Weather derivatives, index insurance, flexible procurement planning	Štulec (2017); Štulec et al. (2019)
Climate change (increasing average temperatures, changing precipitation regimes)	Change in the seasonality of production in export regions, long-term growth of the base energy load	Diversification of suppliers and regions of origin, long-term climate investment planning	Yuan et al. (2024); Bertrand et al. (2024)
Multi-peril risks	The combined effect of several risks (e.g. drought and heat wave) with a greater overall effect than the sum of the individual ones	Risk dependency modeling, scenario planning and stress testing	Benso et al. (2023)

Table 1: Weather and climate risk categories in the cold chain and associated management strategies

3. CASE STUDY: THE BANANA COLD CHAIN IN THE EUROPEAN UNION

Bananas were chosen as an illustrative example because they bring together all the challenges described in the previous chapters: they are produced almost exclusively outside the European Union, they depend on long trans-oceanic transport under strictly controlled temperature conditions, and they represent one of the most important food products in the international fresh

fruit trade. The analysis is based on secondary statistical data from the European Commission (DG AGRI) for the period 2015-2024. The total supply of bananas in the EU-27 increased from 4.92 million tonnes in 2015 to 5.99 million tonnes in 2024, i.e. the supply index (2015=100) reached 121.71 in 2024. The trend was not linear: after strong growth until 2018, there was a slight decline in 2019, then growth in the pandemic year 2020, a milder decline in 2021, and the most pronounced annual decline of 3.56% in 2022, followed by a recovery in 2023 and 2024 (Figure 1). This pattern confirms one of the central findings of the paper, that cold chain disruptions do not necessarily manifest themselves as a sudden collapse in supply volumes, but often as a combination of rising costs, extended delivery times and occasional, time-limited supply drops. The most pronounced drop in supply over the entire period under review, by 3.56% in 2022, coincides with a period of cumulative pressures: continued disruptions related to the pandemic in the first half of the year, a sharp increase in energy and fertilizer prices and, according to FAO reports, adverse weather conditions in some production regions that reduced the availability and application of fertilizers (FAO, 2024). This data supports the thesis that climate and weather risks rarely appear in isolation, but are most often intertwined with economic and geopolitical pressures, resulting in a cumulative effect greater than the sum of the individual causes.



*Figure 1: Trends in total EU-27 banana supply and the base index, 2015-2024.
(Source: Authors representation according to European Commission (2025))*

The supply structure shows a strong dependence on imports: the share of Latin America, the dominant source of supply, increased from 70.8% in 2015 to 76.1% in 2024, while the share of African, Caribbean and Pacific (ACP) countries decreased from 14.2% to 12.5%, and the share of EU production remained below 12% of total supply throughout the period under review. This concentration on a small number of exporting regions represents a structural vulnerability of the system since any change in climatic conditions or institutional stability in these exporting countries is directly transmitted to the security and stability of supply on the European market. In order to quantify this exposure more precisely, a composite index combining climate risk, geopolitical fragility and the EU's trade dependence on its three largest suppliers (Ecuador, Colombia and Costa Rica) is constructed below and used to analyse how this exposure changed over the period 2015-2023 (Table 2).

Climate risk is represented by ND-GAIN Country Index rank, which reflects the country's climate vulnerability and readiness for adaptation (Notre Dame Global Adaptation Initiative, 2024). Geopolitical risk is represented by the overall score of the Fragile States Index, which reflects institutional and geopolitical fragility (Fund for Peace, 2015–2024). The two risk indicators are normalized to a range of 0–1 and combined with equal weights (0.5/0.5) into a composite country risk. Multiplying this result by each country's share of imports and summing across all three countries yields an annual index of the EU's overall exposure to climate and geopolitical risk in this segment of the banana supply chain. Equal weights were put on climate risk and geopolitical fragility, following the recommendation of the OECD/JRC Handbook on Composite Indicators (OECD/European Union/EC-JRC, 2008), according to which equal weighting is recommended when no robust theoretical or empirical evidence exists to justify differential importance among dimensions. Although climate risk, geopolitical disruptions and import dependency affect cold chain resilience through different mechanisms, current literature does not provide quantitative evidence supporting one component being consistently more influential than the others across different contexts.

Country / Year	2015	2016	2017	2018	2019	2020	2021	2022	2023
Ecuador – Composite Risk	0.64	0.62	0.62	0.61	0.60	0.60	0.60	0.60	0.61
Colombia – Composite Risk	0.58	0.58	0.58	0.57	0.55	0.56	0.58	0.57	0.57
Costa Rica – Composite Risk	0.35	0.34	0.35	0.34	0.34	0.33	0.34	0.34	0.33
Aggregate EU exposure index	0.342	0.321	0.337	0.336	0.315	0.327	0.342	0.340	0.345

Table 2: Composite climate and geopolitical risk index for the three largest EU banana suppliers, 2015–2023

Source: Authors' calculation based on Notre Dame Global Adaptation Initiative (2024), Fund for Peace (2015–2024) and European Commission (2025)

Notation

$i \in \{EC, CO, CR\}$ = exporting country; t = year (2015–2023)

$R_{i,t}$ = ND-GAIN rank; N_t = no. of ranked countries (192)

$F_{i,t}$ = Fragile States Index score (0–120)

$M_{i,t}$ = imports from i (t); S_t = total EU supply (t)

w_1, w_2 = risk weights, $w_1 + w_2 = 1$. Baseline weights used in the case study: $w_1 = w_2 = 0.5$.

Formulas

normalised climate risk (0-1):

$$C_{i,t} = R_{i,t} / N_t$$

normalised geopolitical risk (0-1):

$$G_{i,t} = F_{i,t} / 120$$

composite country risk:

$$K_{i,t} = w_1 \cdot C_{i,t} + w_2 \cdot G_{i,t}$$

import share

$$U_{i,t} = M_{i,t} / S_t$$

weighted country contribution:

$$D_{i,t} = U_{i,t} \cdot K_{i,t}$$

aggregate EU exposure index:

$$I_t = \sum_i D_{i,t}, \quad I_t \in [0, 1]$$

The results at the country level show a structurally heterogeneous group of suppliers. Ecuador carries the highest composite risk (0.60–0.64) over the entire period, reflecting a combination of a relatively poorer ND-GAIN score and moderate to high institutional fragility, while its share of EU imports has simultaneously increased from 25.3% in 2015 to 27.9% in 2023. Costa Rica, by contrast, combines the lowest climate vulnerability and the lowest institutional fragility of the three countries, yielding a composite risk of only 0.33–0.35, and functions as a stabilizing base within the supplier portfolio despite its smaller (16–19%) market share. Colombia occupies an intermediate position, with the highest geopolitical fragility component of the three countries (reflecting its long-standing internal conflict), but significantly lower climate risk than Ecuador. At the aggregate level, the EU exposure index has remained within a relatively narrow range (0.315–0.345) throughout the period 2015–2023, including the COVID-19 pandemic (2020) and the war in Ukraine (2022), supporting the broader thesis of supply chain resilience – diversification across structurally diverse countries mitigates aggregate volatility even as country-specific risk fluctuates. However, after the 2019 trough, the index shows a gradual increase, driven almost entirely by Ecuador’s growing share of imports rather than by a deterioration in Ecuadorian risk itself, which has remained relatively stable. This suggests that the main emerging vulnerability in the EU banana supply chain is not a generalised deterioration in climatic or geopolitical conditions in exporting countries, but rather a gradual concentration of import volumes towards the single source with the highest risk in the portfolio. Overall, the case study shows that the banana cold chain in the European Union, despite occasional declines and a constant increase in cost and operational risk, has maintained a relatively high resilience thanks to three factors that directly relate to the theoretical framework of this paper: the diversification of supply routes within a limited number of export regions, the existence of infrastructure capacities that allow the absorption of temporary shocks, and - although secondary statistical data cannot directly measure this - the assumed continuous temperature control during long transoceanic transport, without which a visible increase in supply during the crisis would be difficult to imagine.

4. DISCUSSION ON STRATEGIC INTEGRATION OF WEATHER RISK MANAGEMENT AND THE ROLE OF TRUST IN THE SUPPLY CHAIN

Weather and climate risks in the cold chain rarely act independently, but are intertwined with other disruptions such as pandemics and geopolitical crises, which together cause extended transport times, increased costs and reduced reliability of refrigeration control. Experiences from the COVID-19 pandemic, the war in Ukraine and the Red Sea disruptions show that different types of risks operate through similar mechanisms, which justifies the development of integrated resilience strategies instead of separate approaches for individual threats. Research confirms that natural disasters are among the most significant risks for the cold chain, while existing resilience measures only partially mitigate their negative impact on business performance (Khurshid & Siddiqui, 2024). In recent literature, resilience is increasingly viewed through the concept of social capital, which encompasses structural connections between partners, the quality of their relationships and shared understandings and norms of behaviour. Research conducted on a sample of food companies shows that high levels of trust and frequent, quality communication between supply chain partners significantly mitigate the negative impact of climate-related extreme events on business, while an overly complex network of partnerships can partially negate this positive impact if not accompanied by appropriate coordination (Ali et al., 2023). For the cold chain, this finding has concrete practical implications. When a weather disturbance occurs - for example, a sudden heat wave that threatens the quality of goods in transit or a sudden port closure due to a storm - the speed and quality of the response largely depend on whether there is a relationship of trust already established between manufacturers, carriers, forwarders and distributors that allows for rapid

information exchange and joint decision-making, rather than subsequently seeking blame or waiting for contractually defined procedures. The strategic management of weather risk should therefore not be limited only to financial instruments such as weather derivatives and index insurance, however useful they may be for mitigating the financial consequences of unfavorable weather deviations (Štulec et al., 2016; Benso et al., 2023), but also to building organizational mechanisms of trust and cooperation that enable a quick operational reaction. A practical integration of these two levels - financial and relational - could look like this: companies in the cold chain identify in advance locations and routes with elevated and growing exposure to certain types of climate risk, using approaches such as the one developed by Bertrand et al. (2024), then consider financial instruments for protection against non-catastrophic weather deviations for these locations, and in parallel build formal and informal information exchange mechanisms with partners in the chain so that the operational response to extreme weather events can be carried out without delay. Such an integrated approach directly responds to the call from the literature to view cold chain resilience not as a sum of isolated technical solutions, but as a system in which infrastructure, financial instruments and interpersonal relationships work together.

5. CONCLUSION

The paper started from the question of how cold chain management, coupled with strategic weather risk management, contributes to the resilience of food supply chains in conditions of climate uncertainty. Three main findings emerge from the analysis. First, weather and climate risk in the cold chain operates through two complementary channels - acute events that directly disrupt transport and infrastructure, and chronic trends that gradually change the energy and seasonal profile of the system - and both channels require different but complementary management strategies, from route diversification and investments in more efficient refrigeration equipment to financial instruments such as weather derivatives and index insurance. Second, empirical examples of crisis periods - the COVID-19 pandemic, the war in Ukraine, disruptions in the Suez and Red Seas - show that the cold chain most often absorbs weather risk through cost increases and extended delivery times, and only in extreme cases through a direct decline in the physical volume of supply, a pattern confirmed in the case study of the banana cold chain in the European Union. Third, the resilience of the cold chain depends not only on the technical and financial infrastructure, but also on the level of trust and the quality of cooperation among supply chain actors, which enables a rapid coordinated response when the risk materializes. The scientific contribution of the paper is twofold. Methodologically, it introduces an original composite index of climate and geopolitical risk, applicable beyond the banana case to other import-dependent perishable food categories. Conceptually, it links three levels - operational (cold chain), financial (weather risk management instruments) and relational (trust and cooperation) - into a single conceptual framework, which opens up necessity for the development of integrated risk management strategies that go beyond the usual practice of monitoring individual risks in isolation from each other. Practical implications for food business management include the need to systematically map the climate exposure of key nodes in the cold chain, consider financial instruments to protect against non-catastrophic weather deviations, and consciously invest in long-term relationships of trust with partners in the chain, which act as a kind of additional, non-financial safety net in times of crisis. For policymakers, the findings suggest that regulatory and institutional mechanisms such as the European Food Security Crisis Preparedness Mechanism (EFSCM) should explicitly include weather and climate risk in their scope, rather than treating it as a marginal category alongside geopolitical and market disruptions. The paper also has limitations that provide opportunities for future research.

The case study is based on aggregated secondary statistical data that do not allow for direct measurement of operational indicators of the cold chain, such as actual temperature deviations or duration of interruptions per shipment, so conclusions about the role of temperature control are necessarily based on indirect interpretation. Focusing on a single product, however representative, makes it difficult to generalize to other categories of perishable goods with different temperature requirements and seasonality. Future research should therefore combine secondary statistical data with primary data from practice - for example, temperature records at critical points in the chain or interviews with transporters and distributors - and empirically test the extent to which social capital and trust indeed mediate the relationship between climate risk and resilience in the European context of the food cold chain, following the example of research conducted in other geographical areas. Such an approach would allow for a more precise quantification of the contribution of strategic weather risk management to the overall resilience of food supply chains in the face of increasing climate challenges.

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MARKETING'S NEW SECRET AGENTS: HOW ARTIFICIAL INTELLIGENCE IS TRANSFORMING MODERN MARKETING

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ABSTRACT

Artificial Intelligence (AI) is fundamentally transforming modern marketing through its growing integration into everyday business processes. This paper conceptualizes AI-powered systems as "marketing's new secret agents"—intelligent, data-driven technologies that operate behind the scenes to optimize marketing strategy, customer engagement, and decision-making. The study examines the impact of AI across three key areas: predictive analytics for customer insight and forecasting, personalized content and customer experiences, and AI-driven customer service and communication. Drawing on recent academic literature and industry case studies, the paper demonstrates how AI improves operational efficiency, enhances return on investment (ROI), and enables companies to scale personalized customer relationships. At the same time, it discusses important challenges associated with AI adoption, including data privacy, algorithmic bias, transparency, and the evolving role of human creativity in marketing. The paper argues that AI has evolved from a technological innovation into a strategic necessity, while emphasizing that its successful implementation requires balancing technological capabilities with ethical responsibility and authentic human interaction.

Keywords: *Artificial Intelligence (AI), marketing technology, predictive analytics, personalization, customer relationship management (CRM), digital transformation, ethics in AI, automation*

1. INTRODUCTION

The integration of artificial intelligence (AI) into marketing is rapidly transforming the way organizations communicate with consumers, develop marketing strategies, and manage customer relationships. AI-powered technologies create new opportunities for personalized communication, predictive analytics, and automated customer service, fundamentally changing how businesses interact with their target audiences. As these technologies become increasingly widespread, it is essential to examine not only their business benefits but also their ethical implications, particularly regarding data privacy, algorithmic bias, and transparency. The growing role of AI presents marketers with both significant opportunities and important challenges.

While AI enables organizations to improve efficiency, optimize decision-making, and deliver highly personalized customer experiences, concerns continue to emerge regarding consumer manipulation, the transparency of automated decisions, and the changing role of human marketers. Consequently, understanding the broader implications of AI has become increasingly important for both researchers and practitioners. Traditionally, marketing decisions relied heavily on managerial intuition, demographic analysis, market research, and A/B testing. Although these approaches remain valuable, they are often reactive and time-consuming. In contrast, modern AI systems operate continuously in real time, processing vast amounts of information from social media platforms, online behaviour, purchase histories, and digital interactions. By identifying hidden patterns and predicting consumer intentions, AI enables marketers to make faster and more informed decisions. Today, AI supports a wide range of marketing activities. Intelligent systems personalize content for individual customers, optimize advertising expenditure through automated bidding systems, forecast market trends with increasing accuracy, and provide continuous customer support through AI-powered chatbots and virtual assistants. Importantly, many of these processes operate seamlessly in the background. Consumers often receive highly relevant recommendations, personalized offers, or timely assistance without realizing that artificial intelligence is driving these interactions. This paper explores how AI functions as marketing's "new secret agent" by examining its applications in predictive analytics, personalization, and customer relationship management. It also discusses the strategic benefits and ethical challenges associated with AI adoption, demonstrating that successful marketing increasingly depends on combining advanced technological capabilities with responsible and human-centred decision-making.

2. UNDERSTANDING AI AGENTS

The term AI agent has become increasingly common in articles, films, and academic publications. Although its meaning varies slightly depending on the context, the core concept remains largely the same. IBM defines an AI agent as a system that "can automatically complete tasks on behalf of users ... by designing its own workflow and using available tools" (Hu, Downie & Finio, 2024). In a more formal scientific definition, Sapkota, Roumeliotis and Karkee (2025) describe AI agents as "autonomous software entities designed to perform goal-directed tasks in constrained digital environments." This distinguishes them from earlier expert systems. All of these definitions point to the same conclusion: an AI agent is not simply a passive assistant that follows commands. Instead, it is an active system capable of setting goals, interacting with its environment, and using other tools or systems whenever necessary. So, what does this mean in practice?

An AI agent is essentially a software system capable of making decisions, completing tasks, responding to changes, and adapting its behaviour autonomously. According to Sapkota, Roumeliotis and Karkee (2025), three key characteristics provide the core framework for understanding AI agents:

- 1) **Autonomy:** After deployment, AI agents require minimal human intervention. They can observe their environment, interpret events within a given context, and execute predefined tasks or modify their actions based on what they perceive. This autonomy enables customer service bots, scheduling tools, and other business applications to operate efficiently at scale (Sapkota, Roumeliotis & Karkee, 2025).
- 2) **Task-specificity:** AI agents are designed to perform specific tasks. They are particularly effective at repetitive activities such as filtering emails, searching databases, synchronizing calendars, or processing routine customer requests. This specialization allows organizations to automate processes accurately, consistently, and efficiently (Sapkota, Roumeliotis & Karkee, 2025).

- 3) Reactivity and adaptation: AI agents can respond to real-time events, including user requests, external API calls, and changes in system status. Some systems continuously improve through feedback loops, heuristics, or updated contextual information, allowing them to generate increasingly personalized recommendations and more natural conversational interactions (Sapkota, Roumeliotis & Karkee, 2025).

The IBM paper further illustrates the difference between AI assistants and AI agents through a simple metaphor. While an AI assistant typically waits for instructions, an AI agent is proactive. After receiving an initial objective, it can identify sub-goals, break down complex tasks, design workflows, and execute them without continuous human guidance (Hu, Downie & Finio, 2024). In short, an AI agent is a software system that proactively plans, executes, and adjusts its actions to achieve a defined objective. It may also access external tools, databases, or other digital resources whenever necessary. The growing importance of AI agents in business integration is also illustrated in a presentation delivered at the Marketing Summit Hungary 2025 by Ralf Strauss, chairman of the European Marketing Confederation (Strauss, 2025). The presentation demonstrates how AI agents function as contextual layers connecting business data, known as "truth systems," with dynamic decision-making processes, referred to as "context systems." Rather than operating as isolated tools, AI agents increasingly form part of broader intelligent ecosystems that enable adaptive business intelligence and more effective organizational decision-making (Strauss, 2025).

3. TYPES OF AI AGENTS

Researchers commonly distinguish five primary categories of AI agents: simple reflex agents, model-based reflex agents, goal-based agents, utility-based agents, and learning agents (Stryker, 2024). Each category possesses distinct capabilities and applications, ranging from basic autonomous systems to highly adaptive AI models (Stryker, 2024). *Simple reflex agents:* These represent the simplest type of AI agent because they react directly to environmental inputs. They operate according to predefined condition–action rules whenever specific conditions are met, without considering previous events or future consequences. Examples include thermostats that regulate temperature based on sensor data and traffic lights that respond to real-time traffic conditions. Simple reflex agents perform well in stable and predictable environments but cannot learn from experience or adapt when tasks become more complex and require memory, learning, or strategic planning (Stryker, 2024).

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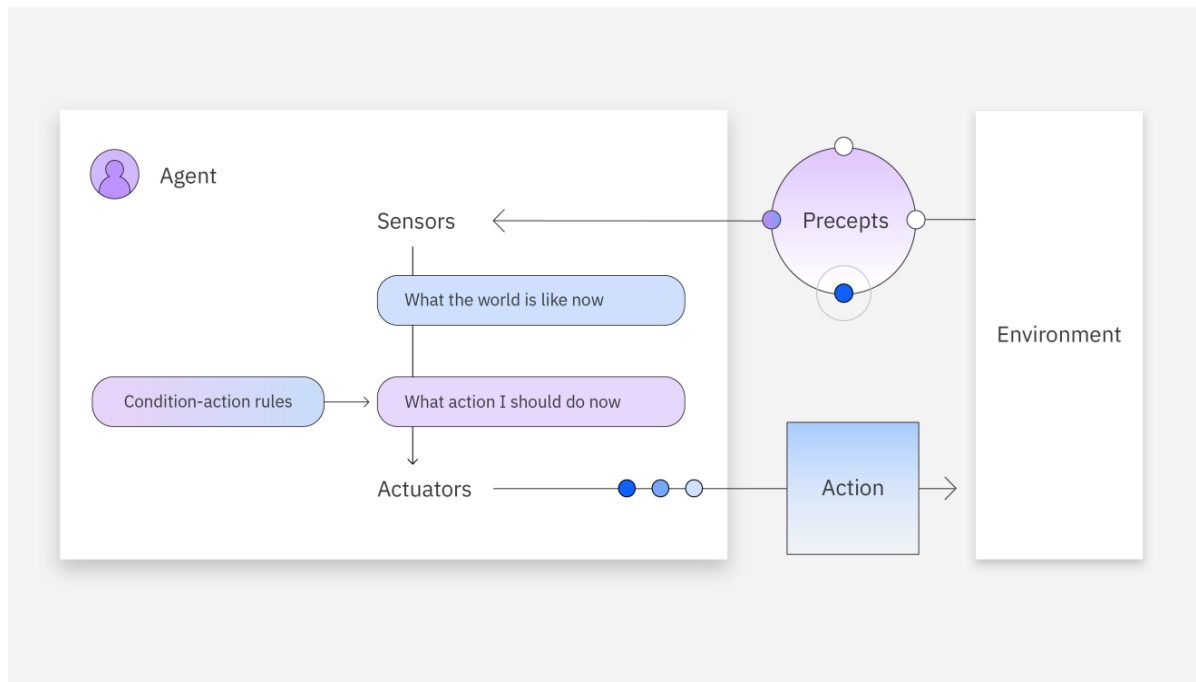


Figure 1. Simple reflex agent operation.
Source: Stryker (2024).

Model-based reflex agents: These extend simple reflex agents by combining condition–action rules with an internal model of the environment. This internal model allows the agent to track environmental changes, remember previous interactions, and make more informed decisions. Model-based agents can function effectively even when only partial information about the environment is available. For example, a robot can navigate a room by remembering previously detected obstacles, even if they are temporarily outside its field of view. Although these agents are more adaptable than simple reflex agents, they still lack the advanced reasoning and learning capabilities required for highly dynamic environments (Stryker, 2024).

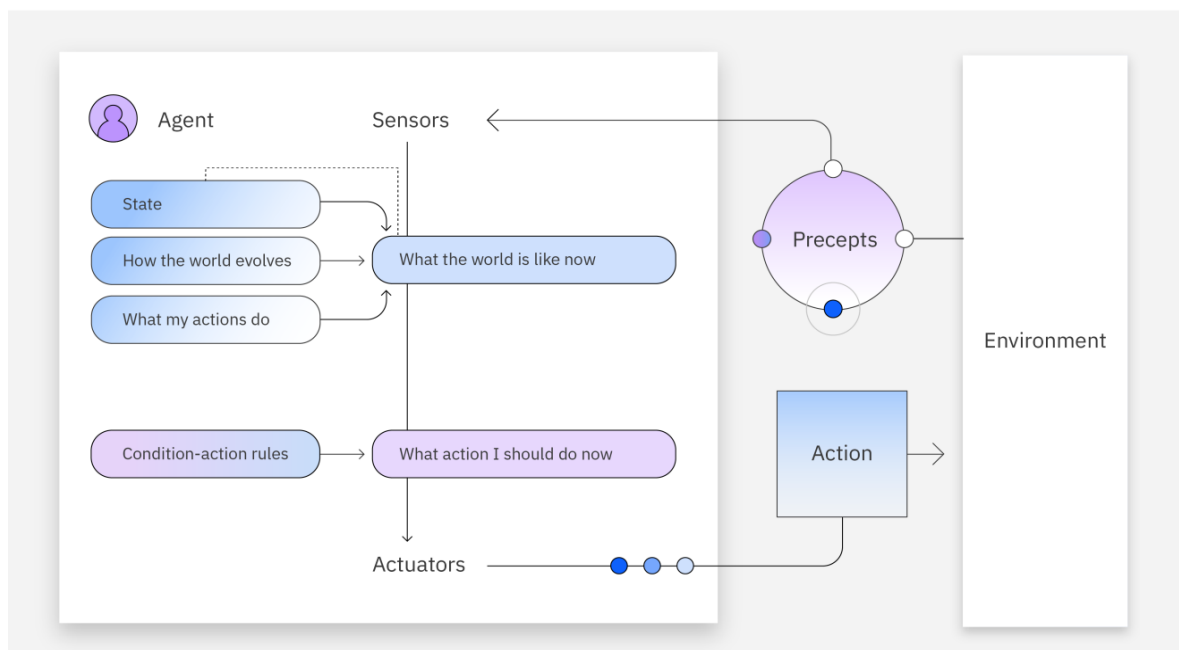


Figure 2. Model-based reflex agent operation.
Source: Stryker (2024).

Goal-based agents: These agents extend the capabilities of model-based agents by incorporating planning and goal-oriented reasoning. Instead of responding solely through predefined rules, they evaluate alternative actions according to how effectively each contributes to achieving a desired objective. For example, an autonomous robot determines the safest and most efficient route to a destination while avoiding obstacles. This proactive approach enables forward planning and more intelligent decision-making. Goal-based agents are widely applied in robotics, simulation systems, and autonomous vehicles (Stryker, 2024).

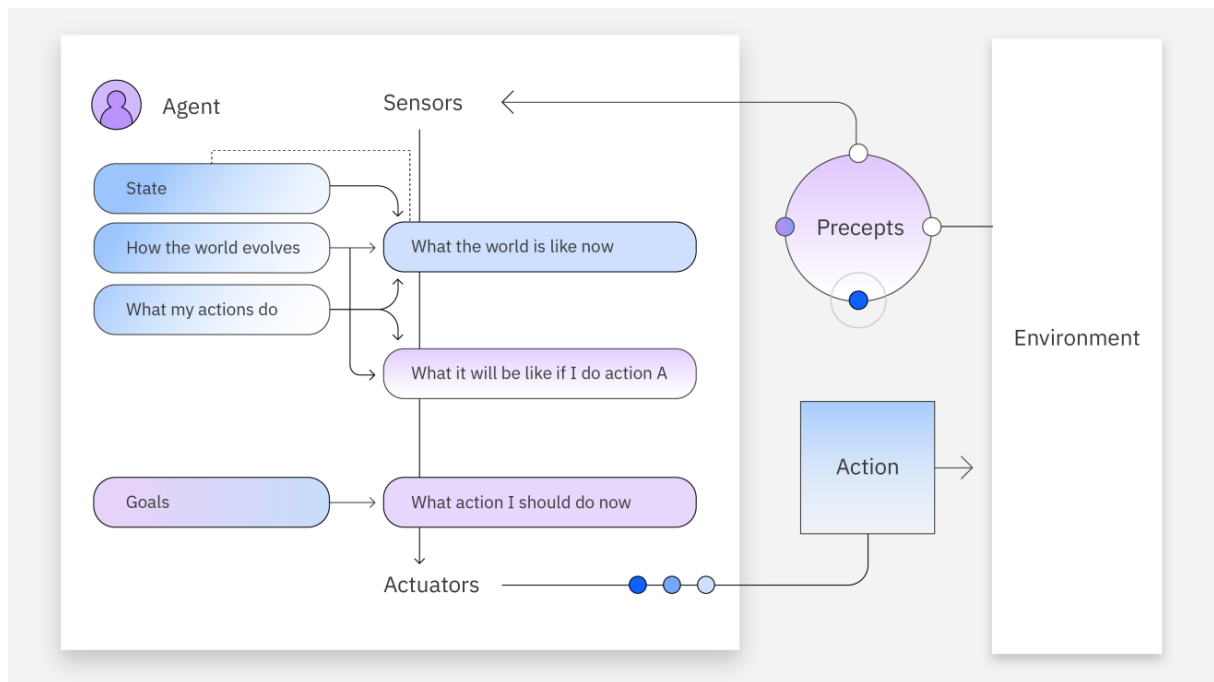


Figure 3. Goal-based agent operation.
Source: Stryker (2024).

Utility-based agents: These agents introduce a utility function that evaluates alternative actions and selects the one expected to produce the highest overall benefit. Rather than simply achieving a predefined goal, they consider multiple possible outcomes and trade-offs to maximize overall utility. Although designing an appropriate utility function can be challenging, this approach enables more flexible and intelligent behaviour in complex decision-making environments (Stryker, 2024).

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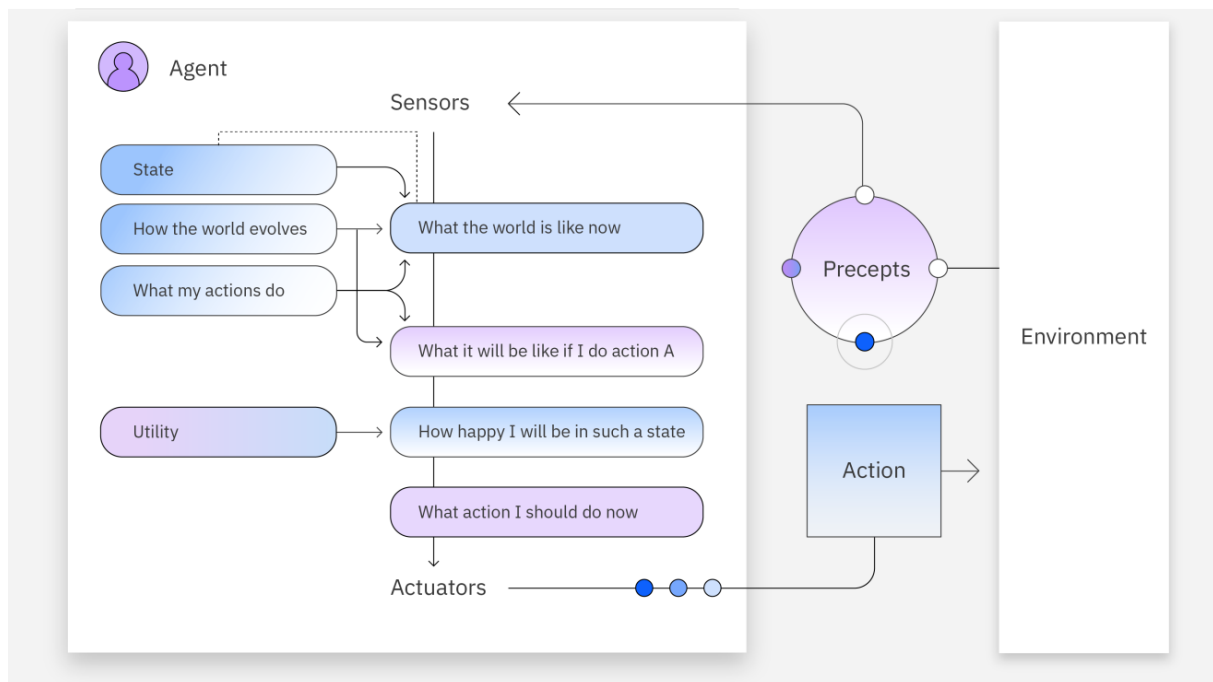


Figure 4. Utility-based agent operation.
Source: Stryker (2024).

Learning agents: Learning agents continuously improve their performance by incorporating new experiences and information from their environment. Unlike rule-based systems, they adapt their behaviour as circumstances change. Their architecture typically consists of performance, learning, critic, and problem-generation components that enable continuous improvement through feedback and exploration. Learning agents are widely used in autonomous vehicles, robotics, virtual assistants, and personalized recommendation systems based on natural language processing (NLP) (Stryker, 2024).

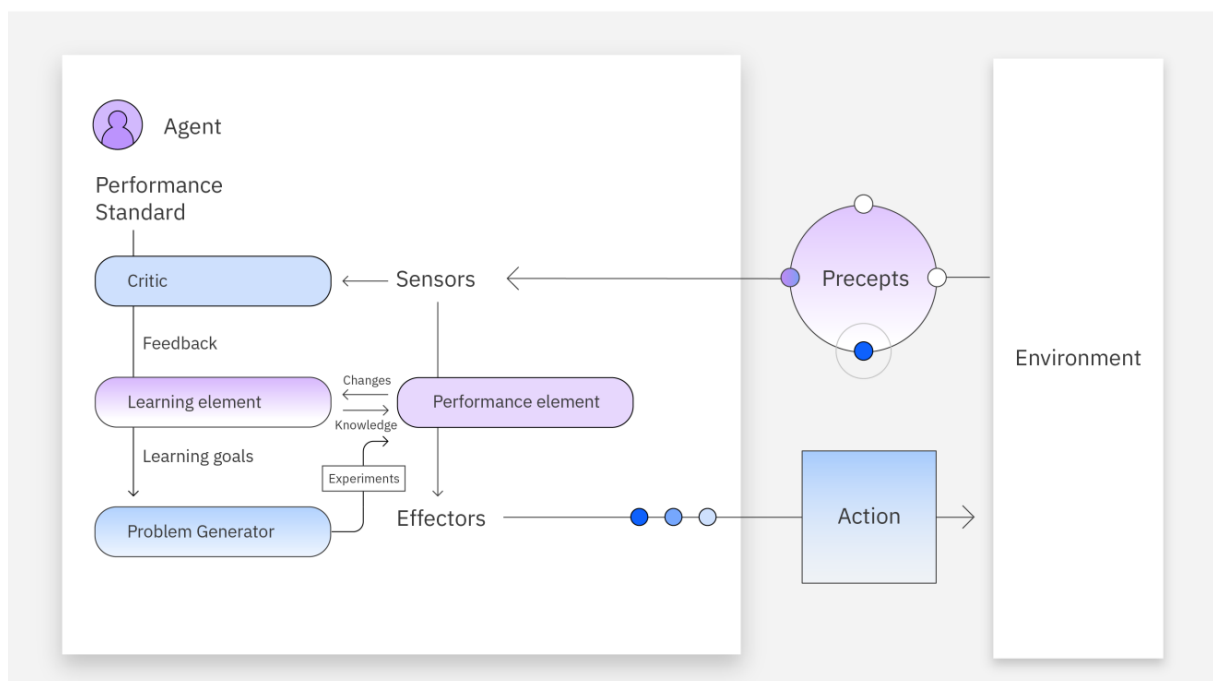


Figure 5. Learning agent operation.
Source: Stryker (2024).

Beyond these five categories, multi-agent systems (also referred to as hierarchical agent systems) coordinate multiple AI agents to solve complex problems by dividing them into smaller, specialized tasks. By orchestrating simple reflex, model-based, goal-based, utility-based, and learning agents, these systems can operate autonomously in real time while improving flexibility, optimizing business processes, and reducing the need for human intervention. Such architectures are increasingly applied in manufacturing, e-commerce, healthcare, logistics, and robotics.

4. BEST PRACTICES FOR IMPLEMENTING AI AGENTS

The literature identifies several fundamental principles for the effective design, deployment, and management of AI agents. *Define clear and focused goals.* AI agents perform most effectively when their objectives are clearly specified and limited in scope. Broad or ambiguous instructions may reduce performance and increase the likelihood of errors. Sapkota, Roumeliotis and Karkee (2025) argue that a mismatch between task complexity and agent architecture may result in either over-engineered or under-engineered solutions. *Enable integration with external tools and data sources.* Effective AI agents should interact seamlessly with external applications, databases, APIs, and other digital systems rather than operate in isolation. According to IBM, connectivity and the ability to perform "tool calling" are defining characteristics that distinguish AI agents from conventional AI assistants (Hu, Downie & Finio, 2024). *Incorporate memory and feedback mechanisms.* AI agents should be able to store previous interactions, evaluate outcomes, and learn from experience. Such feedback mechanisms enable continuous improvement and more adaptive behaviour over time (Hu, Downie & Finio, 2024). *Balance autonomy with human supervision and security.* Although AI agents are designed to operate autonomously, excessive autonomy may create risks such as hallucinations, incorrect decisions, or endless execution loops. IBM therefore emphasizes the importance of human oversight, particularly during the early stages of deployment (Hu, Downie & Finio, 2024). *Match the agent architecture to task complexity.* Sapkota, Roumeliotis and Karkee (2025) emphasize that organizations should select an architecture appropriate to the complexity of the task. Employing a multi-agent framework for relatively simple tasks introduces unnecessary complexity, while relying on a single-agent architecture for complex, multi-step problems may reduce reliability and overall performance. *Monitor agent behaviour and ensure transparency.* Because AI agents operate in dynamic environments and continuously adapt their behaviour, organizations should implement monitoring, logging, and explainability mechanisms. Transparent decision-making increases trust, facilitates governance, and enables organizations to identify potential problems before they become critical.

5. Advantages and Challenges of AI Agents: A Practical Perspective

Based on the practical experience of one of the authors, an AI agent can be defined as an entity that perceives its environment and acts to achieve a specific goal. Approximately two years ago, one of the authors began experimenting with AI agents while developing an automated workflow for a technology company focused on partner evaluation. Instead of relying on basic scripts, the system was built using n8n, a workflow automation platform that enables the creation of complex step-by-step processes. The original objective was to automate the entire content marketing workflow, including collecting news, summarizing articles, generating visual concepts, and publishing content on social media platforms such as Telegram and LinkedIn. In practice, the final solution proved to be somewhat simpler. The AI agent successfully collected headlines, filtered relevant information, used GPT to generate draft texts and image concepts, and prepared ready-to-publish social media posts for human review.

Nevertheless, developing the system revealed several practical challenges. The most significant obstacles were development time and operational costs. Because AI agent technology is still relatively new, building a reliable custom solution required weeks or even months of development, while existing ready-made solutions rarely met the project's specific needs. In addition, operating multiple APIs and integrating different platforms significantly increased costs, especially when higher-quality outputs were required. Technical issues such as slow performance, unstable testing, and missing API credentials for specific services also affected the development process. These practical experiences provide a useful starting point for evaluating both the advantages and disadvantages of AI agents and for examining how issues related to efficiency, complexity, and costs influence marketing applications.

5.1. General Benefits of Automation and System Efficiency

Despite these initial challenges, AI agents offer clear advantages that make them valuable in fields such as finance, marketing, and other business environments where efficiency and consistency are essential. Even relatively simple automation tasks, such as collecting news or preparing articles, can significantly reduce repetitive manual work, illustrating one of the main benefits of AI: increased efficiency. At a broader organizational level, this concept develops into intelligent systems where digital agents perform key business processes autonomously. Research shows that AI agents improve organizational decision-making by automating repetitive activities such as data processing, account management, and compliance monitoring. Automating these tasks reduces human error while providing faster insights and improving operational efficiency. Rather than simply following predefined rules, AI agents continuously adapt to changing business conditions, enabling organizations to respond more quickly to dynamic market environments.

5.2. Benefits of AI Agents in Marketing Performance

The advantages of AI become particularly visible in marketing. The practical experience gained during the development of the AI-supported content publishing system demonstrates how marketing activities can be significantly accelerated through automation. Tasks such as customer segmentation, content preparation, campaign management, inventory monitoring, and information processing can all be optimized using intelligent systems. Previous studies similarly report that automation reduces operational errors while enabling marketers to analyse data in real time and allocate advertising budgets more efficiently (Cunha, 2024). AI agents not only execute predefined marketing tasks but also adapt campaigns dynamically by adjusting budgets, audience targeting, creative content, and promotional strategies according to changing market conditions. Consequently, AI improves both marketing efficiency and the responsiveness of strategic decision-making.

5.3. Challenges and Risks of AI Agents in Marketing

The same autonomy that makes AI agents highly effective also introduces important risks. During the development of the content automation system, managing multiple API connections for GPT, LinkedIn, Telegram, and other platforms frequently resulted in synchronization problems and technical failures. Although these issues may initially appear minor, they illustrate broader challenges associated with integrating multiple AI systems within complex digital environments. A failure affecting one platform may create cascading problems across the entire workflow, making it difficult to maintain consistent brand communication. The growing sophistication of AI agents also raises significant ethical and legal concerns. Highly persuasive AI-generated advertising may unintentionally cross the boundary between effective persuasion and consumer manipulation.

Furthermore, algorithmic bias may influence content selection, recommendation systems, or visual generation if appropriate human oversight is absent. Such biases can gradually damage brand reputation, reduce consumer trust, and expose organizations to legal and regulatory risks. Although AI agents offer considerable efficiency gains, organizations should complement technological innovation with robust governance mechanisms, including data protection, ethical guidelines, and clear human accountability. Ultimately, the successful adoption of AI agents depends not only on technological performance but also on responsible governance. To minimize risks such as cascading system failures, hidden algorithmic bias, or unethical decision-making, organizations should establish transparent monitoring systems and clear accountability structures. Research increasingly emphasizes transparency regarding who develops, deploys, and supervises AI agents, where they operate, and how their decisions are made. In practice, this requires digital identification of AI agents, continuous monitoring, and comprehensive logging of their activities. If an AI system makes an incorrect decision—for example, by overspending on advertising, distributing misleading information, or treating certain customer groups unfairly—it should be possible to identify both the source of the problem and the responsible stakeholders. Therefore, although AI agents can substantially improve efficiency and save time, their long-term success depends on integrating ethical principles and responsible governance into both their design and implementation.

6. COMPARISON WITH RELATED CONCEPTS

6.1. AI Assistant vs. AI Agent

The terminology used to describe intelligent systems has become increasingly complex in recent years. It is therefore important to clearly distinguish between AI assistants, AI agents, generative AI, and agentic AI, as these concepts are closely related but represent different technological approaches. Understanding these differences enables researchers and practitioners to design, implement, and evaluate AI solutions more effectively. AI assistants typically perform only the tasks explicitly requested by users, such as answering questions, writing emails, or managing schedules. According to IBM, AI assistants "need a clearly defined problem or question to get started ... and require ongoing support from the user" (Charlotte, Amanda & Matthew, n.d.). AI agents, by contrast, operate with a much higher degree of autonomy. After receiving an initial goal or prompt, they "can work on their own after the initial prompt." They evaluate assigned objectives, break complex tasks into smaller subtasks, and create workflows to achieve predefined goals (Charlotte, Amanda & Matthew, n.d.). In simple terms, the assistant waits for instructions, whereas the agent takes initiative. As IBM summarizes: "AI assistants are reactive; they do what you tell them to do. AI agents are proactive; they operate autonomously to achieve a given goal by any means necessary" (Charlotte, Amanda & Matthew, n.d.). The main differences can be summarized as follows:

- Scope of control: AI assistants are user-driven, whereas AI agents are goal-driven and may modify their own strategies.
- Interaction mode: AI assistants mainly operate through conversational or question-and-answer interactions, while AI agents organize tasks, use external tools, and may interact with other systems (Charlotte, Amanda & Matthew, n.d.).
- Autonomy: AI assistants generally have limited memory, planning capabilities, and tool usage, whereas AI agents may possess all of these characteristics (Charlotte, Amanda & Matthew, n.d.).

Consequently, when designing an intelligent system, an important question is whether it should simply assist users with specific tasks (AI assistant) or operate more autonomously by managing workflows, accessing external tools, and adapting to new information with minimal human intervention (AI agent).

6.2. Generative AI vs. AI Agents

Generative AI refers to AI systems based on large foundation models—such as large language models (LLMs) or image generation models—that produce text, images, code, audio, or other content in response to user prompts. Their behaviour is fundamentally reactive, as they generate outputs only after receiving an explicit request. As Sapkota, Roumeliotis and Karkee (2025) explain, generative AI systems "only generate output when explicitly prompted and do not autonomously pursue goals or reason on their own". AI agents build upon these generative capabilities by adding objectives, planning, reasoning, and tool integration. According to Sapkota, Roumeliotis and Karkee (2025), AI agents are "modular systems controlled and enabled by LLMs and LIMs for task-specific automation" that extend large language models through the use of external tools, sequential reasoning, real-time information retrieval, and autonomous execution of multi-step workflows. The main differences between generative AI and AI agents can therefore be summarized as follows:

- Generative AI: Prompt → Output. It typically has limited memory and does not pursue goals autonomously.
- AI Agent: Goal → Strategy → Actions. It uses external tools, may retain contextual memory, reasons sequentially, and adapts its behaviour as tasks evolve.

For example, a generative AI model can produce a draft article after receiving a prompt. An AI agent, however, can independently identify relevant sources, retrieve information, write the article, request feedback, publish the content, and subsequently monitor audience reactions. In other words, AI agents perform complete goal-oriented workflows rather than isolated content-generation tasks.

6.3. AI Agent vs. Agentic AI

The concept of agentic AI extends beyond individual AI agents by referring to coordinated multi-agent systems with persistent memory, meta-planning, and dynamic collaboration. According to Ranjan et al. (2025), agentic AI represents a paradigm shift characterized by multi-agent cooperation, dynamic task allocation, persistent memory, and coordinated autonomy. Similarly, Sapkota, Roumeliotis and Karkee (2025) distinguish between individual AI agents and agentic AI by defining AI agents as "single-entity systems that perform goal-oriented tasks using external tools," whereas agentic AI consists of "multiple specialized agents that coordinate, communicate, and dynamically allocate subtasks within a broader workflow to achieve a common goal". The principal differences include:

- Scale: AI agents operate as individual entities, whereas agentic AI consists of coordinated networks of multiple agents.
- Architecture: Agentic AI manages communication, coordination, task allocation, and shared memory across multiple agents.
- Complexity and scope: AI agents are generally suited to modular and well-defined tasks, whereas agentic AI is designed for complex, distributed, and continuously changing environments such as robotic fleets, enterprise automation, or large-scale scientific research.

Consequently, organizations should carefully determine whether a particular application requires a single AI agent or a coordinated multi-agent architecture. The decision largely depends on whether the workflow is relatively linear or requires continuous coordination, adaptation, and collaboration among multiple intelligent agents.

6.4. Summary of the Comparisons

The main differences between these concepts are summarized in Table 1.

Concept	Definition & Core Capability	Autonomy & Workflow	Application Case
AI Assistant	The tool reacts to human commands, but it doesn't have its own goals. (Charlotte, Amanda, Matthew, n.d.)	Low: requires human prompts, limited memory and planning	Chatbots, scheduling assistants.
Generative AI	Reactive model that generates text, images, or code in response to prompts. (Sapkota, Roumeliotis, & Karkee, 2025)	Low: planning based on prompts, not goals	Draft generation, image synthesis.
AI Agent	Goal-oriented, employs tools and logic, and carries out multi-step processes. (Charlotte, Amanda, Matthew, n.d.).	Medium-High: memory potential, tool utilisation, and autonomy after launch	Automation of business workflows, autonomous software agents.
Agentic AI	Multi-agent system, coordination, dynamic task allocation, emergent behaviour. (Sapkota, Roumeliotis, & Karkee, 2025)	Very High: network of agents, persistent memory, self-organising	Robotics fleets, adaptive enterprise systems.

Table 1. Comparison of AI Assistants, Generative AI, AI Agents, and Agentic AI
Source: Authors' own compilation

Researchers and practitioners should clearly understand these distinctions, since misclassifying an AI system may lead to inappropriate system design, unrealistic expectations, and unsuitable evaluation criteria. For example, treating a generative AI model as an autonomous AI agent may overlook the importance of workflow management, planning, and external tool integration. Conversely, designing a simple AI assistant when an autonomous AI agent or agentic AI system is required may significantly reduce the effectiveness of business automation.

7. REAL-LIFE APPLICATIONS AND CASE STUDIES

7.1. Case Study: Autonomous Marketing and the Content Pipeline

One of the clearest ways to demonstrate the practical value of AI agents is through the automation of step-by-step marketing workflows. A practical example of this approach was implemented by one of the authors using n8n to automate content publishing for a technology company's Telegram and LinkedIn channels. The workflow begins by scanning online sources for news matching predefined keywords. The agent then filters the results, selects the most relevant information, and prepares concise summaries.

These summaries are subsequently processed by a large language model (GPT), which generates social media posts and proposes accompanying visual concepts. Instead of spending several hours each week preparing content manually, the automated workflow performs almost the entire process, leaving only the final approval to a human editor before publication. This case demonstrates one of the key strengths of AI agents: their ability to coordinate multiple tools and external services—including large language models, company software, and social media platforms—to achieve a broader business objective. Although the implementation involved practical challenges, such as API costs and integration issues between different platforms, the overall benefits were substantial. The system significantly reduced the time required for content creation and publishing, allowing marketing professionals to focus more on strategic communication, creativity, and audience engagement.

7.2. High-Stakes Automation in Financial Services and Accounting

Beyond marketing applications, AI agents are increasingly being deployed in high-stakes environments where accuracy, consistency, and regulatory compliance are essential. One example highlighted in the literature is the use of intelligent bookkeeping systems. These systems employ autonomous agents to perform complex, multi-step financial processes, including transaction classification, invoice processing, and continuous compliance monitoring. By automating repetitive accounting tasks, AI agents reduce human error while providing faster access to real-time financial information. Such systems must integrate reliably with existing enterprise software while adapting to changing regulatory requirements. Compared with the marketing case presented above, which focused on content creation and digital communication, financial AI agents operate under significantly stricter security and governance requirements. Nevertheless, both applications pursue the same objective: transforming time-consuming manual processes into intelligent, autonomous workflows that improve efficiency, accelerate decision-making, and reduce operational errors.

7.3. Generalizing AI Agents Across Autonomous Workflows

The principles demonstrated in marketing and finance can also be applied to many other industries. AI agents are increasingly capable of designing and managing their own workflows rather than simply executing predefined instructions. As discussed earlier, modern AI agents perceive their environment, analyse information, make decisions, and execute actions while coordinating multiple external tools to achieve specific objectives. For organizations, this enables intelligent automation of increasingly complex activities. Examples include identifying software bugs and automatically generating potential fixes together with corresponding test cases, or managing global supply chains by monitoring inventory levels and adjusting purchasing decisions based on demand forecasts. These examples illustrate that advanced AI agents do more than execute isolated tasks—they continuously adapt their strategies according to new information and previous outcomes. As AI agents become capable of planning, reasoning, learning, and coordinating multiple processes, they represent a significant step forward in intelligent automation across a wide range of industries.

8. CONCLUSION

This paper has demonstrated that Artificial Intelligence is transforming modern marketing through the emergence of increasingly autonomous AI agents. By combining predictive analytics, personalized customer experiences, and automated decision-making, AI agents are shifting marketing from a largely intuition-driven discipline toward a data-driven and continuously optimized business function. Organizations that successfully integrate AI into their marketing activities can improve operational efficiency, strengthen customer relationships, and achieve higher returns on marketing investments.

At the same time, these technological capabilities introduce important ethical and managerial challenges. Issues such as data privacy, algorithmic bias, transparency, and consumer trust require continuous attention. If these challenges are not addressed responsibly, the long-term benefits of AI may be undermined by declining consumer confidence and increasing regulatory concerns. The future of marketing therefore depends not on replacing human marketers with artificial intelligence but on creating effective collaboration between people and intelligent systems. Marketing professionals will increasingly act as designers, supervisors, and interpreters of AI-supported decision-making rather than performing repetitive operational tasks themselves. In conclusion, AI agents are no longer experimental technologies but strategic business tools that are becoming integral to modern marketing practice. Their successful adoption requires not only technological innovation but also responsible governance, ethical decision-making, and a continued focus on authentic human relationships. By combining these elements, organizations can fully exploit the potential of AI while creating sustainable value for both businesses and consumers.

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NAVIGATING CROSS-CULTURAL LEADERSHIP AND MANAGEMENT: A SYNTHESIS OF COLLABORATIVE AND INDEPENDENT SCHOLARSHIP FROM THE CENTER FOR CROSS CULTURAL COMPARISONS

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ABSTRACT

This review synthesizes and analyzes the contributions the Center for Cross Cultural Comparisons (CCCC; <https://crossculturalcentre.homestead.com/>), and affiliated scholars to the field of cross-cultural leadership and management. Through both collaborative and independent research, this research stream provides significant empirical and theoretical insights into leadership preferences, value orientations, and management practices across diverse cultural contexts. The article highlights key publications, methodological approaches, and theoretical implications, with particular attention to large-scale quantitative studies, the development and validation of cultural frameworks, and the application of findings in global management practice. We examine two major research streams: the Slavic Leadership Project (Ljubica & Littrell, 2024), which validates a culture-specific leadership model in Slavic nations, and the FEELS Project (Follower Endorsed Effective Leadership and Sustainability; Warner-Søderholm, et al., 2024), which integrates followership and sustainability into cross-cultural leadership analytics. The review concludes with a critical analysis of the contributions and limitations of this work, discussing its relevance to the Management and International Management literatures and academic communities, and outlining future research trajectories in dynamic and culturally complex global environments.

Keywords: *cultural orientations, cross-cultural leadership, followership, global management leadership prototypes, Slavic leadership, sustainability*

1. INTRODUCTION

Despite the recent articulations related to the “end of the globalization era” (CITE), the inevitable, unstoppable and ever-increasing globalization of businesses necessitates research of the same character, thus, a deeper understanding of how diverse cultural contexts across the globe shape leadership and management practices. Scholars affiliated with the Center for Cross Cultural Comparisons (CCCC, see <https://crossculturalcentre.homestead.com>) have, during the last three decades, both collaboratively and independently, produced a substantial corpus of research that maps and explains cross-cultural variations in leadership preferences and managerial behavior. This article reviews their contributions, emphasizing how their work bridges theoretical rigor with practical application, complicates simplistic cultural dichotomies, and provides tools for developing global leadership capabilities.

2. THEORETICAL AND METHODOLOGICAL FOUNDATIONS

The research projects of the CCCC are based on culturally contingent leadership theory (House et al., 2004) which posits that societal culture shapes followers’ attitudes about leaders’ practices and behaviors, hence, the way they interpret and evaluate such behaviors for compatibility with what they consider desirable and effective.

The more consistent the perceived practice or behavior of the leader is with such employee attitudes, the more positive the employee response. Conversely, if cultural values and norms of employees in a society are incongruent with perceived leader behaviors and practices, employees may become dissatisfied with (those aspects of) their jobs and unmotivated to display expected behaviors and performance (House et al., 2004). The central argument of the theory is, therefore, that managerial leadership in business is influenced by value priorities in a specific culture (Ljubica & Littrell, 2024).

With this regard, the CCCC scholars utilize quantitative, survey-based methodologies, employing the established frameworks such as Hofstede's (Hofstede, 1980; 2001; 2006; Hofstede et al., 2008) cultural dimensions, his Value Survey Module (VSM08; Hofstede et al., 2008) in particular, and Schwartz's (Schwartz, 1992; 1996; 2012) value orientations alongside Leader Behavior Description Questionnaire, version XII (LBDQXII; Stogdill, 1963; 1969). These instruments are used to test and refine culturally contingent leadership theory and across nations (for a detailed review see: Littrell, 2013, abbreviated descriptions of VSM08 and LBDQXII dimensions are presented in Table 1), arguing for the utility of the CCCC's dimensions in academic research as well as in organizational training and development.

3. MAJOR RESEARCH STREAMS AND FINDINGS

3.1. Collaborative Work: Leadership Preferences and Cultural Value Orientations

A central theme of the CCCC research is the examination of which explicit leadership behaviors are perceived as effective across cultures. Studies compare preferences for 12-factor explicit leader behaviors across two large categories - task-oriented and people-oriented (for a detailed description see: Stogdill, 1963; Littrell, 2013; Ljubica & Littrell, 2024), including for instance, charismatic, team-oriented, and participative leadership, in diverse national contexts. Thus far, from the commencement of the CCCC research activities in 1994, the scholars gathered in the CCCC have obtained datasets containing approximately NN observations (examinees, participants) from NN countries covering all continents of the globe. This research challenges East-West dichotomies and highlights nuanced national profiles.

Leader Behavior Dimension	Description
Representation	Measures to what degree the manager speaks as the representative of the group.
Demand Reconciliation	Reflects how well the manager reconciles conflicting demands and reduces disorder to system.
Tolerance of Uncertainty	Depicts to what extent the manager is able to tolerate uncertainty and postponement without anxiety or getting upset.
Persuasiveness	Measures to what extent the manager uses persuasion and argument effectively; exhibits strong convictions.
Initiation of Structure	Measures to what degree the manager clearly defines own role, and lets followers know what is expected.
Tolerance of Freedom	Reflects to what extent the manager allows followers scope for initiative, decision and action.
Role Assumption	Measures to what degree the manager exercises actively the leadership role rather than surrendering leadership to others.
Consideration	Depicts to what extent the manager regards the comfort, well-being, status and contributions of followers
Production Emphasis	Measures to what degree the manager applies pressure for productive output.
Predictive Accuracy	Measures to what extent the manager exhibits foresight and ability to predict outcomes accurately.
Integration	Reflects to what degree the manager maintains a closely-knit organization; resolves inter-member conflicts.
Superior Orientation	Measures to what extent the manager maintains cordial relations with superiors; has influence with them; is striving for higher status.
Cultural Value Dimension	Description
Power distance	The extent to which less powerful people accept that power is distributed unequally.
Individualism	The extent to which people see themselves as independent rather than part of a tightly connected group.
Masculinity	The extent to which assertiveness, competition, and achievement are socially valued.
Uncertainty avoidance	The degree to which a culture feels comfortable with ambiguity and uncertainty.
Long-term orientation	The extent to which a culture emphasizes persistence, adaptation, and future goals.
Indulgence	The extent to which a culture allows relatively free gratification of basic human desires and enjoyment.

Table 3. Descriptions of Leader Behavior and Cultural Value Dimensions in the LBDQXII and VSM08
 (Source: authors according to: Stogdill, 1963; 1969., and Hofstede et al., 2008)

Adding to the research targeting specific countries and subnational variations in culture and leadership, the CCCC has also investigated clusters consisting of multiple countries with strong historical, socio-cultural and business links. The most recent project with such scope was the “Slavic Leadership Project”, that is, an investigation of the cultural value priorities and leadership preferences among three Slavic tribes (Eastern, Southern and Western Slavs) and the dynamics between them (Ljubica & Littrell, 2024). On the other hand, the FEELS (Follower Endorsed Effective Leadership and Sustainability) stream of the CCCC takes a global approach, using an innovated survey and adding a sustainability dimension to the employee perception of preferred leader behaviors. We elaborate on these two major streams of research below.

3.2. The Slavic Leadership Project

A significant collaborative output is the special issue published in the Cross Cultural research journal, titled: “Opening the Black Box: Culture & Leadership in Slavic Nations” (guest-edited by Ljubica and Littrell; for the Editorial consult: Ljubica & Littrell, 2024). This project systematically investigates leadership prototypes within three Slavic tribes consisting, in total, of seven countries participating in the issue. These include Eastern Slavs (Russia), Western Slavs (Poland and Czech Republic) and Southern Slavs (Bosnia & Herzegovina, Croatia & Serbia). Key findings include:

- Validation of a 6-factor Slavic leadership model, distinct from GLOBE’s original models.
- The salient and culturally distinct role of the Self-Protective leadership dimension, linked to the region’s historical and institutional contexts.
- Evidence of both cultural homogeneity across Slavic nations and significant variations within the region.
- Leadership preferences are shaped by unique historical experiences (e.g., Ottoman rule, communism, recent wars) and current socio-economic transitions (Ljubica et al., 2024a; Ljubica et al., 2024b).

3.3. The FEELS (Follower Endorsed, Effective Leadership and Sustainability) Project

Developed primarily CCCC by scholars Minelgaitė, Warner-Søderholm and Littrell, this global analytics project integrates followership and sustainability into cross-cultural leadership research. It employs the innovative, 50-item, Leader Behavior Description Questionnaire (LBDQ50+) and a Sustainable Leadership Questionnaire to measure optimal leader behavior from the follower’s perspective and attitudes toward leader sustainability (Littrell et al., 2018; Helgadóttir, 2021). The project addresses the call to map sustainability values across national cultures and is currently ongoing.

4. CRITICAL ANALYSIS AND IMPLICATIONS FOR SOCIAL AND ECONOMIC DEVELOPMENT WORLDWIDE

The body of work reviewed offers several key contributions relevant to the economic and social development in general, in addition to the conference series:

- Data-Driven Nuance: Provides large-scale empirical evidence that complicates stereotypic cultural classifications.
- Bridging Theory and Practice: Exemplifies scholar-practitioner collaboration, directly informing assessment tools used in global corporations.
- Methodological Considerations: Raises important questions about cultural measurement, the balance between etic and emic approaches, and instrument replication.
- Future Research Trajectories: Points to needed studies on:
 - Dynamic changes in leadership preferences in rapidly developing economies.
 - The intersection of cultural values with religion, generational and demographic shifts.
 - The effectiveness of leadership training programs based on cultural frameworks

5. CRITICAL ANALYSIS AND IMPLICATIONS FOR SOCIAL AND ECONOMIC DEVELOPMENT WORLDWIDE

While there have been many contributions of the CCCC, our research, as all research, possesses several significant limitations. The risk of new essentialisms may shadow these efforts as, while successfully deconstructing East-West binaries, the clustering of nations (e.g., "Slavic") risks creating new, albeit more nuanced, cultural essentialisms. The significant socio-economic and political divergences within such clusters (e.g., between Slavic EU-members and Russia) suggest that leadership cultures may be evolving along different trajectories, a dynamic potentially uncaptured by static models. Methodological constraints also pose a risk. The heavy reliance on survey-based methodologies, while excellent for generalization, prioritizes espoused preferences over observed behaviors in complex organizational contexts. This can obscure the performative, interactive, and power-laden nature of leadership as it is enacted in real time. Similar is the conceptual "stretching" as in, for instance, the integration of "sustainability", in the FEELS project. Although timely, it may facilitate questions related to the conceptual equivalence. Whether sustainability is interpreted primarily as environmental, economic, or social equity may vary culturally, requiring rigorous qualitative grounding to complement the quantitative mapping.

6. REFLECTIONS ON THE DOMINANT PARADIGM AND FUTURE METHODOLOGICAL TRAJECTORIES

The dominant research paradigm of the CCCC is cross-cultural comparison of cultural value and leadership preferences across and within societal cultures and nations utilizing large-scale survey administration as the methodological core. This approach enables systematic comparison, sophisticated statistical testing for measurement equivalence, and generalizable findings highly valued by practitioners. The use of standardized instruments like the Hofstede's Value Survey Module (Hofstede et al., 2008) and several version of the Leader Behavior Description Questionnaire, allowing for direct comparison across cultures, certainly is the Center's strength. The ongoing psychometric work to develop the LBDQ50 demonstrates a commitment to improving cross-cultural validity. The emic-etic tension, however, remains. Even validated instruments may carry latent Western biases in their underlying constructs. Furthermore, the snapshot nature of surveys limits understanding of how leadership preferences change amid globalization, digitalization, and generational shift. To address these limitations and foster innovation, future research, aligned or congenial with that of CCCC, should embrace sequential mixed methods designs. For example, quantitative identification of a unique dimension (e.g., Self-Protective) should be followed by qualitative studies to explore its lived experience and narrative foundations. Researchers should develop longitudinal panels to track the evolution of leadership prototypes in rapidly developing economies, moving from static mapping to dynamic tracking. In the same vein, implementing experimental or scenario-based research designs to examine how cultural values interact with specific situational crises (e.g., a pandemic, an ethical scandal) to shape leader attributions and follower responses, is warranted.

7. PRACTICAL IMPLICATIONS

The direct application of the Center's research is a cornerstone of its impact, generating actionable tools for global management aligned with the economic and social development. For global talent management & development, this work provides the empirical basis for culturally calibrated tools. For instance, global corporations can use country-specific leadership profiles to tailor 360-degree feedback for expatriates, highlighting potential alignment or clash points between their style and local subordinate expectations. Multinationals can design targeted leadership development for specific regions.

In example, programs for Western managers in Slavic Europe could address the contextual appropriateness of "Self-Protective" behaviors related to risk management and procedural adherence. For strategic leadership & mergers and acquisition integration, our findings may enable leaders to move beyond vague awareness to actionable cultural intelligence. Executives can, therefore, anticipate friction in decision-making styles (e.g., participative vs. directive) during integrations or design bicultural leadership teams to bridge cultural gaps in joint ventures. They can also frame strategic change initiatives in ways that resonate with local values, increasing endorsement and reducing resistance. The FEELS project drives innovation towards sustainable and ethical global leadership by providing metrics to assess the alignment between corporate sustainability pledges and the sustainability values actually endorsed by employees across different national units. This stream can facilitate selection and development of leaders who are legitimized not only for performance but also for their commitment to long-term sustainability, enhancing local employee engagement and brand reputation. Finally, but not limited to, the CCCC streams can foster innovation by applying insights on cultural drivers of preferred leaderships styles and behaviors to create psychologically safe, yet culturally resonant, climates for global R&D teams.

8. CONCLUSION

The collaborative and independent scholarship affiliated with the CCCC substantially advances our understanding of the complex interplay between culture and management. By providing foundational empirical mappings, validating culture-specific models, and courageously integrating emerging themes like sustainability and followership, this work serves as a critical resource. It establishes a benchmark for rigorous, applicable cross-cultural research. Our critical analysis confirms its contributions in refining theory and practice while highlighting pathways for future innovation—particularly through methodological diversification and deeper investigation of dynamic cultural change. Ultimately, this body of work exemplifies how scholarly inquiry can foster both innovation in research design and tangible impact in the development of effective, culturally intelligent global leadership, directly responding to the imperative of the economic and social development conference series.

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NOTE ON FURTHER SOURCES:

For a complete list of conference presentations, consult the Academy of Management Annual Meeting Proceedings archives. For CCCC white papers and technical reports, visit the Center's website. Additional publications can be found via Google Scholar and EBSCO using keywords "Cultural Orientations Indicator" and "Center for Cross Cultural Comparisons."

LEADERSHIP CHARACTERISTICS AND ORGANIZATIONAL EFFECTIVENESS

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ABSTRACT

Within the framework of Human Capital Management (HCM), which emphasizes the strategic management and development of human resources as a key determinant of organizational success, leadership represents one of the most important factors influencing organizational effectiveness. The importance of leadership becomes particularly evident during organizational change processes and efforts to improve effectiveness, where strong managerial support and effective communication play a crucial role in the successful implementation of change initiatives and the achievement of organizational objectives. This study examines the relationship between leadership characteristics and organizational effectiveness, with particular emphasis on four aspects: (1) management commitment to the effectiveness assessment, (2) the effectiveness of the managerial structure, (3) managers' uncertainty regarding their own authority and (4) the level of professional development. Organizational effectiveness is assessed using a multidimensional approach that encompasses three dimensions of subjective effectiveness: (1) direct subjective effectiveness, (2) general subjective effectiveness and (3) effectiveness from the employees' perspective. An empirical quantitative research approach was adopted using survey data collected from managers across public administration bodies in the Republic of Croatia. The aim of the study is to determine whether significant differences in leadership characteristics exist between effective and ineffective organizations and to contribute to a better understanding of the role of leadership in enhancing effectiveness. The findings of the paper contribute to the leadership and organizational effectiveness literature by demonstrating how leadership capabilities support organizational performance and strengthen the effective management of human capital.

Keywords: *Leadership Characteristics, Organizational Effectiveness, Public Administration*

1. INTRODUCTION

In an increasingly complex and dynamic organizational environment, leadership has become one of the most important determinants of organizational success. While organizations differ in their objectives, structures, and institutional contexts, effective leadership consistently influences strategic decision-making, organizational adaptability, and the achievement of desired outcomes. As organizations increasingly adopt performance-oriented management practices, the role of leadership extends beyond traditional supervision to include the promotion of effectiveness, innovation, and continuous improvement. Despite the extensive body of literature on leadership and organizational effectiveness, there is no universal agreement regarding which leadership characteristics contribute most strongly to organizational success. Moreover, measuring organizational effectiveness remains methodologically challenging due to its multidimensional nature and the diversity of perspectives from which effectiveness may be assessed. By empirically examining relationships between leadership characteristics and organizational effectiveness in Croatian central government bodies, this study aims to determine whether significant differences in leadership characteristics exist between organizations perceived as effective and those perceived as ineffective.

2. LEADERSHIP: DEFINITIONS, CHARACTERISTICS AND IMPACT ON ORGANIZATIONAL PERFORMANCE

Leadership represents an important element of managerial activity and is closely connected to human resource management. This is also emphasized by Cingula (2016, p. 17), who notes that “leadership is a part of management within the domain of human resource management and can almost be aligned with the concept of managing people. If management means determining direction - that is, regulating an activity toward a predetermined goal - leadership includes an additional specific component, namely the active role of the leader”. This understanding of leadership is consistent with broader international scholarship, which similarly emphasizes influence, direction, and the leader’s active role. According to Yukl (2013), leadership is commonly understood as a process involving intentional influence aimed at guiding and coordinating activities and social interactions within groups or organizations. Due to the numerous definitions and imprecise terminology of leadership, Yukl (2013) identifies several representative definitions which are presented in Table 1.

Leadership is “the behavior of an individual ... directing the activities of a group toward a shared goal” (Hemphill and Coons, 1957, p. 7).
Leadership is “the influential increment over and above mechanical compliance with the routine directives of the organization” (Katz and Kahn, 1978, p. 528).
Leadership is “the process of influencing the activities of an organized group toward goal achievement” (Rauch and Behling, 1984, p. 46).
“Leadership is about articulating visions, embodying values, and creating the environment within which things can be accomplished” (Richards and Engle, 1986, p. 206).
“Leadership is a process of giving purpose (meaningful direction) to collective effort, and causing willing effort to be expended to achieve purpose” (Jacobs and Jaques, 1990, p. 281).
Leadership “is the ability to step outside the culture ... to start evolutionary change processes that are more adaptive” (Schein, 1992, p. 2).
“Leadership is the process of making sense of what people are doing together so that people will understand and be committed” (Drath and Palus, 1994, p. 4).
Leadership is “the ability of an individual to influence, motivate, and enable others to contribute toward the effectiveness and success of the organization...” (House et al., 1999, p. 184).

*Table 1. Definitions of Leadership
(Source: Yukl, 2013)*

Similarly, Sikavica et. al. (2008, p. 468) note that the concept of leadership implies influencing other people so that they follow a defined direction or vision. The definitions presented above indicate that the ability to influence employees and guide their activities represents one of the fundamental characteristics of effective leadership. Given that leadership is a multidimensional concept, this study focuses on four leadership characteristics: (1) management commitment to the effectiveness assessment, (2) the effectiveness of the managerial structure, (3) managers’ uncertainty regarding their own authority and (4) the level of professional development. The importance of leadership becomes particularly evident in processes of organizational change and performance improvement.

As Carter (1984, cited in Poole et al., 2001, p. 407) notes, success in any new administrative practice depends on a firm commitment by top management. Management support is defined by Pool et al. (2001) as the extent to which agency managers communicated commitment to outcome evaluation and realigned staff roles and responsibilities to meet its demands. Similarly, McNabb and Lee (2021) observe that organizational structure and support for the performance process calls for strong leadership, excellent communication, and managerial flexibility. The importance of leadership in quality management has also been emphasized by Saraph, Benson, and Schroeder (1989), who identified eight critical factors of quality management. One of these factors, the role of management leadership and quality policy, refers to top management's responsibility for quality, its active involvement in quality improvement initiatives, the establishment of clear quality goals, and the integration of quality into organizational planning and decision-making processes. Beyond managerial commitment and strategic support, the literature also highlights the importance of an effective managerial structure as a key leadership characteristic. In this regard, Herman and Renz (1998) found a strong relationship between organizational effectiveness and board effectiveness, suggesting that effective governance constitutes a critical dimension of leadership. Building on this perspective, Herman and Renz (2004) conceptualize board effectiveness in terms of responsibility for strategic oversight, financial and risk management, mission definition, and related governance functions. Taken together, these findings indicate that the effectiveness of the managerial structure represents an important leadership characteristic that can substantially influence overall organizational effectiveness. Brown (2005) found that organizations perceived as more effective also reported higher levels of board effectiveness across six governance dimensions. In particular, the strategic and interpersonal dimensions of board performance emerged as significant predictors of organizational performance, highlighting the importance of effective governance structures for organizational success. Although effective leadership is often examined through managerial support, governance arrangements, and organizational structures, research has also identified the importance of individual leader characteristics that shape how leadership is enacted and perceived within organizations. Among these characteristics, confidence has received considerable attention as a psychological resource that influences leaders' behavior, decision-making, and performance outcomes. In the context of Bandura's social cognitive theory (1986), confidence is identified as an important factor in effective leadership and high performance (Luthans and Avolio, 2003). Leaders who possess greater confidence in their capabilities are more likely to embrace challenges, invest greater effort in achieving goals, and demonstrate persistence when facing obstacles. In addition to confidence, the literature suggests that leaders' sense of insecurity may also influence managerial behaviour and organizational outcomes. Rainey, Pandey, and Bozeman (1995) define managerial insecurity as managers' concerns regarding the adequacy of their authority, risk-aversion and the level of trust they place in employees. Beyond personal characteristics, leadership research also often emphasizes the importance of leaders' knowledge, skills, and competencies acquired through education and professional development. Such capabilities enable leaders to respond effectively to organizational challenges, adapt to changing environments, and guide their organizations toward achieving strategic objectives. Sikavica et. al. (2008) argue that the quality of managers and their continuous professional development constitute the foundation of an organization's strategic success and competitiveness. Leroux and Wright (2010) examined the performance measures used by nonprofit organizations in the United States, among which the executive director's level of education and functional training in management, planning, budgeting, and decision-making were identified as important factors contributing to strategic decision-making. Their findings indicate that a higher level of executive director education, together with an effective governing body, constitutes an organizational asset that positively influences the quality and effectiveness of strategic decision-making in nonprofit organizations.

3. ORGANIZATIONAL EFFECTIVENESS AS A MULTIDIMENSIONAL CONSTRUCT

As leadership shapes the conditions under which organizations function, it also provides a useful foundation for exploring organizational effectiveness, a concept that has long occupied a prominent place in organizational theory. A commonly accepted definition of organizational effectiveness refers to how well a company achieves its goals and objectives (Ahmad, Furuoka and Rasiah, 2023, p. 55). It is a multifaceted and complex phenomenon that continues to be a central concern for both academics and practitioners (Curando, Silva, and Prentice, 2025). Organizational effectiveness is one of the most extensively researched concepts in organizational theory, yet there is still no consensus among researchers regarding its definition, terminology, or measurement approaches (Herman and Renz, 1999; Sowa, Selden and Sandfort, 2004). Despite the long tradition of studying this concept, contemporary literature consistently emphasizes that organizational effectiveness is a complex, multidimensional construct whose definition and operationalization depend on the theoretical perspective adopted and the interests of different stakeholders (Ahmad, Furuoka and Rasiah, 2023; Oghojafor, Muo and Aduloju, 2012; Nel, Kotze and Badarai, 2023; Van der Merwe and Olivier, 2024). In international literature, effectiveness is often discussed in relation to efficiency. Mihaljević and Hudeček (2012) clearly distinguish between the two terms, noting that „the English terms effectiveness and efficacy refer to the adequacy of a product or service for the purpose for which it was created (e.g., effective steps toward peace, effective teaching methods, efficacy of proposed measures), whereas efficiency denotes the ability to perform an action with minimal expenditure of time and other resources (e.g., an efficient motor). From a linguistic standpoint, effectiveness refers to the property of something serving its intended purpose, while efficiency refers to the optimality with which that purpose is achieved“. Richard et al. (2009) further distinguish organizational effectiveness from organizational performance by arguing that effectiveness encompasses a wider range of organizational outcomes. Whereas organizational performance is typically assessed through financial, market, and shareholder-related indicators, organizational effectiveness also includes internal operational outcomes and broader external dimensions, including reputation and stakeholder perceptions.

4. RESEARCH DESIGN

The aim of this research is to examine the relationship between leadership characteristics and organizational effectiveness, with a particular focus on identifying which leadership characteristics are important for achieving organizational goals and improving overall performance. In line with the research objectives, four hypotheses have been formulated, as follows: H1: There is a difference in management commitment to effectiveness between effective and ineffective organizations; H2: There is a difference in the effectiveness of the managerial structure between effective and ineffective organizations; H3: There is a difference in managers' uncertainty regarding their own authority between effective and ineffective organizations and H4: There is a difference in professional development (business training) of management between effective and ineffective organizations.

4.1. Variable Operationalization

Before constructing the questionnaire, previous studies were reviewed, and existing instruments from research with similar research questions were partially adapted. Leadership characteristics were examined through four dimensions: (1) management commitment to the effectiveness assessment, (2) the effectiveness of the managerial structure, (3) managers' uncertainty regarding their own authority and (4) the level of professional development.

The measurement of these dimensions was partially based on instruments developed by Saraph, Benson and Schroeder (1989), LeRoux and Wright (2010), and Rainey, Pandey and Bozeman (1995). Subjective organizational effectiveness was measured using a multidimensional approach. The criteria for assessing subjective effectiveness were drawn from existing literature, resulting in three defined dimensions:

- (1) direct subjective effectiveness, measured by the item “Do you consider your organization effective in performing its assigned tasks?”;
- (2) the construct of general effectiveness; and
- (3) the construct of employee-perceived effectiveness.

For the direct measure of subjective effectiveness, the study used the variable applied by Pandey, Coursey and Moynihan (2007). The development of the composite variables general effectiveness and employee-perceived effectiveness was grounded in the theoretical framework of the Multidimensional Integrated Model of Nonprofit Organizational Effectiveness (MIMNOE) proposed by Sowa, Selden and Sandfort (2004).

4.2. Sampling and Data Collection

The empirical research was conducted using an online questionnaire in June 2020. The questionnaire was designed and distributed through the Survey Gizmo online platform. Participation was voluntary and anonymous. A quantitative methodological approach was applied, and the data were analyzed using IBM SPSS Statistics 23. The research sample consisted of central government bodies (ministries and state administrative organizations). The empirical study was carried out on a purposive sample of 157 employees across 25 central government bodies in the Republic of Croatia. The questionnaire was addressed to senior managers within these institutions. Within the sample, 65.6% of respondents were female, and most were employed in the position of head of (independent) service (44.6%). Respondents came from both ministries and state administrative organizations, with a higher proportion employed in ministries (78.3%). On average, respondents had 15 years of work experience in central government bodies.

5. RESULTS

The analysis of previous research shows that both objective and subjective organizational effectiveness are measured through various methodological approaches. However, this paper empirically focuses on the multidimensional concept of subjective organizational effectiveness due to the unavailability of objective effectiveness data in the Croatian public administration. Performance indicators commonly used in this type of research, such as employee turnover rates, the number of completed contracts, finalized projects, processed requests, and similar measures, are often neither systematically collected nor maintained. Moreover, public administration institutions in Croatia are typically reluctant to disclose such data even when they are available.

A direct approach to assessing subjective effectiveness is reflected in the analysis of the variable Do you consider your organization effective in performing its assigned tasks? Table 2 presents the adaptations of the variable used to directly measure the organization’s subjective effectiveness.

Answers	Variable for measuring organizational effectiveness		Answers	New variable effectiveness	
	n	%		n	%
Yes	74	47.1	Yes	74	47.1
No	35	22.3	No	82	52.3
Unable to estimate	47	29.9			
Total	156	99.4	Total	156	99.4

*Table 2: Adaptations of the subjective effectiveness variable
(Source: Malić, 2021)*

In the second approach to measuring effectiveness, the dimensionality of measurement constructs identified in previous research as indicators of organizational effectiveness was tested. To examine the dimensionality of the measurement construct, an exploratory factor analysis was conducted, along with an assessment of the reliability of the identified dimensions. The suitability of factor analysis for the items measuring organizational effectiveness ($n = 6$) was confirmed by the results of the KMO test (0.720) and Bartlett's test ($\chi^2 = 358.102$, $df = 15$, $p < 0.001$), which justify the application of factor analysis. The rotated factor matrix (Varimax method using Kaiser's criterion) indicates the multidimensionality of the construct, with a total explained variance exceeding 75%, as presented in Table 3.

Items	Dimensions	
	1	2
The organization tracks the achievement of its mission.	.894	
This organization's mission is clear to almost everyone who works here.	.874	
The organization has formal documents in place to enable mission implementation.	.867	
Measuring results is an effective way to demonstrate that our organization is accountable for the tasks entrusted to it.		.876
Measuring results will enhance the quality of our services and products.		.859
The outcomes of my work can be measured.		.770
Name of the dimension	General effectiveness	Employee-perceived effectiveness
% of variance explained	39.738%	39.738%
% total of variance explained	35.280%	75.018%
Cronbach's alpha	0.866	0.789

*Table 3: Assessment of the dimensionality and reliability of the subjective effectiveness construct
(Source: Malić, 2021)*

Reliability analysis confirmed the internal consistency of respondents' answers for each dimension. The first dimension, with a Cronbach's alpha of 0.866 and an average inter-item correlation of 0.684, is considered a reliable construct, and based on these three items a new composite variable, general effectiveness, was created. The second dimension, named employee-perceived effectiveness, has a Cronbach's alpha value of 0.789 and an average inter-item correlation of 0.556, which is also considered a reliable construct, and a new composite variable was created based on its three items.

5.1. Application of inferential statistical procedures

The results of the independent samples t-test provide robust empirical evidence of statistically significant differences between organizations that evaluated their own effectiveness as successful and those that did not, across all examined leadership based characteristics. Organizations in which managerial staff actively participate in the enhancement of the performance-management system ($t = 5.555$, $df = 154$, $p < 0.001$), place emphasis on goal attainment ($t = 5.286$, $df = 152.532$, $p < 0.001$), maintain strong interpersonal working relationships ($t = 5.634$, $df = 153$, $p < 0.001$), make clear and well-defined decisions ($t = 7.235$, $df = 154$, $p < 0.001$), demonstrate high levels of trust in employees ($t = 6.285$, $df = 153$, $p < 0.001$), exhibit readiness to engage in risk business actions ($t = 4.899$, $df = 153$, $p < 0.001$), possess sufficient authority to determine how work processes will be executed ($t = 5.346$, $df = 154$, $p < 0.001$), and assume responsibility for performance management ($t = 6.821$, $df = 154$, $p < 0.001$) consistently achieve significantly higher mean scores on all leadership-related statements within the group of effective organizations, as presented in Table 4.

Management	Effectiveness	n	Mean	Std. deviation	Std. error	t-test statistic
Participates in the enhancement of the performance-management system.	yes	74	3.62	1.069	.124	$t = 5.555$, $df = 154$, $p < 0.001$
	no	82	2.72	.959	.106	
Places significant emphasis on goal attainment.	yes	74	3.95	.874	.102	$t = 5.286$, $df = 152.532$, $p < 0.001$
	no	82	3.12	1.070	.118	
Has a strong interpersonal working relationships.	yes	74	3.74	1.061	.123	$t = 5.634$, $df = 153$, $p < 0.001$
	no	81	2.80	1.018	.113	
Has no difficulty making clear decisions.	yes	74	3.66	.880	.102	$t = 7.235$, $df = 154$, $p < 0.001$
	no	82	2.56	1.007	.111	
Displays a high level of trust in this organization's employees.	yes	74	3.58	.951	.111	$t = 6.285$, $df = 153$, $p < 0.001$
	no	81	2.62	.956	.106	
Is not afraid to take risks.	yes	74	3.16	.993	.115	$t = 4.899$, $df = 153$, $p < 0.001$
	no	81	2.35	1.074	.119	
Has enough authority.	yes	74	3.61	1.070	.124	$t = 5.346$, $df = 154$, $p < 0.001$
	no	82	2.68	1.087	.120	
Accepts responsibility for performance management.	yes	74	3.50	1.150	.134	$t = 6.821$, $df = 154$, $p < 0.001$
	no	82	2.30	1.039	.115	

Table 4: Results of the independent samples t-test - leadership characteristics and organizational effectiveness (Source: Malić, 2021)

These findings substantiate the conclusion that such organizations belong to the more effective category. Consequently, hypothesis H1, H2 and H3, in the segment pertaining to leadership characteristics, namely leadership commitment to effectiveness, managerial structure effectiveness, and uncertainty regarding one's own authority is not rejected. To examine the hypothesis H4, relating to leadership development, a chi-square test was conducted. The results indicate no statistically significant association between organizational self-assessments of effectiveness and any of the analysed elements of leadership education: training in management ($\chi^2 = 1.008$, $df = 1$, $p > 0.05$), training in strategic decision-making ($\chi^2 = 1.008$, $df = 1$, $p > 0.05$), training in budget planning ($\chi^2 = 1.008$, $df = 1$, $p > 0.05$), training in controlling ($\chi^2 = 1.008$, $df = 1$, $p > 0.05$), and training in performance measurement/monitoring ($\chi^2 = 1.008$, $df = 1$, $p > 0.05$). These results, shown in Table 5, provide sufficient evidence to reject hypothesis H4.

Table ends on the next page

Training in:			Effectiveness		Total	Chi-square test statistic
			yes	no		
(1) management	yes	n	21	23	44	$\chi^2 = 1.008$, $df = 1$, $p > 0.05$
		% management	47.7%	52.3%	100.0%	
	no	n	44	49	93	
		% management	47.3%	52.7%	100.0%	
	total	n	65	72	137	
		% management	47.4%	52.6%	100.0%	
(2) strategic decision making	yes	n	20	18	38	$\chi^2 = 1.008$, $df = 1$, $p > 0.05$
		% strategic decision making	52.6%	47.4%	100.0%	
	no	n	46	54	100	
		% strategic decision making	46.0%	54.0%	100.0%	
	total	n	66	72	138	
		% s strategic decision making	47.8%	52.2%	100.0%	
(3) budget planning	yes	n	11	9	20	$\chi^2 = 1.008$, $df = 1$, $p > 0.05$
		% budget planning	55.0%	45.0%	100.0%	
	no	n	53	59	112	
		% budget planning	47.3%	52.7%	100.0%	
	total	n	64	68	132	
		% budget planning	48.5%	51.5%	100.0%	

(4) controlling	yes	n	1	11	12	$\chi^2 = 1.008, df = 1,$ $p > 0.05$
		% controlling	8.3%	91.7%	100.0%	
	no	n	14	87	101	
		% controlling	13.9%	86.1%	100.0%	
	total	n	15	98	113	
		% controlling	13.3%	86.7%	100.0%	
(5) performance measurement	yes	n	9	11	20	$\chi^2 = 1.008, df = 1,$ $p > 0.05$
		% performance measurement	45.0%	55.0%	100.0%	
	no	n	57	59	116	
		% performance measurement	49.1%	50.9%	100.0%	
	total	n	66	70	136	
		% performance measurement	48.5%	51.5%	100.0%	

Table 5: Results of the chi-square test procedure – leadership development and organizational effectiveness (Source: Malić, 2021)

4. CONCLUSION

The findings of this study confirm that leadership characteristics represent an important determinant of organizational effectiveness within public administration. Organizations perceived as more effective reported significantly higher levels of management commitment to effectiveness assessment, more effective managerial structures, and lower levels of managerial uncertainty regarding authority. These results support the view that leadership contributes not only to organizational coordination and decision-making but also to the successful implementation of performance management practices and the achievement of organizational objectives. The empirical analysis confirmed hypotheses H1, H2, and H3, indicating that effective organizations are characterized by stronger managerial engagement, clearer decision-making processes, greater trust in employees, more effective governance structures, and greater managerial confidence. These findings are consistent with previous research emphasizing the importance of leadership commitment, organizational support, and effective governance for improving organizational performance and effectiveness. In contrast, hypothesis H4 was not supported, as no statistically significant relationship was identified between the examined forms of management training and perceived organizational effectiveness. Although professional development is widely recognized as an important component of leadership capacity, the findings suggest that formal training alone may not be sufficient to influence organizational effectiveness. Instead, the practical application of leadership competencies, organizational culture, and managerial behaviour may play a more decisive role in determining organizational outcomes. The study also demonstrates the value of adopting a multidimensional approach to measuring organizational effectiveness. By combining direct subjective assessment with broader organizational and employee-oriented dimensions, the research provides a more comprehensive understanding of effectiveness than reliance on a single indicator would allow.

Such an approach is particularly appropriate in public administration settings, where objective performance measures are often unavailable or difficult to compare across organizations. Several limitations should be acknowledged. The study relies on cross-sectional survey data collected from a purposive sample of managers within Croatian central government bodies and uses subjective measures of organizational effectiveness. Consequently, the findings should be interpreted with appropriate caution and cannot be generalized to all public organizations or different institutional contexts. Future research could extend this work by incorporating objective performance indicators where available, applying longitudinal research designs, and examining additional leadership dimensions such as transformational leadership, ethical leadership, communication practices, and employee engagement. Overall, this research contributes to the literature on leadership and organizational effectiveness by providing empirical evidence that leadership characteristics constitute an important organizational resource for improving effectiveness in the public sector. Strengthening managerial commitment, developing effective governance structures, and enhancing leadership capabilities may therefore represent valuable directions for public administration reforms aimed at improving organizational performance and the strategic management of human capital.

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CRYPTOCURRENCY FUTURES MARKETS AND DIGITAL FINANCIAL INNOVATION: A COMPARATIVE ANALYSIS OF MAJOR EXCHANGES

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ABSTRACT

This paper presents a comparative analysis of futures contracts on four major crypto exchanges: Binance, Coinbase, Kraken and KuCoin. The aim of the research was to determine how these exchanges differ in terms of trading costs, available leverage, liquidity, types of futures contracts, and levels of regulation and security, and how these differences affect users and their trading decisions. The research is based on a qualitative comparative approach using descriptive, analytical and comparative methods. Secondary data sources were utilised, primarily the exchanges' official websites, their documentation, academic and professional articles, and reports from regulatory bodies. The analysis was carried out based on pre-defined criteria, which include the types of futures contracts, commission structures, the level of financial leverage, liquidity and trading volume, as well as the degree of regulation and security. The results of the analysis show that, despite offering similar core products, exchanges differ significantly in terms of their risk profiles and trading conditions. Binance and KuCoin offer lower costs, higher leverage and a wider range of trading pairs, but operate in a less regulated environment. Coinbase and Kraken provide a higher level of regulation, legal certainty and user protection, but at higher costs, with lower leverage and a more limited range of products. The findings confirm that there is no single 'best' exchange; rather, the choice depends on the individual user's knowledge, experience and risk tolerance. This paper contributes to a better understanding of the differences between crypto exchanges and enables more informed decision-making when choosing a platform for trading futures contracts.

Keywords: *Cryptocurrency futures, Cryptocurrency exchanges, Derivatives, Liquidity, Financial regulation.*

1. INTRODUCTION

Over the past decade, cryptocurrencies have evolved from a technological innovation into a significant segment of modern financial markets. In addition to traditional trading on the spot market, the market for derivative financial instruments has also developed significantly, with futures contracts playing a central role. Futures contracts are standardised derivative financial instruments whereby the contracting parties undertake to buy or sell a specific underlying asset in the future at a predetermined price (Hull, 2018; Hayes, 2025). Their value derives from the price movements of the underlying asset; in the case of crypto futures contracts, this is the price movements of cryptocurrencies such as Bitcoin or Ethereum. A distinctive feature of crypto futures contracts is their high volatility and the widespread use of financial leverage, which enables traders to control large positions with a relatively small investment (Corporate Finance Institute, 2020). This increases potential returns, whilst also significantly increasing the risk of losses and forced liquidations.

Crypto markets are dominated by so-called perpetual futures contracts, which have no expiry date and use a funding rate mechanism to maintain a link with the spot price (Binance, 2019; Kraken, n.d.-a). The development of futures markets is closely linked to the development of crypto exchanges as the central trading infrastructure. Exchanges not only provide the technical platform for trading, but also set key rules regarding commissions, margins, leverage, liquidation mechanisms, security and regulatory compliance. In doing so, they directly influence trading costs, risk exposure and the suitability of individual platforms for different types of users. Among the largest and best-known exchanges offering futures trading are Binance, Coinbase, Kraken and KuCoin. Although they all provide access to similar instruments, they differ in terms of commission structures, available leverage, liquidity, levels of regulation, security and legal protection for users. These differences can have a decisive impact on the success of trading strategies and on the risks to which users are exposed (Hägele, 2024). The central problem in this area is the lack of systematic, transparent and comparable analyses that would enable users to make an informed choice of a suitable exchange for trading futures contracts. Information is often scattered across various sources, technically complex and difficult to compare, which means that users frequently make decisions based on incomplete information or simply on the popularity of a particular platform. Choosing the wrong exchange can lead to higher costs, a greater risk of liquidation, less legal protection or greater exposure to operational and regulatory risks. This is particularly problematic for less experienced users, who often lack the knowledge to properly assess the differences between platforms. The aim of the research is to analyse and compare the content of futures contracts on the selected cryptocurrency exchanges – Binance, Coinbase, Kraken and KuCoin – and to determine how these exchanges differ in terms of trading conditions, costs, liquidity, available leverage, and levels of regulation and security. Based on this comparison, we assess the suitability of individual exchanges for different types of users.

2. LITERATURE REVIEW

2.1 Basics of futures contracts

Futures contracts are standardized derivative financial instruments that oblige two parties to buy or sell an underlying asset at a predetermined price on a future date (Hull, 2018; Hayes, 2025; Zarembski, 2025). In cryptocurrency markets, perpetual futures are the most common type because they do not have an expiration date and use a funding-rate mechanism to maintain prices close to the spot market. Futures trading enables the use of financial leverage, increasing both potential returns and the risk of losses.

2.2 Overview of individual exchanges

The following section briefly presents the key characteristics of the selected crypto exchanges that are the subject of the comparative analysis, with the aim of providing context for understanding the differences discussed below. Binance was founded in 2017 and quickly became the world's largest crypto exchange in terms of trading volume. It operates globally and offers a wide range of products, including spot and derivative financial instruments. Due to its high liquidity and wide range of offerings, it plays a significant role in the crypto ecosystem, whilst at the same time facing regulatory challenges in certain jurisdictions (Binance, 2021; Binance, 2022). It is particularly important for futures trading due to its very high liquidity and the available financial leverage, which enables the effective implementation of active trading strategies whilst also increasing the risk of rapid liquidations. This classifies it as a highly flexible platform, but one with greater regulatory uncertainty, which is one of the key trade-offs examined in this study. Coinbase was founded in 2012 in the United States and is considered one of the most heavily regulated and institutionally oriented exchanges.

Coinbase is widely regarded as one of the most regulated cryptocurrency exchanges, with a strong focus on compliance, transparency and institutional clients. In the context of futures contracts, this means greater legal certainty and stability, but also a more limited range of products and lower available financial leverage. This position places it amongst the safer, yet less flexible, platforms, which is characteristic of more heavily regulated exchanges (Hägele, 2024; Coinbase, n.d.-a; Coinbase n.d.-b). Kraken was founded in 2011 and is one of the oldest operating crypto exchanges. It is known for its focus on security, stability and compliance with regulatory requirements, which gives it a reputation as a reliable platform for long-term users. Its strength in derivatives lies in striking a balance between regulation, security and functionality, making it suitable for users seeking moderate risk exposure. Kraken thus occupies a middle ground between strictly regulated and more flexible exchanges (Kraken, 2026; Hägele, 2024). KuCoin was founded in 2017 and quickly gained popularity due to its wide range of cryptocurrencies and competitive fees. It offers a range of trading products but is subject to a lower level of regulation than Coinbase and Kraken, which means greater flexibility but also greater risks for users. It is particularly attractive for futures trading due to its access to niche markets and higher financial leverage, but operates in a less regulated environment, which increases legal and operational risks. This means greater accessibility and a wider range of opportunities, whilst at the same time entailing greater exposure to legal and systemic risks (Hägele, 2024; KuCoin, 2026; KuCoin, n.d.-a).

2.3 Literature review

Hägele (2024) researched cryptocurrency exchanges, both centralized (CEXs) and decentralized exchanges (DEXs). Based on a complete review of the literature on this topic published between January 2019 and September 2023, the author describes differences and important dimensions of the comparison. The main advantages of CEXs over DEXs are higher liquidity, advanced trading and established reputation. DEXs, on the other hand, offer more user control and less censorship. Wu (2025) analyses cryptocurrency markets in the period from 2019 till 2024, both in Europe and in the United States. Derivatives trading volume in 2023 represented almost 75% of the total market volume. The author points out the high leverage risk and lack of regulation of cryptocurrency derivatives. According to the author, high leverage (up to 100 times) has a negative impact on market volatility and raises liquidation risk. Most studies on cryptocurrency derivatives were carried out on the cryptocurrency Bitcoin. Alexander et al. (2022) analyse the role of crypto exchange Binance in Bitcoin volatility transmission. The authors examine high-frequency data on spot and derivative contracts for Bitcoin against US dollar and stable coin Tether and argue that the Tether perpetual contract is the main source of volatility. Consequently, market regulators should place more emphasis on Tether derivatives on crypto exchanges, especially on Binance. Alexander et al. (2023) warn against self-selected margin on Bitcoin derivatives positions, since it is frequently inadequate to avoid automatic liquidation in periods of high volatility. The authors propose a hedging strategy that follows two objectives, to minimize the portfolio variance and, at the same time, to minimize the odds of liquidation because of low collateral. Augustin et al. (2023) examine the impact of Bitcoin futures contracts on crypto spot markets. Following the Bitcoin futures introduction, the authors observe increased price efficiency and market liquidity, arguing that the effect of the cryptocurrency derivatives introduction on Bitcoin spot market was positive. The currency pair BTC-USD exhibits the highest price synchronicity among the observed pairs, as shown by an increase in price correlation and a decrease in arbitrage opportunities. An extensive review of the empirical literature on cryptocurrency derivatives did not identify any studies comparing cryptocurrency derivatives trading across different cryptocurrency exchanges. Therefore, the present study addresses this gap in the literature by providing a comparative analysis of trading across major cryptocurrency exchanges.

3. METHODS

3.1 Methodological approach

The study is based on a qualitative comparative research approach, the aim of which is to analyse and compare the content of futures contracts on selected cryptocurrency exchanges. The focus is not on statistical hypothesis testing, but on a systematic comparison of the key characteristics of the exchanges and their futures products. The study employs descriptive, analytical and comparative methods. The descriptive method is used to describe the basic characteristics of futures contracts and trading conditions on individual exchanges, such as commission structures, available financial leverage, contract types, liquidation mechanisms and the basic safety and regulatory framework. The analytical method enables the breakdown of individual criteria and an understanding of their significance for users and the risks involved in trading. The comparative method, meanwhile, enables a systematic comparison of these characteristics across the Binance, Coinbase, Kraken and KuCoin exchanges, and the identification of their similarities and differences.

3.2 Data and data sources

The study is based on secondary data obtained from publicly available and verifiable sources, namely from the web pages of the four crypto exchanges. The data have been collected for the purpose of qualitative comparative analysis and have been selected to enable substantive verification of the research question. To enhance reliability, the most recent data available at the time of the research were utilised. Nevertheless, it should be borne in mind that trading conditions on crypto exchanges change frequently; therefore, the findings apply to the period under consideration during which the data were collected, in our case in January 2026.

3.3 Comparison criteria

The comparative analysis is based on pre-defined criteria derived from the research objectives and research aim. These criteria enable a systematic, transparent and reproducible comparison of futures contracts on the selected crypto exchanges.

The following criteria were used:

- types of futures contracts, in particular the distinction between perpetual contracts and contracts with a maturity date,
- the level and structure of fees, including maker and taker fees and any additional costs,
- available leverage and margin requirements,
- liquidity and trading volume, assessed based on available data on trading volume and market depth,
- regulation and security, assessed in terms of the exchange's legal status, compliance with legislation, security mechanisms and history of security incidents,
- user restrictions, such as geographical restrictions, identification requirements and restrictions on the use of specific products,
- user experience, assessed based on the transparency of the user interface, the availability of information and user support.

For each criterion, relevant data for each exchange were collected and analysed, and the information was then presented in a comparative format. On this basis, key similarities and differences between the exchanges were identified and their significance for users was assessed.

4. RESULTS

This chapter presents the results of a comparative analysis of futures contracts on the selected cryptocurrency exchanges Binance, Coinbase, Kraken and KuCoin. The results are presented according to the key comparison criteria defined in the methodology chapter.

4.1 Comparison of the basic characteristics of crypto exchanges

The comparison of the basic characteristics of crypto exchanges is based on pre-defined criteria set out in the methodology section of this thesis, and includes the types of futures contracts, commission structures, available leverage, liquidity and trading volume, as well as the level of regulation and security. The following table provides a clear comparative overview, enabling a systematic examination of the differences and similarities between the Binance, Coinbase, Kraken and KuCoin exchanges, and serves as a basis for further substantive analysis of the individual criteria.

Feature	Binance	Coinbase	Kraken	KuCoin
Type of futures contract	Perpetual	Perpetual	Perpetual	Perpetual
Maximum permitted leverage	up to 125x	up to 20x	up to 50x	up to 100x
Number of available trading pairs	very large	limited	moderate	very large
Availability in the EU	yes	partially	yes	yes

Table 1: Comparison of key features of crypto exchanges

Source: Authors' compilation based on official exchange documentation (Binance, n.d.; Coinbase, n.d.-c; Kraken, n.d.-b; KuCoin, n.d.-b)

Table 1 shows a comparison of the basic characteristics of futures contracts on the selected crypto exchanges Binance, Coinbase, Kraken and KuCoin. All the exchanges under consideration offer perpetual futures contracts, which means that the contracts do not have a predetermined expiry date and allow for an unlimited duration of open positions. This confirms that perpetual futures contracts are the predominant form of derivative financial instruments in the crypto market. However, there are significant differences between exchanges regarding the maximum permitted leverage. Binance offers the highest leverage of up to 125 $\times$, followed by KuCoin with up to 100 $\times$ and Kraken with up to 50 $\times$, whilst Coinbase offers significantly lower leverage, up to around 20 $\times$. Higher leverage enables greater capital efficiency and potentially higher returns, whilst at the same time significantly increasing the risk of rapid losses and forced liquidations, particularly during periods of heightened volatility. Consequently, exchanges offering higher leverage are particularly suited to experienced and active traders. Differences are also evident in the number of available trading pairs. Binance and KuCoin offer a very wide range of trading pairs, giving users greater flexibility in their choice of trading strategies and access to a variety of crypto assets, including lesser-known altcoins. Kraken offers a medium-sized selection of pairs, whilst Coinbase's offering is more limited, due to stricter regulatory requirements and a more conservative business model. As regards availability within the European Union, all exchanges except Coinbase are fully accessible to EU users. Coinbase is only partially accessible, as certain services, particularly those relating to derivatives, are restricted due to regulatory requirements. A comparison of key features clearly highlights a trade-off between flexibility and the level of regulation. Binance and KuCoin offer greater flexibility, higher leverage and a wider range of products, but operate in a less strictly regulated environment.

Conversely, Coinbase and Kraken provide a higher level of regulation, security and legal protection for users, but with limited trading options and lower permitted leverage. The choice of exchange therefore depends primarily on the user's experience, their risk tolerance and their trading objectives.

4.2 Comparison of trading costs

Trading costs are an important factor when choosing a crypto exchange, as they directly affect the profitability of trading strategies, particularly in the case of frequent trading and the use of leverage. In this analysis, costs are examined in terms of transaction fees (maker and taker fees), any discounts, and indirect costs such as financing costs on perpetual futures contracts.

Exchange	Maker	Taker
Binance	0.02%	0.04%
Coinbase	0.05–0.60%	0.05–0.60%
Kraken	0.16%	0.26%
KuCoin	0.02%	0.06%

Table 2: Comparison of trading costs

Source: Authors' compilation based on official exchange documentation (Binance, n.d.; Coinbase, n.d.-c; Kraken, n.d.-b; KuCoin, n.d.-b)

As can be seen from Table 2, the fee structures vary between exchanges. Binance and KuCoin offer relatively low base maker and taker fees, with Binance additionally allowing fees to be reduced using its own token and loyalty programmes. This means that these two exchanges are more cost-effective for active and high-frequency traders who execute a large number of transactions. Coinbase generally has higher fees compared to the other exchanges under consideration. These higher costs are linked to a higher level of regulation, stricter compliance requirements and greater operational costs, which are passed on to users in the form of higher trading fees. Consequently, Coinbase is less attractive for strategies based on frequent trading and more suitable for less active or institutional users who prioritise security and regulatory compliance. In terms of costs, Kraken falls between the two groups. Its fees are lower than Coinbase's, but slightly higher than those of Binance and KuCoin. This structure allows for relatively competitive costs whilst offering a higher level of transparency and regulatory compliance. In addition to direct fees, one must also consider funding costs, which arise from perpetual futures contracts and depend on the ratio of long to short positions in the market. Although funding rates vary between exchanges and change dynamically, they can have a significant impact on total trading costs during periods of long-term positions. A comparison of trading costs thus reveals a clear trade-off between cost-effectiveness and regulatory safety. Binance and KuCoin offer lower costs, but in a less regulated environment, whilst Coinbase and Kraken offer a higher level of regulation and user protection, but with higher trading costs. The choice of exchange based on costs therefore depends on the user's trading activity, their risk tolerance and the importance they attach to regulation and security.

4.3 Liquidity and trading volume

Liquidity and trading volume are key factors in the efficiency of futures markets, as they influence the speed of order execution, the extent of price slippage, and the ability to enter and exit larger positions without significantly impacting the market. Higher liquidity means deeper order books and narrower spreads between bid and ask prices, which reduces transaction costs and risk for traders (CME Group, 2025).

Exchange	Average daily futures trading volume	Liquidity	Price slippage on larger orders
Binance	very high	very high	low
Coinbase	medium	medium	medium
Kraken	medium	medium	medium
KuCoin	high	medium	low to medium

Table 3: Liquidity and Trading Volume

Source: Authors' compilation based on official exchange documentation (Binance, n.d.; Coinbase, n.d.-c; Kraken, n.d.-b; KuCoin, n.d.-b)

Table 3 shows a comparison of liquidity and trading volume across selected exchanges. Binance has the highest trading volume and the deepest order books, enabling the fast and efficient execution of even very large orders with minimal price slippage. As a result, Binance is particularly suitable for professional and institutional traders, as well as strategies involving large positions. Coinbase and Kraken have stable but lower liquidity compared to Binance. Their market depth is sufficient for most retail and medium-sized users, but larger price slippage may occur with very large orders. As a result, these exchanges are more suitable for small to medium-sized trading strategies. KuCoin has relatively high liquidity in certain markets, particularly for more popular altcoins, but its overall liquidity and futures trading volume are lower than Binance's and comparable to or lower than Coinbase's and Kraken's for major cryptocurrencies such as Bitcoin and Ethereum. This means that there may be a higher risk of price slippage on KuCoin for larger orders. The comparison shows that Binance is the leading exchange in terms of liquidity and trading volume, confirming its position as the central platform for crypto futures contracts. Coinbase and Kraken offer a more stable and regulated environment with moderate liquidity, whilst KuCoin offers greater flexibility and access to niche markets, albeit with a higher risk of liquidity constraints. The choice of exchange based on liquidity therefore depends on the size of positions, trading frequency and the need for rapid order execution.

4.4 Regulation and security

Regulation and security are important factors when choosing a crypto exchange, as they affect user protection, legal certainty and trust in the platform. Crypto exchanges operate in different legal environments and therefore differ significantly in terms of the level of regulation, supervision and compliance with legislation.

Exchange	Level of regulation	KYC requirements	Security mechanisms	Suitability for futures trading
Binance	lower	Mandatory	Cold wallets, 2FA, insurance fund, risk management systems	Highly suitable for active and experienced traders
Coinbase	Very high	Essential	Cold storage, 2FA, regulatory oversight, audits	Suitable for conservative and institutional investors
Kraken	High	Mandatory	Cold wallets, 2FA, regular audits	Suitable for secure and moderate futures trading
KuCoin	Lower	Required	Cold storage, 2FA, security protocols	Suitable for experienced traders with a higher risk tolerance

Table 4: Regulation and Security

Source: Authors' compilation based on official exchange documentation (Binance, n.d.; Coinbase, n.d.-c; Kraken, n.d.-b; KuCoin, n.d.-b)

Coinbase and Kraken operate in a more regulated environment, particularly in the United States and the European Union, where strict regulations apply regarding anti-money laundering (AML), know-your-customer (KYC) and consumer protection. As a publicly traded company, Coinbase is also subject to transparency and reporting requirements, which boosts the confidence of users and institutional investors. Kraken has a long track record of operating without major security incidents, which reinforces its reputation as a reliable platform. Binance and KuCoin operate on a more global scale and within a more fragmented regulatory environment. Although they have established security protocols and internal control mechanisms, they face greater regulatory challenges in individual jurisdictions, which may pose a legal risk to users. The lack of a uniform regulatory framework means greater flexibility and a wider range of products, but also greater uncertainty regarding legal protection in the event of disputes or systemic issues. From a technical security perspective, all the exchanges analysed use advanced security mechanisms, such as multi-factor authentication, cold storage of assets and systems for detecting suspicious activity. Nevertheless, complete security cannot be guaranteed, as confirmed by past incidents in the crypto industry. In this context, regulation acts as an additional layer of protection, as it ensures oversight of exchanges' operations and provides mechanisms to protect users. A comparison shows that Coinbase and Kraken offer a higher level of legal certainty and user protection, but with limited trading options and higher costs. Binance and KuCoin offer greater flexibility, a wider range of products and lower costs, but in a less regulated environment, which increases legal and systemic risks. The choice of exchange therefore depends primarily on the user's preferences regarding the balance between security and regulation on the one hand, and flexibility and cost-effectiveness on the other.

4.4 Comparison with findings from the literature

A comparison of the empirical findings of this analysis with the existing literature reveals a high degree of consistency regarding the key characteristics of crypto futures markets, whilst also highlighting certain differences between theoretical emphases and actual practice on trading platforms. The literature emphasises the importance of liquidity as one of the most significant factors in the efficiency of futures markets, as higher liquidity reduces transaction costs and price slippage (Madhavan, 2000; Hull, 2018). Empirical analysis confirms these findings, as Binance, being the exchange with the highest trading volume, also offers the best conditions for executing large orders, whilst exchanges with lower liquidity face a greater risk of price slippage, particularly for larger positions. The findings regarding the impact of financial leverage are also consistent with the literature, which highlights that leverage acts as a risk amplifier and can lead to chain liquidations during periods of high volatility (ECB, 2022; Gratton, 2024). In practice, this is reflected in the fact that exchanges that allow higher leverage (Binance and KuCoin) offer greater flexibility and potential returns, whilst at the same time increasing the risk of losses compared to more regulated exchanges with lower leverage (Coinbase and Kraken). The literature also emphasises the importance of regulation for protecting users and reducing systemic risks (ECB, 2022). Empirical results confirm that regulated exchanges provide greater legal certainty and transparency, but at the same time restrict trading opportunities and user flexibility. This confirms the theoretical trade-off between regulation and innovation, which is frequently highlighted in the literature. The difference between the literature and empirical findings is particularly evident in the role of user preferences. Whilst the literature often emphasises regulation as a key factor in market stability and security, practice shows that many users are often willing to accept greater regulatory and legal risk in exchange for lower costs, higher financial leverage and a wider range of products. This explains the high popularity of global and less-regulated platforms, despite the risks that have been highlighted on numerous occasions (Hägele, 2024).

Furthermore, the literature often addresses risks at the aggregate or systemic level, whilst empirical analysis reveals that practical factors such as costs, the user interface and the availability of individual products are often more important to individual users. This implies that there is a disconnect between the macroeconomic perspective of the literature and the microeconomic perspective of users (Zhou & Shen, 2022). In conclusion, it can be stated that the empirical findings largely confirm existing theoretical and expert findings, whilst at the same time revealing additional aspects of user behaviour and practical trade-offs that are less emphasised in the literature. This confirms the relevance and contribution of this study to a better understanding of the functioning of crypto futures markets from the perspective of actual users and platforms.

4.6 A comparison of the advantages and disadvantages of exchanges

The following section presents a summary comparison of the advantages and disadvantages of individual exchanges based on the findings from the previous sub-chapters.

Exchange	Advantages	Disadvantages
Binance	High liquidity, low fees, high leverage, wide range of trading pairs	Less regulation, regulatory uncertainty
Coinbase	High level of regulation, legal certainty, institutional reliability	Higher costs, limited product range
Kraken	Stability, security, regulatory compliance	Moderate liquidity, less flexibility
KuCoin	Low fees, access to niche markets, high leverage	Less regulation, greater legal risk

Table 5: Comparison of the advantages and disadvantages

Source: Authors' compilation

The table shows that Binance is a very popular exchange, primarily due to its high liquidity, low trading costs, the option to use high leverage and an exceptionally wide range of trading pairs; however, its drawback is that it is less strictly regulated and often faces regulatory uncertainty in various countries. Coinbase, on the other hand, is known for its high level of regulation, legal certainty and institutional reliability, making it suitable for more cautious investors; however, it has higher fees and offers a more limited range of products. Kraken strikes a balance between security and functionality, as it is renowned for its stability, high security and regulatory compliance; its drawback, however, is slightly lower liquidity and less flexibility compared to the largest exchanges. KuCoin, on the other hand, attracts users with low fees, access to niche and new crypto projects, and the option of high leverage; however, due to a lower level of regulation and greater legal risk, it is primarily suited to more experienced and risk-tolerant users.

5. CONCLUSION

The aim of this study was to compare futures contracts on Binance, Coinbase, Kraken and KuCoin in terms of trading costs, leverage, liquidity, regulation and security. The findings indicate that no single exchange is objectively the best. Instead, each platform offers different advantages depending on the user's experience, investment objectives and risk tolerance. The findings provide a clear answer to the research question. The comparison shows that the selected cryptocurrency exchanges differ significantly in terms of trading costs, available leverage, liquidity, and the level of regulation and security.

Binance and KuCoin offer lower trading costs and higher leverage, whereas Coinbase and Kraken provide stronger regulatory compliance and user protection. Therefore, the choice of exchange depends primarily on the user's experience, trading objectives and risk tolerance. The study has both academic and practical value, as it helps users better understand the trade-offs between trading costs, leverage, liquidity, regulation and security when selecting a cryptocurrency exchange. The findings also emphasise the importance of financial literacy, particularly for less experienced users who may underestimate the risks associated with leverage and less regulated trading environments. The research is also significant from the perspective of regulators and policymakers. The results confirm that stricter regulation increases legal certainty and stability but may at the same time restrict innovation and the competitiveness of platforms. This raises the important question of how to design regulatory frameworks that will both protect users and enable the development of financial innovation. A balanced approach to regulation is key to the long-term stability of the crypto-financial ecosystem. The study also provides a structured comparative framework that may be applied in future research on other cryptocurrency exchanges and derivative products. The study has several limitations. It is based on secondary data and qualitative analysis and therefore does not allow for statistical testing or a quantitative assessment of the magnitude of differences. Furthermore, conditions in the crypto markets are changing rapidly, so the findings are primarily valid for the period during which the data were collected. Furthermore, the study covers only four exchanges, so the results cannot be directly generalised to the entire crypto market. For further research, it would be useful to incorporate a quantitative analysis of actual trading data, analyse user behaviour regarding exchange choice, or examine the impact of regulatory changes on market structure over time. It would also be interesting to analyse the impact of financial leverage and liquidation mechanisms on the stability of crypto markets during periods of extreme volatility. In conclusion, this research confirms key theoretical findings regarding derivative financial instruments while highlighting the practical trade-offs faced by users of cryptocurrency exchanges. The study contributes to a better understanding of crypto futures markets and provides a useful basis for more informed decision-making in a rapidly evolving financial environment.

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WHAT YOUR CLICKS TELL MARKETERS: AN EXPLORATION OF NETWORK SCIENCE, AI-DRIVEN CUSTOMER SEGMENTATION, AND AD PERSONALIZATION IN E-COMMERCE MARKETING

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ABSTRACT

In the rapidly evolving landscape of e-commerce, traditional customer segmentation based solely on demographic characteristics often fails to capture the complexity of modern purchasing behaviour. This paper explores the application of network science as an advanced approach to analysing customer-product interactions. Using a bipartite graph model, it maps the relationships between users and products to identify high-centrality nodes and distinct behavioural clusters. The study contrasts these advanced network-based techniques with traditional segmentation methods, illustrating the shift from manual data processing to automated, AI-driven community detection. Furthermore, a longitudinal case study of Facebook's advertising evolution (2007–2025) demonstrates the transition from manual demographic targeting to predictive artificial intelligence and lookalike modelling. The findings suggest that combining network topology with cluster analysis enables e-commerce platforms to achieve more precise customer segmentation, resulting in improved targeting accuracy and more effective personalization.

Keywords: *artificial intelligence, network science, customer segmentation, e-commerce marketing, behavioural analytics, ad personalization, bipartite graph*

1. INTRODUCTION

If you have ever wondered why you see certain kinds of advertisements on your digital devices that differ from those seen by the next person, or why the content and product advertisements displayed on your device change when you switch locations without modifying your device settings, artificial intelligence may know more about your behaviour than you do. The fact is that something has been anonymously recording users' behaviour, preferences, and interests on their devices. This creates a pathway for personalized product and service suggestions based on individual interests. Admittedly, this is a complex phenomenon, especially for those who are not technology or artificial intelligence experts. However, it can be explained through several concepts linked to algorithms and predictive models, all under the umbrella of data and network science, which encompasses spatial analysis, network formation, clustering, and related approaches.

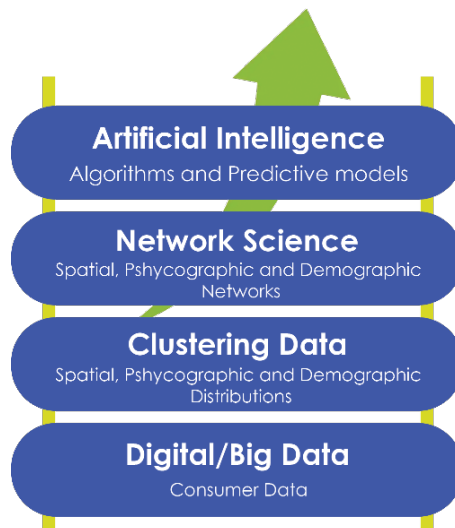


Figure 1: The Hierarchy of AI-Driven Marketing Analytics
Source: Own compilation based on the data processing hierarchy.

The truth is that clicks, connections, and hidden data exchanges make up the digital economy. Every online engagement, such as liking a post, accepting cookies, or interacting with a brand, becomes a traceable signal that powers artificial intelligence systems responsible for classification, personalization, and prediction. Consumers are both participants and products in this ecosystem. This study examines this phenomenon from the perspectives of behavioural clustering, network science, and artificial intelligence. It explores how marketers use voluntarily shared data to create highly targeted e-commerce strategies. Ad personalization has evolved from an experimental practice into the operational foundation of contemporary marketing. Digital footprints from devices, social media, and transactional networks are continuously collected by machine learning algorithms to improve customer segmentation. Predictive modelling, driven by AI systems capable of mapping consumer networks, identifying behavioural clusters, and generating real-time recommendations, has evolved from what originally began as demographic segmentation. This transformation illustrates how network science and behavioural analytics have reshaped decision-making for businesses competing in today's attention economy. A real-world example helps explain this transformation. Consider an AI-powered chatbot integrated into an e-commerce platform. By classifying every question, complaint, and click into "requests" and "responses," the structured data continuously improves the chatbot's future accuracy. At the same time, cookies track browsing behaviour, revealing psychographic and geographic affinities that, when grouped together, create nodes within a behavioural network. Through the resulting segmentation, the system identifies groups of users with similar characteristics and predictive value. Beyond individual customers, marketers can visualize the topology of connected preferences—a digital map where proximity, influence, and behavioural similarity guide targeted advertising. By reviewing studies centred on network centrality and clustering algorithms, including K-means, DBSCAN, and hierarchical clustering, this paper explains how AI-driven segmentation is transforming consumer profiling. It presents marketing as a process of network-based prediction rather than isolated persuasion by combining insights from behavioural pattern analysis and network science. Artificial intelligence is therefore not only about processing data but also about interpreting the relational structure of human decision-making. This is where the present study contributes to the growing field of e-commerce analytics. Structural data drive learning, segmentation, and real-time marketing decisions, making what consumers click far more than a simple individual action.

2. METHODOLOGY

This study adopted an exploratory research approach to investigate how marketers obtain data from consumer behaviour networks, clusters and spatial distribution through the use of Artificial Intelligence (AI). The exploratory design was considered appropriate because it allows us to identify and understand the emerging patterns, tools and processes that shape the use of AI in decision-making. This approach helped us to explore and review the dynamic relationship between data analytics, consumer behaviour, and AI-powered segmentation models in a rapidly evolving digital environment. We obtained data from secondary sources, including peer-reviewed journal articles, academic books, and conference papers that focus on artificial intelligence, network science, clustering algorithms, and geo-marketing. These materials were analysed thematically to identify recurring ideas and empirical findings on how AI enables marketers to recognize and interpret consumer behavioural patterns, networked communities, and spatial connections. We paid particular attention to studies employing clustering techniques such as K-mean, DBSCAN, and hierarchical clustering, as well as network centrality measures which detect communities and relationships among consumers. Through these analyses, we were able to examine how AI-driven insights are integrated into marketing strategies to enhance personalization, optimize campaign efficiency, and improve returns on investment. This approach uncovered how marketers transform data from consumer interactions into actionable intelligence that informs strategic segmentation, personalized experience, and improved organizational outcomes.

3. LITERATURE REVIEW

3.1. The New-Age Quadrant: Digital Data, Artificial Intelligence, Consumer Behaviour and Marketing

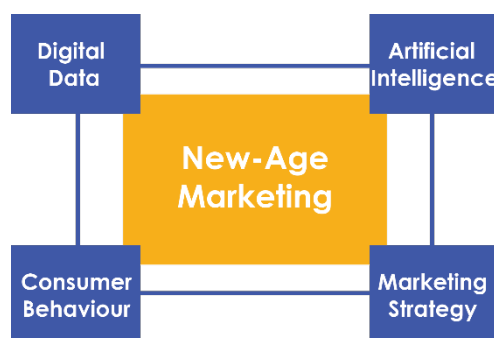


Figure 2: The New-Age Quadrant

Source: Own compilation based on New-Age Marketing.

Several studies have contributed to the growing body of work on how consumer behaviour has changed in the digital age. One of these is the study by Jeetesh, Konar, and Balastubramanian (2020), who found that the restaurant industry and social networks have experienced a significant increase in the generation of digital data as well as publicly accessible information. They argued that social networks can influence consumer behaviour and online purchase decisions by examining the role of eWOM and its relationship with social media and online marketing communities. The study applied the PLS-SEM methodology to analyse data from 270 consumers over a three-month period, and the results suggest that eWOM, social media advertising, and e-commerce can stimulate consumer buying decisions. The study therefore emphasizes the need for organizations to manage their online consumer data, including opinions and product reviews, while considering the specific characteristics of their industry. This, in turn, helps ensure positive user experiences and customer satisfaction.

Earlier, Urban et al. (2000) highlighted the rapid evolution of internet strategies and users' adaptive responses to these changes. These developments have not only led to new user habits and behaviours but have also encouraged personalized strategies for attracting new users (Reyes-Menendez et al., 2019). This trend has been further strengthened by artificial intelligence, as companies increasingly use AI for ad personalization through algorithmic technologies, programmatic advertising systems, network science, spatial networks, and geomarketing (Singhal, 2024). In this context, Singhal (2024) found that AI-powered personalization increases advertisement relevance, leading to higher user satisfaction and engagement, while also improving conversion rates for organizations. The study also highlights important ethical concerns, particularly those related to data privacy and transparency. Nevertheless, it provides a comprehensive overview of the role of artificial intelligence in programmatic advertising and its technological contribution to modern marketing. The growing influence of digital communication, data sharing, and advanced technologies is particularly important because the better companies understand their customers' behaviour, the easier it becomes to engage them through strategies such as content marketing, user experience (UX), influencer marketing, user-generated content (UGC), and electronic word-of-mouth (eWOM). These approaches not only contribute to increased sales and the development of sustainable online businesses but also help organizations better meet customer needs. As Saura et al. (2020) argue, changes in consumer behaviour driven by digital and technological developments create numerous opportunities for businesses. Consequently, new-age marketing has become a combination of digital data, artificial intelligence, evolving consumer behaviour, and innovative marketing strategies. The ability to successfully combine these elements increasingly determines which organizations succeed in today's competitive marketing environment.

3.2. The Transformative Role of Artificial Intelligence, Network Science, and Clustering Data in Marketing

Present-day marketing is largely technology-driven. Undoubtedly, the dominant technology is artificial intelligence (AI). However, artificial intelligence can be viewed from several perspectives. From Data Science and Network Science to Clustering, Predictive Modelling, and Algorithms, the field is broad and complex but crucial to both human and business relationship management. AI essentially simulates human cognitive processes and possesses the ability to learn, reason, and self-correct through the continuous collection and analysis of data while incorporating historical information (Ola-Oluwa, 2024). In marketing, these capabilities are essential for automating decision-making, analysing patterns, and personalizing communications based on real-time customer data (Behera et al., 2024). One important point is that the success of artificial intelligence is fundamentally rooted in data. Whether viewed through the lens of data science, network science, geospatial science, clustering techniques, or other disciplines within the AI ecosystem, everything depends on the power of aggregated data. Studies have consistently demonstrated the synergistic relationship between Big Data and artificial intelligence. While examining this relationship, De Lima (2024) argued that AI systems depend on Big Data to obtain the vast amount of information required to train sophisticated algorithms. Conversely, Big Data benefits from AI's ability to analyse massive datasets rapidly and accurately. This suggests that, in AI-driven marketing, AI systems depend on users' interactions to generate continuous streams of data, while marketers rely on AI to analyse these data accurately for predictive analytics and ad personalization (Alqudah et al., 2025). The role of artificial intelligence in marketing cannot be overemphasized. Researchers have discussed its contribution to improving return on investment (ROI) through more effective and precise marketing activities (Al Azzam et al., 2023), increased customer engagement, improved strategic decision-making, and more personalized offerings and customer experiences (Jarrah, 2025).

Alqudah et al. (2025) further argue that AI's most significant contribution to marketing lies in customer segmentation. Unlike traditional segmentation methods that rely primarily on broad demographic characteristics, AI captures the complexity of consumer behaviour by combining behavioural and contextual data. This enables more dynamic and accurate customer profiles, allowing marketers to deliver highly relevant and personalized communications while reducing costs, improving ROI, and maximizing marketing efficiency. Simply put, artificial intelligence can identify networks, clusters, spatial and geographic distributions, relationships, and data interconnectedness. By analysing historical data, AI predicts customer behaviour, identifies purchasing patterns, and detects emerging market trends. These capabilities support more effective market segmentation and personalized customer targeting while also optimizing inventory management, campaign timing, and overall marketing performance, ultimately leading to higher conversion rates and improved ROI (Suraña-Sánchez & Aramendia-Muneta, 2024).

4. DISCUSSION: HOW AI TRANSFORMS CONSUMER DATA INTO MARKETING INSIGHTS

4.1. How You Volunteer Data to E-Commerce Marketers

You may not realize it, but in many cases you voluntarily provide the information that marketers use to target you through their AI tools. Understandably, artificial intelligence plays an essential role in facilitating how marketers connect with consumers today. This is why organizations have developed strategies to gather the data required by these technologies. The data they need are yours, but how do organizations obtain them?

Organizations require massive amounts of data to train their AI tools to learn about consumer preferences, trends, interests, and other factors (Gao et al. 2025; Avinash, 2021). Thus, organizations use tools such as CRM databases, chatbots, and websites to collect these data. These are complemented by third-party data from marketing campaigns, channels, weather, and location information. Therefore, if you have interacted with a company's CRM system, chatted with its chatbot, accepted cookies on its website, or engaged with one of its marketing campaigns, you have voluntarily provided valuable data to the company's algorithms. Take, for example, AI-powered chatbots integrated into companies' CRM systems and websites, which provide significant economic and managerial benefits. At lower cost, companies can maximize operational efficiency, increase customer satisfaction and retention, and improve customer engagement while simultaneously collecting valuable information from users (Khneyzer et al., 2024). However, with every question you ask and every interaction you have with a chatbot, you generate requests that are stored as data and later used to improve future responses. Similarly, by accepting cookies on a website, you allow it to store certain information about you, including your location. These data remain stored within AI systems and are subsequently used to deliver personalized campaigns and other relevant information. Such information forms the basis of a knowledge database (Sethi, 2020). Sethi (2020) argues that a knowledge database is the key component of a chatbot. It consists of two-dimensional string arrays for requests and responses, where even-numbered rows contain requests and odd-numbered rows contain responses. Additional columns store different types of user questions and the corresponding responses that the chatbot can provide. There is also a default response used when no matching question is found. Such unmatched questions are stored to further improve the AI system over time. This explains why most artificial intelligence tools require continuous updates.

Therefore, if you have interacted with companies' websites or AI tools in one way or another, you have likely provided them with the information needed to identify and reach you, as AI-powered chatbots typically capture users' historical data, predict their current needs, and support more complex consumer decisions in the future (Siglauskienė, 2023).

4.2. Networks and Clusters: What Marketers Know About You Before the Click

As mentioned earlier, if you have ever wondered how AI knows so much about you, the simple answer is that you voluntarily provide the information. The fact is that AI technology is designed to anonymously record users' behaviour, preferences, and interests on their devices. This creates a pathway for personalized product and service recommendations based on individual interests. Admittedly, this is a complex phenomenon, especially for those who are not technology or artificial intelligence experts. However, it can be explained through concepts linked to algorithms and predictive models, all under the umbrella of data and network science, encompassing spatial analysis, network formation, clustering, and related approaches (Reichhardt & Bornholdt, 2007). To manage marketing budgets and achieve maximum cost efficiency, marketers have adopted data science to refine information about consumer behaviour and make more accurate predictions to satisfy customer needs through various forms of market segmentation (Kohn et al., 2020). This claim is consistent with Bornholdt's (2007) study, which examined market segmentation on the online auction platform eBay by analysing users' bidding behaviour. The study investigated the distribution of user activity and the network of bidders connected by common interests, finding that the network's cluster structure corresponded to groups defined not only by shared interests but also by hierarchical and overlapping relationships. The study focused on consumer goods and therefore considered only auctions with a final price below €1,000. Bornholdt (2007) identified Cluster A as bidders united by a common product category, Cluster B as consisting of two subclusters associated with product categories, while Clusters C through H were each linked to a specific product category. Each cluster represents a network of consumers with similar interests. This information can be valuable when retargeting these customers for future auctions based on the behavioural patterns they exhibit. By focusing on bidding behaviour, the study was able to construct a network of bidders based on their competition for individual products. The findings demonstrate that eBay possesses considerably more information about customers within each of these clusters than may be apparent. This can influence marketing decisions regarding what products to promote, to whom they should be promoted, and whether new products should be introduced to particular customer groups. It also explains why customers in Cluster A may not see the same advertisements or promotional messages as customers in Cluster B. Moreover, segmentation is not limited to product categories. Clusters may also be formed according to factors such as location, product interests, price sensitivity, seasonality, income level, and many others. The choice of variables depends on marketers' objectives and the information required for a particular campaign. Understanding these complex and dynamic patterns of consumer behaviour is one of the major contributions of network science, supported by artificial intelligence, through the collection, analysis, and matching of network data with a high degree of accuracy.

4.3. AI Data-Driven Market/Customer Segmentation

With rapidly evolving technology, especially the advent of artificial intelligence, marketing practices have truly switched gears. While traditional marketing practices are still valuable, marketing activities have become increasingly technology- and insight-driven, particularly because market segmentation has become more complex and consumer behaviour is changing rapidly.

In contrast to conventional market segmentation approaches, which rely heavily on predefined criteria and manual analysis, artificial intelligence methodologies have proven capable of adapting to these changes and the increasing complexity of consumer preferences and behaviours (Praveen, Sudha, & Punithavathy, 2024). Thus, AI has the ability to process and analyse vast amounts of continuously generated consumer data in real time, enabling businesses to develop a more accurate and granular understanding of their target audiences and to serve them better through personalized offers, promotions, advertisements, and targeted marketing campaigns.

Artificial intelligence-derived customer insights go beyond basic information. It generates extensive demographic, psychographic, geographic, and behavioural data through social media tracking, purchase history, location information, and even sentiment analysis. Network science, through geospatial analysis, supports the geomarketing objectives of firms, and location information provides significant advantages (Ansari, 2021, 2023). Integrating these data sources and applying them to advanced analytics gives businesses a comprehensive view of customers' journeys and location information while uncovering hidden patterns that can help predict future customer behaviour with remarkable accuracy, enabling businesses to provide the right products and services at the right time. In their study, Praveen, Sudha, and Punithavathy (2024) reviewed the impact of artificial intelligence on market segmentation, specifically exploring AI methodologies and techniques to evaluate the business impact of AI-driven insights.

To demonstrate the relevance of artificial intelligence to market segmentation, they identified several key algorithms and techniques, including clustering algorithms, classification algorithms, neural networks, and deep learning. Among clustering algorithms, K-means divides customers into k segments based on the nearest mean value to identify distinct groups; hierarchical clustering builds nested clusters within the data; and Density-Based Spatial Clustering of Applications with Noise (DBSCAN) identifies clusters of varying shapes. By integrating and analysing diverse data sources, artificial intelligence enables market segmentation to incorporate online behaviour, social media analytics, purchase history, and customer feedback, resulting in more precise targeting, increased customer engagement and satisfaction, enhanced predictive capabilities, and improved strategic decision-making. Marketers can therefore target customers from a more informed perspective through tailored experiences, timely interventions, anticipation of customer needs, and personalized product recommendations.

4.4. E-Commerce Customer Segmentation via Network Science and Behavioural Patterns

In a study, Nasirzonouzi (2025) argues that the rapid growth of e-commerce has increased the need for customer segmentation and recommendation systems, especially those based on behavioural patterns. He believes that this improves both business performance and customer experience. As Praveen, Sudha, and Punithavathy (2024) also noted, RFM analysis and clustering algorithms such as K-means are valuable tools for this purpose. However, Nasirzonouzi (2025) pointed out their limitations in capturing the complex interdependencies between customers and products. Therefore, his study proposed a network science methodology based on a bipartite graph model using an online retail dataset. The approach builds on the work of Louvain and Leiden (Traag et al., 2019), who identified tightly connected clusters of customers and frequently co-purchased products, as well as the study by Leskovec et al. (2009), which demonstrated that the bipartite graph methodology can extract more meaningful retail communities while outperforming traditional clustering methods.

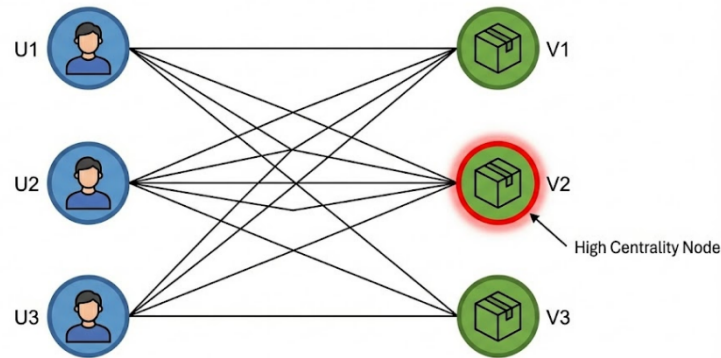


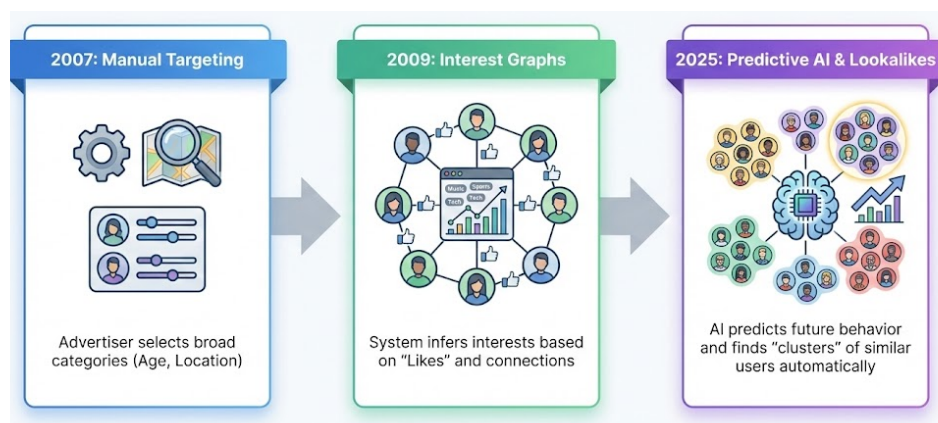
Figure 3: Bipartite Network Model Connecting Customers to Products
Source: Own compilation based on the Bipartite Graph Model by Nasirzonouzi (2025).

Nasirzonouzi's (2025) bipartite graph represents a set of customers and a set of products, with E denoting the weighted edges connecting both entities in the function $G = (U, V, E)$, where V refers to products and U refers to customers. This model was used to identify relationships between customers and products, revealing no isolated nodes, which indicates that every customer interacted with at least one product. The distribution of betweenness centrality was skewed; however, customers with high degree and closeness centrality were found to be well connected. According to the author, this can improve marketing efficiency through personalized promotions and cross-selling, leading to increased customer loyalty and sales. Using the Louvain methodology, the study identified three distinct clusters based on purchasing patterns. Each cluster represents a customer community detected through centrality measures, where higher closeness and centrality indicate a larger and more interconnected network. These communities showed strong preferences for particular product categories. The analysis also identified key customers and products within these communities, supporting cross-selling and up-selling strategies aimed at improving both sales and customer engagement. These centrality measures provide marketers with valuable information by identifying customers who are most suitable for targeted marketing campaigns based on observed customer-product relationships. Overall, the study demonstrates the importance of market segmentation based on customer behaviour revealed through bipartite networks, which support community detection and centrality analysis by uncovering behavioural patterns that strengthen data-driven marketing strategies. The Nasirzonouzi (2025) study is particularly interesting for marketers because it not only applies network science to understand customer-product relationships in an e-commerce environment but also explores customer-to-customer relationships using NetworkX to model co-purchased products. This approach transformed the bipartite graph into a customer network, revealing direct similarities between customers for more focused marketing. The resulting NetworkX model contained 4,362 customer nodes and 5,047,475 edges representing shared products, demonstrating the density and strength of these connections. These findings illustrate the potential of targeted marketing based on customer similarities, suggesting that similar customers can be grouped for personalized communication and product bundling to support cross-selling and up-selling strategies. Combined with behavioural data and community networks, K-means clustering can further strengthen marketing strategies. To explore product recommendation possibilities, Nasirzonouzi (2025) employed a hybrid approach that integrated collaborative filtering with network-based centrality. He pointed out that conventional collaborative filtering usually considers only factors such as purchase history and cosine similarity when making recommendations. However, this approach often fails to incorporate the structural importance of customers within purchasing networks. To overcome this limitation, centrality scores were integrated to leverage the influence of highly connected customers.

Customers with high centrality scores were therefore considered more influential within the purchasing network and consequently more valuable in the recommendation process. This hybrid approach was found to improve recommendation diversity while enhancing personalization. In practice, it gives priority to products purchased by highly connected customers, ensuring that recommendations are not only relevant to individual preferences but also optimized according to the purchasing network. Consequently, it can be inferred that some advertisements are shown not only because of individual preferences but also because of connections to influential customers within the purchasing network.

4.5. Case Study: From Manual Data to AI Networks: The Evolution of Facebook Ads with AI Technology

One relatable case study of how AI has revolutionized customer segmentation in the online community and digital marketing is the evolution of Facebook Ad from what can be considered as manual categorical data to simulative and functional AI-based detailed targeting over the years. When Facebook Ad started in 2007, the targeting capabilities were based on profiles, favourite activities, music preferences, and similar not-too-detailed data. This can be likened to the case of how data are used to form clusters in the explored eBay consumer behaviour study, where nodes are formed, clusters are identified, but not in a particular hierarchy. Around 2009, the AI technology was further instrumentalized in the development of the ad system. This time, Facebook had “enhanced targeting” for advertisers. This time, Facebook shifted from manual profile targeting to intelligent predictive marketing by analysing users’ likes, content interaction, and interests to infer preferences in what appears to be the beginning of machine learning. This time, Facebook was able to predict users’ interests even if they are not manually listed on their profiles. This is an upgrade that could be likened to the Praveen et al. (2024) study, where a hierarchical clustering technique typically builds clusters to identify nested groups with the data, and a Density-Based Spatial Clustering of Applications with Noise (DBSCAN) unravels clusters of varying shapes. As for the Nasirzonouzi (2025) network science methodology where the bipartite graph model demonstrates density and cluster strength simultaneously, where not only nodes but edges are identified, this can be related to the recent development in meta-ad ad where data are accumulated across meta platforms under the tag “detailed targeting”. This is a modern driven AI targeting which relies heavily on machine learning via the principles of clusters and network formation to unravel content analysis, lookalike modelling, and a prediction algorithm to rank which users are most likely to respond to an ad. It was a significant jump for Facebook, as technology made it easy to predict future behaviours, group users into interest clusters, and optimize interest for conversion, not just impressions.



*Figure 4: The Evolution of Facebook Ad Targeting Technology:
Source: Own compilation based on the evolution of Facebook Ads.*

5. CONCLUSION

Our main goal in this study was to examine how marketers use voluntarily provided data to develop e-commerce strategies precisely targeted at specific customers, while also examining this phenomenon from the perspectives of behavioural clustering, network science, and artificial intelligence. The study has shown that every online click, cookie acceptance, and chatbot conversation generates data that marketers use to personalize advertisements and predict consumer needs. Many studies have examined how consumer behaviour has changed in the digital age. In their study, Jeetesh et al. (2020) investigated the role of electronic word of mouth (eWOM) in the effectiveness of social media and online marketing communities. Their results show that eWOM, social media advertising, and e-commerce can all encourage consumer buying decisions. To ensure positive user experiences and customer satisfaction, organizations should focus on the management of their online consumer data, such as opinions and reviews of their products, while considering the specific characteristics of their industry. Today, marketing is largely technology-driven, with AI being the dominant technology. It is important to note that AI can be viewed from different perspectives, including data science, network science, clustering techniques, predictive models, and algorithms. While these fields are complex, they are crucial to both human and business relationship management. Artificial intelligence has fundamentally changed marketing from an intuition-based practice into a predictive, data-driven discipline. With the help of AI, marketers can identify hidden relationships, community structures, and behavioural affinities among consumers. While traditional segmentation methods relied primarily on broad demographic data, AI-driven segmentation incorporates behavioural and contextual information, where consumer intent, network position, and relational influence all play central roles. AI systems enable marketers to uncover meaningful clusters that traditional segmentation models often overlook. The relationship between Big Data and AI is equally important. While Big Data provides vast amounts of behavioural, spatial, and psychographic information, AI transforms these data into actionable insights for marketing decision-making. This enables businesses to conduct predictive modelling, optimize marketing investments, and forecast purchasing trends with greater accuracy. From a behavioural perspective, the study shows that consumers often voluntarily provide personal data through their use of social media and websites, by accepting cookies or interacting with AI-powered customer support. These micro-interactions accumulate into datasets that feed algorithms and knowledge databases. While personalization enhances user experience, it also raises important concerns regarding data ethics and privacy. Ultimately, today's digital marketing ecosystem operates as a network-based prediction system. Unlike traditional marketing, marketers no longer merely persuade consumers; they also anticipate their needs. Firms increasingly rely on algorithmic foresight to reach the right audience with the right message at the right moment. The findings show that the combined use of AI, network science, and behavioural analytics is continuously redefining marketing strategies. A seemingly simple click has evolved into part of a dataset that continuously learns, adapts, and even shapes consumer decision-making patterns. While artificial intelligence and network science have revolutionized modern marketing, they also raise important ethical questions. The future of e-commerce will depend not only on how precisely marketers can predict consumer behaviour but also on how responsibly they protect and respect the data they use to make those predictions.

6. RECOMMENDATIONS

Drawing from the findings of this study, several strategic, ethical, and policy-oriented recommendations can be made for marketers and organizations operating in the field of AI-driven e-commerce analytics. Firms need to increase transparency and consumer trust. Data-driven marketing offers precision and personalization, but it also raises critical privacy concerns.

Organizations should place greater emphasis on implementing clear data policies that explain how user information is collected, processed, and used. By establishing ethical AI data collection practices, data minimization, and clear user consent, companies can build consumer trust and transparency, transforming perceived intrusion into a mutually beneficial exchange of value for both consumers and organizations. Promoting consumer awareness regarding data sharing, algorithmic profiling, and personalized marketing should be a priority. Digital literacy is extremely important because it helps users understand the implications of their online interactions, enabling informed consent and responsible engagement. This should be encouraged across all generations. Although we often assume that younger generations understand online interactions better because they grew up with digital technologies, they may not realize how much data they give away, for example, by accepting cookies on a website without a second thought. Empowered consumers are less likely to become victims of manipulation and have greater control over the data and information they choose to share. Our final recommendation emphasizes the importance of considering ethical and long-term impacts. Marketers and organizations may naturally focus on short-term efficiency by using AI tools to achieve marketing objectives such as targeting the right customers and increasing revenue. However, it is equally important to consider the long-term societal implications, including how AI systems may shape people's thinking, online behaviour, and even societal values over time. For example, over-personalization may create filter bubbles by repeatedly exposing customers to similar content and advertisements, thereby limiting awareness and variety. It is therefore important to regularly review how AI systems make decisions, assessing both their accuracy and ethical implications. This enables companies to identify whether these systems disproportionately target or exclude certain groups. It is equally important to evaluate whether AI systems treat different groups fairly, regardless of ethnicity, gender, or income, thereby preventing marketing systems from reinforcing existing inequalities. By considering these long-term impacts, marketers and organizations can build trustworthy and transparent AI systems that serve both business objectives and the broader interests of society.

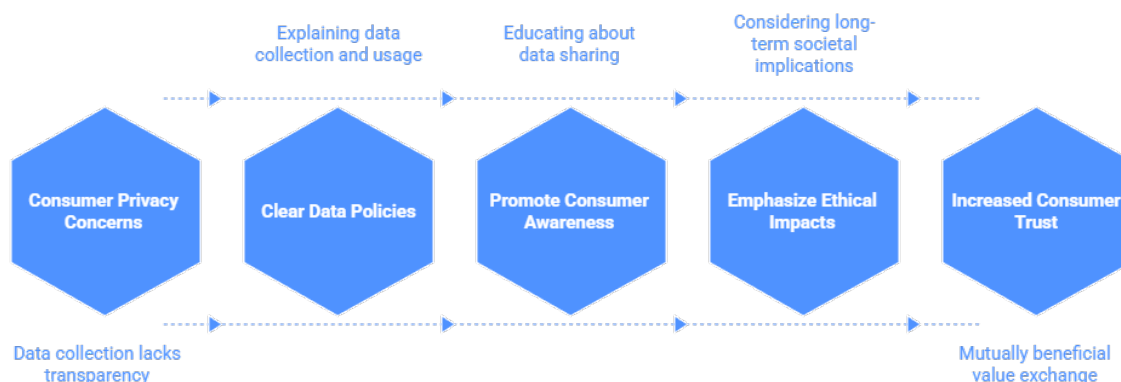


Figure 5: Building Trust in AI E-Commerce

Source: Own compilation based on safe AI usage for e-commerce marketing.

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SUSTAINABILITY RESEARCH, ECONOMIC DEVELOPMENT, AND POLICY ALIGNMENT IN EUROPE: A BIBLIOMETRIC AND NETWORK ASSESSMENT OF THE ECOLOGICAL TRANSITION

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ABSTRACT

The ecological transition has emerged as a central priority in contemporary economic and policy debates, particularly within the European context, where sustainability objectives increasingly shape economic development strategies and regulatory frameworks. This study provides a comprehensive bibliometric and network assessment of the scientific literature linking sustainability research, economic development, and policy alignment in Europe. Using a systematic dataset of 1,920 peer-reviewed publications indexed in the Scopus database, the analysis explores the evolution of the research field, identifies the most influential authors, institutions, and journals, and examines collaboration patterns and thematic clusters through citation and co-occurrence networks. The results reveal a rapid expansion of sustainability-related research—more than 90% of the corpus was published after 2019—characterized by growing interdisciplinarity and increasing integration between environmental economics, innovation studies, and policy analysis. The keyword co-occurrence analysis identifies five dominant thematic clusters: (i) energy transition governance, security, and the just transition, within which emerging technologies such as hydrogen feature prominently; (ii) renewable energy technologies and deployment; (iii) European sustainability governance, the European Green Deal, and policy alignment; (iv) sustainable development, energy efficiency, and decarbonization; and (v) energy communities and the social dimensions of the ecological transition. The findings suggest that accelerating the ecological transition requires stronger integration between scientific research, economic strategies, and environmental policy design, particularly within the European policy framework. The study also identifies key research gaps—including the limited engagement of the literature with core economic development categories and the underrepresentation of South-Eastern Europe—and outlines directions for future research.

Keywords: *Economic development, Sustainability research, Energy transition, Environmental policy, Bibliometric analysis, Network analysis, SLR*

1. INTRODUCTION

The ecological transition—understood as the structural transformation of economies towards climate neutrality, resource efficiency, and environmental sustainability—has moved from the periphery to the centre of European economic policy over the past decade. The adoption of the European Green Deal in 2019 established climate neutrality by 2050 as an overarching objective of the European Union (European Commission, 2019), subsequently codified in the European Climate Law (European Union, 2021).

The 'Fit for 55' legislative package operationalized the intermediate target of a 55% reduction in net greenhouse gas emissions by 2030 (European Commission, 2021), while the REPowerEU plan, adopted in response to Russia's full-scale invasion of Ukraine, added energy security and the accelerated phase-out of Russian fossil fuel imports to the transition agenda (European Commission, 2022). Together, these initiatives have redefined the relationship between environmental policy and economic development strategy in Europe, embedding decarbonization objectives in industrial policy, cohesion policy, financial regulation, and the governance of the single market. This profound policy reorientation has been accompanied by an equally profound expansion of the scientific literature. Research on the ecological and energy transition now spans environmental and energy economics, innovation studies, political science, engineering, and the social sciences, and it increasingly addresses questions of policy design and alignment: how sustainability objectives can be reconciled with growth, competitiveness, and social cohesion, and how scientific evidence can inform the sequencing and coordination of transition policies (Kern and Smith, 2008; Hainsch et al., 2022). The sheer volume, velocity, and interdisciplinarity of this literature, however, make it increasingly difficult for researchers and policymakers to obtain a synoptic view of the field—its intellectual structure, its dominant themes, its geography, and its blind spots. Bibliometric analysis offers a systematic, transparent, and reproducible means of mapping large bodies of scientific literature (Zupic and Čater, 2015; Donthu et al., 2021). By combining performance analysis (publication and citation metrics) with science mapping techniques (co-authorship and keyword co-occurrence networks), bibliometric methods can reveal the social and conceptual structure of a research field in ways that traditional narrative reviews cannot. While bibliometric studies exist for adjacent domains—renewable energy, the circular economy, or climate policy taken separately—the specific intersection of sustainability research, economic development, and policy alignment in the European context has not, to the best of our knowledge, been mapped comprehensively. This study addresses that gap. Drawing on a systematically constructed corpus of 1,920 peer-reviewed publications indexed in Scopus, it pursues four research questions: (RQ1) How has scientific production on the European ecological transition evolved over time, and what are its principal outlets, authors, and institutions? (RQ2) What are the geographical patterns of research activity and international collaboration? (RQ3) What is the conceptual structure of the field—which thematic clusters organize the literature, and how are they interrelated? (RQ4) Which research gaps emerge from this mapping, particularly with respect to the economic development dimension of the transition and its regional coverage? The remainder of the paper is organized as follows. Section 2 situates the study within the relevant conceptual and policy background. Section 3 describes the data and the bibliometric and network methodology. Section 4 presents the results of the performance analysis, the collaboration analysis, and the thematic mapping. Section 5 discusses the findings in relation to the European policy framework and identifies research gaps. Section 6 concludes, acknowledges limitations, and outlines directions for future research.

2. CONCEPTUAL AND POLICY BACKGROUND

The concept of the ecological transition builds on several intersecting research traditions. Sustainability transitions research, rooted in evolutionary economics and science and technology studies, conceptualizes decarbonization as a long-term, multi-actor process of socio-technical regime change, in which policy plays a central coordinating role (Kern and Smith, 2008). Environmental and energy economics contributes the analytical apparatus for evaluating instruments—carbon pricing, subsidies, standards—and for assessing the macroeconomic consequences of the transition for growth, employment, and competitiveness. Innovation studies emphasize the role of directed technological change, mission-oriented policy, and green industrial strategy.

Finally, a rapidly growing social-science literature examines the distributive and participatory dimensions of the transition, crystallized in concepts such as the just transition, energy poverty, energy justice, energy citizenship, and energy democracy (Wahlund and Palm, 2022). In the European Union, these research traditions confront an unusually dense and ambitious policy architecture. The European Green Deal frames the transition explicitly as a growth strategy—'a new growth strategy that aims to transform the EU into a fair and prosperous society, with a modern, resource-efficient and competitive economy' (European Commission, 2019)—thereby fusing environmental and economic development objectives. Subsequent instruments have extended this fusion: the Just Transition Mechanism addresses the regional and social costs of decarbonization; the Recovery and Resilience Facility conditions post-pandemic investment on green criteria; the Carbon Border Adjustment Mechanism links climate policy to trade policy; and the Net-Zero Industry Act and Critical Raw Materials Act connect the transition to industrial policy and strategic autonomy. The 2022 energy crisis further entangled the transition agenda with energy security and geopolitics (Kuzemko et al., 2022). This policy density creates a distinctive research agenda around policy alignment: the vertical alignment of EU, national, and subnational strategies; the horizontal alignment of climate, energy, industrial, and cohesion policies; and the alignment of public policy with private investment and scientific research. Mapping how the scientific literature has engaged with this agenda—and where it has not—is the central task of the present study.

3. DATA AND METHODOLOGY

3.1. Data source and search strategy

The bibliographic data were retrieved from the Scopus database, which offers the broadest coverage of peer-reviewed literature in the social sciences, economics, and energy studies among the major citation databases (Pranckutė, 2021). The search was executed on 8 March 2026 using a query combining terms related to the ecological and energy transition, sustainability, economic development, and policy, restricted to the European context (TITLE-ABS-KEY (("energy transition" OR "ecological transition" OR "green transition") AND (sustainab* OR polic*) AND ("economic development" OR "economic growth" OR governance) AND (europe* OR "Green Deal")) AND PUBYEAR > 1999 AND PUBYEAR < 2027). The search followed the reporting logic of the PRISMA 2020 statement for systematic reviews (Page et al., 2021), adapted to bibliometric purposes. The final corpus comprises 1,920 documents published between 2000 and 2026. Journal articles dominate the corpus (1,344 documents; 70.0%), followed by book chapters (202; 10.5%), conference papers (149; 7.8%), and review articles (139; 7.2%); the remainder consists of books, short surveys, editorials, and other document types. The corpus is overwhelmingly Anglophone (1,830 documents in English; 95.3%), with small contributions in Spanish, Chinese, Russian, Italian, and French, and 61.0% of documents are available in open access. Three records carried implausible publication years attributable to indexing errors in the source database and were excluded from the temporal trend analysis while being retained in the aggregate performance indicators. Publications dated 2026 cover only the first weeks of that year and are reported separately in the trend analysis.

3.2. Analytical approach

The analysis combines the two canonical families of bibliometric techniques distinguished by Donthu et al. (2021): performance analysis and science mapping. Performance analysis describes the productivity and impact of the field's constituents—documents, sources, authors, institutions, and countries—using indicators such as annual scientific production, total and mean citations, and the h-index (Hirsch, 2005).

Science mapping examines the relational structure of the field through network analysis (Aria and Cuccurullo, 2017; van Eck and Waltman, 2010). Two networks are constructed. First, an international co-authorship network is built at the country level: nodes represent countries extracted from author affiliations (whole counting), and edges represent joint publications between country pairs. Second, a keyword co-occurrence network is built from author keywords, following the co-word tradition of Callon et al. (1991): nodes represent keywords and edges represent their joint appearance in a document's keyword list. Prior to network construction, author keywords were harmonized through a thesaurus that merged singular/plural variants, acronyms, and close synonyms (e.g., 'EU' and 'European Union'; 'decarbonisation' and 'decarbonization'; 'CO2 emissions', 'GHG emissions', and 'carbon emissions'). Keywords occurring in at least ten documents were retained, and edges representing a single co-occurrence were pruned to reduce noise. Thematic clusters were identified by applying the Louvain community detection algorithm (Blondel et al., 2008) to the weighted keyword network. The Louvain method greedily maximizes modularity, partitioning the network into communities that are more densely connected internally than externally. Robustness was assessed by varying the minimum keyword occurrence threshold (between 6 and 12); the five-cluster solution reported below is stable in the 8–10 occurrence range. All computations were performed in Python 3.12 using pandas, NetworkX, and the python-louvain implementation of the Louvain algorithm; network layouts use a force-directed (Fruchterman–Reingold) algorithm.

4. RESULTS

4.1. Evolution and profile of scientific production

Figure 1 displays the annual scientific production of the field. The trajectory is one of explosive, policy-synchronized growth. Research output was negligible before 2012 and grew moderately through the mid-2010s, but accelerated sharply from 2019 onwards—the year the European Green Deal was announced—and again after 2021–2022, coinciding with the 'Fit for 55' package, the energy crisis, and REPowerEU. Annual output rose from 5 documents in 2012 to 571 in 2025, corresponding to a compound annual growth rate of 44.0%. Fully 90.3% of the corpus was published in 2020 or later, and 79.1% in 2022 or later; the 172 documents already indexed for the first weeks of 2026 suggest continued expansion. The field, in other words, is not merely growing: it is overwhelmingly a product of the current policy cycle.

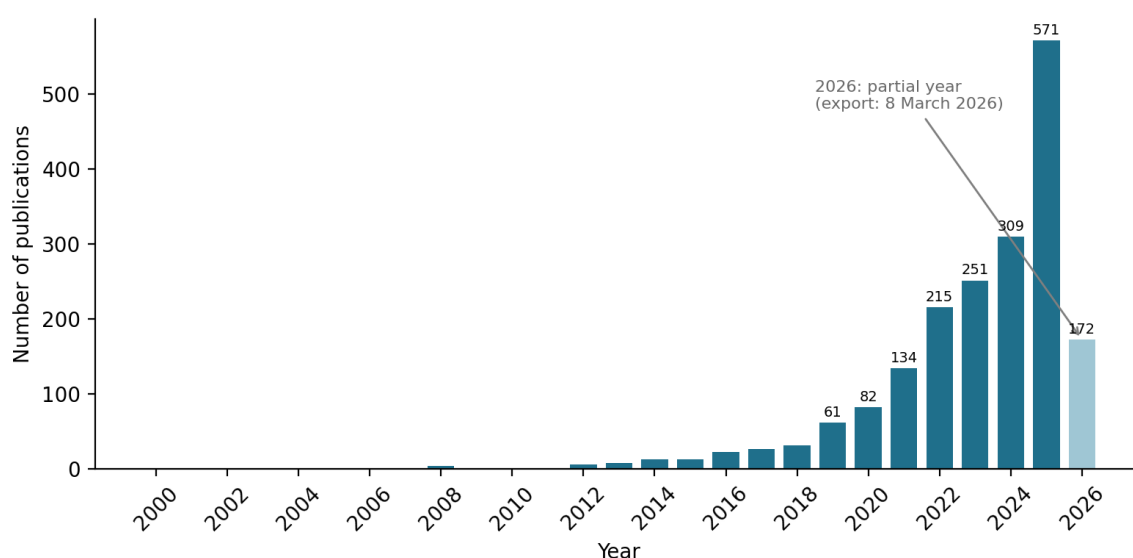


Figure 1. Annual scientific production, 2000–2026 (2026: partial year)

Source: Authors' elaboration on Scopus data

Table 1 summarizes the main characteristics of the corpus. The 1,920 documents were published in 793 distinct sources by 5,542 unique authors, with a mean of 3.39 authors per document and 19.6% single-authored documents—an authorship profile typical of an applied social-science field with a substantial engineering component. The corpus has accumulated 31,500 citations (16.4 per document on average) and reaches an h-index of 80, indicating that 80 documents have received at least 80 citations each. The share of yet-uncited documents (29.2%) reflects the extreme recency of the corpus rather than a lack of impact.

Table 1. Main characteristics of the corpus

Indicator	Value
Timespan	2000 – March 2026
Documents	1,920
Sources (journals, books, proceedings)	793
Authors	5,542
Authors per document (mean)	3.39
Single-authored documents	19.6%
International co-authorships	34.0%
Documents with at least one EU-27 affiliation	74.8%
Open access share	61.0%
Total citations	31,500
Mean citations per document	16.4
h-index	80
Author keywords (distinct, after harmonization)	4,782

Source: Authors' elaboration on Scopus data (export: 8 March 2026).

4.2. Sources, authors, and institutions

Table 2 lists the fifteen most productive sources. The distribution of outlets reveals the field's dual character. On one side stand large, multidisciplinary open-access journals—Energies (140 documents) and Sustainability (94)—which account for volume; on the other stand the field-defining journals of energy policy and energy social science—Energy Policy (91 documents; 3,066 citations) and Energy Research and Social Science (87; 2,978)—which account for disproportionate influence.

Renewable and Sustainable Energy Reviews exhibits the highest citation intensity of all major outlets (34 documents attracting 2,347 citations, i.e., 69 citations per document), consistent with its role as the field's principal review outlet. The co-presence of economics-oriented (Energy Economics, Resources Policy), engineering-oriented (Applied Energy, Renewable Energy), and policy-oriented (Climate Policy) journals among the top outlets confirms the interdisciplinarity claimed for the field.

Table 2. Most productive sources (top 15)

Source	Documents	Total citations
Energies	140	2,158
Sustainability	94	1,279
Energy Policy	91	3,066
Energy Research and Social Science	87	2,978
Renewable and Sustainable Energy Reviews	34	2,347
Energy	26	1,500
Energy Economics	25	443
Applied Energy	23	653
Journal of Cleaner Production	22	569
Energy, Sustainability and Society	20	334
Renewable Energy	16	817
Energy Strategy Reviews	14	411
Resources Policy	14	311
Energy Reports	12	198
Climate Policy	11	336

Source: Authors' elaboration on Scopus data

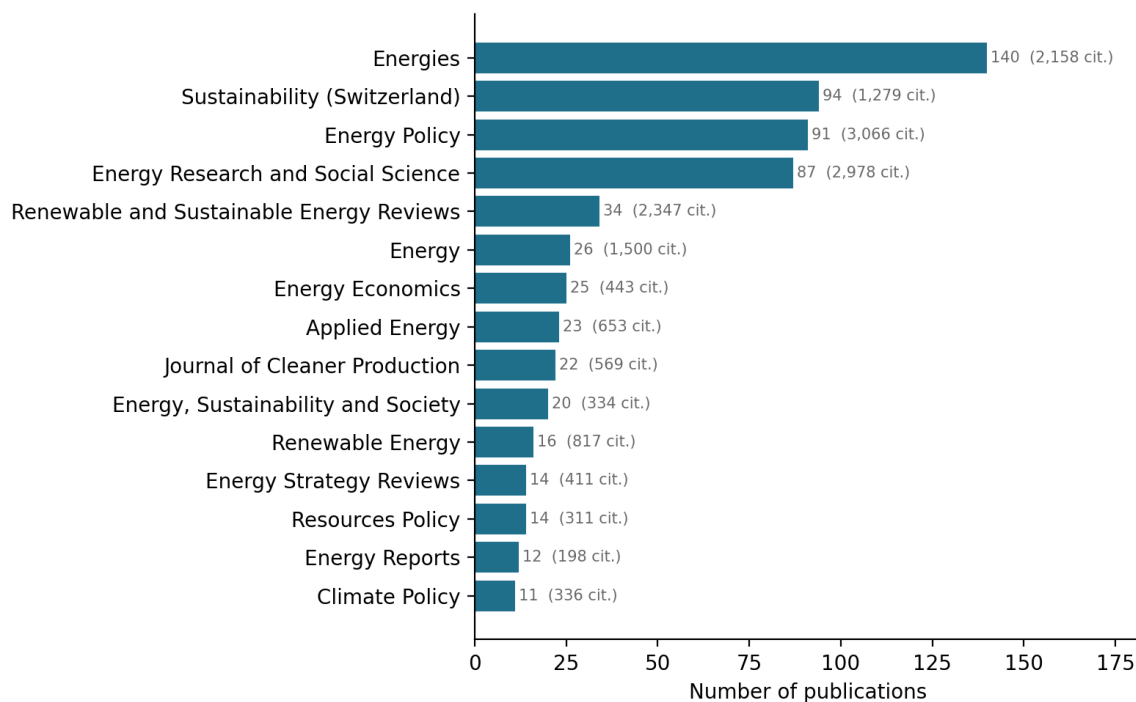


Figure 2. Most productive sources with document counts and total citations

Source: Authors' elaboration on Scopus data

Author-level productivity (Table 3) is comparatively dispersed: no author contributes more than 13 documents, and the top of the ranking mixes distinct research profiles.

Dalia Streimikiene (13 documents) leads in productivity, with a portfolio centred on sustainable energy development and multi-criteria assessment. Piotr Żuk (9) and Paweł Żuk (7) anchor the sociological strand on energy politics and just transition in Central and Eastern Europe; Magdalena Tutak and Jarosław Brodny (8 each) contribute comparative EU-level assessments of energy transition performance; Christian Breyer (8 documents; 741 citations) and Benjamin K. Sovacool (7; 705) combine high productivity with the highest citation impact among the top authors, from energy-systems modelling and energy social science respectively; and Panagiotis Fragkos (8) represents the integrated-assessment modelling community. Institutionally (Table 4), the ranking is led by the Silesian University of Technology (28 documents)—reflecting the intense research attention devoted to Poland's coal transition—followed by a cluster of Dutch universities (Delft, Utrecht, Groningen, Amsterdam, Erasmus Rotterdam), the Bucharest University of Economic Studies, the University of Coimbra, and major technical universities (NTNU, Politecnico di Milano, Politecnico di Torino, TU Munich).

Table 3. Most productive authors (top 10)

Author	Documents	Total citations
Streimikiene, Dalia	13	288
Żuk, Piotr	9	405
Breyer, Christian	8	741
Brodny, Jarosław	8	381
Fragkos, Panagiotis	8	341
Tutak, Magdalena	8	381
Hoppe, Thomas	7	177
Panait, Mirela	7	178
Sovacool, Benjamin K.	7	705
Żuk, Paweł	7	256

Source: Authors' elaboration on Scopus data

Table 4. Most productive institutions (top 10)

Institution	Documents
Silesian University of Technology (Poland)	28
Bucharest University of Economic Studies (Romania)	18
Delft University of Technology (Netherlands)	18
University of Coimbra (Portugal)	18
University of Groningen (Netherlands)	18
Utrecht University (Netherlands)	18
University of Amsterdam (Netherlands)	16
Norwegian University of Science and Technology (Norway)	15
Politecnico di Milano (Italy)	15
Sapienza University of Rome (Italy)	15

Source: Authors' elaboration on Scopus data. Institution names harmonized from affiliation strings.

4.3. Geography of research and international collaboration

Figure 3 and Table 5 present the country-level distribution of research activity. Italy (284 documents), Germany (220), Spain (196), Poland (194), the United Kingdom (181), and the Netherlands (169) form the productive core of the field. Overall, 74.8% of documents involve at least one EU-27 affiliation, confirming that research on the European ecological transition is predominantly—though not exclusively—produced within the Union itself. Two features of the ranking deserve emphasis. First, Poland's fourth position is remarkable relative to the size of its research system and reflects the scientific salience of its coal-dependent energy transition, a pattern also visible in the institutional ranking. Second, extra-European participation is substantial: China (103 documents) and the United States (86) both rank among the top eleven countries, indicating that the European transition functions as a global reference case.

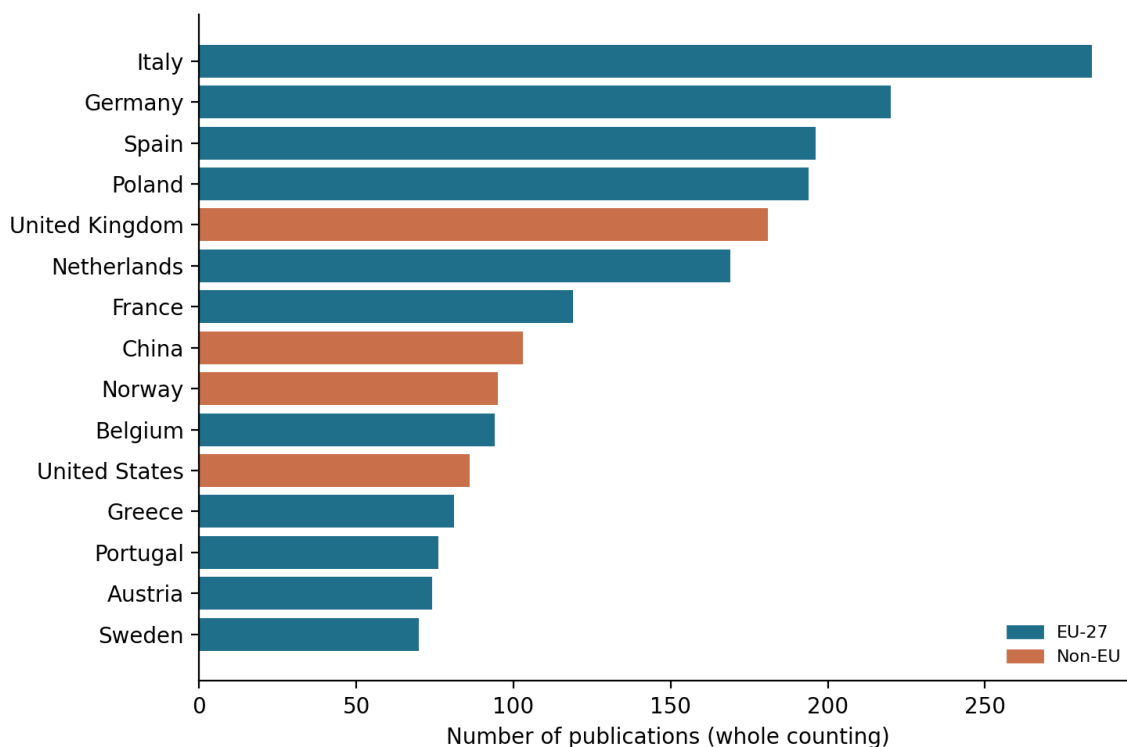


Figure 3. Most productive countries (top 15, whole counting)
Source: Authors' elaboration on Scopus data.

Table 5. Most productive countries (top 15, whole counting)

Rank	Country	Documents	Rank	Country	Documents
1	Italy	284	9	Norway	95
2	Germany	220	10	Belgium	94
3	Spain	196	11	United States	86
4	Poland	194	12	Greece	81
5	United Kingdom	181	13	Portugal	76
6	Netherlands	169	14	Austria	74
7	France	119	15	Sweden	70
8	China	103			

Source: Authors' elaboration on Scopus data

International collaboration is a defining feature of the field: 34.0% of all documents are internationally co-authored. The country co-authorship network (Figure 4) comprises 61 countries with at least five documents, connected by 716 collaboration links, and exhibits a high density (0.391) for a network of this size—evidence of an intensely integrated European research space. Germany occupies the most central position in the network (total link strength of 374 joint publications), followed closely by the United Kingdom (365), Italy (319), Spain (276), and the Netherlands (273). The strongest bilateral axes are United Kingdom–Germany (36 joint documents), Spain–Italy (35), Germany–Netherlands (32), and Germany–Austria (31), delineating a collaboration core that mirrors the geography of EU research funding and long-standing academic ties. Norway (total link strength of 190) is the most connected non-EU country, consistent with its deep integration into European energy research through the EEA and Horizon programmes.

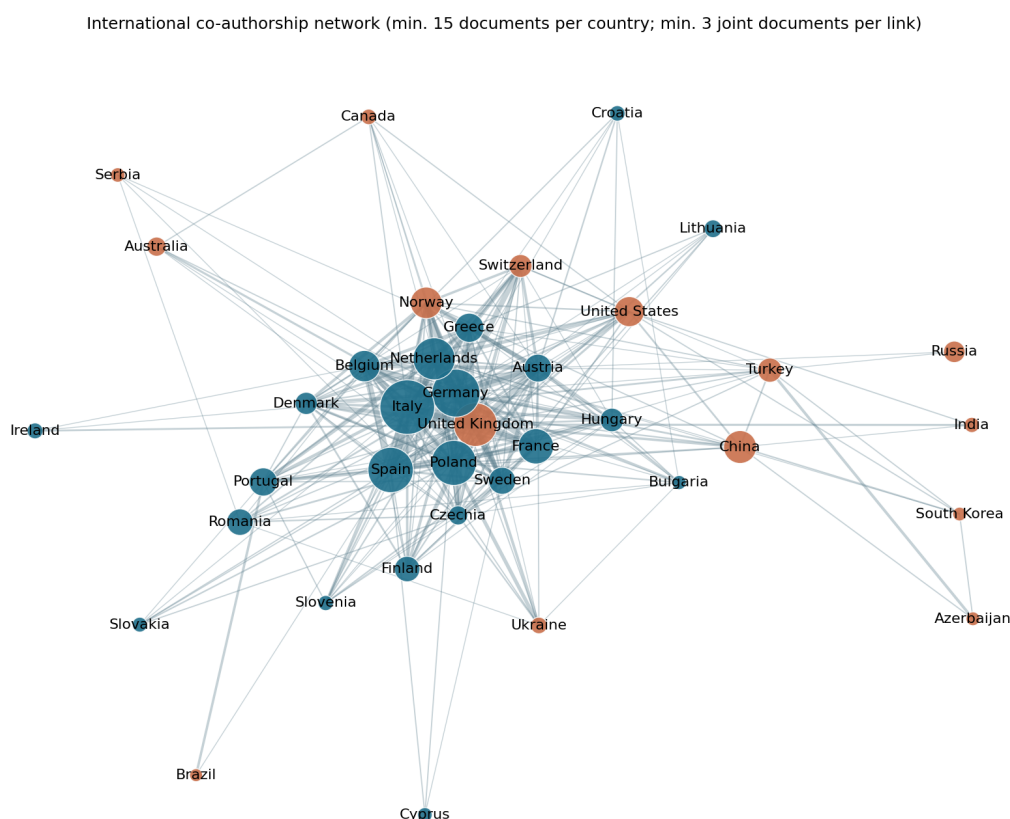


Figure 4. International co-authorship network. Node size proportional to documents; blue = EU-27, orange = non-EU. Source: Authors' elaboration on Scopus data.

4.4. Citation analysis

Table 6 lists the ten most cited documents in the corpus, which jointly delineate the field's intellectual reference points. The list is headed by Hassan et al. (2024) on the role of renewables in global energy transformations (1,201 citations)—a striking case of near-instantaneous citation accumulation. The remainder of the list maps the field's principal concerns: continental-scale renewable energy system modelling (Child et al., 2019; Bódis et al., 2019); the governance of renewable energy communities under the EU Clean Energy Package (Lowitzsch et al., 2020); electric mobility (Biresselioglu et al., 2018); the foundational transition-policy analysis of Kern and Smith (2008)—the only pre-2018 document in the list and, in effect, the field's classic; the hydrogen economy as a route to net zero (van der Spek et al., 2022); and the participatory turn

represented by energy democracy and citizenship (Wahlund and Palm, 2022) and energy community business models (Reis et al., 2021). The prominence of review articles among the most cited documents (six of ten) is characteristic of a rapidly consolidating field in which synthesis commands a premium.

Table 6. Most cited documents (top 10)

Document	Source	Citations
Hassan et al. (2024), The renewable energy role in the global energy transformations	Renewable Energy Focus	1,201
Child et al. (2019), Flexible electricity generation, grid exchange and storage for the transition to a 100% renewable energy system in Europe	Renewable Energy	495
Lowitzsch et al. (2020), Renewable energy communities under the 2019 European Clean Energy Package	Renew. Sustain. Energy Rev.	486
Biresselioglu et al. (2018), Electric mobility in Europe: motivators and barriers	Transp. Res. Part A	389
Kern and Smith (2008), Restructuring energy systems for sustainability? Energy transition policy in the Netherlands	Energy Policy	374
Bódis et al. (2019), A high-resolution geospatial assessment of the rooftop solar photovoltaic potential in the EU	Renew. Sustain. Energy Rev.	373
Li et al. (2022), Review and outlook on the international renewable energy development	Energy and Built Environment	348
van der Spek et al. (2022), Perspective on the hydrogen economy as a pathway to reach net-zero CO2 emissions in Europe	Energy Environ. Sci.	319
Wahlund and Palm (2022), The role of energy democracy and energy citizenship for participatory energy transitions	Energy Res. Soc. Sci.	276
Reis et al. (2021), Business models for energy communities: a review of key issues and trends	Renew. Sustain. Energy Rev.	272

Source: Authors' elaboration on Scopus data (citation counts as of 8 March 2026)

4.5. Conceptual structure: keyword co-occurrence and thematic clusters

After harmonization, the corpus contains 4,782 distinct author keywords. Their frequency distribution is steeply skewed: 'energy transition' (579 occurrences) dominates the field's vocabulary, followed by 'renewable energy' (300), 'European Union' (209), 'ecological transition' (126), 'energy policy' (114), 'climate change' (98), and 'decarbonization' (93). The prominence of 'European Green Deal' (79), 'energy security' (74), 'just transition' (51), 'hydrogen' (51), and 'energy poverty' (48) signals how strongly the field's conceptual agenda tracks the policy agenda. The keyword co-occurrence network (Figure 5) retains the 79 keywords occurring in at least ten documents, connected by 449 co-occurrence links. Louvain community detection partitions the network into five clusters (modularity = 0.099). The low modularity value is itself informative: it indicates that the field's themes are densely interwoven around a small number of integrating hubs rather than separated into siloed subfields.

Indeed, 'energy transition' exhibits by far the highest betweenness centrality in the network (0.337), followed by 'renewable energy' (0.213) and 'European Union' (0.104): these three concepts function as the connective tissue of the entire literature. Table 7 summarizes the five clusters.



Figure 5. Author-keyword co-occurrence network (min. 10 occurrences), Louvain communities. Node size proportional to occurrences
Source: Authors' elaboration on Scopus data

Table 7. Thematic clusters identified by Louvain community detection in the keyword co-occurrence network (Table ends on the next Page)

Cluster (items; occurrences)	Representative keywords	Interpretation
C1 (30; 1,407)	energy transition; energy policy; decarbonization; energy security; climate policy; hydrogen; just transition; energy poverty; energy justice; natural gas; geopolitics; coal; Poland	Energy transition governance, security, and the just transition — the field's core, fusing climate/energy policy with the security and social agenda; hydrogen features prominently as the leading emerging technology
C2 (20; 651)	renewable energy; Europe; governance; economic development; solar energy; wind energy; nuclear energy; electric vehicles; machine learning	Renewable energy technologies and deployment — technology-oriented and comparative analyses of renewable deployment in Europe

Cluster (items; occurrences)	Representative keywords	Interpretation
C3 (15; 809)	European Union; ecological transition; climate change; European Green Deal; sustainability; circular economy; industrial policy; critical raw materials; innovation	European sustainability governance and policy alignment — the Green Deal's institutional architecture, industrial policy, and resource dimensions
C4 (9; 249)	sustainable development; energy efficiency; carbon emissions; green economy; SDGs; climate neutrality	Sustainable development, efficiency, and decarbonization — macro-level assessment of environmental-economic performance
C5 (5; 105)	energy communities; energy democracy; community energy; prosumers; EU policy	Energy communities and the social dimensions of the transition — participatory and decentralized energy governance

Source: Authors' elaboration on Scopus data. Louvain algorithm (Blondel et al., 2008), weighted network, min. keyword occurrence = 10

The five clusters can be read as concentric layers of the field. Cluster C1—by far the largest, with 30 keywords and 1,407 aggregate occurrences—constitutes the core: it binds the governance of the energy transition to energy security, climate policy, and the social question of the just transition, and it is here that emerging technologies, above all hydrogen (51 occurrences), are debated.

Cluster C3 forms the institutional layer, organized around the European Union, the European Green Deal, the ecological transition, and their extensions into circular economy, industrial policy, and critical raw materials. Cluster C2 provides the technological layer of renewable deployment; Cluster C4 the macro-evaluative layer connecting sustainable development, energy efficiency, and emissions; and Cluster C5 the participatory layer of energy communities, democracy, and prosumers. Notably, 'economic development' (25 occurrences) sits inside the renewable-deployment cluster rather than forming a cluster of its own—a first indication of the limited autonomous presence of development economics in this literature, to which we return in Section 5.

Figure 6 traces the temporal dynamics of six diagnostic keywords over 2016–2025. Three waves are visible. 'Circular economy' and 'European Green Deal' rise from 2019–2020, tracking the Green Deal policy cycle. 'Energy security' surges dramatically after 2022—from a marginal presence to appearing in roughly one in fifteen documents—registering the impact of Russia's invasion of Ukraine on the research agenda, together with 'hydrogen', whose rise reflects both REPowerEU and national hydrogen strategies. 'Just transition' and 'energy poverty' rise more steadily across the period, indicating a durable, rather than merely crisis-driven, social turn in the literature.

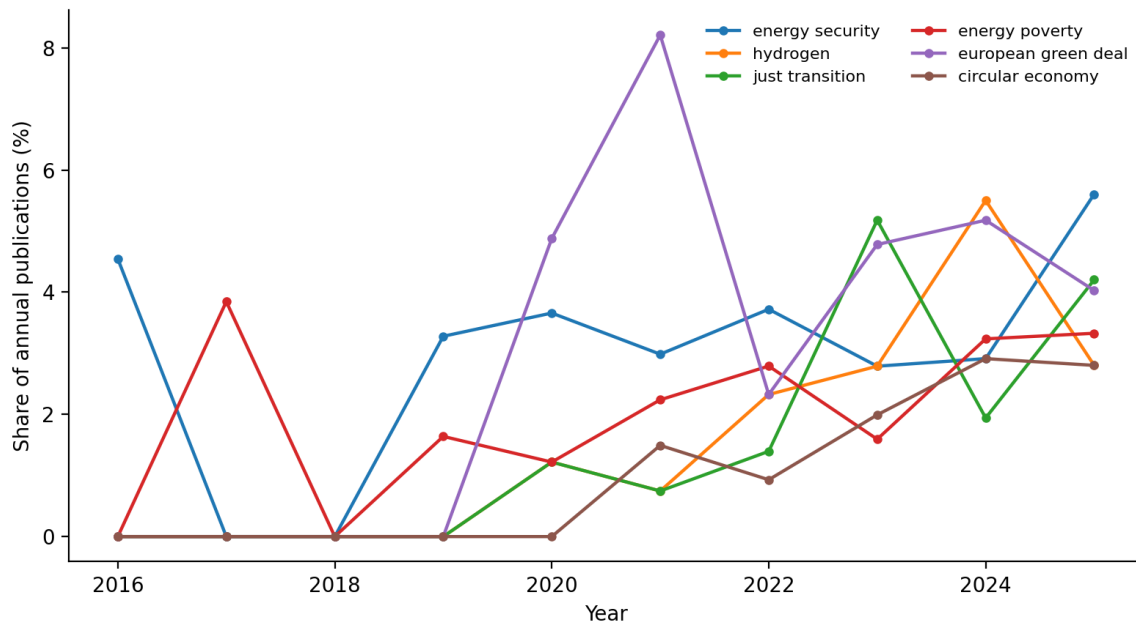


Figure 6. Share of annual publications featuring selected author keywords, 2016–2025.
Source: Authors' elaboration on Scopus data.

5. DISCUSSION

5.1. A policy-synchronized research field

The single most salient finding of this study is the extraordinary degree to which scientific production on the European ecological transition is synchronized with the European policy cycle. Each inflection in the publication curve corresponds to a policy event: the 2019 announcement of the European Green Deal, the 2021 'Fit for 55' package and European Climate Law, and the 2022 energy crisis and REPowerEU. The keyword dynamics confirm this at a finer grain: 'energy security' and 'hydrogen' surge precisely when the policy agenda pivots towards them. This synchronization cuts both ways. On the one hand, it demonstrates a research community that is responsive and policy-relevant—an asset for evidence-informed policymaking. On the other hand, it raises the question of whether the literature leads or follows the policy agenda: a field whose thematic priorities are set by Brussels' legislative calendar risks under-investing in anticipatory research on problems that have not yet reached the political agenda, and in the patient accumulation of evidence on policies already adopted.

5.2. Interdisciplinary integration and its structure

The network results qualify the common claim that transition research is fragmented across disciplines. The low modularity of the keyword network (0.099), the extreme betweenness centrality of 'energy transition', and the co-presence of engineering, economics, policy, and social-science journals among the top outlets together indicate a field that is integrated around shared boundary concepts rather than fragmented into disciplinary silos. The five thematic clusters are layers of a single conversation, not separate conversations. This integration is a relatively recent achievement: the social clusters (just transition, energy poverty, energy communities) that now interpenetrate the governance core were marginal before 2019. The European research space also emerges as socially integrated: a co-authorship network density of 0.391 and an international co-authorship share of 34% place the field among the more collaborative areas of social-science-adjacent research, plausibly reflecting the coordinating role of the EU framework programmes.

5.3. The missing economics of the ecological transition

Against this backdrop, the study's most consequential negative finding concerns the economic development dimension announced in our title. The vocabulary of development economics is strikingly rare in the corpus: 'economic development' (including 'economic growth') appears as an author keyword in only 25 documents, 'employment' in 6, 'green finance' in 6, 'regional development' in 5, 'cohesion policy' in 4, 'competitiveness' in 3, and 'productivity' in a single document, while 'GDP' does not appear at all among harmonized keywords occurring in the network. In a policy environment in which the Green Deal is explicitly framed as a growth strategy, and in which debates over competitiveness (culminating in the 2024 Draghi report's diagnosis) and the financing of the transition dominate the political discourse, the scientific literature captured here engages only thinly with the transition's core economic categories: growth, productivity, employment, investment, and regional convergence. The economics that is present is overwhelmingly energy economics—prices, efficiency, security—rather than development economics. This constitutes, in our reading, the field's most important research gap.

5.4. Geographical asymmetries

The geography of the field displays a second asymmetry. Research is concentrated in Western and Southern Europe, with Poland as the sole Central-Eastern European country in the productive core—and Polish research is itself heavily concentrated on the coal transition. The remainder of Central, Eastern, and especially South-Eastern Europe is thinly represented: Romania contributes 67 documents, Hungary 53, Czechia 35, Croatia 23, Serbia 20, and Bulgaria 19, while the non-EU Western Balkans are nearly absent from the corpus. This is a substantive, not merely a bibliometric, problem: the candidate countries of South-Eastern Europe face the most demanding versions of the transition—carbon-intensive energy systems, limited fiscal space, and EU accession conditionality that increasingly incorporates the climate acquis and the Green Agenda for the Western Balkans—yet generate the least evidence about it. The alignment of sustainability research, economic development, and policy that this paper takes as its object is weakest precisely where the transition is hardest.

5.5. Implications for policy and research alignment

Three implications follow. For research funders, the findings argue for instruments that counteract the field's procyclicality: sustained funding lines for ex-post policy evaluation and for the economics of the transition (productivity, labour reallocation, investment, distributional incidence), rather than calls that track the legislative agenda. For policymakers, the demonstrated integration of the field's social and governance strands suggests that the evidence base for designing just-transition instruments is maturing rapidly, whereas the evidence base for the Green Deal's growth-strategy claims remains comparatively thin and should be commissioned deliberately. For the research community of South-Eastern Europe and the enlargement countries, the geographical gap identified here represents both a responsibility and an opportunity: regionally grounded research on the economics and governance of the transition in candidate and potential-candidate countries would fill the corpus's most visible blind spot and directly serve the accession process.

6. CONCLUSIONS, LIMITATIONS, AND FUTURE RESEARCH

This study has provided a bibliometric and network assessment of the scientific literature linking sustainability research, economic development, and policy alignment in Europe, based on 1,920 Scopus-indexed documents. Four conclusions stand out. First, the field has expanded explosively and in near-perfect synchrony with the European policy cycle, with over 90% of the corpus published after 2019.

Second, its social structure is densely collaborative and its intellectual structure is integrated rather than fragmented: five thematic clusters—energy transition governance and the just transition; renewable energy technologies; European sustainability governance and the Green Deal; sustainable development and decarbonization; and energy communities—are woven together by the boundary concepts of energy transition, renewable energy, and the European Union. Third, emerging technologies, above all hydrogen, and the post-2022 energy-security agenda have moved to the centre of the field. Fourth, the field exhibits two consequential gaps: the near-absence of core development-economics categories, and the underrepresentation of Central-Eastern and especially South-Eastern Europe. The study's limitations follow from its design. The corpus derives from a single database (Scopus) and a single, albeit systematic, search strategy; coverage of books, national-language journals, and grey literature—including the policy literature itself—is necessarily partial, which may understate the contribution of smaller research systems publishing in national outlets. Citation counts are a lagging and field-dependent indicator, particularly unkind to the most recent documents that dominate this corpus. The absence of cited-reference data in the export precluded co-citation and bibliographic-coupling analyses of the field's intellectual base. Keyword harmonization, however carefully performed, involves judgment; and the Louvain algorithm's stochastic character means cluster boundaries should be read as robust tendencies rather than sharp partitions—a reading reinforced by the network's low modularity. These limitations chart the agenda for future research. Methodologically, complementing the present mapping with co-citation analysis (on a references-enabled export), topic modelling of abstracts, and a systematic-review layer that codes methods and findings would deepen the assessment. Substantively, the two gaps identified here define priorities: rigorous empirical work on the economic development consequences of the European transition—productivity, employment, investment, and regional convergence under the Green Deal—and regionally grounded research on transition governance and financing in Central, Eastern, and South-Eastern Europe, including the Western Balkan enlargement countries. Bridging these gaps would bring the scientific literature into fuller alignment with the questions on which the success of the European ecological transition will ultimately be judged.

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INFLUENCER MARKETING AND CONSUMER BEHAVIOR IN THE COSMETICS INDUSTRY: THE ROLE OF SOCIAL MEDIA IN PURCHASE DECISION-MAKING

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ABSTRACT

The increasing importance of social media has substantially changed the way cosmetic brands communicate with consumers. In this environment, influencer marketing has become a widely used promotional approach that allows brands to reach target audiences through authentic and engaging content. By sharing product experiences, reviews, and recommendations, influencers can affect consumers' perceptions of brands and products, ultimately influencing their purchasing decisions. This paper explores the relationship between influencer marketing and consumer behavior in the cosmetics industry, with particular attention given to the role of social media in the decision-making process. The theoretical section reviews relevant concepts related to digital marketing, consumer behavior, and influencer marketing, emphasizing factors such as trust, credibility, and authenticity. These factors are increasingly recognized as important drivers of consumer engagement and purchase intention. The empirical research was conducted using a survey questionnaire administered to a sample of 350 respondents who actively use social media platforms. The study examines the extent to which consumers follow influencers, trust their recommendations, and consider influencer-generated content when purchasing cosmetic products. In addition, differences in attitudes among various age groups are analyzed, together with the influence of specific social media platforms on consumer choices. The results are expected to demonstrate that influencer marketing plays a significant role in shaping consumer behavior within the cosmetics industry. In particular, higher levels of trust in influencers are anticipated to be associated with stronger purchase intentions. The findings contribute to a better understanding of contemporary marketing practices and provide useful insights for cosmetic brands seeking to improve the effectiveness of their promotional activities in the digital environment.

Keywords: *consumer behavior; cosmetics industry; influencer marketing; purchase intention; social media*

1. INTRODUCTION

Digital transformation has significantly changed the way companies communicate with consumers, with the development of the internet, mobile technologies and social networks enabling the transition from traditional one-way marketing communications to interactive forms of information exchange, all of which make digital marketing a key instrument for building relationships with consumers. Social networks play a special role in this, enabling consumers to actively participate in the creation and sharing of content and the development of electronic word-of-mouth (eWOM). In such an environment, influencer marketing has become one of the most important forms of digital marketing communication.

Its effectiveness is based on the perception of credibility, expertise and authenticity of influencers and on the development of parasocial relationships with followers, which can significantly influence consumers' attitudes, trust and purchase intentions. It is particularly pronounced in the cosmetics industry, where visual presentation of products, application demonstrations and user experiences play an important role in the process of making purchasing decisions, and therefore Instagram, TikTok and YouTube have become key communication channels between brands and consumers. Numerous studies confirm the importance of influencer marketing in shaping consumer behavior, but continuous changes in the digital environment and social media algorithms require constant reexamination of existing knowledge about the effectiveness of influencer marketing. Accordingly, the aim of this paper is to analyze the impact of influencer marketing on consumer behavior in the cosmetics industry, with a special emphasis on the role of social networks in the purchase decision-making process. The paper contributes to the existing literature by integrating key determinants of influencer marketing, including trust, credibility, authenticity and parasocial relationships, and provides guidelines for developing more effective marketing strategies in the digital environment.

2. LITERATURE REVIEW

Digital marketing has become one of the key elements of modern business strategies because it enables personalization of marketing activities, continuous communication with users and monitoring of their behavior in real time (Lou and Yuan, 2019; Ki and Kim, 2019). A systematic literature review conducted by Vrontis et al. (2021) confirms that digital marketing is no longer limited to product promotion, but represents a strategic approach to building long-term relationships with consumers through the integration of various digital communication channels. A particularly important role in digital marketing is played by social networks, which have changed the way consumers gather information, communicate with brands and make purchasing decisions. Platforms such as Instagram, TikTok, YouTube and Facebook have enabled the development of electronic word-of-mouth (eWOM), where users share experiences, publish reviews and recommend products to other users. This form of communication increases market transparency and significantly affects the perception of product quality and purchasing behavior (Ki and Kim, 2019; Lou and Yuan, 2019). According to Vrontis et al. (2021), social networks are the foundation of modern influencer marketing because they enable continuous interaction between influencers, brands and consumers and create an environment in which trust and engagement are developed through long-term communication, rather than through one-off promotional activities. The development of social networks has also stimulated the intensive growth of influencer marketing, which in recent years has become one of the most significant forms of digital marketing communication. Influencer marketing is based on cooperation between companies and individuals who have built recognition and credibility among their followers and can influence their attitudes, perceptions and behavior. Unlike traditional advertising, influencers create content that is often perceived as more personal, authentic and less commercial, which is why their recommendations have a stronger impact on consumers (Lou and Yuan, 2019). A systematic review by Vrontis et al. (2021) shows that the effectiveness of influencer marketing is based on the interaction of influencer credibility, content quality, audience engagement and the development of emotional relationships with followers, with none of these factors acting in isolation. The cosmetics industry is one of the areas where influencer marketing is most effective. Cosmetic products belong to the category of high-involvement products because consumers try to gather as much information as possible about quality, application method and expected results before purchasing. Visually oriented platforms such as Instagram and TikTok allow the display of products through videos, tutorials, demonstrations and comparisons of results before and after use, which reduces the perception of risk and facilitates the decision to purchase.

Silva et al. (2020) state that digital influencers, through continuous interaction with the audience, significantly increase user engagement and positively influence the perception of the product, while Schouten et al. (2020) show that influencers achieve greater audience identification and a greater perception of authenticity than traditional celebrities. One of the most frequently researched factors for the success of influencer marketing is trust in the influencer. Source credibility theory assumes that the effectiveness of communication depends on the perception of the expertise, reliability, and attractiveness of the information source. When consumers perceive an influencer as competent and honest, the likelihood of accepting their recommendations and developing positive attitudes towards the product increases. Lou and Yuan (2019) found that the informative value of the content, credibility, and attractiveness of the influencer positively affect trust in sponsored posts, brand awareness, and purchase intention. Similarly, Sokolova and Kefi (2020) confirm that the credibility of the influencer has a direct positive effect on consumer purchase intentions, while recent research emphasizes that the transparency of sponsored posts and the authenticity of the content are becoming more important than the number of followers (Vrontis et al., 2021). Along with trust and credibility, the concept of authenticity is attracting increasing attention in the literature. Consumers today are increasingly recognizing overly commercialized posts and react more positively to influencers who consistently communicate their own values, openly indicate paid collaborations, and publish content that is not exclusively promotional. According to Vrontis et al. (2021), authenticity is one of the most important factors in the long-term effectiveness of influencer marketing because it contributes to the development of trust, engagement, and loyalty of followers. Tanwar et al. (2022) also conclude that contemporary trends in influencer marketing are increasingly based on the quality of the relationship between influencers and their audience, while the popularity of the influencer itself is becoming less important.

An important theoretical concept in explaining the effectiveness of influencer marketing is parasocial relationships. These are one-sided emotional relationships in which followers develop a sense of closeness with the influencer despite the fact that the mutual communication is not reciprocal. Reinikainen et al. (2020) showed that parasocial relationships increase the perception of influencer credibility and indirectly strengthen trust in the brand and purchase intention. Sokolova and Kefi (2020) confirm that emotional connection develops through regular communication, sharing of personal experiences and the continuous presence of influencers on social networks. Such relationships are particularly pronounced in beauty communities, where influencers often share skincare routines, product experiences and advice, thereby further reducing the psychological distance between themselves and their followers. The literature also points to differences between micro and macro influencers. Although macro influencers achieve a greater audience reach, research shows that micro influencers often achieve higher engagement rates, higher levels of trust and stronger relationships with their followers. Schouten et al. (2020) point out that micro-influencers achieve a greater perception of authenticity and audience identification, while recent literature reviews emphasize that the number of followers is not a sufficient indicator of the success of influencer marketing. The effectiveness of a campaign depends to a greater extent on the fit between the influencer and the brand, the quality of the content, the credibility of the source and the level of audience engagement (Vrontis et al., 2021). Based on the analyzed literature, it can be concluded that influencer marketing is one of the most important instruments of modern digital communication, especially in the cosmetics industry. Previous research consistently confirms that influencer credibility, content authenticity, follower trust, parasocial relationships and audience engagement have a positive impact on brand attitudes and purchase intentions.

At the same time, systematic literature reviews warn that existing knowledge is still partially fragmented and that there is a need for integrated models that will simultaneously observe the interrelationships of the aforementioned constructs in different industrial and cultural contexts.

3. RESEARCH METHODOLOGY

The empirical research was conducted using a structured questionnaire with the aim of examining the impact of influencer marketing on consumer behavior in the cosmetics industry. The quantitative approach enabled the collection of data from a larger number of respondents and the statistical analysis of the relationship between the key research constructs: trust in influencers, their authenticity and credibility, the influence of social networks, and the intention to purchase cosmetic products. The sample includes 350 respondents who actively use at least one social network and buy cosmetic products. The research included adults who had purchased at least one cosmetic product in the last six months. The largest share of respondents is made up of people aged between 18 and 34, which is in line with the results of previous research confirming that this population uses social networks and follows influencer content the most intensively (Lou and Yuan, 2019; Ki and Kim, 2019). The measurement instrument is based on a structured questionnaire that includes four sections: demographic characteristics of respondents, patterns of social network use, attitudes towards influencer marketing, and purchasing behavior. A five-point Likert scale was used to measure the latent constructs. The measurement scales were taken and adapted from previously validated studies (Lou and Yuan, 2019; Ki and Kim, 2019; Sokolova and Kefi, 2020; Reinikainen et al., 2020). Statistical data processing was performed in JASP. The analysis included descriptive statistics, assessment of the reliability of the measurement scales using Cronbach's α coefficient, Pearson correlation analysis, multiple linear regression, and one-way analysis of variance (ANOVA). Statistical significance was assessed at the $p < 0.05$ level. Based on the literature review, five research hypotheses were formulated:

H1: Trust in beauty influencers positively affects the intention to purchase cosmetic products.

H2: Perception of influencer authenticity positively affects consumer trust.

H3: Frequency of following beauty influencers positively affects the intention to purchase cosmetic products.

H4: There are statistically significant differences between age groups in the impact of influencer marketing on purchase intention.

H5: Instagram and TikTok have a greater impact on cosmetic product purchase decisions than other social networks.

The research was conducted in accordance with the basic ethical principles of social research. The participation of respondents was voluntary and anonymous, and all collected data was processed exclusively at the group level.

The results of the research are presented through descriptive analysis, assessment of the reliability of measurement scales, correlation and regression analysis, and analysis of differences between age groups. The sample is dominated by women (72.0%), while men make up 28.0% of the respondents. The most represented age groups are 18 to 24 years (35.1%) and 25 to 34 years (32.0%), which confirms the dominant representation of younger users of social networks.

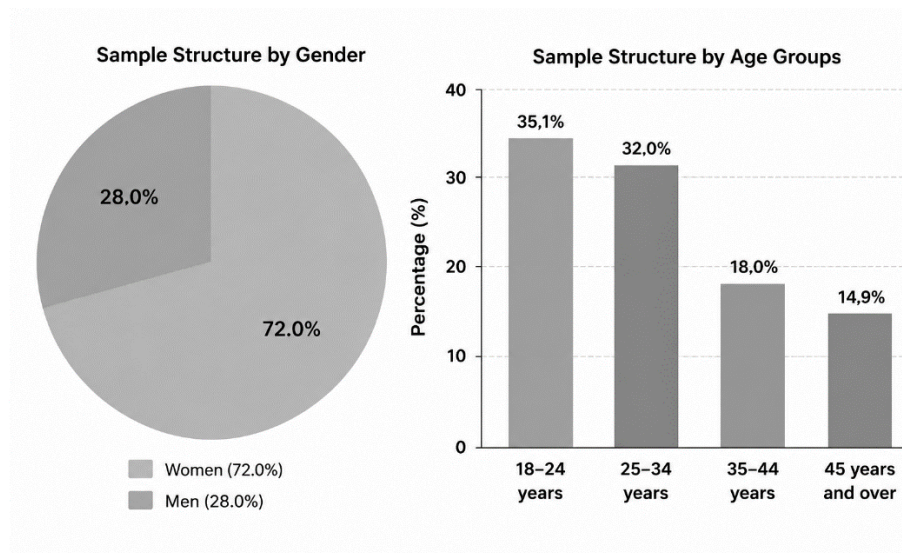


Figure 1. Sample Structure by Gender and Groups (N=350)

Cronbach's α values for all constructs range between 0.87 and 0.91, confirming the high reliability of the measurement scales. Descriptive analysis shows that respondents most often follow beauty influencers (M = 3.92; SD = 0.88), while the average value of purchase intention is slightly lower (M = 3.59; SD = 0.91). Trust in influencers (M = 3.74), authenticity (M = 3.68) and credibility of content (M = 3.81) also record relatively high average values.

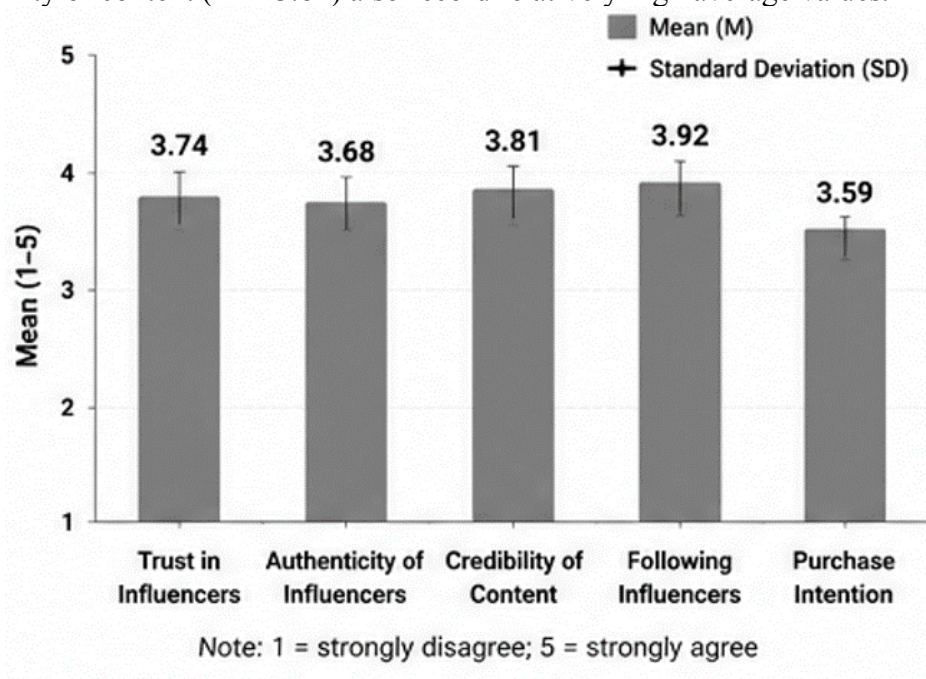
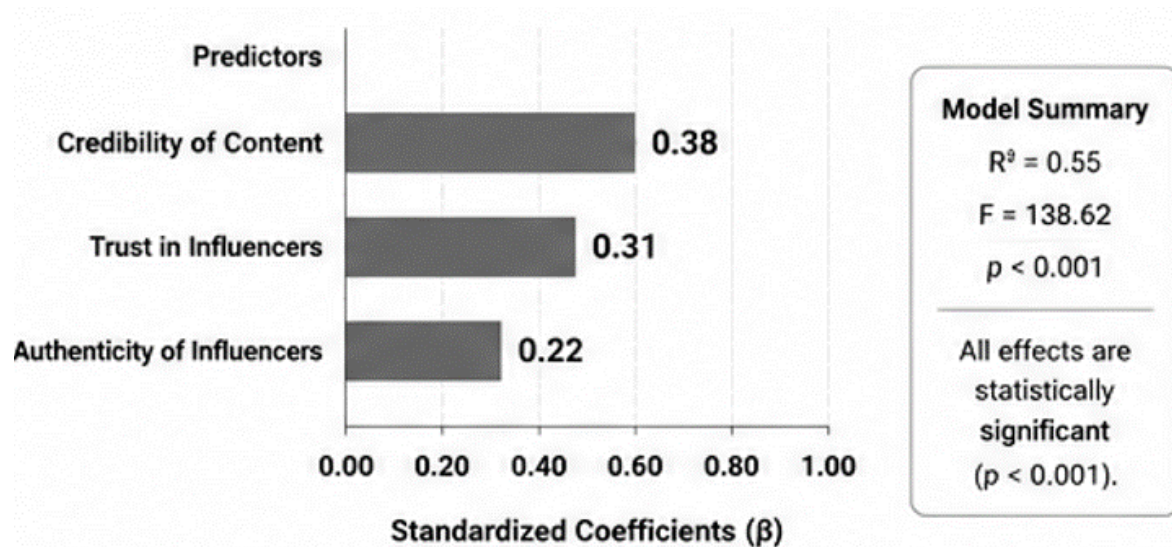


Figure 2. Descriptive Statistics (Mean and SD)

Pearson correlation analysis showed statistically significant positive associations between all observed constructs ($p < 0.01$). The strongest association was found between influencer credibility and purchase intention ($r = 0.72$), while authenticity was strongly associated with trust in influencers ($r = 0.71$). The results confirm that trust, authenticity and credibility are interrelated factors that shape consumer purchasing behavior. Multiple linear regression analysis showed that the model was statistically significant ($F = 138.62$; $p < 0.001$) and explained 55% of the variance in purchase intention ($R^2 = 0.55$).

Influencer credibility was the strongest predictor of purchase intention ($\beta = 0.38$), followed by trust ($\beta = 0.31$) and authenticity ($\beta = 0.22$), with all effects being statistically significant ($p < 0.001$). This confirmed hypotheses H1, H2 and H3.



Note: The model explains 55% of the variance in purchase intention.

Figure 3. Multiple Linear Regression Results

The results of one-way analysis of variance showed statistically significant differences between age groups ($F = 9.84$; $p < 0.001$). The highest level of purchase intention was reported by respondents aged 18 to 24, while the lowest value was recorded by respondents older than 45, confirming hypothesis H4. Analysis of social media usage showed that Instagram (88%) and TikTok (74%) have the greatest influence on decisions to purchase cosmetic products, while YouTube and Facebook have a lesser influence. This also confirms hypothesis H5.

Hypothesis	Hypothesis Description	Result	Status
H1	Trust has a positive effect on purchase intention.	$\beta = 0.31$; $p < 0.001$	Confirmed
H2	Authenticity has a positive effect on trust.	$\beta = 0.22$; $p < 0.001$	Confirmed
H3	Following influencers has a positive effect on purchase intention.	$\beta = 0.38$; $p < 0.001$	Confirmed
H4	There are statistically significant differences between age groups.	$F = 9.84$; $p < 0.001$	Confirmed
H5	Instagram and TikTok have the greatest influence on purchasing decisions.	Instagram: 88%; TikTok: 74%	Confirmed

Table 1: Summary of hypothesis testing results shown

The results confirm that influencer marketing plays a significant role in shaping consumer behavior in the cosmetics industry. Influencer credibility was shown to be the most important predictor of purchase intention, while authenticity has a positive effect on the development of trust among followers. The results are in line with previous research (Lou and Yuan, 2019; Sokolova and Kefi, 2020; Schouten et al., 2020), which emphasizes the importance of credible and authentic communication in the digital environment.

The differences between age groups confirm that younger social media users show a greater tendency to accept influencer recommendations. At the same time, Instagram and TikTok stand out as platforms with the greatest influence on making decisions about purchasing cosmetic products, which confirms their key role in modern digital marketing strategies.

4. CONCLUSION

The results of the study confirm that influencer marketing has a significant impact on consumer behavior in the cosmetics industry, with influencer trust, credibility, and authenticity being key predictors of purchase intention. These findings are consistent with previous research that highlights that the perception of source credibility is one of the most important factors in the effectiveness of influencer marketing (Lou & Yuan, 2019; Sokolova & Kefi, 2020). The results show that credibility is the strongest single predictor of purchase intention, which is consistent with the findings of Sokolova and Kefi (2020), who point out that consumers are significantly more likely to accept recommendations from influencers they perceive as professional and honest. Also, the high correlation between authenticity and trust confirms theoretical models according to which authentic communication increases the emotional connection between influencers and their audience. The results of the ANOVA analysis show that younger age groups (18–34 years) show significantly greater sensitivity to influencer marketing compared to older groups. This finding is consistent with research by De Veirman et al. (2017), who state that younger social media users are more likely to accept influencer recommendations due to their more intensive use of digital platforms and greater exposure to content. Additionally, the results confirm that Instagram and TikTok are dominant platforms in the context of influencing purchasing decisions in the cosmetics industry. This is in line with research that emphasizes the importance of visual platforms in the promotion of cosmetic products, where video content and tutorials significantly reduce the perceived risk of purchase and increase decision certainty. The results indicate that emotional connection with influencers further enhances the impact of recommendations on purchasing behavior. These findings support the work of Reinikainen et al. (2020), who emphasize that through continuous interaction on social media, a sense of closeness develops that increases trust and loyalty. The results have important implications for cosmetics brands and marketers. First of all, they emphasize the need to select influencers who possess a high level of credibility and authenticity, instead of focusing exclusively on the number of followers. Furthermore, the results suggest that collaborations with micro-influencers can be particularly effective due to their higher levels of trust and audience engagement. Therefore, brands should develop long-term partnerships with influencers to build consistent communication and emotional connections with consumers.

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THE ROLE OF DONORS IN THE DIGITAL TRANSFORMATION OF HUMANITARIAN SUPPLY CHAINS

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ABSTRACT*

In the last years, digital transformation of humanitarian supply chains has been emerging as one of the key areas for the advancement of efficiency, transparency and resilience of humanitarian operations. In the process, donors have been gaining huge importance not only because they ensure financial resources, but also influence the change of digital technologies, the development of transparent reporting systems and the digitalization of logistical and operational processes with their demands and expectations. The findings of previous researches show how among donors, there are still certain insecurities and distrust towards the implementation of digital technologies, which can be an obstacle to their broader use in humanitarian supply chains. The goal of this paper is to analyse the existing scientific knowledge about the role of donors in the digital transformation of humanitarian supply chains and to identify the key factors that shape their role in encouraging or limiting the implementation of digital solutions. The paper synthesizes the current know-how, points to the existing research gaps and offers guidelines for future research endeavours, with special attention given to understanding the role of donors as the most important stakeholders in humanitarian supply chains in the Republic of Croatia and their contributions to the digital transformation of the humanitarian sector.

Keywords: *humanitarian supply chain, donors, digital transformation, humanitarian logistics*

1. INTRODUCTION

Humanitarian operations involve many stakeholders and are therefore considered not easy to manage. Successful management of such operations and timely responses to the needs of the population in danger depend on efficient interorganizational cooperation and coordination (Freeman et al., 2021). The advancement of digital technologies has enabled the organizations operating in humanitarian supply chains to gather a great amount of data. It is the analysis of those data that enables the managers of humanitarian supply chains to allocate resources more efficiently, to respond quicker to crisis situations and to distribute humanitarian help more effectively (Dubey et al., 2022). Today, most discussions on social media about the management of humanitarian supply chains relate to the implementation of technology to establish a more ethical and reliable humanitarian supply chain (Shrivastav & Bag, 2024). To better understand the stakeholders involved in the operations, it is crucial to efficiently exchange information and give special attention to their coordination. The results of these endeavours are more effective decision-making and better adjustment of logistical and supply processes to different humanitarian requirements.

This can be achieved through the application of digital technologies that can help achieve better communication, data exchange and coordination among the stakeholders in humanitarian supply chains. In this way, humanitarian operations become more efficient and transparent (Mutebi et al., 2025). It is estimated that humanitarian supply chains make up between 60 % and 80 % of total global expenditure for humanitarian aid, including the activities from the phase of procurement to the final delivery of help (European Commission, 2022). The optimization of the costs leads to better efficiency and releases additional resources that can make humanitarian aid be of even greater help to the affected population. The donors, being one of the crucial stakeholders in the humanitarian supply chain, can expect that humanitarian organizations use digital technologies to improve their risk management, respond quicker to crisis situations and strengthen their resilience (Papadopoulos et al., 2017). Recently, the donors have been demanding better transparency and liability in the humanitarian sector (Iqbal & Ahmad, 2022), which can be met through the application of digital technologies. Current studies mostly analyse digital technologies in the context of humanitarian logistics and humanitarian supply chain management and the role of the donors is most often seen as just one of the elements belonging to a broader system. Therefore, there is a research gap regarding the understanding of their role in the digital transformation of the humanitarian supply chain which is of utmost importance when considering the fact that the donors are one of the key stakeholders that influence the efficiency of humanitarian operations. In line with that, the goal of this paper is to, by providing a comprehensive review of the relevant scientific literature, synthesize the existing facts about the role of donors in the digital transformation of humanitarian supply chains, point to the critical research gaps and suggest the recommendations for future research. The paper is based on the analysis of secondary data resources presented in five chapters. After the introduction, the digital transformation of humanitarian supply chains is explained. The third chapter focuses on the donors as one of the crucial stakeholders in the humanitarian supply chain. Their role in the digitalization of humanitarian supply chains is analysed in the fourth chapter. Concluding remarks, limitations of the conducted study and recommendations for further research are presented in chapter five.

2. DIGITAL TRANSFORMATION OF HUMANITARIAN SUPPLY CHAINS

Supply and demand work differently in commercial and humanitarian logistics. In the latter, there are many more insecurities regarding supply and demand (Van Wassenhove, 2006), but there is also a greater risk of poor coordination (Jahre et al., 2015). The value is also regarded differently; it is expected that humanitarian supply chains provide value for the end user from the affected communities, not the traditional buyer (Sabri, 2018). The stakeholders in the humanitarian supply chain have a complicated role of designing it to adjust to many different environments (Tomasini & Van Wassenhove, 2009). Therefore, humanitarian logistics has to develop new and original approaches to problem-solving. Over the last years, digital technologies have been emerging as solutions to these challenges. They can play a crucial role in the transformation of the humanitarian supply chains. Artificial intelligence, blockchain technology and big data analytics are some of the options that can help the operations in humanitarian supply chains become more visible. Also, these technologies can help the exchange of information and contribute to a better coordination of the stakeholders participating in humanitarian activities. Digital transformation implies the development of an interoperable digital eco-system that will enable the exchange of data among humanitarian organizations, donors and other stakeholders. Fragmented digital systems, conflicting standards and limited exchange of information still represent significant obstacles to the efficient management of the humanitarian supply chain (European Commission, 27.5.2026).

Humanitarian organizations that operate in humanitarian supply chains need digital platforms and tools because they contribute to better coordination and enable efficient exchange of information. Also, these technologies help organizations develop strategies that enable quicker responses in times of crises and encourage cooperation among governments, NGOs and logistics partners (Shrivastav & Bag, 2024). Organizations in humanitarian supply chains have been using different digital tools, such as artificial intelligence (AI), Internet of Things (IoT), blockchain technology, big data analytics, cloud computing and different information-communication systems. By using these technologies, organizations in the humanitarian supply chain can collect, process and exchange data faster in real time when a crisis occurs, and in doing so, make better decisions and improve the visibility of humanitarian operations (Jayadi, 2025; Rodríguez-Espíndola et al., 2020). Here, one of the most important and valuable tools are big data analytics and systems for the exchange of information in real time. They give the opportunity to the management to allocate the resources more efficiently, to distribute humanitarian aid more effectively and to understand and respond to the needs of the affected population with more care and with better results (Dubey et al., 2019). Other technologies include blockchain technology, that enables better transparency and traceability of aid flows, and the Internet of Things that is used for tracking of the shipments, vehicles and resources during humanitarian operations (Rodríguez-Espíndola et al., 2020). According to Dubey et al. (2019), the application of big data analytics has a positive effect on the cooperation and coordination of the organizations operating in the humanitarian supply chains, especially when the information needs to be exchanged quickly. Besides the flow of information, it is critical that technologies, such as the blockchain, artificial intelligence and 3D printing, are used for enhancing transparency and traceability and tracking the flow of goods in humanitarian supply chains (Rodríguez-Espíndola et al., 2020). Digital transformation is the key prerequisite for efficiency, transparency and responsibility in the humanitarian supply chain. The implementation of digital technologies creates opportunities for better visibility and data exchange; the needs for humanitarian aid can be anticipated more effectively and the processes of the procurement, supply management and better decision-making can be made easier and faster. This leads to higher efficiency of humanitarian interventions (European Commission, 27.5.2026). According to Jayadi (2025), over the last years, the digitalization of humanitarian supply chains has been developing as one of the key areas of humanitarian logistics. This is the result of the rising need for faster decision-making, better coordination of the stakeholders and more efficient resource management in times of crises. Singh (2025a) highlights the importance of collecting data in real time by using sensor technologies (real-time sensing). He also gives importance to predictive analytics and the process of alignment. They enable humanitarian organizations to better adjust to crisis situations and manage the discrepancies in the supply chain more effectively (Singh, 2025a). Even though digital tools like artificial intelligence, blockchain, Internet of Things and big data analytics all have the potential for creating a more effective supply chain and improving the coordination in humanitarian supply chains (Jayadi, 2025), their practical implementation is still limited. The reasons for this can be found in the fragmentation of the system, the lack of standardization and insufficient connectedness of research and operational application. It is therefore critical to understand and work on the implementation of digital tools that can help with the flow of the necessary aid in the supply chain, boost resilience of the humanitarian supply chain and improve coordination of humanitarian organizations, logistics partners, donors and local communities. In this way, humanitarian operations can be developed and managed more efficiently and become more resilient.

AUTHOR(S), YEAR	RESEARCH GOAL	KEY FINDINGS
Alvarenga et al. (2026)	To investigate how digital technologies influence humanitarian supply chains' readiness to respond to natural disasters. It also deals with how digital technologies are connected with memory development within these supply chains.	Significant to the policy makers because they emphasize the strategic importance of integrating digital technologies and memory into disaster management policies. If the policies aim at preserving and mobilizing disaster memory which is supported by digital technologies, then the results are better readiness to respond to natural disasters.
Panagiotopoulos et al. (2026)	To present the current technological landscape for shaping the next generation of humanitarian aid management systems. A new target-platform, called AidTech, is at the centre of matching algorithmic and operational aspects.	The architectural perspective of humanitarian supply chains is in the focus. Modern humanitarian infrastructures will increasingly rely on hybrid optimization methods integrating graph theory, dynamic routing under stochastic demand, multi-criteria decision analysis and distributed ledger technologies.
Singh (2025a)	To analyse the role of Digital Twin Technology and stakeholder collaboration in enhancing supply chain resilience and agility.	Digital Twin Technology, without question, improves supply chain resilience and agility which is driven by real-time sensing, predictive analytics and process alignment. Stakeholder collaboration is crucial, and so is a combined use of technological and relational resources to enable an agile and resilient humanitarian supply chain.
Singh (2025b)	To investigate the role of technology adoption (TA) in improving the efficiency and environmental sustainability through collaboration and supply chain agility.	TA plays a critical role in improving both collaboration and supply chain agility in humanitarian operations. The results of the research support the idea that they improve the effectiveness and ENS of aid delivery, cut down operational costs, reduce the response time and minimize the environmental impact.
Bag et al. (2023)	To analyse the impact of donor confidence in digital technology on antifragility in the HSC through the mediating influence of digital technology applications in sourcing, material flow, and distribution.	This study contributes greatly to bridging the gap between theory and practice. It supports the idea that digital technology application in sourcing, material flow, and distribution is a critical mediator in building an antifragile HSC.
Kabra et al. (2023)	To investigate barriers to IDT adoption in HSCs.	The findings show the importance of ranking the barriers: strategic barriers (SBs) are of greatest importance, followed by organizational, technological, financial and human barriers. The difference in ranking barriers influences the adoption of IDTs in HSCs compared to the commercial supply chain.

*Table 1: Review of the selected research on digital transformation of humanitarian supply chains
(Source: author-compiled based on the selected literature)*

The key findings from the selected research on digital transformation of humanitarian supply chains are displayed in Table 1.

Digital transformation of humanitarian supply chains does not depend solely on technology. According to Singh (2025a), the stakeholders carry the significant intermediary role aimed at collaboration, i.e. the coordination of humanitarian organizations, logistics partners and other stakeholders in the supply chain. Singh (2025b) highlights the fact that the implementation of digital technologies can improve the exchange of information and decision-making, and contribute to a more efficient coordination of humanitarian activities.

The organizations and other stakeholders in the humanitarian supply chain need to collaborate effectively and digital transformation can play a crucial role here. Digital platforms and integrated information systems contribute to better collaboration between donors, humanitarian organizations and local communities. This can help them become better at allocating the resources and respond faster to the challenges in dire situations. Dubey et al., (2019) and Rodríguez-Espíndola et al. (2020) support this idea and suggest that digital technologies have been increasingly considered vital tools for improving coordination, visibility and adaptability of the humanitarian supply chain. There are other authors who agree with this idea. Shrivastav and Bag (2024) claim that digital technologies in humanitarian supply chains contribute to more efficient information management and more advanced logistics processes.

Additionally, they attribute strengthening of cooperation, building resilience, sustainability and transparency of humanitarian operations to the positive effects of digital technologies. The implementation of digital technologies in the humanitarian environment changes the traditional framework of risk management significantly. The tools like an ERP system or a platform for the exchange of data in real time (e.g. DigPlat), improve the coordination and anticipation of needs, contribute to the reduction of the variability of demand and foster adaptability of the supply chains (Gningue & Tliche, 2026).

In order for digital transformation to happen successfully, it is necessary to continuously invest in digital infrastructure, in the development of common standards of digital management, data protection and cyber safety. Digital transformation should not be seen as an administrative cost but rather as the basic operational capacity of humanitarian organizations that requires long-term financial support (European Commission, 27/5/2026).

3. DONORS AS THE STAKEHOLDERS IN HUMANITARIAN SUPPLY CHAINS

The concept of a stakeholder was first defined by Freeman (1984). According to him, a stakeholder in an organization is any group or an individual that can have an impact on the accomplishment of the goals set by the organization or can be influenced by the organization.

All stakeholders have important responsibilities and tasks they perform to ensure humanitarian logistics is carried out successfully and economically (Daud et al., 2016). It is imperative to understand the issues, interrelations and the hierarchy of the stakeholders and to strive to establish a balance of multifold goals based on different dimensions of the basic humanitarian goal. All the stakeholders need to put effort into providing humanitarian aid in as effective, efficient and eco-friendly manner as possible (European Commission, January 2022).

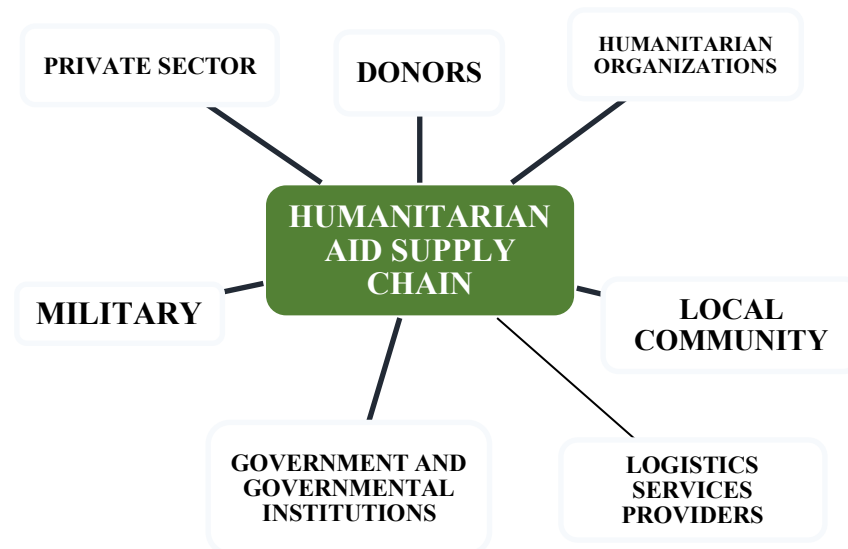


Figure 1: Core stakeholders in the humanitarian aid supply chain
 (Source: author-compiled according to Kovács, G., Spens, K. M. (2007). *Humanitarian logistics in disaster relief operations. International journal of physical distribution & logistics management*, 37(2), p. 106)

Kovács and Spens (2007) divide the stakeholders into several categories. The division is presented in Figure 1, and it includes the government, the military, donors, humanitarian organizations, other non-governmental organizations and logistics service providers as the main actors in the humanitarian operations. Kovács and Spens (2007) consider donors as key stakeholders because their role is to provide most of the financial aid for the main humanitarian activities. Additionally, in the last years, foundations, individual donors and the private sector have become important sources of financing for humanitarian organizations. Donors are all the parties that support humanitarian activities, not only financially, but also by donating products as valuable resources (Cozzolino, 2012). Wei et al. (2019) advocate the idea that donors' support is critical for enabling effective and timely responses to emergencies. The same authors also support the opinion that donors play a critical role in improving the well-being of the affected communities. Chandes & Pache (2010) think that a good relationship with the donors is crucial for the functioning of humanitarian organizations, while Schiffing & Piecyk (2014) highlight the idea of donors being crucial in the humanitarian supply chain because they exercise most power. Some of the most common donors are governments, intergovernmental organizations (e.g., the United Nations and its agencies), nongovernmental organizations (NGOs), private foundations, corporations, and individual philanthropists (Bag et al., 2019). Donors' special role is represented in the fact that they can be both clients and suppliers involved in humanitarian activities (McLachlin et al., 2010). They contribute with their one-time donations or long-term funding. Quick responses to emergencies are facilitated with financial support that also helps create programs that guide the affected population through the difficulties that follow after the actual emergency event. It is also important to note that often donors have specific priorities and focus areas for their support (Aflaki and Pedraza-Martinez, 2016). Donors play a crucial role in ensuring financial resources that help overcome limitations connected with the lack of resources and capacities, while the private sector provides products and services necessary for the implementation of the development programs (Sodhi et Knuckles, 2021).

It is a fact that donors have been turning from being merely funding providers into strategic partners supporting innovation, capacity building, and predictive planning (Toufah, 2026). Their financial decisions are crucial for directing humanitarian activities and humanitarian logistics depends on financial preparedness (Sandwell, 2011). Current literature supports the three key features of donors: power, urgency and legality. Humanitarian organizations evaluate demand (Long & Wood, 1995) and are therefore seen as the most important stakeholders in the humanitarian supply chain. They can operate globally (larger organizations) or regionally (purpose-specific humanitarian organizations) (Thomas & Kopczak, 2005).

4. DONORS AND DIGITAL TRANSFORMATION OF HUMANITARIAN SUPPLY CHAINS

Donors participating in the supply chain should strive to collaborate together with the aim of strengthening the chain and promoting compliance with the regulations. With their funding, they impact the activities greatly and direct their efforts towards the reforms within the supply chain. Their efforts can reduce fragmentation and support collective approaches so that all the stakeholders can work together towards the same goal. The funding should be in the form of investments in strategic capacity and digital transformation at both organisational and network levels (European Commission, 27/5/2026). Understanding the attitudes of donors and their trust in digital technologies is extremely important because it can influence the successfulness of the operations of humanitarian supply chains (Bag et al., 2023). When donors direct the help for humanitarian activities, they often want to know how and when their donations are used. This implies transparency in the process of the allocation of resources and the responsibility of the organizations that deliver donations to the affected population. In this context, digital transformation of humanitarian supply chains plays a key role because the implementation of digital technologies enables tracking the flow of donations in real time, better traceability of resources, more effective reporting and better transparency and responsibility of humanitarian organizations towards donors. Donors evaluate the successfulness of humanitarian operations primarily based on media reporting about the overall response to the crisis. Certain organizations here can, but do not have to be, specifically distinguished for their contributions. Based on the information about different humanitarian organizations that they receive via the media, donors shape their decisions about making donations (Oloruntoba & Gray, 2009). During the recovery phase, digitalization offers support to the activities that precede the recovery process after the catastrophic events by enabling the monitoring of the users of humanitarian aid and ensuring transparency towards donors (Kruger & Schutte, 2026). Akhtar et al. (2025) highlight the fact that digitalization of humanitarian supply chains contributes to better performance and boosts donor satisfaction. Digital technologies, like blockchain technology, can have a crucial role in creating and enhancing donor trust in humanitarian operations. Blockchain technology helps facilitate accountability, achieve better resource mobilization and proper allocation of resources (Hunt et al., 2022). The role of donors has been changing and they are becoming strategic partners. Their aim is to support digital infrastructure, predictive planning, and build volunteer capacity (Toufah et al., 2026). Digital health interventions in the humanitarian environment are the target of many government and donors' funding because these technologies improve the quality of health care and service delivery (Shrivastav & Bag, 2024). It is important to note that Bag et al. (2023), based on the findings of their primary research, came to the conclusion that donors are those who give the opportunity to humanitarian organizations to implement digital technologies, to make better decisions based on the actual data and to stimulate innovation through supporting digital solutions, ensuring financial resources and encouraging cooperation between the stakeholders.

This collaborative approach helps build more resilient humanitarian supply chains that can effectively respond to emergencies, handle disruptions and continuously work on their ability to satisfy the needs of those under threat (Bag et al., 2023). Donors' trust is one of the critical prerequisites for a successful digital transformation of humanitarian supply chains. It is therefore paramount to develop transparent frameworks of digital management, to ensure effective communication with the donors and demonstrate in a clear way the benefits that arise from the use of digital technologies (Bag et al., 2023). Boosting donors' trust and establishing effective practices of digital management enable better use of the potential that digital technologies bring to the table, which contributes to higher efficiency, transparency and timeliness of humanitarian activities and improves coordination, resource allocation and the delivery of humanitarian aid. Digitalization does not merely contribute to the efficiency of humanitarian logistics, but also contributes to transparency of humanitarian supply chains by establishing joint digital platforms that enable donors to monitor the use and flow of their donations (Falagara Sigala et al., 2020). The success of digital transformation depends on clearly defined and complementary roles of all the stakeholders. Donors can shape a formative environment by connecting the financing with the application of open standards and principles of an inclusive development of digital solutions. Humanitarian organizations should be pioneers of digital transformation by adopting common standards and classifications and by increasing their own digital capacities. The transition from fragmented initiatives to a coordinated digital eco-system represents a necessary step for a successful digital transformation of the humanitarian sector, especially in times of intense changes (Nieto et al., 1/10/2025). In the context of the Republic of Croatia, adopting digital transformation of humanitarian supply chains by the donors can have an important role in boosting the efficiency and transparency of humanitarian activities. Donors, whether they be public institutions, companies, foundations or private persons, can encourage digital transformation by directing their financing towards the development of digital infrastructure, information systems and platforms for tracking the flows of donations and humanitarian aid. This approach could enable effective monitoring of the use of the donations, better traceability of the material and financial flows and more effective coordination between humanitarian organizations and other stakeholders. At the same time, the implementation of digital technologies has contributed to better transparency and responsibility in managing humanitarian aid which can additionally increase trust by the existing donors and encourage others to join the endeavours. Taking into account the increasing number of crisis situations across the Republic of Croatia, the development of interoperable digital solutions and digital capacities of humanitarian organizations represent an important step towards building more resilient and effective humanitarian supply chains in the Republic of Croatia.

5. CONCLUSION

Digital transformation of humanitarian supply chains is one of the key prerequisites for improving efficiency, transparency, responsibility and resilience of humanitarian activities. The review of the relevant literature shows that the implementation of digital technologies enables better coordination of the stakeholders, more efficient resource allocation, smarter information management and traceability of humanitarian aid. Although current studies focus primarily on technological and logistical aspects of digital transformation, some researches confirm that donors play a crucial role in encouraging digital innovations through financing digital infrastructure, supporting the development of interoperable systems and creating demands for higher transparency and responsibility of humanitarian organizations. In the context of the Republic of Croatia, it is necessary to continuously encourage the introduction of digital technologies in humanitarian supply chains and simultaneously strengthen donors' trust in digital systems and processes.

This implies the development of transparent models of digital management, building interoperable information systems, application of common standards for data exchange and continuous reporting on the use of financial and material resources. Higher transparency and traceability can increase the trust the existing donors have in digital technologies, encourage the inclusion of new donors and contribute to more effective responses by humanitarian organizations to emergencies. One of the limitations of this paper is the fact that it is a review paper. The conclusions are based solely on the analysis of the available international scientific literature, with no empirical examination in the context of Croatia. Additionally, due to the limitations of the number of studies that deal directly with the role of donors in digital transformation of humanitarian supply chains, some conclusions are drawn based on a broader review of literature on digital transformation, humanitarian logistics and humanitarian supply chain management. Future research should include empirical research to investigate the level of digital development of humanitarian organizations in the Republic of Croatia, the perception and trust of different groups of donors towards digital technologies and the factors that influence their readiness to finance digital transformation. Furthermore, it is recommended to examine the existing models of cooperation between donors and humanitarian organizations, the possibilities of developing interoperable digital platforms and the effects of digital technologies on transparency, responsibility and efficiency of humanitarian supply chains in the context of Croatia. Such studies would represent a valuable scientific and practical base for the development of a more efficient, resilient and digitally connected system of humanitarian operations in the Republic of Croatia.

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FOOTBALL EUPHORIA AND THE BATTLE FOR MEANING: ANALYSING FOOTBALL'S DISCURSIVE CONSTRUCTION IN MOROCCO'S DEVELOPMENT PATH

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ABSTRACT

In recent years, football in Morocco has transcended its role as a popular sport to become a central site of political, economic and symbolic meaning. Following the historic performance of the Moroccan national team during the 2022 FIFA World Cup and the country's participation in hosting the 2030 FIFA World Cup, Moroccan media and institutional discourse have increasingly drawn connections between football – as both an on-field sports activity and a cultural phenomenon – and broader narratives of national development, modernisation and global visibility. These narratives, however, are far from homogenous. Instead, Moroccan public discourse features the emergence of two opposing and ideologically-defined narrative formations that contend as they present different constructs of football's developmental role. This paper explores how Moroccan media and institutional actors both construct, circulate and legitimate these clashing discourses. The first formation can be referred to as a reductionist critique, where the mobilisation of football within development discourses is represented as an economically-inefficient and politically instrumentalised phenomenon. Here, investments into stadium construction, large-scale events, and sports infrastructure are often prescribed as a diversion of public resources from urgent social needs, elevating concerns with regard to corruption, inequity and symbolic politics. Conversely, a second formation constructs football as a strategic agent for development and internationalisation. Institutional communication and pro-advocacy media discourses often highlight the economic and diplomatic gains associated with football, including, tourism promotion, infrastructural modernisation, global branding and soft power projection. These discourses frame football as a pivotal instrument that Morocco uses to enhance national cohesion, while simultaneously advancing its posture of global relevance. Methodologically, the study employs the three-dimensional framework formulated by Norman Fairclough within Critical Discourse Analysis. The analysis focuses on the textual characteristics (lexical choices, metaphors and evaluative language) as well as the discursive practices under which these narratives are produced and reproduced on Moroccan media platforms. By drawing attention to the co-existence of these clashing discursive formations, the study illustrates how football has become a contested symbolic site through which larger substantive debates about development modalities, governance and national identity are negotiated in contemporary Morocco.

Keywords: *football mediatization, development discourse, Morocco, critical discourse analysis, media representation*

1.INTRODUCTION

On December 10, 2022 the roar of The Atlas Lions shook Al Bayt Stadium in Qatar and sent afterquakes across the sporting world declaring the rise of a new era of Moroccan and African football. Morocco's victory over Portugal in the quarter-final granted its team the honour of becoming the first African and Arab squad to get to the FIFA World Cup semi-finals. This accomplishment shook the national environment, which is still characterised by the Arab Spring's aftershocks, economic reconstruction and diplomatic assertion, and sparked narratives of national renewal.

Hence, football transcended its sporting character and became a pivotal character in the country's path towards development, international recognition and modernization. This, in fact, received more momentum when Morocco's co-host of the 2030 World Cup with Spain and Portugal was declared in 2023. Such decision Cemented the Kingdom's status as a hub for global mega-events (Niya 2024). However, the discourse produced on this issue is noticeably polarising where state and media contentions are locked in consequential struggle. This paper argues that, football has become increasingly mediatized in contemporary Morocco; it has also turned into a space where different discourses compete. Within that space, two ideologically opposed frameworks are vying to establish their own understanding of how football relates to national development. The first of these, what can be labelled the reductionist critique, interprets the state's considerable spending on stadiums and mega-events as a politically convenient but economically questionable tactic. This line of argumentation seems to be essentially found in independent media, civil society statements and opposition platforms where such investments are seen as nothing more than symbolic politics that is a spectacle to shift public's attention from the structural challenges in the country such as unemployment, water crises and a shaky educational system. The discourse that is used at this platform is more of suspicion, often linking football projects to clientelism, the squandering of public money and corruption. The second discourse, what can be grasped as the strategic stimulus discourse, is mainly affiliated with the state institutions and media, here football is represented as a real engine of modernization, economic flourishment and a key instrument of the country's foreign policy. Exponents highlight concrete benefits such as urban renewal, tourism boost, national branding and soft power projection- all of which reflect a Moroccan official development strategy; including the Nouveau Modele de Developpment (new development model). The central research question that this study aims to answer is as such: how do these clashing discourses build, justify and challenge football as site of development in Morocco? To have a clear answer to this, the study will base on the three-dimensional model of critical discourse analysis developed by Fairclough (1995, 2003) to get out of mere text analysis and enable a close analysis of discursive practices through which these texts and discourses clash in the process of production and consumption. Furthermore, this method will enable the researcher to investigate broader social practices such as governance, economic policy, the building of national identity which are equally made and created by the language user. By analysing the corpus materials of Moroccan media (press releases, editorials, opinion pieces, televised debates from 2022 to 2025). This study will reveal that the contention regarding what football represent is really a stand into deeper debates. These debates concern the very character of a Moroccan development model: a genuine attempt for deeper structural change or spectacle of modernity that hides persistent inequalities in their society. The research aims to contribute to the growing body of academic work regarding the politics of sport in the Middle East and North Africa (MENA). It goes beyond celebratory narrative of athletic success and rather questions power dynamics and ideological struggle that are situated in the media's representation of football.

2.1 The Power of Discourse: Fairclough's Three-Dimensional Model

The work of Norman Fairclough is the primary theoretical angle, which has had huge impact on CDA by providing tools of analysis to scrutinize the relationship between language, power and ideology. Fairclough (1995) contends that discourse does not only reveal social reality, but it is also a constitutive component of it. It forms social relations, systems of knowledge and identities. Fairclough operationalizes his framework through the interconnected dimensions of text, discursive practice and social practice.

The textual component capitalizes on the micro analysis of linguistic elements and features including vocabulary (e.g., the choice of “waste” instead of “investment”), grammar (e.g., agency and nominalization), and textual structures (e.g., patterns of argumentation). According to Fairclough (2003), to uncover the implicit assumptions and embedded ideologies in any language textual analysis should be conducted. In this research, the examination of how lexical choices construct football projects either as “mega projects of the future” or as “white elephant” is capitalized. At the discursive practice level, emphasis is laid more on text production, distribution and consumption. It highlights the producer of the discourse, the media used and the reception and interpretation of it. It relies on the concept of intertextuality, maintaining that texts are not produced in a vacuum rather constructed on and respond to other texts (Fairclough, 1995). In the case of this study, a state affiliated media’s take on, for instance, a newly built stadium shall implicitly counter and engage with the critical discourse produced by an independent media outlet. Concerning the social practice dimension, a link between the discourse and the wider socio-political and economic context is established. It investigates the way discourses are ideologically moulded by power relations and can participate in social change. It; indeed, permits us to link the discursive contestation over football to wider social practices, like the neoliberal economic model being adopted in Morocco and its quest for international acclaim (Fairclough, 2003).

2.2 Mediatization, Mega-Events and the Spectacle of Development.

To understand why football has become a powerful discursive site it is necessary to draw on the concept of mediatization. According to Hjarvard (2013) mediatization can be identified as the process by which social institutions and practices become shaped, influenced and subordinated to the media industry. In the present investigation, this means that sporting events and policy decision making are intended to engender coverage of media and resonate with an international audience. Particularly, this is evidenced in the phenomenon of mega-events, like the World Cup. In this respect, Roche (2000) & Manzenreiter (2006) contend that such events are complex social and political projects. They are instrumentalized by states as a tool of soft power, nation branding and urban regeneration. Popularized by Joseph Nye (2004), the concept of soft power reflects a certain state’s ability to fulfil goals via co-operation and attraction rather than coercion. In the Moroccan case, World Cup hosting is considered an unprecedented opportunity to demonstrate and disseminate an image of modernity and stability to the world with the hope of boosting foreign investment and tourism. Nevertheless, criticism of this approach is sharpened against its contradictions and costs. In their criticism, Boyle and Haynes (2004) unveil the intricate play of the nexus of “sport-media-business” which gives priority to political and economic dimensions over immediate community needs. Criticism of these events warns against undesirable ramifications such as human rights abuses, gentrification and burdening public debts and weak and concrete benefits for the local population (Zimbalist, 2015). Such critique, clearly, serves as the intellectual foundation for the reductionist discourse witnessed in Morocco.

2.3 Development and the Post-Colonial State: Between Modernization and Inequality.

The discussion over the developmental role of football stems from a wider post-colonial framework. As it is the case for several Global South nations, including Morocco, development is not only an economic endeavour, but a profound symbolic assertion of sovereignty and modernity. Since the 1980s, the role of the state as the key player of development has been challenged by neoliberal reforms; however, the state’s pivotal role as a large-scale infrastructure projects investor is still unshaken. Practically, the state has recently been following a policy of achievement characterized by the visibility of huge projects’ realization such as ports, high speed rails and economic and industrial zones.

These projects are presented as concrete evidence of development, progress and modernization (Catusse & Destremau, 2010). Yet, opponents of this take, like Bayart (1993), have maintained that, in the context of African politics, the states very often work through “extraversion”. This refers to a strategy the state follows to use resources from its position within the global economy usually at the expense of a genuine local accountability. In this vein, the reductionist discourse in Moroccan media makes allusion to this understanding, considering football investments as a way of political clientelism and what can be called “politics of the belly”- which asserts that public funds are diverted to maintain a state and its network of patronage (Bayart, 1993). Hence, the contention over the role of football is a contestation over the real meaning of progress and state developmental agenda.

3. METHODOLOGY

The analysis of the rival discourses in this study is grounded on Fairclough’s CDA (1995, 2003) qualitative and interpretive approach. The methodology seeks to provide a systematic and meticulous analysis of the discursive construction of football and development.

3.1. Corpus and Sampling

The study’s corpus encompasses randomly selected 120 textual units, including online news reports, newspaper articles, official press releases and opinion columns published between 2022 and 2025. The choice behind choosing this time span is justified by covering the Moroccan national team’s World Cup campaign, the immediate aftermath and the planning stages for the 2030 World Cup hosting, which provides a rich dataset for analysing and interpreting the evolution and consolidation of discourses. To ensure the representation of various ideological stances a purposive sampling strategy was opted for. Sources that represent different linguistic markets and ideological positions are chosen: *Hespress* for its immense reach and its comment sections as a site of vernacular discourse; *Le360* for mainstream, pro-business perspectives; *TelQuel* for its tradition of critical, elite journalism; *Medi1 TV* for broadcast media; and official communications from the FRMF to capture the institutional voice.

4. DATA ANALYSIS AND FINDINGS: TWO COMPETING DISCURSIVE FORMATIONS

The analysed data revealed a plain divergence in how the role of football as a developmental factor is represented. The two rival discourses are inherently structured and systematically articulated through a variety of distinct stylistic, rhetorical and linguistic dimensions.

4.1 The Reductionist Critique: The Spectacle of Waste

The prevalent sites of this discourse are predominantly opinion columns, social media commentaries and independent media. The core argument of such discourse is constructed on the belief that investments devoted to football are a mere diversion of already scarce public resources and a political spectacle instead of a founded economic policy.

4.1.1. Lexical Choices

The following table summarises the main lexical choices deployed:

Table following on the next page

Category	Description	Examples	Discursive effect
Lexical choices	Vocabulary dominated by economic inefficiency and political manipulation	Gaspillage (waste), détournement de fonds (embezzlement), cathedrales de beton (concrete cathedrals), poudre aux yeux (eye-wash), clientelisme (clientelism), chantiers pharaoniques (pharaonic construction sites)	Constructs football infrastructure as excessive, corrupt, and economically unjustifiable; shifts perception from development to waste and political misuse.
Metaphors	Use of powerful, ideologically loaded metaphors to frame football discourse	“Opium of the people” (Marxist reference); editorial from <i>TelQuel</i> (Dec 2023): football as distraction from education and water crises; “white elephant” (costly, underused infrastructure)	Frames football as a tool of social control and distraction; highlights lack of sustainability and critiques state priorities.
Evaluative language and Agency	Strategic use of passive and active voice constructions to manage responsibility and blame.	Passive : “des milliards de dirhams ont été engloutis...” (Billions of dirhams were swallowed up); Active: (negative agency); Hespress (April 2024): “not investments, but political payoffs... should go to marginalized douars”	Passive voice obscures accountability; explicit agency reinforces accusations of corruption and political clientelism; strengthens oppositional discourse.

Table 1. - main lexical choices

4.1.2. Discursive Practice

The reductionist critiques mainly originate from independent online Media platforms which present themselves as investigation spaces for critical voices, those outlets use often intertextuality strategies referring to official statements in order to deconstruct and question them; a frequent pattern is "the investigation" pieces, that put-on the discussions or stadiums spendings with underreported or leaked social programs budgets. This is not a discourse which is detached from context it is framed by groups of journalists, civil society activists and members of parliamentary opposition; their circulation and the amplification of these narratives constitute a counter public discourse while on the other hand the audiences are engaging into these discourses on social media platforms where they express their opinions and criticism. Hashtag such as *StadesvsHopitaux* (Stadiums vs Hospitals) gained traction following the reverberation of the message and the people engagement on challenging the prevalent narratives.

4.2. The Strategic Driver Discourse: The Engine of National Renovation

The discourse of football as a genuine driver of development is advocated by state affiliated media and business aligned platforms. It depicts football not as a cost, but a strategic asset which breeds economic and diplomatic gains crucial for the country's evolution as a global actor. The following table presents the main textual features of this discourse:

4.2.1. Textual Features

Category	Description	Examples	Discursive Effect
Lexical choices	Vocabulary drawn from business, diplomacy, and future oriented discourse.	Investissement strategique (strategic investment), rayonnement international (international radiance), soft power, modernisation, infrastructures du futur (future infrastructure), enceinte sportive de derniere generation (state-of-the-art sports complex).	Frames football infrastructure as forward-looking, economically rational, and globally competitive; constructs development as inevitable progress and modernization.
Metaphors	Use of dynamic and growth-oriented metaphors to legitimize investment.	Football as a “locomotive” driving sectors like tourism and transport; MAP press release: events as catalyseur (catalyst) for development and job creation; “window to the world” showcasing a “new Morocco”.	Portrays football as an engine of national development; reinforces narratives of acceleration, visibility, and global integration; legitimizes mlarge-scale investment.
Evaluative language and agency	High-certainty (modal) language with strong, centralized attribution of agency.	“cela permettra...” (this will allow...), “le Royaume est determine a ...”, “(the kingdom is determined), “ sous les hautes orientations de sa majeste...”, (following the high orientations of his Majesty...). Le Matin (February 2025): royal instructions for Grand Stade in Benslimane framed as visionary.	Constructs an authoritative, unified state discourse; minimizes uncertainty; attributes legitimacy and vision to the monarchy; embeds projects within national pride and moral authority.

Table 2. – Textual features

4.2.2. Discursive Practice

The intricate components of this discourse are plainly centralized. The press releases by *MAP* are rearticulated and reproduced across other aligned supportive outlets, creating a consistent circulation and reproduction of the news. Here, the discursive practice is entrenched on a solid intertextuality with a larger global discourse on development. Frequent reference and citation of international bodies such as FIFA is made to highlight their praise of Morocco’s vision and infrastructure granting the national project legitimacy through external recognition. It is remarked that the “consumption” of this discourse is considered an act of patriotism and a departure from the nihilistic vision. This is clearly noticed in debates broadcast on channels like Al Oula (state channel), during which criticizing investment in football is considered sometimes as “defeatism” or even a “swim against the current”; therefore, creating a duality of us (state) vs them (nihilists).

5. DISCUSSION: FOOTBALL AS A CONTESTED SYMBOLIC ARENA

The analysis transcends the superficial rivalry between both discourses over football's policy as merely a sports management to a deeply seated symbolic conflict over what national priorities are and should be and the country's development model. This discussion provides a synthesis of the findings across the three dimensions of critical discourse analysis.

5.1. The Micro-Politics of Lexicon: From "Investment" to "waste"

A close investigation of the textual level reveals that there is a battle over the language deployed to represent the same objective reality. The discussion over the huge Benslimane Stadium construction, for the state supported discourse, centres on a *projet structurant* (structuring project) which will bring immense economic benefits to the region and the country at large. Yet, criticism of the same project, in the reductionist discourse, presents it as a *gouffre financier* (Financial abyss) and a *monument megalomane* (megalomaniacal monument) situated in a remote isolated area and whose benefits after the world cup are very little. According to Fairclough (2003) the "wording" of a phenomenon is a site of ideological contestation. The state-affiliated media's persistence in using the term *investissement* is move to naturalize and normalize the argument that these projects have a financial soundness, while critics insist that it is merely *gaspillage* (waste) to reframe them as irrational. Similarly, the contrast of the locomotive and white elephant metaphors reveals a struggle over cause-and-effect narrative. The locomotive metaphor suggests a linear, positive chain reaction, while the white elephant metaphor implies stagnation and loss. This discursive discrepancy mirrors deeply opposed ideological stances: one seated in a neoliberal belief in mega-projects as impetus for growth, the other rooted in a social or left-nationalist critique of state-led and elite serving interests.

5.2. Discursive Practices and the Construction of Legitimacy

At the discursive practice level how power functions in the construction, production and circulation these narratives are accentuated. The strategic driver discourse makes use of the institutional power of the monarchy and the state apparatus. Waterbury (1970) and Daadaoui (2011) note that the institution of the Monarchy has a historical control of the public sphere and the instruments of legitimation. The construction and reproduction of the state discourse through state-affiliated media such as MAP, TV channels and newspapers create an aura of consensus around the pivotal role of football as a means of development. In fact, the constant reference to the king's "high instructions" invokes a sense of sacredness around the projects situating them in beyond normal political debate. Conversely, the space of relative autonomy is where the reductionist discourse functions and navigates constant pressure. Advocates of this discourse venture being labelled unpatriotic or even undermining national unity in such "exceptional" juncture of the World Cup. They use intertextuality, here associating football infrastructure spendings to depriving the people from health and education services, to powerfully counter hegemonic discourse. they attempt to challenge the state's policy of compartmentalization and call for a united stance on social welfare presenting themselves as the real guardians of national interests. Indeed, this is a reflection of a classic Gramscian contention: the state and its aligned media seek to produce hegemony, while critical/independent media struggle to counter this hegemony.

5.3. Social Practice: The Debate as a Proxy for Development Models

Connecting discourse to its social practice proves that this controversy reveals profound anxiety and tensions over the nature of the state and the suitable model of development it should adopt. The strategic discourse makes the foundations of the Moroccan state's "new development model" (Nouveau Modele de Developpement), which stresses the attraction of foreign investment, competitiveness and the improvement of infrastructure as key drivers of growth.

Football, hence, is depicted as the most spectacular and emotionally resonant means to attain these technocratic aims. Nevertheless, the reductionist discourse, often supported by reports from national institutions such as Cour des Comptes (the state financial oversight body), maintains that this model engenders inequality, vulnerability and is susceptible to corruption. In this regard, Thompson (1971) contends that the discourse of waste and diversion is a language of moral economy. It is a direct critique of the state's manipulation of public resources, entrenched in what can be qualified as a just and fair allocation of public wealth. By emphasizing the "pharaonic" nature of the sporting infrastructure, criticism accentuates a view of a different Morocco- one which advocates investment in education, health and jobs creation over the pursuit of global spectacle. The decision to jointly host the 2030 World Cup may be interpreted as a hegemonic endeavour aimed at neutralizing the reductionist discourse. By unifying the nation on one goal and promising global recognition, the state seeks to transform the debate over football from contention to unification. Yet, the reductionist discourse seems unwilling to compromise revealing deep unsolved social contaminations. The stadium, this way, transcends its sporting function to an arena where the national identity, priorities and future are contested.

6. CONCLUSION

The aim of this article has been the demonstration of substantial and constant discursive contestation rising from the mediatization of football in Morocco. The application of Fairclough's three-dimensional framework facilitated the identification and analysis of two distinctly overriding discourses. Each encases the vision of its exponents polarise the debate regarding the role of football investment between a state's strategic development tool versus independent media's money squandering policy. This controversy on the role of football within development and the discourses this generated open disputes about social justice, equality and governance which reveal this controversy is stark proof of the meaning making of what is contemporary Morocco. The present study provides it analytical model for understanding the politization of football in countries in which sporting mega events are used as state policy acts. As a step forward the future research can integrate the visual dimension within the discourses where the architecture of the stadiums and the televised broadcast can add a more multi-modal approach to this issue. Furthermore, the study of Moroccan football fandom and ultras discourses can provide deeper reflection of the people pules and the story that they create on such events.

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THE LONGEVITY ECONOMY AND THE LABOUR MARKET IN THE REPUBLIC OF CROATIA

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ABSTRACT

Population ageing and longer life expectancy are becoming increasingly significant challenges for labour markets. In this context, the concept of the longevity economy has emerged as an important framework for adapting labour markets to changing demographic structures. The aim of this paper is to analyse the adaptation of the Croatian labour market to the concept of the longevity economy and to examine the intention of employed persons aged over 55 to continue working after becoming eligible for old-age retirement. The study is based on secondary statistical data on demographic trends, the employment of older persons, and the employment of pensioners in Croatia, as well as on the results of an empirical survey conducted on a sample of 382 employed individuals aged between 55 and 65 years. The findings indicate that the Croatian labour market is still insufficiently adapted to the concept of the longevity economy, as reflected in the relatively low share of older workers and pensioners remaining active in the labour market. At the same time, one quarter of respondents expressed the intention to continue working after retirement, with statistically significant differences identified according to certain sociodemographic characteristics. Respondents identified additional income as the primary motive for continuing to work, while job satisfaction and maintaining mental activity were also recognised as significant reasons for post-retirement employment. The results suggest the need for a stronger adaptation of the Croatian labour market to demographic changes and the concept of the longevity economy, particularly through encouraging longer labour market participation among older persons, developing more flexible forms of work, and reducing barriers to employment after retirement.

Keywords: *longevity economy, labour market, older workers, retirement, Croatia*

1. INTRODUCTION

Developed countries are increasingly confronted with rising life expectancy and accelerating population ageing (Scott, 2021). These demographic trends have far-reaching implications for the functioning of labour markets, productivity dynamics, and the sustainability of public finances, as well as social security and care systems. Against this background, the concept of the longevity economy has emerged, viewing increased longevity not solely as a fiscal and social challenge, but also as a potential source of economic and social opportunities (Chen, 2023; Moreira et al., 2023). The longevity economy can be understood as an analytical and developmental framework aimed at creating institutional and market conditions adapted to an increasingly large older population. This includes the development of products and services appropriate for older age, as well as the promotion of active social participation, labour market engagement, and lifelong learning (Klimczuk, 2021). Unlike traditional approaches that emphasise the costs of ageing, this concept highlights the importance of extending the healthy lifespan (healthspan) and adapting institutions and workplaces to the new demographic reality (Scott, 2021; Drvenkar and Barković Bojanić, 2023). The focus thus shifts from the question of “how long we live” to “how we live and how long we remain productive”.

The World Economic Forum (2024) operationalises the longevity economy through the principles of financial resilience across the life course, healthy ageing, lifelong learning, a multigenerational workforce, and the reduction of longevity inequalities. Such an approach challenges the traditional linear model of a working career, in which education, employment, and retirement are strictly separated phases of the life cycle. In the context of extended longevity, the boundaries between these phases become more flexible, and retirement increasingly takes on the characteristics of a process rather than a one-time event. In the literature, increases in life expectancy are most commonly analysed through the lens of pressures on pension and healthcare systems (Meštrović Špoljar & Vajagić, 2015; Jakovljević et al., 2016; Bazzana, 2020; Hajizadeh et al., 2024). However, an increasing number of researchers also emphasise the potential positive effects of longevity on long-term economic growth. A longer expected lifespan may encourage greater investment in education and skills development and increase the accumulation of human capital (Bloom et al., 2004). Nevertheless, these effects materialise only if longer life expectancy is accompanied by an extension of working life.

If additional years of life are predominantly concentrated in a period of inactivity, the positive effects on growth do not occur (Hazan & Zoabi, 2006). Empirical evidence for the United Kingdom shows that extending working life by one year can increase GDP by approximately 1% (Barrell et al., 2011), confirming the importance of how additional years are distributed between working life and retirement. Retirement is often associated with a decline in living standards, changes in daily routines, and the need to find new ways of spending free time (Tur-Sinai & Spivak, 2021). For this reason, some individuals express a desire to remain in the labour market even after meeting the statutory conditions for retirement, whereby continued work does not represent solely an economic necessity but also a means of preserving social inclusion, a sense of usefulness, and personal identity. At the same time, contemporary societies are facing intense demographic ageing, which reduces the labour supply and increases pressure on social security systems. In such circumstances, extending working life and retaining older workers become important elements of labour market policies and pension system sustainability.

Accordingly, organisations are increasingly seeking to develop practices aimed at retaining older employees and encouraging longer participation in the labour market (Turek et al., 2020). The Republic of Croatia is also confronted with these challenges, characterised by unfavourable demographic trends, population ageing, and labour shortages in certain sectors of the economy. As a result, public debates, strategic documents, and labour market policies increasingly highlight the issue of extending the employment of older persons and adapting the labour market to the concept of the longevity economy. Against this background, researchers have shown growing interest in examining the intentions of older workers to continue working after retirement, as well as the motives, barriers, and factors that shape their decisions. Building on the above, the aim of this paper is to analyse the adaptation of the Croatian labour market to the concept of the longevity economy and to examine the intention of employed persons aged over 55 to continue working after becoming eligible for old-age retirement. In line with the objectives of the paper, the following research questions are posed: To what extent do indicators of the Croatian labour market point to adaptation to the concept of the longevity economy? To what extent do employed persons aged 55 and over express an intention to continue working after becoming eligible for old-age retirement? Are there statistically significant differences in the intention to continue working after retirement with respect to the sociodemographic characteristics of respondents? What are the dominant motives for continuing to work after becoming eligible for old-age retirement?

2. PREVIOUS RESEARCH

Longevity and its economic implications have been the subject of extensive debate in the scientific literature over recent decades. Research shows that increasing life expectancy can have a positive effect on economic growth, particularly in societies that succeed in maintaining the health, work ability, and productivity of the older population (Sirag et al., 2020; He & Li, 2020). In this context, the concept of prospective age is emphasised, according to which chronological age is no longer a sufficient indicator of ageing, as the boundaries of old age shift in parallel with rising life expectancy and improvements in population health (Sanderson & Scherbov, 2019). Consequently, today's sixty-year-olds often have greater work capacity, better health, and different expectations regarding work and retirement compared with previous generations. Such changes are transforming the traditional life course, with the period following the statutory retirement age increasingly involving continued professional activity. Older workers represent an important resource for organisations, as they possess extensive work experience, specific knowledge, and well-developed professional competencies that can be transferred to younger generations of employees (Fasbender & Gerpott, 2022). Their continued employment can contribute to the stability of organisational knowledge, the continuity of business processes, and the reduction of the loss of expert experience. However, despite the potential benefits, numerous authors emphasize that extending working lives requires adjustments to the institutional framework, the labour market, and public policies (Murphy & Topel, 2006; Scott, 2023). The literature shows a relatively broad consensus on the need to encourage longer participation in the labour market, particularly in the context of demographic ageing and the decline in the working-age population. However, it is also emphasized that older workers do not constitute a homogeneous group. Differences in health, education, skills, working conditions, and professional experience accumulate over the life course, resulting in varying capacities and opportunities to continue working in later life (Wallenius, 2023; Scott, 2023). Precisely because of the heterogeneity among older workers, contemporary approaches to extending working lives are increasingly moving away from relying solely on administrative increases in the statutory retirement age, and instead focusing more on the development of flexible and incentive-based mechanisms to support voluntary continued employment. Such mechanisms include financial incentives for longer working lives, opportunities for part-time work, adjustments to working conditions, lifelong learning, and policies aimed at maintaining employees' health. The goal of these measures is not only to increase the labour market participation of older individuals, but also to ensure the quality of work and the sustainability of employment in older age. Research on longevity in the context of the labour market can be divided into several thematic areas. One of the most prominent focuses on examining the motives for continuing to work after becoming eligible for an old-age pension, analysing the economic, psychological, and social factors that influence individuals' decisions to extend their working lives (e.g. Kooij et al., 2008; Bratun et al., 2023; Tur-Sinai et al., 2024). A second important area of research concerns the adaptation of older workers to the demands and challenges of contemporary work. This includes issues such as work ability, adaptability to technological change, stress management, and the balance between job demands and health limitations (Yeatts et al., 2000; Ng & Law, 2014). A third thematic area encompasses organisational policies and practices aimed at older workers, including age diversity management, flexible work arrangements, workplace adaptation, and strategies for retaining older employees (e.g. Conen et al., 2014; Parker et al., 2020; Acemoglu et al., 2022). Financial motives often represent a key reason for continuing to work after retirement, particularly among individuals with lower pensions, limited financial resources, and increased economic insecurity (Hokema & Scherger, 2016; Madero-Cabib & Kaeser, 2016; Dingemans & Henkens, 2019). In such circumstances, post-retirement work serves as a means of maintaining living standards and household financial stability.

However, research simultaneously shows that the decision to remain longer in the labour market is not driven solely by economic factors. Intrinsic motivations also play an important role, such as a sense of usefulness, professional identity, job satisfaction, and the need to maintain social contacts and an active lifestyle (Chan & Au-Yeung, 2024). In addition to individual motives, job characteristics also have a significant impact on older individuals' willingness to continue working. Flexible working hours, opportunities for part-time work, job autonomy, and the adaptation of work tasks positively influence decisions to extend working lives (Maestas et al., 2017; Ameriks et al., 2020). Such forms of work organisation enable older employees to better balance job responsibilities with health and personal needs, thereby contributing to the preservation of their work ability. Conversely, physically demanding occupations, adverse working conditions, and poor health significantly reduce the capacity to work in later life (Dingemans et al., 2016; Oleksiyenko & Życzyńska-Ciołek, 2018; Zitikytė, 2019). In the Croatian context, research indicates a relatively low level of labour market participation among older individuals, but also the existence of considerable untapped labour potential within the older population. Ostrovidov Jakšić and Jakšić (2019) conclude that extending working lives would not have a negative impact on the employment of younger workers, while Goić (2017) points to a pronounced problem of long-term unemployment among individuals over the age of 50. Furthermore, Galić et al. (2019) emphasize that older workers in Croatia are in a less favourable position compared to the European Union average in terms of working conditions, job autonomy, and opportunities for professional development. These findings point to the need for developing policies and organisational practices that would enable better inclusion of older individuals in the labour market and encourage voluntary continued employment after eligibility for retirement.

3. THE REPUBLIC OF CROATIA AS A RESEARCH CONTEXT

In the context of the longevity economy, it is particularly important to analyse demographic indicators that point to changes in the structure of the working-age population and the potential for extending working lives. Table 1 presents the key demographic indicators of the Republic of Croatia in the period from 1960 to 2026.

Year	Share aged 65+ (%)	Share aged 0–14 (%)	Share aged 15–64 (%)	Life expectancy (years)	OADR (65+ per 100 persons aged 15–64)
1960	7,26	27,0	65,70	65,9	11,1
1970	9,42	23,2	67,40	69,2	14,0
1980	11,50	21,1	67,40	71,0	17,1
1990	11,60	19,8	68,60	72,2	16,9
2000	15,90	16,9	67,20	74,0	23,7
2010	17,90	15,3	66,80	76,7	26,8
2014	18,80	14,7	66,50	77,5	28,3
2018	20,70	14,6	64,80	77,9	31,9
2022	22,50	14,3	63,20	78,3	35,6
2026	24,00	13,5	62,50	79,1	38,4

*Table 1: Demographic Indicators for the Republic of Croatia, 1960–2026
(Source: Georank, 2026)*

Table 1 shows that since the 1960s there has been a continuous increase in the share of the population aged 65 and over, while the proportion of the young population has been declining. The share of the working-age population began to decrease after the 1990s, further intensifying pressure on the labour market and social security systems.

At the same time, life expectancy at birth increased from 65.9 years in 1960 to an estimated 79.1 years in 2026. These changes are also reflected in the growth of the old-age dependency ratio (OADR), indicating an increasingly pronounced imbalance between the number of retirees and the number of active contributors. The observed trends highlight the need to adapt the labour market to the concept of the longevity economy, particularly by encouraging longer participation of older individuals in employment and increasing their labour market participation. An additional incentive for continued work stems from the relatively low adequacy of pensions. Croatia has one of the lowest pension replacement rates in the European Union, with the initial pension covering only around 32% of a worker's last gross wage (CPII, 2025). Such a low level of pension income may increase the economic necessity for older individuals to continue working after becoming eligible for retirement, especially in the context of rising living costs and growing household financial insecurity. At the same time, the Croatian labour market in certain sectors is facing a pronounced labour shortage, which further increases interest in involving retirees in work processes. A survey conducted by the Croatian Employment Service in 2022 showed that 78% of surveyed employers reported a need to hire new workers, while 68% expressed interest in employing retirees. The highest interest in employing retirees was recorded among employers in the service sector (16.3%), education (13.0%), construction (10.9%), and trade (8.5%) (CES, 2022). These findings indicate a gradual recognition of older workers as an important source of labour potential in the context of population ageing and a shrinking labour supply. However, despite the demographic and economic factors indicating the need to extend working lives, as well as the fact that the legal framework in the Republic of Croatia allows employment after eligibility for an old-age pension, subject to certain conditions and employer consent (Pension Insurance Act, OG 96/25), the share of older individuals who continue working after retirement remains relatively low (Table 2).

Stopped working	Continued working without changes	Continued working with changes	Did not work
75,2%	1,2%	3,8%	19,8%

Table 2: Recipients of old-age pensions by labour status at the time of retirement (2023)
(Source: Eurostat (2023), table: lfso_23pens06)

Only 1.2% of individuals continue working without changes in their employment status, while an additional 3.8% remain active with certain adjustments, most commonly through reduced working hours. In contrast, as many as 75.2% of individuals cease working immediately upon becoming eligible for retirement, while nearly one-fifth were not employed at all at the time they reached the age of 65. Further insight into the involvement of retirees in the labour market is provided by data on the number of employed retirees and their share in the total retiree population.

The data in Table 3 indicate a continuous increase in the number of employed pensioners in Croatia over the observed period. The number of employed pensioners rose from 10,098 in 2019 to 36,119 in 2025, representing an increase of more than threefold. At the same time, the share of employed pensioners in the total number of pensioners increased from 0.81% to 2.94%. Although this share remains relatively low within the overall pensioner population, the growth trend suggests a gradual strengthening of post-retirement employment in Croatia.

Year	Average net pension for all pension beneficiaries	Average number of pensioners	Employed pensioners	Share of employed pensioners in the average number of pensioners (%)
2019	395,07	1 240 607	10 098	0,81
2020	407,86	1 243 273	12 822	1,03
2021	419,30	1 238 136	14 678	1,19
2022	445,89	1 226 775	22 198	1,81
2023	516,14	1 226 380	26 593	2,17
2024	593,86	1 227 254	31 075	2,53
2025	659,94	1 229 882	36 119	2,94

*Table 3: Statistical Data on Pensions and Pensioners
(Source: authors' calculations based on CPII data (2026))*

Despite positive trends, the share of employed pensioners remains relatively low, suggesting that the potential of the longevity economy in Croatia has not yet been fully realized. This points to the need for further development of flexible forms of work, the promotion of lifelong learning, and the adaptation of workplaces and institutional policies to the needs of older workers.

4. RESEARCH METHODOLOGY

The empirical part of the paper focuses on examining the intention to continue working after retirement and the motivations underlying such decisions. The study was conducted using an online survey administered in May 2026 in the Republic of Croatia. The target population consisted of employed individuals aged 55 to 65, that is, persons approaching the statutory retirement age. Previous research suggests that individuals begin to think more intensively about retirement approximately ten years before the expected retirement date (Lim, 2003), making this age group particularly relevant for examining intentions to remain in the labour market after reaching the statutory retirement age.

The data were collected using the snowball sampling method. The authors distributed the questionnaire link via email and social media to business associates, friends, and acquaintances, who were asked to further share the questionnaire with individuals they knew belonged to the target age group. The introductory section of the questionnaire provided information about the purpose of the study and the use of the data, and participation was voluntary. The collected data were processed in accordance with ethical guidelines and data protection regulations. The questionnaire consisted of three sections. The first section included respondents' sociodemographic characteristics, such as gender, age, level of education, employment status, sector of employment, and self-assessed health status. The second section focused on the intention to continue working after becoming eligible for an old-age pension. Respondents were asked whether they planned to continue working after retirement, assuming that institutional conditions would allow it, with the response options "yes", "not sure", and "no". For the purposes of statistical analysis, the responses "yes" and "not sure" were combined into a single category indicating potential continuation of work. The third section addressed the motives for continuing to work after retirement, with respondents being allowed to select multiple reasons from the list provided. The data analysis employed both descriptive and inferential statistical methods, including the chi-square test and Cramer's V coefficient.

The chi-square test was used to determine the existence of statistically significant associations between categorical variables, while Cramer's V was applied as a measure of effect size. Since the chi-square test does not provide information on the strength of the association, the calculation of Cramer's V enabled additional interpretation of the practical significance of the obtained results. The interpretation of Cramer's V values was based on commonly used guidelines for effect size, according to which values of 0.10 indicate a small effect, 0.30 a medium effect, and 0.50 a large effect (Kolesarić & Humer, 2016). It should be noted that the results presented here form part of a broader study that also addressed topics related to the silver economy and the consumption patterns of the older population. However, this paper presents only the findings relevant to the analysis of extending working lives.

5. RESEARCH RESULTS AND DISCUSSION

A total of 382 valid responses were collected from employed individuals aged 55 to 65. Of these, 95 respondents (24.9%) report an intention to continue working after becoming eligible for an old-age pension, while 287 respondents (75.1%) do not intend to remain active in the labour market after retirement. The results indicate that, although the majority of respondents do not plan to continue working, there is a notable share of older employees who express a willingness to extend their working lives. This finding may be interpreted as an indicator of a gradual shift in perceptions of work in older age and the potential development of the longevity economy in Croatia. The findings are particularly interesting when compared with national and European statistics that show relatively low labour market participation rates among older individuals in Croatia. Although the proportion of respondents intending to continue working remains relatively modest, it is still higher than the actual share of employed pensioners recorded in official statistics. This may point to a gap between intention and the actual ability to continue working after retirement. In other words, some older workers may express a willingness to remain employed, but institutional, organisational, or health-related factors may constrain the realisation of such intentions.

5.1 Differences in Intentions to Work After Retirement

To gain a deeper understanding of the factors shaping the decision to continue working after becoming eligible for an old-age pension, the analysis examines the association between the intention to work and selected sociodemographic characteristics of the respondents. Table 4 presents the results of chi-square tests and the corresponding Cramér's V coefficients, which allow for the assessment of statistical significance and effect size. The analysis shows a statistically significant association between gender and the intention to continue working ($\chi^2 = 5.1922$; $p = 0.0227$). Men are more likely to plan to continue working after becoming eligible for an old-age pension (31.0%) compared to women (20.7%). The value of Cramér's V (0.1166) indicates a small effect size. This finding suggests that gender plays a certain, but not decisive, role in shaping the intention to remain in the labour force after the age of 65. A statistically significant association is also observed between age and the intention to continue working ($\chi^2 = 6.7707$; $p = 0.0339$). The proportion of respondents planning to continue working increases with age: from 18.1% in the 55–59 age group, to 28.9% in the 60–62 group, and 30.4% in the 63–65 group. This pattern may be linked to the fact that individuals approaching retirement are better able to realistically assess their financial needs and their ability to continue working. At the same time, some respondents may only become aware of the potential decline in their standard of living shortly before exiting the labour force. Cramér's V = 0.1331 also indicates a small effect size.

Variable	Category	Intend to continue working		Do not intend to continue working		Total	χ^2	p	Cramér's V
		n	%	n	%				
Gender	Men	48	31,0	107	69,0	155	5.1922	0.022688	0.1166
	Women	47	20,7	180	79,3	227			
Age	55-59	29	18,1	131	81,9	160	6.7707	0.033865	0.1331
	60-62	28	28,9	69	71,1	97			
	63-65	38	30,4	87	69,6	125			
Employment status	Self-employed	37	41,1	53	58,9	90	16.6235	0.000046	0.2086
	Employed by an employer	58	19,9	234	80,1	292			
Employment sector	Private sector	64	28,1	164	71,9	228	3.1016	0.078215	0.0901
	Public sector	31	20,1	123	79,9	154			
Education level	Tertiary or higher	39	27,1	105	72,9	144	0.6065	0.436118	0.0398
	Secondary or lower	56	23,6	182	76,4	238			
Self-rated health status	Good / very good	67	29,0	164	71,0	231	5.3483	0.020742	0.1183
	Average / poor	28	18,5	123	81,5	151			

*Table 4: Differences in the Intention to Continue Working After Retirement by Sociodemographic Characteristics (N = 382)
(Source: research results)*

Employment status shows the strongest association with the intention to continue working ($\chi^2 = 16.6235$; $p < 0.001$). The self-employed are considerably more likely to plan to remain economically active (41.1%) compared to employees working for an employer (19.9%). Cramér's $V = 0.2086$ indicates a moderate effect size and represents the largest effect among the analysed variables. This result is consistent with previous research showing that self-employed workers have greater autonomy and flexibility in organizing their work and are therefore more likely to remain active at older ages (Hochguertel, 2015). Differences by employment sector are not statistically significant ($\chi^2 = 3.1016$; $p = 0.0782$). Although respondents from the private sector are somewhat more likely to plan to continue working (28.1%) compared to those employed in the public sector (20.1%), the p-value exceeds the 0.05 threshold. Education level does not show a statistically significant association with the intention to continue working ($\chi^2 = 0.6065$; $p = 0.4361$). Although individuals with higher levels of education are somewhat more likely to plan to continue working (27.1%) compared to those with secondary or lower levels of education (23.6%), the difference is not statistically significant. Health status shows a statistically significant association with the intention to continue working ($\chi^2 = 5.3483$; $p = 0.0207$). Respondents who rate their health as good or very good are more likely to plan to continue working (29.0%) compared to those with average or poorer health (18.5%). Cramér's $V = 0.1183$ indicates a small effect size; however, health status remains one of the key prerequisites for extending working lives.

5.2 Motives for Continuing to Work After Retirement

To gain a more detailed understanding of the reasons for continuing to work after becoming eligible for a pension, the dominant motives underlying this decision were analysed among respondents who expressed an intention to continue working.

Reason for Continuing to Work After Retirement	Number of respondents (n)	Percentage of respondents (%)
Additional income	65	68,4
Enjoyment of work / Job satisfaction	51	53,7
Maintaining mental activity	47	49,5
Maintaining social contacts	44	46,3
Sense of usefulness and social contribution	36	37,9
Knowledge transfer to younger colleagues	30	31,6

Table 5: Reasons for the Intention to Continue Working After Retirement (n = 95)

*Note: Respondents were allowed to select multiple answers; therefore, the sum of percentages exceeds 100.
(Source: research results)*

The most frequently cited reason for continuing to work after retirement is the need to secure additional income, reported by 68% of respondents. This result confirms the importance of financial security as a key factor in extending working lives in Croatia. Given the relatively low pension replacement rate and the rising cost of living, continued employment represents a way for some older individuals to maintain their standard of living and reduce financial insecurity. These findings differ from those reported in studies conducted in more developed European countries, where intrinsic motives, such as job satisfaction and enjoyment of work, tend to play a more prominent role than financial considerations. The second most frequently reported motive relates to job satisfaction and enjoyment of work, cited by 54% of respondents. This finding suggests that working in later life is not necessarily driven solely by financial necessity, but may also represent an important source of personal fulfilment, identity, and sense of purpose. In line with recent research in the economics of longevity, the results highlight the importance of intrinsic motivation and the psychological dimensions of work in older age. Almost half of the respondents report maintaining mental activity as an important reason for continuing to work. This finding may be linked to the perception of work as a means of preserving cognitive abilities, daily structure, and an active lifestyle. At the same time, 46% of respondents cite maintaining social contacts as an important motive for working after retirement. For many older individuals, the workplace represents an important setting for social interaction, a sense of belonging, and interpersonal relationships. A proportion of respondents also emphasise a sense of usefulness and the desire to transfer knowledge to younger colleagues. These results further underline the importance of intergenerational cooperation and the potential value of older workers for organisations and the labour market. Older workers represent not only a labour resource, but also a valuable source of experience, expertise, and organisational knowledge. Overall, the findings indicate that the motivations for continuing to work after retirement are multidimensional and arise from a combination of economic, psychological, and social factors. These findings are consistent with theoretical approaches in the economics of longevity, which emphasise the need to view older populations not only as beneficiaries of social systems, but also as active participants in economic and social life.

6. CONCLUSION

The aim of this paper is to analyse the adaptation of the Croatian labour market to the concept of the longevity economy and to examine the intention of employed individuals aged 55 and over to continue working after becoming eligible for an old-age pension. The analysis of theoretical and empirical insights shows that increasing life expectancy creates a need to redefine the traditional relationship between education, work, and retirement. In this context, the longevity economy emphasises the importance of longer and higher-quality participation of older individuals in the labour market.

The first research question relates to the adaptation of the Croatian labour market to the concept of the longevity economy. The analysis of relevant statistical indicators suggests that Croatia has not yet sufficiently adapted its labour market to demographic changes. Although life expectancy continues to increase, the share of the working-age population is declining and the number of older individuals is rising, while labour market activity among individuals aged over 65 remains notably low. Data show that as many as 75.2% of individuals stop working immediately upon becoming eligible for a pension, and the share of employed pensioners in the total number of pensioners remains very low (2.94%). These indicators suggest that institutional and organisational conditions are still not adequately adapted to extending working lives, and that the potential of the longevity economy in Croatia remains underutilised. The second research question focuses on the intention of employed individuals aged 55 and over to continue working after becoming eligible for a pension. The evidence suggests that approximately one quarter of respondents express an intention to continue working after retirement. This proportion is considerably higher than the actual labour market participation of pensioners in Croatia, where, according to official statistics, only around 2–3% of pensioners are employed. This discrepancy suggests a gap between intention and actual behaviour, indicating that while some older workers express a willingness to remain employed, institutional, organisational, or health-related constraints may limit the realisation of these intentions. In other words, intention exists to a greater extent than actual behaviour, further confirming that the Croatian labour market is not yet sufficiently adapted to extended working lives. The third research question addresses differences in the intention to continue working with respect to sociodemographic characteristics. The findings indicate statistically significant differences by gender, age, employment status, and health status, while no statistically significant differences are found with respect to education and employment sector.

A greater propensity to continue working is observed among men, older respondents, the self-employed, and individuals who assess their health as good or very good. Although some differences are statistically significant, their effect sizes are generally small, suggesting limited practical relevance when these factors are considered in isolation. Therefore, the findings should be viewed as an analytical basis for future research that could, using a broader sample and additional methods, further investigate the mechanisms linking sociodemographic characteristics, working conditions, and decisions to continue working after retirement. The fourth research question concerns the motives for continuing to work after retirement. The results confirm that this decision is not determined solely by economic factors. Although earning additional income is the most frequently cited motive, intrinsic factors such as job satisfaction, maintaining mental activity, social contacts, and a sense of usefulness also play an important role. This pattern is fully consistent with findings from international research, which emphasise that work in older age increasingly reflects a combination of economic needs and psychosocial motivations, with older workers perceiving work as a source of identity, structure, and social inclusion. The findings should be interpreted in light of certain methodological limitations. The study is conducted on a convenience sample, which limits the generalisability of the results to the overall population of older workers in Croatia. An additional limitation is the absence of longitudinal tracking of work intentions and actual behaviour after retirement. Based on the results, several recommendations can be formulated for policymakers and employers: to develop flexible forms of work tailored to older workers; to promote lifelong learning and the development of digital skills; to adapt workplaces to changes in work ability; to develop age diversity management policies; to strengthen measures aimed at preserving the health and work ability of older employees; and to create institutional incentives for a gradual transition from employment to retirement.

The findings confirm that the longevity economy in Croatia represents both a challenge and a development opportunity. Successfully adapting the labour market to demographic change requires an integrated approach that aligns public policy, organisational practices, and the capacities of older workers.

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IMMERSIVE MARKETING: CREATING ENGAGING BRAND EXPERIENCES THROUGH DIGITAL TECHNOLOGIES

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ABSTRACT

This paper examines the role of immersive marketing and how it is transforming the ways consumers interact with and relate to brands. Applications such as IKEA Place, which enables consumers to visualize products in their own homes using augmented reality (AR), illustrate how marketing communication has evolved from simply presenting products to creating interactive brand experiences. The paper reviews the evolution of marketing from traditional print and television advertising to digital communication and, more recently, immersive experiences that blend the physical and digital worlds. It also discusses the main tools used in immersive marketing, including AR try-on applications, virtual reality (VR), and 360° virtual tours, supported by examples from companies such as Gucci, Gentle Monster, and the Gentle Monster × Bratz collaboration. Finally, the paper examines the impact of immersive marketing on both consumers and businesses, including consumer engagement, brand loyalty, social media reach, and sales performance. Although challenges such as implementation costs and accessibility remain, immersive marketing is becoming an increasingly important approach for building stronger relationships between brands and consumers.

Keywords: *Alorem, Bipsum, Dolor sit amet, Eum in partem, Mappareat, Nullamcorper, Udocendi alienum*

1. INTRODUCTION

Imagine being able to furnish and decorate your home before purchasing a single piece of furniture. Instead of relying solely on imagination, you can virtually place a sofa, table, or lamp inside your own living room, experiment with different layouts, and immediately see how the products fit the space. IKEA made this possible through IKEA Place, an augmented reality application that allows customers to visualize furniture in their homes before making a purchase (IKEA, 2017). This application does more than simply help consumers choose furniture. It makes the shopping process interactive, enjoyable, and highly personal. Users can experiment with layouts, explore different possibilities, and make purchase decisions with greater confidence. A case study highlights that IKEA's use of AR and VR successfully increased customer engagement and reduced purchase uncertainty because consumers could "test" products in context before committing (Esquan Marketing, 2024).

The IKEA Place application illustrates a broader transformation in marketing communication. Instead of merely presenting products, brands increasingly create experiences that actively involve consumers. This shift reflects the emergence of immersive marketing, which combines digital technologies, interactivity, and storytelling to strengthen consumer engagement and build more meaningful relationships between brands and their audiences. Marketing communication has changed significantly over the past decades. Traditional one-way communication has gradually evolved into interactive digital communication, allowing consumers to participate in brand experiences rather than simply receive marketing messages. As digital technologies continue to develop, companies increasingly focus on creating memorable experiences instead of only promoting products (Pacsi & Szabó, 2018). The aim of this paper is to present the concept of immersive marketing, review its evolution, introduce its main strategies and technological tools, examine its impact on consumer behaviour and business performance, and illustrate its practical application through several real-world examples, with particular attention to the Gentle Monster × Bratz collaboration

2. IMMERSIVE MARKETING: CONCEPT AND EVOLUTION

2.1 What Is Immersive Marketing?

Immersive marketing is defined by Amazon Ads (2025) as a marketing approach that combines technology, interactivity, and sensory elements to engage consumers in meaningful experiences. According to Amazon Ads (2025), it places customers in immersive environments where they actively participate rather than simply observe. Rather than offering people information to read or advertisements to watch, immersive marketing encourages consumers to experience brands through interactive tools such as filters, simulations, 3D product visualization, and storytelling. According to ThingLink (2025), this approach enables brands to inspire and connect with consumers on a more meaningful level by allowing them to explore information with curiosity and freedom. Unlike traditional marketing, which primarily focuses on communicating product benefits, immersive marketing seeks to involve consumers directly in the brand experience. By combining digital technologies with interactive content and sensory stimulation, brands create environments in which consumers become active participants rather than passive observers. This shift transforms marketing communication into a more engaging, memorable, and emotionally meaningful experience.

2.2 Evolution of Marketing

Marketing has not always looked the way it does today. In its early stages, communication was primarily one-way, with companies delivering messages through television, magazines, radio, and posters, while consumers had little opportunity to respond or participate. As technology developed, digital marketing transformed this relationship. Websites, social media platforms, and search engines enabled consumers to engage with brands, comment, and share opinions. Businesses also gained access to customer data, allowing marketing messages to become increasingly personalized rather than generic. Shortly afterwards, experiential marketing emerged. Brands recognized that consumers wanted more than advertising messages and began creating experiences through pop-up stores, live events, product demonstrations, and similar activities. According to Lawton (2025), experiential marketing developed because consumers increasingly wanted something to experience rather than simply something to read. Today, immersive marketing represents the next stage of this evolution. Instead of inviting consumers to observe products or attend events, brands create environments that people can actively enter and explore, often by combining digital and physical elements. Draw & Code (n.d.) describes immersive marketing as an approach that blends these two worlds, giving consumers a stronger sense of presence, interaction, and control.

Overall, the evolution of marketing can be summarized as a progression from telling, to involving, and finally to immersing consumers in meaningful brand experiences. Each stage places consumers increasingly at the centre of communication, reflecting the continuous evolution of consumer expectations (Lawton, 2025).

2.3 Core Components of Immersive Marketing

Immersive marketing works because it does not rely on a single element but combines several complementary components to create engaging and memorable consumer experiences. One of its fundamental technologies is augmented reality (AR), which overlays digital content onto the physical environment and enables consumers to visualize products before making a purchase. Rather than simply displaying information, AR allows consumers to interact with products in real-world settings, increasing confidence and reducing purchase uncertainty. Another important component is virtual reality (VR), which transports users into fully digital environments, such as virtual showrooms, branded games, or interactive simulations. Rather than simply presenting information, VR enables consumers to explore products and services through immersive experiences. Mixed reality (MR) combines elements of AR and VR by allowing digital and physical objects to interact within the same environment. According to Draw & Code (n.d.), this integration creates a greater sense of realism while providing users with increased freedom of interaction. Beyond immersive technologies, gamification also plays an important role by incorporating game elements such as points, rewards, badges, levels, and challenges to encourage participation and strengthen customer engagement (Pacsi & Szabó, 2017). Another essential component is sensory design, which combines visual, auditory, and sometimes tactile stimuli. According to ThingLink (2025), engaging multiple senses creates more memorable experiences because consumers are more likely to remember what they experienced than what they merely observed. Finally, storytelling connects all these components into a coherent experience. As noted by Amazon Ads (2025), immersive marketing is most effective when consumers become part of a meaningful journey rather than simply viewing an advertisement. When people feel involved in the story instead of remaining passive observers, the experience becomes more engaging and emotionally meaningful. Together, these elements transform marketing from simply informing consumers into creating interactive experiences that encourage stronger and more personal connections between brands and their audiences.

3. STRATEGIES OF IMMERSIVE MARKETING

Immersive marketing focuses on creating experiences in which consumers actively participate rather than simply observe. These experiences are designed to evoke emotions, encourage exploration, and make consumers feel part of the brand's world. The most important strategies of immersive marketing include story-driven experiences, personalization, interactivity and co-creation, and multi-sensory stimulation (Kotler, 2024). Together, these strategies provide the foundation for memorable and engaging brand experiences.

3.1 Story-Driven Experiences

Story-driven experiences represent one of the core strategies of immersive marketing. Instead of presenting products in a traditional way, brands create stories or environments that consumers can explore and experience. This transforms the brand message into a living, emotional, and engaging world in which consumers actively participate. Story-driven experiences strengthen emotional connections between consumers and brands. Whether through immersive spaces, AR storytelling filters, or virtual brand worlds, they help brands differentiate themselves while creating memorable experiences (Kotler, 2024).

3.2 Personalization

Personalization is another key strategy that makes brand experiences feel tailored to individual consumers. Immersive marketing frequently uses customer data and digital technologies to personalize content, visuals, and interactions. For example, AR try-on applications and personalized recommendation systems enable consumers to visualize products within their own environment. When consumers perceive that an experience has been designed specifically for them, their engagement, satisfaction, and emotional connection increase significantly. Personalization also creates a stronger sense of relevance and ownership (Kotler, 2024).

3.3 Interactivity and Co-Creation

Immersive marketing transforms audiences from passive viewers into active participants. Interactivity encourages consumers to explore, make decisions, customize products, complete challenges, interact with digital installations, and even create content themselves. Co-creation allows consumers to contribute directly to the brand experience, strengthening both involvement and loyalty. Consequently, brands use interactivity not only for entertainment but also to build meaningful consumer engagement (Kotler, 2024).

3.4 Multi-Sensory Stimulation

One of the distinctive characteristics of immersive marketing is the simultaneous stimulation of multiple senses to enhance the consumer experience. Visual elements such as lighting, projections, and design can be combined with sound, scent, and texture to create richer and more realistic environments. By engaging multiple senses, brands create experiences that evoke stronger emotions and remain more memorable. Multi-sensory design is particularly effective in pop-up stores, experiential retail spaces, and hybrid installations, where the atmosphere strongly influences how consumers perceive and interact with the brand (Kotler, 2024).

3.5 Micro-Trends Supporting Immersive Marketing

In addition to these core strategies, several micro-trends are accelerating the adoption of immersive marketing. According to Kotler (2024), these developments explain why immersive marketing is becoming not only an innovative communication tool but also an increasingly important direction for the future of marketing.

Short-form video content, community-based social media, and interactive e-commerce have fundamentally changed the way consumers expect to engage with brands. Today's consumers increasingly seek fast, visually rich, personalized, and socially engaging experiences. At the same time, technological developments such as immersive devices and artificial intelligence make it easier for companies to create deeper and more interactive environments.

Together, these technological and behavioural trends accelerate the growth of immersive marketing by encouraging consumers to participate, interact, and create rather than simply observe. These developments demonstrate how technological innovation and changing consumer expectations reinforce one another. As a result, immersive marketing has evolved from a creative marketing approach into a natural progression of modern marketing communication.



Figure 1: Micro-Trends Driving the Growth of Immersive Marketing
 (Source: Kotler, P., Kartajaya, H., & Setiawan, I. (2024).
*Marketing 6.0: The Future Is Immersive**. Wiley.)*

4. TECHNOLOGICAL TOOLS OF IMMERSIVE MARKETING

Today's consumers increasingly expect interactive content and meaningful engagement rather than passive advertising. Consequently, brands must adopt technologies that support these changing expectations. Immersive marketing relies on a range of digital tools that enable companies to create experiences that are interactive, personalized, emotionally engaging, and memorable. Among the most important technologies are augmented reality (AR), virtual reality (VR), gamification, 360-degree content, and hybrid offline–online environments (Forbes Business Council, 2025).

4.1 Augmented Reality (AR)

Augmented reality (AR) is one of the most widely used technologies in immersive marketing. It overlays digital elements onto the physical world through smartphones or other digital devices, allowing consumers to interact with products in their real environment. AR makes brand interactions more engaging, informative, and personalized without requiring specialized equipment. Brands commonly use AR for virtual try-ons of clothing, cosmetics, or eyewear, interactive packaging, and product visualization. By allowing consumers to see how products look or function before purchasing, AR increases confidence in purchase decisions while supporting personalized customer engagement (PeekPro, 2023). IKEA Place is a well-known example, enabling customers to visualize furniture in their homes using only a smartphone.

4.2 Virtual Reality (VR)

Unlike AR, virtual reality (VR) creates a completely digital environment that users experience through a VR headset. It transports users into immersive virtual spaces where they can explore products, services, or branded environments. VR is particularly effective for virtual showrooms, product demonstrations, and simulated product testing. Because users feel physically present inside the experience, VR often creates stronger emotional engagement with the brand. Although the technology requires dedicated equipment, companies increasingly use VR to deliver memorable and distinctive experiences (Forbes Business Council, 2025). For example, Volvo developed a virtual test drive that allows potential customers to experience driving one of its vehicles without visiting a dealership.

4.3 Gamification

Gamification incorporates game elements such as points, levels, missions, and rewards into brand experiences. These elements transform ordinary interactions into engaging and motivating activities that encourage continued participation. Brands use gamification to strengthen customer loyalty, increase long-term engagement, and encourage repeated interaction. Consumers enjoy completing challenges and earning rewards because these activities create a sense of achievement. Gamification is particularly effective when combined with storytelling or personalization, as consumers become active participants in the brand journey rather than passive observers (PeekPro, 2023). Starbucks Odyssey is one example, allowing customers to complete missions and earn rewards through interactive experiences.

4.4 360-Degree Video and Interactive Web Experiences

360-degree videos and interactive web experiences enable consumers to explore environments freely without requiring specialized equipment. Users can control their viewing perspective, interact with different elements, and navigate through digital spaces using smartphones, computers, or smart TVs. Brands frequently use these technologies for virtual tours, destination previews, and interactive campaigns (Binder et al., 2017; Zhang & Szabó, 2024). Because consumers can experience places, products, or environments remotely, these tools remove many physical limitations while increasing engagement (PeekPro, 2023). National Geographic's 360-degree experiences, for example, allow users to explore destinations and natural environments from anywhere in the world.

4.5 Hybrid Offline–Online Experiences

Hybrid experiences combine physical environments with digital technologies to create immersive brand spaces that merge the real and virtual worlds. These experiences may incorporate digital displays, projections, augmented reality installations, multisensory design, and interactive physical objects. Rather than creating fully virtual environments, hybrid experiences rely on atmosphere, sensory stimulation, and direct physical interaction. They encourage visitors to explore spaces, create personalized content, and share their experiences through social media. Hybrid experiences are increasingly used in pop-up stores, concept shops, themed cafés, exhibitions, and experiential events to transform traditional retail locations into memorable brand environments (Amazon Ads, 2025). Gentle Monster and Tamburins are well-known examples, as their stores resemble art installations rather than conventional retail spaces. Their distinctive interior design and immersive environments have become an important part of their brand identity (Fan et al., 2025).

5. WHY DO IMMERSIVE MARKETING STRATEGIES WORK?

Immersive marketing is generally more effective than traditional advertising because it encourages consumers to explore, experience, and actively participate in the brand environment rather than simply observe it. The strategies discussed in the previous section create a strong sense of presence, allowing consumers to feel that they are "inside" the brand's world. This sense of immersion increases customer engagement and strengthens brand loyalty. Emotions also play a crucial role in memory formation. By combining storytelling, atmosphere, interactive installations, and multi-sensory stimulation, immersive marketing creates memorable experiences that remain with consumers long after the interaction has ended. Immersive marketing transforms passive audiences into active participants. Activities such as exploring spaces, completing challenges, or interacting with digital objects encourage consumers to engage more deeply with brands. Active participation leads to greater satisfaction, stronger emotional involvement, and increased brand loyalty. It also creates a sense of personalization, making consumers feel personally connected to both the experience and the brand. Personalization further strengthens this relationship by making brand experiences more relevant and meaningful. When experiences reflect consumers' preferences, appearance, or behaviour, they become more authentic and valuable. Interactive features, avatars, filters, and personalized content allow consumers to express their identity while creating memorable emotional experiences. As a result, personalization increases motivation, satisfaction, and the likelihood of sharing the experience with others. Finally, immersive experiences often feel innovative, surprising, and enjoyable. Their novelty naturally attracts attention and stimulates curiosity, encouraging consumers to explore further. In today's digital environment, visually appealing and interactive experiences are also more likely to be shared on social media, extending their reach beyond the original audience and attracting new consumers.

6. CASE STUDY: GENTLE MONSTER × BRATZ COLLABORATION (SEOUL, 2025)

The South Korean eyewear and lifestyle brand Gentle Monster is widely recognized for transforming its retail stores into immersive brand environments (Gentle Monster, 2025). Rather than operating traditional retail outlets, the company creates interactive spaces resembling contemporary art installations, where each room tells its own story through sculptures, lighting, sound design, and sensory experiences. This hybrid offline–online strategy has positioned Gentle Monster as one of the leading examples of immersive marketing, offering visitors memorable and emotionally engaging brand experiences. One of the authors had the opportunity to experience one of these immersive spaces during a visit to Seoul, South Korea, in October 2025. At that time, Gentle Monster was presenting its collaboration with Bratz. The installation combined nostalgia, digital interaction, and artistic design to create a highly immersive environment. Each room featured a different Bratz-inspired sculpture, demonstrating how storytelling, personalization, and interactivity can be integrated into a single brand experience. One of the most memorable elements was the integration of augmented reality. Visitors could create a personalized Bratz avatar using an AR application, making the experience both interactive and highly personal. The feature also encouraged visitors to save and share their creations on social media, extending the campaign's reach beyond the physical retail environment. The combination of artistic design, sensory stimulation, and digital interaction demonstrates how hybrid offline–online experiences can create memorable and emotionally engaging brand interactions. Overall, the Gentle Monster × Bratz collaboration illustrates how immersive marketing successfully combines artistic expression, digital technologies, and storytelling to strengthen brand identity. Today, Gentle Monster is recognized not only for its eyewear products but also for its highly distinctive retail environments. Many visitors specifically seek out the brand's stores and temporary collaborations because of the immersive experiences they offer.

During the visit, the immersive environment itself influenced the purchase decision, ultimately leading to the purchase of a pair of sunglasses. This example demonstrates how immersive marketing can influence consumer behaviour by creating experiences that are not only visually impressive but also personal, interactive, and emotionally meaningful. (Gentle Monster, 2025)

7. IMPACT OF IMMERSIVE MARKETING

Immersive marketing has a significant impact on both consumers and businesses. It influences purchasing decisions, strengthens customer engagement and loyalty, creates measurable business value, and shapes the future direction of marketing communication. At the same time, it also presents several technological, financial, and ethical challenges that companies need to address to ensure successful implementation.

7.1 Consumer Behaviour

When making purchasing decisions, consumers consider many aspects of a product, but one of the most important stages is the pre-purchase phase. According to Tang, Wong, and Ho (2025), "The pre-purchase stage is critical as it involves consumers meticulously evaluating available information and forming expectations that will ultimately affect their satisfaction and loyalty." This stage is particularly important because it shapes consumers' first impressions of both the product and the brand. Over the years, the pre-purchase stage has evolved from relying primarily on word-of-mouth recommendations to incorporating immersive digital experiences. Consumers have higher expectations than ever before, and immersive marketing helps them make more informed purchasing decisions. Tang et al. (2025) also found that "perceived value was affected by performance expectancy and effort expectancy, and it had a noteworthy progressive effect ($B = 0.573$) on the intention to use the metaverse for obtaining product information." These findings suggest that consumers increasingly rely on MR, VR, and AR experiences when evaluating products, often considering them more valuable than traditional advertising or even social media content. Experiencing a product rather than simply seeing it significantly improves the decision-making process (Fici et al., 2024). Beyond influencing purchasing decisions, immersive marketing also strengthens brand loyalty. Positive immersive experiences encourage consumers to recommend brands to others through word-of-mouth communication. Emotional engagement increases confidence in the brand, helping companies attract new customers while developing long-term relationships with existing ones.

7.2 Business Impact

Many companies have already experienced measurable business benefits after implementing immersive marketing strategies. One notable example is the collaboration between Gucci and Snapchat, which introduced the first global AR try-on filter to promote Gucci's footwear collection. The campaign allowed Snapchat users to virtually try on shoes before purchasing them. According to Snapchat for Business (2020), more than 18.9 million users interacted with the filter. By enabling consumers to visualize products before purchase, the campaign increased confidence in purchasing decisions while significantly improving engagement with the collection. The partnership also generated considerable social media exposure, as users shared their virtual try-on experiences with friends and followers. Consequently, the campaign benefited both Gucci and Snapchat while demonstrating the commercial potential of immersive marketing and encouraging other brands to adopt similar technologies.

7.3 Challenges

Despite its numerous advantages, immersive marketing also presents several challenges. As a relatively new field, its outcomes remain uncertain, and implementation often requires considerable technological and financial investment.

According to Rachmawati et al. (2024), "Consumers often face issues with the reliability and complexity of immersive technology. Problems such as hardware reliability, software glitches, and the learning curve associated with user interfaces can hinder widespread adoption." These challenges indicate that successful immersive marketing depends not only on creative ideas but also on reliable technological infrastructure. Target audience characteristics also play an important role. Not all consumer groups possess the technological skills or financial resources necessary to fully benefit from immersive experiences. Older consumers, for example, may be less familiar with advanced digital technologies, while specialized equipment can reduce accessibility for lower-income audiences. Privacy represents another major concern. As Rachmawati et al. (2024) note, "Privacy issues, especially related to the use or sharing of personal data, add complexity to consumer acceptance." Because immersive marketing often relies on collecting and processing consumer data, companies must ensure transparency, security, and responsible data management. Failure to do so may negatively affect consumer trust and damage brand reputation.

7.4 Future Trends

Immersive marketing continues to evolve rapidly, requiring companies to continuously adapt to new technologies and changing consumer expectations. As digital experiences become more sophisticated, consumers increasingly expect personalized, interactive, and emotionally engaging brand experiences. Artificial intelligence is expected to play an increasingly important role in the future development of immersive marketing. According to Rachmawati et al. (2024), "Further integration with AI and machine learning can provide more adaptive interactions and better personalization, enhancing user experiences and expanding the applications of immersive technology." AI-driven personalization is already becoming an important component of immersive marketing and is likely to become even more significant as these technologies continue to develop.

8. CONCLUSION

Marketing has evolved from traditional print advertising and mass communication to digital marketing and, more recently, immersive marketing. Rather than simply presenting products, immersive marketing enables consumers to experience brands through interactive, personalized, and emotionally engaging environments. Technologies such as augmented reality, virtual reality, gamification, and hybrid offline–online experiences strengthen customer engagement, improve purchasing decisions, and build stronger emotional connections between consumers and brands.

The Gentle Monster × Bratz collaboration demonstrates how immersive marketing can successfully combine storytelling, artistic design, and digital technologies to create memorable brand experiences. Similarly, Gucci's AR campaign illustrates the measurable business benefits that immersive technologies can generate. Despite its considerable potential, immersive marketing still faces important challenges, including implementation costs, technological complexity, accessibility, privacy concerns, and data security. As these challenges are gradually addressed and technologies continue to develop, immersive marketing is likely to become an increasingly important component of future marketing communication. Overall, immersive marketing represents a significant shift from passive advertising toward active consumer participation, creating stronger relationships between brands and consumers while offering new opportunities for innovation and competitive advantage.

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CROATIA'S BLUE ECONOMY IN THE EU MIRROR: A PERFORMANCE BENCHMARK UNDER THE EUROPEAN OCEAN PACT

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ABSTRACT

Blue economy has become the centre of European economic policy. In June 2025, European Ocean Pact was adopted by the European Commission. It is a single framework that combines together the health of ocean and a blue economy that is sustainable. This shift has raised a practical question for coastal member states: what is the performance of their blue economy and how vulnerable or exposed is it? Croatia serves as an instructive case when compared to the size of its national economy its blue economy serves as one of the largest in the Union still it relies heavily on a single sector. Present paper benchmarks Croatia's blue economy to that of European Union average and its Mediterranean counterparts. By employing public data available in EU Blue Economy Observatory and the EU Blue Economy Report this study tries to measure the size, national importance, sector structure and dependence on tourism sector. The results are read against the priorities of the Ocean Pact. The findings showcase a blue economy that is quite large, recovering strongly after Covid-19 and highly concentrated where coastal tourism accounts for around three-quarters of Croatian blue value added and jobs. Conversely, against a Union that averages nearly one-third. Present study states that this concentration is the central planning challenge, and our study sets out how the Ocean Pact's instruments can be utilised to broaden the base. Present study adds an up-to-date, member-state benchmark and a replicable model that other coastal states can adopt.

Keywords: *blue economy; European Ocean Pact; maritime spatial planning; coastal tourism; economic concentration; Croatia*

1. INTRODUCTION

In recent past the ocean has become a crucial matter of economic policy in Europe. The largest combined maritime area in the world is with European Union that ranges about 70,000 kilometres of coastline and approximately two out of five citizens live within a radius of fifty kilometres of the sea. This maritime ecosystem generates lot of activities in form of coastal tourism, trade through shipping, ports, fishing, aquaculture and recently offshore energy has gained lot of importance. Together they all make the blue economy. For many decades these sectors were regulated by individual often disconnected policies. All this saw a change in June 2025, European Commission took up the European Ocean Pact, it is a single framework that combines ocean policy with six priorities, backed with one billion euro and has promised an Ocean Act by 2027 while revising the Maritime Spatial Planning Directive. This new approach leads to an old question with fresh urgency.

If we desire blue economy to be both competitive and sustainable policy makers should know how blue economy performs today, how it will perform in near future and what are the potential bottlenecks. Performance, however, is not uniform. It differs significantly between member states and national averages hide the real risks. This is the gap our study will address by taking one revealing case of Croatia.

1.1 Statement of the Problem

One of the significant blue-dependent economies in the Union is Croatia. A large share of Croatia national income, output and employment comes from the ocean. This dependence serves as an asset, but at same time it is also a vulnerability, because as observed from past the Croatian blue economy is highly concentrated in a single sector, coastal tourism. A blue economy that is running on single sector is quite vulnerable to global shocks, to seasonality and to the environmental limitations of that sector. The Ocean Pact argues for including more sectors and making blue economy more diverse and competitive, but there is limited evidence on how concentrated Croatia's blue economy really is and how it compares to other European economies.

1.2 Why Croatia, and what is new

Croatia has been selected for three major reasons. It has a long Adriatic coastline and decades old maritime tradition, its blue economy is quite large compared to its size and it is a Union member who is still transforming and shaping its maritime planning. The major contribution of present study is threefold. Firstly, by employing an up-to-date data, it analysis the member-state benchmark of Croatia's blue economy. Secondly, it does the examination against the newly adopted European Ocean Pact, which earlier studies have not done. Thirdly, it provides a simple, transparent method which is based on size, structure and concentration that other coastal states can replicate and reuse.

1.3 Objectives and Research Questions

Present study is based on three objectives (O), that comes out of certain research question (RQ):

(RQ1: How large Croatia marine ecosystem is and how does its weight in the national economy when compare with the Union?) O1 – To Measure the size of Croatian blue economy and assess the national importance of its blue economy.

(RQ2: How concentrated is Croatia blue economy and where does the value come from?) O2 – To examine the sectoral structure and tourism dependence of its blue economy.

(RQ3: Where does Croatia stand relatively when compared to its coastal states?) O3 – To Benchmark Croatia blue economy against the Union average and its Mediterranean counterparts.

The further paper is divided into Section 2 that gives the policy background. Section 3 is concerned with reviewing the literature and states the research gap as well. Section 4 deals with data collection and methodology. Section 5 highlights the results and findings. Sections 6 and 7 are concerned with discussing policy implications. Section 8 presents the limitations and Section 9 concludes the paper.

2. BACKGROUND: THE BLUE ECONOMY AND THE EUROPEAN OCEAN PACT

The blue economy is concerned with the established marine sectors like fisheries and aquaculture, trade and port activities, renewable energy, marine logistics, repair, shipping and coastal tourism all come together with a set of new and emerging areas such as blue biotechnology and ocean energy. In 2021 these established sectors provided employment to about 3.59 million individuals in the Union and generated approximately 623.6 billion euro in turnover and 171.1 billion euro in gross value added. Coastal tourism had the largest part accounting for about 54% of blue jobs and 29% of blue value added. The European Ocean Pact that was adopted on 5 June 2025, will serve as the policy backdrop for current study. It brings together many ocean policies of the Union's under one coordinated strategy which is supported by one billion euro that was announced at the 2025 UN Ocean Conference. The work is planned under six priorities: starting with restoration of ocean health; taking steps to boost a sustainable and competitive blue economy; taking measures to support communities related with coastal and island; advancing ocean research and promoting skills; strengthening and enhancing maritime security and lastly reinforcing ocean governance for better coordination. The Pact also governs an Ocean Act by 2027 and a review of the Maritime Spatial Planning Directive, this is a legal tool through which member states plan and organise competing uses of their ocean space. Croatia sits squarely within this agenda. Its large Adriatic coast, heavily dense with islands, supports tourism, ports and shipping, fishing and aquaculture in the same waters. Balancing and managing these uses sustainably is the task that Pact and the planning directive are meant to support which makes Croatia a timely economy to study.

3. LITERATURE REVIEW

The idea of “blue growth” – expanding the marine economy while protecting marine ecosystems – has been debated for more than a decade. Early policy work by the OECD projected strong growth in the ocean economy to 2030. Scholars soon questioned how to reconcile growth with conservation, warning that “blue growth” can mean very different things to different actors (Eikeset et al., 2018). Others examined how marine ecosystem services underpin the agenda (Lillebo et al., 2017) and how ocean governance must balance use and protection (Ehlers, 2016). A second strand measures the blue economy. The Union's annual Blue Economy Report has become the standard reference, providing harmonised, sector-level data across member states (European Commission, 2024). National and regional studies build on it; for Croatia, the World Bank's recent work charts the country's blue economy pathways and stresses the weight of coastal activity (World Bank, 2024). Maritime spatial planning is treated as the main tool for coordinating uses, following the planning directive of 2014. A third strand, drawn from regional and tourism economics, warns about concentration. An economy that leans on one sector is more exposed to shocks and seasonality. This logic is well established for tourism-dependent regions, yet it has rarely been applied to the blue economy of a specific member state.

3.1 Research gap

Three gaps follow. First, while Union-level blue economy data are rich, member-state benchmark studies remain scarce, and few use the most recent figures. Second, no study yet reads Croatia's blue economy against the European Ocean Pact, which is only months old. Third, the concentration lens – treating tourism dependence as a planning risk – has not been applied to Croatia's blue economy in a comparative way. This paper addresses all three: O1 and O2 close the descriptive and structural gaps, O3 the comparative gap, and O4 links the evidence to the new policy frame.

4. DATA AND METHODOLOGY

4.1 Data sources

Present study made use of public and secondary data. The main data sources are the EU Blue Economy Observatory and the EU Blue Economy Report, both reports are released by the European Commission and is based on harmonised Eurostat data. Policy implication part comes from the Ocean Pact communication. Table 1 below presents the sources and their use.

Table 1. Data sources and their use

Source	Provider	Use
EU Blue Economy Observatory (country profile)	European Commission	Size of Croatia, shares of sector and tourism dependence
EU Blue Economy Report (2024, 2025)	European Commission / JRC	Union totals, sector shares, comparison of peer countries
Structural business & tourism statistics	Eurostat	Underlying sectoral data
The European Ocean Pact, COM(2025) 281	European Commission	Policy formulation and priorities
Charting Croatia's Blue Economy Pathways	World Bank	National contribution and emerging sectors contribution

Source: authors' compilation

4.2 Method

The method employed in our study is comparative and indicator-based benchmark. We measured four things: to analyse the size of Croatia's blue economy in terms of both employment and value added; its relative importance in the national economy in terms of blue shares of national employment and value added; the contribution of each sector; and lastly its concentration (the share of value coming from coastal tourism which is treated as a dependence ratio). For concentration we have computed a simple diversification index, the Herfindahl-Hirschman index of sector value-added shares, where a high value of HHI index meant a less diversified and more vulnerable blue economy.

The relative comparison is between Croatia, the Union average, and Mediterranean counterparts (Greece, Spain, Italy). All figures presented are extracted from the sources in Table 1; some values are based on authors' calculations, such as the share of employment (Union average) and the diversification index, are flagged in the relevant source lines. The method is deliberately kept simple so that audience can easily replicate or reuse it.

5. RESULTS

5.1 Size and national importance

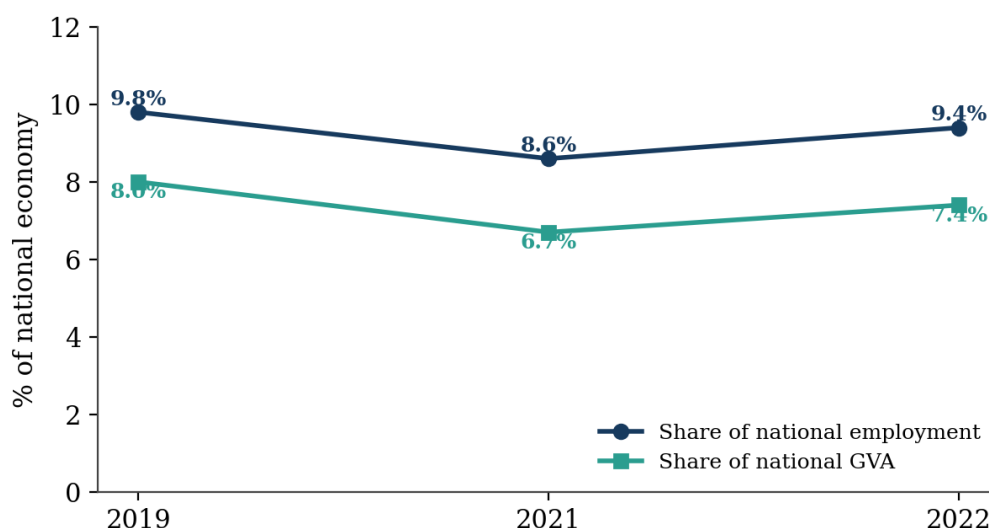
Croatia's blue economy is quite large in comparison to size of the country. In 2022 its established sectors was engaged in employing about 151,000 people and successfully generated approximately 4.1 billion euro in gross value added. More striking feature is its weight in the national economy: the blue economy helped in generating around 9.4% of national employment and 7.4% of national value added in 2022. Both shares successfully recovered from the covid-19 trough and were approaching same levels as in 2019. Table 2 and Figure 1 highlights the recent pathway.

Table 2. Headline Indicators for Croatia's blue economy: 2019–2022

Indicator	2019	2021	2022
Employment (persons)	~158,000	~136,000	~151,000
Gross value added (€ billion)	~4.2	~2.9	~4.1
Share of national employment (%)	9.8	8.6	9.4
Share of national GVA (%)	8.0	6.7	7.4
Coastal tourism, share of blue GVA (%)	79	76	75

Source: EU Blue Economy Observatory (Croatia profile) and EU Blue Economy Report. 2019 employment and GVA levels are approximate, read from the reported shares

Figure 1. Croatia's blue economy as a share of the national economy, 2019–2022

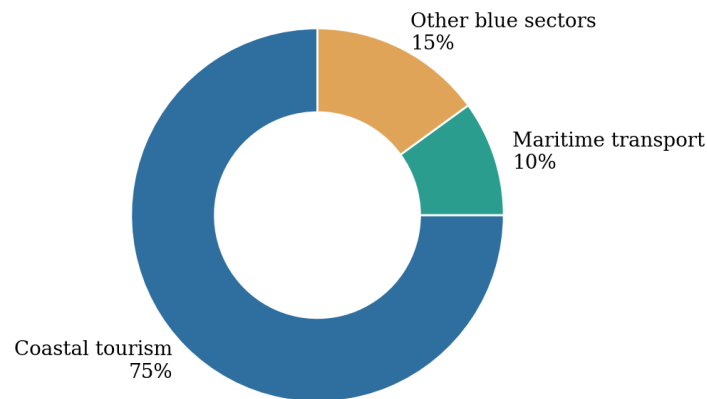


Source: EU Blue Economy Observatory. The 2020 pandemic trough is omitted for clarity

5.2 Sector structure and tourism dependence

One of the most defining feature of Croatia's is its blue economy. Coastal tourism sector alone contributes for about 75% of blue value added and 75% of blue jobs as in 2022. Other significantly large contributors are marine living resources also it generates for around 11% of blue jobs and maritime transportation that provides 10% of blue value added. Remaining sectors together contribute a small portion. Figure 2 presents the overall value-added composition which means this blue economy is resting on one single pillar.

Figure 2. Croatia's blue economy by value added, 2022



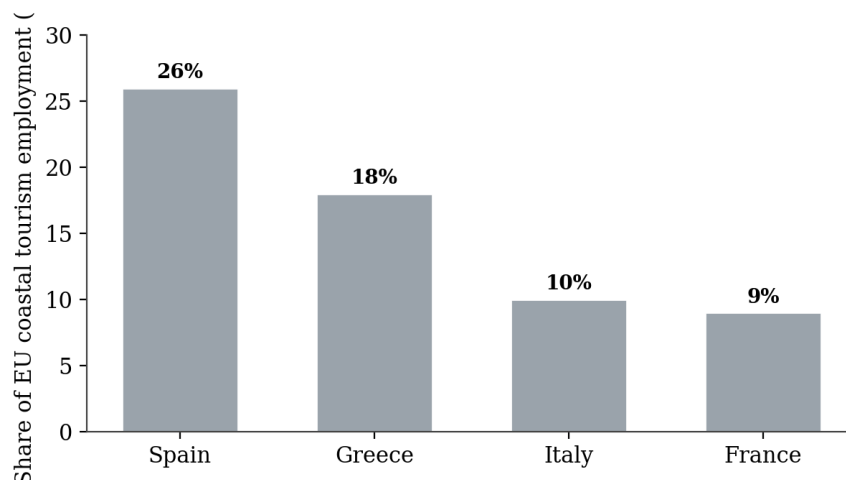
Source: EU Blue Economy Observatory. "Other blue sectors" is the residual across living resources, non-living resources, ports and shipbuilding

The strong post-pandemic recovery ran through this same sector. Croatia's total blue value added rose from about 2.9 billion euro in 2021 to 4.1 billion in 2022, while coastal tourism value added climbed from 2.4 to 3.1 billion over the same year. Figure 6 (below) shows both. Recovery is welcome, but it also deepened the reliance on tourism.

5.3 Croatia in the EU Mirror

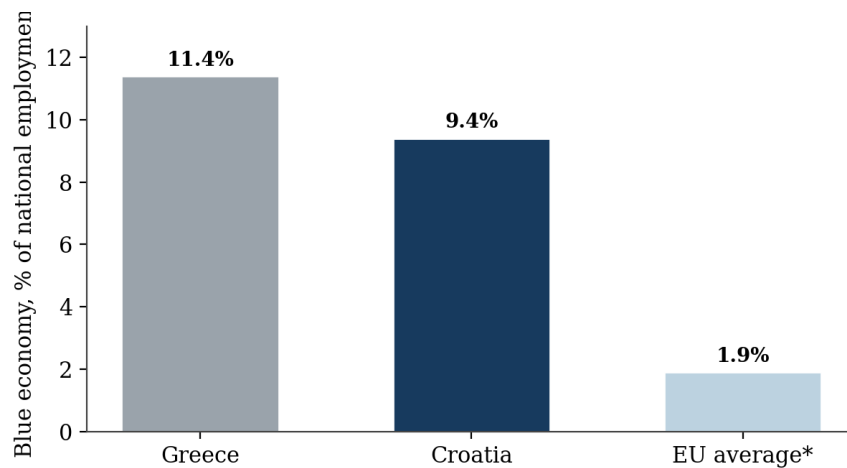
Placed right behind its counterparts, Croatia stands out in certain ways. Firstly, its blue economy serves as a significant asset to the national economy. In terms of employment it is behind Greece but it is amongst the most blue-reliant states; in terms of value-added Croatia registered the highest blue share in comparison to any member state in 2021. Figure 4 below presents the national employment share as against Greece and the Union average. Secondly, despite having this weight, Croatia in terms of absolute coastal tourism serves as a mid-sized player, standing seventh in the Union for providing tourism employment and eighth in terms of tourism value added. As showcased in Figure 3 the Union's coastal tourism is run by Spain, Greece, Italy and France.

Figure 3. Leading EU countries in coastal tourism employment, 2022



Source: EU Blue Economy Report 2025. Croatia ranks seventh in the EU on this measure

Figure 4. Blue economy as a share of national employment, selected countries



*Source: EU Blue Economy Report (2021–2022 data). *EU average is an authors' calculation: 3.59 million blue jobs over total EU employment*

The overall summarisation is done in Table 3, where the study brings the comparative indicators all together.

Table 3. Benchmark: Croatia versus the EU and Mediterranean peers

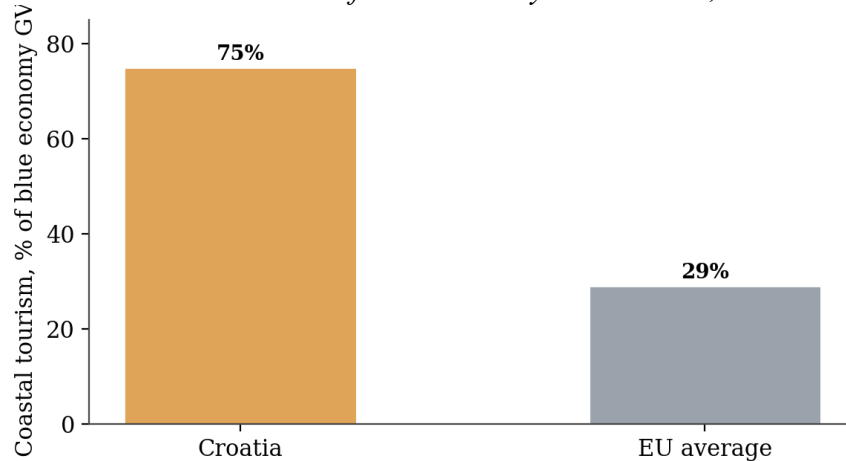
Indicator	Croatia	Greece	EU avg.	EU leader
Blue economy, % of national employment	9.4	11.4	~1.9*	Greece
Blue economy, % of national GVA	7.4	–	–	Croatia (2021)
Coastal tourism, % of blue GVA	75	–	29	–
EU rank, coastal tourism employment	7th	2nd	–	Spain
EU rank, coastal tourism GVA	8th	–	–	Spain

*Source: EU Blue Economy Observatory and EU Blue Economy Report. *Authors' calculation; "–" indicates not reported in the sources used.*

5.4 Concentration and diversification

The heart and core of the benchmark is concentration result. The results state that Coastal tourism is engaged in supplying about 75% of Croatia's blue value added, when compared against a Union average of approximately 29%. Croatia's blue economy when compared is more than twice as tourism-dependent as the Union as a whole. Below Figure 5 presents the contrast plain.

Figure 5. Coastal tourism as a share of blue economy value added, Croatia versus the EU



Source: EU Blue Economy Observatory (Croatia) and EU Blue Economy Report (EU average)

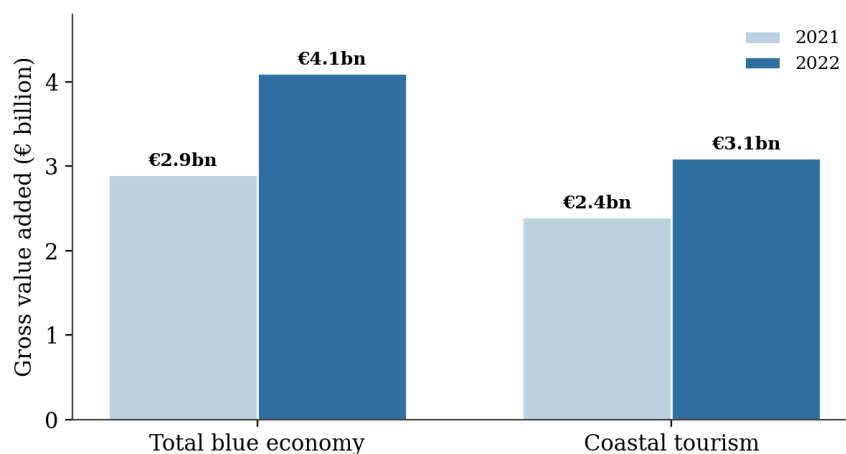
Present study employed the HHI index of value-added shares, Results showcase Croatia's blue economy scored quite high on concentration, which is driven single handedly by the tourism sector. A more balanced blue economy would score low and be more resilient and not dependent on single pillar rather be dependent on strong maritime transport, fishing and aquaculture and new emerging energy sectors. Table 4 below highlights the concentration measures.

Table 4. Concentration and diversification measures

Measure	Croatia	EU average
Tourism dependence (tourism % of blue GVA)	75%	29%
Largest two sectors (% of blue GVA)	~85%	—
Diversification index (HHI of GVA shares)*	High	Lower

Source: authors' calculation on published EU Blue Economy Observatory sector shares. *HHI rises with concentration; reported qualitatively where full sector shares for the EU were not available

Figure 6. Croatia's blue economy value added: recovery from 2021 to 2022



Source: EU Blue Economy Observatory (Croatia profile)

5.5 SWOT under the Ocean Pact

Table 5 below summarises the results against the priorities of the European Ocean Pact by performing a SWOT analysis.

Table 5. SWOT of Croatia's blue economy under the European Ocean Pact

Strengths	Weaknesses
Croatia serves as a Large blue economy compared to its national size; recovered strongly after covid-19 pandemic; Vast and long Adriatic coastline; Already established tourism sector with good maritime-transport base.	Heavily reliant on coastal tourism (~75% of value added); seasonality plays a major role; thin presence in higher-value and emerging blue sectors; environmental pressure on the Adriatic.
Opportunities	Threats
International agreements and pacts. Ocean Pact funding and the planned Ocean Act; diversification from tourism to aquaculture, maritime transport and offshore renewable energy sources; maritime spatial planning to coordinate uses.	Heavy-reliance on tourism increases global shocks; seasonality and climatic changes i.e. coastal flooding ; increasing competition for ocean space; if planning lags there can be heavy loss of coastal-community livelihoods

Source: authors' synthesis based on the data above and the Ocean Pact priorities

6. DISCUSSION

Two findings of current study stand out. We have known that Croatia's blue economy is quite large and crucial but it is dangerously narrow. The results state that very few member states are able to draw as much of their employment and value added from the ocean. The second is the problem related with planning, the one which Ocean Pact was made to solve. When almost three-quarters of blue value added is coming from one seasonal that too climatic sensitive sector, any bad season or a climate shock, global events that have direct impact on environmental resources can ripple through the whole coastal economy and economy could collapse. The Ocean Pact is designed to offer concrete levers. Its priority is to have a blue economy that is competitive and sustainable hence pointing directly at diversification and inclusion of more sectors like stronger fishing and aquaculture, marine living resources, modern ports and maritime transport and a strong hold in green energy specifically emerging sectors like offshore renewable energy and blue biotechnology. For an economy whose islands depend on the sea, the support for coastal and island communities matters a lot therefore a planned re-structured Maritime Spatial Planning Directive gives Croatia an instrument to coordinate and control tourism, ports, aquaculture, shipping and renewable energy at the same Adriatic waters rather than letting them compete unmanaged.

7. POLICY IMPLICATIONS

On the basis of findings of our study certain priorities follow for Croatian policy makers and their Union partners:

Diversification in the blue base: Channel Ocean Pact and cohesion funding towards fishing and aquaculture, maritime transportation and offshore renewable energy to decrease reliance on single sector i.e. coastal tourism.

Planning the use of ocean space: By using the maritime spatial planning framework and the coming directive revisions in form of protecting ecosystem and coordinate competing Adriatic uses.

Protection to coastal communities: The main constraint with coastal tourism is its nature of seasonality. This problem needs to be addressed secondly island livelihoods needs to be protected so that when diversification is promoted it does not leave tourism-reliant towns behind.

Building the data base: For promoting growth it's important to track blue-economy concentration over the period of time, so that growth and progress towards a more balanced economy can be observed and measured.

With respect to Union and other coastal states, Croatia can serve as a useful warning and a useful template: having generated a high blue share in employment and value added does not specifically make any economy resilient. Lastly, the benchmark employed here can be applied wherever the data exist and can easily be replicated.

8. CONCLUSION

In light of the European Ocean Pact, which was charting a new course, the present study is based on a comparative analysis of the blue economy in Croatia against the Union and its members at that time. The present study measures its size and national weight (O1), maps its structure and dependence on tourism (O2), puts it in the Union mirror (O3) and reads the findings against the Pact (O4). Croatia's blue economy is one of the most significant in the Union for its size, which has made an impressive recovery from the pandemic, but it heavily relies on coastal tourism, accounting for some three quarters of its blue value added, compared to around one third for the Union. The Ocean Pact's tools – funding, the Ocean Act and maritime spatial planning – provide the framework for Croatia to expand its blue base. There are three restrictions to be mentioned. First: The analysis is based on published, aggregated data, which means that it is based on benchmarking and comparing, not based on the empirical results of causal effects. Second, some comparative cells and the diversification index are restricted to the information provided in the sources and are marked as such. Third, the data are recent but still one year or two years behind, which is typical of harmonised data. Future research should develop a comprehensive multi-country diversification indicator using disaggregated sectoral data, incorporate an environmental sustainability theme into the benchmark and analyse the indicators over subsequent releases of the Blue Economy Report to test whether the Ocean Pact has an impact on the structure of Croatia's blue economy.

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ANTECEDENTS AND CONSEQUENCES OF ORGANIZATIONAL LEGITIMACY: A SYSTEMATIC LITERATURE REVIEW

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ABSTRACT

Organizational legitimacy is an important concept in research because it helps explain how organizations gain stakeholder support, access key resources and improve their long-term prospects. However, research on organizational legitimacy remains fragmented, especially regarding the factors that shape it and its outcomes. To address this gap, this study presents a systematic literature review of organizational legitimacy research based on articles identified in the Web of Science Core Collection. This review is based on a systematic search and screening process, combined with inductive coding procedure. The initial search identified 1,873 records and resulted in a final sample of 171 peer-reviewed journal articles. The analysis identified five categories of organizational legitimacy antecedents: organizational attributes, institutional factors, strategic factors, relational factors, and governance and leadership. The analysis also identified five main categories of organizational legitimacy consequences: performance outcomes, stakeholder outcomes, resource outcomes, maintenance and repair outcomes, and survival and growth outcomes. This review provides an integrated synthesis of the antecedents and consequences of organizational legitimacy and summarizes them in a conceptual framework. The findings suggest that organizational legitimacy should be understood as a socially constructed judgment of organizational appropriateness and as a strategic organizational resource that supports stakeholder relationships, organizational performance and long-term survival. This literature review also identifies directions for future research, particularly the need for longitudinal studies and more attention to organizational legitimacy in digital, sustainability and crisis-related contexts.

Keywords: *Antecedents, Consequences, Organizational legitimacy, Systematic literature review*

1. INTRODUCTION

Organizational legitimacy helps explain why organizations gain social acceptance, stakeholder support and access to critical resources (Suchman, 1995; Deephouse & Suchman, 2008; Bitektine & Haack, 2015; Suddaby et al., 2017). It is defined as the perception that an organization's actions are appropriate within socially constructed systems of norms, values and beliefs (Suchman, 1995). Organizations perceived as legitimate are more likely to gain stakeholder trust, ensure reputation, secure critical resources and long-term survival (Fombrun, 1996; Zimmerman & Zeitz, 2002; Deephouse & Carter, 2005; Schnackenberg & Tomlinson, 2016; Suddaby et al., 2017; Gomez-Trujillo & Gonzalez-Perez, 2024). Since Suchman's (1995) seminal study, organizational legitimacy has been studied from different theoretical perspectives (Berger et al., 1998; Bitektine, 2011; Bitektine & Haack, 2015; Suddaby et al., 2017). Also, organizational legitimacy is being examined in a wide range of organizational settings (Aldrich & Fiol, 1994; Kostova & Zaheer, 1999; Zimmerman & Zeitz, 2002; Spanuth & Urbano, 2024). However, research on organizational legitimacy remains fragmented, particularly regarding the factors that ensure organizational legitimacy and its consequences.

Existing reviews focused on definitions of organizational legitimacy and the issues related to measuring of organizational legitimacy across different organizational contexts (Kozlowski & Klein, 2000; Deephouse & Suchman, 2008; Bitektine & Haack, 2015; Suddaby et al., 2017). They did improve the understanding of organizational legitimacy but provided only limited insights into the evidence on factors driving organizational legitimacy and the organizational outcomes that result from it. Consequently, the existing literature remains fragmented and examines antecedents and consequences separately, within specific contexts, industries or theoretical perspectives. To the best of our knowledge, no systematic literature review has integrated both the antecedents and consequences of organizational legitimacy into a single analytical framework. Therefore, this study presents a systematic literature review of research published between 1995 and 2025, synthesizing existing knowledge on both the antecedents and consequences of organizational legitimacy and proposing an integrated conceptual framework. This paper, in its section 2, presents the theoretical background and describes the systematic literature review methodology. Section 3 reports the review findings and identifies main categories of organizational legitimacy antecedents and consequences. Finally, section 4 discusses the implications of the findings and proposes directions for future research.

2. THEORETICAL BACKGROUND AND THE METHODOLOGY

Organizational legitimacy is built through stakeholders' evaluations of organizations and their alignment with stakeholders' expectations (Bitektine, 2011; Bitektine & Haack, 2015). This means that organizational legitimacy can be gained, maintained, challenged or repaired as stakeholder expectations change through time (Elsbach, 1994; Suchman, 1995; Bundy, 2017; Suddaby et al., 2017; Li & Bosma, 2025). Institutional theory emphasizes that conformity with prevailing rules, norms and beliefs is the main source of organizational legitimacy (Meyer & Rowan, 1977; DiMaggio & Powell, 1983; Haack et al., 2021). On the other hand, strategic perspective views organizational legitimacy as a resource that organizations can actively build and manage through communication, stakeholder engagement and different symbolic actions (Suchman, 1995; Golant & Sillince, 2007; Gomez-Trujillo & Gonzalez-Perez, 2024). These two perspectives were used to examine antecedents and consequences of organizational legitimacy. The literature search was conducted in the Web of Science Core Collection (including the Social Sciences Citation Index (SSCI), Science Citation Index Expanded (SCI-EXPANDED), and Emerging Sources Citation Index (ESCI)), by using the following Topic Search (TS) query: TS=("organizational legitimacy" OR "organisational legitimacy" OR "organizational legitimation" OR "organisational legitimation" OR "firm legitimacy" OR "corporate legitimacy" OR "organizational legitimation" OR "corporate legitimation strategies"). The search was performed on 27 April 2026 and included journal articles published in English between 1995 and 2025. Reviews, conference proceedings, editorials, book chapters, letters, and other publication types were excluded from the search. The starting year was selected because of Suchman's (1995) key research that marked the beginning of broader organizational legitimacy research. The search identified 1,873 peer-reviewed articles. After removing (two) duplicates, 1,871 articles were screened based on their title and abstract. 1,615 records were excluded because they have not dealt with organizational legitimacy as a central construct. The full-text of remaining 256 articles was reviewed, which resulted in exclusion of additional 85 articles. Articles were excluded if organizational legitimacy was examined exclusively from a political, individual or governmental view. The final sample consisted out of 171 journal articles. This study selection process is summarized in Table 1.

Table 1: Study selection process

Eligibility criteria	Included	Excluded
Publication type	Peer-reviewed journal articles	Conference papers, reviews, editorials, book chapters, letters, notes and other non-article publications
Language	English	Non-English publications
Publication period	1995–2025	Before 1995 or after 2025
Research focus	Organizational legitimacy as the primary research construct	Studies where organizational legitimacy was not the primary focus
Level of analysis	Organizational level	Political, governmental and individual

Articles meeting the eligibility criteria were analysed using an inductive coding approach. After the full-text review, the first author coded all articles in Microsoft Excel. The coding categories were not defined in advance, but were developed during the analysis (similar themes were identified across the studies). Table 2 presents the coding framework, including the operational definition of each category and representative examples of the coded factors. Each article was coded according to the reported antecedents and consequences of organizational legitimacy. Similar themes were grouped into categories, resulting in five antecedent and five consequence categories. The second author reviewed the coding and the category classification. Differences in opinions were discussed until an agreement was reached. As many studies reported more than one antecedent or more than one consequence of organizational legitimacy, they could have been assigned to more than one category.

Table 2: Coding framework (Table ends on the next page)

Coding category	Operational definition	Examples of coded factors
Organizational attributes	Internal organizational characteristics that influence stakeholders' perceptions of an organizational and its credibility	Reputation, identity, age, size, prior performance, innovation capability, operational effectiveness
Institutional factors	External institutional pressures and expectations that shape organizational legitimacy	Regulations, industry standards, professional norms, institutional conformity, certifications, expectations regarding sustainability
Strategic factors	Deliberate organizational actions aimed at building, maintaining, or restoring organizational legitimacy	Corporate social responsibility initiatives, sustainability reporting, public disclosures, symbolic activities, legitimacy strategies
Relational factors	Relationships with stakeholders and external actors that influence legitimacy judgments	Stakeholder engagement, partnerships, alliances, endorsements, networks, collaboration with reputable organizations
Governance and leadership	Governance structures and leadership practices that signal	Leadership behaviour, board independence, accountability,

Coding category	Operational definition	Examples of coded factors
	responsible organizational behaviour	transparency, ethical principles, stakeholder representation
Performance outcomes	Organizational performance associated with organizational legitimacy	Competitiveness, effectiveness, market position
Stakeholder outcomes	Positive stakeholder responses resulting from organizational legitimacy	Trust, stakeholder support, commitment, cooperation
Resource outcomes	Access to organizational resources (tangible and intangible)	Financial resources, employees, partnerships, knowledge, social capital
Maintenance and repair outcomes	Outcomes related to preserving or restoring organizational legitimacy over time	Crisis resilience, legitimacy repair, governance reforms
Survival and growth outcomes	Long-term organizational viability supported by organizational legitimacy	Survival, growth, expansion, innovation, market opportunities

3. RESULTS

3.1. Antecedents of organizational legitimacy

Table 3 presents the frequency of antecedent categories identified in 171 studies that were reviewed. Organizational attributes were the most frequently reported antecedents (67.3%) followed by institutional factors and strategic factors (64.3% each), relational factors (63.7%) and governance and leadership related factors in the end (58.5%).

Table 3. Frequency of antecedent categories (N = 171)

Antecedent category	Studies (N)	% of studies
Organizational attributes	115	67.3
Institutional factors	110	64.3
Strategic factors	110	64.3
Relational factors	109	63.7
Governance and leadership	100	58.5

Results shows that organizational legitimacy is mostly connected with organizational attributes: characteristics that signal competence, credibility and reliability (Bitektine, 2011; Deephouse & Carter, 2005; Suddaby et al., 2017). The most frequently identified attributes within the category of organizational attributes were good reputation, identity, age, size, performance, innovation capability and operational effectiveness (Deephouse, 1996; Zimmerman & Zeitz, 2002; Deephouse & Carter, 2005; Tost, 2011; Bitektine & Haack, 2015; Suddaby et al., 2017). Organizations with established reputation and identity, strong performance are more likely to be perceived as appropriate and trustworthy (Ashforth & Gibbs, 1990; Dutton & Dukerich, 1991; Deephouse & Suchman, 2008; Brown et al., 2006; Bitektine & Haack, 2015; Suddaby et al., 2017; Shu et al., 2024; Vaara et al., 2024; Li et al., 2025; Radisatra & Ganiem, 2025). Institutional factors were identified in 110 of the 171 reviewed studies (64.3%).

Reviewed studies show that organizational legitimacy is often associated with an organization's ability to align with prevailing norms, values, regulations and industry expectations (Meyer & Rowan, 1977; DiMaggio & Powell, 1983; Deephouse, 1996). Such an alignment signals to relevant stakeholders that organizational practices are appropriate and acceptable (Deephouse, 1996). Regulatory compliance, adherence to professional standards, certifications and alignment with established industry practices are most frequently reported institutional mechanisms supporting organizational legitimacy (Ruef & Scott, 1998; Kostova & Zaheer, 1999; Bitektine & Haack, 2015). Institutional factors are especially important in times of uncertainty (Bitektine & Haack, 2015; Aldrich & Ruef, 2022; Spanuth & Urbano, 2024). As stakeholders' expectations change through time, organizational legitimacy depends on an organization's ability to respond to their evolving expectations (Wickert & Risi, 2021; Mohliver et al., 2023). Strategic factors were identified in 110 of the 171 reviewed studies (64.3%), indicating that organizations can shape their organizational legitimacy through deliberate activities, including communication (Castelló et al., 2016). Namely, communication and disclosure practices are among the most frequently reported strategic mechanisms supporting organizational legitimacy. Organizations use sustainability reporting, corporate social responsibility initiatives and public communication to demonstrate accountability and alignment with stakeholders' expectations (Palazzo & Scherer, 2006; Suddaby et al., 2017; García-Rivas et al., 2023). These practices help reduce information asymmetry and strengthen stakeholder perceptions of organizational legitimacy by demonstrating commitment to stakeholder expectations and socially appropriate behaviour (Deephouse & Suchman, 2008; Delams & Burbano, 2011; Velte, 2022; García-Rivas et al., 2023; Wickert & Risi, 2023). Relational factors were identified in 109 of the 171 reviewed studies (63.7%), noting the importance of stakeholder relationships for organizational legitimacy. Namely, organizational legitimacy is strongly influenced by an organization's relationships with key stakeholders, including customers, investors, business partners, regulators, professional associations and local communities (Kostova & Zaheer, 1999; Bitektine, 2011; Bitektine & Haack, 2015; Nartey et al., 2023). Organizations often benefit from associations with actors that are already perceived as legitimate, such as established firms, universities, government agencies, industry associations and reputable investors (Zimmerman & Zeitz, 2002; Deephouse & Suchman, 2008; Fu & Wang, 2024). These relationships provide external validation, strengthen stakeholder confidence, particularly for new and emerging organizations (Fombrun, 1996; Zimmerman & Zeitz, 2002; Deephouse & Suchman, 2008; Nartey et al., 2023). Governance and leadership factors were identified in 100 of the 171 reviewed studies (58.5%). These indicate that relevant stakeholders evaluate organizational legitimacy based on governance structures, leadership behaviour and accountability mechanisms signaling transparency and ethical conduct (Tost, 2011; Bitektine & Haack, 2015; Suddaby et al., 2017). Leaders play an important role in strengthening organizational legitimacy by demonstrating integrity, competence and trustworthiness (Bitektine & Haack, 2015; Spanuth & Urbano, 2024). Governance mechanisms, such as board independence and ethical behaviour represent important signals of organizational legitimacy (Palazzo & Scherer, 2006). They strengthen stakeholder trust by showing that organizational decisions are subject to adequate controls and are aligned with appropriate (conduct) standards (Palazzo & Scherer, 2006; Aguilera-Caracuel & Guerrero-Villegas, 2018).

3.2. Consequences of organizational legitimacy

Table 4 presents the consequence categories of organizational legitimacy identified across 171 reviewed studies. Performance outcomes and stakeholder outcomes were the most frequently identified consequences (59.1% each) followed by resource outcomes (39.2%), maintenance and repair outcomes (35.1%), and survival and growth outcomes in the end (34.5%).

Findings suggest that organizational legitimacy contributes to different aspects of organizational performance: better organizational performance, stronger stakeholder support, improved access to resources, greater resilience, long-term survival and growth (Dacin et al., 2007).

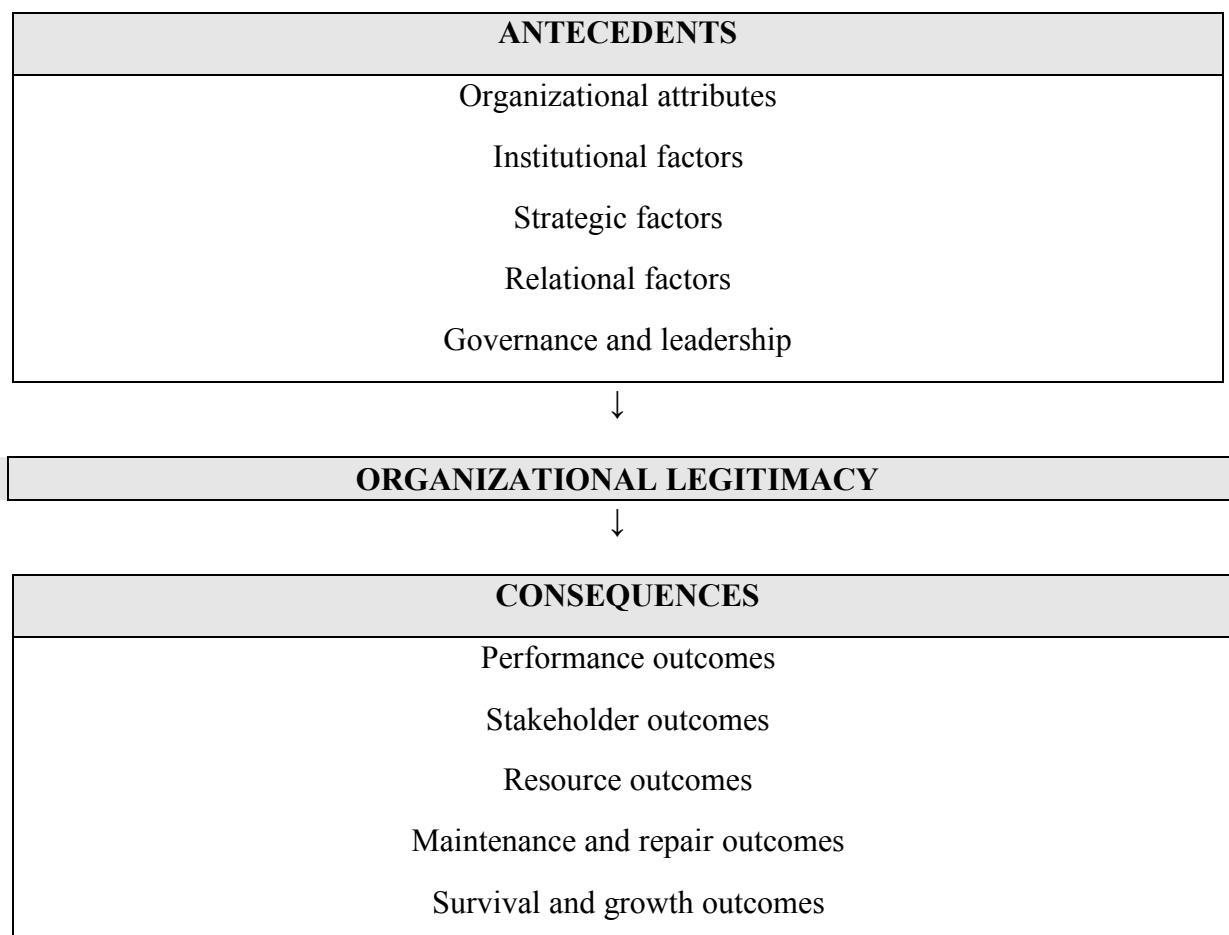
Table 4. Frequency of consequence categories (N = 171)

Consequence category	Studies (N)	% of studies
Performance outcomes	101	59.1
Stakeholder outcomes	101	59.1
Resource outcomes	67	39.2
Maintenance and repair outcomes	60	35.1
Survival and growth outcomes	59	34.5

Performance outcomes appeared in 101 of the 171 reviewed studies (59.1%). Organizational legitimacy is consistently associated with improved organizational performance, stronger reputation, greater competitiveness and higher organizational effectiveness (Oliver, 1997; Dacin et al., 2007; Gomez-Trujillo & Gonzalez-Perez, 2024; Balzano & Modugno, 2025). Organizations perceived as legitimate are more likely to improve their market rate and achieve long-term goals (Gomez-Trujillo & Gonzalez-Perez, 2024). There is a two-way relationship between organizational legitimacy and performance: better performance strengthens stakeholder perceptions of organizational legitimacy, and higher legitimacy further supports organizational success (Balzano & Modugno, 2025). Studies that were reviewed show that organizational legitimacy increases perceptions of organizational credibility, reliability and predictability (García-Rivas et al., 2023; Gomez-Trujillo & Gonzalez-Perez, 2024; Wickert & Risi, 2023). These positive perceptions encourage cooperation, reduce resistance to organizational initiatives and strengthen long-term stakeholder commitment (Deephhouse & Suchman, 2008; Bitektine & Haack, 2015). Stronger stakeholder support contributes to different organizational benefits: better reputation, improved access to resources and greater organizational resilience (Gomez-Trujillo & Gonzalez-Perez, 2024). Resource outcomes were identified in 67 of the 171 reviewed studies (39.2%), emphasizing the role of organizational legitimacy in ensuring access to critical resources, such as knowledge, social capital and stakeholder goodwill. Organizations perceived as legitimate are more likely to attract financial resources, recruit employees and establish relevant strategic partnerships (Blanco-González et al., 2023). Organizational legitimacy raises investments and increases stakeholders' willingness to collaborate with organizations (Nartey et al., 2023). Organizational legitimacy is especially important for organizations in times of uncertainty and for new ventures, as it serves as a signal of organizational quality (Deephhouse, 1996; Zimmerman & Zeitz, 2002; Fisher et al., 2016). Maintenance and repair outcomes were identified in 60 of the 171 reviewed studies (35.1%). Organizations with established organizational legitimacy are generally better able to respond to crises, stakeholder criticism and recover from events that endanger their reputation (Elsbach, 1994; Bitektine & Haack, 2015; Vigolo et al., 2025). Accumulated organizational legitimacy creates a reserve of stakeholder trust that helps reduce the negative effects of adverse events (Díez-Martín et al., 2022; Chen et al., 2025). Survival and growth outcomes were identified in 59 of the 171 reviewed studies (34.5%). Organizations perceived as legitimate are better able to cope with institutional change and competitive pressures (Oliver, 1997; Bitektine & Song, 2023). Namely, organizational legitimacy supports organizational growth by facilitating expansion, innovation and new market opportunities, which increases their chances of long-term survival (Shu et al., 2024).

Organizational legitimacy has also been found to support sustainable organizational growth (Kostova & Zaheer, 1999; Deephouse & Suchman, 2008; Suddaby et al., 2017; Gomez-Trujillo & Gonzalez-Perez). Figure 1 summarizes the findings of this literature review and integrates the identified antecedents and consequences of organizational legitimacy into a single conceptual framework. It shows that organizational legitimacy is a result of multiple antecedents and is associated with a wide range of organizational outcomes.

Figure 1. Framework of organizational legitimacy



4. CONCLUSION

This review integrates three decades of organizational legitimacy research (1995 - 2025) and shows that organizational legitimacy should be understood as a concept shaped by organizational, institutional, strategic, relational and governance-related factors. It indicates that organizational legitimacy is a result of different internal organizational characteristics and external stakeholder evaluations (Suchman, 1995; Bitektine, 2011; Bitektine & Haack, 2015; Suddaby et al., 2017; Spanuth & Urbano, 2024). This review also emphasises the relevant role of stakeholders in the process of gaining organizational legitimacy. Organizations seek for organizational legitimacy through institutional conformity, strategic communication and relationship-building activities (Etter et al., 2019). However, these activities contribute to organizational legitimacy only when they are positively perceived by relevant stakeholders (Castelló et al., 2016; García-Rivas et al., 2023).

This means that organizational legitimacy is a socially construed judgment that depends on how organizational behaviour is interpreted by relevant audience (Suchman, 1995; Suddaby & Greenwood, 2005; Tost, 2011; Bitektine & Haack, 2015; Bitektine & Song, 2023). On the other hand, organizational legitimacy can be interpreted as a strategic organizational resource that creates numerous advantages over time (Zimmerman & Zeitz, 2002; Deephouse & Suchman, 2008; Suddaby et al., 2017). Finally, this review suggests that organizational legitimacy depends on compliance with institutional expectations and the organizations' ability to respond to changing stakeholders' expectations related to sustainability, transparency and responsible governance (Castelló et al., 2016; Gomez-Trujillo & Gonzalez-Perez, 2024; Spanuth & Urbano, 2024). However, future studies on organizational legitimacy should adopt a more integrated approach that examine organizational, institutional, strategic, relational, and governance-related antecedents together rather than separately. This would provide a better understanding of how these factors interact to shape organizational legitimacy across different organizational contexts (Bitektine & Haack, 2015; Suddaby et al., 2017; Spanuth & Urbano, 2024). Also, future research should focus more on dynamic nature of organizational legitimacy. Although organizational legitimacy is evolving through time, existing studies rely solely on cross-sectional research designs (Kostova & Zaheer, 1999). Longitudinal studies could provide a better understanding of how legitimacy is gained, maintained, challenged and restored over time (Bitektine & Haack, 2015; Suddaby et al., 2017). Another important area for future research is organizational legitimacy in new contexts, such as digital and artificial intelligence. Future studies should explore if antecedents and the outcomes of organizational legitimacy differ between traditional and technology-driven organizations and if new forms of organizational legitimacy are emerging (Bitektine & Song, 2023; Shu et al., 2024).

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FROM FAN DATA TO MARKET SUCCESS: UNDERSTANDING LOCATION INTELLIGENCE IN SPORTS MARKETING THROUGH THE CASE OF FC BARCELONA

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ABSTRACT

This paper examines how location intelligence can support football clubs in making more informed marketing and business decisions, using FC Barcelona as a case study. It begins by discussing the club's decision to open an official store in Tbilisi, Georgia, a move that initially appeared surprising but quickly proved to be strategically successful. The paper argues that understanding where fans live and how they behave can reveal valuable market opportunities that organizations often overlook. It also explores consumer purchasing behaviour through the 4P marketing mix and highlights the role of location intelligence in planning merchandise strategies. Furthermore, the study explains how geospatial data, mobility patterns, and consumer behaviour can support more effective marketing decisions. Finally, it examines online interactions between FC Barcelona and Real Madrid supporters to demonstrate how digital engagement can indicate fan activity and identify potential growth markets. Overall, the findings suggest that location intelligence enables football clubs to integrate online and offline consumer insights, resulting in more targeted and effective marketing and commercial strategies.

Keywords: *location intelligence; sports marketing; FC Barcelona; consumer behaviour; geospatial data; spatial analytics; marketing strategy*

1. INTRODUCTION

What if choosing a store location were as strategic as scoring a goal on the pitch? This question has become increasingly relevant for marketers, particularly when deciding where to open new stores. In March 2025, FC Barcelona adopted a surprising yet highly effective strategy by opening an official store in the heart of Tbilisi, the capital of Georgia. As soon as fans learned about the opening, they lined up outside the store wearing Barça jerseys, T-shirts, and waving club flags. In Georgia, as in many countries outside Spain, authentic FC Barcelona merchandise had previously been difficult to obtain. Consequently, the opening of an official store attracted considerable attention. At first glance, the decision seemed unexpected. Georgia is neither one of the largest football markets nor a major tourist destination, and it is certainly not among the first countries that come to mind when football clubs consider international expansion. Nevertheless, the store quickly proved to be a commercial success.

The answer to the question, "Why Georgia?" is straightforward. Today, successful market expansion is no longer based on intuition or guesswork alone. Instead, it is increasingly driven by data. FC Barcelona is widely recognized as one of the world's most successful and strategically managed football clubs. By analysing data on fan locations, market interest, and consumer behaviour, both online and offline, the club identified an opportunity in a market characterised by relatively low competition but a growing, highly engaged, and commercially attractive fan base. This example illustrates the growing importance of data-driven decision-making in marketing. More specifically, it demonstrates the value of location intelligence, which combines spatial information with consumer insights to support strategic business decisions. By applying location intelligence, FC Barcelona identified a promising market opportunity and successfully transformed fan data into commercial value. Against this background, the paper addresses the following research question: How does location intelligence contribute to success in sports marketing?

2. THEORETICAL FRAMEWORK

2.1 Consumer Behaviour in Sports Markets

The success and revenue generation of modern football clubs increasingly depend on their ability to operate as global brands, similar to companies such as Louis Vuitton or Nike. Consequently, a significant proportion of their income is generated through merchandise sales rather than match tickets alone. Unlike traditional retail markets, consumer behaviour in sports markets is strongly influenced by emotions, passion, identity, and personal values. Three key factors shape purchasing behaviour in sports: emotional attachment, social influence, and convenience and accessibility.

2.1.1 Emotional Attachment

For fans to purchase football merchandise, products do not necessarily need to offer exceptional features or innovative designs. A single social media post by a popular player wearing a specific product can immediately increase demand, as loyal supporters seek to express their attachment to both the player and the club through their purchases.

2.1.2 Social Influence

The desire to own products similar to those purchased by friends or fellow supporters demonstrates the importance of social influence in consumer decision-making. When fans see others wearing FC Barcelona shirts, scarves, backpacks, or other merchandise, they are more likely to buy similar products themselves. Merchandise sales also tend to increase before major matches, such as UEFA Champions League fixtures, when supporters want to wear official club apparel while attending or watching the game.

2.1.3 Convenience and Accessibility

Store location has a direct impact on merchandise sales and revenue generation. It determines how easily consumers can access a store and how frequently they encounter it. Merchandise stores located in high-traffic areas, tourist districts, or near major public transport hubs are more likely to attract spontaneous purchases. At the same time, online shopping enables clubs to serve supporters worldwide who cannot easily visit official stores in person.

2.2 Marketing Mix (4Ps) in Football Merchandise

One of the most important frameworks for deciding where to open new stores is the 4P Marketing Mix developed by E. Jerome McCarthy. According to Kutip et al. (2025), the marketing mix serves as a conceptual tool that helps managers align products with consumer needs by balancing the four elements of Product, Price, Place, and Promotion.

Understanding these elements is essential for analysing football merchandising strategies and their relationship with location intelligence (Faizal et al., 2025).

2.2.1 Product

FC Barcelona offers a wide range of products, including official jerseys, training apparel, lifestyle clothing, accessories, and limited-edition merchandise. Among these, the home and away kits remain the club's most popular products.

2.2.2 Price

FC Barcelona applies a premium pricing strategy. Because official merchandise is available only through selected channels and stores, the club can maintain premium prices while reinforcing the exclusivity of its brand.

2.2.3 Place

Place is the most important element of the marketing mix in the context of this paper because it is directly connected to location intelligence. Store location determines customer accessibility, visitor numbers, and long-term commercial performance. By analysing consumer locations and mobility patterns, location intelligence helps identify the most suitable places for new stores, increases visibility, attracts tourist traffic, and supports international market expansion.

2.2.4 Promotion

FC Barcelona frequently promotes its products through digital marketing campaigns featuring star players and compelling brand stories. By highlighting players' careers, achievements, and personal journeys across social media platforms, the club creates emotional engagement and excitement around new merchandise launches. Such promotional activities encourage fans to purchase products both online and in official stores. Overall, the marketing mix demonstrates that successful football merchandising depends not only on the products themselves but also on pricing, promotion, and, particularly, the strategic selection of retail locations.

2.3 Location Intelligence

According to Jonker and Gomstyn (n.d.), location intelligence is the process of deriving insights from geospatial data to identify patterns, make predictions, and support location-based decision-making. In practice, it combines geographic information, demographic characteristics, tourism statistics, mobility patterns, and consumer behaviour to support strategic business decisions, including store location planning. According to Esri UK (n.d.), location intelligence transforms geographic data into visual and analytical tools, such as GIS maps, dashboards, and spatial analytics, enabling organisations to better understand why activities occur in specific locations and how spatial patterns influence business performance. The main applications of location intelligence include:

- identifying where customers or fans are located and how they move;
- evaluating the performance of existing store locations;
- comparing store networks with those of competitors to identify new market opportunities.

3. IMPORTANCE OF LOCATION INTELLIGENCE

Location intelligence plays a crucial role in several aspects of business strategy and decision-making. Its applications include improved targeting, better integration of online and offline activities, more efficient resource allocation, personalization, deeper customer understanding, and enhanced operational productivity.

3.1 Improved Targeting

Traditional marketing data, such as age, gender, and interests, often lack a spatial dimension. Location intelligence fills this gap by incorporating geographic information, enabling marketers to better understand consumer behaviour. For example, people passing near a store are generally more likely to make a purchase. Bernritter et al. (2021) found that advertisements triggered by geolocation and user context achieved higher conversion rates than generic advertisements. Their study concluded that location-based promotions generated greater store traffic, increased purchase intention, and improved marketing relevance.

3.2 Online and Offline Integration

Location intelligence enables marketers to connect consumers' online behaviour with their real-world actions. Location data can reveal how many users of an app or website eventually visit a physical store or make a purchase. In sports marketing, it can indicate how many supporters actually visit an official club store after interacting with digital content. By combining online and offline data, organisations gain a more comprehensive understanding of customer behaviour (Khudiyev & Szabó, 2020). Tudor et al. (2025) also demonstrated that firms using spatial data when selecting store locations generally achieve better business performance.

3.3 Efficient Resource Allocation

Another important application of location intelligence is site selection. By analysing traffic flows, demographic characteristics, and competitor locations, businesses can identify the most profitable locations for new stores while reducing the risk of poor investment decisions. According to a retail industry report (Grepser, n.d.), companies using spatial data during expansion are less likely to experience market cannibalization and generally achieve stronger first-year performance than firms relying solely on demographic information.

3.4 Personalization

Location-based marketing tools, such as geofencing and local advertising, enable organisations to reach consumers when they are physically close to a store or event. The combination of relevance, timing, and location increases the effectiveness of promotional activities and improves conversion rates. Such approaches are widely used during sporting events and concerts, where marketers deliver real-time offers at stadium entrances, exits, and during halftime.

3.5 Customer Understanding

Location intelligence also supports customer segmentation by distinguishing between local residents, international visitors, commuters, and other consumer groups based on their spatial behaviour. These insights help organisations better understand purchasing patterns and tailor their marketing activities accordingly. For example, research conducted in Great Britain (Hospa, 2023) found that sports fans spend 36% more in establishments broadcasting live sports than other customers and are more likely to revisit those venues. Such information enables clubs and retailers to develop more targeted promotional strategies during sporting events.

3.6 Operational Productivity

Finally, location intelligence contributes to operational productivity by supporting supply chain management, logistics, demand forecasting, and capacity planning. These applications are relevant not only in retail but also in stadium management, where traffic and spatial data help organisations optimise staffing, inventory management, and visitor flows, ultimately improving the overall customer experience (Pacsi & Szabó, 2017, 2018).

4. APPLICATIONS OF LOCATION INTELLIGENCE IN SPORTS MARKETING: THE CASE OF FC BARCELONA

The application of location intelligence in sports helps bridge the gap between the digital and physical customer journey, creating a seamless connection between the two. While data on website visits, clicks, and social media activity provide insights into users' interests, spatial information reveals real-world behaviour, such as who is near the stadium on match days, which nationalities visit official club stores, which neighbourhoods generate the highest revenues, and which locations are the most popular meeting points for fans. These spatial insights enable sports clubs to:

- adapt marketing communications to the matchday experience;
- deliver time-sensitive offers that increase conversion rates;
- optimize operational processes in real time;
- identify the most suitable locations for merchandise sales and other commercial activities.

By applying these practices, sports clubs can increase store visits and sales while improving the fan experience through more relevant and less intrusive marketing activities. FC Barcelona provides a useful example of how location intelligence can support sports marketing in practice. The concept can be applied in three main areas: matchday operations, fan attraction and retention, and commercial activities. During matchdays, real-time analytics help manage visitor flows, improve safety, and reduce congestion around the stadium. To strengthen fan attraction and retention, the club can use heat maps showing the geographical distribution of supporters, helping identify suitable locations for temporary events and promotional activities. Location intelligence can also support decisions regarding new store locations, merchandise selection, and product adaptation to the characteristics of different neighbourhoods and markets. Altogether, these applications enable the club to transform fan engagement into commercial opportunities. FC Barcelona's commercial strategy currently focuses on premium customer experiences, global digital content, official merchandise, and international fan engagement (FC Barcelona, 2020). Each of these strategic priorities can benefit from location intelligence:

- Matchday revenue generation – delivering location-based offers, such as seat upgrades or special discounts;
- Tour optimization – using traffic analytics to schedule and promote stadium and museum tours to nearby visitors;
- Temporary retail activities – identifying neighbourhoods suitable for pop-up stores and limited-time promotions;
- Digital content promotion – targeting Barça TV+ and other digital services in areas with high concentrations of supporters and football audiences.

Considering FC Barcelona's continued investment in digital media and customer relationship management, the club has considerable potential to expand its use of location intelligence. By combining customer segmentation with spatial behaviour, the club could offer more personalised products and services. For example, loyal supporters who regularly attend matches or visit the museum could receive exclusive offers from official merchandise stores. Such integration of online and offline data can strengthen fan engagement while creating additional commercial value for the club.

5. CONNECTING SOCIAL MEDIA ENGAGEMENT WITH LOCATION INTELLIGENCE

Social media has become one of the most influential communication channels for sports organizations, enabling fans to interact, express their opinions, and engage with their favourite clubs. Beyond supporting communication, social media also generates valuable behavioural data that can help organizations better understand fan engagement and develop more effective marketing strategies. When combined with location intelligence, these digital interactions provide additional insights into where fans are located, how they behave, and where marketing activities may be most effective. One example is the online rivalry between FC Barcelona and Real Madrid supporters. While social media facilitates communication and community building, it has also increased negative behaviours such as online harassment, cyberbullying, and hate speech (ElSherief et al., 2018; Olteanu et al., 2018). Many online platforms consist of user-defined communities where members express their opinions and interact with rival groups (Khosla et al., 2019). According to Khosla et al. (2019), the number of tweets containing hate speech increases significantly during football matches involving rival teams. Their study also found that hate-oriented posts are primarily intended to strengthen the identity of one's own community while attacking rival supporters. Interestingly, most of these hostile messages originate from relatively small accounts with fewer than 100 followers rather than from highly influential users. Although these studies focus primarily on online interactions, they also demonstrate how digital engagement reflects broader patterns of fan behaviour. These behavioural signals become even more valuable when combined with location intelligence. Liu et al. (2020) argue that large-scale location data enable organizations to better understand human mobility and analyse where fans move, gather, and interact across geographic space. Similarly, Wang et al. (2013) and Karamshuk et al. (2013) show that location-based platforms generate extensive mobility data that reveal where users are active and demonstrate that movement patterns are highly predictable when spatial and temporal information are considered. Furthermore, combining geolocated social media data with spatial analytics enables organizations to identify areas with high concentrations of supporters and design more effective location-based marketing campaigns (Tudor et al., 2025). The integration of geospatial technologies into marketing research has significantly improved the understanding of consumer behaviour by linking purchasing decisions to specific locations (Tudor et al., 2025). Likewise, context-aware recommendation systems and GIS-enabled e-commerce platforms combine spatial, temporal, social, and behavioural data to deliver more personalised marketing messages that reach fans when and where they are most receptive (Zhang et al., 2022). Overall, integrating social media analytics with location intelligence enables sports organizations to identify geographically concentrated fan communities, improve audience segmentation, and develop more targeted marketing strategies. By combining online engagement with spatial data, football clubs can strengthen both fan relationships and commercial performance.

6. CONCLUSION

This study demonstrates that location intelligence provides football clubs with a valuable foundation for making more informed and effective marketing and business decisions. The opening of FC Barcelona's official store in Tbilisi, Georgia, illustrates how understanding where fans live, how they behave, and what they prefer can reveal business opportunities that may not be identified through intuition alone. By combining insights from the marketing mix, consumer behaviour, geospatial data, mobility patterns, and online engagement, football clubs can better understand market demand and develop more effective merchandising and expansion strategies. Furthermore, the analysis of online interactions between FC Barcelona and Real Madrid supporters shows that digital engagement can provide valuable signals about fan communities and potential areas for future growth.

Overall, location intelligence enables football clubs to integrate digital and physical aspects of fan engagement, resulting in more targeted, efficient, and globally oriented marketing strategies. The findings also offer several implications for future research. Further studies could combine social media analytics with location intelligence to achieve a deeper understanding of global fan behaviour. In addition, greater attention should be given to emerging football markets, such as Georgia, where highly engaged fan communities may develop outside traditional football centres. As organizations increasingly rely on mobility and location data, future research should also examine ethical issues related to privacy, transparency, and the responsible use of consumer data. From a managerial perspective, the results highlight the strategic value of location intelligence for football clubs and other sports organizations. Mapping fan activity can help identify previously overlooked markets, while combining spatial analytics with online engagement data supports more effective decisions regarding store locations, promotional campaigns, merchandising strategies, and event planning. Location intelligence can also improve matchday operations through better crowd management, staffing, and resource allocation. Ultimately, integrating spatial and behavioural data enables sports organizations to strengthen fan relationships while improving their commercial performance and long-term competitiveness.

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