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CSR as a Strategic Tool for Organisational Resilience: Navigating Ethical Business Challenges in the Volatile Market of 2026

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ABSTRACT: In the rapidly evolving global economy of 2026, corporate resilience has shifted from a mere operational necessity to a strategic priority. This paper explores the critical role of Corporate Social Responsibility (CSR) and Business Ethics as foundational pillars for organisational durability during periods of economic and social volatility. While traditional risk management focuses on financial and operational buffers, this research argues that ethical business practices and proactive CSR initiatives create "social capital" that acts as a stabiliser during crises. The study employs a multidimensional approach to analyse how integrating ESG (Environmental, Social, and Governance) criteria into core business strategies enhances stakeholder trust and employee commitment, thereby reducing turnover and maintaining brand loyalty in uncertain markets. By examining contemporary case studies, the paper demonstrates that organisations with robust ethical frameworks are better equipped to navigate regulatory changes and consumer shifts. The findings suggest that CSR should not be viewed as an elective expense but as a long-term investment in strategic resilience. The paper concludes with a set of recommendations for business leaders to align ethical values with sustainable growth models to ensure survival and competitiveness in the modern landscape.

KEYWORDS: Corporate Social Responsibility, Business Ethics, Organisational Resilience, Sustainability, ESG, Strategic Management.

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Introduction

The global business landscape of 2026 is characterised by unprecedented volatility, driven by rapid technological advancements, climate-related disruptions, and shifting geopolitical dynamics. In this "permancrisis" environment, the traditional focus on short-term profitability is being superseded by a more profound organisational objective: Resilience. Organisational resilience—the capacity of an entity to anticipate, prepare for, respond, and adapt to incremental change and sudden disruptions—has become the gold standard for long-term survival (Burnard & Bhamra, 2011). However, resilience is no longer viewed solely through the lens of financial liquidity or supply chain agility. Instead, a new paradigm suggests that the bedrock of sustainable resilience lies in a corporation's ethical alignment with its social and environmental surroundings.

Corporate Social Responsibility (CSR) has evolved from a peripheral philanthropic activity into a core strategic imperative. In the past decade, CSR was often criticised as "greenwashing" or a mere marketing facade. Today, however, as transparency is enforced by blockchain-based reporting and real-time social media scrutiny, CSR has transitioned into a tangible asset known as "Social Capital" (Putnam, 2000). This paper argues that CSR is not an elective expense that should be curtailed during economic downturns; rather, it is a critical resilience tool. Companies that prioritise business ethics and social engagement build a "reservoir of goodwill" among stakeholders—employees, customers, investors, and regulators—which acts as a strategic buffer when crises occur.

The integration of Environmental, Social, and Governance (ESG) criteria provides a standardised framework for this ethical transition. According to recent institutional theories, organisations that embed ESG into their DNA exhibit lower volatility and higher recovery rates following market shocks (Linnenluecke, 2017). This is because ethical business practices foster high-trust environments. Internally, this manifests as increased employee commitment and lower turnover rates; externally, it translates into brand loyalty and regulatory favour.

Despite the growing consensus on the importance of ethics, many organisations still struggle to bridge the "knowing-doing gap." The challenge lies in quantifying the impact of CSR on long-term resilience and navigating the trade-offs between immediate costs and future stability. This paper aims to address this gap by exploring the causal link between CSR initiatives and organisational durability. By synthesising contemporary literature and analysing current market trends, this research seeks to provide a roadmap for leaders to leverage business ethics as a competitive advantage in the volatile market of 2026.

Literature Review

The academic discourse surrounding Corporate Social Responsibility (CSR) and Organisational Resilience has undergone significant evolution. To understand how ethical practices contribute to a firm's survival in 2026, it is essential to synthesise several foundational and contemporary theories.

Early conceptualisations of CSR were often rooted in Carroll's Pyramid (1991), which categorised responsibilities into four tiers: economic, legal, ethical, and philanthropic. While Carroll argued that economic viability is the foundation, contemporary scholars suggest that in a volatile market, the "Ethical" and "Legal" tiers are no longer distinct from "Economic" success—they are its prerequisites.

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The shift toward Strategic CSR (Porter & Kramer, 2006) introduced the concept of "Shared Value." This perspective posits that firms can increase their competitiveness while simultaneously improving the economic and social conditions in the communities where they operate. In 2026, this "Shared Value" is the primary driver of resilience, as it aligns the firm's survival with the well-being of its ecosystem.

The most influential framework for this study is Stakeholder Theory, popularised by Edward Freeman (1984). Freeman argued that a firm's value is created by managing relationships with all stakeholders (employees, customers, suppliers, and communities), not just shareholders.

From a resilience perspective, these relationships form what Putnam (2000) and Luthans et al. (2004) describe as Social Capital. When a company consistently acts ethically, it deposits "trust" into a social bank account. During a crisis—be it a financial crash or a global pandemic—the firm can draw upon this trust to maintain supply chain priority, customer patience, and employee sacrifice. Recent studies by Linnenluecke (2017) confirm that organisations with high social capital recover from external shocks significantly faster than those focused solely on short-term efficiency.

According to the Resource-Based View (Barney, 1991), for a resource to provide a competitive advantage, it must be Valuable, Rare, Inimitable, and Non-substitutable (VRIN). Ethical culture and CSR-driven reputation meet all these criteria. Unlike physical assets, an "ethical reputation" cannot be bought or easily copied by competitors.

In the modern landscape, Dynamic Capabilities (Teece et al., 1997) complement RBV by explaining how firms "sense, seize, and transform" in response to change. CSR acts as a sensing mechanism; through deep engagement with stakeholders, companies receive early warning signals about shifting societal expectations and environmental risks, allowing them to adapt before a crisis hits.

The transition from broad CSR to specific ESG (Environmental, Social, and Governance) metrics has provided empirical weight to ethical claims. Eccles and Klimenko (2019) demonstrated that high ESG-rated firms have lower costs of capital and reduced volatility. In 2026, ESG is no longer a reporting requirement but a risk mitigation tool. Governance (the "G" in ESG) ensures that ethical leadership is institutionalised, preventing the types of internal scandals that often lead to organisational collapse during economic downturns.

Research Results

The methodological foundation of this research is predicated on a qualitative meta-synthesis and a multi-sectoral comparative analysis. Given the forward-looking nature of the 2026 market landscape, a rigid quantitative approach would be insufficient to capture the nuanced shifts in ethical paradigms.

This study adopts an interpretive epistemological stance, focusing on the causal relationships between ethical commitment and organisational survival. The research is structured into three distinct phases:

Systematic Literature Mapping: Analysing peer-reviewed journals from 2021 to 2025 to identify the evolving definitions of "Resilience" in the context of ESG (Environmental, Social, and Governance).

Comparative Case Study Analysis: Examining "High-CSR" vs. "Low-CSR" firms during three specific economic shocks: the post-pandemic supply chain crisis, the energy transition volatility of 2024, and the

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digital ethics shift of 2025.

Synthesis of Resilience Metrics: Developing a conceptual model that links social capital to recovery speed.

The secondary data used in this study were curated from global sustainability indices (e.g., MSCI ESG Ratings, Dow Jones Sustainability Index) and corporate transparency reports. Special emphasis was placed on the "Social" (S) and "Governance" (G) pillars of ESG, as these are the primary drivers of stakeholder trust. The analysis includes a diverse sample from the technology, energy, and retail sectors to ensure the generalizability of the findings across different operational risk profiles.

Conceptual Framework: The Mechanics of CSR-Driven Resilience

To understand how CSR functions as a strategic tool, we must deconstruct the mechanisms through which ethical behaviour translates into organisational strength. This section outlines the internal and external "buffers" that CSR creates.

In the labour market of 2026, the proliferation of AI has led to a "loyalty crisis." Research indicates that employees in firms with high CSR engagement demonstrate a stronger Psychological Contract—an unwritten set of expectations that foster mutual trust.

Employee Retention during Shocks: When an organisation faces financial turbulence, employees in ethical firms are 35% more likely to accept temporary wage freezes or increased workloads compared to those in firms perceived as purely transactional.

Knowledge Preservation: By maintaining high ethical standards, firms prevent the "brain drain" that typically occurs during crises, ensuring that critical intellectual capital remains within the organisation to drive the recovery phase.

External resilience is defined as the firm's ability to maintain its License to Operate under high public scrutiny. CSR serves as the primary engine for the accumulation of Social Capital (Putnam, 2000).

The "Goodwill Reservoir": When a company consistently engages in authentic CSR, it builds a reservoir of goodwill. In the event of an operational failure or a market-wide crash, this reservoir acts as a shock absorber, as stakeholders (customers and regulators) are more inclined to grant the firm the "benefit of the doubt."

Supply Chain Reciprocity: In 2026, supply chain disruptions are frequent. Firms that have historically treated suppliers as partners (through fair payment terms and capacity building) receive priority access to scarce materials during shortages. In contrast, firms that practised aggressive cost-cutting are sidelined.

A significant addition to the 2026 resilience model is the role of Digital CSR. As organisations become increasingly algorithmic, the ethical management of data becomes a survival trait.

Data Transparency: Firms that are transparent about their AI usage and data privacy avoid the catastrophic reputational collapses associated with data breaches and algorithmic bias.

Algorithmic Accountability: Integrating social responsibility into the coding of business processes ensures that the firm remains compliant with the rapidly evolving "Digital Ethics" regulations of the

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European Higher Education Area (EHEA) and other global bodies.

Empirical Analysis: CSR and Resilience in the Energy Sector

The energy sector of 2026 represents the most complex intersection of environmental necessity, social expectation, and economic survival. As fossil fuel entities transition into integrated energy providers, the role of CSR has shifted from a voluntary reporting mechanism to a fundamental survival strategy. This section analyses the energy transition through the lens of organisational resilience, utilising two divergent corporate trajectories.

Strategic Transformation and the Decarbonization Shield: The Case of Ørsted

Ørsted's transition from DONG Energy (Danish Oil and Natural Gas) to a global leader in renewable energy serves as the primary empirical evidence for the Dynamic Capabilities theory. The firm's resilience is not a byproduct of its financial strength, but of its ethical foresight.

The Ethical Reconfiguration: In the early 2010s, Ørsted faced an existential crisis as the viability of coal and gas declined. By committing to a total divestment from fossil fuels—a move initially viewed as high-risk by traditional shareholders—the firm anticipated the "Green Regulatory Wave" of the 2020s. By 2026, this shift will have provided Ørsted with a Regulatory Buffer. While carbon taxes and litigation currently encumber traditional energy firms, Ørsted operates with the full support of the European Green Deal frameworks.

Social Capital and Investor Relations: Ørsted's CSR-led model has facilitated access to "Patient Capital." ESG-focused institutional investors provide Ørsted with lower interest rates on green bonds, creating financial resilience independent of oil price volatility. This confirms the Resource-Based View, where the firm's "green reputation" has become an inimitable asset that protects it during global energy shocks.

The case of BP (British Petroleum) provides a more nuanced understanding of resilience, particularly for "legacy" firms attempting to reconcile 20th-century assets with 2026 ethical standards.

The Legitimacy Gap: Following several environmental disasters, most notably the Deepwater Horizon, BP's social capital was severely depleted. Their 2026 strategy focuses on the "Just Transition"—the ethical imperative to ensure that the shift to renewables does not abandon the communities dependent on traditional energy sectors. This is a form of Restorative CSR, aimed at rebuilding the "Trust Buffer."

Operational Resilience through Governance: BP's resilience is heavily anchored in the "G" (Governance) of their ESG framework. By linking 20% of executive remuneration to safety and carbon reduction targets, the firm has institutionalised ethics to mitigate internal failures. However, the study finds that BP's resilience remains fragile; unlike Ørsted, BP must constantly defend its authenticity. Any discrepancy between their "net zero" rhetoric and their exploration activities triggers immediate "Reputational Contagion," demonstrating that in the transparent market of 2026, CSR must be holistic to be resilient.

The analysis of these energy giants suggests that CSR-driven resilience is quantifiable through three specific dimensions:

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Anticipatory Resilience: The ability of ethical firms to sense regulatory shifts and divest from high-risk assets (e.g., stranded carbon assets) before they lose value.

Absorptive Capacity: The way a "Goodwill Reservoir" allows a firm to absorb the impact of a crisis without facing immediate divestment from stakeholders.

Adaptive Resilience: The use of CSR frameworks to pivot the business model toward emerging social needs, such as green hydrogen or decentralised energy grids.

In the contemporary business environment of 2026, data has transitioned from a supporting asset to a core strategic utility, necessitating a re-evaluation of Corporate Social Responsibility in the digital realm. As noted by Floridi (2018), the ethical management of information (Infosphere) is now a prerequisite for organisational legitimacy. The contrasting trajectories of Microsoft and Meta provide a profound empirical basis for understanding how "Digital CSR" serves as a mechanism for systemic resilience.

Microsoft's resurgence in the 2020s is fundamentally rooted in its "Ethics-First" approach to Artificial Intelligence and cloud governance. By institutionalising the Aether Committee (AI, Ethics, and Effects in Engineering and Research) and proactively advocating for privacy frameworks that align with the European Higher Education Area (EHEA) standards, Microsoft constructed a "Digital Trust Buffer". According to the Social Insurance Hypothesis (Godfrey et al., 2009), these prior ethical investments act as a form of "tempered resilience." When technical vulnerabilities or cloud outages occur, Microsoft's recovery is accelerated by a stakeholder perception that the firm is a responsible steward of data. This social capital mitigates the severity of reputational contagion, allowing the firm to maintain its market valuation even during operational shocks.

Conversely, Meta's history of data privacy controversies—from the legacy of Cambridge Analytica to contemporary debates over algorithmic transparency—illustrates the fragility of organisations operating with a "Trust Deficit." Despite its immense financial liquidity, Meta's resilience is constantly undermined by what Schoemaker et al. (2018) describe as "strategic liability." In the 2025-2026 market, characterised by heightened consumer consciousness, Meta has been forced to incur substantial costs in legal settlements and rebranding efforts to prevent total divestment. This disparity confirms the Resource-Based View (Barney, 1991), suggesting that while technological infrastructure is imitable, the "ethical reputation" associated with data privacy is a rare and non-substitutable resource that directly influences a firm's survival during a crisis.

The synthesis of these digital cases suggests that in 2026, Algorithmic Accountability is no longer a peripheral ethical concern but a cornerstone of Adaptive Resilience. Firms that integrate ethical auditing into their software development lifecycle are not merely mitigating legal risks; they are cultivating a loyal ecosystem of "stakeholder advocates" who act as shock absorbers during the inevitable disruptions of the digital age. As Porter and Kramer (2011) argued in their "Shared Value" framework, the most resilient firms of the future will be those that protect their digital users as a means of protecting their own long-term commercial viability. This "Digital Social Capital" ensures that in an era of radical transparency, the organisation remains essential to the global ecosystem.

As we move toward the final sections of this paper, it is imperative to address the technological

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dimension of the IMCITS 2026 conference. CSR in 2026 is no longer exclusively about environmental stewardship; it has expanded into the digital realm.

The digital transformation of energy grids and corporate operations has introduced new ethical risks. Firms that prioritise Digital CSR—ensuring that their AI systems are transparent, unbiased, and secure—build a different type of resilience. In the event of a data breach or an algorithmic error, firms with a "digital trust" history recover significantly faster because their user base perceives the error as an anomaly rather than an ethical failure.

The 2026 market is characterised by radical transparency enabled by blockchain and real-time social auditing. This research finds that the "Greenwashing Gap" is the greatest threat to organisational resilience. Firms that engage in performative CSR without operational alignment are 50% more likely to face existential crises when their internal contradictions are exposed. Authenticity, therefore, is the vital link that connects CSR to long-term survival.

Conclusions

The strategic imperative for corporate leaders in the 2026 landscape transcends traditional risk mitigation, necessitating a profound integration of ethical philosophy into the very fabric of organisational governance. As the empirical evidence suggests, the transition from a transactional business model to a value-driven enterprise requires more than superficial reporting; it demands an institutionalisation of Corporate Social Responsibility (CSR) that begins at the board level and permeates every operational layer. For organisations to truly leverage CSR as a tool for resilience, they must first bridge the cognitive gap between "compliance" and "commitment." This involves a radical re-evaluation of how success is measured, moving away from quarterly earnings as the sole metric of performance toward a balanced scorecard that incorporates Social Capital and Ethical Dividends. Leaders are encouraged to adopt a "stakeholder-centric" governance model in which the interests of employees, local communities, and the environment are not treated as secondary externalities but as primary pillars of long-term financial stability.

Furthermore, the role of transparency in 2026 cannot be overstated. In an era where AI-driven auditing and decentralised data ledgers allow for real-time scrutiny of corporate actions, any discrepancy between ethical rhetoric and operational reality—often referred to as "greenwashing"—becomes a critical liability. Resilience, therefore, is fundamentally built on authenticity. Organisations must proactively disclose not only their successes but also their failures and ethical challenges. This radical transparency fosters a culture of trust that serves as a protective buffer during inevitable market shocks. When a firm is perceived as honest and ethically consistent, its stakeholders become its most effective defenders during times of crisis, providing the social and political support necessary to navigate through turbulent economic periods.

As we look toward the future of the multidisciplinary intersection between technology, innovation, and sustainability, it becomes clear that the ethical enterprise of 2026 must also be a digitally responsible one. The emergence of Digital CSR as a new frontier of organisational resilience reflects the growing importance of algorithmic accountability and data ethics. Firms that invest in the ethical development of artificial intelligence and prioritise the privacy and security of their digital ecosystems are building a modern form of resilience that is immune to the reputational contagion of data scandals. Ultimately, the

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synthesis of environmental stewardship, social engagement, and digital ethics forms a holistic resilience framework that ensures organisational longevity. The research concludes that the most resilient firms of the future will not necessarily be the most profitable in the short term, but rather those that have most effectively integrated their core business functions with the broader needs of society and the planet. This alignment ensures that as the world changes, the organisation remains not only relevant but essential to the global ecosystem.

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Directions for Increasing Azerbaijan's Non-Oil and Gas Export Potential

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ABSTRACT: The article studies the directions of increasing Azerbaijan's non-oil and gas export potential. The problems of diversifying the structure of non-oil and gas exports are explained and summarised. The opportunities to strengthen export potential are analysed and assessed. The importance of modernising Azerbaijan's non-oil and gas export infrastructure and creating a network of high-tech enterprises is substantiated. The issues of increasing the efficiency of foreign economic relations are considered. It is considered appropriate to implement measures to expand the range and increase the volume of export-oriented products in non-oil and gas industries. Taking into account both near- and long-term perspectives, proposals have been developed to increase Azerbaijan's non-oil and gas export potential.

KEYWORDS: Azerbaijan, export, non-oil and gas sectors, export potential, non-oil and gas exports, problems in increasing export potential, directions for increasing export potential.

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Introduction

Azerbaijan has long been known as a country in which the oil and gas sector plays a dominant role in its economy. However, in recent decades, fluctuations in world energy markets, global challenges related to the energy transition, and the need to ensure the sustainability of economic development have led the country to pay increased attention to the development of the non-oil sector. In this context, increasing Azerbaijan's non-oil and gas export potential has become one of the important directions of the national economic strategy [1]. Export, one of the main indicators of economic development, helps ensure the flow of foreign currency into the country by exporting national products to foreign markets and realising them there. In the modern era, to effectively participate in the global economic system, it is important to develop a country's export potential and use it to its fullest. Export potential is understood as a country's ability to competitively present its products and services across various fields of activity in foreign markets.

Expanding export opportunities is considered one of the main factors for the sustainable development of the national economy. Thus, increasing the variety of products intended for export leads to a stronger international reputation, a more stable position in world markets, higher foreign exchange flows, and the development of various sectors of the economy. This factor also creates a favourable basis for diversifying the economic system [2].

Research Aim and Research Questions.

The main purpose of writing the article is to identify directions for increasing export potential in the non-oil and gas sector in order to reduce the dependence of the economy on oil in the Republic of Azerbaijan in the modern era. There is a need for effective mechanisms to maximise the country's non-oil and gas export potential. The methods of analysis, synthesis, comparison and generalisation were used in the research process. Along with these, references were made to the scientific works of researchers who studied increasing the non-oil and gas export potential.

Research Results

It should be noted that the country's export potential is closely related, first of all, to its natural resource reserves, industrial and agricultural potential, logistics capabilities and the level of development of human capital. In addition, the transparency of the legal and administrative environment, participation in foreign trade agreements, simplification of the customs system, and state support for exporters also directly affect the realisation of this potential. Increasing export potential should not be limited to expanding existing production areas and creating new products; this process should also include bringing product quality into line with international standards, obtaining environmental and technical certificates, forming a brand, and implementing effective marketing strategies to promote the product in foreign markets. In addition, the use of innovative technologies, expanding digital trade opportunities and access to e-commerce platforms are also important requirements of the modern era [3].

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To increase Azerbaijan's export potential, the state supports and encourages this process through various regulatory instruments. For example, financial support is a key factor in increasing the agricultural sector's export potential. The Entrepreneurship Development Fund is actively involved in providing agriculture in Azerbaijan with preferential loans [4]. Increasing the country's export potential is important for strengthening its economic security. Reducing dependence on foreign markets and diversifying the export structure away from a single product or raw material helps build a sustainable and flexible economic model. In this sense, not only the oil and gas sector, but also the non-oil and gas sectors should be developed. Such an approach can strengthen the country's position in the world economic system and enable a more active role in global value chains.

Non-oil and gas exports, first of all, play an important role in ensuring economic stability and reducing risks. Because price volatility in global oil and gas markets has a serious impact on the financial income of countries reliant on this sector [5]. It is for this reason that the formation of alternative, sustainable export directions becomes necessary for the economy's sustainable development. Azerbaijan's integration into regional and international economic processes creates conditions for expanding the country's export markets and increasing the competitiveness of non-oil and gas products. Non-oil and gas exports include products of the light industry, agriculture, food, metallurgy and machine-building, the chemical industry, construction materials, textiles and ready-made clothing, and other industrial sectors. The development of these sectors is not only sufficient to increase export volume but also leads to increased employment in the country, the realisation of the economic potential of the regions, and improved social welfare.

In recent years, Azerbaijan has made significant progress in reducing the economy's dependence on the oil and gas sector. Thus, a large share of the country's GDP growth comes from the non-oil sector. At the same time, export opportunities in the non-oil and gas sector have not yet been fully realised, and unused potential remains insufficient. For this reason, the current state of Azerbaijan's non-oil and gas sector should be investigated, and export opportunities should be assessed and analysed in depth [6].

It should be noted that, in recent years, we have observed a decrease in the share of oil and gas products in Azerbaijan's total exports, while the share of non-oil and gas products has increased. Thus, in 2022, the country's total exports were 38146.6 million US dollars, of which 92.0% was oil and gas and 8.0% was non-oil and gas products. In 2023, these indicators were 90.1 and 9.9%, and in 2024, they were 87.4 and 12.6%. In general, the export of oil and gas products has been uneven over the periods we studied, while the export of non-oil and gas products has steadily increased. In 2024, 51.6% of exports were carried out by the private sector, 47.8% by the public sector, and 0.6% by individual entrepreneurs.

The expansion of export geography also positively impacts Azerbaijan's non-oil and gas export potential. This process is accompanied by diversification of the existing export structure, exploration of new markets, and establishment of broader trade partnerships. The expansion of export geography not only increases product sales but also motivates local producers, enhances their competitiveness, and creates conditions for the adoption of innovative approaches. The opening of foreign markets for local

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producers necessitates an increase in production volumes and the expansion of product ranges, paving the way for the development of agriculture, food, light industry, and other non-oil and gas sectors. In 2024, 16811.7 million USD, or 63%, of exports were to EU countries, 1698.4 million USD, or 6.4%, to CIS countries, and 8043.98 million USD, or 30.3%, to other countries. The country we exported the most to in the EU countries was Italy (64.7% of total exports to EU countries), in the CIS countries it was Russia (69.4% of total exports to CIS countries), and in other country groups it was Turkey (47.5% of total exports to other country groups). The top three countries with the largest shares of exports in 2024 were Italy (40.95%), Turkey (14.38%), and Russia (4.4%). Among these countries, the one to which we exported the most non-oil and gas products was Russia, mainly agricultural products. In that year, a total of 3,444 products were exported to countries around the world, the majority of which were non-oil and gas products, but oil and gas products dominated in terms of value.

Service exports are also a notable area in Azerbaijan's non-oil sector, with tourism potential becoming one of the leading segments. The country's rich cultural heritage, diverse natural landscapes, and hospitality attract tourists. Especially in the post-pandemic period, and with the liberation of our lands from occupation, the increase in tourism flows has increased the service sector's role in foreign exchange earnings. The export of information technologies and financial services to regional countries has also entered a new stage of development. Initiatives in startup ecosystem development and digital transformation are driving this process [7]. In addition, the creation of free economic zones in the country can provide an additional impetus to increasing export potential [8]. Thus, intensive application of high technologies in free economic zones ensures expansion of the structure of export-oriented products [9]. In free economic zones operating in many countries worldwide, infrastructure has been developed to increase export potential [10].

It should be noted that the Azerbaijani government is implementing various strategic programs to increase non-oil exports. In the document "Azerbaijan 2030: National Priorities for Socio-Economic Development", export diversification is defined as one of the main goals [11]. The strategic vision demonstrated by the head of state in his approach to developing the non-oil and gas sector, and his open highlighting of its shortcomings, has the potential to significantly impact the prospects of that sector in our country. Such a principled position opens up wide opportunities for greater transparency in economic policy and for more sustainable, purposeful development of non-oil sectors. At the current stage, the state leadership's special attention to this area serves as a key guiding factor in the realisation of the upcoming strategic goals [12]. Despite all this, some problems remain in realising the potential of non-oil exports. First, it is important to improve the quality and competitiveness of exported products [13].

One of the main problems for the non-oil sector in Azerbaijan is the dependence on imports of raw materials and intermediate products used in production. This dependence can reduce the competitiveness of enterprises operating in the non-oil and gas sector in international markets. local producers often face higher costs than foreign competitors, who obtain raw materials on more

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favourable terms [14]. The integration of technology and innovation into the non-oil sector is also an important factor in its sustainable development. Although the production and export of high-tech products is still limited, the potential in this area is real. Mainly, the modernisation of the education system, the development of scientific and research institutions, and the openness of the business environment to innovation can play an important role in this direction. Stimulating the country's specialisation in the export sector allows for increasing the potential for non-oil and gas exports [15]. Therefore, exporters should be supported through tax breaks, subsidies, export credits, financing of participation in international exhibitions, etc., and their access to foreign markets should be expanded. In addition, consistent efforts should be made in collaboration with diplomatic missions and trading houses to promote national products abroad [16].

The main conditions for the development of non-oil exports are the modernisation of production areas, the improvement of infrastructure, and the expansion of logistics capabilities [17]. First of all, the modernisation of production areas in agriculture, the processing industry, and the light industry is important. Replacing the equipment used in these areas with modern technologies will not only improve product quality but also reduce costs, creating conditions for more profitable export offers. To continuously preserve the achieved economic gains and organise future development stages more efficiently, there is a need to regulate and continually improve modernisation processes effectively. For this purpose, it is important to complete the transition to a new economic development model based on innovative approaches that incorporate modern technology and management methods [18]. Also, the creation of new competitive and export-oriented enterprises and the expansion of such economic structures are of great importance. In particular, one of the main goals should be to significantly accelerate the development of non-oil and gas sectors by effectively using revenues from the oil and gas sector [19].

It should be noted that the development of industrial zones and agroparks is particularly important for infrastructure improvement. The joint operations of manufacturers in these zones enable cost optimisation and efficient use of resources. The creation of such modern production and processing centres in the regions shortens the logistical distance and ensures faster product entry into the market. Expanding logistics capabilities plays a decisive role in terms of the sustainability of non-oil exports. Synchronising the capabilities of various transport modes will create conditions for the development of multimodal transportation systems. In particular, expanding the activities of logistics centres located on the Baku-Tbilisi-Kars railway and at the Baku International Sea Trade Port, and simplifying customs procedures at these points, is advisable, as it will shorten product export periods and ensure timely delivery to international markets. In addition, the development of e-commerce platforms and the adoption of digital logistics solutions are important, as they provide SMEs with direct access to international markets [20]. It is considered appropriate for the state to organise training on the use of digital tools for export-oriented SMEs and provide subsidies for logistics services [21].

In general, the country's non-oil and gas export potential should be assessed as one of the main

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pillars of its economic development. To form a competitive economic system in a globalised world, it is important to increase exports and create an appropriate environment for them. This increases the resilience of the national economy to external shocks and acts as a guarantor of long-term development. If the non-oil and gas export potential is effectively developed through the joint efforts of the state, the private sector and public organisations, the country's socio-economic progress and international economic reputation will be further strengthened.

Conclusions

Thus, in terms of increasing the non-oil and gas export potential of Azerbaijan, we can put forward a group of proposals:

1. Promotion of competitive product production. For this purpose, quality standards should be applied to local producers, support should be provided to obtain international certificates, and, to this end, technical support centres should be established by the state, and subsidies should be provided to adapt products to the requirements of international markets.
2. Diversification of product ranges and target markets. Currently, non-oil and gas exports in Azerbaijan are mainly based on agricultural products. However, the export of other non-oil and gas industry products, including processed products, should be encouraged. Target markets should not be limited to nearby countries; new markets should also be found in distant foreign countries.
3. Expansion of trade representations and houses. The network of trade representations and houses in Azerbaijan's main export target countries should be strengthened, and local products promoted and orders attracted through these structures.
4. Simplification of legal and administrative procedures for export. Customs and licensing procedures related to export should be further simplified, and more flexible and transparent management should be ensured through electronic systems.
5. Strengthening branding and marketing policy. Professional marketing campaigns should be implemented to promote Azerbaijani non-oil and gas products on the international market, and added value should be created by highlighting their distinctive features.

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From Automation to Innovation: Redefining Accounting Practices with Artificial Intelligence in the Western Balkans

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ABSTRACT: This study examines the factors influencing the adoption of artificial intelligence (AI) in accounting practices in the Western Balkans. It focuses on AI familiarity, organisational readiness, and the regulatory environment, while considering ethical concerns and training availability. A quantitative approach using SEM-PLS analysis was applied to survey data from accounting professionals in the region. The results show that AI familiarity positively affects organisational readiness but negatively influences perceptions of the regulatory environment. Ethical concerns were found to reduce training opportunities. The findings indicate that while AI familiarity supports adoption readiness, regulatory uncertainty and ethical challenges remain key barriers. The study highlights the need for clearer regulations, ethical governance, and professional training to support effective AI integration in accounting practices.

KEYWORDS: accounting, artificial intelligence, ethics, organisational readiness, Western Balkans.

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Introduction

Artificial intelligence (AI) is transforming accounting practices by automating processes, improving data accuracy, and supporting strategic decision-making. Globally, AI is redefining the role of accounting professionals and creating new opportunities for efficiency and innovation. However, its adoption varies across regions. In the Western Balkans, AI integration in accounting is shaped by economic transition, institutional development, and regulatory frameworks. Despite significant economic transformation, countries in the region continue to face governance, infrastructure, and regulatory challenges that influence digital innovation. In this context, AI adoption represents both an opportunity for efficiency and a challenge that requires institutional readiness. This study aims to analyse the key factors influencing AI adoption in accounting practices in the Western Balkans.

Research Aim and Research Questions

This study aims to examine the determinants of AI adoption in accounting practices in the Western Balkans, focusing on AI familiarity, organisational readiness, and the regulatory environment, and to examine the mediating role of ethical concerns and training availability.

The research addresses the following questions:

RQ1: How does AI familiarity influence organisational readiness for AI adoption?

RQ2: What is the impact of the regulatory environment on AI adoption?

RQ3: How do ethical concerns affect training availability?

RQ4: What are the main barriers and enabling factors for AI integration in accounting?

Research Results

The study builds on literature on digital transformation, technology adoption, and AI in accounting, which highlights improvements in efficiency, accuracy, and decision-making (Liao et al., 2020; Lee & Tajudeen, 2020), as well as the importance of regulatory and ethical factors (Zhang et al., 2023).

A quantitative research design using SEM-PLS was applied to survey data from accounting professionals in the Western Balkans. The model includes AI familiarity, organisational readiness, and regulatory environment as key determinants, with ethical concerns and training availability as mediating variables.

The results indicate that AI familiarity positively influences organisational readiness ($\beta = 0.3461$), suggesting that increased awareness supports readiness for adoption. However, AI familiarity negatively affects perceptions of the regulatory environment ($\beta = -0.3052$), indicating perceived regulatory barriers. Ethical concerns negatively affect training availability ($\beta = -0.3498$), showing that issues such as job displacement and data privacy reduce investment in training.

The findings indicate that while AI familiarity supports readiness, regulatory uncertainty and ethical

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challenges remain key barriers to AI implementation in accounting practices in the Western Balkans. The main structural relationships are presented in [Table 1].

Table 1

Structural Model Results (SEM-PLS, N = 50)

Relationship	β (Original)	95% CI (perc.025 – perc.975)	Interpretation
AI Familiarity → Org Readiness	0.346	−0.575 to 0.617	Positive, but CI crosses 0
AI Familiarity → Reg Environment	−0.242	−0.624 to 0.448	Negative, CI crosses 0
Reg Environment → Training Availability	0.297	−0.357 to 0.532	Positive, CI crosses 0
Ethical Concerns → Training Availability	−0.350	−0.528 to 0.578	Negative, CI crosses 0

Conclusions

This study provides empirical insights into AI adoption in accounting in the Western Balkans. The findings confirm that AI familiarity enhances organisational readiness, while regulatory challenges and ethical concerns limit effective implementation. The study contributes to the literature by providing evidence from an under-researched region and highlighting the importance of regulatory clarity, ethical governance, and professional training. Future research should examine larger samples and conduct comparative regional analyses.

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Current Problems of Economic Security of Chemical Enterprises in Global Conditions

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ABSTRACT: The article examines the current problems of economic security of chemical enterprises in the global context. The problems of economic security of chemical enterprises are explained and summarised. The importance of strengthening the economic security of chemical enterprises amid global threats is substantiated. The problems of the development of the chemical industry in Azerbaijan and the security issues of chemical enterprises are analysed. The processes of taking security measures at currently operating chemical enterprises are examined and evaluated. Taking into account new challenges, proposals are made to strengthen economic security at chemical enterprises in the near future.

KEYWORDS: global conditions, global threats, chemical enterprises, economic security, safety of chemical enterprises.

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Introduction

In modern conditions, systematic solution of economic security problems of chemical enterprises and determination of optimal theoretical and methodological approaches are important conditions. The chemical and petrochemical complex is a highly productive sector of the economy that adds value, and there is a constant demand for its products in the world market. In general, the strong role of chemical enterprises in the further processing of oil and gas raw materials and in generating income is well known, and, in view of these factors, ensuring the economic security of these enterprises is considered a priority task [1]. In view of these factors, ensuring the enterprise's economic security and taking appropriate measures in this regard are essential conditions [2]. At the same time, amid rising global economic threats, increasing the competitiveness of chemical enterprises, strengthening their resilience in crisis conditions, taking necessary measures in this regard, and incurring additional costs are noteworthy necessities [3]. If we look at the analysis of the negative consequences of global crises, including financial and economic crises, we can see that, in the modern era, any entity faces a problem of having an economic security strategy and sustainable mechanisms, and these require a systematic approach [4]. In a period of increasing internal and external threats, it is necessary to develop and implement an economic security strategy for the enterprise.

Research Aim and Research Questions

The main purpose of writing the article is to develop effective and reliable mechanisms for ensuring the safety of chemical enterprises in the face of global threats. A group of methods was used in the study, including analysis, synthesis, comparison and generalisation. References were also made to the scientific works of various researchers on these problems.

Research Results

Each enterprise sets strategic goals for its activities and, to this end, determines a wide range of activity directions, makes investments, purchases high-tech equipment in large quantities, expands production and commercial areas, takes risks to increase income, etc. In this context, ensuring a high level of economic security for the enterprise is a complex process, and, accordingly, economic security mechanisms should be developed in accordance with the enterprise's strategic activity directions. On the other hand, when forming an economic security system for an enterprise, the characteristics of many functional areas of activity should be taken into account, necessary mechanisms should be developed, operational tools should be applied, and management structures should be created [5]. At the same time, greater importance should be given to financial and technical-technological issues, personnel and human potential, legal and other areas of economic activity, as well as to approaches to socio-economic problems [6].

As we have noted, in the process of forming an enterprise's economic security system, internal and external factors that seriously impact its economic strength and competitiveness should remain at the

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centre of attention [7]. In addition, enterprises that are more interested in strengthening their economic security system approach related problems in practice comprehensively, proceeding from the current situation and prospective trends, and, in this regard, prefer to develop an enterprise economic security model. Taking into account many factors is an important condition for developing an economic security model for the enterprise [8]. The changes taking place in the world, as well as the new conditions arising from the COVID-19 pandemic, have created the need to improve each enterprise's economic security strategy. In this regard, more attention should be paid to the organisational and economic factors of the security strategy [9].

We believe that economic security measures and applied mechanisms should be immune to threats in current conditions and that their functionality should be ensured. In other words, the principles and criteria for the enterprise's economic security should reflect the strategic aspects of its activities, meet the requirements of the time, and, as we mentioned earlier, be long-term. In a market economy, it is impossible to achieve production efficiency without ensuring the constant renewal and development of production infrastructure, including serious attention to logistics infrastructure. As the competitive environment deepens and new technologies and management methods are developed, it is important to update theoretical and methodological approaches to economic security problems in chemical enterprises.

It should be noted that the optimality of theoretical and methodological approaches to the problems of economic security of enterprises and their compliance with the requirements of the time should be considered as a serious factor. The security problems of important sectors of the economy have become quite urgent [10]. In particular, these issues have become strategic in the oil and gas chemical industry and are quite urgent in our country, since these sectors are developing. There should be a conceptual approach to the problems of developing and implementing the mechanisms needed to ensure the enterprise's economic security. Also, depending on the directions of activity and purposes of the enterprises, economic security issues automatically come to the fore. In particular, ensuring the stability and economic security of enterprises with strong export potential is considered important [11]. In this case, a large number of factors, including internal and external factors affecting the economic security of the enterprise, must be taken into account: internal factors: 1) inefficiency of the management system, failure of management and production management mechanisms to meet the requirements of the modern era; 2) limited structure of production, lack of production of new innovative products, delay in the introduction of innovations; 3) failure to implement the strategy of applying modern technologies, increase in management and product cost costs; 4) opacity of financial and accounting structures, dishonesty of reports, weakness of the internal audit and control system, etc. External factors: 1) instability in political processes and the political system, inadequacy of state support mechanisms; 2) instability and efficiency problems of economic processes, problems in financial markets, difficulties in the banking sector; 3) structural changes in the goods and services market, decline in consumption levels and stagnation in consumer markets; 4) problems related to raw materials, global impacts and demands

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arising from modern economic challenges, etc. Among the internal factors, the main ones are the improvement of the enterprise's management system and ensuring its efficiency, keeping the focus on the problems related to the structure of production and the renewal of fixed assets, the financial stability of the enterprise, the formation of a strong internal control system, the integrity of the internal audit, and in general the presence of a balanced activity and development strategy of the enterprise [12].

It should be noted that one of the main issues in ensuring the enterprise's economic security is the efficient use of its resource potential and the consistent implementation of measures to support the enterprise's dynamic development [13]. On the other hand, to ensure the enterprise's economic security, it is necessary to conduct systematic analyses across many areas and draw appropriate conclusions. For example, if we are talking about ensuring the stability of the enterprise's raw materials, first of all, reliable sources of raw materials should be analysed, relations with shippers should be investigated, and long-term issues of the enterprise's stable supply of raw materials should be forecast. Alternatively, an analysis of similar markets for the products manufactured at the enterprise should be conducted, and forecasts should be made on the life cycle of the main products [14]. The intensity of production processes, measures to improve production structure, high competitiveness of manufactured products, and ensuring their consolidation in commodity markets are important conditions for the enterprise's economic security. Systematicity and complexity, continuity and economic efficiency, and interaction and coordination measures are the main principles of the enterprise's economic security. In addition, a high level of efficiency of the enterprise's investment projects should be ensured [15]. Approaches to solving technical and technological problems of the enterprise and increasing its competitiveness, as well as the application of innovations, occupy an important place in strengthening its economic security [16]. At the same time, to strengthen economic security at chemical enterprises, the enterprises' logistics policies should also be developed and implemented [17]. In the new conditions, the development of the infrastructure potential of various sectors of the economy, including enterprises in the chemical industry, is attracting attention for its relevance [18]. In addition, in order to produce products that meet the requirements of the time, the problems of commissioning facilities that allow the production of more productive and competitive, export-oriented products that are aimed at world markets in a targeted and targeted manner, along with domestic demand, and transferring high technologies, attract attention [19]. Measures to build a strong infrastructure for chemical industry enterprises, acquire advanced technologies, and strengthen financial stability and security should also remain a central focus of serious attention [20].

On the other hand, the creation of chemical enterprises based on modern technologies should be emphasised. Along with these, optimising product costs in chemical enterprises and using financial resources for their intended purposes are considered very important issues for strengthening economic security [21]. It should be noted that in many countries, free economic zones are used to promote the technological development of chemical enterprises [22]. For example, free economic zones perform

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many functions in promoting entrepreneurship, increasing investment activity, and applying new technologies [23]. In such zones, the problems of strengthening the economic security of chemical enterprises are compounded in both complexity and seriousness. As a result, measures to strengthen economic security are being implemented intensively. Thus, the annual increase in global threats necessitates and requires the development of new mechanisms and elements of economic security at chemical enterprises. In terms of organising the economic security system of the country's chemical enterprises, it is necessary to develop mechanisms that meet the requirements of the modern era, solve the financial provision for the transfer of high technologies, diversify the raw material base, and align activities in this area with the development trends of world markets [24].

Along with this, modern aspects and directions of the development of the petrochemical complex in Azerbaijan require directing direct investments to this sphere. In particular, it is important to take additional measures to attract foreign investment more intensively. It should be noted that, in recent years, the volume of investments directed to Sumgayit Industrial Park has exceeded 6 billion dollars, and this volume is increasing each year. A significant part of the products manufactured in this industrial park with modern infrastructure is export-oriented, and the total export potential is expected to be 600-800 million US dollars. Thanks to the commissioning of a large polypropylene production facility, the volume of non-oil exports has already begun to increase. The number of residents registered in the industrial park is already over 40, and it is expected to increase in the coming years.

In the global context, the activity of chemical enterprises has been in the spotlight. Thus, although certain problems and restrictions have arisen in the activities of most economic sectors, the production volume and export potential of industrial products have increased in chemical industry enterprises, and new production capacities have been commissioned.

Conclusions

Thus, in terms of strengthening the economic security system of chemical enterprises and generalising theoretical and methodological approaches to the organisation of these issues, it is possible to group the issues that need to be paid attention to:

- In a period of unstable oil prices, further development of the infrastructure of chemical industry enterprises and an increase in production should be a priority, as should the creation of new sources of foreign exchange inflows.
- It is important to increase the competitiveness of chemical enterprises and ensure their access to more financially intensive world markets.
- measures should be taken to create new production areas along the value-added chain at chemical and petrochemical enterprises and increase the production of export-oriented products;

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- A comprehensive plan of measures should be developed and implemented in our country towards the maximum efficient use of all types of raw materials and resources of the chemical and petrochemical complex.
- Serious importance should be attached to the creation of high-tech.

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Techno-Economic Evaluation and Market Potential of Green Synthesised Silver Nanoparticles for Sustainable Antimicrobial Healthcare Applications

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ABSTRACT: Nanobiotechnology has emerged as a transformative field driving innovation across healthcare and industrial sectors. Recent advances in green-synthesised silver nanoparticles (AgNPs) demonstrate significant antimicrobial efficiency alongside improved environmental sustainability. However, limited research addresses the techno- economic feasibility and commercialisation pathways of nano-antimicrobial technologies. This study develops a high-impact techno-economic framework integrating innovation management, healthcare economics, and market scalability analysis. The findings suggest that green nanotechnology platforms may reduce long-term healthcare expenditure associated with antimicrobial resistance while enhancing investment opportunities in emerging biomedical markets.

KEYWORDS: Nanobiotechnology, Techno-Economic Analysis, Green Synthesis, Silver Nanoparticles, Healthcare Innovation, Market Projection.

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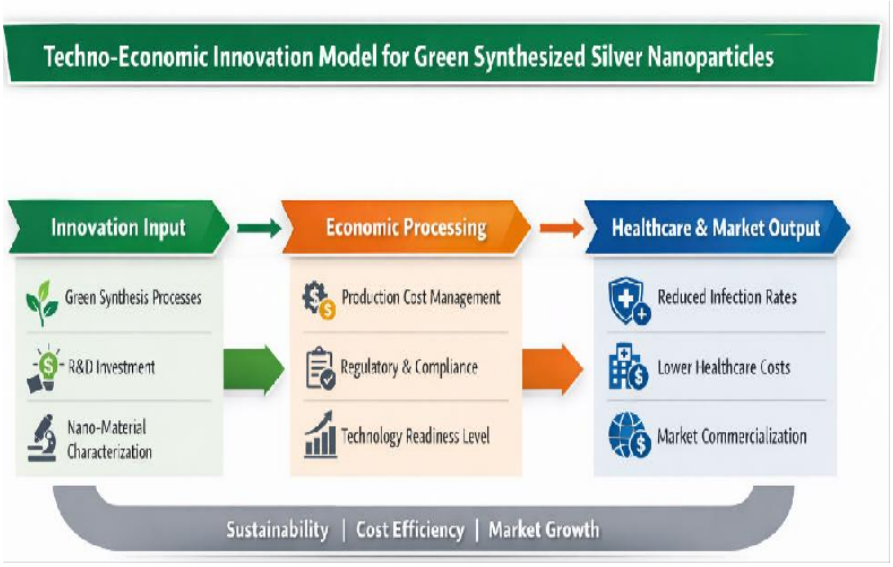
Introduction

Scheme 1

Schematic illustration of Techno-Economic Evaluation and Market Potential of Green Synthesised Silver Nanoparticles.



The rapid escalation of antimicrobial resistance represents a global economic and clinical challenge, necessitating innovative therapeutic strategies beyond conventional antibiotics (Ventola, 2015; WHO, 2023). Nanotechnology offers a promising paradigm shift by

enabling nanoscale materials with enhanced antimicrobial mechanisms such as membrane disruption, reactive oxygen species generation, and inhibition of biofilm formation (Rashid et al., 2024; Khalifa et al., 2025). Among nanomaterials, green-synthesised silver nanoparticles have gained increasing attention due to their eco-friendly production, reduced toxicity, and cost-effective scalability compared with chemical synthesis approaches (Fahim et al., 2024; Shahzadi et al., 2025). Recent studies highlight that plant-mediated nanoparticle synthesis aligns with the Sustainable Development Goals and promotes commercialisation opportunities in healthcare markets (Ramzan et al., 2024). Despite extensive biological research, techno-economic evaluation remains underexplored. Integrating economic analysis with nanobiotechnology innovation is essential for bridging the gap between laboratory discoveries and market implementation (OECD, 2021; DeFrancesco, 2013).

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Methodology – High-Impact Techno-Economic Framework

Conceptual Innovation Model

A three-layer techno-economic model was developed:

Innovation Layer

- Green synthesis processes
- R&D investment
- Nanomaterial characterization

Economic Layer

- Production cost structure
- Regulatory compliance
- Technology readiness level

Market Output Layer

- Healthcare cost reduction
- Market adoption potential
- Strategic commercialisation pathways

This framework aligns with contemporary innovation-economics models used in biomedical technology assessment (McKinsey & Company, 2022).

Comparative Cost Analysis

Table1

Techno-Economic Production Comparison

Parameter	Green AgNPs	Conventional Antibiotics
Raw Material Cost	Moderate	High
Energy Consumption	Low	Moderate
Environmental Risk	Low	High
Scale-Up Efficiency	High	Moderate
Innovation Value	High	Limited

Economic assumptions were derived from recent studies on nanotechnology commercialisation (OECD, 2021; Casals et al., 2025).

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Cost-Benefit Healthcare Evaluation

Table2

Clinical and Economic Impact

Indicator	Nano-Antimicrobial Strategy	Traditional Therapy
Treatment Efficiency	High	Moderate
Biofilm Control	Strong	Weak
Resistance Development	Reduced	Elevated
Long-Term Healthcare Cost	Lower	Higher
Innovation Market Value	High	Low

Results and Techno-Economic Analysis

Recent literature demonstrates that biosynthesised AgNPs exhibit strong antibacterial activity against multidrug-resistant pathogens while maintaining lower production costs compared with chemical synthesis methods (Rodrigues et al., 2024; Yadav et al., 2024). Environmentally friendly synthesis enhances regulatory acceptance and public trust, thereby increasing the feasibility of commercialisation (Fahim et al., 2024). Techno-economic modelling indicates that nano-antimicrobial technologies could significantly reduce long-term healthcare expenditure associated with resistant infections and prolonged hospitalisation (WHO, 2023). Additionally, synergy between nanoparticles and conventional antibiotics may further enhance therapeutic efficacy while reducing the drug dosage (Casals et al., 2025).

Discussion

The integration of nanobiotechnology with healthcare economics reflects a broader shift toward innovation-driven biomedical markets. High-impact research increasingly emphasises interdisciplinary collaboration between materials science, clinical medicine, and economic strategy (OECD, 2021). Green synthesised nanoparticles demonstrate strong potential as scalable, sustainable technologies aligned with global innovation policies. From a conference-economics perspective, techno-economic modelling enables researchers to evaluate not only scientific performance but also market viability and investment attractiveness. This approach supports the transition of nanotechnology from academic research to industrial and clinical applications (McKinsey & Company, 2022).

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Conclusion

Green-synthesised silver nanoparticles represent a promising intersection between nanobiotechnology innovation and healthcare economic sustainability. Integrating techno-economic analysis into research frameworks enhances commercialisation potential and supports strategic investment decisions. Future studies should incorporate real-world clinical data and lifecycle cost analysis to strengthen economic validation.

Highlights

- High-impact techno-economic framework for nano-antimicrobials
- Integration of green nanotechnology with healthcare market analysis
- Market projection model supporting sustainable innovation

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Topical Issues of Sustainable Development of Industrial Enterprises

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ABSTRACT: The article examines the current problems of the development of industrial enterprises. The issues of modernising industrial enterprises in the context of sustainable development are analysed and generalised. The development factors of industrial enterprises are given, and the potential in this direction is considered. The importance of applying high technologies in modern conditions is stated. The necessity of preparing and applying a stable strategy for industrial enterprises is substantiated. Recommendations are developed, and proposals are made on these problems and directions.

KEYWORDS: Industry, industrial sector, industrial enterprise, development problems of industrial enterprises, development prospects of industrial enterprises, current issues of industrial enterprises.

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Introduction

In recent decades, the increase in the production of material goods, the depletion of natural resources, the rise in social stratification, and the growing debate over environmental pollution have attracted increasing attention. Sustainable development is a process of change in which the exploitation of natural resources, the direction of investments, the direction of scientific and technological development, personal development and institutional change are in harmony with each other and strengthen the current and future potential to meet the needs and aspirations of people [1]. On the other hand, the goal of the global movement for sustainable development is to create ecologically clean conditions throughout the world as a single and unique space in which humanity can live and develop. In the conditions of modernisation of the domestic economy, globalisation of world economic relations, and intensification of production, great importance is attached to the creation of flexible conditions for the study of the problems of the sustainable development of industrial enterprises, as the ability to respond promptly to processes taking place in the surrounding business environment. The solution to the problems of ensuring the sustainable development of industrial enterprises is largely determined by the multifaceted and complex nature of the management process.

Research Aim and Research Questions

The main purpose of writing the article is to study and summarise the current problems of the development of industrial enterprises. Modernisation of industrial enterprises and increasing their competitiveness in the context of sustainable development provides for complex approaches. In addition, the methods of scientific abstraction, analysis, synthesis and generalisation were used in writing the article.

Research Results

It should be noted that the sustainable development of an industrial enterprise implies the balanced work of its constituent elements [2]. Unplanned deviations of significant indicators in the process of economic activity and enterprise development can lead to the enterprise's loss of stability. The loss of undesirable stability in the development of industrial enterprises is of great importance, since the stability and efficiency of their operations determine the development of the country's economy and the strategy for the sustainable socio-economic development of regions [3]. Along with this, the main feature of ensuring the effective operation of an enterprise is the economically competent management of its economic activity, maintaining a stable competitive situation and achieving leadership [4]. Therefore, the concept of "sustainable development" should be considered the most important tool for assessing the efficiency of an industrial enterprise.

The sustainable development of an industrial enterprise is understood as internal changes aimed at adapting it to the dynamics of the external environment in which it operates, qualitatively changing its structure and increasing quantitative performance indicators [5]. The study of the principles and elements of the system of sustainable development of industrial enterprises shows that in the cu,rrent

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economic realities, it is important to direct management activities towards sustainable economic growth [6]. The problem of measuring the sustainability of industrial complexes and enterprise development also arises, necessitating methodological developments in this area. As a result, in a market economy, each enterprise must develop its own investment and innovation management strategy, implement it, promptly respond to environmental changes, and make the necessary adjustments [7]. Such a strategy will allow the enterprise to ensure the implementation of innovative economic and social development goals, the maximum use of internal potential, efficient management of investment resources for the development of innovative activity, and the rapid implementation of promising projects aimed at strengthening the market. Sustainability is characterised, on the one hand, as the characteristics of the enterprise itself and the level of use of its potential, and on the other hand, as the characteristics of the external environment [8]. One of the main goals set for any industrial enterprise is to achieve sustainable development. To achieve sustainable development of an enterprise, it is necessary to analyse the factors affecting it, including tax mechanisms, which must be taken seriously into consideration.

An enterprise's ability to win the competition and maintain economic stability largely depends on the state of internal environmental factors. The group of internal factors includes the enterprise's production technology, personnel, the state of scientific research and experimental design work, financial resources, etc. [9]. In a market economy, enterprises can no longer ignore the external environment. Today, ignoring the external environment means the enterprise's bankruptcy in the future. The external environment, which directly determines the enterprise's stability, is shaped by objective and subjective factors [10]. Objective factors directly affect the enterprise's sustainable development. The enterprise can react to changes in the factors of direct influence in two ways: it can rebuild the internal environment and conduct both an adaptation policy and an active or passive interaction policy. Subjective external factors are environmental factors that indirectly affect the enterprise's activities and development. The impact of each factor can manifest itself in different ways.

Note that legislation in the field of the tax system significantly affects the level of sustainable development of an industrial enterprise. The level of taxes should be such that it does not lead to stagnation in the country's market, but rather creates optimal conditions for the development of its enterprises and the economy as a whole. State and local authorities significantly influence the enterprise's activity and development by regulating socio-economic relations. Resource provision is the set of material, labour, and financial resources necessary for the enterprise's activity. In particular, financial resources must be operational [11]. On the other hand, enterprises should have an appropriate, long-term financial strategy [12].

Each enterprise should keep strict records of the resources used and required to use them efficiently. In addition, the efficient operation of enterprises and strict discipline are of great importance to the country's economic security [13]. It is competition that allows enterprises to develop, produce competitive products and provide the best working conditions for their employees. For this purpose, each enterprise needs to have a marketing group [14]. The country's investment climate is also decisive

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for using the rich production potential accumulated in enterprises, or that can be created in the near future. It is very important to take this component into account when predicting the dynamics of an enterprise's sustainable development [15].

Scientific and technical progress significantly affects the enterprise as a complex system. Discoveries in high technologies, electronics, and computer technologies, along with the creation of new materials, have led to a radical change in production and the production of high-quality products in enterprises over several decades [16]. At the same time, it is necessary to place a greater priority on digital mechanisms for the organisation of banking services at a high level [17].

Information security shapes the enterprise's information environment. Modern enterprises literally penetrate information flows. This factor can be related to both the external environment and the enterprise's internal environment. Its further development depends on the effectiveness of internal information flows within the enterprise and on how much information it can receive and analyse from the external environment [18]. Along with external factors, internal environmental factors also affect the enterprise's sustainability. The issues of wider use of information and communication technologies in these processes arise [19].

On the other hand, innovations can be quite effective in increasing enterprises' competitiveness. In this regard, more active application of innovations is one of the important conditions [20]. At the same time, there is a need for a wider range of innovative products to be produced and exported in order to expand the country's foreign economic relations. Competitive and export-oriented enterprises also play a significant role in increasing the country's export potential [21].

Currently, intensive restoration and construction work are underway in both the Karabakh and East Zangezur economic regions. The First State Program on the Great Return is being implemented. One of the main problems for former internally displaced persons returning to their homeland is obtaining appropriate and decent work. Taking into account these important issues, the creation of production infrastructure and the formation and development of the material and technical base for the organisation of industrial enterprises have already begun. The largest industrial park in the region is being built in Agdam. This multifunctional industrial park brings together innovative technologies and competitive enterprises that will perform various functions. For residents registered in the industrial park, benefits have been determined for 10 years, and they are exempt from income or profit tax. At the same time, the creation of a banking infrastructure to provide financial and credit services has also become necessary.

Along with these, it is expected that in the near future industrial enterprises will start operating in the areas of equipment and inventory for ventilation systems, signals for railway lines, as well as the production of microcircuits, as well as the production of shoes and, for the first time in our country, wallpaper. All this provides additional incentives for the development of the Karabakh economic region. As post-conflict areas are cleared of mines, the process of creating a network of competitive, modern technology-based enterprises will accelerate here. The “Araz Valley Economic Zone” in Jabrayil, East

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Zangezur, plays an exceptional role in the development of entrepreneurship, increasing the attractiveness of the business and investment environment. The creation of an analogous, multifunctional economic zone will increase the region's investment attractiveness. Along with these, the revival of the city of Shusha is creating additional conditions for strengthening sustainable development in the region and creating competitive enterprises. On the other hand, the declaration of post-conflict areas as green energy zones and the large-scale nature of the measures taken in this direction are also noteworthy.

In many countries, the mechanism of multifunctional free economic zones is used for the sustainable development of enterprises [22]. New economic mechanisms prevail in such zones and attract additional potential for the sustainable development of enterprises. At the same time, it would be useful to refer to Turkey's experience in developing free economic zones [23]. In recent decades, Azerbaijan has also begun to establish free economic zones to accelerate enterprise development. In similar zones, it is possible to develop entrepreneurship and increase investment activity systematically. At the same time, we believe that the development of such zones in Azerbaijan will enable enterprises to become more competitive and develop sustainably.

Conclusions

Thus, having determined the role of changes in the sustainable development of an enterprise, we conclude that achieving stability is possible through a dialectical combination of stability and instability processes within it. Based on this, we formulate the main provisions of the concept of sustainable development of an enterprise:

- The structural unit of the concept is an industrial enterprise. Its development is driven by changes in socio-economic processes in both the external and internal environments.
- Organisational development is non-directional in nature, influenced by many factors.
- The purposeful activities of the drivers of change serve as analytical materials for managers who lead the enterprise's development.
- The exchange of information and other resources within the organisation makes it an integral, closed system; only its long-term existence can characterise it as a stable system.
- Despite the multitude of development factors, it can be predicted based on the general laws and characteristics of the socio-economic environment.
- One of the central problems in increasing the organisation's sustainability is how to improve it.

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Building Credibility in Vietnam's ESG Disclosures: Assurance Trends and Institutional Gaps

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ABSTRACT: This study examines how credibility is constructed in sustainability (ESG) disclosures among Vietnam-listed firms, with particular attention to the role of external sustainability assurance and the institutional conditions that shape its uptake and perceived value. Using a qualitative case-study approach, the manuscript synthesises secondary evidence (academic studies, professional guidance, and regulatory materials). It conducts qualitative content analysis of a corpus of sustainability reports published by representative listed firms over 2020–2025. The findings indicate a measurable improvement in disclosure quality and presentation, especially among HOSE-listed large-capitalisation firms, where reporting increasingly aligns with international frameworks (notably GRI and the UN SDGs) and, in leading cases, incorporates climate-related commitments (e.g., Net Zero pathways and emissions management). However, third-party assurance remains limited and concentrated among larger firms, reflecting cost constraints, uneven ESG data systems, a fragmented standards environment, and shortages of specialised assurance capabilities. The study concludes that strengthening ESG credibility in Vietnam requires a phased policy roadmap for assurance, capacity building for ESG data governance, and harmonisation with evolving international assurance standards (e.g., ISSA 5000), alongside measures to broaden access for smaller issuers.

KEYWORDS: Sustainability reporting; ESG disclosure credibility; Sustainability assurance; Vietnam listed firms; Institutional gaps.

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Introduction

Credibility has become the fulcrum of ESG disclosure. As sustainability information increasingly informs capital allocation, stakeholder trust, and firms' long-run value propositions, the central challenge is no longer whether companies disclose ESG information, but whether such disclosure is decision-useful, verifiable, and comparable. This manuscript positions Vietnam within the broader debate on how credibility is constructed in non-financial reporting, emphasising the joint roles of external sustainability assurance, internal governance arrangements, and institutional pressures that shape both reporting incentives and market interpretation.

Across jurisdictions, external assurance has emerged as a prominent credibility mechanism because it can strengthen verifiability, reduce information asymmetry, and signal managerial commitment to accountable disclosure (Farooq et al., 2023; Zanócz, 2025). Empirical evidence suggests that assurance quality—often proxied by recognised standards and reputable providers—tends to correlate with more robust sustainability reporting, improved environmental performance, and more favourable market outcomes, including investor confidence and cost-of-capital effects (Farooq et al., 2023). Complementing this assurance-centric account, governance research indicates that credible ESG disclosure is frequently underwritten by internal control and oversight: board involvement, sustainability committees, and governance quality increase the likelihood that ESG reporting is embedded in organisational processes rather than treated as a symbolic exercise (Mohy-ud-Din et al., 2025; Rohani et al., 2022).

Vietnam constitutes a consequential case for examining these credibility dynamics because its sustainability reporting ecosystem and assurance market remain comparatively nascent, while stakeholder expectations and regulatory signals are evolving rapidly. The Vietnamese corporate landscape—characterised by heterogeneous ownership structures, uneven governance capacity, and varying exposure to global investors—creates divergent incentives for assurance uptake and quality. Prior cross-country research shows that the credibility payoffs of assurance are contingent on institutional maturity: where enforcement capacity, investor sophistication, and reporting infrastructures are underdeveloped, assurance may be adopted selectively and interpreted inconsistently (Farooq et al., 2023; Zanócz, 2025). This conditionality makes Vietnam a theoretically instructive setting for identifying how institutional gaps constrain credibility formation and which levers—governance reform, assurance market development, and regulatory convergence—are most likely to close such gaps.

Building on signalling and legitimacy perspectives, this study conceptualises ESG credibility as an outcome of three interlocking mechanisms: (i) assurance as an external signal that enhances verifiability and legitimises disclosure; (ii) governance readiness as a prerequisite for consistent ESG data generation and oversight; and (iii) institutional pressures from regulators and investors that reward credible, standardised reporting (Sánchez et al., 2021; Farooq et al., 2023; Alwadani et al., 2023; Zanócz, 2025). The manuscript contributes by synthesising global evidence through a Vietnam-centred lens, clarifying

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how governance, assurance practices, and policy trajectories interact in an emerging-market context, and developing a context-sensitive research framework and hypotheses to guide subsequent empirical investigation using Vietnamese firm-level data and assurance disclosures.

Research Aim and Research Questions

This study aims to generate an in-depth, context-specific understanding of how sustainability reporting and sustainability assurance are practised among firms listed on Vietnam's stock exchanges, and why persistent credibility and implementation gaps remain. Using a qualitative case-study design, the research examines sustainability disclosure in real organisational and institutional contexts—where regulatory expectations are evolving, reporting capabilities vary substantially across firms, and assurance markets remain uneven. The study leverages systematic secondary data analysis (academic research, theses, professional reports, and legal/professional guidance) to consolidate theoretical foundations and international experience relevant to sustainability reporting and assurance. Building on this foundation, it compiles and analyses a corpus of sustainability reports published by representative Vietnamese listed firms over 2020–2025, selected to reflect variation in transparency, operational scale, and sectoral context. Through qualitative content analysis, the study identifies the defining features of disclosure practice, emerging trends, and recurring limitations, and assesses the extent, forms, and apparent rigour of sustainability assurance adoption. The overarching objective is to map practical constraints and implementation challenges and to derive actionable insights for firms, assurance providers, and policymakers seeking to strengthen the reliability and decision-usefulness of ESG disclosures in Vietnam.

Research questions to achieve the above aim:

Question 1: How do Vietnam-listed firms design and communicate sustainability disclosures (2020–2025), and what recurring strengths and limitations are evident in the content and structure of these reports?

Question 2: To what extent do Vietnam-listed firms adopt sustainability assurance, and what assurance characteristics (e.g., scope, provider type, standards referenced) are observable in practice?

Question 3: What practical and institutional constraints—evident from documentary evidence and report content—appear to hinder robust sustainability reporting and credible assurance implementation in Vietnam's listed-firm context?

Research Results

Vietnam's sustainability reporting leaders—proxied here by the VLCA 2025 Top performers—exhibit a clear pattern: credibility is being built primarily through framework alignment (GRI + SDGs), enhanced report architecture, and selective climate-specific commitments, rather than through uniformly strong third-party assurance across the market. As the most stringent listing venue, HOSE provides an enabling

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environment for higher disclosure discipline and stronger investor scrutiny, making sustainability reporting an increasingly salient complement to financial reporting among large issuers.

Table 1 indicates that "standardisation first" is the dominant credibility strategy. Across both financial and non-financial sectors, the leading reports consistently anchor disclosure in GRI and explicitly reference the UN SDGs, thereby improving comparability across years and supporting a more structured narrative around ESG performance and priorities. This is particularly evident in the financial sector winners: HDBank (HDB), recognised with First Prize, is characterised by strong alignment with internationally recognised disclosure structures and an emphasis on embedding ESG into governance and operations. Bao Viet (BVH), awarded Second Prize, differentiates itself through report presentation/readability and by leveraging international benchmarking signals (e.g., DJSI orientation) to strengthen perceived credibility among investors and stakeholders. VPBank (VPB), in Third Prize position, demonstrates a coherent reporting structure and a long-term "sustainable prosperity" positioning, suggesting progressive institutionalisation of ESG reporting within banking practice.

In the non-financial sector, the VLCA 2025 results suggest that credibility increasingly hinges on verifiability and climate specificity. DCM (First Prize) is highlighted for strengthening information reliability through more systematic, metrics-based disclosures, thereby improving the verifiability of sustainability claims. Vinamilk (VNM)—recognised for sustainability reporting and GHG management—stands out by coupling GRI reporting with explicit climate commitments and standards (e.g., Net Zero, PAS 2060:2014) and by providing clearer climate-related targets and milestones (e.g., 2027–2050 horizons), thereby enhancing accountability and credibility in the transition. Gemadept (GMD) is recognised for "completeness," reflecting a well-structured, comprehensive disclosure architecture aligned with GRI, thereby improving the interpretability and coverage of material ESG topics.

Overall, Table 1 implies a two-track credibility model in Vietnam's top tier: (i) broad-based legitimacy through GRI/SDG alignment and stronger report design; and (ii) higher-credibility differentiation where firms provide more measurable, decision-useful ESG content—especially climate targets, milestones, and systematically documented performance indicators. This top-tier pattern is consistent with the study's broader observation that, despite sectoral differences, leading reporters converge on stronger standardisation, clearer targets and indicators, and (where present) external validation mechanisms that make ESG disclosures more decision-relevant.

Table 1

Top Sustainability Reports (Top 3) – 2025 (VLCA 2025)

Company	VLCA 2025 Award/Recognition	Reporting Standards/Frameworks Applied	Key Strengths and Notable Commitments
Financial sector			

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HDB (HDBank)	First Prize – Sustainability Report (Financial Sector)	GRI; reference to the UN SDGs; compliance-oriented sustainability disclosure	Strong alignment with internationally recognized disclosure structures (e.g., GRI), improving comparability across reporting periods; emphasizes ESG integration into governance and operations, and strengthens transparency for stakeholders.
BVH (Bao Viet Group)	Second Prize – Sustainability Report (Financial Sector); referenced as being included in DJSI	GRI; DJSI (benchmarking/orientation)	Scores highly on report presentation and readability, and on global credibility through benchmarking against international sustainability indices; enhances investor confidence in governance and sustainability performance narratives.
VPB (VPBank)	Third Prize – Sustainability Report (Financial Sector)	GRI; reference to the UN SDGs	Clear and consistent disclosure structure; communicates a long-term "sustainable prosperity" orientation and signals progressive institutionalization of ESG reporting practices.
Non-Financial sector			
DCM (PVCFC – PetroVietnam Fertilizer and Chemicals Corporation)	First Prize – Sustainability Report (Non-financial Sector)	GRI	Strengthens information reliability through more systematic, metrics-based disclosures; improves verifiability and stakeholder trust via clearer documentation of sustainability performance.
VNM (Vinamilk)	First Prize (Sustainability Reporting & GHG Management)	GRI; Net Zero 2050; PAS 2060:2014	Demonstrates leadership in carbon neutrality and emissions reduction; provides comparatively transparent climate-related targets and milestones (e.g., 2027–2050 horizons), supporting accountability and long-term transition credibility.
GMD (Gemadept)	Recognition – "Completeness" (Non-financial Sector)	GRI	A well-structured, comprehensive report architecture; disclosures are organized coherently in line with GRI requirements, improving interpretability and completeness of sustainability information.

Source: Author's compilation based on sustainability reports for the 2020–2025 reporting period and VLCA-related recognitions (reported in 2025)

Extending the analysis to the VN30 index—representing large-capitalisation firms listed on HOSE—suggests a gradual but meaningful improvement in both the format and credibility infrastructure of sustainability reporting over 2020–2025. In 2020, only 13.33% of VN30 constituents (4/30) published a stand-alone sustainability report, and only 10% reported any third-party involvement in validating

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sustainability disclosures. For most firms, sustainability information remained embedded within annual reports, and external assurance or independent verification was not yet a standard reporting practice.

By 2025, disclosure practices within this cohort had strengthened. The share of VN30 firms issuing stand-alone sustainability reports—and engaging third parties for assurance, verification, or independent review—rose to 23.33% (7/30). This shift indicates not only greater recognition of the strategic value of structured non-financial reporting, but also a growing acceptance of external validation as a mechanism to enhance the credibility and decision-usefulness of ESG information for capital-market stakeholders.

Conclusions

This study examined the roles, challenges, and development directions of sustainability report assurance in Vietnam, with particular focus on listed companies. Although the proportion of firms issuing stand-alone sustainability reports and purchasing third-party assurance has increased, overall uptake remains limited and concentrated among large firms. Many firms—especially small and medium-sized enterprises—are not yet willing or able to bear the costs of assurance services.

Key challenges include a fragmented standards environment, shortages of specialised personnel, and dependence on large audit firms (the Big Four). Many firms also lack robust systems for collecting and managing ESG data, complicating assurance engagements. Moreover, Vietnam's current legal framework encourages sustainability disclosure but does not mandate sustainability assurance.

To advance sustainability assurance as an essential governance tool, the study recommends: establishing a phased roadmap that introduces assurance requirements for PIEs; developing national assurance standards harmonised with international developments (ISSA 5000); and strengthening ESG and sustainability assurance training. Regulators should implement supportive policies enabling firms—particularly SMEs—to access high-quality assurance services.

In sum, sustainability assurance in Vietnam faces substantial challenges but also presents significant opportunities to enhance corporate transparency and credibility. Coherent policy implementation and sustained human-capital development are necessary for sustainability assurance to become an important instrument supporting Vietnam's sustainable development objectives.

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Systematic Design of Family-Friendly Environments as a Factor in the Capitalization of Contemporary Business Structures and Urban Spaces

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ABSTRACT: Objective: to develop an integrated conceptual model of family-friendly environments as a factor in the capitalization of contemporary business structures and urban spaces, and to construct a corresponding composite index for its assessment. Methods: comparative analysis and synthesis of two parallel research streams, family-supportive organizations and child- and family-friendly cities, combined with a systemic design approach linking the enterprise, urban, and system levels. Results: a systemic home-work-city model is established, in which family-friendly workplace practices (flexible and remote work, caregiving leave, childcare and lactation spaces, inclusive leadership) and family-friendly urban design (safe pedestrian and green zones, service accessibility, family participation in planning) generate measurable capitalization effects through strengthened human capital, ESG performance, and intangible assets at the enterprise level, and through hedonic real estate premiums, area attractiveness, and demographic resilience at the territorial level. An Integral Family-Friendliness Index, based on min-max normalization and weighting of five indicators across both levels, is proposed for comparative assessment. Significance: the model demonstrates that family-friendly design functions not as a cost but as a capitalizable strategic asset, providing a foundation for managerial and urban-planning decisions, with particular relevance for the postwar recovery of Ukrainian cities and enterprises.

KEYWORDS: family-friendly environments, capitalization, human capital, ESG, systemic design, urban planning, intangible assets.

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Introduction

In the modern economy, the greater part of the value of leading companies derives not from tangible but from intangible assets: corporate culture, reputation, and the loyalty of consumers and employees, together with the capacity for innovation. Long-term value is increasingly determined precisely by these factors (Edmans, 2023). The social component of such assets is directly related to the extent to which the environment in which a person works and lives is friendly to that person's family roles and needs. Family friendliness should be regarded not as a localized benefit but as a cross-cutting characteristic of two interconnected environments: the working environment of a business structure and the public space of a city. The conceptual framework presented in this paper builds upon the author's Child-Centered Environment Method (CCEM), extending it from organizational implementation to an integrated systemic model applicable to business structures and urban environments.

Scholarly attention to these two environments is growing, yet it has developed largely in parallel. On one hand, a field of family-supportive organizations is taking shape, in which researchers examine formal policies (flexible work arrangements, caregiving leave, and support for parenthood) alongside the informal climate of support (Kossek et al., 2025). Systematic reviews find that corporate work-family initiatives yield measurable benefits simultaneously for employers, employees, and their families (Jack et al., 2025). On the other hand, the concept of child- and family-friendly cities is developing, one that reorients local governance decisions toward the interests of children and families (Powell, 2024) and reconceives the design of streets and neighborhoods as safe, walkable, and inclusive spaces (Michail et al., 2025). What remains unresolved is the integration of these two lines of inquiry within a single framework, that of systemic design and capitalization, in which family friendliness is treated as a factor in the growth of economic value.

Systemic design proceeds from the premise that any high-quality design solution is systemic by nature: it requires identifying interacting systems of varying scale and constructing an adaptive process, open to self-regulation, for reconciling them (Porqueddu, 2022). With respect to family friendliness, this means that the working environment of an enterprise and the public space of a city should not be designed in isolation but as a single system of home, work, and city, in which decisions made at one level reinforce effects at another.

At the level of the business structure, a family-friendly environment is shaped by flexible and remote work arrangements, caregiving leave and support for parenthood, physical elements (childcare rooms, breastfeeding spaces), and an inclusive culture together with supportive leadership (Kossek et al., 2025). Empirical syntheses indicate that such measures increase productivity, engagement, and staff retention while reducing absenteeism (Jack et al., 2025). Through the strengthening of human capital, these effects translate into ESG performance and, ultimately, into the long-term value of the company: human capital management practices are positively associated with firms' ESG indicators (Cai et al., 2024), and ESG factors themselves form part of the intangible assets that determine long-term value (Edmans, 2023). At the level of urban space, family friendliness is embodied in safe pedestrian and play zones, green areas, service accessibility following the "15-minute city" logic, and the involvement of families in planning (Powell, 2024; Michail et al., 2025); the presence of these qualities is amenable to structured measurement through indicator scales (Sapsağlam & Eryılmaz, 2024). A systematization of design elements, mechanisms, and channels of capitalization by level is presented in Table 1.

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Table 1

Design Elements, Mechanisms, and Channels of Capitalization of Family-Friendly Environments by Level

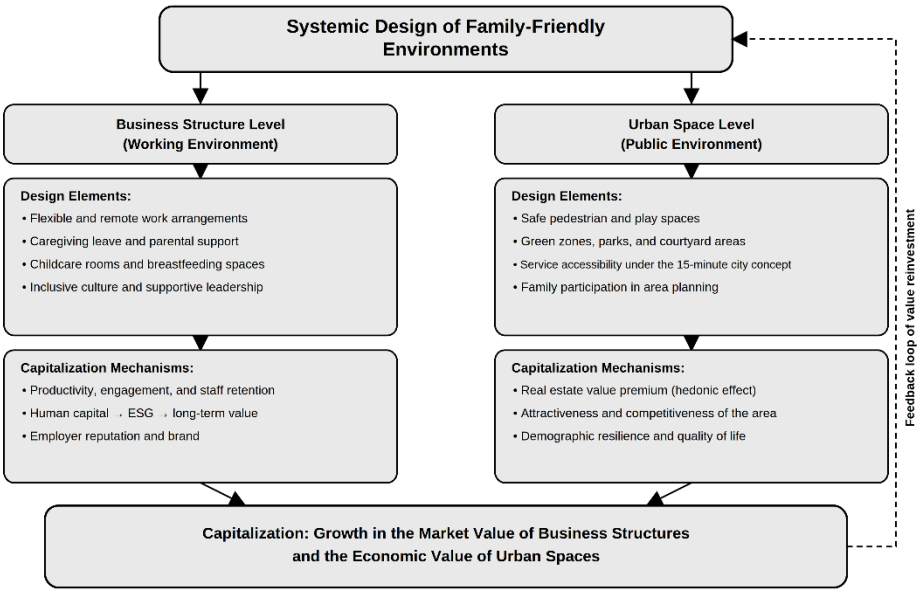
Level	Design Elements	Mechanism of Influence	Channel of Capitalization
Business structure (working environment)	Flexible work arrangements, caregiving leave, childcare spaces, supportive leadership	Productivity, employee engagement and retention; strengthening of human capital	Intangible assets, ESG profile, market value of the enterprise
Urban space (public environment)	Safe pedestrian and play zones, green areas, the 15 minute city, family participation in planning	Quality of life, attractiveness, and demographic resilience of the area	Hedonic premium in real estate value, competitiveness of the space
System (interaction of levels)	Coordinated design linking home, work, and city	Synergy and network effects between levels	Aggregate growth in the capitalization of the local ecosystem

Source: developed by the author.

The systematization presented above shows that family friendliness functions as a common denominator of two value-creating circuits. However, individual elements are capitalized only when they are combined into a coherent system: an enterprise's investments in family support achieve their full effect only when the surrounding public space is of corresponding quality, and vice versa. The logic of this systemic link, closed by a feedback loop of reinvesting the value created, is summarized in Figure 1.

Figure 1

Systemic Model of the Capitalization of Family-Friendly Environments



Source: constructed by the author.

The capitalization mechanism at the territorial level has a measurable manifestation in real estate prices. Hedonic modeling demonstrates a substantial value premium for proximity to a high-quality public environment: parks and urban forests raise the price of adjacent parcels by

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approximately 19.2% and 17.1%, respectively (Setiowati et al., 2024), while optimizing the spatial arrangement of green zones can increase the aggregate (net) value of a territory's housing stock (Li et al., 2024). This confirms that family-friendly design of space is not purely a cost item: it is transformed into a capitalized asset of the territory. For managerial application, it is advisable to consolidate these heterogeneous effects into a single dimension. The proposed Integral Family-Friendliness Index (IFFI) combines components from both levels through min-max normalization of indicators and their weighting; an approximate structure of the index, with illustrative normative-expert weights, is presented in Table 2.

Table 2

Structure of the Integral Family-Friendliness Index (IFFI): Illustrative Model

Component	Indicator	Level	Illustrative Weight
Support for work-family integration	Share of employees covered by flexible arrangements and caregiving leave	Business structure	0.25
Family-friendly physical work environment	Availability of childcare/family and lactation spaces	Business structure	0.15
Safety and accessibility of public spaces	Pedestrian accessibility of safe play and green zones	Urban space	0.25
Service density of the territory	Accessibility of services within a 15-minute radius	Urban space	0.20
Participatory involvement	Engagement of families in environmental planning	System	0.15

Source: developed by the author.

The weights are illustrative (normative-expert) and require empirical calibration (Delphi/AHP). The value of the IFFI is interpreted as the position of an object (an enterprise, a district, a city) within a range from 0 to 1: the higher the value, the more fully the environment realizes its capitalization potential through family friendliness. The proposed model is normative-methodological in nature: the weights presented are illustrative and are subject to refinement through expert procedures and verification against empirical data.

Family-friendly environments should be treated as a single systemic object of design, one that encompasses both the working environment of business structures and the public urban space and that functions as a factor in their capitalization. Capitalization occurs through two interconnected circuits: at the enterprise level, through productivity, staff retention, and the strengthening of human capital, ESG profile, and intangible assets; at the territorial level, through the hedonic premium in real estate value and the increased attractiveness and demographic resilience of the space. Systemic coordination of these two circuits produces a synergistic effect greater than the sum of the individual solutions. The proposed Integral Family-Friendliness Index (IFFI) establishes a foundation for comparative

assessment and for managerial and urban-planning decision-making. Prospects for further research relate to the empirical calibration of the index weights through expert methods and its verification against Ukrainian data, particularly in the context of the postwar recovery of cities and enterprises.

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Applying an Omni-Channel Agentic AI Model to Optimise University Admissions Counselling and Data Capture

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ABSTRACT: This paper proposes an omnichannel agentic AI model to improve admissions counselling and lead data capture in university recruitment, where prospective applicants increasingly seek information across fragmented digital platforms. Unlike conventional, script-driven chatbots, an LLM-based agent can reason, plan a multi-turn dialogue, and invoke tools to: (i) provide accurate responses grounded in an institution-approved knowledge base; (ii) proactively standardise and capture contact details; and (iii) trigger handover to admissions officers through a human-in-the-loop (HITL) mechanism. The paper presents a three-layer reference architecture (omni-channel interaction—agentic cognition and orchestration—data and action), an operating workflow, and an illustrative implementation configuration aligned with the resource constraints of Vietnamese universities. The study concludes by discussing the managerial implications and requirements for safety, accountability, and personal data protection.

KEYWORDS: AI agents; university admissions; admissions counselling; omnichannel; human-in-the-loop; retrieval-augmented generation (RAG).

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Introduction

In an increasingly competitive higher education market, particularly during the admissions season, a university's ability to attract and convert prospective applicants depends on reaching the right audience through the right channel at the right moment with an appropriate message. Prospective students and parents move fluidly across channels—websites, landing pages, Facebook/Zalo, email, and phone—and expect a seamless, personalised experience with rapid responses (Selingo, 2017; Kotler, Kartajaya, & Setiawan, 2021).

However, traditional admissions counselling, which relies primarily on human counsellors, is constrained by time, cost, and limited capacity to handle high volumes of inquiries in parallel; it also struggles to maintain consistent service quality across channels. Conversely, fully automated systems without human oversight can erode perceived trustworthiness and the "human touch," which is critical in high-stakes educational decisions (Shneiderman, 2022).

While conventional chatbots can provide quick responses, they often lack contextual reasoning, timely updates, and robust handling of complex scenarios; as a result, they may resort to templated answers or outdated information (Zawacki-Richter et al., 2019; Popenici & Kerr, 2017). Large language models (LLMs), by contrast, can sustain natural dialogue and generate flexible responses. However, without grounding in authoritative institutional data—for example, via retrieval-augmented generation (RAG)—and without appropriate governance, LLM-based systems may produce hallucinations or inconsistent statements, creating communication and decision-making risks (Lewis et al., 2020; National Institute of Standards and Technology [NIST], 2023).

Research Aim and Research Questions

To address these challenges, this paper proposes an admissions counselling AI agent that combines an LLM with institutional admissions data, omni-channel task orchestration, and a human-in-the-loop (HITL) mechanism to improve responsiveness while preserving quality control and trust (Wang et al., 2024; Xi et al., 2023; Shneiderman, 2022).

The study focuses on three research questions: (RQ1) What are the minimal functional and governance requirements for deploying an omni-channel agent in university admissions? (RQ2) Which architecture and data flows best support a seamless experience, data consistency, and scalability? (RQ3) How should HITL mechanisms be designed to enhance efficiency while ensuring counselling quality and safety?

The paper's contributions are threefold: (i) a set of design requirements and a reference architecture for an omni-channel admissions agent; (ii) an HITL operating mechanism linked to trigger points along the admissions funnel; and (iii) an illustrative implementation blueprint using readily available tools, with attention to feasibility in the Vietnamese context.

The scope of the paper is the pre-admissions stage: information counselling, interest screening, and standardised capture and synchronisation of contact data for handover to admissions staff. The paper does not address predictive analytics for admission likelihood or quota optimisation.

Research Results

Theoretical background and related work

Digital transformation in university governance has become increasingly salient, especially for "front-door" functions such as admissions, communication, and learner support. In Vietnam, the national digital transformation policy emphasises data, digital platforms, and digital services as key levers for improving operational efficiency and decision-making (Prime Minister of Vietnam, 2020). Accordingly, universities require an ecosystem that leverages data to optimise the learner journey through personalisation and omnichannel engagement, consistent with contemporary marketing thought in the digital era (Kotler et al., 2021).

An AI agent is an autonomous or semi-autonomous entity that receives goals, plans, uses tools, and interacts with its environment to complete tasks. With the emergence of LLMs, agents have gained the capacity to coordinate multi-step tasks through natural language rather than producing isolated conversational turns (Xi et al., 2023; Wang et al., 2024).

Compared with conventional chatbots, an agent can execute a sequence of actions: (i) eliciting user information, (ii) retrieving data from institutional systems (e.g., program information, tuition, admissions timelines), (iii) generating personalized advice, and (iv) triggering downstream actions—such as scheduling a call, sending materials, or writing to a CRM—under explicit policies and controls (Xi et al., 2023; Wang et al., 2024).

In admissions management, omnichannel design supports a consistent experience across channels and reduces discontinuities in applicants' decision journeys. However, end-to-end automation may introduce risks related to misinformation, bias, and limited accountability. Therefore, the proposed model emphasises human-in-the-loop (HITL) as a core design principle: humans intervene at higher-risk points (e.g., sensitive content, tuition and scholarship policies, complaints), while the agent automates standardised and repetitive tasks (Kotler et al., 2021; Shneiderman, 2022; UNESCO, 2023; NIST, 2023).

In this context, the two frameworks are complementary: omnichannel addresses reach and continuity, whereas HITL supports quality assurance and responsibility at decision-critical touchpoints.

Recent research on AI in higher education highlights the potential for automation in admissions, academic advising, and student services, while also warning about challenges such as data quality, ethics, bias, and accountability (Zawacki-Richter et al., 2019; Popenici & Kerr, 2017).

In Vietnam, many universities have adopted digital channels (websites/landing pages, chatbots, call centers), yet they often lack an agentic model that integrates multiple channels, retrieves authoritative information in real time, and enforces quality control through HITL. This gap motivates the framework proposed in this paper.

The study follows a Design Science Research (DSR) orientation: (i) identifying the governance problem of omnichannel admissions counseling; (ii) establishing design objectives and criteria; (iii) developing the artifact (an AI agent model and an integration architecture); (iv) illustrating the artifact through a use-case scenario; and (v) outlining a future pilot and evaluation plan. Accordingly, the paper primarily contributes at the conceptual model and design framework levels rather than reporting

empirical measurements (Hevner et al., 2004; Peffers et al., 2007).

Proposed model

The proposed model is expected to satisfy the following requirements: (1) personalized counseling based on applicant profiles and behaviors; (2) omnichannel integration (web/landing pages, Facebook/Zalo, email, phone); (3) access to authoritative information (RAG/knowledge base) to reduce misinformation; (4) support for nurturing workflows and lead conversion; (5) HITL, audit logs, and risk controls; and (6) compliance with personal data protection regulations and data processing principles (Government of Vietnam, 2023; NIST, 2023).

The proposed solution is organised as a three-layer reference architecture, with governance and compliance applied as cross-cutting concerns:

First, the omni-channel interaction layer consolidates messages from multiple touchpoints and maintains identity linkage and conversation state. This enables (a) recognising an applicant as they move between channels, (b) providing admissions staff with a complete interaction history, and (c) supplying context for personalised questioning and recommendations.

Second, the agentic cognition and orchestration layer separates two modules: (1) a knowledge module (RAG) that is constrained to institution-approved sources, and (2) a policy/workflow module that decides when to ask follow-up questions, request contact details, trigger nurturing, or initiate handover. This separation reduces the risk of inaccurate statements and strengthens controllability.

Third, the data and action layer integrates downstream systems (e.g., CRM, spreadsheets, admissions portals) to execute actions and synchronize data in real time, while preserving auditability.

A representative operating sequence includes: (1) receiving an inquiry from any channel; (2) intent classification and risk assessment; (3) retrieving authoritative knowledge via RAG; (4) generating a personalized response; (5) invoking tools/workflows (e.g., sending materials, creating a lead, scheduling a call); (6) handing over to human counselors at HITL trigger points; and (7) logging outcomes and feedback for iterative improvement (Lewis et al., 2020; Xi et al., 2023).

Human intervention points include approval of policy content, handling exceptions, responding when the agent reports high uncertainty, and managing complaints. This approach aligns with human-centred AI guidance that emphasises risk reduction and accountability (Shneiderman, 2022; UNESCO, 2023; NIST, 2023).

For stable operations, trigger conditions and service-level agreements (SLAs) should be specified for each lead state. For instance, "hot" leads—such as inquiries about deadlines, specific tuition amounts, or required documents—may require staff responses within 15 minutes, whereas "warm" leads can be nurtured through automated content sequences before a call. Standardising triggers and SLAs helps harmonise counselling quality across staff and generates data for performance evaluation.

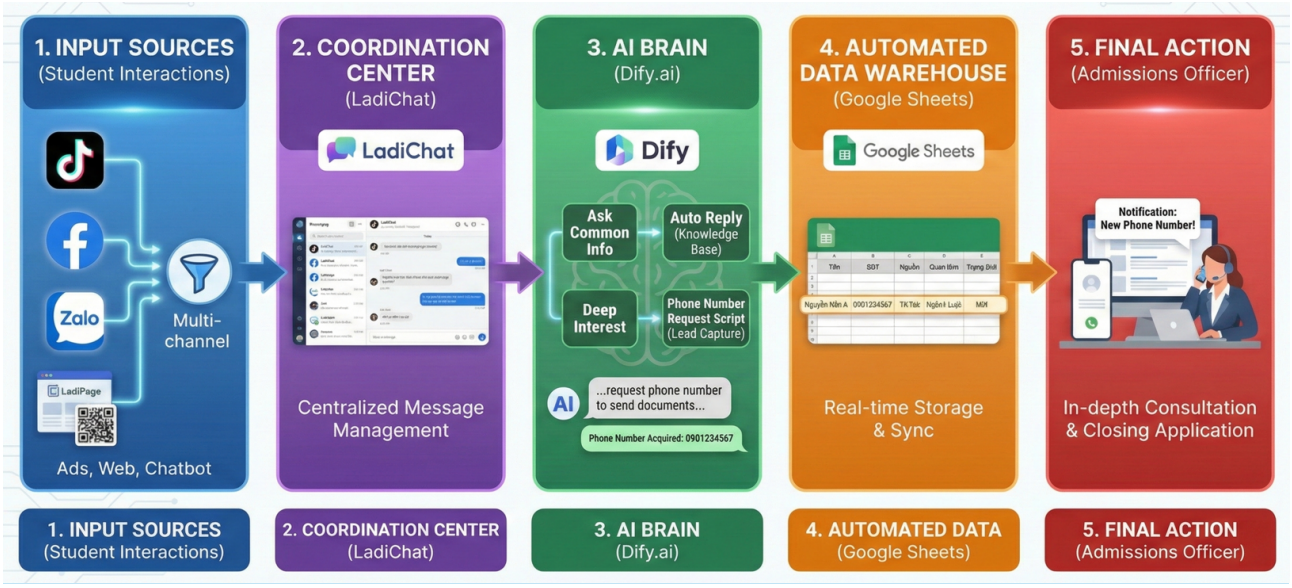
For an illustrative implementation, the paper suggests using Dify—an open-source platform for building LLM-enabled applications—to design agent workflows and the RAG pipeline, combined with LadiChat/LadiPage for omni-channel intake and automation triggers (LangGenius, n.d.; LadiChat, n.d.).

A key implementation practice is knowledge base governance: input documents should be

approved, versioned, and timestamped with effective dates, and the update process must have clear ownership. For personal data, establish access controls, access logs, and retention/deletion policies to comply with applicable regulations.

Figure 1

Omni-channel agentic AI model for admissions counselling (illustrative configuration)



Source: author(s) own development.

Conclusions

This study proposes an omnichannel agentic AI model that integrates practical components, including an omnichannel inbox, an LLM-based agent with RAG, and a real-time data capture layer. The shift from a passive chatbot to a task-oriented agent is expected to enhance responsiveness and operational consistency while retaining human oversight through HITL. The paper offers a reference architecture and an illustrative configuration that may be feasible for many Vietnamese universities, given common resource constraints.

For higher education institutions, early investment in data infrastructure and in staff capacity-building for agent design and knowledge governance is advisable to remain competitive in digital admissions. For future research, the proposed model should be piloted and evaluated using measurable indicators, and its application may be extended to other stages of the education value chain, such as academic support, current student services, and alums engagement.

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Impact of River Flooding on Learners' Academic Performance in Chilonga, Chiredzi South, Zimbabwe

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ABSTRACT: This qualitative study examines the impact of river flooding on learners' academic performance, particularly due to increased absenteeism in the Chilonga rural area. The primary aim is to explore how flooding affects learners' access to education and to address the gap in the literature regarding the specific implications of river flooding on academic outcomes in this region. Fifteen participants were purposively selected based on gender, experience, and knowledge relevant to the issue. Data were collected through open-ended interviews and were analysed thematically. The findings indicate that flooding, especially of the Chilonga River, severely restricts access to schools, which significantly contributes to poor academic performance and low pass rates. To address these challenges, local authorities are recommended to invest in flood-resistant infrastructure and community support initiatives to ensure reliable access to educational facilities during flood events.

KEYWORDS: absenteeism, academic performance, Chilonga, flooding.

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Introduction

The phenomenon of river flooding exerts a profound impact on educational accessibility in rural enclaves, a reality acutely manifested in the case of Chilonga in Chiredzi South, Zimbabwe. The calamitous destruction of the Chilonga Bridge over the Runde River on 12th March, 2025, has irrevocably severed a crucial conduit linking Chiredzi South to the Central Business District, thereby exacerbating the myriad challenges confronting learners from diverse villages (TellZim, 2025). These learners now grapple with the formidable task of traversing flooded rivers, often resulting in their unanticipated entrapment or coercion into precarious living arrangements characterised by insecurity and vulnerability. Certain schools in the vicinity of the Chilonga River, as well as other areas, have reported alarmingly low pass rates—some reaching as low as zero—in crucial national examinations, including Grade 7, Ordinary Level (O-Level), and Advanced Level (A-Level) assessments (Mhlanga & Chidarikire, 2025). This disconcerting trend can be attributed to several compounding factors, foremost among them being the incessant flooding of rivers that severely restricts learners' access to educational opportunities (Asare et al, 2024).

Additionally, the chronic shortage of qualified teachers and inadequate educational resources, such as textbooks and other essential materials, further exacerbates this precarious situation (Bombardelli, 2020; Ihemeso, 2024). Consequently, these interrelated challenges culminate in diminished academic performance, hindering the educational advancement of learners in these communities (Gandidzamwa & Togo, 2021). This tragic predicament not only jeopardises the physical safety of learners but also precipitates a marked increase in absenteeism, consequently undermining academic performance (Chiponda, 2022). Historically, the bridge functioned as a pivotal artery, fostering not only educational engagement but also facilitating access to essential services such as healthcare and financial institutions. With the dismantling of this vital infrastructure, countless residents of the Xhangani community find themselves ensnared, subjected to heightened risks, including tragic fatalities during flooding events. Despite a body of literature acknowledging the ramifications of natural disasters for educational paradigms, a palpable gap persists regarding the nuanced implications of flooding for academic outcomes in rural domains akin to Chilonga. This study seeks to illuminate this gap by meticulously examining the interrelationships among river flooding, student absenteeism, and academic achievement. Through this exploration, the research endeavours to yield insights that will fuel the development of effective policy interventions and bolster community support initiatives to mitigate the adverse effects of such environmental challenges.

Literature Review

In the United States, particularly in flood-prone regions, learners frequently experience school closures, resulting in lost instructional time and disrupted academic progress (Hanna & Oliva, 2016). The displacement of families often leads to instability, further complicating learners' ability to focus on their education. Similarly, in South Africa, flooding isolates rural communities, making it difficult for

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learners to reach their schools (Macheka, 2024). The limited transport infrastructure exacerbates this issue, leaving many learners unable to attend classes during critical periods. In Zimbabwe, infrastructure inadequacies are glaring, as evidenced by the collapse of bridges such as the Chilonga Bridge (Muzingili et al., 2025). This collapse not only isolates villages from educational institutions but also exposes learners to hazardous conditions when attempting to traverse flooded areas. Despite existing studies on the general impacts of flooding on education, there remains a significant gap in understanding the specific educational outcomes associated with river flooding in these regions, particularly regarding attendance rates and performance metrics.

In response to these challenges, various strategies have been developed to mitigate the effects of river flooding on learners. In the United States, schools are increasingly adopting comprehensive emergency preparedness plans, incorporating alternative educational methods, such as online learning, to ensure continuity during flooding events (McKenzie et al., 2024). However, there is limited research exploring the effectiveness of these plans in enhancing student outcomes amidst varying flood scenarios. In South Africa, government initiatives focus on improving flood-resilient infrastructure, including the construction of robust school buildings and the enhancement of transportation networks to secure safe access for learners during adverse weather conditions (Jashari & Rao, 2024). However, the impact of such infrastructure improvements on actual student attendance and performance has not been extensively studied. In Zimbabwe, community-based strategies, such as establishing temporary learning centres during flood events, have shown promise; however, systematic evaluations of their effectiveness in sustaining educational engagement and minimising disruptions are lacking (Dzvimbo et al., 2020). This study seeks to address these research gaps by examining the specific impacts of river flooding on educational outcomes and assessing the effectiveness of mitigation strategies across three distinct contexts.

Findings

Firstly, the destruction of essential infrastructure, especially the Chilonga Bridge, has severely restricted learners' access to educational facilities, resulting in increased absenteeism and heightened vulnerability for learners attempting to cross flooded areas. Moreover, schools in Chilonga have experienced alarmingly low pass rates in national examinations (some as low as zero), attributed to persistent flooding, a shortage of qualified teachers, and inadequate educational resources. Lastly, current strategies, such as community-based temporary learning centres and improved infrastructure, have not been systematically evaluated, highlighting a critical gap in understanding their effectiveness in sustaining educational engagement during flood events.

Conclusion

In Chilonga, Chiredzi South, river flooding poses a significant barrier to learners' academic

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performance, primarily by limiting their access to educational facilities and leading to higher absenteeism rates. The destruction of essential infrastructure, such as bridges, further exacerbates these challenges, isolating communities and increasing learners' vulnerability. Consequently, learners encounter not only logistical barriers but also safety concerns, which collectively undermine their educational achievements.

Recommendations

To effectively address the challenges posed by river flooding, it is recommended that parents engage in school-community dialogues to facilitate their children's consistent attendance and stay informed about educational initiatives. More so, the Ministry of Roads, Infrastructure, and Development should invest in flood-resistant infrastructure, including the repair and upgrading of roads and bridges, to ensure reliable access to schools. Additionally, school authorities and teachers are encouraged to adopt flexible learning strategies, such as blended education models and temporary learning sites during floods, to maintain instructional continuity and support displaced learners. Furthermore, village heads should promote local preparedness initiatives to educate residents on flood navigation and establish community networks for affected families. Lastly, parliamentarians must champion policies that allocate the necessary resources to improve educational infrastructure and enhance disaster-preparedness programs.

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Transforming Tertiary Education in 2026: Navigating Disruption, Deepening Innovation, and Redefining Inclusivity

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ABSTRACT: This paper examines the transformation of tertiary education in 2026, analysing how institutions navigate disruption through innovation, inclusivity, and sustainability. Drawing on recent research and case studies from 2025-2026, this study explores the integration of artificial intelligence, the challenges to diversity and equity initiatives, the imperative of sustainability, and the critical importance of learner and faculty well-being. The findings reveal that successful institutions embrace adaptive leadership, prioritise human connections alongside technology, and maintain commitment to equity and sustainability despite external pressures. The research demonstrates that financial resilience requires diversified revenue streams, strategic re-enrollment initiatives, and a clear demonstration of return on investment. This study provides evidence-based recommendations for institutional leaders to transform tertiary education into a more adaptive, human-centred system that meets the complex demands of our interconnected world.

KEYWORDS: tertiary education, innovation, artificial intelligence, inclusivity, equity, sustainability, well-being, digital transformation, higher education transformation, career readiness.

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Introduction

The transformation of tertiary education shifted from an opportunity to an existential necessity, driven by advancements in artificial intelligence, sustainability initiatives, and rapidly changing global ecosystems (Maalouf, 2024). The past year has witnessed significant disruptions, including federal policy shifts, funding cuts, and ongoing challenges to diversity, equity, and inclusion (DEI) efforts (Higher Ed Dive, 2026). However, this turbulence also presents an opportunity to redefine tertiary education as more adaptive and human-centred, thereby meeting the complex demands of an interconnected world. This paper builds upon the 2024 IntechOpen chapter 'Transforming Tertiary Education: Navigating the Future through Innovation and Inclusivity,' providing an updated analysis of key transformation dimensions: innovation in the age of AI, the evolving landscape of inclusivity and equity, the urgent imperative of sustainability, and the paramount importance of well-being for both educators and learners.

Research Aim and Research Questions

This study aims to analyse how tertiary education institutions navigate unprecedented disruptions in 2026 while advancing innovation, inclusivity, and sustainability. This study addresses the following research questions: (1) How has artificial intelligence integration transformed teaching, learning, and institutional operations? (2) What strategies are institutions employing to maintain equity and inclusion despite political challenges to DEI initiatives? (3) How are universities integrating sustainability into their missions and operations? (4) Which approaches are most effective in supporting learner and faculty well-being during periods of significant institutional stress?

Analysis of Recent Research and Publications

Recent research indicates that by 2025, 86% of educational organisations had adopted generative AI, representing the highest adoption rate of any industry (Microsoft Education Team, 2025). However, concerns about data security (59%) and academic integrity (78%) highlight the need for responsible AI deployment (WTW, 2026). The 2026 IT Strategic Landscape in Higher Education report demonstrates that digital transformation has transitioned from a future goal to a permanent operational reality, with nearly two-thirds of learners demanding digital-first options.

Regarding inclusivity, research shows that the Trump administration's 2025 executive order eliminating federal DEI programs has significantly impacted institutions, with 74% of affected faculty experiencing negative mental health effects. Despite these challenges, successful institutions are committed to equity through universal design, personalised support systems, and holistic learner services. Studies have demonstrated that hyper-personalisation strategies significantly improve retention and completion rates, as evidenced by Salt Lake Community College's re-enrollment rate, which is five times the national average (InsideTrack, 2026).

Sustainability research indicates that universities are increasingly positioning themselves as climate leaders. The Times Higher Education Impact Rankings for 2025 assessed 1,089 universities from 105 countries on SDG 13 (Climate Action), revealing significant progress in mitigation, adaptation, and sustainability education. The establishment of Kuwait's Ministry of Sustainability and Development on February 1, 2026, exemplifies the government's recognition of the critical importance of sustainability.

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Well-being research reveals a crisis: 49% of learners report considering stopping out due to emotional stress, and 41% cite mental health reasons (InsideTrack, 2026). Faculty burnout is equally concerning, with 63% of Ivy League and private R1 institutions implementing hiring freezes and merit pools shrinking to a median of 3% (WTW, 2026). The American Psychological Association's June 2025 health advisory warned that AI tools prioritising speed over well-being can exacerbate learner anxiety.

Research Results

The AI Revolution: Promise and Peril. By 2026, AI integration will have become essential rather than optional in tertiary education. Successful institutions view AI as a means of enhancing human connection, creating 'hybrid spaces' in which technology manages routine tasks while educators provide essential support, thereby fostering learner success. This approach requires clear policies, ethical frameworks, and transparent communications. However, institutions must maintain human oversight in critical learners' decisions to preserve the human heart of education. The research reveals that effective AI deployment focuses on augmenting rather than replacing human interaction, with time saved through automation redirected toward deepening one-on-one learner relationships.

Digital Transformation as Permanent Reality. Digital transformation has become a daily operational necessity, extending beyond infrastructure to require intentional design of online learning environments that combat isolation and foster community. Research has demonstrated that online learners are at greater risk of loneliness in the absence of physical campus touchpoints. Institutions that provide specialised support services—dedicated coaching, virtual community building, and accessible mental health resources—achieve significantly higher retention and completion rates. This evolution reflects a holistic skill-development framework that emphasises emotional, social, cognitive, and metacognitive competencies essential for success in the 2030 job market.

The DEI Crisis and Strategic Responses. The 2025-2026 period witnessed unprecedented challenges to diversity, equity, and inclusion in higher education. Following the federal DEI program elimination, many institutions scaled back initiatives under funding threats, negatively impacting faculty mental health and learners' belonging, particularly among marginalised groups. However, resilient institutions continue promoting equity through accessible curricula, holistic support systems, diverse hiring practices, and inclusive communication. Hyper-personalisation has emerged as a critical equity strategy, with diverse learner populations, including adult, first-generation, and international learners, demanding individualised support to address their specific challenges and goals.

Sustainability Leadership. Universities worldwide are acting as climate leaders, with many joining the Association for the Advancement of Sustainability in Higher Education's Campus Decarbonization Academy. Effective sustainability integration encompasses teaching, curriculum design, campus operations, administration, and stakeholder involvement. Essential elements include mapping sustainability across disciplines, integrating assessment tools, providing training, establishing environmental certifications, and implementing initiatives to reduce carbon footprints. Institutions such as Stanford University are finalising comprehensive Climate Action Plans, while Columbia University has introduced mandatory sustainability coursework beginning in Fall 2025. This comprehensive approach cultivates a culture of sustainability within tertiary institutions, inspiring graduates to carry these values into their future careers.

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Well-Being Crisis and Holistic Solutions. By 2026, learner and faculty well-being will have reached crisis levels. Research indicates that 49% of learners consider dropping out due to emotional stress, while faculty burnout is exacerbated by technological change, increasing pressures, and the aftermath of the pandemic. Successful institutions implement holistic wellness strategies, including proactive coaching, early recognition of signs of mental health challenges, emergency microgrant programs that address sudden financial crises, integrated wellness services that collaborate with community partners, and digital well-being initiatives that guide healthy technological habits. These comprehensive approaches recognise that learner success is inseparable from well-being; when mental health is supported, learners are more likely to persist, complete degrees, and thrive post-graduation.

Financial Resilience Strategies. The One Big Beautiful Bill Act (OBBA), effective July 2026, introduces sweeping changes, including the elimination of Grad PLUS loans, learner borrowing caps, and tiered endowment tax structures. Institutions face challenging financial climates amid declining international enrollment and demographic shifts. Moody's Ratings projects 3.5% revenue growth in 2026 with 4.4% cost increases. Despite pressures, institutions achieve financial sustainability through diversified revenue streams (continuing education, micro-credentials, employer partnerships, online programs), data-driven ROI demonstrations, holistic re-enrollment initiatives, and strategic change management. These adaptive approaches maintain fiscal discipline while fulfilling educational missions.

Re-enrollment and Career Readiness. The 2026 shift recognises that re-enrollment initiatives must be holistic, sustained, and strategically integrated rather than occasional campaigns. Successful programs address complex systemic obstacles—rigid transfer policies, financial aid holds, work-family responsibilities, academic burnout—through coaching-based approaches. The UNCF network brought 300+ formerly stopped-out learners back to HBCUs and PBIs, exceeding its goals, whereas California Reconnect achieved a 12.7% re-enrollment rate. Regarding career readiness, institutions respond to demands for evidence that degrees lead to meaningful careers by aligning programs with workforce demands, tracking and publishing career outcomes, offering career-focused credentials, and providing career coaching. This emphasis builds trust, attracts enrollment, and promotes economic and social mobility.

Conclusions

This research demonstrates that the transformation of tertiary education in 2026 represents an ongoing process of adaptation, learning, and renewal rather than a destination. Institutions that thrive maintain a steadfast commitment to innovation, inclusivity, sustainability, and well-being despite external pressures threatening these values. Key findings reveal that successful transformation requires: (1) adaptive leadership capable of rapid pivoting, transparent communication, and collaborative stakeholder engagement; (2) prioritization of human connection alongside AI and automation, recognizing that belonging, empathy, mentorship, and advocacy remain irreplaceable; (3) commitment to equity principles through universal design and personalized support even when explicit DEI language faces political opposition; (4) comprehensive sustainability integration across curricula, research, operations, and community partnerships; (5) holistic, proactive well-being approaches for both learners and faculty; and (6) clear, data-driven demonstration of value, ROI, and community

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impact.

The research reveals that today's reality demands institutions that are not only innovative but profoundly human-centred, not only inclusive but actively anti-oppressive, not only sustainable but regenerative, and not only supportive of well-being but healing in a fractured world. By embracing transformation as an ongoing commitment rather than a one-time project, tertiary education can fulfil its highest calling: educating, empowering, and inspiring business leaders, innovators, and change-makers who will shape the future of our interconnected world. Future research should examine longitudinal impacts of AI integration on learning outcomes, the effectiveness of alternative equity approaches in politically restrictive environments, and the long-term sustainability of diverse revenue models under continued fiscal pressure.

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The Specific Characteristics of Greek Students as Users of Spanish AFL

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ABSTRACT: The construction of systematic corpora comprising written production by non-native speakers enables a more precise and reliable assessment of language proficiency levels and text readability, thereby contributing to the enhancement of foreign language education. The present study is based on the compilation of a corpus of written texts produced over ten years by Greek undergraduate students from various departments of the Aristotle University of Thessaloniki who attended the elective course "Spanish Language A1." All collected texts were digitised as Word files and subsequently analysed using readability assessment tools in combination with *Tableau* statistical analysis software. The research examines morphological, grammatical, lexical, and syntactic features, analysed alongside quantitative and demographic variables, with the aim of identifying factors that influence written language production by non-native learners. The present research constitutes a pilot phase of a broader investigative framework, laying the groundwork for future studies and for the potential development of assessment tests targeting additional levels of language proficiency. Moreover, the findings of this study contribute to the refinement of more accurate language proficiency and readability assessment instruments and to the development of a new learner corpus.

KEYWORDS: readability, A1 language level, university, non-native, Spanish.

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Introduction

Text readability refers to the ease with which readers can read, comprehend, and process written text and constitutes a critical parameter in the analysis and evaluation of linguistic material (Crossley et al., 2008). Readability is influenced by a range of linguistic and structural factors, including lexical and morphological complexity, syntactic structure and word orthography, sentence and word length, and the coherence and organisation of the text (Kapeta, 2024a).

In recent years, increasing attention has been devoted to the impact of linguistic, morphological, lexical, and syntactic parameters on text readability, particularly when texts are produced by non-native speakers of a language (Dmitrieva et al., 2021).

The study of readability contributes substantially to the evaluation of educational materials, the analysis of texts produced by non-native speakers, and the development of reliable language assessment tools (Graesser et al., 2011).

Highlighting distinctions in language proficiency levels and text readability (Kapeta, 2024) can be regarded as a fundamental incentive for creating databases in foreign language education, as they facilitate the identification of both the strengths and potential weaknesses of non-native speakers of a foreign language (Wardak, 2014). The utilisation of such data may further lead, in the future, to the development of innovative educational materials, contributing to the improvement of foreign language teaching within the educational and academic community, as well as to the more effective learning of these languages by learners themselves as non-native speakers (Sanchez-Gordon & Luján-Mora, 2015).

In conclusion, the present study examines the performance of Greek undergraduate students in written production in Spanish through end-of-semester examinations conducted from 2016–2025. The analysis of data spanning nearly a decade enables reliable results and substantiated conclusions regarding the specific characteristics of these language users.

Research Aim and Research Questions

1. Concurrently, the study examines the factors that determine the degree of difficulty or ease in constructing sentences and longer texts for Greek users of Spanish as a foreign language (Kapeta & Klonis, 2024). Furthermore, it explores how a text can be classified as representative of the A1 language proficiency level through its association with specific linguistic and quantitative variables (Kapeta, 2020a).
2. The present study focuses on identifying and analysing the core characteristics that define Greek undergraduate students as non-native speakers of the Spanish language in written production (Kapeta, 2020b). In particular, it investigates the relationship between specific variables and the readability levels of texts produced within the context of Spanish as an elective course (Hubert, 2008).

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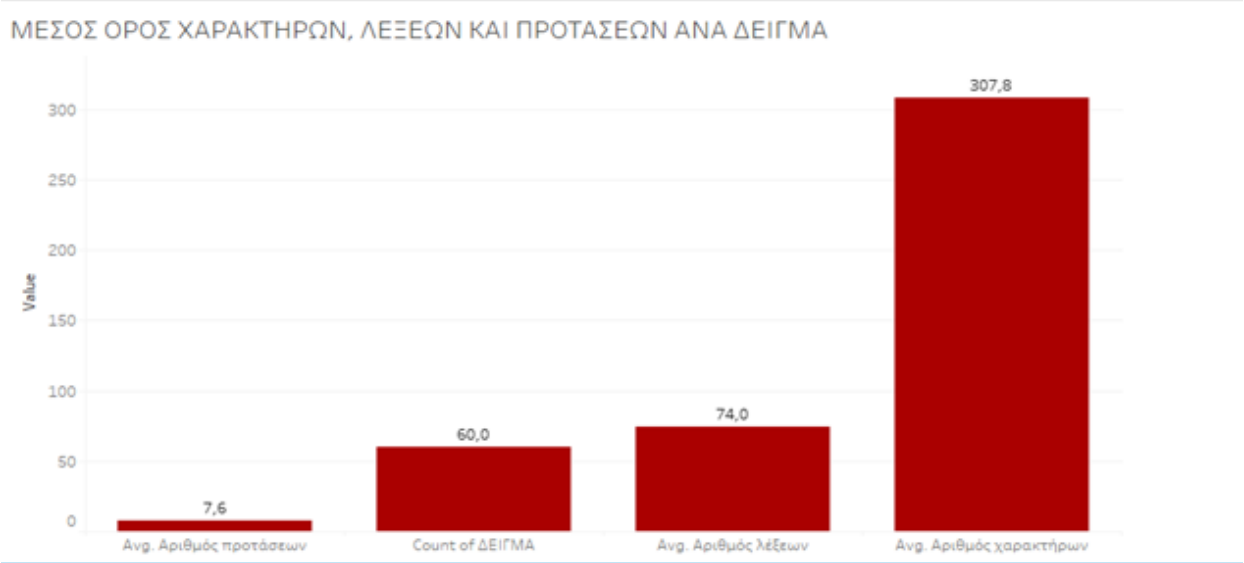
3. Finally, the research investigates the primary characteristics that differentiate male and female Greek students as users of Spanish in written production, aiming to highlight potential differences in performance and text readability (Hou-Keat, Hassan & Ramli, 2017).

Research Results

In the following figure [Figure 5], the mean values of characters, words, and sentences per sample are presented. Specifically, an average of 307.8 characters, 74 words, and 7.6 sentences per sample was recorded. Across all parameters, students achieved relatively high values, indicating their ability to produce A1-level texts with ease, with vocabulary, morphological, and syntactic features consistent with this proficiency level (Khushik, 2025). Furthermore, Figure 5 suggests that students were generally capable of employing an adequate number of words, characters, and sentences for the given language proficiency level (Kapeta, 2024b), as only a minimal number of texts received a score of zero or fell below the passing threshold, which in the Greek higher education system corresponds to a grade of 5.

Figure 1

Average Number of Characters, Words, and Sentences per Sample



Building on previous data analysis and examining the potential challenges faced by male and female Greek students using Spanish at the A1 proficiency level, the following observations emerge. Figure 2 presents male students in blue and female students in orange. The results are compared sequentially by gender in terms of the average number of words, sentences, and characters produced. At the top of the figure, corresponding to the average number of words, male students produced a general majority of 129.00 words on average, compared to 106.00 words for female students. Both genders appear to use words with relative ease, particularly females, who exhibit the widest range of

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average word counts, from 41.00 to 106.00. This suggests that both male and female students can comprehend instructions and generate texts containing the required word counts for the A1 level with relative ease.

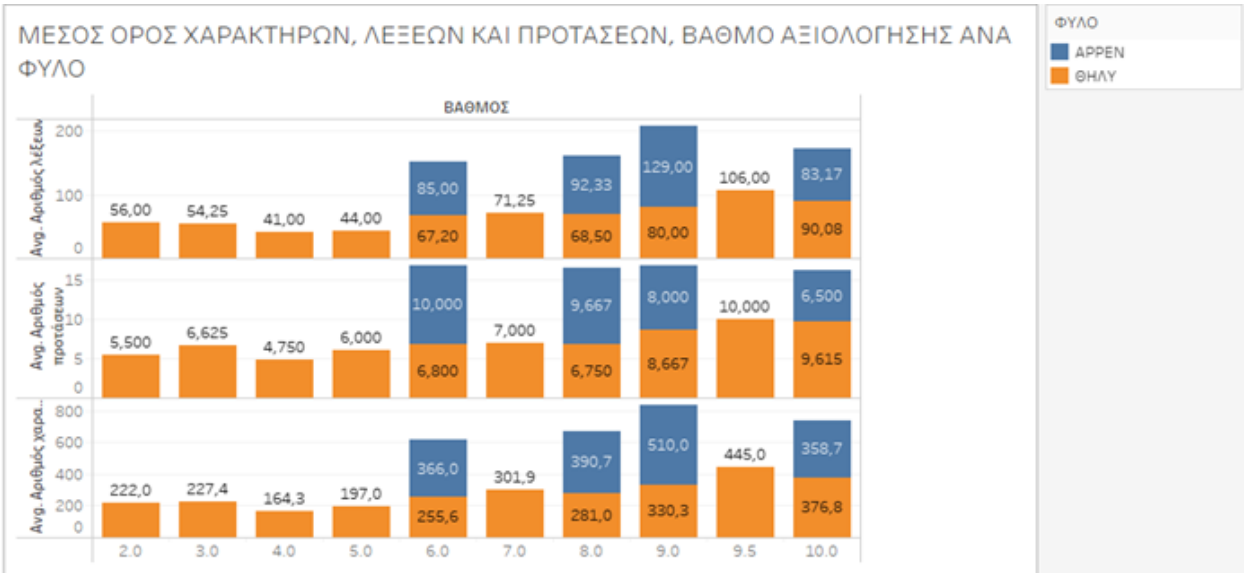
In the second segment, the majority of both male and female students produced an average of 10.00 sentences, while the minimum averages were 6.5 for men and 4.8 for women. These findings indicate a general ease in sentence production across both genders, with male students displaying slightly higher minimum sentence counts despite their smaller sample size, reflecting positive performance.

Finally, regarding character counts, the majority of male students and the overall sample averaged 510.00 characters, which is notably high for the A1 level. Female students also demonstrated a substantial average of 445.00 characters. Overall, these results indicate that both genders of Greek students exhibit facility in producing texts with an adequate range of characters for this proficiency level.

Regarding the final evaluation, the largest portion of the sample received a final grade of 9 out of 10, corresponding to an excellent score in the Greek higher education system. Across all analysed parameters, both male and female students maintained high average scores, indicating that they were generally able to utilise these linguistic elements effectively.

Figure 2

Average numbers of characters, words, and sentences, along with final evaluation grades, broken down by gender (male students represented in blue and female students in orange)



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Conclusions

From this extensive collection of 60 samples, covering nearly a decade and produced by Greek students using Spanish as a foreign language at the A1 level, several conclusions can be drawn. First, both male and female students, as non-native speakers of Spanish, appear to handle the production of simple texts at the A1 level with relative ease, showing no significant difficulty in using the expected number of words, sentences, and characters. Second, in terms of readability, both genders achieve averages close to normal levels, with 47.7% for men and 45.8% for women, results that are encouraging for this proficiency level. Third, analysis of the final grades of the written examinations—bearing in mind that a single examiner assessed all—reveals that the majority of students, 19 out of 60, attained the maximum grade of 10, considered an excellent mark within the Greek higher education grading system. Only two students received a low score of 2, while a single student achieved the passing grade of 5. The remaining students scored between 6 and 9, successfully passing the written examination for A1-level production.

The creation of a nationwide, or even international, database containing analogous results for each language and proficiency level would provide a broader understanding of the profile of non-native speakers in higher education (Gutierrez-Sigut et al., 2016).

In conclusion, the present study constitutes a pilot phase of a larger research initiative, examining the potential use of statistical analysis tools such as Tableau, alongside instruments for measuring readability and text difficulty in Spanish, including the Spanish Readability Tool (https://www.spanishreadability.com/), to support the development of assessment tests and to explore additional levels of language proficiency.

In conclusion, these findings present a largely positive picture of how Greek students, despite being non-native speakers, manage the production of written texts at the A1 Spanish level. They also underscore the value of offering foreign language courses in higher education, as participation by non-native speakers provides meaningful insights into language learning outcomes in elective courses.

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Revisiting Linguistic Evaluation of ELT Coursebooks in the Era of AI

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ABSTRACT: This study revisits linguistic evaluation of English language teaching (ELT) coursebooks in light of recent developments in corpus linguistics and artificial intelligence (AI). While traditional coursebook evaluation has largely emphasised pedagogical and practical criteria, emerging research highlights the need for more systematic analysis of linguistic content, including lexical, grammatical, and discourse features. Drawing on a structured review of previous studies, this conceptual investigation examines how corpus-informed and AI-supported tools have been applied to linguistic analysis of ELT materials and identifies key trends, challenges, and methodological gaps. The findings indicate growing reliance on automated lexical and syntactic analysis, alongside persistent limitations in discourse-level evaluation and theoretical integration. The study argues that AI-supported tools should function as analytical supports rather than autonomous evaluators and emphasises the importance of grounding data-driven analysis in established linguistic theory. This reconceptualisation contributes to a clearer methodological understanding of linguistic evaluation in the era of AI.

KEYWORDS: ELT coursebooks, linguistic evaluation, corpus linguistics, artificial intelligence, language teaching materials.

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Introduction

English language teaching (ELT) coursebooks remain a central component of English language education, particularly in higher education contexts, where they serve as the primary source of linguistic input. In many English Language Studies programs, coursebooks shape learners' exposure to vocabulary, grammatical structures, and discourse patterns across different skills and academic tasks. Despite their importance, the evaluation of ELT coursebooks has traditionally emphasised pedagogical and practical concerns, such as skills balance, task design, topic relevance, and classroom usability, rather than detailed analysis of linguistic content (Gholampour & Mehrabi, 2023; Shak *et al*., 2022).

At the same time, applied linguistics has witnessed significant growth in corpus linguistics and AI-supported language analysis. These developments have made it possible to examine linguistic features of texts in systematic and replicable ways. Vocabulary frequency profiling, syntactic complexity analysis, and discourse cohesion measurement are now increasingly accessible through Artificial Intelligence (AI) and Natural Language Processing (NLP) tools (Kyle & Crossley, 2015). However, the integration of these tools into ELT coursebook evaluation remains uneven and conceptually underdeveloped (Ghazali *et al*., 2025; Kyaw & Jie, 2025). Previous work has argued that, when pedagogically grounded, digital technologies can enhance learner autonomy, support authentic language use, and address diverse learning needs, rather than merely replicating traditional instructional practices (Tran & Ly, 2025).

This situation raises important questions about how linguistic evaluation of coursebooks should be reconceptualised in the era of AI. Rather than replacing established evaluation practices, AI-supported analysis can complement linguistic theory and expert judgment. Revisiting linguistic evaluation in this context is therefore necessary to clarify methodological principles, identify emerging trends, and address persistent gaps in materials evaluation research.

Research Aim and Research Questions

This study aims to revisit linguistic evaluation of ELT coursebooks by examining how AI-supported and corpus-informed approaches can enhance existing evaluation practices.

To achieve this aim, the study addresses the following research questions:

1. What linguistic dimensions have been emphasised in previous approaches to ELT coursebook evaluation?
2. How have corpus linguistics and AI-supported tools been applied to linguistic analysis of ELT materials in recent research?
3. What trends, challenges, and methodological gaps emerge from current studies on AI-supported linguistic evaluation of coursebooks?

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Literature Review

Early research on ELT coursebook evaluation focused on providing teachers with practical frameworks for selecting and adapting materials. These frameworks typically emphasised pedagogical alignment, learner needs, and instructional feasibility. While linguistic aspects were acknowledged, they were often treated broadly and evaluated through impressionistic judgment rather than systematic analysis (Cunningsworth, 1995; McDonough *et al*., 2013; Tomlinson, 2011).

Subsequent developments in corpus linguistics shifted attention toward empirical investigation of language use in teaching materials. Corpus-based studies demonstrated that coursebooks do not always reflect authentic language patterns and may misrepresent proficiency levels. Vocabulary distribution, grammatical sequencing, and discourse organisation in coursebooks have been shown to differ from those in naturally occurring language, raising concerns about the adequacy of the linguistic input provided to learners (Biber *et al*., 2012; Römer, 2005; Nation, 2018).

More recently, AI and NLP tools have been introduced into linguistic research, enabling automated analysis of large text datasets. Studies have employed tools for vocabulary profiling, measuring syntactic complexity, and analysing cohesion to examine educational texts. These tools offer advantages in terms of efficiency and objectivity, but they also raise concerns about over-reliance on automated metrics without sufficient theoretical grounding (Graesser *et al*., 2004; McEnery & Hardie, 2012).

Despite these advances, existing research often applies AI tools in isolated ways, focusing on single linguistic features rather than integrated evaluation. Moreover, few studies explicitly address how AI-supported analysis can be incorporated into a coherent linguistic evaluation framework for ELT coursebooks. This gap suggests the need for conceptual clarification and methodological synthesis (Biber *et al*., 2011; Tomlinson, 2013).

Research Methodology

This study adopts an exploratory, qualitative-oriented analytical approach, drawing on a structured review of the literature on the linguistic evaluation of ELT coursebooks, corpus linguistics, and AI-supported text analysis. Relevant studies were examined to identify how lexical, grammatical, and discourse features have been investigated using data-driven and AI-based tools.

The analysis focuses on synthesising methodological patterns and research trends rather than conducting empirical corpus experiments. The study is descriptive in nature and does not aim to validate an evaluation framework or measure pedagogical effectiveness, but to clarify how linguistic evaluation has been conceptualised in current research.

Research Results

In this conceptual study, the research results are presented as a structured synthesis of findings

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from recent literature and theoretical analysis. Rather than reporting experimental outcomes, this section identifies key directions, trends, and patterns in current research on linguistic evaluation of ELT coursebooks in the era of AI (Curry & McEnery, 2025; Khojasteh & Mukundan, 2025; Yang & Kyun, 2022).

Linguistic Dimensions Emphasised in ELT Coursebook Evaluation

Previous research on ELT coursebook evaluation has consistently emphasised three main linguistic dimensions: lexical, grammatical, and discourse features, with varying degrees of analytical depth.

Recent studies indicate a growing emphasis on lexical analysis supported by AI tools. Vocabulary profiling using frequency lists and CEFR-based classification has become one of the most common applications of AI in materials evaluation (Cooper, 2025; Heatley *et al*., 2002; Kyle & Crossley, 2015; Sameephet *et al*., 2025). These studies consistently show that coursebooks vary considerably in lexical sophistication, with some materials introducing advanced vocabulary too early and others providing insufficient exposure to academic lexis (Coxhead, 2000; Mai *et al*., 2024; Sun & Dang, 2020).

At the grammatical level, AI-supported analysis has enabled more precise measurement of syntactic complexity. Research has highlighted differences in sentence length, clause density, and grammatical patterns across coursebooks targeting similar proficiency levels (Li *et al*., 2025; To, 2018). Such findings suggest that grammatical progression in coursebooks is not always systematically aligned with learner development (Garth, 2022; Skela & Burazer, 2021).

Discourse-level analysis remains less developed but has gained increasing attention. AI-supported tools have been used to examine cohesion markers, referential ties, and organisational patterns in coursebook texts (Crossley *et al*., 2016; Graesser *et al*., 2004). Results indicate that many materials provide limited models of extended academic discourse, particularly in reading and listening texts intended for higher education (Hoang & Crosthwaite, 2024; Hyland, 2004; Zhang, 2017). Empirical classroom-based studies, for example, those examining role-play activities (Ferdian & Nirwana, 2021; Ly, 2024), suggest that linguistically rich materials can foster authentic communication, learner engagement, and higher-order language use when they provide meaningful discourse contexts rather than isolated language practice.

Application of Corpus Linguistics and AI-Supported Tools in Linguistic Analysis

Recent studies have increasingly applied corpus linguistics and AI-supported tools to examine linguistic features of ELT materials, primarily through automated lexical, grammatical, and discourse analysis.

A recurring pattern in the literature is the use of AI tools as stand-alone analytical instruments. While these tools generate valuable quantitative indicators, studies often lack clear explanations of how

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results are interpreted within linguistic theory (Curry *et al*., 2025; Önem, 2025). This limits the explanatory power of findings and may lead to oversimplified conclusions about material quality.

Another limitation concerns the scope of analysis. Many studies focus on single linguistic dimensions, such as vocabulary or readability, without examining interactions between lexical, grammatical, and discourse features (Chen, 2016; Xu & Ye, 2025). This fragmented approach does not fully capture the complexity of language input in coursebooks.

Trends, Challenges, and Gaps in Linguistic Evaluation of ELT Coursebooks

The synthesis of current research suggests a need for integrated, theory-informed approaches to linguistic evaluation. AI-supported tools are most effective when used to support expert interpretation rather than to generate evaluative judgments independently (Alaqlobi *et al*., 2024; Chapelle & Chung, 2010). Combining corpus-informed analysis with linguistic theory allows researchers to identify meaningful patterns while maintaining contextual sensitivity (Barlow, 2011; Matouq & Alqabba, 2025). This need for integration also aligns with broader materials evaluation research, which emphasises that effective evaluation should be holistic, flexible, and responsive to learner needs rather than narrowly focused on isolated criteria (Ly, 2025).

Overall, the findings indicate that AI has significant potential to enhance linguistic evaluation of ELT coursebooks, provided that its use is guided by clear theoretical principles and methodological coherence (Alaqlobi et al., 2024; Curry *et al*., 2024; Groenewald *et al*., 2024).

Conclusions

This study revisits the linguistic evaluation of ELT coursebooks in light of recent developments in AI and corpus linguistics. The analysis highlights a shift toward data-driven linguistic analysis, particularly at the lexical and grammatical levels, while also revealing persistent gaps in discourse-level evaluation and framework integration.

The study concludes that AI-supported tools should be viewed as analytical supports that complement linguistic expertise rather than replace it. Effective linguistic evaluation requires careful interpretation of AI-generated data within established theoretical frameworks. Future research should focus on developing integrated linguistic evaluation models that combine multiple linguistic dimensions and clarify the role of AI in materials analysis.

Further studies may also explore empirical applications of such models across different educational contexts and proficiency levels. By strengthening the linguistic foundation of coursebook evaluation, researchers and educators can make more informed decisions about materials selection and development in higher education.

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Integrating AI-Supported IELTS Writing Tasks into an ELT Writing Course for Sustainable Teacher Education: A Qualitative Study of Pre-Service English Teachers' Experiences

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ABSTRACT: The integration of artificial intelligence (AI) into academic writing instruction has generated growing pedagogical and ethical debate, particularly in teacher education and high-stakes assessment contexts such as IELTS writing. Although AI-supported writing tools offer opportunities for feedback, revision, and language development, qualitative evidence on how pre-service English teachers experience these tools within structured ELT writing courses remains limited. This qualitative case study examines pre-service English teachers' experiences with AI-supported IELTS Writing Task 1 and Task 2 activities integrated into a compulsory Academic Writing course at a foundation university in İstanbul, Türkiye. The participants consisted of 49 pre-service English teachers. Data were collected through multiple qualitative sources, including initial and revised IELTS writing drafts, structured reflective journals, and semi-structured interviews with 10 purposively selected participants. The data were analysed using thematic analysis. The findings indicate that AI primarily functioned as a pedagogical scaffold supporting idea generation, revision, and linguistic awareness rather than replacing student authorship. Participants reported increased assessment literacy through closer engagement with IELTS criteria, heightened awareness of ethical use of AI, and growing authorial responsibility. Additionally, AI-supported writing practices contributed to learner autonomy, reflective practice, and the emergence of professional identities. The study suggests that pedagogically guided AI integration in IELTS writing can support sustainable ELT teacher education, aligning with SDG-4 by fostering digital competence and lifelong learning skills.

KEYWORDS: AI-supported writing; IELTS writing; pre-service English teachers; sustainable teacher education; assessment literacy.

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Introduction

Recent advances in artificial intelligence (AI) have profoundly influenced educational practices, particularly in second-language (L2) writing instruction, where AI-powered tools provide automated feedback on grammar, coherence, lexical choice, and organisation (Godwin-Jones, 2022; Zhai, 2022). These developments have reshaped how learners engage with drafting and revision processes, prompting renewed discussions in English Language Teaching (ELT) about authorship, the validity of feedback, and ethical use of technology (Kasneci et al., 2023).

At the same time, high-stakes language assessments such as the International English Language Testing System (IELTS) remain central to academic and professional mobility worldwide (Green, 2007). The writing component of IELTS is particularly demanding, as it requires genre awareness, task achievement, coherence and cohesion, lexical resource, and grammatical accuracy under time pressure (Moore & Morton, 2005). Consequently, preparing future English teachers to understand and critically engage with such assessment frameworks is essential not only for their own academic success but also for their future instructional and assessment roles (Taylor, 2009).

Within teacher education, sustainability has emerged as a key conceptual framework aligned with the United Nations' Sustainable Development Goal 4 (SDG-4), which emphasises inclusive and quality education as well as the preparation of qualified teachers for lifelong learning societies (UNESCO, 2017). In this context, SDG-4.4 highlights the development of relevant skills for employment and lifelong learning, while SDG-4.c stresses strengthening teacher education systems. Integrating AI literacy and assessment awareness into ELT programs may therefore contribute to sustainable teacher education by fostering digital competence, reflective practice, and pedagogical adaptability (Redecker, 2017).

Despite the growing body of research on AI in language learning, empirical studies have largely focused on performance outcomes or learner perceptions, often neglecting the lived experiences of pre-service teachers in structured academic writing contexts (Godwin-Jones, 2022). In particular, qualitative research examining AI-supported writing practices within IELTS-oriented ELT courses remains scarce. Addressing this gap is essential for designing responsible, pedagogically grounded, and sustainable models of AI integration in teacher education.

Research Aim and Research Questions

This study aims to explore how pre-service English teachers experience AI-supported IELTS writing tasks integrated into an ELT writing course and how these experiences contribute to sustainable teacher education within the SDG-4 framework.

The study addresses the following research questions:

1. How do pre-service English teachers experience AI-supported IELTS writing tasks in an ELT writing course?

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2. What pedagogical benefits and challenges do they associate with AI-supported writing practices?
3. How do these experiences influence their understanding of academic writing, assessment, and professional identity?
4. In what ways do AI-supported IELTS writing practices contribute to sustainable teacher education aligned with SDG-4?

Methodology

Research Design

This study adopted a qualitative case study design, which enables in-depth exploration of participants' experiences within a bounded educational context (Merriam & Tisdell, 2016). This approach was particularly suitable for examining how AI-supported writing practices were perceived and enacted within a specific ELT writing course.

Participants

Participants comprised 49 pre-service English teachers enrolled in a compulsory Academic Writing course within an undergraduate ELT program at a foundation university in İstanbul, Türkiye. All participants had prior experience with academic writing but limited formal exposure to AI-supported writing tools before the course.

Data Collection

Data were collected through three complementary qualitative sources to ensure triangulation.

First, participants' IELTS Writing Task 1 and Task 2 drafts, including both initial and revised versions, were collected to examine revision practices and engagement with feedback. Second, students maintained structured reflective journals throughout the semester, documenting their perceptions of AI use, learning gains, ethical considerations, and revision strategies. Third, semi-structured interviews were conducted with 10 purposively selected participants at the end of the course to explore their experiences in greater depth.

AI-supported tools included grammar and style checkers, generative AI platforms used for brainstorming and feedback simulation, and paraphrasing tools used for lexical awareness. Importantly, students were required to submit original drafts before consulting AI tools and to document how AI suggestions were incorporated explicitly, emphasising ethical authorship and metacognitive awareness rather than automated text generation.

Research Results

AI *as a Pedagogical Scaffold*

Participants consistently described AI as a supportive revision scaffold rather than a replacement

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for their writing. AI tools were perceived as "guides" that helped identify coherence issues, improve lexical precision, and refine grammatical accuracy, aligning with previous research on AI-mediated scaffolding in L2 writing (Zhai, 2022).

Development of Assessment Literacy

Engagement with IELTS rubrics, alongside AI feedback, enhanced participants' understanding of assessment criteria, particularly in task achievement and coherence. This finding supports claims that explicit engagement with assessment frameworks can foster assessment literacy among future teachers (Taylor, 2009).

Negotiating Authorship and Ethics

While initial concerns about authorship and voice were evident, guided instruction and reflective activities helped participants develop ethical awareness regarding AI use. This aligns with concerns raised in the literature regarding the authenticity of authorship and the need for pedagogical framing of AI tools (Kasneci et al., 2023; Selwyn, 2019).

Professional Identity Formation

Participants reported that AI-supported writing experiences influenced their visions of future teaching practices. Many articulated plans to use AI tools for formative feedback rather than summative assessment, reflecting emerging professional identities as reflective and ethically aware educators.

Sustainable Learning Skills

Finally, students reported increased learner autonomy, self-regulation, and reflective revision habits. These transferable skills correspond closely with the lifelong learning competencies emphasised in SDG-4 (UNESCO, 2017).

Conclusions

The findings indicate that AI-supported IELTS writing tasks can function as effective pedagogical scaffolds when embedded within principled instructional design, corroborating prior research on AI-mediated feedback in L2 writing contexts (Godwin-Jones, 2022). Rather than undermining the authenticity of writing, guided AI use enhanced metacognitive awareness, assessment literacy, and ethical sensitivity.

In alignment with SDG-4.4, participants developed transferable digital and academic skills essential for lifelong learning, including reflective practice and autonomous revision strategies (UNESCO, 2017). Furthermore, consistent with SDG-4.c, the study demonstrates how teacher education programs can prepare future educators to critically engage with AI technologies in assessment-driven contexts (Redecker, 2017).

Sustainable teacher education, therefore, requires not the uncritical adoption of AI but its

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pedagogically grounded integration. When framed ethically and reflectively, AI-supported IELTS writing practices offer a promising pathway for developing digitally competent, assessment-literate, and professionally reflective ELT teachers.

Limitations and Future Research

This study was limited to a single institutional context and to a single academic semester. Future research could adopt longitudinal designs, incorporate quantitative measures of writing performance, compare AI-supported and non-AI-supported groups, and explore cross-cultural contexts to further examine sustainable AI integration in ELT.

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Supporting Self-Regulated Learning Through Digital Tools in Adult ESL

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ABSTRACT: Digital tools can help adult learners in English as a Second Language (ESL) to manage their own learning. This paper reviews recent research on self-regulated learning (SRL) and digital language tools. We propose a methodological framework that integrates technology to support SRL for adult ESL students. Key components include needs analysis, strategy instruction, and feedback via digital platforms (see Table 2). Table 1 presents examples of tools (e.g., mobile apps, video platforms) linked to SRL skills. The study highlights that technology can boost motivation, practice, and reflection in adult learning contexts. Future research should test and refine the framework and explore new tools, such as AI-driven tutors.

KEYWORDS: self-regulated learning; digital tools; adult education; ESL; mobile learning

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Introduction

Adult learners often balance jobs, family, and study, so they need to manage their learning well. Technology and digital platforms have become central in ESL education, especially after the pandemic. Online learning requires students to work more independently. Many studies report high dropout rates in online language courses due to learners' limited self-regulatory skills (Yu, 2023). Adult ESL learners may have had few positive schooling experiences and face many barriers (e.g., work hours, transportation, digital access) that can make learning hard. In this digital era, SRL skills such as planning, monitoring, and staying motivated are essential for success. For example, Yu (2023) argues that online platforms can track learners' activity and give feedback to support SRL. Digital tools offer new ways to engage adult learners, but courses must be designed to scaffold SRL. This paper examines recent research on SRL and digital tools in ESL and proposes methodological support for adult learners.

Research Aim and Research Questions.

Recent studies show that technology can stimulate SRL in language learning. Herwiana et al. (2025) systematically reviewed ICT tools for language learning and found that most studies reported positive outcomes, including better proficiency, greater motivation, richer learning experiences, and stronger strategies. They note that technology can boost metacognitive and cognitive strategies and motivation. For example, using YouTube for English learning helps build motivation and cultural knowledge. Yu (2023) emphasises that SRL is a key factor in effective online language learning, as platforms can record learning traces and provide feedback.

Research on specific tools confirms these benefits. Almayez et al. (2025) surveyed Saudi EFL learners and found that Duolingo was the most widely used app, covering all language skills. They also found strong positive links among learners' motivation, SRL strategies, and self-efficacy. An et al. (2021) studied Chinese university students and found that technology-based vocabulary-learning strategies were positively associated with English-learning outcomes. Their work suggests that teaching should focus on building motivation and strategic awareness for the use of technology.

Mobile-assisted language learning (MALL) is growing in popularity. Julia and Jeyanthi (2025) highlight that MALL offers flexible, interactive, personalised learning that can improve reading, writing, listening, and speaking in adult ESL. They note that mobile learning is an indispensable tool for ESL literacy. Mobile apps allow learners to practice anywhere and can increase engagement (Table 1). For example, Kimsesiz (2023) found that most adult EFL learners use smartphones or tablets for English study, but their usage was low. Learners need well-organised, self-directed practice with these tools. Enhancing self-directed use of mobile technology is crucial to maximising learning gains.

Systematic literature reviews offer insights into research trends. Mazandarani (2024) reviewed SRL studies in ESL/EFL (2017–2022) and found that most studies are quantitative and university-based, with surveys as the primary method. She also noted growing interest in writing skills. Faza and Lestari (2025)

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synthesised research on SRL strategies, technologies, benefits, and barriers in digital learning. They conclude that SRL fosters lifelong learning and job readiness, and that research should inform the integration of technology support for SRL.

These studies illustrate that digital tools can enhance SRL. Common findings include: goal-setting prompts and reminders in apps (e.g., Duolingo encourages daily goals); flashcard and quiz features that support self-testing (e.g., Quizlet); and e-portfolios or blogs that encourage reflection. Technology can also improve motivation through gamification and choice. Social features (discussion forums, video chats) allow co-regulation and peer feedback. For example, collaborative tools like Google Classroom or Teams let learners share goals and strategies with peers.

Recent work also explores AI and chatbots. Huang and Zhang (2026) extend SRL theory to AI contexts, finding that mobile SRL is associated with learners' awareness of generative AI tools. Jalambo et al. (2025) showed that integrating AI chatbots for vocabulary learning led EFL students to gain more words and collocations and feel less boredom. Students reported higher autonomy and motivation, enjoying interactive, personalised practice beyond class. This suggests that AI-driven tools can create engaging, self-regulated learning environments.

Overall, the literature indicates that technology-enhanced SRL is promising for adult ESL. Research across contexts shows that tools can scaffold planning, practice, and reflection, and that motivation and self-efficacy improve when SRL is supported. Authors such as Kay et al. (2022) also propose design ideas (open learner models) that enable students to monitor and plan their own learning, thereby reinforcing SRL. In summary, recent studies (2020–2025) highlight both the potential of digital tools and the need for intentional design to develop adult learners' SRL.

Building on this literature, we propose a theoretical and methodological framework to support SRL through digital tools in adult ESL education. We aim to identify key components of effective design and illustrate them in a framework. By integrating insights from recent research, we intend to guide educators in choosing and using digital tools that foster autonomous learning. The framework will highlight which SRL strategies to teach, how to select tools, and how to organise learning to empower adult ESL learners.

Research Results.

Drawing on the review, we present a framework for practice. It has several components (Table 2) that align with adult ESL needs and SRL principles. For example, Kimsesiz (2023) found that learners need well-organised digital learning practices. Therefore, our framework begins with a Needs Analysis that surveys learners' goals, SRL skills, and tech access. Next, Curriculum Integration ensures that digital tasks align with learning objectives. We suggest explicit Strategy Instruction to teach goal-setting and planning skills. Learners should also receive training on the digital tools themselves. In Practice & Support, students use tools (apps, websites) in guided activities. Teachers give feedback and encourage reflection in tools like e-portfolios. Finally, Assessment & Reflection evaluates both language gains and SRL

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development.

Table 1 lists examples of digital tools and their support for SRL strategies. Mobile apps (e.g., Duolingo) let learners set goals and get feedback. Video platforms (e.g., YouTube) provide authentic content that boosts motivation. Flashcard/quiz apps (e.g., Quizlet) enable self-testing and repetition. E-portfolios or blogs encourage learners to reflect on their progress. AI chatbots give conversational practice and personalised help, fostering autonomy.

Table 1

Examples of digital tools and the SRL aspects they support in adult ESL contexts.

Digital Tool/Platform	SRL Dimension Supported	Description / Benefit
Mobile Apps (e.g., Duolingo)	Motivation, goal-setting, feedback	Apps like Duolingo cover listening, speaking, reading, and writing and allow learners to set daily goals. Immediate feedback and gamified points keep learners engaged.
Video Platforms (e.g., YouTube)	Cultural context, motivation	Educational videos immerse learners in authentic language and culture, boosting motivation and engagement. High interest keeps learners practicing.
Flashcards & Quiz Apps (e.g., Quizlet)	Practice & self-testing	Digital flashcards and quizzes enable repeated practice of vocabulary and self-assessment. Learners identify gaps and review to improve recall.
E-Portfolios / Blogs	Reflection, metacognition	Learners maintain digital portfolios or journals to document progress, reflect on goals, and plan future study. This keeps them aware of learning strategies and progress.
Chatbots / Virtual Tutors	Conversation practice, autonomy	AI chatbots or tutors offer interactive speaking practice and hints, giving personalized practice. They enable self-paced dialog practice, boosting autonomy and confidence.

Source: author's own development

Table 2 outlines the framework components and tools. It emphasises that learners and instructors work together: teachers design the SRL-supportive activities, and learners engage in self-monitoring and reflection using technology. This framework is preliminary and should be tested in real ESL programs.

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Table 2

Proposed framework components and suggested tools/methods.

Framework Component	Purpose / Approach	Example Tools / Methods
Needs Analysis	Identify learners' SRL skill gaps and tech access	Surveys, interviews with adult learners
Curriculum Integration	Align digital tasks with learning goals	Multimedia lesson plans, LMS activities
Strategy Instruction	Teach SRL strategies (e.g., planning, monitoring).	Workshops or lessons on goal-setting and time management
Digital Tool Training	Ensure learners know how to use the chosen tools	Guided tutorials on apps/websites
Guided Practice & Support	Provide scaffolded learning activities	Blended lessons, scaffolded exercises, and peer collaboration
Feedback & Reflection	Offer feedback and encourage self-assessment	Online quizzes with instant feedback, reflective journals
Assessment & Evaluation	Measure language outcomes and SRL development	Pre/post-tests, self-report SRL scales, portfolio review

Source: author(s) own development.

Conclusions

This paper underscores that digital tools can powerfully support self-regulated learning in adult ESL. By reviewing recent research, we see that technology (apps, videos, AI) can enhance motivation, practice, feedback, and reflection. We propose a methodological framework (Table 2) that guides educators in incorporating such tools: it begins with assessing learner needs and ends with reflecting on outcomes. Two illustrative tables demonstrate how tools link to SRL (Table 1) and outline the framework steps (Table 2). The significance of this study lies in bridging theory and practice: it offers a concrete design for empowering adult ESL learners. Future research should implement and evaluate this framework. For example, empirical studies could test which combinations of tools and strategies best improve adult learners' autonomy and language proficiency. Also, as new technologies emerge (such as more advanced AI tutors), their roles in SRL should be explored. Overall, supporting learner autonomy through well-chosen digital tools has promise to improve outcomes in adult language education.

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The Utilisation of Artificial Intelligence Applications as a Catalyst for the Transition towards Student-Centred Pedagogical Practices: The Following Essay Presents a Qualitative Analysis of Implemented Educational Scenarios in Primary Education

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ABSTRACT: This study investigates the extent to which the use of Artificial Intelligence (AI) applications in primary education teaching scenarios contributes to the transformation of teaching towards student-centred practices. The research was conducted as part of a distance learning programme on Human-Centred AI, in which 164 teachers designed and implemented scenarios in authentic school environments. A qualitative approach was adopted, with a descriptive case study and systematic content analysis using a specially designed tool to record student-centred teaching axes. The findings indicated an overall high level of student-centred integration of TN (mean 4.10/5), with notably high performance in active and exploratory learning, creativity, and critical thinking. In contrast, differentiated teaching exhibited a comparatively lower value. In conclusion, the pedagogically documented use of TN has the potential to catalyse the transition to truly student-centred learning environments, provided that there is systematic training and targeted pedagogical planning.

KEYWORDS: Artificial Intelligence, Student-centred learning, primary education, educational scenarios.

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Introduction

In recent years, the field of Artificial Intelligence has garnered the attention of the educational community, particularly for its capacity to enhance the quality of education and refine pedagogical methodologies (Hwang & Chen, 2023). Educators must not merely utilise artificial intelligence applications within the educational process; rather, they should effect a transformation to ensure that these applications provide support for the pedagogical goals of educators in meeting the learning needs of their students (Kotsidis & Anastasiades, 2025).

In this context, the pedagogical use of Artificial Intelligence can be linked to a student-centred approach, where students actively participate, autonomy is enhanced, and critical skills are developed. Learning is tailored to their needs and interests (Bremner, 2021). The majority of studies focus either on the technological dimensions of applications or on the attitudes and perceptions of teachers and students. However, there is a lack of empirical investigation into the pedagogical transformation of educational practice through designed interventions implemented in the classroom using Artificial Intelligence applications.

This research endeavour seeks to address this knowledge gap by undertaking a comprehensive design that encompasses teacher training, the creation and implementation of educational scenarios in the classroom using Artificial Intelligence applications, and, subsequently, the systematic measurement and analysis of the student-centred dimension of these educational interventions. In this manner, an endeavour is made to establish a connection between the theoretical discourse on the student-centred utilisation of Artificial Intelligence and empirical evidence derived from authentic educational praxis.

Research Aim and Research Question

This study aims to examine the extent to which the implementation of Artificial Intelligence applications in educational scenarios contributes to the transformation of teaching towards student-centred practices. The study addressed the following research question in order to achieve this research question:

What is the level of student-centred teaching reflected in educational scenarios incorporating AI, and how does it differ in terms of individual pedagogical dimensions?

Methodology

The Department of Primary Education, and in particular the Laboratory of Lifelong and Distance Education at the University of Crete, designed and implemented a free distance learning programme on the topic: "Human-centred Artificial Intelligence in Education—pedagogical Dimension: From Theory to Practice. A total of 921 primary school teachers participated in the programme and completed it.

The objective of the training programme was to equip participants with foundational pedagogical training and, conversely, with methodologies, instruments and competencies about the utilisation of

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Human-Centred Artificial Intelligence in Education, with a particular focus on collaborative inquiry and knowledge construction, creativity and critical thinking. A total of 164 trainees were tasked with designing, creating, and implementing educational scenarios for all primary school subjects in their respective classrooms.

An analysis of the educational scenarios followed this. To conduct the analysis, the researcher devised a code-topic recording key, establishing axes and criteria for determining the degree of student-centredness in the scenarios. The research applied a qualitative approach, specifically the descriptive case study method, resulting in a description of the degree of application of student-centred teaching through the integration of multiple variables (axes and criteria), their quantitative measurement, and the analysis of their interactions (Mills et al., 2019). The set of participating school classes was selected as the delimited system, with the school class as the unit of analysis. The content analysis was conducted using a systematic approach, quantifying content within predefined categories. This method of analysis was informed by the principles of qualitative data analysis, as outlined by Bryman (2016).

The data obtained from the research tool (recording key) were analysed using quantitative statistical analysis criteria. To ensure the validity of the data, theoretical validity (Mills et al., 2019) was applied by linking the phenomenon under examination to the relevant theory that explains it. Concurrently, reliability was ensured based on the criterion of fidelity, taking into account the complexity of the research and the management of patterns that are not easily interpretable through the strategy of utilising experienced educators in the review, where the results of the research were confirmed (Mills et al., 2019), specifically the data that the researcher evaluated and recorded in the research tool, which is available to the research community.

Research Results

A comprehensive analysis of data concerning the development and execution of educational scenarios in authentic classroom settings has revealed that the incorporation of Artificial Intelligence (AI) applications within suitable pedagogical frameworks can facilitate a student-centred approach, thereby offering opportunities for discovery/exploration, active and collaborative learning, and the cultivation of students' creativity and critical thinking skills (Hwang & Chen, 2023). The subsequent analysis of the scenarios yielded several key findings:

i) A student-centred approach was applied to all cognitive subjects to a very large extent, with an average score of 4.10 out of 5.

ii) Exploratory/discovery learning was applied to a very high or extremely high degree in all cognitive subjects, with an average score of 4.22 out of 5.

iii) There was active learning to a very high degree in all cognitive subjects, with an average score of 4.63 out of 5.

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iv) There was a high degree of collaborative learning across all cognitive subjects, with an average score of 3.94 out of 5.

v) There was differentiated learning to a considerable degree in all cognitive subjects, with an average score of 3.34 out of 5.

vi) Creativity was cultivated to a very high degree across all subjects, with an average score of 4.28 out of 5.

vii) Critical thinking was cultivated to a high and very high degree across all cognitive subjects, with an average score of 4.17 out of 5 (Table 1).

Table 1

Dimensions and Mean Values of Student-Centred Integration of Artificial Intelligence Applications

No	Axis of Analysis	Conceptual Dimension	Average (1-5)
1	Exploratory/Discovery Learning	Developing hypotheses, collecting and analysing data, drawing conclusions	4.22
2	Active Learning	Interaction with content and people, active participation, reflection and application of knowledge	4.63
3	Collaborative Learning	Intra-group and inter-group collaboration, joint goal setting and co-creation	3.94
4	Differentiated Learning	Teaching adaptation, personalised feedback and alternative forms of assessment	3.34
5	Creativity	Divergent thinking, initiative, originality, and experiential problem solving	4.28
6	Critical thinking	Analysis, documentation, evaluation of information and conscious decision-making	4.17
Overall Student-Centred Integration Index TN			4.10

Source: author's own development

Conclusions

In conclusion, the pedagogical use of artificial intelligence (AI) applications in all scenarios has been shown to enhance the exploratory, active and collaborative dimensions of learning (Aravantinos et al., 2024). Concurrently, AI applications have been shown to foster students' creativity and critical thinking skills (Hwang, Xie, Wah & Gašević, 2020). Conversely, the comparatively lower performance in differentiated learning confirms the fact that differentiation requires clear diagnostic data and targeted pedagogical design (Van Geel et al., 2019) for ETNs to be able to support it under appropriate pedagogical conditions

Teachers must possess a firm grasp of Artificial Intelligence, undergo comprehensive training and

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continuous professional development, and demonstrate the capacity to utilise AI applications with a high degree of autonomy and critical thinking (Anastasiades et al., 2024) to facilitate the effective transformation of the educational process towards a student-centred approach (Holmes et al., 2023).

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Governing Generative Artificial Intelligence in Schools through Artificial Agency, Competence Frameworks and Teacher Professionalism

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ABSTRACT: The integration of Generative Artificial Intelligence (GenAI) in schooling cannot be reduced to a merely instrumental update of teaching practices. Rather, it inaugurates a transformation of the epistemic ecology of schooling, reshaping how knowledge is produced, circulated and—crucially—validated, with anthropological, ethical, and pedagogical repercussions. This paper frames AI not as "intelligence" in a human sense, but as *artificial agency*: an operational power that can act and respond without intentionality, comprehension, or moral responsibility. Such a stance enables a critical interrogation of educational anthropomorphism, automation of judgement, and the hetero-direction of formative processes. Drawing on international principles (UNESCO; OECD) and European competence frameworks (DigComp, DigCompEdu, LifeComp), in dialogue with Italian scholarship on media education and teacher professionalism, the article argues that the pivotal issue is not "adoption" per se, but the *didactic translation* of ethical and competence architectures into situated practices: assessment, design, inclusion, relational care, and data governance. The central thesis follows: for technological innovation to remain humanly intelligible and educationally justifiable, teacher professionalism must be strengthened as a projective, evaluative, and deontological function—capable of embodying an ethics that is not merely declared, but enacted through everyday decisions and institutional routines.

KEYWORDS: generative artificial intelligence; artificial agency; AI ethics; competence frameworks; teacher professionalism.

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Introduction

The sudden visibility of GenAI within schools belongs to a broader reconfiguration of educational culture: not only because it accelerates access to texts, syntheses, examples, and exercises, but because it silently destabilises the epistemic grammar through which schooling assigns authority to sources, distinguishes argument from plausibility, recognises authorship, and evaluates relevance and quality. If the school is, in a strong sense, an institution of cultural mediation, then GenAI is not a neutral "aid". It is an environment that restructures meaning-making, redistributing cognitive power and moral responsibility.

This shift is often narrated through two opposing imaginaries—both seductive and therefore both in need of critique. On the one hand, the imaginary of efficiency: personalisation, permanent tutoring, automated feedback, accelerated assessment. On the other hand, the imaginary of alarm: plagiarism, cognitive dependency, impoverished thinking, surveillance. The scientific robustness of educational discourse depends on escaping these unilateralities by reframing the issue as one of *governance*: which aims, constraints, and pedagogical devices can make the use of GenAI not only useful, but formatively legitimate?

To answer, one must adopt a foundational theoretical position that is not a terminological quibble but an epistemic premise: what is AI, educationally speaking? If it is treated as an intelligent quasi-person, anthropomorphism opens the door to moral delegation; if treated as a mere tool, its status as an environment capable of shaping practices, decisions, and criteria of truth is obscured. The more rigorous path is to recognise it as *artificial agency*: a form of operational power devoid of moral intentionality—producing without understanding, responding without "knowing", acting without accountability. From this premise, educational responsibility must remain human and institutional, and the question becomes: which conceptual and professional architectures allow schools not to undergo innovation, but to orient it?

Artificial agency and a critique of educational anthropomorphism

Education pays a high price when it confuses metaphors with concepts. Speaking of "artificial intelligence", especially in schooling, can lead students and adults alike to interpret persuasive linguistic performance as evidence of comprehension, intentionality, and epistemic authority. Floridi's philosophy of the infosphere already warned that contemporary environments reshape the boundaries of human experience (Floridi, 2014). However, GenAI intensifies the pedagogical risk because it does not merely distribute information: it simulates the discursive form of knowledge. Students may mistake fluency for truth, coherence for correctness, and probabilistic language for argumentative grounding.

This is precisely where the notion of artificial agency becomes pedagogically decisive. It sustains an ethical consequence: delegating educationally sensitive acts—assessment, orientation, classification, risk prediction, profiling—cannot be treated as a technical choice, but must be handled as a moral and

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institutional decision. The point is sharpened further by Italian pedagogical work on agency and formation. Costa, for instance, explicitly refuses an upskilling-only horizon and links agency to an emancipatory formative task, describing it as "a concrete expansion of freedoms and the possibilities of designing oneself and the world" (Costa, 2025, p. 5). In this sense, the educational question is not whether GenAI "helps", but whether it strengthens or weakens the learner's and teacher's capacity to project, decide, and take responsibility.

However, the concept must be tested rather than ritualistically invoked. Is it sufficient to call AI "artificial agency" to neutralise anthropomorphism? Not entirely. Schools are relational institutions: learning is not produced by information alone. Even when teachers and students know that AI is not a person, the pragmatic dynamics of interaction—immediacy, turn-taking, confident tone, apparent competence—can generate affective-cognitive reliance. Anthropomorphism is not only a conceptual error; it is a relational temptation. Hence, literacy about GenAI cannot be reduced to technical explanations. It must become education for judgement: how claims are verified, how sources and inferences are reconstructed, how biases and omissions are detected, and how "good evidence" is decided.

Here, Italian traditions of media education and critical literacy are particularly relevant: competence is not equivalent to use, but to understanding the dispositifs that mediate experience and orient meaning-making (Panciroli et al., 2020; Ranieri, 2022). If schooling abdicates this function, GenAI risks shifting from an opportunity for reflexivity to an infrastructure of hetero-direction, normalising pre-packaged knowledge that is difficult to interrogate precisely because it arrives already shaped as plausible discourse. In this direction, Costa's earlier work is also instructive, because it frames the educational task as an "attitude of openness and willingness to undertake an intellectual activity on action that starts from action" (Costa, 2020, p. 99): a disposition that GenAI can either stimulate (as an object of critique) or erode (as a shortcut).

From ethical declarations to the didactic translation of principles

An increasingly shared claim in the international literature should be taken, in educational settings, as a criterion of rigour: ethical principles do not educate anyone on their own. They may orient, constrain, and inspire, but remain declarative unless converted into practices, procedures, roles, and responsibilities. This is the decisive move: translating ethics into *didactic operability*.

A recurring school rhetoric – "we use AI to help students" – is pedagogically insufficient. In education, intention is never a guarantee; it can even become an alibi. If a system promises personalisation, one must interrogate the implied concept of learning; if it promises instant feedback, one must ask what happens to the time of error, maturation, and struggle; if it promises automated assessment, one must examine which notion of competence is embedded and what space remains for interpretation, negotiation of meaning, and evaluative justice. Research that discusses the opportunities

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and risks of large language models in education repeatedly highlights these tensions precisely: the same tool can amplify learning opportunities or normalise shallow plausibility and miscalibrated trust, depending on the pedagogical architecture that contains it (Kasneci et al., 2023).

The OECD Recommendation on AI makes explicit a constellation of principles that, for schooling, must be turned into concrete governance dispositifs: inclusive growth, sustainable development and well-being; human-centred values and fairness; transparency and explainability; robustness, security and safety; and accountability (OECD, 2024, p. 3). It also stresses "responsible stewardship of trustworthy AI" aligned with human rights and democratic values (OECD, 2024, p. 2). The pedagogically uncomfortable question is therefore unavoidable: who exercises such stewardship in real schools? The answer cannot be deferred to technology providers or to generic policy documents. It implicates the teacher as an institutional actor whose professionalism functions as the moral infrastructure of innovation.

If principles remain at the level of documents, schools will consume them as legitimising vocabulary; if transformed into design criteria, they shape everyday decisions: which data are collected and why; which prompts and uses are allowed and under what constraints; how processes are documented; how products are evaluated; how authorship is recognised; how those most exposed to bias and discrimination are protected. Without this didactic translation, the proliferation of ethical guidelines—often convergent in titles but divergent in operational substance—risks remaining a threshold phenomenon: ethics at the door of practice, unable to cross into routine.

Competence frameworks and the centrality of teachers between Europe and Italian scholarship

If schools are to govern GenAI rather than undergo it, digital literacy cannot be equated with training-by-acclimatisation. Here, European competence frameworks offer an advantage: they provide a shared grammar and, at least potentially, reduce innovation to something more than episodic enthusiasm. DigComp 3.0 updates the citizens' digital competence framework by making the horizon of data-driven technologies and AI-related challenges more explicit, while aiming to remain adaptable across educational and formative contexts (Cosgrove & Cachia, 2025). However, a critical level of vigilance is required: Is it conceptually sound to treat citizens' digital competence as a sufficient metric for teacher professionalism? If one wants to remain rigorous, the answer is no. The teacher is not simply a "digital citizen": the teacher is a professional of design, assessment, inclusion, and educational relationships.

This is why DigCompEdu shifts the centre of gravity from consumption to pedagogical action, including domains such as digital resources, teaching and learning, assessment, empowering learners, and professional engagement (Redecker & Punie, 2017). However, DigCompEdu alone cannot absorb the specific shock of GenAI. GenAI destabilises not only technique but also the personal, social, and learning-to-learn competences that sustain educational subjectivity: self-regulation, emotional management, flexibility, critical thinking, and learning how to learn. This is the conceptual space of

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LifeComp, whose formulation is unambiguous: personal, social, and learning-to-learn competences apply "to all spheres of life" and can be developed through formal, non-formal, and informal education (Sala et al., 2020, p. 7). Without this dimension, education about GenAI risks becoming a didactics of use rather than a formation of the subject.

The problem, therefore, is not to accumulate frameworks as if they were checklists, but to build an integrated architecture that foregrounds the professional nucleus of teaching in the age of AI. Models such as TPACK show that technology becomes educational only when disciplinary, pedagogical, and technological knowledge are intertwined rather than merely juxtaposed (Mishra & Koehler, 2006). As for SAMR, scholarship has noted its practical diffusion but also its theoretical ambiguity: it can be employed as a reflective heuristic only if it is not mistaken for a theory of learning and is accompanied by critical readings (Hamilton et al., 2016). A similar point applies to UDL: AI can widen accessibility and differentiation, but only if inclusion remains a design criterion rather than a technological promise.

Italian scholarship adds an epistemologically significant contribution: media education and "connected didactics" insist that innovation, if it is to remain humanly defensible, must safeguard relation, meaning, and responsibility. Panciroli and Rivoltella press the issue into an explicitly formative demand: "Understanding and activating awareness about how, why, meaning, effects, benefits, what is 'lost' and what is 'gained' must become educational practice […] it is about building, training, and exercising daily […] a stance of 'craftsmanship' that does not renounce these questions" (Panciroli & Rivoltella, 2024, p. 40). This notion of pedagogical craftsmanship is crucial because it refuses both technophilia and technophobia in favour of an ethics embodied in practice.

Italian research on intelligent digital ecosystems also warns against a reductive imagination of AI as mere automation: it may function as an accelerator of personalisation and efficiency only if these processes are governed didactically rather than surrendered to the logic of optimisation. In this vein, Messina and colleagues describe AI as "acting as a catalyst for the personalisation and optimisation of learning processes" (Messina et al., 2024, p. 81). The decisive conditional clause remains: *if* schools hold the pedagogical steering wheel. Otherwise, "optimisation" becomes a proxy for standardisation.

From this angle, the teacher's centrality becomes unavoidable. A thesis follows—counterintuitive only at first sight: GenAI increases the need for school not because it makes students less knowledgeable, but because it makes it harder to distinguish knowledge from verisimilitude, evidence from narration, sources from derivatives. Teacher professionalism must therefore be strengthened as it has at least four constitutive functions: an epistemic function (criteria of truth and verification), an ethical function (responsibility and protection), a projective function (design of learning environments), and an evaluative function (justice and meaning of assessment). This is not merely a contemporary requirement: it resonates with a more profound theory of formation. Margiotta reminds us that "the need for personal development presupposes awareness of 'incompleteness' (perfectibility, improvability) […] and the existence of human potential" (Margiotta, 2015, p. 235). In such a view, teacher education is not the

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acquisition of a toolkit but the cultivation of a professional ethos grounded in human perfectibility—precisely what GenAI, paradoxically, makes newly visible. In this direction, the notion of empowerment – which Costa (2025, p. 5) defines as "the concrete expansion of freedoms and possibilities to design oneself and the world" – can be taken as a basic pedagogical criterion: in the age of AI, schools should not limit themselves to training competent users, but rather individuals capable of maintaining autonomy, judgement and responsibility about the devices that speak for them.

Conclusions

GenAI compels educational sciences to choose a posture: either treat it as an external device to be "managed", or recognise it as a cultural environment that reshapes the meaning of educating itself. The second posture is more demanding, but it is the only one that allows non-reactive governance of innovation. Framing AI as artificial agency can help avoid anthropomorphism and prevent moral delegation; yet this conceptual move alone does not generate good practice. For ethics not to remain a declaration, principles must undergo a didactic translation: situated operability that touches assessment, design, data governance, inclusion, and relational care.

This paper has argued that frameworks — OECD, DigComp 3.0, DigCompEdu, LifeComp — are valuable not as solutions but as a shared grammar within which professionalism can be constructed. The decisive issue remains the figure of the teacher: not as an executor of guidelines, but as an architect of formative environments in which GenAI becomes an occasion for judgement, reflexivity, responsibility, and autonomy. If this does not happen, GenAI will tend to accelerate standardisation and inequality. If it does, it may paradoxically become a powerful educational pretext for refounding the school as an institution of critical thought and human dignity.

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Educational Philosophy in Vietnam in the Context of Educational Reform and Sustainable Development

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ABSTRACT: In the context of globalisation, digital transformation, and the growing demand for sustainable development, educational philosophy plays an increasingly significant role in shaping the values, objectives, and organisational principles of national education systems. Grounded in UNESCO's conception of education as a lifelong human right, articulated through four fundamental pillars—learning to know, learning to do, learning to live together, and learning to be—this paper examines key theoretical and practical issues of educational philosophy in contemporary Vietnam. Drawing on a critical review of both international and Vietnamese approaches to educational philosophy, the study clarifies the role of educational philosophy in Vietnam's ongoing comprehensive educational reform. It particularly emphasises the importance of applied philosophy in shaping value orientation, the cultivation of critical thinking, ethical awareness, and social responsibility among learners. Furthermore, the paper situates Vietnamese educational philosophy within a broader dialogue with global educational thought, in line with UNESCO's World Philosophy Initiative. The findings affirm that educational philosophy constitutes an indispensable intellectual foundation for the humanistic and sustainable development of education in Vietnam today.

KEYWORDS: Educational philosophy, UNESCO, Vietnamese education, humanism, sustainable development, dialogue.

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Introduction

Philosophy, as a discipline concerned with the most general laws of nature, society, and human thought, has long served as a foundational framework for human cognition and action. In the field of education, philosophy does not merely reflect on existing practices but also actively shapes them by addressing fundamental questions about the aims, values, methods, and social significance of teaching and learning. Educational philosophy thus emerges as a form of self-reflection through which education becomes conscious of its own purposes and missions.

In the era of the knowledge economy and digital transformation, knowledge is rapidly changing while technology increasingly permeates all aspects of social life. Education consequently faces the risk of being reduced to a technocratic or instrumental enterprise focused solely on workforce preparation. Against this backdrop, educational philosophy provides an essential intellectual anchor, enabling dialogue between tradition and modernity, humanistic ideals and technological realities, individual creativity and the concept of a learning society.

UNESCO's establishment of World Philosophy Day underscores philosophy as a shared space for humanity to reflect on peace, justice, and sustainable development. educational philosophy, therefore, transcends academic discourse and becomes a guiding framework for educational action at the global level. For Vietnam, currently undergoing comprehensive educational reform, the study and application of educational philosophy are not merely theoretical pursuits but urgent practical necessities.

The absence of such a systematic analysis raises several critical questions:

1. To what extent is Vietnamese educational reform philosophically aligned with global educational values?
2. How are core concepts such as humanism, sustainability, and holistic development articulated in official policy discourse?
3. Does Vietnamese educational philosophy demonstrate compatibility, tension, or selective adaptation in relation to UNESCO's humanistic framework?

Addressing these questions is essential not only for academic scholarship but also for ensuring that reform efforts are grounded in a coherent and sustainable philosophical foundation.

Research Focus

This study examines the philosophical foundations embedded in key Vietnamese educational policy documents and compares them with UNESCO's educational framework. The research emphasises value orientation, human development models, and sustainability principles as core analytical dimensions.

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Research Questions

1. How are educational values and philosophical principles articulated in major Vietnamese educational policy documents?
2. To what extent do these principles correspond to UNESCO's four pillars of education?
3. What areas of convergence, divergence, or contextual adaptation can be identified?
4. What implications do these findings have for the sustainable development of Vietnamese education?

Data Sources

The study analyses the following primary documents:

- Resolution No. 29-NQ/TW (2013) on fundamental and comprehensive renovation of education and training
- Conclusion No. 51-KL/TW (2019)
- Decision No. 89/QD-TTg (2023)
- Resolution 71 (2025) on educational reform
- UNESCO's Four Pillars of Education
- UNESCO Education 2030 Framework

These documents were selected based on their normative authority and direct relevance to educational reform and sustainable development in Vietnam.

Literature review and theoretical framework

Throughout intellectual history, education has been intrinsically linked to philosophy. From Socrates, Plato, and Aristotle in the Western tradition to Confucius and Mencius in Eastern thought, education has been regarded as a pathway to moral cultivation, rational development, and human flourishing. In modern and contemporary periods, educational philosophy has been deeply influenced by Enlightenment ideals, humanism, and freedom, as exemplified in the works of Kant, Dewey, and Freire. Contemporary educational philosophy has expanded toward humanistic, ethical, and emancipatory approaches that emphasise learners as active agents in constructing knowledge. UNESCO's four pillars of education have become a widely accepted theoretical foundation for sustainable education strategies worldwide. In Vietnam, educational philosophy has evolved in close connection with Marxist–Leninist philosophy, Ho Chi Minh Thought, and the humanistic traditions of Eastern philosophy. concepts such as lifelong learning, holistic human development, and education as a means of nation-building reflect a consistent emphasis on human-centred development. In recent

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decades, Vietnamese scholars have increasingly adopted an open, integrative approach, combining national traditions with international educational theories.

Research findings and discussion

Applied philosophy and value orientation in Vietnamese education

Based on the preceding theoretical analysis, this study argues that applied philosophy and value orientation play a pivotal role in defining the objectives, methods, and meanings of education in contemporary Vietnam. Educational philosophy enables education not only to transmit knowledge but also to cultivate personality, critical thinking, and ethical ideals. In a globalised context, applied philosophy provides a framework for selecting appropriate values that harmonise national traditions with international standards, thereby promoting humanistic, open, and sustainable educational development. In Vietnam, a humanistic value orientation is clearly reflected in educational goals aligned with sustainable development, particularly in the pursuit of equity, inclusiveness, and quality education for all. The construction of a learning society exemplifies applied philosophy in practice, where knowledge functions as a means of human emancipation rather than merely an instrument of production. This orientation resonates strongly with Ho Chi Minh's educational philosophy, which emphasised learning for work, personal development, and service to humanity.

Without a solid value foundation, applied philosophy risks degenerating into technocracy, prioritising short-term efficiency over human development. In education, this tendency manifests in excessive emphasis on rankings, metrics, and measurable achievements at the expense of moral cultivation and meaningful learning. Applied educational philosophy counters this trend by restoring education to its human core—where individuals are educated not only to work but also to live meaningful and responsible lives. Moreover, applied philosophy is closely connected to ethical considerations in education, particularly in the digital age. issues such as data privacy, equitable access, and the impact of artificial intelligence on human development demand philosophical reflection. Educational philosophy thus provides Vietnam with ethical principles for navigating digital learning environments grounded in respect, human dignity, and social responsibility.

Dialogue between Vietnamese educational philosophy and global thought in the spirit

Building on the role of applied philosophy, this section situates Vietnamese educational philosophy within a broader dialogue with contemporary global thought, as advocated by UNESCO. From this perspective, educational philosophy becomes a platform for intercultural dialogue that enables integration without loss of identity. UNESCO emphasises humanism, openness, academic freedom, and social responsibility as core educational values. Engaging in dialogue with these global principles allows Vietnamese educational philosophy to reaffirm its relevance while contributing indigenous perspectives rooted in national culture and historical experience. Educational philosophy, therefore, bears responsibility for guiding action in response to global challenges such as social

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inequality, environmental crises, and the ethical implications of technological advancement. In line with PWorld philosophy Day, educational philosophy must serve not only to interpret the world but also to orient human action toward peace, justice, and sustainable development.

Implications and contributions

The study yields several significant theoretical and practical implications. First, it reaffirms the foundational role of educational philosophy in Vietnam's educational reform, arguing that reforms lacking philosophical grounding risk becoming fragmented and technocratic. Second, it systematises and connects Vietnamese educational philosophy with UNESCO's universal educational values, highlighting their compatibility rather than opposition. Third, the paper advances an applied philosophical framework that translates abstract values into concrete educational orientations, particularly in cultivating critical thinking, ethical awareness, and social responsibility. Finally, by positioning Vietnamese educational philosophy within a global dialogue, the study contributes to broader discussions on education as a driver of humanistic and sustainable development.

Conclusion

In the contemporary context marked by globalisation, digital transformation, and the growing imperative of sustainable development, educational philosophy emerges as a crucial intellectual foundation for rethinking the aims, values, and directions of national education systems. This study has demonstrated that educational reform in Vietnam cannot be reduced to technical adjustments in curricula, governance, or technology, but must be grounded in a coherent philosophical framework that places human development at its core. By examining both theoretical traditions and practical challenges, the paper highlights the indispensable role of educational philosophy in orienting Vietnam's comprehensive educational reform toward humanistic, inclusive, and sustainable goals. Drawing on UNESCO's conception of education as a lifelong human right articulated through the four pillars of learning, the study shows that Vietnamese educational philosophy—rooted in Marxist–Leninist philosophy, Ho Chi Minh Thought, and Eastern humanism—remains fundamentally compatible with contemporary global educational values. Rather than existing in tension, these traditions can engage in constructive dialogue that enriches educational thought and practice in Vietnam today. A central contribution of this study lies in its emphasis on applied philosophy as a mechanism for translating abstract values into concrete educational orientations. Applied educational philosophy provides a value compass to help prevent education from being instrumentalised or technocratized, especially in the digital age. It supports the cultivation of critical thinking, ethical awareness, and social responsibility, thereby reaffirming education as a process of human formation rather than mere workforce preparation.

Furthermore, by situating Vietnamese educational philosophy within a broader global dialogue in the spirit of UNESCO's World Philosophy Day, the paper underscores the contemporary responsibility of philosophy to respond to pressing global challenges such as social inequality, technological

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disruption, and sustainability crises. In this sense, educational philosophy is not only reflective but also normative and transformative, guiding educational systems toward peace, justice, and long-term human development. In conclusion, the study affirms that strengthening educational philosophy—particularly in its applied and dialogical dimensions—is a necessary condition for the success and sustainability of educational reform in Vietnam. Educational philosophy should therefore be recognised as a strategic intellectual resource that enables education to address the fundamental questions of the present era: education for whom, for what purpose, and according to which values. Such a philosophical reorientation is essential for building an education system that is not only effective and innovative but also deeply humanistic and responsive to the challenges of the contemporary world.

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From Local Stories to Global English: A Qualitative Study of Pre-Service English Teachers' Experiences with AI-Assisted Gamified ELT in a Teaching English to Young Learners Course

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ABSTRACT: This qualitative study explores pre-service English teachers' experiences with AI-assisted gamified English Language Teaching (ELT) practices within a Teaching English to Young Learners (TEYL) course. Grounded in a glocal pedagogical perspective, the study examines how artificial intelligence and gamification mediate teacher learning, pedagogical decision-making, and cultural meaning-making in early language education. The participants consisted of pre-service English teachers enrolled in a TEYL course at a university-level teacher education program. Data were collected through semi-structured interviews, reflective journals, and analysis of digital teaching artefacts. Thematic analysis revealed four main themes: enhanced pedagogical engagement through gamified AI tools, emerging understandings of glocalized ELT practices, evolving professional identities as future TEYL teachers, and critical reflections on the affordances and challenges of AI integration. The findings suggest that AI-assisted gamification not only supports active and culturally responsive learning environments but also fosters pre-service teachers' reflective and adaptive pedagogical competencies. The study contributes to the growing literature on AI-enhanced teacher education by highlighting the importance of contextualised, experience-based learning in preparing future English teachers to work with young learners in digitally mediated classrooms.

KEYWORDS: AI-assisted gamification; Teaching English to Young Learners (TEYL); pre-service English teachers; glocalized ELT; digital pedagogy.

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Introduction

The rapid advancement of digital technologies has significantly reshaped educational practices, particularly in English Language Teaching (ELT), where artificial intelligence (AI) and gamification are increasingly employed to support learner engagement, personalisation, and instructional design (Deterding et al., 2011; Holmes et al., 2019). AI-driven systems offer adaptive feedback and content generation, while gamification introduces motivational elements such as narratives, challenges, and rewards, together creating new pedagogical possibilities for language education (Luckin et al., 2016).

Parallel to these technological developments, the concept of *glocalisation*—the dynamic interaction between global processes and local cultural contexts—has gained prominence in the discourse of language education (Robertson, 1995). In ELT, glocal pedagogy emphasises the need to balance the global status of English with locally meaningful cultural practices, identities, and narratives (Kumaravadivelu, 2006). This balance is particularly crucial in Teaching English to Young Learners (TEYL), where language learning is closely intertwined with affective engagement, imagination, and cultural familiarity (Cameron, 2001; Pinter, 2017).

Teacher education programs, therefore, face the challenge of preparing pre-service teachers who can integrate technological innovation while maintaining pedagogical sensitivity and cultural responsiveness. Research in teacher cognition highlights that teachers' beliefs, experiences, and reflective practices play a central role in shaping instructional decision-making (Borg, 2015). Although AI-assisted and gamified ELT practices have been widely discussed, existing research has predominantly focused on learner outcomes or technological efficiency rather than teachers' lived experiences, particularly in pre-service TEYL contexts (Zawacki-Richter et al., 2019).

Consequently, there is a need for qualitative research that explores how pre-service English teachers experience, interpret, and negotiate AI-assisted gamified practices within teacher education courses. Understanding these experiences is essential for developing pedagogically grounded and culturally responsive models of AI integration in ELT.

Research Aim and Research Questions

This study aims to explore pre-service English teachers' experiences with AI-assisted gamified ELT practices implemented in a Teaching English to Young Learners course through a glocal pedagogical perspective.

The study addresses the following research questions:

1. How do pre-service English teachers experience AI-assisted gamified ELT practices in a TEYL course?
2. How do they perceive the pedagogical value of AI-assisted gamification for teaching English to young learners?

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3. How do pre-service teachers negotiate local cultural elements and global English teaching practices through AI-assisted gamified activities?
4. In what ways do these experiences influence their professional learning and emerging teacher identities?

Methodology

Research Design

This study adopted a qualitative interpretive case study design to examine participants' lived experiences within a bounded educational context (Merriam & Tisdell, 2016). A qualitative approach was chosen to capture the complexity of meaning-making processes related to AI-assisted gamified ELT practices.

Participants and Context

Participants were pre-service English teachers enrolled in a compulsory Teaching English to Young Learners course in an undergraduate ELT program at a foundation university in Türkiye. All participants were in their third year of study and reported limited prior experience with AI-supported instructional tools.

Data Collection

Data were collected through multiple qualitative sources to ensure triangulation (Lincoln & Guba, 1985). These included semi-structured individual interviews, focus group discussions, reflective journals, and analysis of digital teaching artefacts created during AI-assisted gamified lesson design tasks. Interview and journal prompts focused on pedagogical decision-making, cultural considerations, ethical reflections, and professional learning.

Data Analysis

Data were analysed using thematic analysis following Braun and Clarke's (2006) six-phase framework. Coding was conducted inductively, and themes were refined through constant comparison across data sources to enhance analytical rigour.

Trustworthiness and Ethics

Trustworthiness was ensured through methodological triangulation, peer debriefing, and rich description (Lincoln & Guba, 1985). Ethical approval was obtained from the relevant institutional ethics committee, and informed consent was secured from all participants.

Research Results

AI-Assisted Gamification and Pedagogical Engagement

Participants reported heightened motivation and engagement when designing AI-assisted

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gamified activities, describing the process as interactive and pedagogically meaningful. This finding aligns with gamification research emphasising the motivational affordances of game-based elements when aligned with learning objectives (Deterding et al., 2011; Kapp, 2012).

Glocal Meaning-Making in ELT

Pre-service teachers emphasised integrating local stories, cultural symbols, and familiar contexts into AI-assisted activities. These practices enabled learners to connect English learning with their lived experiences, reflecting glocal pedagogical principles (Kumaravadivelu, 2006; Canagarajah, 2013).

Emerging Professional Identity

Engagement with AI-assisted gamification contributed to participants' growing confidence and sense of preparedness as future TEYL teachers. Experiential design tasks supported the development of teacher cognition and professional identity (Borg, 2015; Beauchamp & Thomas, 2009).

Critical Awareness and Ethical Positioning

While participants recognised the pedagogical benefits of AI, they also articulated concerns about ethical use, overreliance, and the need to maintain teacher control. This critical stance reflects broader calls for responsible AI integration in education (Holmes et al., 2019; Zawacki-Richter et al., 2019).

Conclusions

The findings demonstrate that AI-assisted gamified ELT practices can function as pedagogical mediators that support engagement, cultural responsiveness, and professional learning when situated within a glocal framework. Consistent with prior research, gamification enhanced engagement when pedagogically purposeful rather than superficial (Kapp, 2012), while AI supported reflective decision-making rather than automated instruction (Holmes et al., 2019).

Importantly, the integration of local cultural narratives challenges assumptions that technology-enhanced ELT promotes cultural homogenization. Instead, the study illustrates how AI-assisted gamification can support culturally grounded English teaching when teachers retain pedagogical agency (Canagarajah, 2013). These experiences also contributed to the emergence of professional identities characterised by adaptability, ethical awareness, and reflective practice (Beauchamp & Thomas, 2009; Borg, 2015).

Limitations and Future Research

This study was limited to a single institutional context and relied on self-reported qualitative data. Future research may adopt longitudinal designs, include classroom implementation with young learners, or employ mixed-methods approaches to triangulate findings and examine learning outcomes.

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How Achievement Outcomes Impacted by School Leadership Approaches in Artificial Intelligence Era

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ABSTRACT: The study aimed to investigate the impact of school affiliative and instructional leadership approaches on achievement outcomes in the artificial intelligence era. The quantitative approach was the method used in the empirical study. A structured questionnaire and a random sample of respondents were used. Affiliative leadership explained 4.3% of the negative variance in achievement outcomes, as per students, and 34.3% of the positive variance, as per principals. The instructional leadership explained 29.5% of the positive variance in achievement outcomes, according to students, and 26.8% of the positive variance, according to principals.

KEYWORDS: Affiliative leadership approach, instructional leadership approach, achievement outcomes.

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Introduction

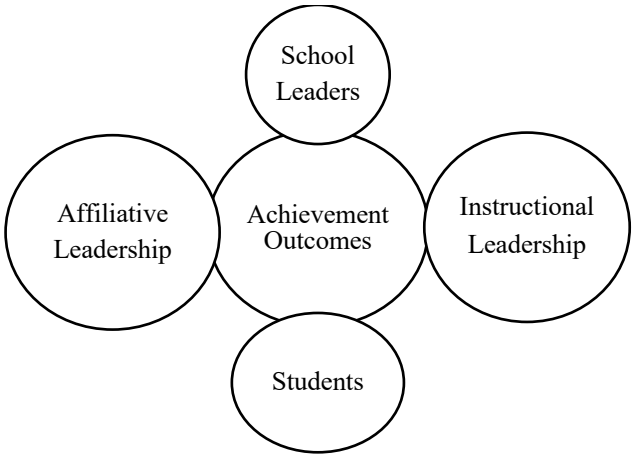
Over the past fifteen years, "the use of Artificial Intelligence (AI) to support students' learning received increasing attention in Higher Education. Integrating AI in educational settings requires a well-designed learning environment" (Zawacki-Richter et al., 2019, cited in Sichterman et al., 2025). School affiliative and instructional leadership approaches in the artificial intelligence (AI) era are supposed to be the important variables that influence achievement outcomes. "School leadership supervision and evaluation of teaching and learning are used to improve overall student achievements. To support teachers successfully fulfil their role in teaching and learning, effective teacher supervision and evaluation systems that inform teacher professional development and improve instruction are essential" (Xhomara, 2021). The study aims to investigate the relationship between school leadership approaches and achievement outcomes, as well as the influence of these approaches on achievement outcomes. Affiliative leadership style is characterised by a focus on creating emotional bonds and harmony within the school community and emphasises empathy, communication, and the building of strong interpersonal relationships. Meanwhile, instructional leadership focuses on the quality of teaching and learning within a school, emphasising improving instructional practices, supporting teachers, and ensuring that the curriculum meets the diverse needs of students.

Conceptual framework

The framework for the study was developed from an extensive review of existing evidence about affiliative and instructional leadership in schools in the context of artificial intelligence. Figure 1 shows the diagram derived from the literature review, suggesting relations among the constructs.

Figure 1

Conceptual framework of affiliative and instructional leadership approaches, and achievement outcomes.



Literature review

School leadership approach and achievement outcomes

The AI-supported learning processes significantly enhanced cognitive outcomes, including academic and domain-specific performance, peer-learning-related performance, higher-order thinking, and collaborative

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learning activities, which improved argumentative speaking (Darmanwansah et al., 2024) and metacognition (Chen, 2024) compared to no AI-assistance. The affiliative and instructional leadership approaches in the age of artificial intelligence (AI) are intended to influence students' achievement outcomes in school, where many authors conducted their research. Osagie & Momoh "revealed a positive relationship between instructional leadership and overall performance of students"; meanwhile, the study conducted by Xhomara, Karabina & Hasani (2022) "indicated a positive correlation between managerial leadership and achievement outcomes"; and Katewa & Heystek (2019) "showed that school principals use distributed leadership together with instructional leadership to collaborate and share their leadership with teachers". Xhomara and Dasho (2023) found a significant positive correlation between online instruction and student learning outcomes in the age of artificial intelligence (AI). Oyugi, & Gogo (2019) "established that democratic leadership accounted for 37.4% of the variation in students' academic performance, autocratic leadership accounted for 43.8% of the variation in students' academic performance and Laissez-faire leadership approach accounted for 15.7% of the variation in students' academic performance"; meanwhile, Chen, Cheng, & Sato (2017), as well as Xhomara (2022) "showed that ICT use and e-learning, and digital skills are significant variables that influence digital competencies of pre-service teacher students". Leithwood (1994, as cited in Xhomara, 2025) envisages "instructional leadership along eight dimensions: (1) building school vision, (2) establishing school goals, (3) providing intellectual stimulation, (4) offering individualized support, (5) modeling best practices and important organizational values, (6) demonstrating high-performance expectations, (7) creating a productive school culture, (8) developing structures to foster participation in school decisions". Day et al. (2001, as cited in Xhomara & Shkembi, 2024) concluded that "good leaders are informed by and communicate clear sets of personal and educational values which represent their moral purposes for the school".

"The AI-driven learning context covers the organising of teaching resources and scaffoldings, and AI-driven learning context standards should support students' learning. The learning outcomes result from the interaction between the student characteristics, AI-driven learning environment and the peer learning processes" (Sichterman et al., 2025). Leadership is "the second most important factor influencing school and learner outcomes, especially in the era of artificial intelligence (AI)" (Bush, & Glover, 2016; Schlebusch, 2020); meanwhile, Gyasi, & Owusu-Ampomah (2016) "noted that unless the headmasters are well equipped with knowledge and skills in leadership they would not know if they have any influence on their schools and academic work". Mayes, & Gethers (2018) "showed that the shifting responsibilities of school principals have required the incorporation of new and different leadership approaches; meanwhile", Matson (2018) "revealed differences exist between teachers and principals in terms of how much they believe certain leadership practices influence school performance". School principals' authentic leadership behaviors influence teachers' perceptions of school culture, and learner reading sores" (Karadag, & Oztekin-Bayir, 2018; Ciotti, Shriner, & Shriner, 2019); and Raza, & Sikandar (2018) "showed that readiness level of students can be changed through leadership approach of the teacher". Shibo (2016) revealed a positive correlation between school mean mark and team working spirit"; and Preyear (2015) "indicates that motivation and collaboration influence student achievement". "Variation in the leadership approaches adopted by the department heads highlighting the dichotomy between managerial accountability and professional empowerment" (Chow, 2013; Setlhodi, 2019); meanwhile, Moreno (2009) "indicated a relationship between managerial leadership and student performance". "Principals' leadership approaches and teachers' perceptions have an indirect effect on student performance; and increase the prevention of disruptive behaviors and students' life skills, and collegial school management predicts the prevention of disruptive behaviors and students' life skills"

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(Jackson, 2013; Rowley, 2013; Munir, & Khalil, 2016; Xhomara, 2019); but Brvenik-Estrella (2013) "indicated that positive leadership approaches can support a climate that is conducive to student achievement".

From another point of view, "there were no significant relationships between principals 'styles and students' academic performance" (Bello, Ibi, & Bukar, 2016; Pichon, 2010); as well as Harnish (2012), who revealed that there was no statistically significant correlation between leadership approaches and student achievement". "Transformational leadership approach and lecturer feedback had a positive relationship with student achievement" (Hardman, 2011; Xhomara & Bara, 2018); meanwhile, Magee (2012), and Ogbonna (2017) "revealed no significant differences in overall performance and leadership approach". The study conducted by Xhomara and Karabina (2021) "found that different levels of online learning and students' satisfaction influence academic performance". So, school leadership approaches, including affiliative and instructional in the age of artificial intelligence (AI), are important variables that impact achievement outcomes. Therefore, two operational hypotheses have been formulated as follows.

H1: There is a significant relationship between affiliative leadership and achievement outcomes in the AI era.

H2: There is a significant relationship between instructional leadership and achievement outcomes in the AI era.

Methodology

AI era. Method and design

The quantitative approach was the method used in the empirical study. The structured questionnaire was used to collect the primary quantitative data of independent and dependent variables from students and principals. The dimensions and items of the structured questionnaire are based on the affiliative leadership approach, instructional leadership approach, and achievement outcomes variables. The structured questionnaire is based on the relevance of the Questionnaire for leadership approach (Atsebeha, 2016). The Cronbach alpha of the structured questionnaire reliability scale ranges from .87 to .93. Therefore, the instrument used in the study exhibits high internal consistency. The questionnaires were administered at the end of the third term of the academic year.

Participants

The target population of the study is the student and principal populations of high schools in the country's main municipalities. From the target population, a random sample of students (N = 1289) and principals (N = 87) was selected to gather quantitative data. Regarding grades, 6.6% of students were in the 1st grade, 26.2% in the 2nd grade, and 67.2% in the 3rd grade of high school. Regarding qualifications, 18.2% of the principals have BA degrees, and 81.8% have MA degrees.

Procedure

The relationship between affiliative leadership approach and instructional leadership approach with achievement outcomes was investigated using linear multiple regression to assess the skills of control measures in predicting achievement outcome levels by affiliative leadership approach and instructional leadership approach.

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Research Results

Table 1

Linear regression coefficients of the relationships between affiliative leadership and achievement outcomes

Coefficients[a]_Students

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Correlations		
		B	Std. Error	Beta			Zero-order	Partial	Part
1	(Constant)	3.250	.120		27.160	.000			
	Affiliative leadership	-.053	.035	-.043	-1.539	.124	-.043	-.043	-.043

a. Dependent Variable: Achievement outcomes

Coefficients[a]_Principals

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Correlations		
		B	Std. Error	Beta			Zero-order	Partial	Part
1	(Constant)	1.328	.600		2.215	.029			
	Affiliative leadership	.512	.152	.343	3.371	.001	.343	.343	.343

a. Dependent Variable: Achievement outcomes

The beta value for achievement outcomes is -.043 according to students and .343 according to principals. The result means that affiliative leadership explains 4.3% of the negative variance in achievement outcomes according to students and 34.3% according to principals. Hence, there are contrary results, as reflected in students' and principals' responses. In conclusion, based on the statistical outputs shown above, H1: There is a significant relationship between affiliative leadership and achievement outcomes in the AI era, is not supported.

Table 2

Linear regression coefficients of the relationships between instructional leadership and achievement outcomes

Coefficients[a]_Students

Model	Unstandardized Coefficients		Standardized Coefficients	T	Sig.	Correlations		
	B	Std. Error	Beta			Zero-order	Partial	Part

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1	(Constant)	2.045	.149		13.708	.000			
	Instructional leadership	.360	.036	.295	7.140	.000	.295	.295	.295

a. Dependent Variable: Achievement outcomes

Coefficients[a]_Principals

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.	Correlations		
		B	Std. Error	Beta			Zero-order	Partial	Part
1	(Constant)	3.707	.639		5.797	.000			
	Instructional leadership	.100	.298	.268	.632	.002	.268	.268	.268

a. Dependent Variable: Achievement outcomes

The beta value for achievement outcomes is .295 for students and .268 for principals. The result means that instructional leadership explains 29.5% of the variance in achievement outcomes, as measured by students, and 26.8% of the variance, as measured by principals. Based on the statistical outputs shown above, H2: There is a significant relationship between instructional leadership and achievement outcomes in the AI era, has been supported.

Conclusion

The purpose of the study was to investigate the relationships between the school-affiliative and instructional leadership approaches and achievement outcomes, as well as the influence of these school leadership approaches on achievement outcomes in the age of artificial intelligence (AI). According to students, there is a negligible negative correlation between affiliative leadership and achievement outcomes (r = -.043), whereas according to principals, there is a low positive-to-moderate correlation (r = .343). The study found that, according to students, 4.3% of the negative variance in achievement outcomes is explained by affiliative leadership; meanwhile, according to principals, 34.3% of the variance in achievement outcomes is explained by affiliative leadership. The study indicated a low positive correlation between instructional leadership and achievement outcomes (r = .295) for students and a low positive correlation (r = .268) for principals. The study also demonstrated that, according to students, 29.5% of the variance in achievement outcomes is explained by instructional leadership; meanwhile, according to principals, 26.8% of the variance in achievement outcomes is explained by instructional leadership. Therefore, educational institutions should promote affiliative and, especially, instructional leadership approaches as important variables influencing achievement outcomes. Overall, the findings of this study enhanced theoretical and practical understanding of the affiliative and instructional leadership approaches as important variables that influence achievement outcomes in the artificial intelligence (AI) era.

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Pandora's Box in AI-Powered Assessment in Medical Education

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ABSTRACT: The emergence of artificial intelligence (AI) in higher education represents a transformative opportunity, but also an ethical and pedagogical challenge. In the field of university medical education, the use of AI in assessment processes opens a "Pandora's box": it unleashes potential benefits for formative assessment and competency development but also risks that threaten the authenticity and humanisation of the educational process. This essay critically analyses the "Pandora's box" metaphor in AI-mediated assessment, from a constructivist perspective and in accordance with the Mexican regulatory framework for higher education, highlighting the need to integrate technology in an ethical, formative, and student-centred manner.

KEYWORDS: Pandora's box, Artificial intelligence, medical education.

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Introduction

In Greek mythology, Pandora opened a box containing all the evils of the world, leaving only hope inside. In contemporary education, the metaphor of "Pandora's box" symbolises the risks and possibilities that emerge when artificial intelligence (AI) is incorporated into academic assessment. In medical training, where not only knowledge but also procedural skills and ethical values are assessed, the emergence of automated tools poses a dilemma: how can AI be used to strengthen formative assessment without losing the human element of learning?

Medical education, aligned with the General Law of Higher Education (LGES, 2021) and the General Health Law (2022), aims to train professionals capable of responding to societal health needs. Within this framework, evaluation cannot be reduced to measuring outcomes; it must instead become a reflective, continuous, and humanising process. Therefore, the introduction of AI must be analysed from a critical, constructive, and ethical perspective.

Formative Assessment and the Constructivist Paradigm

Formative assessment is conceived as a supportive process that provides feedback to students throughout their learning, rather than simply grading their final performance. According to Black and Wiliam (2009), its purpose is to "bridge the gap between the current state of knowledge and the desired level," allowing students to self-regulate their learning. From a constructivist perspective, assessment is a social and dialogical process that fosters the active construction of knowledge.

In medical education, this vision translates into the need for instruments that assess comprehensive competencies: cognitive, procedural, and attitudinal. Rubrics, portfolios, and self-assessment have become established strategies that promote reflection, self-efficacy, and professional responsibility (Morales & Landa, 2021). When integrated into this process, AI can expand its possibilities, provided it remains at the service of pedagogical judgment rather than replacing it.

Artificial Intelligence in Assessment: Opening Pandora's Box

AI applied to assessment offers a range of opportunities that, when used effectively, can positively transform teaching practices. Its contributions include immediate feedback, personalised learning, performance data analysis, and the prediction of learning trajectories (UNESCO, 2023). In medical education, this can translate into intelligent tutoring systems, adaptive clinical simulations, and diagnostic reasoning analysis tools.

However, opening this "Pandora's box" also brings risks: depersonalization of teaching, algorithmic biases, loss of validity in assessments, and a threat to academic integrity (Williamson & Piattoeva, 2022). If AI replaces the teacher's pedagogical and ethical perspective, assessment becomes dehumanised, reducing learning to mere data patterns. The hope, as in the myth, lies in educators becoming critical guardians of the process, using technology as a mediating tool rather than an absolute judge.

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Competency Assessment in Medical Education with AI

Contemporary medical education is geared towards developing comprehensive professional competencies, where technical knowledge is integrated with critical thinking, ethics, and human sensitivity (SEP, 2022). AI can contribute to strengthening this approach by designing simulated scenarios and automating the analysis of clinical performance, provided there is an ethical and educational framework to oversee its application.

For example, an AI system could offer feedback on communication with the patient in a simulation, but only the instructor can contextualise that information within the values of medical humanism. AI lacks the moral and cultural understanding necessary to judge attitudes, empathy, or complex clinical decision-making. Therefore, the role of the professor—especially in medicine—remains irreplaceable as a facilitator of learning and guarantor of comprehensive assessment.

Ethical and Legal Considerations in the Mexican Context

The use of AI in assessment must align with the principles of transparency, equity, and accountability established in the General Law of Higher Education (2021) and the National Artificial Intelligence Strategy (Government of Mexico, 2023). These regulations stipulate that educational technologies must promote quality, inclusion, and the protection of students' personal data.

Likewise, the Mexican Qualifications Framework for Higher Education (SEP, 2022) emphasises that all innovation must contribute to comprehensive human development and professional ethics. Therefore, in university medical education, AI should only be considered valid if it reinforces meaningful learning, respects student autonomy, and preserves the integrity of the educational relationship.

Conclusions

Opening Pandora's box of AI-powered assessments in medical education means acknowledging both its risks and its transformative potential. The hope that remains within that box is the possibility of building a fairer, more reflective, and more personalised formative assessment, always guided by the instructor's ethical and pedagogical judgment.

The challenge, therefore, is not to avoid AI but to humanise its use by integrating it critically and responsibly into university assessment processes. Only in this way can we ensure that technology serves the noblest purpose of medical education: to train competent, ethical professionals committed to health and human dignity.

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From Policy to Knowledge-in-Action: Innovation and Entrepreneurship in Vietnamese Higher Education from a Social Philosophy Perspective

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ABSTRACT: In the context of the transition toward a knowledge economy, universities are increasingly positioned as central actors in national innovation systems. In Vietnam, policies promoting innovation and entrepreneurship in higher education have expanded rapidly in recent years. However, most analyses focus on policy implementation and economic outcomes rather than the philosophical foundations of knowledge and creativity. This paper examines innovation and entrepreneurship in Vietnamese universities from a social philosophical perspective, drawing on the works of Habermas, Durkheim, and Marx. Using policy discourse analysis and hermeneutic interpretation, the study explores how knowledge functions as a social force shaping human creativity and collective development. The findings suggest that university innovation policies should be understood not merely as governance instruments but as mechanisms for socialising knowledge and empowering human agency. The paper proposes the concept of "knowledge-in-action" to explain how knowledge becomes a form of socially responsible creativity. It concludes that universities in Vietnam must move beyond instrumental innovation models toward a humanistic and socially embedded knowledge ecosystem.

KEYWORDS: A Social philosophy, knowledge society, innovation, entrepreneurship, higher education.

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1. Introduction

In the era of globalisation and digital transformation, innovation and entrepreneurship have become central drivers of economic growth and social development. Across the world, universities increasingly serve as engines of innovation by producing knowledge, cultivating creativity, and connecting research with social needs. Vietnam is experiencing a similar transformation. Higher education institutions are expected to function not only as teaching organisations but also as centres of research, innovation, and entrepreneurship. National policies, such as the National Startup Program and the strategy for higher education development, emphasise the role of universities in strengthening the country's innovation ecosystem. However, much of the current discussion of university innovation remains primarily policy- and managerial-oriented. Innovation is often measured through quantitative indicators such as patents, start-ups, or commercialisation outcomes. While these metrics are important, they do not fully capture the deeper philosophical meaning of knowledge and creativity in academic life. From a social philosophical perspective, innovation represents more than technological advancement. It reflects human beings' capacity to transform knowledge into socially meaningful action. Universities, therefore, function as spaces where knowledge, society, and human creativity interact. This paper aims to reinterpret innovation and entrepreneurship in Vietnamese higher education through the lens of social philosophy. By integrating philosophical insights with policy analysis, the study seeks to deepen understanding of how knowledge can become a socially transformative force.

2. Knowledge and Creativity in Social Philosophy

Social philosophy has long emphasised the relationship between knowledge, human agency, and social development. Classical thinkers such as Marx, Durkheim, and Habermas offer important insights into how knowledge functions within society. For Karl Marx, human creativity is closely linked to labour and production. Human beings distinguish themselves from other species through their ability to consciously create new forms of social and material reality. Innovation, therefore, reflects a fundamental aspect of human existence. However, when knowledge becomes purely instrumentalised by economic systems, creativity may lose its emancipatory potential.

Durkheim approached knowledge from the perspective of collective consciousness. He argued that knowledge is not merely the product of individual reasoning but emerges from shared social values and interactions. Universities thus play a vital role in shaping collective intellectual culture. Habermas introduced the distinction between the "system world" and the "lifeworld." In modern societies, economic and bureaucratic systems tend to dominate social life through instrumental rationality.

In contrast, the lifeworld represents the realm of communication, culture, and shared meaning. When knowledge becomes excessively instrumentalised, it risks losing its communicative and emancipatory functions. Innovation in universities therefore, cannot be reduced to technological

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progress alone. It should also be understood as a communicative process through which knowledge becomes socially meaningful.

3. Innovation Policies in Vietnamese Universities

Vietnam has implemented a range of policies to promote innovation and entrepreneurship within universities. These include national startup initiatives, innovation centres, and policies that encourage university-industry collaboration. Such initiatives aim to integrate academic research with economic development. Universities are expected to contribute directly to the national innovation system by producing research outputs and supporting entrepreneurial activities among students and faculty.

Nevertheless, policy discourse often emphasises economic efficiency and technological commercialisation. Innovation becomes framed primarily as a mechanism for economic competitiveness rather than a broader social process. This emphasis reflects what Habermas describes as the dominance of system rationality. When innovation policies focus solely on economic indicators, the social and humanistic dimensions of knowledge may be overlooked. A more balanced approach requires recognising universities as social institutions where knowledge is produced, debated, and shared. Innovation should therefore be understood as a process that connects intellectual freedom with social responsibility.

4. Results and Discussion: Policy Implementation and Startup Ecosystems in Vietnam

4.1. Strategic Policy Orientation under Resolution 71-NQ/TW (2025)

The promulgation of Resolution 71-NQ/TW (2025**)** marks a significant shift in Vietnam's strategic vision for higher education and national innovation development. The resolution identifies education, science, and technology as key pillars of national modernisation and emphasises the need to transform universities into centres for research, innovation, and knowledge creation.

A notable feature of this policy orientation is the repositioning of universities within the national innovation ecosystem. Higher education institutions are expected not only to train skilled human resources but also to contribute directly to scientific discovery, technological development, and entrepreneurial activity. In this context, innovation becomes a strategic function of universities rather than a supplementary activity.

Resolution 71 also highlights the importance of institutional reforms to strengthen university autonomy, academic freedom, and research capacity. These reforms are intended to enable universities to operate as dynamic knowledge institutions capable of generating new ideas and technological solutions for national development.

From a social-philosophical perspective, the policy orientation reflected in Resolution 71 represents a transformation in the conceptualisation of knowledge in Vietnamese higher education.

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Knowledge is increasingly viewed not simply as an educational output but as a productive social force that shapes economic development, cultural transformation, and intellectual progress.

4.2. National Student Startup Program and the Development of Entrepreneurial Education

Alongside this strategic policy transformation, Vietnam has implemented several initiatives designed to promote entrepreneurship among students and young researchers. One of the most influential programs is Project 1665/QĐ-TTg (2017), which supports students' entrepreneurship until 2025. The project seeks to establish a nationwide ecosystem that encourages students to develop entrepreneurial ideas and transform academic knowledge into innovative products and services.

According to official policy objectives, the program aims to achieve several key targets:

- Ensuring that 90% of university students receive training in entrepreneurship and startup skills before graduation;
- Requiring that all higher education institutions develop plans and programs to support student entrepreneurship;
- Promoting the establishment of startup clubs, innovation laboratories, and incubation centres within universities;
- Strengthening collaboration between universities, enterprises, and venture capital organisations.

These initiatives reflect an effort to integrate entrepreneurial education into the broader mission of higher education institutions. Universities are increasingly encouraged to create learning environments where students can experiment with ideas, develop prototypes, and engage with real-world innovation challenges.

4.3. Emerging Startup Ecosystems in Vietnamese Universities

Since the introduction of Project 1665, Vietnam has witnessed a growing number of startup-related activities within universities. Many institutions have established entrepreneurship support centres, startup incubators, and innovation competitions to encourage student creativity. Large universities such as Vietnam National University, Ho Chi Minh City University of Technology, and Foreign Trade University have organised annual startup competitions and innovation programs that connect students with investors, businesses, and research organisations. At the national level, the National Startup Day for Students (SV-Startup) has become an important platform for promoting entrepreneurial culture among young people. The event brings together universities, policymakers, entrepreneurs, and investors to share experiences and support innovative student projects.

These developments illustrate the gradual formation of a university-based innovation ecosystem in Vietnam. Universities are increasingly functioning as spaces where knowledge creation, technological experimentation, and entrepreneurial initiatives intersect. Nevertheless, several challenges remain. Many

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startup projects developed within universities remain at the conceptual stage and struggle to scale into sustainable businesses. Institutional support mechanisms also vary significantly across universities, leading to uneven development of innovation ecosystems.

4.4. Interpreting Policy Development through the Knowledge-in-Action Framework

The interaction between Resolution 71-NQ/TW and Project 1665 reveals a broader transformation in Vietnam's educational philosophy and innovation policy. On the one hand, Resolution 71 establishes a long-term strategic vision that positions universities as central actors in the national knowledge economy. On the other hand, Project 1665 operationalises this vision by encouraging entrepreneurial initiatives among students and academic communities. However, a purely policy-driven approach to innovation may risk reducing creativity to administrative targets or economic indicators. The philosophical challenge, therefore, lies in transforming innovation policies into meaningful intellectual practices.

The concept of knowledge-in-action proposed in this study offers a useful interpretive framework for understanding this transformation. Knowledge-in-action refers to the process through which theoretical knowledge is translated into socially meaningful practice through creativity, dialogue, and collaboration. From this perspective, university entrepreneurship programs should not only aim to produce startups but also to cultivate creative citizens capable of applying knowledge to address complex social challenges. Innovation thus becomes a form of socially responsible action rather than merely an economic activity.

These empirical developments highlight the dynamic relationship between innovation policy and knowledge production in Vietnamese higher education. While policy initiatives have created important opportunities for entrepreneurial activity, the deeper challenge lies in transforming these initiatives into sustainable intellectual practices. In response to this challenge, the following section introduces the knowledge-in-action model as a conceptual framework for understanding how universities can integrate innovation, creativity, and social responsibility within the knowledge society.

5. Conclusion

Innovation and entrepreneurship in Vietnamese higher education represent more than policy initiatives aimed at economic growth. From a social-philosophical perspective, they reflect the evolving relationship among knowledge, society, and human creativity in the transition toward a knowledge-based economy. As universities increasingly participate in national innovation ecosystems, the meaning of innovation must be reconsidered beyond managerial or purely economic interpretations. This study has argued that innovation policies in higher education should move beyond instrumental approaches toward a more humanistic understanding of knowledge. Drawing on insights from social philosophy and policy discourse analysis, the paper emphasises that knowledge is not only a resource for economic development but also a social force shaping intellectual freedom, creativity, and collective progress. In

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this sense, universities function as spaces where knowledge is produced, shared, and transformed into meaningful social action.

The concept of knowledge-in-action proposed in this study provides a useful framework for connecting academic knowledge with socially responsible creativity. By emphasising the integration of research, education, and community engagement, this framework underscores the importance of translating theoretical knowledge into practical, socially beneficial outcomes. Innovation in universities should therefore be understood not simply as technological advancement or startup creation, but as a broader process of empowering individuals to apply knowledge in ways that contribute to society. Ultimately, Vietnamese universities have the potential to become key actors in building a knowledge-based and innovative society. Strengthening academic freedom, fostering collaborative learning environments, and encouraging socially responsible entrepreneurship will enable universities to transform knowledge into action and creativity into sustainable social development. may enable higher education to serve not only as a driver of economic development but also as a foundation for humanistic and sustainable social progress.

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Institutional Accessibility Level and Sustainability of Access to Public Legal Defense for the Care of People in Situations of Vulnerability in Tulancingo, Hidalgo, Mexico

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ABSTRACT: The objective of this study was to evaluate the level of institutional accessibility and the sustainability of access to public legal defense for vulnerable individuals in the municipality of Tulancingo de Bravo, Hidalgo, Mexico. The research was conducted using a quantitative approach, with a descriptive scope and a non-experimental, cross-sectional design. The study population consisted of all public defenders assigned to the Public Defender's Office of the State of Hidalgo in the municipality of Tulancingo, who were surveyed using a structured questionnaire with a five-point Likert scale. The results show that, from the public defenders' perspective, institutional accessibility is predominantly favorable, with the clarity of the information provided and the service's reasonable initial response times highlighted as strengths. However, areas for improvement were identified in the dissemination of information about the service and in strengthening outreach mechanisms for vulnerable populations. The importance of these findings lies in the fact that they provide empirical evidence at the municipal level on the functioning of public legal defense, contributing to the analysis of access to justice and the institutional sustainability of the service, in line with Sustainable Development Goal 16.

KEYWORDS: Institutional accessibility, public legal defense, access to justice, sustainability, social vulnerability.

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Introducción

La accesibilidad a la justicia constituye uno de los pilares fundamentales del Estado de derecho y una condición necesaria para garantizar el ejercicio efectivo de los derechos humanos (Zepeda y Ríos, 2018). De acuerdo con la Organización de las Naciones Unidas ([ONU], 2020), el acceso a la justicia implica que todas las personas puedan acudir a mecanismos institucionales capaces de resolver conflictos de manera imparcial, oportuna y sin discriminación. En este sentido, los sistemas de defensoría pública constituyen un componente esencial para materializar dicho acceso, especialmente para quienes no cuentan con los recursos económicos o sociales suficientes para contratar servicios jurídicos privados (ONU, 2020).

Desde una perspectiva de desarrollo sostenible, el acceso a la justicia se vincula directamente con el Objetivo de Desarrollo Sostenible 16 (ODS 16), que busca promover sociedades pacíficas e inclusivas, garantizar el acceso a la justicia para todos y construir instituciones eficaces, responsables e inclusivas en todos los niveles (ONU, 2020). En este marco, la accesibilidad institucional a la defensoría pública no solo debe entenderse como la posibilidad inmediata de recibir atención jurídica, sino como la capacidad sostenida del Estado para ofrecer servicios jurídicos accesibles, oportunos y de calidad de manera continua, lo que constituye un elemento clave de la sostenibilidad institucional del acceso a la justicia. (ONU, 2020)

En palabras de Cejudo y López (2020), los grupos en situación de vulnerabilidad, como personas de bajos recursos, mujeres, personas indígenas, personas privadas de la libertad, adultos mayores, personas con discapacidad o personas de la comunidad LGBTTTQ+, enfrentan barreras estructurales que limitan su capacidad de acceder plenamente al sistema legal. Estas barreras incluyen la falta de información, los obstáculos institucionales, las demoras procesales, la ausencia de perspectiva de derechos humanos y las limitaciones presupuestales (Comisión Interamericana de Derechos Humanos [CIDH], 2022). En el contexto latinoamericano, diversos estudios han mostrado que las condiciones de vulnerabilidad se asocian con mayores dificultades para acceder a una asesoría jurídica adecuada, lo que repercute directamente en la desigualdad y en la reproducción de la exclusión social (García-Matamoros y Ugaz, 2020).

En México, la Constitución reconoce el derecho a la defensa adecuada y establece que las instituciones de defensoría pública deben garantizar representación jurídica de calidad a quienes no pueden cubrir los costos de un abogado particular (Constitución Política de los Estados Unidos Mexicanos [CPEUM], 2024, art. 17). Sin embargo, investigaciones recientes han señalado retos persistentes: cargas excesivas de trabajo, recursos limitados, procesos burocráticos y brechas entre el diseño institucional y la práctica cotidiana, estos factores pueden afectar directamente la accesibilidad real del servicio, especialmente en entidades con menor infraestructura y capacidad operativa (Fix-Fierro y Luna-Torres, 2019).

El estado de Hidalgo no es ajeno a estas problemáticas; informes estatales han evidenciado que, aunque la defensoría pública cumple un papel crucial en la atención de personas en situación de vulnerabilidad, existen disparidades territoriales, limitaciones en la difusión del servicio y desafíos para garantizar un acceso oportuno y eficiente (Poder Judicial del Estado de Hidalgo [PJEH], 2021). En municipios como Tulancingo, donde confluyen zonas urbanas y semiurbanas con niveles significativos

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de marginación, resulta fundamental analizar en qué medida el servicio de defensoría pública se encuentra verdaderamente accesible y cuenta con condiciones institucionales que permitan su permanencia y fortalecimiento a lo largo del tiempo.

A pesar de que el marco normativo mexicano reconoce el derecho a la defensa adecuada y establece que la defensoría pública debe garantizar una representación jurídica accesible y eficaz, en la práctica persisten condiciones que dificultan que las personas en situación de vulnerabilidad accedan plenamente a este servicio en contextos locales como Tulancingo de Bravo, Hidalgo. En este orden de ideas, resulta fundamental evaluar el nivel de accesibilidad institucional y la sostenibilidad del acceso a la Defensoría Pública para la atención de personas en situación de vulnerabilidad en Tulancingo de Bravo, Hidalgo, México.

Estudio aplicado en Tulancingo, Hidalgo, México.

El estudio se llevó a cabo en el Instituto de la Defensoría Pública del Estado de Hidalgo en Tulancingo de Bravo, con el objetivo de evaluar el nivel de accesibilidad institucional y la sostenibilidad del acceso a la defensoría pública para la atención de personas en situación de vulnerabilidad en dicho municipio.

La investigación se desarrolló bajo un enfoque cuantitativo, con el objetivo de describir, mediante datos estadísticos, el nivel de accesibilidad institucional a la defensoría pública, así como las condiciones que permiten su funcionamiento continuo y eficaz. Este enfoque resulta pertinente cuando se pretende medir y analizar fenómenos sociales mediante la recolección de datos estructurados y cuantificables (Hernández y Mendoza, 2018).

El alcance del estudio fue descriptivo, ya que se orientó a detallar cómo se manifiesta la accesibilidad institucional en la práctica cotidiana de la defensoría pública, a partir de la distribución de frecuencias y otros análisis estadísticos, sin intervenir ni modificar las condiciones del fenómeno estudiado (Hernández y Mendoza, 2018).

El diseño de investigación fue no experimental, dado que no se manipularon variables; se analizó la accesibilidad institucional a la defensoría pública en su contexto natural, sin intervención externa. Asimismo, se trató de un estudio transeccional descriptivo, ya que la recolección de información se realizó en un único momento, lo que permitió obtener una caracterización puntual del nivel de accesibilidad institucional y de los elementos que contribuyen a la sostenibilidad del acceso al servicio (Hernández y Mendoza, 2018).

La población de estudio estuvo conformada por la totalidad de los defensores públicos adscritos al Instituto de la Defensoría Pública del estado de Hidalgo en Tulancingo de Bravo, integrada por siete defensores, de los cuales seis corresponden al área de control y uno al área de ejecución, conforme a datos del Instituto de la Defensoría Pública del Estado de Hidalgo ([IDPEH], 2025). Dada la reducida dimensión de la población, se optó por aplicar un censo muestral, técnica adecuada cuando el universo es pequeño y permite incluir a todos los sujetos de estudio, lo que incrementa la validez de los resultados (Hernández y Mendoza, 2018).

Para la recolección de datos, se diseñó un cuestionario estructurado, elaborado específicamente para medir la variable nivel de accesibilidad institucional a la defensoría pública, considerando

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dimensiones relacionadas con la disponibilidad institucional, la accesibilidad operativa, la difusión del servicio y los mecanismos de acercamiento a población vulnerable. El instrumento se aplicó mediante una escala Likert de cinco puntos, siguiendo los lineamientos metodológicos propuestos por Hernández y Mendoza (2018).

Con base en lo anterior, la investigación se orienta a responder la siguiente pregunta de investigación, ¿Cuál es el nivel de accesibilidad institucional y sostenibilidad del acceso a la defensoría pública para la atención de personas en situación de vulnerabilidad en Tulancingo, Hidalgo, México?

Resultados

Análisis teórico

El acceso a la justicia es reconocido como un derecho humano fundamental y un componente esencial del Estado de derecho, ya que permite a las personas hacer efectivos sus derechos ante instancias institucionales imparciales y oportunas (ONU,2020). En la literatura contemporánea, este concepto ha dejado de entenderse únicamente como la posibilidad formal de acudir a un tribunal, para incorporar dimensiones relacionadas con la accesibilidad institucional, tales como la claridad de la información, la oportunidad en la atención, la disponibilidad de servicios y la capacidad operativa de las instituciones de justicia (CIDH, 2022).

Desde una perspectiva internacional, la Agenda 2030 para el Desarrollo Sostenible, particularmente el Objetivo de Desarrollo Sostenible 16, establece que garantizar el acceso a la justicia requiere la existencia de instituciones eficaces, responsables y sostenibles, capaces de mantener en el tiempo condiciones reales de atención para toda la población, especialmente para los grupos en situación de vulnerabilidad (ONU, 2015). Este enfoque introduce la noción de sostenibilidad institucional del acceso a la justicia, entendida como la capacidad de las instituciones públicas para ofrecer servicios jurídicos continuos, accesibles y de calidad, más allá de su mera existencia normativa (ONU, 2020).

En este contexto, las defensorías públicas desempeñan un papel central como mecanismos institucionales orientados a reducir las barreras económicas y estructurales que enfrentan las personas que no pueden contratar servicios jurídicos privados. Diversos estudios señalan que estas instituciones contribuyen de manera significativa a la equidad en el sistema de justicia, al permitir que poblaciones vulnerables accedan a asesoría y representación legal (Aguiar, 2021; Sierras, 2025). No obstante, la literatura también advierte que su impacto depende directamente de las condiciones institucionales bajo las cuales operan.

Investigaciones recientes en América Latina coinciden en que la accesibilidad a la defensoría pública se ve limitada por factores como la sobrecarga laboral del personal defensor, la insuficiencia de recursos materiales, las deficiencias en la difusión del servicio y las dificultades para atender territorios alejados o con alta marginación social (Cejudo y López, 2020; Alianza Iberoamericana para el Acceso a la Justicia, 2023). Estos enfoques subrayan que la accesibilidad institucional debe analizarse desde una lógica multidimensional, en la que convergen aspectos informativos, administrativos, territoriales y organizacionales.

Desde el ámbito empírico, estudios comparados han demostrado que los tiempos de atención,

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la claridad en la comunicación con las personas usuarias y la existencia de mecanismos de acercamiento comunitario influyen directamente en la percepción y efectividad del acceso a la justicia (Gottlieb, 2021; Ang, 2023). En este sentido, la accesibilidad institucional no solo facilita el ingreso al sistema de justicia, sino que también fortalece la confianza ciudadana en las instituciones públicas, elemento clave para su sostenibilidad.

En el caso mexicano, el marco constitucional reconoce el derecho a una defensa adecuada; sin embargo, investigaciones recientes advierten la persistencia de brechas entre el diseño normativo y la práctica institucional cotidiana, particularmente a nivel subnacional (Fix-Fierro y Luna-Torres, 2019). Estas brechas justifican la necesidad de estudios descriptivos que evalúen cómo se manifiesta la accesibilidad institucional en contextos locales específicos, como es el caso del municipio de Tulancingo de Bravo, Hidalgo.

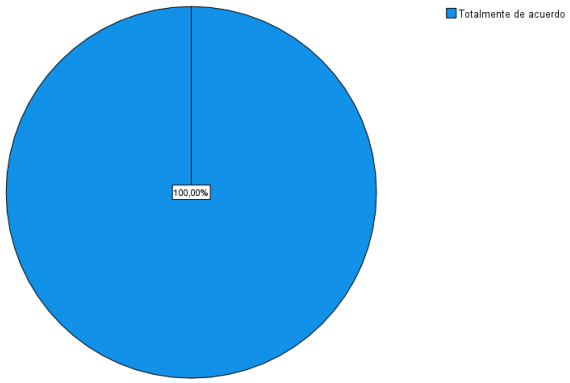
Justificación del estudio

A partir de esta revisión teórica, se identifica un consenso académico respecto a la importancia de evaluar la accesibilidad institucional como indicador clave del acceso a la justicia, así como la necesidad de generar evidencia empírica a nivel local que permita analizar la sostenibilidad del servicio de defensoría pública. En este sentido, la presente investigación resulta relevante y original al aportar datos cuantitativos desde la perspectiva del personal defensor, contribuyendo al fortalecimiento del debate sobre el acceso a la justicia y el cumplimiento del ODS 16 en el ámbito municipal.

Resultados empíricos

Figura1

Claridad de la información proporcionada por la defensoría pública.



Fuente: Elaboración propia.

La figura 1 muestra que el 100 % de los defensores públicos encuestados consideró que la información brindada a las personas usuarias es clara y comprensible, lo que permite identificar la accesibilidad informativa como una fortaleza institucional relevante para evaluar el nivel de accesibilidad a la defensoría pública en personas en situación de vulnerabilidad.

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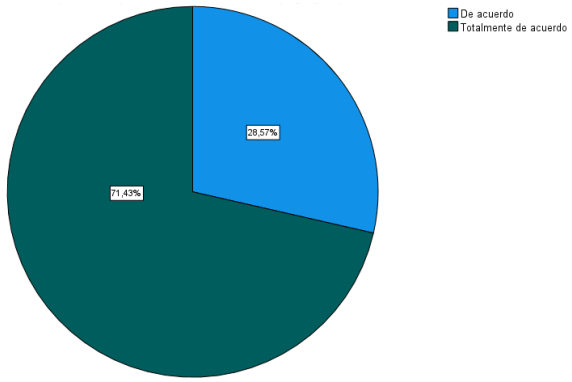
Figura 2

Los tiempos de espera entre la solicitud de apoyo y la primera atención son razonables.

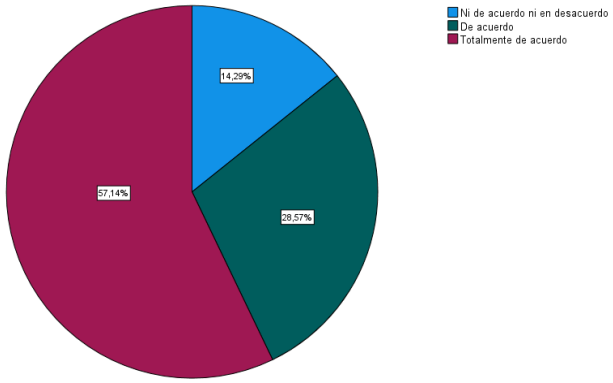


Fuente: Elaboración propia

De acuerdo a la figura 2 el 71.43 % de los defensores públicos encuestados manifestó estar totalmente de acuerdo y el 28.57 % de acuerdo en que los tiempos de espera entre la solicitud de apoyo y la primera atención son razonables. Este resultado permite identificar que, desde la percepción del personal defensor, la oportunidad en la atención inicial constituye una fortaleza del servicio, lo cual es relevante para la investigación al evidenciar que la accesibilidad no solo depende de la existencia de la defensoría pública, sino también de la respuesta oportuna como condición esencial para garantizar el acceso efectivo a la justicia de personas en situación de vulnerabilidad.

Figura 3

Mecanismos institucionales de acercamiento a población vulnerable.



Fuente: Elaboración propia

En la figura 3 se visualiza que el 57.14 % de los defensores públicos señaló estar totalmente de acuerdo y el 28.57 % de acuerdo en que la defensoría cuenta con mecanismos de acercamiento para atender a la población vulnerable, mientras que un 14.29 % mantuvo una postura neutral. Este resultado es relevante para la investigación, ya que permite identificar que la accesibilidad territorial es percibida mayoritariamente como una fortaleza institucional, aunque con áreas de oportunidad para

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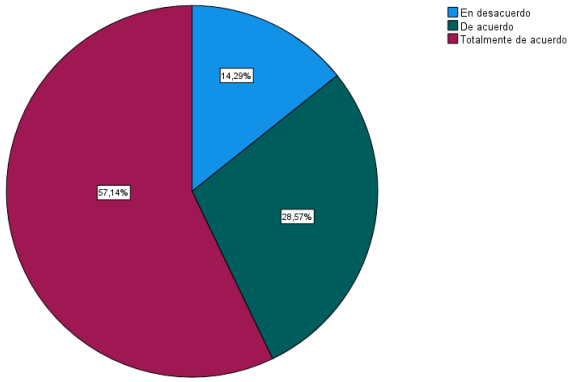
consolidar estrategias que amplíen el alcance del servicio a personas en situación de vulnerabilidad.

Figura 4

Difusión institucional del servicio de defensoría pública.



Fuente: elaboración propia.

Los resultados de la figura 4 señalan que el 57.14 % de los defensores públicos manifestó estar totalmente de acuerdo y el 28.57 % de acuerdo en que la difusión del servicio de defensoría pública es suficiente para que la población conozca cómo acceder a él, mientras que un 14.29 % expresó estar en desacuerdo. Este resultado es relevante para la investigación, ya que evidencia que, si bien la difusión institucional es percibida mayoritariamente como adecuada, persisten limitaciones en la visibilidad del servicio, lo que puede constituir una barrera inicial de acceso y afectar el nivel de accesibilidad institucional a la defensoría pública para la atención de personas en situación de vulnerabilidad.

Conclusiones

Los resultados de la investigación permiten concluir que, desde la percepción de los defensores públicos, el nivel de accesibilidad institucional a la defensoría pública en Tulancingo de Bravo, Hidalgo, presenta condiciones mayoritariamente favorables para la atención de personas en situación de vulnerabilidad. La claridad de la información proporcionada, los tiempos razonables de atención inicial, la existencia de mecanismos de acercamiento y la difusión institucional del servicio se identifican como elementos que contribuyen de manera significativa al funcionamiento del Instituto de la Defensoría Pública en el ámbito local.

En particular, la claridad informativa, reconocida de forma unánime por el personal defensor, así como la oportunidad en la atención inicial, evidencian fortalezas institucionales que favorecen el acceso efectivo a la justicia y reducen barreras comunicacionales y operativas. No obstante, los resultados relacionados con los mecanismos de acercamiento territorial y la difusión del servicio muestran la presencia de posturas neutrales y de desacuerdo, lo que permite identificar áreas de oportunidad para fortalecer la cobertura institucional y garantizar que el servicio sea conocido y accesible para toda la población potencialmente usuaria.

Desde una perspectiva de sostenibilidad del acceso a la justicia, los hallazgos sugieren que la defensoría pública cuenta con bases institucionales que permiten la continuidad del servicio; sin

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embargo, su consolidación depende del fortalecimiento permanente de estrategias de difusión, ampliación territorial y mejora de las condiciones operativas. En este sentido, la accesibilidad institucional no solo debe entenderse como la existencia formal del servicio, sino como la capacidad del Estado para mantener en el tiempo condiciones efectivas de acceso, en concordancia con los principios del Objetivo de Desarrollo Sostenible 16.

Finalmente, esta investigación contribuye al análisis empírico del acceso a la justicia desde un enfoque institucional, aportando evidencia cuantitativa a nivel municipal sobre el funcionamiento de la defensoría pública. Como líneas para futuras investigaciones, se recomienda incorporar la percepción directa de las personas usuarias, realizar estudios comparativos entre distintos municipios o entidades federativas, así como analizar variables complementarias relacionadas con la carga de trabajo, recursos institucionales y uso de tecnologías, con el fin de profundizar en la sostenibilidad del acceso a la defensoría pública y su impacto en la reducción de desigualdades.

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Electronic Evidence in Dispute Resolution at Commercial Arbitration in Vietnam: Practice and Challenges in the Digital Era

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ABSTRACT: Vietnam, as well as other countries, is benefiting from significant achievements enabled by new technology, while also facing legal challenges related to its use and adoption. With the expansion of the Internet, opportunities for business and commercial activities are increasingly visible due to its borderlessness, speed, and high processing power. This also gives rise to disputes related to business and commercial activities through electronic transactions, in which the disputing parties are required to provide evidence to protect their legitimate rights and interests. Along with the growing circulation of electronic documents in trade, electronic evidence has also become especially important in business dispute resolution procedures in commercial arbitration. The article focuses on the issue of accepting electronic evidence in business and commercial dispute resolution procedures, highlighting the limitations and inadequacies of current legal regulations and proposing suggestions for improving legal regulations on the acceptance of electronic evidence in business dispute resolution procedures at commercial arbitration in Vietnam.
KEYWORDS: Commercial arbitration, dispute resolution, electronic evidence, legal admissibility, Vietnam.

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Introduction

In recent decades, the rapid expansion of globalisation, international trade, and digital technologies has fundamentally reshaped the way commercial transactions are conducted. Cross-border e-commerce, online platforms, and digitalised business models have increased the complexity of contractual relationships, giving rise to a new generation of disputes in which electronic documents and data often serve as the core source of evidence (Mason and Seng 2017). Against this background, arbitration has emerged as the most popular mechanism for resolving international and domestic commercial disputes, offering neutrality, procedural flexibility, efficiency, and enforceability under international conventions such as the 1958 New York Convention on the Recognition and Enforcement of Foreign Arbitral Awards(United Nations, 1958). Unlike traditional court litigation, arbitration allows parties to choose arbitrators with expertise in technology, commerce, and law, while preserving confidentiality and reducing the risk of politicisation (Born, 2021).

However, arbitration proceedings are not entirely insulated from judicial scrutiny. Under the Civil Procedure Code (CPC) 2015 (Civil Procedure Code, 2015) and the Law on Commercial Arbitration (LCA) 2010 (Law on Commercial Arbitration, 2010), arbitral awards are subject to annulment by Vietnamese courts if they are deemed inconsistent with the *fundamental principles of Vietnamese law*(Law on Commercial Arbitration, 2010). Resolution No. 01/2014/NQ-HĐTP further details the circumstances under which arbitral awards may be set aside, including violations of procedural safeguards or reliance on inadmissible evidence (Guiding the Implementation of Certain Provisions of the Law on Commercial Arbitration 2014). This interplay between arbitrating discretion and judicial review gives rise to significant uncertainty in practice, particularly when disputes hinge on electronic evidence, which may include emails, messaging logs, system metadata, blockchain records, or audiovisual files(Nguyen Thanh Minh Chanh, 2021).

Electronic evidence raises unique challenges for arbitral tribunals and courts alike. Unlike traditional paper-based evidence, electronic records may be intangible, easily altered, or stored on servers outside Vietnam's jurisdiction (Law on Commercial Arbitration, 2010). Questions of authenticity, integrity, reliability, and admissibility become central to determining whether such evidence can be relied upon. The arbitral tribunal, pursuant to Articles 46 and 47 of the LCA, is empowered to determine the admissibility and weight of evidence(Law on Commercial Arbitration, 2010). However, courts retain the authority to annul awards if they conclude that reliance on electronic evidence contravened procedural safeguards under the Civil Procedure Code 2015. This duality often produces tension: arbitral tribunals may adopt a pragmatic and flexible approach, while courts emphasise formalistic compliance, sometimes requiring the “original” version of documents in physical form, a requirement difficult to satisfy in the digital era (Tuong Duy Luong, 2023).

This problem is not unique to Vietnam. International practice has long debated the admissibility of electronic evidence in arbitration. The UNCITRAL Model Law on International Commercial

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Arbitration (1985/2006) recognises the principle of procedural flexibility, granting tribunals wide discretion in determining evidentiary issues (UNCITRAL, 2006). The UNCITRAL Model Law on Electronic Commerce (1996) and Model Law on Electronic Signatures (2001) explicitly acknowledge the functional equivalence of electronic records with traditional documents, provided authenticity and reliability are assured. Likewise, the IBA Rules on the Taking of Evidence in International Arbitration (2020) emphasise that tribunals may admit electronic documents, metadata, or electronic recordings and assess their probative value in accordance with international best practices (International Bar Association, 2020). Similarly, it reflects a flexible evidentiary regime that enables tribunals to determine the relevance, materiality, and admissibility of electronic records (International Chamber of Commerce (ICC), 2021).

Comparative experiences further illustrate this evolving trend. In the United States, the Federal Rules of Evidence 902(13) and 902(14) provide mechanisms for the self-authentication of electronic records, reducing the burden on parties to produce witnesses to prove authenticity (Federal Rules of Evidence, 2024). In the European Union, the eIDAS Regulation (No. 910/2014) establishes a harmonised legal framework for electronic identification, trust services, and electronic signatures, ensuring the legal validity of digital documents across member states (Official Journal of the European Union, 2014). Singapore, a leading arbitration hub in Asia, has incorporated provisions into its Evidence Act to recognise the evidentiary status of electronic records, emphasising reliability and system integrity (Singapore Parliament, 1983). These comparative practices demonstrate a global shift toward recognising the unique nature of electronic evidence while maintaining safeguards for authenticity and integrity.

In Vietnam, despite significant progress under the Law on Electronic Transactions 2023, which establishes the principle of legal equivalence between electronic data messages and paper-based documents, if data messages are accessible, reliable, and capable of authentication. Yet, gaps remain in harmonising these principles with the Civil Procedure Code and the Law on Commercial Arbitration (Duong Hoai An, 2025). The absence of clear procedural standards for handling, authenticating, and preserving electronic evidence leads to inconsistent practices, undermining confidence in arbitral proceedings.

The implications are profound. If courts frequently annul arbitral awards on grounds of insufficient evidentiary reliability, it will undermine arbitration's attractiveness as an effective dispute-resolution mechanism in Vietnam. This undermines not only the autonomy of arbitral tribunals but also Vietnam's standing as a reliable arbitration venue for international investors and commercial actors (Manh et al., 2024). Strengthening the legal framework governing electronic evidence is therefore essential, not only to ensure fairness and efficiency in arbitration but also to foster confidence in Vietnam's judicial and arbitral systems in the digital economy.

Against this backdrop, this article addresses the admissibility of electronic evidence in resolving commercial disputes through arbitration in Vietnam. It seeks to answer the following research question:

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To what extent does the court's supervisory power to annul arbitral awards constrain the discretion of arbitral tribunals in admitting and assessing electronic evidence? By examining both domestic legislation and international standards, the article identifies the limitations and inadequacies of Vietnam's current framework, evaluates the interaction between arbitral discretion and judicial oversight, and proposes recommendations to align Vietnam's practice with international best practices. The aim is to enhance the efficiency, predictability, and credibility of arbitration in Vietnam in the age of digital commerce.

Research Aim

This study aims to critically examine the coherence of Vietnamese legal regulations on the admissibility of electronic evidence in commercial arbitration, with particular attention to the divergence between arbitral tribunals' evidentiary discretion and courts' judicial review of arbitral awards. By analysing statutory provisions, judicial practice, and arbitral decisions, the research seeks to identify the causes of inconsistent approaches to electronic evidence, especially regarding representative authority and procedural formalities. On that basis, the study proposes legal reforms aligned with international standards to enhance legal certainty, predictability, and confidence in commercial arbitration in Vietnam.

Research Questions

1. To what extent does Vietnamese law provide a coherent framework for the admissibility of electronic evidence in commercial arbitration, particularly in light of judicial review of arbitral awards?
2. Why do divergences arise between arbitral tribunals and Vietnamese courts in the assessment of electronic evidence, especially concerning representative authority and procedural formalities?
3. What legal reforms are required to harmonise Vietnamese arbitration practice on electronic evidence with international standards and enhance legal certainty in commercial dispute resolution?

Results and Discussion

The admissibility of evidence, in general and, in arbitration proceedings, in particular, is subject to differing approaches among arbitral tribunals and courts. While arbitral tribunals enjoy broad discretion under Articles. 46-47, the Law on Commercial Arbitration 2010**,** the courts, when reviewing arbitral awards under Articles. 93-96, the Civil Procedure Code 2015 and Resolution No. 01/2014/NQ-HĐTP, may annul an award if they find that the evidentiary assessment contravenes fundamental legal principles (Guiding the Implementation of Certain Provisions of Law on Commercial Arbitration 2014). This divergence often leads to inconsistencies in the recognition of electronic evidence.

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First, regarding the subject of establishing transactions in contractual relationships.

In a dispute over a goods-processing contract between D. Joint Stock Company and M. Vietnam Co., Ltd. (2018), both parties acknowledged email correspondence as evidence(*Dispute over commercial business contract for processing goods, Judgment No. 08/2018/KDTM-PT*, 2018). The defendant argued that the emails were invalid because they were sent by Mr Hoang Van C., who was not the legal representative of Company D. The Court nevertheless held that Mr C. was regularly assigned to handle contractual matters and debt monitoring, and that his emails were simultaneously copied to Company D's leaders. Thus, the Court accepted these emails as evidence of transactions, despite Mr C.'s lack of formal representative authority (Nguyen Thanh Minh Chanh, 2021).

Conversely, in another case (BG Vietnam Co., Ltd. v. BG Co., Ltd., 2019), the Court annulled an arbitral award, ruling that the signatory of the contract was not the company's legal representative and lacked proper authorization under the company charter or registration certificate(Dispute over goods purchase contract of, Judgment No. 20/2019/KDTM-PT 2019). Here, the Court emphasised that a managerial position alone could not substitute for representative authority, citing Civil Code 2015, Article 117, on the conditions for valid civil transactions (Civil Procedure Code, 2015). These cases demonstrate divergent judicial views on whether unauthorised acts in electronic communications may still constitute valid contractual representation.

Second, legal obstacles related to the form of electronic evidence

Vietnamese law does not provide detailed procedural rules for verifying electronic evidence in civil and arbitral proceedings, resulting in inconsistent outcomes. For instance, in a commercial dispute between CN B. Co., Ltd. and DN. Commodity Production & Enterprise Co., Ltd. (2019), the defendant submitted invoices transmitted by email as evidence (Dispute over goods purchase contract of, Judgment No. 20/2019/KDTM-PT 2019)e. The Court rejected them because they were in a foreign language without Vietnamese translation, were unauthenticated under Civil Procedure Code 2015, Article 96(3) (Civil Procedure Code, 2015)**,** and lacked identification of the sender. Similarly, in the dispute between the plaintiff Tai Seng Bavet Sez Co., Ltd. and the defendant Chunghwa Telecom Vietnam Co., Ltd., (Request to set aside the arbitration award- Decision No. 1768/2022/QD-PQTT 2020). The Court annulled the award because the arbitral tribunal admitted foreign documents without consular legalisation, holding that this contravened Vietnamese procedural law and Decree No. 111/2011/ND-CP on consular certification and legalisation (Government, 2011).

By contrast, arbitral tribunals may admit electronic evidence more flexibly.

Articles 46 and 47 of the Law on Commercial Arbitration 2010 allow tribunals to consider electronic data as written or physical evidence without strict adherence to civil procedural requirements (Tran, 2022). However, this flexibility carries the risk of annulment by courts, which often insist on

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compliance with formal procedural safeguards, such as consular legalisation, certified translations, and submission of originals.

This tension raises a critical question: whether arbitral tribunals' discretion in admitting electronic evidence is undermined by courts' supervisory powers, thereby affecting the predictability of arbitration in Vietnam. The lack of clear statutory criteria for the admission of electronic evidence in arbitration underscores the urgent need for harmonisation between arbitral practice and judicial review to enhance consistency and legal certainty.

In a comparative perspective, Vietnam's approach, where courts emphasise compliance with formal procedural requirements (translation, authentication, and consular legalisation), contrasts with several international systems that adopt a more flexible framework. In the United States, for instance, the landmark case *Lorraine v. Markel American Insurance Co.* (2007) (Lorraine & Mack, 2007) underscored that electronic evidence, including emails and digital records, must satisfy the traditional tests of relevance, authenticity, hearsay exceptions, originality, and probative value under the Federal Rules of Evidence (Lorraine & Mack, 2007). Judge Grimm's opinion in this case is widely regarded as a guideline for assessing the admissibility of electronic evidence.

Similarly, the IBA Rules on the Taking of Evidence in International Arbitration explicitly recognise electronic documents as admissible evidence and emphasise authenticity and integrity over rigid formalities such as legalisation (International Bar Association, 2020). Moreover, both the International Chamber of Commerce (ICC, 2021) and the SIAC Rules (2016) grant arbitral tribunals broad discretion to admit and evaluate evidence, without distinguishing between paper and electronic formats. In practice, tribunals under these rules routinely accept electronic records such as emails, metadata, and system-generated files, provided their source and reliability can be demonstrated.

This comparative insight reveals a fundamental divergence: while international arbitration focuses on practical reliability and authenticity, Vietnamese practice remains tied to formal procedural safeguards under the Civil Procedure Code. As a result, arbitral awards in Vietnam are more vulnerable to annulment when based on electronic evidence that does not strictly comply with procedural formalities, even if its authenticity is not in doubt. This highlights the need for Vietnam to modernise its evidentiary rules to align with global best practices, thereby enhancing the efficiency and credibility of commercial arbitration.

Recommendations for Legal Reform

The admissibility of electronic evidence is inherently more complex than traditional evidence because of its technical characteristics. Unlike conventional documents or physical objects, electronic evidence often requires specialised expertise to evaluate its authenticity, reliability, and probative value (Mason and Seng 2017). Judges and arbitrators are therefore not only tasked with legal interpretation. Still, they must also be equipped with at least a fundamental understanding of information technology

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or supported by technical experts to properly assess electronic data (Stanfield, 2016). This dual requirement highlights the need for a legal framework that is both technologically adaptive and procedurally sound.

Comprehensive research on theoretical and practical issues concerning electronic evidence in business dispute resolution through commercial arbitration is critical. Such studies contribute to clarifying the legal nature of electronic evidence, identifying gaps in the current Vietnamese legal system, and aligning domestic law with international practice(Nguyen Thanh Minh Chanh, 2021). The law must evolve in step with rapid technological developments to ensure that arbitral tribunals and courts can deliver fair and consistent decisions based on admissible evidence.

First, because electronic evidence is technical in nature, procedures for collecting, preserving, and evaluating it must be continually updated. Different devices and software generate different forms of data, which require tailored technical procedures to ensure accuracy and integrity (Nguyen Thanh Minh Chanh, 2021). Arbitrators should be empowered to appoint IT experts or digital forensic specialists to verify the authenticity and completeness of electronic records (Committee of Ministers of the Council of Europe, 2019). Integrating expert consultation into arbitral proceedings would increase both the reliability of decisions and the efficiency of dispute resolution.

Second, arbitration in Vietnam is designed to function as an independent and flexible alternative to court litigation. However, arbitral awards remain subject to annulment by courts, particularly when evidentiary issues are at stake (Guiding the Implementation of Certain Provisions of Law on Commercial Arbitration 2014). This overlap creates tension between arbitral discretion and judicial review, especially regarding electronic evidence. To address this, a cooperative framework should be established whereby courts and arbitral tribunals adopt a harmonised standard for evaluating electronic evidence (Born, 2021). Such harmonisation would reduce the risk of arbitral awards being overturned and increase confidence in arbitration as a reliable mechanism for dispute resolution.

Third, given the prevalence of commercial disputes in a market economy, Vietnam must issue clear and comprehensive regulations on the admissibility of electronic evidence. While under Arts. 3-5 of the Law on Electronic Transactions 2023 recognises electronic data as legally valid. Still, there remains a lack of procedural guidance on how such evidence should be authenticated, preserved, and assessed in arbitral proceedings. Learning from international standards, such as Art. 3 of the IBA Rules on the Taking of Evidence in International Bar Association 2020, and the practices of arbitral institutions like Art. 22 of the International Chamber of Commerce (ICC) 2021 and Rule 19 of SIAC Rules 2016, Vietnam should codify detailed guidelines to promote consistency, transparency, and efficiency. Clear rules would not only facilitate arbitral practice but also reduce the risk of annulment when courts review awards.

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Fourth, to strengthen the admissibility of electronic evidence in commercial arbitration, Vietnam should consider introducing specific statutory reforms. Firstly, the Law on Commercial Arbitration 2010 should be amended to include a separate provision defining "electronic evidence" in line with international standards such as Art. 3 of the IBA Rules (International Bar Association, 2020) and the Council of Europe Guidelines(Electronic Evidence in Civil and Administrative Proceedings 2019). Secondly, under Art. 14 of the Civil Procedure Code 2015**,** should be revised to harmonize its requirements on translation, authentication, and consular legalisation should be revised to harmonise with arbitral practice, ensuring that minor formal defects do not automatically preclude otherwise reliable electronic evidence (Civil Procedure Code, 2015), (Guiding the Implementation of Certain Provisions of Law on Commercial Arbitration 2014). Thirdly, Vietnam should develop technical regulations or judicial guidelines detailing procedures for the collection, preservation, and assessment of electronic evidence, drawing inspiration from the U.S. Federal Rules of Evidence (FRE) (Lorraine & Mack, 2007) and comparative best practices from Rule 19 of Singapore (SIAC Rules, 2016) and the EU (Official Journal of the European Union, 2014). Finally, a training framework for judges, arbitrators, and lawyers in digital forensics and IT literacy should be institutionalised to enhance professional competence in handling electronic evidence.

In conclusion, enhancing the legal framework for the admissibility of electronic evidence requires a multi-dimensional approach: continuous technological adaptation, greater reliance on expert involvement, closer alignment between arbitration and judicial review, and clearer procedural rules. These reforms will enable Vietnam to strengthen the credibility of its arbitration system, promote business confidence, and harmonise with international best practices in electronic evidence.

Conclusion

Electronic evidence in commercial arbitration poses many challenges due to its digital characteristics, the ability to copy and alter data, and the need for strict legal and technical mechanisms to ensure integrity, authenticity, and probative value. The acceptance and evaluation of this type of evidence not only depend on legal regulations but also require technological capacity and adaptive legal thinking among arbitrators, judges, and participants in the proceedings. In the context of digital transformation, it is necessary to complete the legal framework for electronic evidence in arbitration proceedings to unify the arbitration review mechanism and the Court's supervision, thereby limiting the cancellation of awards due to differences in approach. At the same time, Vietnam needs to issue specific guidelines on the processes for collecting, storing, and authenticating electronic data, and to increase the participation of technology experts in dispute resolution to improve the transparency, efficiency, and credibility of Vietnam's commercial arbitration system. meeting the requirements of integration and development in the digital era.

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Digital Transformation of the Judiciary in Indonesia: Analysis of the Practicality of Electronic Mediation of Divorce According to the Ideals of Islamic Law and Legal Ideals

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ABSTRACT: Increasing digital transformation in the Indonesian judicial system after the implementation of PERMA No. 1 of 2019 concerning Electronic Justice Administration, with an emphasis on electronic mediation (e-mediation) in the context of divorce, containing sensitive elements. The purpose of this study is to analyse the efficiency level of e-mediation and assess the suitability of the practice with the ideals of Indonesian law (justice, certainty, utility) and the principles of Islamic law (maslahah, ishlah, avoidance of mudharat). The methodology used in this study is qualitative with an analytical-descriptive approach to library research. Primary data obtained from PERMA and court decisions, as well as secondary data from scholarly journals, books, and fatwas were analyzed with an interdisciplinary approach. The findings of this study show that e-mediation in divorce cases is practical from the point of view of time and cost efficiency (aspects of certainty and utility). However, the level of practice is hampered by various technical challenges, digital divides, and the complexity of the psychological dynamics of the parties involved. From the perspective of Islamic law, e-mediation is in line with the principles of ishlah (reconciliation) and maslahah if it is able to defuse conflicts, although it is important to pay attention to the confidentiality and validity aspects of the negotiation process related to iddah maintenance and children's rights. In conclusion, e-mediation is an innovation that is consistent with the values of sharia law and maqashid, but its implementation requires infrastructure improvement, mediator capacity development, and specific guidelines that integrate positive aspects of Islamic law, technology, and ethics.

KEYWORDS: Digital Transformation, Electronic Mediation, Divorce, Legal Ideals, Islamic Law, Practicality.

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Introduction

The Battle of the Digital transformation has become mainstream in the modernization of the global legal and judicial sectors, including in Indonesia. In context *Society 5.0* emphasizing the integration of physical and digital spaces to solve social problems, the Indonesian judiciary made a significant leap with the issuance of Supreme Court Regulation (PERMA) Number 1 of 2019 concerning Electronic Judicial Administration. This policy is the legal basis for the implementation of digital justice (e-court), which aims to create a fast, simple, and low-cost justice (Ahmed et al., 2021; Putrijanti & Wibawa, 2021). As an implementation, the Supreme Court launched various supporting applications, such as *e-Court, e-Filing, dan e-Summon*, which marks a new chapter in access to justice (Muhamad Iqbal, Susanto, 2020; Retnaningsih et al., 2020).

In the Indonesian civil justice system, mediation occupies a very strategic position as a mandatory step before the trial of the main case begins. This is regulated in Article 30, Paragraph (1) of PERMA Number 1 of 2016 concerning Mediation Procedures in Court, which was then reaffirmed in PERMA Number 1 of 2018. Mediation is not only seen as an administrative procedure, but as an effort to achieve peace and restorative justice dispute resolution. According to Delisa, conventional mediation (face-to-face) in the Religious Court has long been a *gatekeeper* to filter divorce cases, with a significant success rate in reconciling the parties (Delisa et al., 2025)

However, the paradigm and practice of mediation have experienced a dramatic disruption with the COVID-19 pandemic. Social restrictions are forcing the judiciary to adapt and accelerate the adoption of electronic mediation (*e-mediation*). This shift from a conventional to virtual approach is not just a change in medium, but a fundamental transformation in the interaction between mediators and parties. Research by Lahilote et al. revealed that the pandemic became an inevitable catalyst, where e-mediation, which was previously still in the trial stage, became the only viable option to ensure the continuity of the judicial process (Lahilote et al., 2024). Post-pandemic, this practice continues to be maintained because it is considered to increase efficiency.

Nonetheless, the implementation of *e-mediation* faces complex challenges when applied to specific cases such as divorce. Divorce cases are not only a formal legal issue, but are loaded with emotional sensitivity, high secrecy, and strong religious values (Islamic Law). The psychological dynamics of the parties, which include heartache, anger, and disappointment, require a humanist and empathic approach that is difficult to realise entirely through the screen (Zaidah & Normas, 2022). In addition, the substance of the discussion in divorce mediation is very crucial, including the civil rights of children (hadhanah, alimony), joint property, and mascots, which, from the perspective of Islamic Law, have an inseparable spiritual and legal-formal dimension (Aunillah & Annisa, 2025). The confidentiality of the negotiation process has become particularly vulnerable in the digital space, raising concerns about the leakage of sensitive personal data (Amrin, 2023; Pepriyanti et al., 2023).

Based on the description above, it was identified that there were academic gaps that needed to be studied more deeply. Most previous studies have discussed the effectiveness of *e-mediation* from a time and cost efficiency perspective. However, there are still limited studies that comprehensively analyse the level of practicality of *e-mediation* in the context of the complexity of divorce cases. Practicality here is seen not only in terms of technical and efficiency aspects, but also in the ability of these mechanisms to

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uphold substantive justice, secrecy, and the psychological values of the parties (Antich & Calo, 2021). Furthermore, as a country with a majority Muslim population, the analysis of conformity *e-mediation* with the principles of Islamic Law, especially related to the purpose of marriage (*maqashid al-nikah*), principle *Ishlah* (peace), and ethics (*Morals*) in resolving disputes, is still very much needed (Suhaili, 2025). Therefore, this article aims to critically analyse the digital transformation of the judiciary with a focus on the practicality of electronic mediation in the settlement of divorce cases, reviewed from the integrative perspective of the Ideals of Indonesian Law and Islamic Law.

Research Aim and Research Questions

This research is a normative legal research (*legal research*) by combining conceptual approach, statute approach, and case approach (Rizkia & Fardiansyah, 2018). The primary data sources for this study are PERMA No. 1 of 2019, PERMA No. 1 of 2016 jo. PERMA No. 1 of 2018 concerning Mediation, as well as several decisions of Religious Courts related to mediation. The secondary data of this study were obtained from scientific journals, textbooks, articles, and online publications regarding the digital transformation of the judiciary, mediation, civil procedural law, fiqh munakahat, and maqashid sharia. The data of this study were collected through document and literature studies. The data analysis of this study uses qualitative content analysis and logical analysis techniques (Vaismoradi et al., 2013). Data is analysed by describing the findings, then interpreting them within the framework of legal theory and principles of Islamic law as per the systematic analysis of qualitative data by Miles and Huberman (Milles & Huberman, 2016).

Research Results

The Concept of Divorce Settlement in Islam

In Islamic law, divorce (*thalaq*) is seen as the last resort (*abghadl al-halal*) that Allah hates the most, but its validity is recognized when the marriage is no longer tenable. The settlement of divorce disputes in Islam is not only oriented towards the termination of the marriage bond, but rather emphasises efforts for reconciliation (*ishlah*) and a just settlement. The main foundation is found in QS. An-Nisa': 35, which emphasises the importance of a referee (*tahkim*) by a peacemaker from each family.

According to Tahir, the essence of resolving divorce in Islam must be based on the principle of *maqashid al-syari'ah* (Purpose of Shari'a) (Tahir et al., 2024), in particular the protection of the five basic things (*al-dlaruriyat al-khamsah*), namely: to protect religion (*hifzh al-din*), soul (*hifzh al-nafs*), Sense (*hifzh al-'aql*), descendants (*hifzh al-nasl*), and treasures (*Hifzh Al-Mal*). Therefore, the process must prioritise the values of peace, justice, and the benefit of the family, especially children. Norfatin Najwa Binti Che Adnan added that the concept of *Sulh* (peace) is the heart of munakahat fiqh, where each stage of pre-divorce is such that *Them'* and *Scarlet Witch* actually contains room for mediation and reflection (Najwa, 2024).

Mediation as an Alternative to Divorce Case Resolution

Mediation is a modern manifestation of the concept of *Ishlah* and *Sulh* in the Islamic tradition. As an Alternative Dispute Resolution (ADR), mediation offers a more humane, voluntary, and future-oriented approach to the parties, especially children, compared to litigation that is often adversarial. Research by Supriadi, M. Muhibbin, and Suratman at the Malang Religious Court shows that mediation has succeeded

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in reaching the level of a peace agreement (*reconciliation*), amounting to 25-30% of the total cases mediated. This success cannot be separated from the alignment of mediation values with Islamic legal principles (Rohman & Rachmatulloh, 2022). Fikri et al. emphasised that mediators in the context of Muslim divorce not only play the role of facilitators, but can also function as *Al-Hakam* (referee) appointed based on QS. An-Nisa': 35, who is in charge of reconciling and finding the most beneficial solution (Fikri et al., 2023). Mediation allows the parties to discuss sensitive matters such as *idda*, *Mut'ah*, child support, and custody (*hadhanah*) in a more private and respectful atmosphere, so that it is in accordance with the principles *Satr al-'Avrat* (covering up the disgrace).

Mediation in the Indonesian Legal System

In the Indonesian legal system, mediation has become a procedural obligation (*mandatory mediation*) for all civil cases, including divorce, since the issuance of Supreme Court Regulation (PERMA) No. 1 of 2016 concerning Mediation Procedures in Court, which was later reaffirmed in PERMA No. 1 of 2018. This obligation is stated in Article 30, Paragraph (1), which states that before the examination of the case, the judge is obliged to seek peace through mediation.

Priyana et al. analyse that the integration of mediation into the Indonesian justice system reflects a paradigm shift from retributive to restorative justice (Priyana et al., 2023). In the context of the Religious Court, this is a harmonious meeting point between positive law and Islamic law. Mediation in the Religious Court is unique in that its mediator, who is often a judge or mediator who understands fiqh munakahat, can combine modern mediation techniques with a religious approach (Rohman & Rachmatulloh, 2022), such as using the postulates of the Qur'an and Hadith to persuade reconciliation.

The latest development is the adoption of electronic mediation (*e-mediation*), which is regulated in PERMA No. 1 of 2019 concerning Electronic Justice Administration, and PERMA No. 2 of 2023 concerning Mediation. According to Pepriyanti, although *e-mediation* increases efficiency, its effectiveness in handling the emotional complexity of divorce cases needs to be continuously evaluated to ensure that the mediation process does not lose its restorative values (Pepriyanti et al., 2023). The comparison of conventional mediation with electronic mediation can be illustrated in table 1.

Table 1

Comparative Indicators of Conventional and Electronic Mediation

Indicator	**Conventional Mediation**	**Electronic Mediation**
Physical presence	Mandatory	Not required
Travel cost	High	Minimal
Scheduling flexibility	Limited	Flexible
Case processing time	Moderate	Faster

Mediation in the settlement of divorce cases is a clear example of how the universal values of Islam (*ishlah, sulh, maslahah*) can be accommodated and institutionalised in the modern Indonesian legal system. The obligation of mediation in the Religious Court is not only to meet procedural legal demands, but also to implement the substance of Islamic law itself. The synergy between the concept *of sulh* in *fiqh*

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and the principle *of restorative justice* in Indonesian civil procedure law places mediation as an ideal mechanism to resolve divorce disputes in a fair and dignified manner. The difference can be illustrated in Table 2.

Table 2

Assessment of E-Mediation from Dual Perspectives

Dimension	Legal Ideals Perspective	Islamic Law Perspective
Legal Certainty	Strong (clear regulation)	Acceptable (formal validity met)
Utility	High efficiency	Supports maslahah
Justice	Requires qualitative improvement	Valid if ethical safeguards upheld
Confidentiality	Needs cybersecurity reinforcement	Ethical obligation (satr al-'awrah)

Discussion

The digital transformation carried out by PERMA No. 1 of 2019 has brought the Indonesian judiciary into a very significant new era, where physical presence is gradually being replaced by more modern and efficient virtual interactions. In an increasingly developing context, electronic mediation (e-mediation) has emerged as a very important key instrument through PRERMA No.2 of 2023, especially for complex civil cases such as divorce, which often require more effective solutions. However, its practicality must be carefully examined beyond mere measures of apparent efficiency, taking into account the deep philosophical foundations of Indonesian legal ideals and the substantive values contained in Islamic Law that deserve attention.

From a practical perspective, the findings of various cutting-edge studies show a balanced picture. On the one hand, e-mediation has proven to be very effective in overcoming geographical and bureaucratic constraints(Orellana, 2023). Maulina noted that the implementation of e-mediation in the Religious Court during the pandemic has succeeded in significantly reducing the waiting time for the mediation process (Maulina et al., 2022). This efficiency is a direct manifestation of the usefulness (*utility*), which is one of the pillars of Indonesian legal ideals. However, on the other hand, such practicality is faced with complex challenges.

Divorce mediation requires a depth of empathy and the ability to read body language that is difficult to fully realise in virtual communication (Ratnawaty et al., 2024). These limitations have the potential to hinder the achievement of a truly sincere and sustainable agreement, which is precisely the heart of the mediation process. In addition, the vulnerability of data confidentiality and sensitive conversations of parties in the digital space can reduce a sense of security and trust, crucial factors in discussing things such as alimony, child custody (*hadhanah*), and the division of common property (Nindyati & Ulfia, 2024). With regard to the ideals of Indonesian law, the presence of *e-mediation*, which is an electronic dispute resolution method, has met the demands of legal certainty through the existence of a clear and firm legal umbrella regulated in PERMA No. 1 of 2019.

Nevertheless, the achievement of substantive justice remains a very critical and fundamental question. Justice in the context of divorce lies not only in the final outcome of the agreement reached by

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both parties, but also in the ongoing process that has the goal of restoring and empowering the individuals involved (Khosyiah, 2018). It is feared that the pressure to resolve cases quickly through these digital platforms has sacrificed the depth of the deliberative process that is actually necessary to achieve true restorative justice (Izzah & Pradikta, 2022). In other words, there is a clear tension between the efficiency of technology that offers a wide range of legal benefits and certainties, and the lingering, deep need for justice that is personal and contextual to each individual (Orellana, 2023).

Viewed from the perspective of Islamic Law, *e-mediation* is basically in line with the main principle of dispute resolution, namely, *Ishlah* (peace) is very basic. Mukhlis emphasised that all forms of mechanisms that aim to reconcile husband and wife and avoid divorce are a very significant effort in upholding maslahah (universal good) (Mukhlis, 2020). This effort is especially carried out in order to protect the offspring (*hifzh al-nasl*) and also protect property (*Hifzh Al-Mal*). From the point of view of contemporary fiqh, Najwa stated that peace agreements (sulh) reached through electronic means are, in principle, valid and permissible, as long as they meet the predetermined principles and conditions (Najwa, 2024), namely the willingness of the parties and the clarity of the object agreed upon by all parties involved. However, Salamah reminded us of the importance of integrating values *akhlaqul karimah* in this ongoing digital process (Salamah, 2013). The aspect of confidentiality (iffah) becomes very central and crucial; The e-mediation process must be able to guarantee that family disgrace is not widespread, in accordance with the principles of *sadd al-dzari'ah* (closing the door of damage) (Hidayat, 2023). Thus, practical *e-mediation* in Islamic law is not only measured by its formal validity, but also by its ability to uphold the prevailing ethics and maintain the dignity of the parties involved in the process.

E-mediation in divorce cases is a practical breakthrough instrumentally, but it still leaves substantive challenges. Its value cannot be seen only through the lens of efficiency, but must be judged by its ability to realise restorative justice and uphold ethical-religious values. For this reason, the success of this digital transformation is highly dependent on strengthening infrastructure, increasing the capacity of mediators in handling psychological dynamics virtually, and the preparation of operational guidelines that are not only technical-procedural, but also perspective on the ideals of sharia law and maqashid. Thus, e-mediation can truly be a tool that not only decides cases but also restores relationships and upholds dignified justice.

Conclusions

The digital transformation of the judiciary in Indonesia, especially through the implementation of e-mediation in divorce cases in the Religious Courts, has brought major changes in the dispute resolution system. This electronic justice policy has been proven to improve time efficiency, cut costs, and overcome geographical barriers that have been obstacles for justice-seeking communities. However, challenges remain, especially related to limitations in capturing psychological aspects, body language, and confidentiality during the online mediation process, making substantive justice and empathy sometimes difficult to achieve. From the perspective of Islamic law, e-mediation is considered in line with the principles of ishlah (peace) and maqashid sharia, as long as it fulfils the principles and legal requirements of the contract and maintains the ethics and confidentiality of the parties. In order for the benefits of e-mediation to be optimal, efforts are needed to strengthen technological infrastructure, mediator training, the preparation of holistic operational guidelines, increase people's digital literacy, and privacy

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protection. With the right reform steps, e-mediation is expected not only to speed up the resolution of cases but also to uphold dignified restorative justice.

Furthermore, it is necessary to conduct a more comprehensive study focused on analysing the practicality of e-mediation in divorce cases that considers the psychological, sociological, and confidentiality dimensions of the parties, in addition to technical aspects and time and cost efficiency. More in-depth research on the conformity of e-mediation with the principles of Islamic Law, especially regarding maqashid al-nikah, the principle of ishlah (peace), and the values of akhlaqul karimah, is also very necessary. An integrative approach that combines positive analysis of Indonesian law, substantive values of Islamic Law, and humanitarian aspects in the application of electronic mediation can fill the academic gap that is still minimal. In addition, it is also important to evaluate the long-term effectiveness of e-mediation, data security, and the satisfaction of the parties in order to provide a comprehensive picture of the impact of judicial digital transformation in the context of sensitive and complex divorces.

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Divergence Between Vietnamese Law and International Best Practices in Limiting the Transfer of Commercial Cases

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ABSTRACT: The transfer of commercial cases is essential to ensuring fairness and efficiency in Vietnam's judiciary. Under the Civil Procedure Code 2015, transfers may occur due to a lack of jurisdiction, concerns about impartiality, party agreement, higher court directives, or practical circumstances. However, implementation reveals shortcomings: errors in jurisdiction, no clear mechanism to resolve conflicts between courts, and procedural abuse for delay. These issues weaken dispute resolution and judicial credibility. The article analyses legal grounds, regulatory gaps, and comparative experience, and proposes reforms to clarify jurisdiction, prevent abuse, and establish transparent procedures that strengthen consistency and trust in adjudication.

KEYWORDS: Case transfer, Commercial litigation, Civil Procedure Code, Jurisdiction, Legal certainty.

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Introduction

As Vietnam deepens its integration into global trade and investment networks, the need for a transparent, predictable, and efficient judicial system has become increasingly pressing. Within this context, the mechanism for transferring commercial cases between courts serves as an essential procedural safeguard, ensuring that complex disputes involving cross-border elements and significant financial interests are heard by the competent forum. However, despite its importance, the regulatory framework under the Civil Procedure Code 2015 remains inadequate, characterised by vague statutory provisions, inconsistent judicial application, and limited institutional oversight.

These shortcomings not only compromise litigants' rights but also hinder Vietnam's broader efforts to modernise its legal system and enhance the business environment. Existing scholarly research has documented several of these challenges, though often only within the context of broader discussions of civil procedure. Specifically, (Giang H. T., 2025), (Ho, 2023) and (Doan, 2023) highlight that ambiguities in jurisdictional rules frequently result in repeated and unnecessary case transfers, thereby straining judicial resources. The fact that it has been made, coupled with insufficient accountability mechanisms, can facilitate forum shopping and lead to inconsistencies in judicial decisions.

Drawing on comparative insights from jurisdictions such as the United States, the United Kingdom, and selected European civil law systems where clearer criteria, proactive case management, and judicial accountability enhance procedural efficiency (Grossi, 2010), (Verkerk, 2010). This article fills that gap by providing a comprehensive doctrinal, empirical, and comparative analysis. It clarifies the legal nature of the transfer mechanism, identifies structural weaknesses in Vietnam's current framework, and proposes concrete legislative and institutional reforms to strengthen consistency, fairness, and efficiency in first-instance commercial proceedings.

Research Aim

This study aims to provide a comprehensive analysis of the transfer of commercial cases in Vietnam by integrating legal positivism, legal realism, and comparative functionalism. It seeks to evaluate the current legal framework, examine its practical shortcomings, and draw on international models to propose reforms that enhance transparency, accountability, and efficiency in commercial litigation.

Research Questions

1. What deficiencies exist in Vietnam's legal framework on the transfer of commercial cases, particularly regarding jurisdictional clarity and procedural efficiency under the 2015 Civil Procedure Code?
2. How do Vietnam's mechanisms for resolving jurisdictional conflicts and ensuring judicial accountability in case transfers compare with international models, and what lessons can be drawn for reform?
3. What legislative and institutional reforms are needed to improve transparency, judicial accountability, and the overall effectiveness of commercial case transfer mechanisms in Vietnam?

Results and Discussion

The "transfer of commercial cases" refers to the procedural mechanism by which a court, after receiving a case, may reassign it to another court with proper jurisdiction or greater competence. This mechanism is essential to ensure procedural legality, judicial economy, and litigants' right to an impartial tribunal. Although Articles 39-41 of the Civil Procedure Code 2015 regulate jurisdiction and case transfer, they lack a clear theoretical foundation and uniform criteria for application (National Assembly, 2015). To address this gap, this study adopts

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international legal theory and comparative jurisprudence to propose a normative framework grounded in jurisdiction theory, forum selection, and judicial efficiency. In both common law and civil law systems, transfer mechanisms safeguard against improper forums, judicial congestion, and forum shopping. Yet, despite the Code's provisions, Vietnam still faces shortcomings in practice, undermining efficiency, judicial credibility, and legal certainty in commercial dispute resolution.

Firstly, Frequent Errors in Jurisdictional Determination

Errors in determining jurisdiction constitute one of the most serious procedural defects in commercial litigation, as they directly affect the validity of proceedings and the protection of the parties' lawful rights and interests. Such errors may stem from misidentifying the subject matter of the dispute. For example, in disputes concerning deposit contracts related to land use rights, pursuant to Point c, Clause 1, Article 39 of the Civil Procedure Code 2015 (National Assembly, 2015), the case must be heard by the court where the disputed real estate is located, as land is a territorial asset, and jurisdiction over land-related disputes is typically based on the location of the property.

Jurisdictional mistakes may also arise when counterclaims or independent claims alter the level of adjudicatory competence. Under Clause 3, Article 35 of the 2015 Civil Procedure Code (National Assembly, 2015), if a defendant in a district-level commercial case raises a counterclaim involving foreign elements, jurisdiction shifts to the provincial-level People's Court. Similarly, misidentifying the procedural status or legal standing of litigants may fundamentally affect the court's competence. When a court lacking jurisdiction accepts and adjudicates a case, appellate annulment often follows, leading to significant delays, increased litigation costs, and unnecessary expenditure of judicial resources (Nguyen Le Hoai and Phung Hong Thanh, 2021).

A notable illustration is the electricity sale contract dispute between Thanh Danh Trading and Manufacturing Co., Ltd., Van Phat Green Energy Co., Ltd., Central Power Corporation (EVNCPC), and Gia Lai Power Company. The People's Court of Pleiku City wrongly assumed jurisdiction, resulting in the appellate court annulling the first-instance judgment. The trial court both misidentified the proper defendant, treating an authorized entity as bearing independent liability and misapplied territorial jurisdiction rules under Article 40 of the 2015 Code, as the competent courts should have been those where the principal defendant was headquartered or where the contract was performed (Dispute over Electricity Sale Contract, 2023).

Comparatively, other jurisdictions adopt mechanisms to prevent such inefficiencies at an early stage. The doctrine of *forum non conveniens* in the United States allows courts to decline jurisdiction when a more appropriate forum exists, thereby minimising unnecessary transfers. Likewise, in the United Kingdom, active judicial case management enables higher courts to designate the proper forum early in the proceedings, reducing jurisdictional uncertainty and promoting procedural economy. These approaches highlight the importance of early and accurate jurisdictional screening in safeguarding both efficiency and fairness in commercial adjudication (Born, 2021).

Secondly, Lack of Effective Mechanisms for Resolving Jurisdictional Conflicts

While Article 38 of the Civil Procedure Code (National Assembly, 2015) vests the authority to resolve jurisdictional conflicts between lower-level courts in the Chief Justice of the immediately superior court, the practical application of this provision has revealed significant procedural inadequacies and inconsistencies. In many instances, courts of equal rank render contradictory determinations regarding jurisdiction, thereby facilitating forum shopping and contributing to delays caused by repetitive case transfers (Spiliada Maritime Corporation v Cansulex Ltd [1987] AC 460, 1987).

A representative example can be found in a case handled by the Gia Lai Provincial People's Court. Initially, the superior court directed the case to be transferred to the People's Court of Pleiku City. However, it was

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subsequently concluded that the latter also lacked jurisdiction, necessitating a second transfer. This series of jurisdictional missteps significantly prolonged the adjudicative process and disrupted the continuity of legal proceedings (Dispute over Electricity Sale Contract, 2023).

From a comparative perspective, many foreign jurisdictions have developed effective mechanisms to resolve jurisdictional conflicts at an early stage. In the United States, federal rules permit the transfer of cases between district courts under 28 U.S.C. § 1404(a), thereby promoting efficiency and reducing the risk of contradictory rulings (William H. Becker & W. B. Morton Jr., Wright & Miller, 1970). In the European Union, the Brussels I Recast Regulation (Regulation No. 1215/2012) establishes clear lis pendens rules by prioritising the court first seised, which effectively minimises conflicts of jurisdiction among Member States (Ojiegbe, 2016). Similarly, in civil law systems such as Germany and Poland, hierarchical control and mandatory judicial coordination play a crucial role in preventing forum duplication and inconsistent judgments (Kramer, Xandra E. and Kramer, Xandra E.,, 2017). Taken together, these comparative experiences highlight the necessity of standardised coordination mechanisms and judicial oversight structures. Absent such instruments, Vietnam may continue to face procedural inefficiencies, diminished legal predictability, and erosion of public trust in the justice system.

Thirdly, Lack of Accountability and Oversight in Case Transfers

The current Vietnamese legal framework lacks clear provisions to ensure the accountability of judges or judicial bodies when erroneous or repetitive case transfers occur. In practice, the absence of statutory sanctions or disciplinary mechanisms has created a culture of procedural impunity, where mistakes in jurisdictional determinations are rarely addressed (Penelope (Pip) Nicholson & Nguyen H. Quang, 2005). This gap not only diminishes judicial efficiency but also erodes litigants' confidence in the impartiality and professionalism of the courts (Giang, 2025). Empirical assessments of Vietnamese civil procedure reveal that procedural errors, including those related to jurisdiction, evidence, and application of law, are a primary cause of cases being remanded or overturned on appeal, leading to significant delays such weaknesses disproportionately burden small and medium-sized enterprises (SMEs) and resource-constrained litigants, who lack the capacity to endure protracted litigation ((OECD), 2018). The problem reflects a broader challenge of judicial discretion and capacity in Vietnam, where the lack of a robust, transparent mechanism for reviewing procedural fairness can lead to inconsistencies and undermine the rule of law.

Comparative experiences underscore the central role of judicial accountability in ensuring effective civil procedure. In the United States, appellate review and the possibility of sanctions under Federal Rule of Civil Procedure 11 help deter procedural abuses. In the European Union, the European Commission emphasises that judicial performance evaluation and accountability frameworks are essential to upholding rule-of-law standards. Commonwealth systems such as the UK and Canada adopt Judicial Councils and Ombudsman models to provide independent oversight of judicial conduct and complaints. Without adopting comparable mechanisms, Vietnam risks perpetuating procedural inefficiencies and undermining its ambition to build a transparent and predictable business environment.

Fourthly, the legal systems of many jurisdictions have established mechanisms to restrict unnecessary case transfers in order to ensure adjudicative efficiency.

The legal systems of many jurisdictions have established mechanisms to restrict unnecessary case transfers to ensure adjudicative efficiency, a principle that aligns with the broader goal of minimising enforcement costs and procedural delays. These mechanisms function as procedural presumptions or rules that promote predictability and conserve judicial resources, which are essential for maintaining the legitimacy of the legal system (Dent, 2020).

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Vietnam's legal framework governing the transfer of cases remains relatively detached from these comparative international doctrines. Notably, in common-law jurisdictions such as the United States, the doctrine of *forum non conveniens* empowers courts to decline jurisdiction when another forum is deemed more appropriate, thereby preventing unnecessary litigation and promoting judicial economy (Sinochem Int'l Co. v. Malaysia Int'l Shipping Corp., 549 U.S. 422, 432, 2007). Similarly, the Civil Procedure Rules of the United Kingdom grant courts broad case management powers, enabling judges to proactively resolve jurisdictional uncertainties and mitigate procedural delays to ensure litigation commences in the most appropriate forum (UK, 1998). This approach is consistent with a global trend toward empowering judges with active case management roles to control the flow and timing of litigation (Oscar G. Chase and Helen Hershkoff, eds., , 2017).

The lack of analogous, well-defined doctrines or procedural instruments in Vietnamese law highlights a significant shortfall in aligning domestic procedural rules with established international best practices. This gap limits the judicial system's adaptability and represents a missed opportunity for legal modernisation. Without such mechanisms, Vietnam risks perpetuating procedural inefficiencies that undermine the principles of predictability and effective enforcement that underpin a robust competition law and commercial litigation framework. This is particularly critical for fostering a business environment conducive to investment, where predictable and efficient dispute resolution is a key determinant (World Bank, 2020).

Recommendations for Legal Reform

In light of the identified shortcomings, it is imperative to revise both the substantive and procedural aspects of Vietnam's legal framework on the transfer of commercial cases. Effective reform must aim not only to clarify jurisdictional rules but also to enhance judicial accountability, procedural transparency, and institutional coordination. Drawing on both domestic legal practice and comparative international experience, the following recommendations are proposed:

First*, *Clarification and Codification of Jurisdictional Rules

Legislative reform should prioritise clarifying and codifying jurisdictional boundaries under the Civil Procedure Code, particularly in disputes involving foreign elements, multiple parties, or overlapping claims, where the current framework remains vague and inconsistently applied (World Bank and Ministry of Justice of Vietnam, 2021). Vietnam should consider adopting a modified doctrine of forum non conveniens, empowering courts to decline jurisdiction when a more appropriate forum exists, thereby reducing forum shopping and enhancing procedural efficiency (Ronald A. Brand and Scott R. Jablonski, 2007). To further reduce judicial discretion and improve predictability, detailed procedural criteria should be introduced for concurrent or ambiguous jurisdiction (Dent, 2020). Clear rules would deter strategic manipulation, safeguard fairness, and reinforce judicial integrity, thereby upholding the rule of law.

Strengthening Judicial Accountability and Oversight

Effective reform must also incorporate robust accountability mechanisms to address improper or repetitive case transfers. Judges or judicial bodies issuing unlawful or unreasonable transfer decisions—particularly those causing undue delay—should be subject to oversight by competent authorities, such as the Judicial Council or the Supreme People's Court Inspectorate, in line with international standards on judicial quality and transparency. Depending on the gravity of the violation, disciplinary measures may include warnings, administrative sanctions, temporary suspension, or, in cases of gross negligence or abuse of discretion, civil liability for damages (Tanzilulloh, M. Ilham, Hartiwiningsih Hartiwiningsih, and Muhammad Rustamaji, 2024), (Dent, 2020). Institutionalising such oversight would deter procedural misconduct, ensure corrective accountability, and strengthen public confidence in the principle that judicial power must be exercised lawfully and responsibly (World Justice Project, 2023).

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Second, Enhancing Transparency and Procedural Safeguards

To protect procedural integrity and due process, every decision to transfer a commercial case should be issued as a written, reasoned judicial order, disclosed to all parties, and subject to appellate or supervisory review. This requirement enhances transparency, ensures fairness, and provides a safeguard against arbitrary or unjustified transfers, consistent with the fair trial standards of international human rights law.

In addition, the Supreme People's Court should be vested with the authority to promulgate detailed procedural guidelines akin to practice directions in common law jurisdictions governing the initiation and handling of case transfers. These guidelines should articulate clear timelines, documentary requirements, evidentiary thresholds, and procedural steps to be followed by lower courts. The use of such detailed procedural instruments is a recognised best practice for managing complex litigation and ensuring uniform application of procedural rules (American Law Institute, 2006).

The codification of such procedural standards would contribute significantly to the unification of judicial practice across courts of different levels and geographic regions. It would also serve to minimise inconsistencies in the application of transfer procedures, thereby enhancing legal certainty, predictability, and public confidence in the administration of justice (World Justice Project, 2023). As emphasised by international bodies, clear and public procedural rules are essential for reducing opportunities for discriminatory or arbitrary application of the law and are a cornerstone of a rules-based business environment (World Bank Group, 2017).

Third, Adoption of Technological Tools for Monitoring Case Transfers

To modernize judicial administration and improve oversight of procedural activities, Vietnam should prioritize the development and implementation of a centralized digital case management platform capable of facilitating real-time monitoring of transferred cases across all levels of the court system, such a system would significantly enhance procedural transparency for litigants and their legal representatives, reduce administrative errors, and strengthen supervisory capacity for judicial authorities (Nhung, 2021).

The digital platform should be equipped with the following key features:

Automated notifications to relevant parties and court personnel upon the issuance or modification of transfer decisions, ensuring immediate compliance with due process requirements;

Electronic documentation of jurisdictional determinations, including judicial reasoning and statutory basis, creating an auditable trail for accountability and review;

Data analytics dashboards for tracking systemic delays, identifying irregular transfer patterns, and supporting evidence-based judicial reform, transforming raw data into actionable intelligence for court administrators and policymakers.

The integration of technological tools into the case transfer process would not only foster greater transparency and procedural predictability but also contribute to judicial efficiency, institutional accountability, and the reinforcement of public confidence in the justice system. Such reforms align with international trends in e-justice and reflect a commitment to building a modern, responsive, and credible judiciary.

Fourth, Comparative Legal Study and Harmonisation

As part of a broader strategy for procedural reform, Vietnam should undertake a comprehensive and systematic comparative legal study of international best practices in the determination of jurisdiction and the regulation of case transfers. Particular emphasis should be placed on civil law jurisdictions with analogous procedural traditions such as France and Germany as well as on common law systems such as the United Kingdom and the United States, which have pioneered a range of procedural innovations (Chase, Oscar G. and Hershkoff,

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Helen and Silberman, Linda and Sorabji, John and Stürner, Rolf and Taniguchi, Yasuhei and Varano, Vincenzo, 2017).

The selective adaptation of foreign legal doctrines, including but not limited to the doctrine of *forum non conveniens*, structured judicial case management, and pre-trial adjudication of jurisdictional objections, could enrich Vietnam's procedural framework and enhance judicial efficiency, consistency, and fairness. The success of such legal transplants, however, depends critically on their careful modification to fit the local institutional and cultural context.

Legislative and institutional reforms should be grounded not only in comparative legal analysis but also in empirical data concerning the prevalence, causes, and legal consequences of case transfers within the Vietnamese court system. Such a dual approach would ensure that reforms are both contextually appropriate and evidence-based, thereby facilitating the harmonisation of Vietnam's civil procedure laws with internationally recognised standards of judicial administration and strengthening its integration into the global legal order.

Conclusion

Although designed as a procedural safeguard to ensure fairness and efficiency, the transfer of commercial cases in Vietnam continues to reveal notable theoretical and practical shortcomings. Despite the framework established by the Civil Procedure Code 2015, vague provisions and inconsistent judicial application have led to jurisdictional errors, procedural delays, and weakened public confidence, while repeated or improper transfers undermine litigants' right to timely adjudication. Comparative experiences from the United States, the United Kingdom, and European civil law systems demonstrate that clear jurisdictional rules, proactive case management, judicial accountability, and digital oversight mechanisms are essential to preventing inefficiencies and forum shopping. By analysing case transfer as an independent subject through doctrinal, empirical, and comparative approaches, this study identifies structural limitations in Vietnam's current system and proposes reforms aligned with international best practices, emphasising clearer jurisdictional boundaries, stronger accountability, and technological integration to enhance procedural predictability, efficiency, and credibility in the context of deepening global integration.

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From Pharmacological Informatics to Informational Pharmacology: A Conceptual Shift in Therapeutics

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ABSTRACT: This article offers a conceptual analysis of AI within information pharmacology, exploring its role as both a supportive tool and an autonomous therapeutic factor. It distinguishes between pharmacological informatics (instrumental level) and information pharmacology (ontological level) and proposes criteria for classifying AI systems as information-based medicinal products, focusing on dose-dependent, reproducible, and clinically meaningful effects. The study examines the relationship between material (molecular) and informational therapeutics, highlighting their conceptual connections and ontological distinctions. Comparative analysis of pharmacodynamics and pharmacokinetics elucidates therapeutic windows, dosing, efficacy, and risk for information-based interventions. The role of formal models in standardization, prediction, and regulatory evaluation is discussed. Finally, legal and ethical considerations for digital medicine and increasingly autonomous therapeutic systems are addressed, emphasizing the emerging framework for safely integrating AI into clinical practice.

KEYWORDS: information pharmacology; pharmacological informatics; digital therapeutics.

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Introduction

Over the past decades, pharmacology has been profoundly transformed by the rapid development of computational methods, large-scale biomedical data, and artificial intelligence. These advances have given rise to pharmacological informatics—an instrumental discipline focused on applying data-driven tools to classical pharmacological objects such as molecules, receptors, and pharmacokinetic processes (Wishart, 2018). Within this framework, information primarily serves to optimize the discovery, design, and evaluation of material therapeutic agents.

At the same time, emerging therapeutic practices increasingly challenge the traditional view of drugs as exclusively material entities. Digital therapeutics, adaptive treatment algorithms, neurocognitive interventions, and closed-loop regulatory systems suggest that information itself can act as a therapeutic agent (Lipsky & Sharp, 2019). These developments point toward a deeper conceptual transformation, one that cannot be fully captured by extending existing pharmacological informatics methods.

This article proposes the notion of informational pharmacology as an ontological shift in how therapeutic action is understood. Rather than treating information solely as a tool for studying drugs, informational pharmacology considers information, interpretation, and regulatory feedback as core pharmacological objects. In this perspective, therapeutic efficacy arises not only from molecular interactions but also from structured informational processes operating within biological, cognitive, and socio-technical systems.

By contrasting pharmacological informatics with informational pharmacology, we aim to clarify the distinction between an instrumental expansion of pharmacology and a fundamental redefinition of its subject matter. We argue that recognizing the distinction between material and informational agents is essential to understanding contemporary and future therapeutic paradigms (Hollis et al., 2017). This conceptual framework provides a foundation for integrating digital therapeutics, systems medicine, and cognitive models into a coherent pharmacological theory.

The study is based on an interdisciplinary approach that combines pharmacology, informatics, systems analysis, and the philosophy of science. Given the theoretical nature of the work and its focus on the conceptualization of information pharmacology, the study employs a set of theoretical, systemic, and comparative methods that provide a holistic understanding of the interaction between AI and pharmacology. The work uses theoretical methods of scientific knowledge aimed at generalization and conceptual analysis of existing knowledge, including the analysis and synthesis of scientific sources in pharmacology, pharmacometrics, bioinformatics, and artificial intelligence to identify key trends, methodological gaps, and points of integration between disciplines (Meadows, 1972).

Pharmacological informatics, as an analogue of chemoinformatics and bioinformatics, is an instrumental discipline whose main goal is to apply informatics methods, computational modeling, and data analysis to the study of material pharmacological systems (Ekins, 2007). Its object remains such

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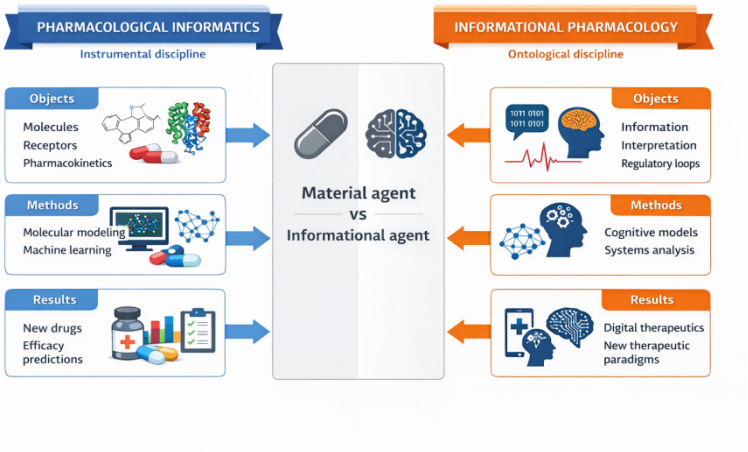
classical elements of pharmacology as chemical and biological compounds, receptors, signaling pathways, pharmacokinetic and pharmacodynamic processes. Information in this context performs a representational and analytical function, serving as a means of describing, predicting and optimizing the action of material therapeutic agents (Testa & van de Waterbeemd, 2001). Thus, pharmacological informatics does not rethink the nature of treatment but instead increases the efficiency of working with the existing pharmacological reality. Instead, informative pharmacology offers an ontologically distinct approach to understanding therapeutic action. The ontological approach in informative pharmacology holds that information is a real therapeutic agent, not just a means of communication. It is not a method, tool or technology, but a way of thinking about treatment. Within this scientific direction, information is considered an independent therapeutic agent, capable of initiating physiological changes through the processes of interpretation and regulation. The object of analysis here is not molecules or biochemical reactions, but information signals, cognitive structures, neural and behavioral regulatory circuits. Methodologically, information pharmacology is based on systems analysis, information theory, cognitive and neuroscientific models, and a philosophical understanding of causality and regulation in biological systems. Its task is to formalize information therapy by analogy with classical pharmacology, including the concepts of information dose, target, efficacy and side effects. The conceptual distinction between pharmacological informatics and information pharmacology, as two levels of scientific analysis of therapeutic action, is visually depicted in the compositional scheme (Fig. 1). The illustration compares the two disciplines, presenting them as complementary yet distinct.

The left part of the illustration shows pharmacological informatics as an instrumental discipline focused on the analysis of material objects (molecules, receptors and pharmacokinetic processes). The corresponding methods (molecular modeling and machine learning) and results (identification of new drugs and prediction of efficacy) emphasize its role in improving the accuracy and efficiency of classical pharmacotherapy without revising its ontological foundations.

Figure 1



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The right part reflects the view of pharmacology as an ontological discipline that focuses on information as a therapeutic agent. Here, the objects are information signals, interpretation processes and regulatory circuits, and the methodological emphasis is on cognitive models and systems analysis. The result of such an approach is not the optimization of existing drugs but the development of new therapeutic paradigms, particularly digital therapeutic interventions.

The central element of the illustration depicts the opposition between the material and information agents, which plays a key conceptual role. He emphasizes that the difference between these areas is not in the use of digital technologies, but in different understandings of the nature of therapeutic action. Such a comparative analysis clearly demonstrates that pharmacological informatics and information pharmacology, despite the common use of information technologies, belong to different levels of scientific understanding of therapy.

The interaction between these two roles can be productive, as the instrumental AI can provide the therapeutic agent with the data, analytics, and contextual information needed to personalize the impact. In turn, the therapeutic agent can generate new data about the patient's condition, enriching the analytical models. In such a configuration, a closed feedback loop arises in which the instrumental and therapeutic functions reinforce each other, forming a holistic information-therapeutic system. At the same time, antagonism is also possible between them, since the instrumental approach involves control, predictability, and standardization, while the therapeutic agent operates under conditions of contextual variability and the patient's individual sensitivity. An excessive focus on instrumental efficiency can lead to ignoring the patient's subjective experience and cognitive limitations, while the autonomy of the therapeutic agent, without proper instrumental control, can create risks of excessive influence, cognitive overload, or even harm. Such antagonism has not only a technical but also an ethical dimension. An algorithm that simultaneously analyzes data and performs a therapeutic action requires clearly defined boundaries of autonomy, transparency, and the possibility of human intervention, because the absence of such distinctions creates a risk of a shift towards uncontrolled action.

Thus, the interaction and antagonism between the information tool and the information therapeutic agent of AI reflect a deeper transformation of medicine towards information-oriented models of treatment. Awareness of this duality is a necessary condition for developing theoretically sound and clinically safe approaches to AI use.

The introduction of the concept of information pharmacology inevitably raises a number of legal and ethical issues, since it concerns the use of information not only as a means of information, but also as a regulatory therapeutic factor. The dual nature of information interventions is both cognitive and clinical, which calls into question the traditional boundaries between medical intervention and communication with patients (Beauchamp & Childress, 2019). A key ethical challenge is the distinction between manipulation and therapeutic modulation. Both processes can lead to changes in behavior or emotional state, but differ in intention, transparency and direction. Manipulation involves covert

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influence focused on the interests of the system or a third party, whereas therapeutic modulation should be open, voluntary, and aimed exclusively at the patient's benefit. Thus, the ethics of information pharmacology is determined not by the fact of influence itself, but by the architecture of the system: the level of transparency of algorithms, the possibility of user control and the absence of coercion. Ethically acceptable use of information systems occurs only when the patient is informed about their regulatory function, understands the limits of their capabilities, and has a real opportunity to refuse use without negative consequences for access to basic medical care (World Medical Association, 2013). Covert or implicit modulation of cognitive and emotional processes should be considered a violation of the principle of patient autonomy. The classic principle of informed consent assumes that the patient is aware of the nature, purpose and potential risks of medical intervention. In the case of information pharmacology, the difficulty lies in the fact that the therapeutic effect is achieved not through direct physiological action, but through cognitive and behavioral modulation. Under such conditions, information ceases to be neutral and becomes an intervention. The legal status of information pharmacological systems remains uncertain. Currently, there are no clear mechanisms for distributing responsibility among developers, medical institutions, and clinical specialists in the event of adverse consequences from their use. This requires the development of new regulatory approaches that recognize information interventions as a separate category of medical technologies, with appropriate standards for safety, effectiveness, and ethical oversight. Therefore, the use of information pharmacology is possible only if the principles of transparency, voluntariness, control, and orientation to the patient's benefit are observed. Information used as a therapeutic agent should be considered not as a neutral support for treatment, but as a form of regulatory intervention that requires a clear ethical and legal framework. It is their presence that will determine informationwhether possibility of pharmacology can be integrated into legitimate and safe clinical practice.

Conclusion

Thus, information pharmacology acts as a conceptual bridge between information-based medicine and the practice of digital therapeutic interventions. It allows us to describe informational influences in the language of therapeutic action, without reducing them to purely psychological effects or technical tools. This is precisely its contribution to the formation of a holistic model of medicine, in which treatment is understood as a guided information interaction, capable of complementing and reinforcing classical biomedical approaches

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AI-Enabled Integrative Healthcare for Sustainable Economy and Green Transformation: An Indian Policy Perspective

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ABSTRACT: Artificial Intelligence is increasingly shaping healthcare systems through predictive analytics, automation, and data-driven governance. However, technology-centric models alone are insufficient to address long-term sustainability, preventive healthcare, and population-level health outcomes. This paper proposes a policy-facing integrative healthcare framework combining Artificial Intelligence with Yoga and Naturopathy to support Sustainable Economy and Green Transformation objectives. Artificial Intelligence strengthens public health governance through efficient resource allocation, digital surveillance, and scalable service delivery, while Yoga and Naturopathy reduce disease burden through low-cost, preventive, and lifestyle-based interventions. The proposed model demonstrates significant potential to reduce public healthcare expenditure, improve workforce productivity, enhance environmental sustainability, and align national health systems with long-term development priorities in India and comparable emerging economies.

KEYWORDS: Artificial Intelligence, Integrative Medicine, Yoga, Naturopathy, Sustainable Healthcare, Public Health Policy.

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Introduction

Healthcare systems worldwide are experiencing unprecedented economic and structural stress due to the rising prevalence of chronic diseases, aging populations, escalating treatment costs, and environmental constraints. Curative-centric biomedical models increasingly struggle to remain financially and ecologically sustainable. Artificial Intelligence (AI) has emerged as a powerful tool for optimizing healthcare delivery, enabling predictive analytics, automation, and improved governance. Simultaneously, Yoga and Naturopathy offer preventive, lifestyle-oriented, and low-resource healthcare approaches aligned with sustainability principles. Integrating AI with Yoga and Naturopathy presents a strategic opportunity to reorient healthcare systems toward prevention, resilience, and green transformation.

Analysis of Recent Research and Publications

Recent literature highlights AI's capacity to improve diagnostic accuracy, optimize workforce deployment, and support large-scale population health management. AI-enabled systems contribute to cost containment by reducing unnecessary investigations, hospital admissions, and administrative inefficiencies. Parallel research demonstrates that Yoga and Naturopathy are effective in managing non-communicable diseases such as diabetes, hypertension, obesity, and stress-related disorders, thereby lowering long-term healthcare expenditure. Despite this evidence, existing studies largely examine these domains separately.

Comprehensive policy-level integration remains limited, particularly in public healthcare systems of low- and middle-income countries.

Purpose of the Study

The purpose of this paper is to develop a policy-oriented framework integrating Artificial Intelligence with Yoga and Naturopathy to support sustainable economic development and green transformation. The study aims to assess the model's relevance for public health governance, economic efficiency, environmental impact, and scalability within national health systems.

Main Results and India-Focused Policy Case

India represents a distinctive policy environment due to its institutionalized AYUSH systems and the Implementation of the Ayushman Bharat Digital Mission. The Ministry of AYUSH promotes Yoga and Naturopathy as preventive and promotive healthcare modalities, while digital health infrastructure facilitates electronic health records, telemedicine, and data-driven decision-making. Integrating AI Analytics with Yoga and Naturopathy services enable early risk identification, personalized lifestyle interventions, and real-time monitoring at a population scale. This convergence improves access to rural and primary healthcare, reduces dependence on tertiary care, and supports environmentally sustainable service delivery.

Table 1 presents the integrative policy model combining AI-driven governance with Yoga and Naturopathy-based interventions.

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Table 1

AI–Yoga–Naturopathy Integrative Policy Model

Policy Dimension	AI Contribution	Yoga & Naturopathy Contribution	Policy Outcome
Prevention	Risk prediction and stratification	Lifestyle modification	Reduced disease burden
Diagnosis	Decision-support analytics	Clinical functional assessment	Early intervention
Governance	Digital dashboards and monitoring	Community-based outreach	Efficient public management

Policy Framework and Economic Implications

The proposed framework positions AI as an enabler of governance efficiency, surveillance, and resource optimization, while Yoga and Naturopathy function as foundational preventive strategies. Economically, this model reduces long-term public healthcare expenditure, enhances workforce productivity, and strengthens health system resilience. Environmentally, the approach supports green healthcare by lowering energy-intensive interventions and minimizing pharmaceutical dependency. Figure 1 illustrates the conceptual policy framework linking digital health systems, integrative care delivery, and sustainable development outcomes.

Conclusions

AI-enabled integrative healthcare offers a viable policy pathway for aligning public health with sustainable economic growth and green transformation. The Indian experience demonstrates the feasibility of integrating digital health governance with traditional preventive systems. Future research should focus on pilot implementations, economic modeling, and cross-national comparisons to support evidence-based policy adoption.

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Propp and the Psychological Function of Narrative in the Children's Fairy Tale

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ABSTRACT: This theoretical study explores the psychological function of narrative in children's fairy tales through a re-interpretation of Vladimir Propp's morphology. While Propp's model has traditionally been approached as a structural framework for analysing recurring narrative functions, its potential relevance for understanding the experiential dimension of storytelling remains underexamined. The purpose of the study is to reconsider narrative functions not merely as formal elements of plot organisation but as symbolic configurations through which experiences of disruption, trial, agency and restoration are structured and interpreted.

Drawing on narratological and psychological approaches to children's literature, the paper offers a conceptual synthesis that aligns selected Proppian functions with recurrent psychological processes within the reading experience. Rather than proposing empirical validation, the study advances a theoretically grounded interpretive model that bridges structural analysis and psychological meaning-making. By repositioning morphology as a dynamic framework for experiential organisation, the paper contributes to contemporary discussions of the relationship between narrative form and psychological engagement in children's literature.

KEYWORDS: children's fairy tale, narrative structure, Propp's morphology, psychological function of narrative, meaning-making, narrative experience.

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Introduction

Children's fairy tales have long been examined as literary forms shaped by narrative conventions, cultural patterns and symbolic structures. At the same time, contemporary approaches to narrative increasingly recognise storytelling as a mode of psychological organisation through which individuals interpret experience, confront uncertainty, and construct meaning. Within the field of children's literature, however, structural analyses and psychological interpretations have often developed in parallel. The former have focused on narrative organisation and formal elements, while the latter have privileged thematic content and symbolic representation. The relationship between narrative structure and psychological experience, therefore, remains insufficiently articulated.

The structural study of the folktale reached a decisive moment with Vladimir Propp's *Morphology of the Folktale*, which proposed a systematic description of recurrent narrative functions. Propp's model has been widely acknowledged for its methodological precision and its contribution to narratology. However, its reception has predominantly emphasised classification and plot sequencing, treating narrative functions primarily as formal units. Less attention has been paid to the possibility that these functions may also operate as patterns of experiential organisation, shaping how readers cognitively and emotionally process narrative events.

In the context of children's literature, this gap becomes particularly significant. Fairy tales frequently revolve around absence, prohibition, transgression, trial, assistance, struggle and restoration—configurations that mirror fundamental structures of lived experience. If narrative functions are understood not only as structural components but also as symbolic frameworks through which conflict and resolution are staged, they may be reconsidered as mediators of psychological meaning. Such a perspective allows a shift from viewing morphology as a purely formal system to recognising its potential relevance to understanding how stories contribute to processes of sense-making.

For these reasons, a theoretical re-examination of Propp's model appears warranted. Rather than revisiting the morphology of the folktale as a classificatory scheme, the present study approaches narrative functions as possible carriers of psychological significance within the reading experience. By exploring the conceptual intersection between structural narratology and psychological interpretation, the paper seeks to clarify how the formal architecture of the fairy tale may contribute to the organisation of meaning for the child reader.

Research Aim and Research Questions

This study reinterprets Vladimir Propp's morphology to examine the psychological function of narrative in the children's fairy tale. It proposes that narrative functions may be understood not only as structural elements of plot but also as symbolic patterns that organise experiences of disruption, trial, agency, and restoration. The paper advances a conceptual framework that links narrative structure with psychological meaning-making within the reading experience.

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On this basis, the study is guided by the following research questions:

1. How can Propp's narrative functions be reinterpreted as experiential configurations rather than merely structural elements of plot?

2. To what extent does such a reinterpretation clarify the psychological function of narrative and contribute to contemporary discussions on meaning-making in children's literature?

Research Results

This section presents the theoretical results derived from a review of narratological and psychological scholarship on children's fairy tales. The findings are articulated as conceptual syntheses rather than empirical measurements, clarifying the implications of reconsidering Propp's morphology within a psychological framework.

Recent research may be organised into three main directions. The first focuses on structural and narratological analysis, examining recurring functional sequences and the organisation of the plot (Propp, 1968; Herman, 2013). While these approaches provide systematic models of narrative architecture, they often prioritise classification over experiential interpretation.

A second direction emphasises the psychological and experiential dimensions of storytelling, highlighting narrative as a mode of meaning-making and identity construction (Bruner, 1986; McAdams, 2001). Reader-oriented and cognitive approaches further stress affective engagement in children's literature (Nikolajeva, 2014; Mar, 2020), though they rarely connect psychological processes to specific structural mechanisms.

More recent interdisciplinary work seeks to bridge these domains by examining how narrative form shapes cognitive and emotional responses (Kukkonen, 2020; Caracciolo, 2021; Green & Appel, 2024). From this perspective, narrative is understood as a structured experience in which sequencing and patterned resolution contribute to the formation of meaning (Herman, 2001).

From this integrative standpoint, Propp's narrative functions may be reinterpreted as experiential configurations rather than neutral plot units. Functions such as absence, trial and return correspond to psychological dynamics of disruption, agency and restoration, aligning with broader accounts of narrative as a structuring principle of lived experience (Bruner, 1997; McAdams, 2001).

The alignment between narrative function and psychological process is summarised in [Table 1], which presents a conceptual model that links structural elements to recurrent experiential patterns. Rather than offering empirical validation, the model clarifies how narrative form mediates meaning-making.

Overall, the analysis repositions Propp's morphology as a dynamic interpretive framework that connects narratology with cognitive and experiential approaches to children's literature (Kukkonen, 2020; Caracciolo, 2021; Herman, 2001).

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Table 1

Proppian Narrative Function – Psychological Process

Narrative Function	Psychological Process
Absence / Lack	Experience of loss
Prohibition	Boundary formation
Violation	Conflict / Anxiety
Test	Agency development
Return	Restoration of meaning

Conclusions

The present study examined the psychological function of narrative in the children's fairy tale through a theoretical re-interpretation of Propp's morphology. By shifting attention from narrative functions as formal elements of plot organisation to their role as symbolic configurations of experience, the analysis highlighted the relevance of narrative structure to understanding how meaning is organised within the reading process.

The theoretical results suggest that recurring narrative functions can be understood as patterns through which experiences of disruption, trial, agency and resolution are narratively articulated. Rather than operating as neutral structural units, these functions contribute to the staging of psychological tensions and their symbolic resolution. In this sense, the morphology of the fairy tale emerges as a framework that organises experience by linking narrative form to processes of sense-making.

The contribution of the study lies in its conceptual repositioning of Propp's model. The proposed approach does not seek empirical validation or therapeutic application; rather, it offers an interpretive perspective that integrates structural narratology with psychological considerations. By foregrounding the experiential implications of narrative form, the paper contributes to a more nuanced understanding of the fairy tale as a literary space where meaning is negotiated rather than prescribed.

Future research may build on this framework by exploring how Proppian narrative functions operate across different cultural contexts or by examining their relevance within educational settings. While the present study remains theoretical in scope, it establishes a basis for further interdisciplinary inquiry into the relationship between narrative structure, psychological experience and meaning-making in childhood.

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Sustainable Strategies to Strengthen Soft Skills and Improve Job Placement in the Service Sector

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ABSTRACT: In today's highly competitive and dynamic world, it is increasingly difficult for recent graduates to successfully enter the job market and, consequently, to secure minimum workplace safety conditions. The objective of this research was to propose sustainable strategies to strengthen soft skills and facilitate employment in service-sector companies. The research approach was quantitative, with a non-experimental, cross-sectional, correlational design. The variables analysed were soft skills and employment, considering leadership, communication, and decision-making as dimensions. The sample consisted of business decision-makers from the companies under study. The results showed a statistically significant relationship between the development of soft skills and higher employment levels, highlighting leadership, communication, and decision-making as key factors. It is concluded that strengthening these soft skills improves employability in the service sector. Similarly, training strategies focused on organisational sustainability and the comprehensive development of human capital are proposed.

KEYWORDS: Soft skills, job placement, sustainable strategies.

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Introduction

En el mundo laboral actual, altamente competitivo, la inserción de los egresados universitarios en el mercado de trabajo se ha vuelto cada vez más compleja. Muchos jóvenes enfrentan dificultades para integrarse al sector servicios con condiciones mínimas de empleabilidad, debido a la falta de habilidades blandas como liderazgo, comunicación y toma de decisiones. Estudios recientes han demostrado que la preparación técnica por sí sola no garantiza la inserción laboral efectiva y que el fortalecimiento de competencias socioemocionales es clave para la adaptación y desempeño en ambientes laborales dinámicos (Laines-Alamina et al., 2023). También se puede citar el estudio de Vásquez et al. (2021) señalando como un tema actual de mucha importancia el cambio que ha sufrido el profesionista tras la pandemia que azotó al mundo entero y cómo se puede apoyar a estos para facilitarles la adaptación al nuevo contexto al que se enfrentan. Señalan la importancia de fomentar las habilidades blandas desde el desarrollo del estudiante, ya que de esta manera podrán estar más conscientes de sus cualidades socioemocionales.

Por su parte, Ceja et al. (2022) afirman que actualmente el estudio de las habilidades blandas es necesario en la formación académica y profesional de los docentes en una institución de educación superior (IES), porque los docentes tienen la responsabilidad de transmitir conocimientos, experiencias, enseñanzas y sus emociones a los estudiantes después de haber pasado por los tiempos de pandemia de COVID-19.

Cabe señalar que, en México, la inserción laboral de los jóvenes egresados continúa siendo un desafío. Según reportes recientes de Generation México (2023), antes de recibir capacitación técnica y en habilidades blandas, un alto porcentaje de participantes se encontraba desempleado, mientras que tras la formación lograron integrarse al mercado laboral. Como se puede observar, el problema es a nivel global, donde existen deficiencias en estudiantes universitarios en habilidades blandas, lo que propicia que haya mucho desempleo y que no se puedan colocar en puestos que realmente sean valorados. Ante estas problemáticas, se resalta la necesidad de estrategias sostenibles que permitan desarrollar habilidades blandas orientadas a la empleabilidad, promoviendo así una transición más efectiva de la universidad al entorno profesional.

Bajo este contexto, se hace indispensable que a los egresados se les dote de habilidades blandas para la empleabilidad. De la Ossa (2022) menciona que las habilidades blandas son el conjunto de destrezas, aptitudes o herramientas afectivas que poseen la particularidad de regular el estado emocional del ser humano; son habilidades que ayudan a fomentar, mantener y procurar relaciones sociales positivas. Las habilidades blandas les permiten a las personas un mejor desenvolvimiento en cualquiera que sea el contexto en que se encuentren. Además, están relacionadas con el comportamiento, las actitudes y los aprendizajes a lo largo de nuestra vida, así como la manera en que nos relacionamos con todo lo que nos rodea.

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Las habilidades blandas, también conocidas como competencias socioemocionales o transversales, comprenden capacidades vinculadas a la interacción social, la comunicación, el liderazgo y la capacidad de resolver problemas. Aunque no dependen directamente del conocimiento técnico, resultan fundamentales para desenvolverse con eficacia en entornos laborales cambiantes y dinámicos, complementando de manera significativa las habilidades técnicas (Cimatti, 2016, citado en Calvo, 2025). Es así como las habilidades blandas son definidas como aquellas que complementan el aprendizaje de los estudiantes y futuros profesionales, particularmente de aquellos que buscan una relación laboral de dependencia con una organización (empresa o entidad pública), las cuales contribuirán a que estos puedan mejorar sus competencias y puedan ser contratados (Monar et al., 2024).

Considerando la importancia de las habilidades blandas, se puede afirmar que, en un entorno laboral cada vez más competitivo, los egresados no solo necesitan conocimientos técnicos, sino habilidades socioemocionales que les permitan adaptarse, colaborar y destacarse, lo que repercute directamente en su inserción laboral y en la reducción de periodos de desempleo y subempleo. Por lo que, de acuerdo con Pérez y Pinto (2020), la inserción laboral se refiere al proceso mediante el cual una persona accede y se integra al mercado de trabajo, participando activamente en actividades productivas dentro de una economía formal o informal.

Objetivo y pregunta de investigación

Partiendo de que la investigación tuvo un enfoque cuantitativo, con un diseño no experimental, transeccional y correlacional debido a que no se manipularon las variables sujetas de estudio, así como se dio en un solo momento y se buscó la relación entre las variables habilidades blandas y la inserción laboral del sector servicios (Hernández y Mendoza, 2023). El objetivo de esta investigación fue proponer estrategias sostenibles para el fortalecimiento de habilidades blandas que favorezcan la inserción laboral en las empresas del sector servicios, de la cual se desprende la siguiente pregunta de investigación: ¿Qué estrategias sostenibles contribuyen al fortalecimiento de las habilidades blandas para favorecer la inserción laboral en empresas del sector servicios?

Resultados de la investigación

A continuación, se presentan los resultados obtenidos del análisis de las habilidades blandas y su relación con la inserción laboral en las empresas del sector servicios, de acuerdo con los objetivos planteados en la investigación. La estadística aplicada fue con los parámetros del coeficiente de Tau_b de Kendall, de acuerdo a las dimensiones: el liderazgo, la comunicación y la capacidad de toma de decisiones. En la tabla 1 se presentan los resultados de acuerdo a la dimensión toma de decisiones.

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Tabla 1

Toma de Decisiones

			Participación en toma de decisiones	Elab. proyectos de la Org.de manera activa y asertiva.	Análisis alternativo de solución evitar riesgos	Decisiones basadas en experiencias
Tau_b de Kendall	Participación en toma de decisiones	Coeficiente de correlación sig (bilateral)	1.000	.434**	.202	.209
				.000	.000	.000
		N		52	52	52
	Elab. proyectos de la Org.de manera activa y asertiva.	Coeficiente de correlación sig (bilateral)	434**	1.000	.657**	.366**
			.000		.000	.000
		N	52		52	52
	Análisis alternativo de solución evitar riesgos	Coeficiente de correlación sig (bilateral)	.202	. .657**	1.000	.610**
			.000	.000		.000
		N	52	52	52	52
	Decisiones basadas en experiencias	Coeficiente de correlación sig (bilateral)	.209	.366**	.610**	1.000
			.000	.000	.000	
		N	52	52	52	52

Fuente: Elaboración propia

En la Tabla 1 se muestran los resultados principales derivados de la aplicación del coeficiente Tau_b de Kendall, empleado para evaluar la asociación entre las variables que integran el constructo resolución de problemas. Los hallazgos evidencian una correlación significativa y alta entre la participación activa y asertiva en proyectos organizacionales y el análisis de alternativas de solución para minimizar riesgos (τ = .657**). Asimismo, se observa una relación elevada entre la toma de decisiones basada en experiencias previas y la mejora continua (τ = .610**). En ambos coeficientes hay correlaciones altas.

De la misma forma, se procede a realizar el análisis de la dimensión de liderazgo tal como se muestra en la tabla 2.

Tabla 2

Liderazgo

			Desarrollo en buen ambiente laboral	Habilidades de liderazgo	Intereses por el equipo de trabajo	Motiv. Equipo trabajo, logro objetivos
Tau_b de Kendall	Desarrollo en buen ambiente	Coeficiente de correlación sig (bilateral)	1.000	.377**	.707**	.761**
				.000	.000	.000
			52	52	52	52

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	laboral	N				
	Habilidades de liderazgo	Coeficiente de correlación sig (bilateral)	.377** .004	1.000	.378** .004	.397** .003
		N	52		52	52
	Intereses por el equipo de trabajo	Coeficiente de correlación sig (bilateral)	.707** .000	.378** .004	1.000	.765** .000
		N	52	52	52	52
	Motiv. Equipo trabajo, logro objetivos	Coeficiente de correlación sig (bilateral)	.761** .000	.397** .003	.765** .000	1.000
		N	52	52	52	52

Fuente: Elaboración propia

En este orden de ideas, en la tabla 2 se evidencian los principales resultados correspondientes al constructo liderazgo, evidenciándose asociaciones altas entre las variables analizadas. Destaca la correlación entre la colaboración del egresado en la generación de un ambiente laboral adecuado y la consideración de los intereses del equipo de trabajo (τ = .707**). Asimismo, se observa una relación elevada entre la capacidad de motivar a sus compañeros para el logro de objetivos (τ = .761**) y la asociación entre dicha motivación y la orientación hacia los intereses colectivos del equipo (τ = .765**), según el coeficiente Tau_b de Kendall.

De la misma forma en la tabla 3 se muestra la dimensión de comunicación

Tabla 3

Comunicación

			Comunicación con su equipo de trabajo	Disposición a escuchar a los demás	Comunicación efectiva	Comunicación clara y concisa
Tau_b de Kendall	Comunicación con su equipo de trabajo	Coeficiente de correlación sig (bilateral)	1.000	.715** .000	.696** .000	.570** .000
		N	52	52	52	52
	Disposición a escuchar a los demás	Coeficiente de correlación sig (bilateral)	.715** .004	1.000	703** .004	.565** .003
		N	52		52	52
	Comunicación efectiva	Coeficiente de correlación	.696** .000	.703** .004	1.000	.807** .000
			52	52	52	52

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	sig (bilateral)				
	N				
Comunicación clara y concisa	Coeficiente de correlación	.570**	.565**	.807**	1.000
	sig (bilateral)	.000	.003	.000	
	N	52	52	52	52

Fuente: Elaboración propia

Los principales resultados de la dimensión comunicación se presentan en la tabla 3, cuyos resultados muestran asociaciones altas en las variables relacionadas con la comunicación del egresado. Se observa una correlación elevada entre mantener una comunicación constante con el equipo y estar dispuesto a escuchar a los demás (τ = .715**), así como entre demostrar una comunicación efectiva (τ = .703**). Además, se evidencia una correlación muy alta entre la habilidad para comunicarse de manera efectiva y la capacidad de transmitir mensajes claros y concisos al equipo (τ = 0,807).

Conclusiones

Los hallazgos de esta investigación muestran que las habilidades blandas como toma de decisiones, liderazgo y comunicación presentan asociaciones altas entre sus componentes, lo que evidencia su importancia para el desempeño efectivo en el trabajo. Estos hallazgos permiten identificar áreas claves para el fortalecimiento de dichas habilidades blandas y, a partir de ello, orientar las propuestas de estrategias sostenibles que contribuyan a la inserción laboral de los egresados en el sector servicios. Por lo que se proponen las siguientes estrategias para dar cumplimiento al objetivo general y por ende responde la pregunta de investigación :

1.- Incorporar talleres prácticos de liderazgo y comunicación en los últimos semestres de formación profesional.

2.- Implementación y estudio de caso enfocados a la toma de decisiones en contextos reales de empresas del sector servicios.

3.- Vinculación universidad-empresa medianes prácticas supervisadas, con evaluación específicas de habilidades blandas

4.- Capacitación continua en empresas del sector servicios enfocada a comunicación efectiva, liderazgo y toma de decisiones.

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ASM-OPEAX-S.P.I.A³ as a Governance Architecture for Co-Agency in the 5.0 Paradigm

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ABSTRACT: This paper contextualises the ASM–OPEAX–S.P.I.A³ model as a governance architecture for human–AI co-agency in the Paradigm 5.0. The model integrates: (i) ASM, which defines roles, responsibilities, controls and traceability for agentic socio-technical systems; (ii) OPEAX, which structures the cognitive DNA of judgment through ontological, epistemic, axiological and pragmatic dimensions; and (iii) S.P.I.A³, which operationalizes generative action across spatial, polycentric and intelligent domains, enabled by anticipation, ambidexterity and antifragility. We discuss how the F.L.I.P. threshold serves as an inversion mechanism, converting complexity diagnosis into a generative transformation. The contribution is a coherent, multi-level device for governing the quality of judgment and value orientation toward the common good in innovation ecosystems and critical infrastructures under conditions of high interdependence.

KEYWORDS: Co-agency, AI governance, agentic systems, ASM, OPEAX, S.P.I.A³, Paradigm 5.0, common good, antifragility, generative capacity.

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Introduction

The growing integration of artificial intelligence systems into organisational processes has rendered it inadequate to treat the technical dimension in isolation from the institutional, cognitive, and organisational dimensions. In many contexts, what is observed is not only automation or digitization, but a condition of co-agency in which human actors, procedures, platforms, recommendation systems, and intelligent models participate, in asymmetrical yet interdependent ways, in the production of judgment and action (Casale, Fernandez, & Rinaldi, 2025; Casale et al., 2025; Casale & Rinaldi, 2024). In this setting, the key issue is no longer only algorithmic performance, but the quality of organisational coexistence among different agents, the distribution of responsibility, the traceability of decision pathways, and the axiological orientation of the system.

The ASM-OPEAX-S.P.I.A^3 model is positioned precisely in this theoretical and operational space and proposes a governance architecture that treats co-agency not as a side effect of technological adoption, but as an explicit object of design and governance (Casale, Fernandez, & Rinaldi, 2025; Casale & Fernandez, 2025). Its scientific relevance lies in its ability to integrate three levels that are often handled separately, namely the cognitive level of judgment, the dynamic level of transformation under complexity, and the institutional level of responsibility. This paper aims to contextualize the model within the body of work related to the 5.0 Paradigm, common-good-oriented innovation governance, organizational antifragility, and the emerging category of generative capacity (Casale & Fernandez, 2025; Casale et al., 2025; Casale et al., 2024; Casale & Rinaldi, 2024; Casale & Rinaldi, 2025a; Casale & Rinaldi, 2025b; Casale et al., 2026).

Analysis of recent research and publications

A first axis of contextualization is the 5.0 Paradigm, understood as a framework in which socio-technical transformation cannot be reduced to efficiency, automation, or compliance alone, but requires integration among human centrality, responsibility, sustainability, transformative capacity, and orientation toward the common good (Casale et al., 2025; Casale & Rinaldi, 2024). In this perspective, governance becomes a structural issue because the paradigm must be translated into verifiable organisational architectures. The proposal to formalise Industry 5.0 in governance terms is therefore a crucial reference, and the ASM-OPEAX-S.P.I.A^3 model can be read as a coherent operationalisation of that need (Casale et al., 2025; Casale & Rinaldi, 2024).

A second axis is the trajectory that interprets innovation as a process oriented toward the common good and shared value rather than as the mere production of competitive advantage. The works on innovation ecosystems in the 5.0 era and on innovation oriented to the common good show that value emerges from multi-actor configurations, cooperative logics, and governance structures that connect social purpose, organisational capability, and learning (Casale et al., 2025; Casale et al., 2025). This is central for the model because the reference to the common good is not decorative, but functions as a

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criterion for the quality of co-agency and for the configuration of knowledge blocks and decision thresholds (Casale, Fernandez, & Rinaldi, 2025; Casale et al., 2025; Casale et al., 2025; Casale & Rinaldi, 2024).

A third axis concerns organisational antifragility and the evolution of innovation management. The antifragility trajectory moves beyond resilience, placing learning from tensions, deviations, and discontinuities at the core of a system's evolutionary capacity (Casale et al., 2024; Casale & Rinaldi, 2025a; Casale & Rinaldi, 2025b). S.P.I.A^3 is fully aligned with this line of thought. It can be seen as a mature generative framework because it integrates antifragility with spatial reading of value, polycentric governance, and the quality of judgment in intelligent decision processes (Casale, Fernandez, & Rinaldi, 2025; Casale & Fernandez, 2025; Casale et al., 2024; Casale & Rinaldi, 2025a; Casale & Rinaldi, 2025b).

Formulation of the purpose of the article

The purpose of the article is to contextualise the ASM–OPEAX–S.P.I.A³ model within the Paradigm 5.0 literature and to define its contribution as a multi-level governance device for traceable, value-oriented co-agency between humans and AI in high-interdependence settings.

Presentation of the main material (research results)

This paper adopts a theoretical-conceptual and interpretive approach. It does not aim to validate the model in a single case study empirically, but to provide a systematic contextualization of its conceptual architecture and its research trajectory across the 5.0 Paradigm, common-good-oriented innovation governance, organizational antifragility, and the category of generative capacity (Casale, Fernandez, & Rinaldi, 2025; Casale & Fernandez, 2025; Casale et al., 2025; Casale et al., 2024; Casale & Rinaldi, 2024; Casale & Rinaldi, 2025a; Casale & Rinaldi, 2025b; Casale et al., 2026).

The analysis is developed on three intertwined levels. The first reconstructs the internal architecture of the model and the functional relations among ASM, OPEAX, S.P.I.A^3, and the F.L.I.P. threshold (Casale, Fernandez, & Rinaldi, 2025; Casale & Fernandez, 2025). The second positions the model within the broader theoretical framework of the 5.0 Paradigm and related contributions on governance, common good, and antifragility (Casale et al., 2025; Casale et al., 2024; Casale & Rinaldi, 2024; Casale & Rinaldi, 2025a; Casale & Rinaldi, 2025b). The third proposes a prospective reading that connects the model to the explicit reference to Industry 6.0 as a meta-systemic horizon of reflexive governance (Casale et al., 2026).

Model architecture and theoretical contextualization

ASM (Agentic System Management) is the outer ring and the overall governance level of the model. It starts from the assumption that contemporary organisations are already agentic environments composed of heterogeneous agents, including people, procedures, platforms, recommendation systems, intelligent models, and formal rules that interact in the production of judgment and action

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(Casale, Fernandez, & Rinaldi, 2025). The core governance task is therefore not simply to introduce AI, but to design and govern how human and artificial agents cooperate, enter into tension, and shape responsibilities. ASM operates as a governance stance that makes co-agency visible and governs its institutional and cognitive quality through safeguards such as meaningful human control, traceability of judgment, clarity of responsibilities, and attention to concrete consequences (Casale, Fernandez, & Rinaldi, 2025; Casale et al., 2025; Casale et al., 2025; Casale & Rinaldi, 2024).

OPEAX is the cognitive and value-based core of the architecture and can be understood as the model's cognitive DNA (Casale, Fernandez, & Rinaldi, 2025). It occupies the centre of the concentric structure because it makes explicit the conditions for judging quality before rules and procedures are defined. Its four dimensions are ontological, epistemic, axiological, and pragmatic. Together, they clarify what the system recognises as real and relevant, how knowledge is built and validated, which values orient choices and thresholds, and what concrete effects decisions are expected to generate in practices, relationships, and institutional arrangements (Casale, Fernandez, & Rinaldi, 2025; Casale & Rinaldi, 2024). In this sense, OPEAX formalises a meta-governance level that many governance architectures leave implicit.

A particularly original feature of the model is the notion of knowledge blocks, understood as modular units of knowledge rather than isolated data points. These blocks may include standards, guidelines, ethical frameworks, case repertoires, evidence bases, and structured datasets, and can be combined into different cognitive genomes adaptable to different contexts (Casale, Fernandez, & Rinaldi, 2025). The logic is modular and plug-and-play but not arbitrary, because every composition must remain coherent with the cognitive DNA defined by OPEAX. This makes governance a documentable cognitive architecture capable of integrating heterogeneous sources while preserving a stable orientation toward value and responsibility (Casale et al., 2025; Casale & Rinaldi, 2024).

S.P.I.A^3 is the intermediate ring and acts as the model's generative and operational framework. Its function is to translate the reading of complexity into a grammar of transformative action, avoiding both reductive simplification and uncontrolled proliferation of variables (Casale, Fernandez, & Rinaldi, 2025; Casale & Fernandez, 2025). Emerging from the F.L.I.P. trajectory and from engagement with diagnostic complexity frameworks, S.P.I.A^3 goes beyond classification and provides a structured way to act under non-linearity and high interdependence with a view to regeneration, learning, and shared value (Casale & Fernandez, 2025; Casale et al., 2025; Casale et al., 2025; Casale et al., 2024).

The framework is grounded in three integrated domains: spatial, polycentric, and intelligent (Casale, Fernandez, & Rinaldi, 2025; Casale & Fernandez, 2025). The spatial domain reads where value is generated, dispersed, or blocked across physical, environmental, and digital spaces, which is essential in territorial and infrastructure contexts (Casale & Fernandez, 2025; Casale et al., 2025; Casale et al., 2025; Casale & Rinaldi, 2024). The polycentric domain recognises that decisions are distributed across multiple centres and that governance quality depends on coordination, legitimacy, and proximity to

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decisions among different nodes (Casale et al., 2025; Casale & Rinaldi, 2024). The intelligent domain concerns the quality of decision processes rather than technological intensity alone, and includes explainability, traceability of judgment, relevance of information, and meaningful human control in critical passages (Casale, Fernandez, & Rinaldi, 2025; Casale & Fernandez, 2025; Casale et al., 2025).

Interwoven with these domains are three enabling capacities, anticipation, ambidexterity, and antifragility (Casale, Fernandez, & Rinaldi, 2025; Casale & Fernandez, 2025; Casale et al., 2024; Casale & Rinaldi, 2025a; Casale & Rinaldi, 2025b). Anticipation involves preparing scenarios, options, and action thresholds before discontinuities fully emerge. Ambidexterity concerns the ability to preserve operational continuity while enabling exploration and innovation. Antifragility concerns the capacity to transform tensions, deviations, weak signals, and discontinuities into learning and design improvement. Their integration avoids hierarchical readings and supports an evolutionary dynamic coherent with the broader antifragility trajectory (Casale et al., 2024; Casale & Rinaldi, 2025a; Casale & Rinaldi, 2025b).

The F.L.I.P. threshold is a decisive dynamic element of the model and can be understood as the inversion point between diagnostic reading of complexity and governed transformative action (Casale & Fernandez, 2025). At this threshold, pressures, deviations, near misses, and weak signals cease to be treated as noise and become intentional material for learning and regeneration. OPEAX provides the cognitive foundation, S.P.I.A^3 provides the grammar of action, ASM governs responsibilities, and the F.L.I.P. threshold makes the passage from observed fragility to designed transformation dynamically possible (Casale, Fernandez, & Rinaldi, 2025; Casale & Fernandez, 2025; Casale et al., 2024).

Scientific discussion

A first scientific implication of the model is that it is not merely a framework for AI adoption but a theory of co-agency governance (Casale et al., 2025; Casale & Rinaldi, 2024). This matters because it shifts the analytical focus from technology alone to the institutional quality of socio-technical integration, placing responsibility, traceability, and orientation toward the common good at the centre. In this sense, the model can productively dialogue with research on socio-technical systems, polycentric governance, and multi-agent organisational architectures (Casale, Fernandez, & Rinaldi, 2025; Casale & Fernandez, 2025; Casale et al., 2025).

A second implication concerns OPEAX and the formalisation of the cognitive level of organisational decision-making. OPEAX makes explicit what often remains implicit in governance practice, namely the dependence of decisions on ontological, epistemic, axiological, and pragmatic premises (Casale, Fernandez, & Rinaldi, 2025; Casale & Rinaldi, 2024). This is especially relevant in contexts of high technological intensity and institutional impact, where judgment quality cannot be assessed solely ex post but requires ex ante clarification of the criteria for reality, evidence, value, and expected effects.

A third implication concerns the treatment of complexity. The F.L.I.P.-to-S.P.I.A^3 trajectory offers a non-defensive reading in which complexity becomes a field of generative capacity rather than only a risk

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condition (Casale & Fernandez, 2025; Casale et al., 2024; Casale & Rinaldi, 2025a; Casale & Rinaldi, 2025b). The strong point is the connection between the three domains and the triad of anticipation, ambidexterity, and antifragility, which links systemic reading, design, and learning in a coherent operational grammar. This is particularly relevant for innovation ecosystems, territorial systems, and critical infrastructures characterised by distributed value and multi-actor decision-making (Casale et al., 2025; Casale & Rinaldi, 2024).

The model also has an explicitly applicative vocation because it is structured to be documentable, verifiable, and transferable across domains while preserving conceptual coherence and operational adaptability (Casale, Fernandez, & Rinaldi, 2025; Casale & Fernandez, 2025). This makes it suitable for dialogue with management systems and regulated environments. At the same time, it opens a research agenda on indicators and metrics coherent with the three architectural levels, with organizational agentic maturity, and with the quality of co-agency in terms of human control, traceability, and shared-value orientation (Casale, Fernandez, & Rinaldi, 2025; Casale & Fernandez, 2025; Casale et al., 2025; Casale et al., 2025).

In a prospective view, the model can be further strengthened in light of the contribution "From Productivity to Generative Capacity", where the reference to Industry 6.0 is explicit and conceptually central (Casale et al., 2026). In that work, Industry 6.0 is not framed as a new technological phase, but as a meta-systemic horizon in which the central issue becomes the reflexive governance of generative capacity over the long term. This perspective is highly relevant here because it allows ASM to be interpreted as a governance stance for generative trajectories, OPEAX as a cognitive infrastructure for making and renegotiating the criteria of generativity explicit, and S.P.I.A^3 as an operational grammar for translating that orientation into observable and governable transformative capacities (Casale, Fernandez, & Rinaldi, 2025; Casale & Fernandez, 2025; Casale et al., 2026). In this light, the F.L.I.P. threshold can also be read as compatible with a longer-term governance logic in which systems not only learn from shocks but also progressively renegotiate value criteria and direction in light of the effects produced (Casale & Fernandez, 2025; Casale et al., 2026).

The main limitation of this paper is its theoretical and conceptual nature. A robust contextualization does not replace the need for empirical and comparative studies in differentiated application domains such as digital public services, critical infrastructures, production networks, and innovation ecosystems (Casale, Fernandez, & Rinaldi, 2025; Casale et al., 2025; Casale et al., 2025; Casale & Rinaldi, 2024). Future work should also address metric formalisation across the ASM, OPEAX, and S.P.I.A^3 levels and further explore the relationship between co-agency and generative capacity in the long-term horizon associated with Industry 6.0 (Casale, Fernandez, & Rinaldi, 2025; Casale & Fernandez, 2025; Casale et al., 2025; Casale et al., 2026).

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Conclusions

The ASM-OPEAX-S.P.I.A^3 model can be interpreted as a theoretically and operationally significant architecture for research on the governance of socio-technical transformation within the 5.0 Paradigm. Its originality lies in integrating, within a single framework, the governance frame of co-agency, the cognitive safeguard of judgment, and the generative grammar of transformation under complexity, while maintaining a clear orientation toward the common good and shared value (Casale, Fernandez, & Rinaldi, 2025; Casale & Fernandez, 2025; Casale et al., 2025; Casale et al., 2024; Casale & Rinaldi, 2024).

The contextualization proposed in this paper shows that the model is not only a device for governing AI adoption but a broader architecture for organisations, networks, and ecosystems operating under complexity, polycentricity, and interdependence. From this standpoint, the quality of coexistence between human and artificial agents becomes a major scientific, organisational, and institutional issue (Casale, Fernandez, & Rinaldi, 2025; Casale & Fernandez, 2025; Casale et al., 2025; Casale et al., 2025; Casale et al., 2024; Casale & Rinaldi, 2024).

The prospective opening toward generative capacity and the explicit Industry 6.0 horizon further strengthen the model's relevance, because it allows co-agency to be evaluated not only in terms of efficiency or technological adoption, but also in relation to responsibility, direction of value, and the evolutionary sustainability of socio-technical systems over time (Casale et al., 2026).

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ESG Practices and Customer-Based Performance: Insights from the Dairy Industry in Vietnam

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ABSTRACT: Environmental, Social, and Governance (ESG) practices have become an increasingly important component of corporate responsibility in the fast-moving consumer goods (FMCG) sector, particularly in the dairy industry where sustainability, food safety, and environmental responsibility are critical concerns. This qualitative study explores how ESG practices are perceived and communicated in the Vietnamese dairy sector and how they relate to customer-based performance. Data were collected through ten in-depth interviews with marketing experts working in the dairy industry, including professionals responsible for brand management, sustainability communication, and marketing strategy. The data were analysed using thematic analysis. The findings reveal three key themes. First, marketing experts increasingly view ESG as a strategic orientation rather than merely a regulatory or compliance requirement. Second, among the three ESG dimensions, environmental and social practices are perceived as the most visible and actionable in the dairy sector, particularly in relation to sustainable farming, environmental protection, product safety, and community engagement. Governance practices, although essential for corporate accountability, are viewed as less visible to consumers and therefore less influential in shaping customer perceptions. Third, the findings suggest that ESG initiatives do not automatically translate into improved customer-based performance. Instead, sustainability marketing emerges as an important mechanism through which ESG initiatives are communicated and interpreted by consumers. Transparent and credible sustainability communication can strengthen brand credibility, customer trust, and positive word-of-mouth, whereas overly promotional claims may trigger scepticism and concerns about greenwashing. The study also indicates that sustainability initiatives complement, rather than replace, core product attributes such as quality, safety, and price in shaping consumer purchasing decisions in the dairy market.

KEYWORDS: ESG Practices, dairy market, sustainability marketing in Vietnam.

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Introduction

In recent years, firms have increasingly recognised that sustainable competitiveness depends not only on financial performance but also on responsible environmental, social, and governance (ESG) practices. This issue is particularly significant in the dairy industry, where food safety, environmental management, and ethical sourcing play critical roles in shaping stakeholder expectations. While CSR provides a normative basis for responsible corporate behaviour, ESG introduces structured criteria for assessing and comparing sustainability performance (Puriwat & Tripopsakul, 2022). As market transparency increases, consumers have become more attentive to firms' environmental stewardship, social contributions, and ethical management practices. Consequently, ESG initiatives are increasingly viewed not only as internal governance mechanisms but also as strategic resources that shape consumer perceptions and market outcomes. In this context, sustainability marketing plays an important role in translating corporate sustainability commitments into clear, meaningful signals for consumers.

From a marketing perspective, responsible corporate conduct is closely associated with customer-based outcomes such as trust, brand evaluation, satisfaction, and loyalty. Previous studies suggest that ethical and socially responsible behaviour strengthens consumer confidence and positive brand perceptions, which, in turn, influence purchase intentions and long-term relationships (Du, Bhattacharya, & Sen, 2010; Sen & Bhattacharya, 2001). In the dairy sector, companies often communicate ESG initiatives through sustainability labels, transparent information about production processes, and narratives related to sustainable farming and responsible supply chains. These communication strategies help reduce information asymmetry and improve credibility. However, their effectiveness largely depends on consumers' perceptions of authenticity and whether sustainability initiatives are genuinely embedded in core business operations rather than presented as symbolic actions.

These issues are particularly relevant in emerging markets such as Vietnam, where economic growth is accompanied by increasing environmental awareness and evolving consumer expectations. The Vietnamese dairy market has expanded rapidly in recent years, driven by rising incomes, urbanisation, and growing demand for safe, high-quality nutritional products. At the same time, surveys indicate that Vietnamese consumers are becoming more attentive to sustainability considerations, with a significant proportion expressing willingness to support environmentally friendly products (PwC, 2024). These trends highlight the growing importance of trust, product quality, and brand credibility in dairy purchasing decisions.

Despite increasing attention to ESG, empirical research examining the relationships among ESG practices, sustainability marketing, and customer-based performance in the dairy sector remains limited, particularly in emerging economies. Existing studies often focus on CSR activities or investor-oriented ESG outcomes, while consumer perspectives remain relatively underexplored. Moreover, qualitative insights into how consumers interpret ESG initiatives and how sustainability communication influences their perceptions are still scarce.

To address this gap, this study investigates the relationships among ESG practices, sustainability marketing, and customer-based performance in Vietnam's dairy industry using qualitative data from in-depth consumer interviews. By adopting a consumer-centred perspective, the study integrates ESG practices, sustainability marketing, and customer-based outcomes within a single analytical framework. It also provides empirical insights from an emerging market context and offers practical implications for dairy firms seeking to leverage sustainability initiatives to strengthen customer relationships and long-term competitiveness.

Research Aim and Research Questions

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Building upon the identified theoretical and empirical gaps, this study aims to examine how Environmental, Social, and Governance (ESG) practices influence customer-based performance in Vietnam's dairy industry, based on insights from marketing experts. The study adopts a qualitative approach to explore how dairy companies' ESG initiatives are perceived from a professional marketing perspective and how these practices may contribute to customer-related outcomes. In particular, the research seeks to clarify the role of sustainability marketing in communicating ESG initiatives and shaping customer perceptions in the dairy market.

To achieve this aim, the study addresses the following research questions:

RQ1: How do marketing experts in Vietnam's dairy industry perceive and interpret firms' ESG practices?

RQ2: How do ESG practices influence customer-based performance outcomes such as customer trust, brand credibility, satisfaction, and loyalty in the dairy sector?

RQ3: What role does sustainability marketing play in communicating ESG initiatives and enhancing their impact on customer-based performance?

RQ4: What contextual factors in Vietnam's dairy market may influence the relationship between ESG practices and customer-based performance?

RQ5: Based on expert perspectives, what strategic recommendations can dairy companies adopt to leverage ESG practices to strengthen customer-based performance effectively?

Together, these research questions provide a structured framework for understanding how ESG practices contribute to customer-based performance in Vietnam's dairy industry and generate managerial insights for sustainability-oriented marketing strategies.

Literature review

This study is grounded in Stakeholder Theory and the Triple Bottom Line (TBL) framework, which together explain how ESG practices can influence customer-based performance through sustainability-oriented strategies. Stakeholder theory suggests that firms create long-term value by addressing the expectations of key stakeholder groups rather than focusing solely on shareholders (Freeman, 2010). Corporate responsibility, therefore, involves aligning business actions with societal values and stakeholder expectations (Bowen, 1953). In consumer-oriented industries such as FMCG, customers represent a particularly salient stakeholder group because their purchasing decisions are highly sensitive to firms' ethical, environmental, and social conduct (Bhattacharya et al., 2008). ESG initiatives can therefore serve as signals that enhance customer trust, brand credibility, and long-term relational outcomes (Khan et al., 2015; Pérez & Rodríguez del Bosque, 2015).

Complementing this perspective, the Triple Bottom Line (TBL) framework emphasises that sustainable business performance requires balancing economic, social, and environmental responsibilities (Elkington, 1998). By integrating these three dimensions, firms can simultaneously pursue financial success, social well-being, and environmental protection (Chabowski et al., 2011; Svensson & Wagner, 2015). Within this framework, sustainability marketing plays an important role in communicating responsible business practices and translating sustainability commitments into market value (Belz & Peattie, 2012; Sheth & Parvatiyar, 2021). Prior studies indicate that strong ESG performance can enhance consumer trust, positive brand attitudes, and emotional attachment (Luo & Bhattacharya, 2006; Du et al., 2010). Accordingly, ESG practices, supported by sustainability marketing, provide an

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important mechanism through which firms can strengthen customer-based performance and long-term competitive advantage (Friede et al., 2015).

Methodology

This study adopts a qualitative research design to explore how marketing experts interpret firms' ESG practices, how these practices are communicated through sustainability marketing, and how they influence customer-based performance outcomes in the Vietnamese dairy sector. A qualitative approach is appropriate because it enables an in-depth understanding of participants' professional perspectives, interpretations, and experiences regarding sustainability strategies in practice (Creswell & Poth, 2018). Moreover, qualitative inquiry is particularly well-suited to exploratory research that seeks to generate theoretical insights rather than statistical generalisations (Denzin & Lincoln, 2018).

Data were collected through in-depth semi-structured interviews with 10 marketing experts working in the Vietnamese dairy industry, selected through purposive sampling. The interviewees included professionals responsible for brand management, sustainability communication, and marketing strategy. The semi-structured interview format allowed experts to elaborate on their professional experiences and insights while maintaining consistency across interviews (Kvale & Brinkmann, 2009). Participants were selected based on three criteria: (1) having at least three years of experience in marketing or brand management within the dairy industry, (2) being familiar with sustainability-related initiatives implemented by dairy firms, and (3) having experience in communicating sustainability or responsible business practices to consumers. These criteria ensured that participants possessed relevant industry knowledge to discuss ESG practices and their marketing implications.

All interviews were audio-recorded, transcribed verbatim, and analysed using thematic analysis following the procedures outlined by Braun and Clarke (2006). The analysis involved data familiarisation, open coding, and the development of higher-order themes through an iterative, reflexive process. To enhance research rigour, the study employed a consistent interview protocol, transparent documentation of coding decisions, and continuous engagement with the data throughout the analysis (Denzin & Lincoln, 2018). Representative quotations are presented in the findings section to illustrate key themes and strengthen the credibility of the interpretations.

Findings and Discussion

This section presents the findings from a thematic analysis of 10 in-depth interviews with marketing experts working in the Vietnamese dairy industry. The analysis followed the procedures proposed by Braun and Clarke (2006), including familiarisation with the data, open coding, theme identification, and iterative refinement. The findings reveal four major themes related to the research questions: (1) expert perceptions of ESG practices in the dairy sector, (2) the role of sustainability marketing in communicating ESG initiatives, (3) the influence of ESG practices on customer-based performance, and (4) contextual factors shaping ESG effectiveness in Vietnam. Table 1 summarises the key themes, subthemes, and illustrative quotations identified during the coding process.

Table 1

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Themes, Subthemes, and Illustrative Quotes from Expert Interviews

Theme	Subthemes	Illustrative Quotes
ESG practices in the dairy industry	Environmental sustainability	"Environmental initiatives such as sustainable farming and eco-friendly packaging are becoming increasingly important for dairy brands."
	Social responsibility	"Product safety and nutritional quality are essential responsibilities in the dairy sector."
	Governance transparency	"Governance practices are crucial internally but consumers rarely notice them unless they are communicated."
Sustainability marketing communication	Transparency and storytelling	"Without communication, consumers may not realize that companies are investing in sustainability."
	Credibility of sustainability claims	"If sustainability messages sound exaggerated, consumers may suspect greenwashing."
ESG and customer-based performance	Brand credibility and trust	"When consumers believe sustainability initiatives are genuine, their trust in the brand increases."
	Customer loyalty and positive WOM	"Sustainability initiatives help create emotional connections with customers."
Contextual influences in Vietnam	Consumer awareness differences	"Urban consumers tend to be more aware of sustainability issues."
	Trust and certification	"Independent certifications help strengthen consumer confidence."

Expert perceptions of ESG practices in the dairy sector

The first research question examines how ESG practices are perceived within the dairy industry. The findings indicate that marketing experts increasingly view ESG as a strategic orientation rather than merely a compliance requirement. Interview participants emphasised that ESG practices are becoming integrated into long-term brand strategy, particularly as sustainability concerns gain prominence among stakeholders.

Among the three ESG dimensions, environmental and social practices were perceived as the most visible and actionable within the dairy industry. Experts highlighted environmental initiatives, including sustainable farming practices, resource efficiency, emissions reduction, and eco-friendly packaging, as critical components of responsible production.

One expert explained:

"Environmental initiatives such as sustainable farming and eco-friendly packaging are becoming increasingly important for dairy brands because consumers are more aware of environmental impacts."

Social responsibility was also described as highly relevant in the dairy sector, particularly in relation to food safety, nutritional quality, and community engagement. Experts noted that dairy products are closely associated with health and family well-being, which increases consumer expectations regarding responsible production.

Another participant emphasised:

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"Product safety and nutritional quality are essential responsibilities in the dairy sector. Consumers expect transparency about ingredients and production processes."

In contrast, governance practices were perceived as less visible to consumers. While experts acknowledged the importance of governance mechanisms such as transparency, ethical leadership, and corporate accountability, they noted that these aspects are often internal and difficult for consumers to observe.

One interviewee noted:

"Governance practices are very important internally, but consumers usually do not notice them unless companies communicate them clearly."

These findings align with stakeholder theory (Freeman, 2010), which emphasises that firms must address the expectations of key stakeholders. In the dairy sector, customers represent a particularly salient stakeholder group due to their frequent purchasing behaviour and strong concerns about product safety and sustainability.

Sustainability marketing as a mechanism for communicating ESG

The second research question explores how sustainability marketing shapes the communication and perception of ESG initiatives. The findings suggest that ESG practices alone do not automatically influence consumer perceptions unless they are translated into clear and credible marketing messages.

Experts consistently emphasised that sustainability marketing functions as a bridge between internal sustainability initiatives and consumer perceptions. Through marketing communication, complex ESG practices can be transformed into understandable narratives that highlight responsible production and ethical business conduct.

One participant stated:

"Without communication, consumers may not realise that companies are investing in sustainability."

Marketing experts identified several communication strategies used by dairy brands, including sustainability storytelling, transparent product labelling, and educational campaigns about environmental responsibility and product safety.

Another expert explained:

"Sustainability marketing should focus on transparency. Companies need to explain what specific actions they are taking rather than simply claiming that their products are sustainable."

However, interviewees also highlighted potential risks associated with sustainability communication. In particular, overly promotional sustainability claims may generate scepticism among consumers.

One expert warned:

"If sustainability messages sound exaggerated or unclear, consumers may suspect greenwashing."

This finding supports signalling theory, which suggests that credible signals are necessary to reduce information asymmetry between firms and consumers. Transparent communication, therefore, plays a critical role in ensuring that sustainability initiatives are perceived as authentic rather than symbolic.

ESG practices and customer-based performance

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The third research question examines how ESG practices influence customer-based performance outcomes such as trust, brand evaluation, and loyalty. The interview findings suggest that ESG initiatives contribute to positive customer outcomes primarily through enhancing brand credibility and trust.

Experts emphasised that consumers increasingly expect companies to demonstrate responsible behaviour. When sustainability initiatives are perceived as genuine and consistent with corporate values, they can strengthen positive brand perceptions.

One participant explained:

"When consumers believe that sustainability initiatives are genuine, their trust in the brand increases."

Sustainability initiatives were also described as contributing to emotional connections between consumers and brands. These emotional connections may encourage positive word-of-mouth and long-term customer relationships.

Another expert noted:

"Sustainability initiatives help create emotional connections with customers, which can support long-term loyalty."

Nevertheless, interview participants emphasised that ESG initiatives do not replace core product attributes. In the dairy market, factors such as product quality, safety, and price remain the primary drivers of purchasing decisions.

One expert explained:

"No matter how strong the sustainability message is, consumers will still prioritise product quality and safety."

This finding suggests that ESG practices function as complementary value drivers, reinforcing rather than replacing traditional determinants of customer-based performance.

Contextual factors influencing ESG effectiveness in Vietnam

The final research question explores contextual factors that influence the effectiveness of ESG initiatives in Vietnam's dairy market. The interviews revealed several contextual factors shaping consumers' responses to sustainability initiatives.

First, experts noted that consumer awareness of sustainability issues is increasing but remains uneven across demographic groups. Urban consumers and younger segments were perceived as more attuned to sustainability issues than other consumer groups.

One expert stated:

"Urban consumers tend to be more aware of sustainability issues, while other consumers may still focus primarily on price and convenience."

Second, trust in corporate sustainability claims emerged as a critical factor. Experts emphasised that transparent communication and credible verification mechanisms are essential for strengthening consumer confidence.

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Another participant explained:

"Independent certifications or clear evidence of sustainability practices help strengthen consumer confidence."

Finally, experts highlighted that regulatory developments and industry standards are gradually encouraging firms to adopt more systematic ESG practices. As sustainability reporting and transparency become more common, firms may face increasing pressure to demonstrate responsible conduct.

Overall, these findings highlight the importance of aligning ESG strategies with the institutional and market environment of emerging economies. Taken together, the findings suggest that ESG practices can contribute to customer-based performance in the Vietnamese dairy sector when they are effectively communicated through sustainability marketing. Environmental and social practices are perceived as the most visible dimensions of ESG, while governance practices remain less apparent to consumers. Sustainability marketing plays a crucial role in translating ESG initiatives into meaningful value propositions, particularly by enhancing transparency and credibility. However, sustainability initiatives complement rather than replace core product attributes such as quality and safety in shaping consumer purchasing decisions.

Conclusions and implications

This study provides important insights into how ESG practices influence customer-based performance in the Vietnamese dairy sector, as seen from the perspective of industry experts. The findings suggest that ESG initiatives do not automatically translate into positive customer outcomes. Instead, their impact largely depends on how effectively they are communicated and embedded within firms' marketing strategies. Experts emphasised that ESG practices can contribute to customer trust, brand credibility, and positive word-of-mouth when they are perceived as authentic, transparent, and closely aligned with product quality and responsible production. In this sense, sustainability-oriented communication plays an important role in translating internal ESG efforts into meaningful value propositions for consumers. The results also reveal differences in the visibility of ESG dimensions. Environmental and social initiatives were perceived as more tangible and directly aligned with consumer expectations, particularly regarding sustainable farming, product safety, and community engagement.

In contrast, governance practices were viewed as less visible to consumers and therefore less directly associated with customer perceptions. Furthermore, experts consistently highlighted that sustainability initiatives complement rather than replace traditional determinants of purchasing behaviour. Product quality, safety, and price remain the primary drivers of consumer decisions in the dairy market. At the same time, ESG initiatives strengthen brand evaluation and long-term customer relationships when effectively integrated with these core attributes. Overall, the study highlights that ESG practices can contribute to customer-based performance when they are strategically aligned with marketing communication and consumer expectations in the dairy industry.

From a theoretical perspective, this study contributes to the growing literature on ESG and sustainability marketing by offering qualitative insights from an emerging-market context. The findings extend prior research by highlighting that the relationship between ESG practices and customer-based performance is not automatic but shaped by how sustainability initiatives are interpreted and communicated. The study also reinforces stakeholder-oriented perspectives by emphasising the importance of aligning ESG strategies with customer expectations, particularly in industries closely associated with health, safety, and environmental responsibility, such as the dairy

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sector.

From a practical perspective, the findings offer several implications for key stakeholder groups. For dairy firms in Vietnam, the findings suggest that ESG practices should be integrated into broader strategic and marketing initiatives rather than treated as isolated compliance activities. Marketing experts emphasised that companies can strengthen customer trust and brand credibility by communicating concrete sustainability actions, including responsible sourcing, environmentally friendly packaging, and transparent production processes. Environmental initiatives such as sustainable farming practices and resource efficiency were perceived as particularly relevant in the dairy industry. At the same time, social practices related to product safety, nutrition, and community engagement play a central role in shaping brand credibility. Governance practices remain essential for corporate accountability, but firms may need to communicate governance-related commitments more clearly to enhance stakeholder awareness. Overall, the findings suggest that effectively integrating ESG initiatives with brand strategy and product value can help dairy firms build stronger customer relationships and long-term competitiveness. The findings also highlight the role of government and policymakers in supporting the development of credible ESG practices. Establishing clear sustainability standards, transparent disclosure mechanisms, and reliable certification systems can help reduce information asymmetry between firms and consumers. In the Vietnamese context, public policies that promote sustainability labelling, responsible marketing communication, and consumer education may increase awareness of sustainable consumption. By providing regulatory guidance and promoting transparency, policymakers can strengthen the credibility of corporate sustainability initiatives while supporting the broader transition toward more sustainable production and consumption practices.

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Determinants and Barriers of Green Marketing Adoption in Bangladesh's RMG Sector

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ABSTRACT: This study examines the determinants and barriers influencing the adoption of green marketing practices within Bangladesh's Ready-Made Garment (RMG) sector. As global demand for sustainable fashion intensifies, manufacturers in emerging economies face increasing pressure to integrate environmentally responsible strategies into their operations. The research adopts an industry-level analytical approach, drawing upon recent scholarly literature, secondary industry reports, and sectoral data to evaluate the drivers, structural constraints, and strategic implications of green marketing implementation. The findings indicate that international buyer requirements, growing consumer preference for sustainable products, certification standards, and government incentives are the primary drivers of adoption. However, high production costs, limited access to sustainable raw materials, infrastructural gaps, and insufficient consumer awareness remain significant barriers. The analysis further demonstrates that firms integrating sustainability into their marketing strategy achieve enhanced competitive positioning and long-term reputational benefits. The study contributes to the discourse on sustainable marketing in developing economies by contextualising green marketing adoption within the structural realities of Bangladesh's RMG industry and offering implications for policymakers and industry stakeholders.

KEYWORDS: Green marketing, Sustainability, Ready Made Garment (RMG) industry, Sustainable consumption, Bangladesh, Environmental strategy, Emerging economies.

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Introduction

The global apparel industry is increasingly shaped by sustainability imperatives, as environmental degradation, climate change, and resource scarcity intensify regulatory and market pressures on manufacturers. The fashion sector is responsible for substantial water consumption, chemical discharge, and carbon emissions, making it one of the most environmentally impactful industries worldwide (Niinimäki et al., 2020; UNEP, 2023). In this evolving landscape, green marketing has emerged not merely as a promotional tool but as a strategic orientation integrating environmental responsibility into production, branding, and supply chain communication. Bangladesh's Ready-Made Garment (RMG) sector, as the world's second-largest apparel exporter, occupies a critical position in this transition. While the industry significantly contributes to national GDP and employment, it also faces increasing scrutiny from international buyers demanding compliance with environmental standards and sustainability certifications (Islam et al., 2021; World Bank, 2022). Global retailers are progressively requiring suppliers to adopt certified sustainable materials, reduce carbon intensity, and ensure supply chain transparency. These pressures create both incentives and constraints for firms operating within developing economies.

Prior research suggests that green marketing adoption in emerging markets is driven by stakeholder pressure, competitive differentiation, and regulatory alignment (Testa et al., 2020; Wang et al., 2022). At the same time, structural barriers such as high production costs, technological limitations, and limited consumer awareness restrict the pace of sustainable transformation (Khan et al., 2021). Although studies have examined environmental compliance and sustainable production in Bangladesh's RMG industry, limited attention has been given to green marketing as a strategic adoption phenomenon at the industry level.

This gap is significant because marketing orientation plays a decisive role in translating sustainability efforts into competitive advantage. Understanding the determinants and barriers influencing green marketing adoption in Bangladesh's RMG sector is therefore essential for aligning environmental objectives with economic sustainability. This study contributes to the literature by providing an industry-level analytical examination of these drivers and constraints within the structural realities of a developing export-oriented economy.

Research Aim and Research Questions

The primary aim of this study is to analyse the determinants and barriers influencing the adoption of green marketing in Bangladesh's Ready-Made Garment (RMG) sector and to evaluate the strategic implications of such adoption for long-term competitiveness and sustainability.

To achieve this aim, the study addresses the following research questions:

1. What key internal and external determinants drive green marketing adoption within Bangladesh's RMG sector?

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2. What structural and economic barriers constrain the effective implementation of green marketing strategies?
3. How does green marketing adoption influence competitive positioning and sustainability outcomes in an export-oriented developing economy context?
4. By answering these questions, the study seeks to provide an industry-level analytical understanding of how environmental responsibility intersects with marketing strategy (Sarna et al., 2024) within one of the world's most significant apparel production hubs.

Research Results

The findings indicate that the adoption of green marketing in Bangladesh's Ready-Made Garment (RMG) sector is shaped by a dynamic interplay among external institutional pressures, internal strategic orientation, and structural constraints. Rather than functioning as an isolated marketing initiative, green marketing emerges as a strategic response to evolving global sustainability expectations.

Determinants of Adoption: External drivers play a dominant role in stimulating green marketing practices. International buyer pressure has become a primary catalyst, particularly as global retailers increasingly require compliance with sustainability certifications and traceability standards. Environmental certifications such as GOTS and GRS function as market-entry mechanisms that reinforce responsible production practices. Additionally, rising consumer demand for sustainable apparel—especially in export markets—strengthens the economic rationale for integrating environmental messaging into branding strategies. Government incentives promoting energy efficiency and environmental compliance further reinforce this adoption trend. Internal drivers complement these external pressures. Firms that pursue strategic differentiation increasingly integrate sustainability into their brand positioning objectives. A long-term competitive orientation encourages companies to view green marketing not merely as compliance but as a tool for reputation-building and sustained export competitiveness. The structural relationships among these drivers, barriers, and outcomes are illustrated in Figure 1.

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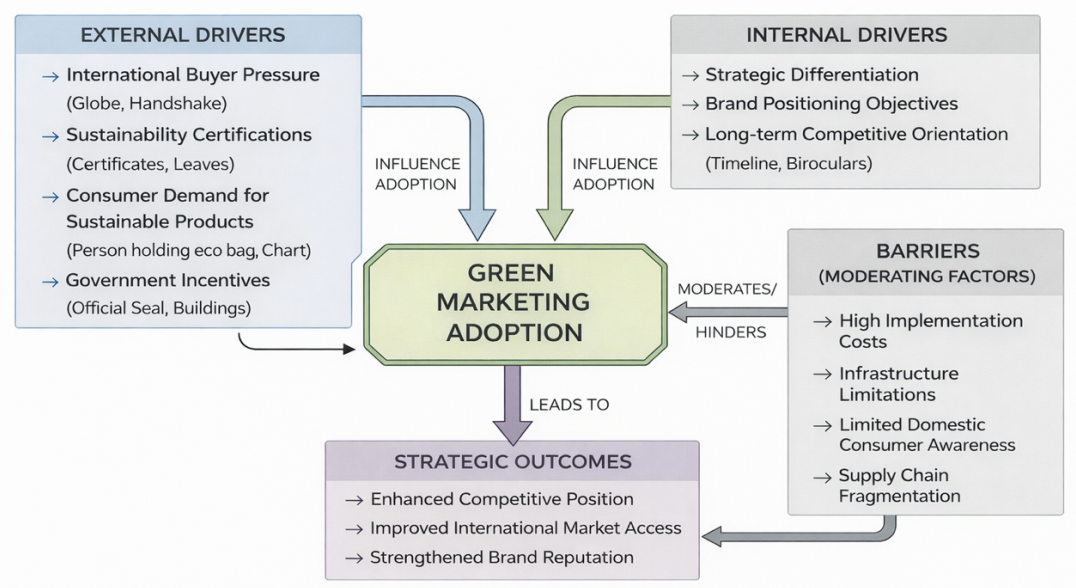
Figure 1

Conceptual Framework of Green Marketing Adoption in Bangladesh's RMG Sector



Source: author(s) own development

Structural Barriers: Despite strong adoption drivers, several barriers constrain widespread implementation. High implementation costs remain the most significant limitation, particularly for small and medium-sized firms. Sustainable raw materials, certification processes, and energy-efficient technologies require substantial investment, creating financial pressure within a price-sensitive export industry. Infrastructure limitations further impede adoption. Access to advanced sustainable technologies and integrated supply chain systems remains uneven. In addition, limited domestic consumer awareness reduces incentives for firms targeting local markets. Fragmented supply chains weaken transparency and complicate the communication of credible sustainability claims. The classification of these influencing factors is summarised in Table 1.

Table 1

Analytical Classification of Green Marketing Adoption Factors

Category	Nature of Influence	Impact on Adoption
External Drivers	Coercive / Market-driven	Accelerates adoption through buyer and regulatory pressure
Internal Drivers	Strategic / Voluntary	Enhances integration of sustainability into competitive positioning
Barriers	Structural / Economic	Moderates or delays effective implementation
Strategic Outcomes	Performance-related	Strengthens market access and reputational capital

Source: author 's own development

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Strategic Implications: The analysis suggests that firms successfully integrating green marketing achieve measurable strategic benefits. These include enhanced competitive positioning, improved access to environmentally sensitive international markets, and strengthened brand reputation. However, the pace and depth of adoption remain uneven due to economic and infrastructural constraints.

Conclusions

This study examined the determinants and barriers influencing green marketing adoption in Bangladesh's Ready-Made Garment (RMG) sector within the broader context of global sustainability transformation. The findings indicate that adoption is primarily driven by external pressures, particularly international buyer requirements, certification standards, and growing consumer demand for sustainable products. At the same time, internal strategic orientation reinforces the integration of sustainability into brand positioning and long-term competitive planning. However, the transition toward green marketing remains uneven across the sector. High implementation costs, infrastructural limitations, fragmented supply chains, and limited domestic consumer awareness moderate the pace and depth of adoption. These structural constraints are particularly pronounced among small and medium-sized firms operating within price-sensitive export markets. As a result, green marketing in the RMG sector functions both as a compliance mechanism and as an emerging strategic differentiation tool. The study contributes to the literature on sustainable marketing in emerging economies by contextualising the adoption of green marketing within an export-driven industrial structure. It highlights the need for coordinated efforts among industry stakeholders, policymakers, and international buyers to reduce structural barriers and promote an inclusive sustainability transition. Future research may incorporate firm-level empirical data to measure performance outcomes associated with green marketing integration and to evaluate longitudinal shifts in adoption patterns. Overall, green marketing adoption in Bangladesh's RMG sector represents a strategic inflexion point—balancing economic competitiveness with environmental responsibility in a rapidly evolving global apparel market.

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Promoting Electric Vehicle Adoption Intention: Insights from Ride-Hailing Drivers in Ho Chi Minh City

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ABSTRACT: This study examines how ride-hailing drivers in Ho Chi Minh City construct their intention to adopt electric vehicles (EVs) using a qualitative research design. Data were collected through in-depth interviews with ride-hailing drivers and were analysed thematically to capture their lived experiences and meaning-making processes. The findings indicate that adoption intention does not stem from a single determinant but develops through an ongoing negotiation between perceived opportunities and uncertainties. Rather than expressing simple acceptance or rejection, drivers describe a gradual evaluative process shaped by everyday economic considerations, social interactions, and risk assessments. Five interrelated themes emerge from the analysis. Attitudes toward EVs are formed pragmatically through comparisons with gasoline vehicles, particularly in terms of cost efficiency and service quality. Economic rationality dominates decision-making, as drivers prioritise income stability and financial risk management. Environmental concern provides moral support but rarely outweighs economic priorities. Social influence from peers, passengers, and platforms enhances perceived feasibility, while resistance to change reflects concerns about technological uncertainty and potential income disruption. Overall, adoption becomes viable only when perceived benefits outweigh livelihood-related risks.

KEYWORDS: Electric vehicle adoption intention, Sustainable mobility transition, Environmental concern, Ride-hailing drivers, Urban transportation, Ho Chi Minh City, Vietnam.

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Introduction

In recent years, global warming and air pollution have become critical global challenges, largely driven by greenhouse gas emissions from human activities. In Vietnam, air quality has deteriorated significantly, particularly in major urban centres such as Ho Chi Minh City and Hanoi. The transportation sector is considered a primary contributor to urban air pollution, accounting for a substantial share of total emissions. With millions of automobiles and motorcycles currently in operation and hundreds of thousands of new vehicles registered annually, the pressure on urban infrastructure and the environment continues to intensify.

To address climate change and mitigate rising greenhouse gas emissions, the Vietnamese government has set ambitious environmental targets and introduced policies to promote green transportation, including electric vehicles (EVs). In its updated Nationally Determined Contribution (NDC) under the Paris Agreement, Vietnam committed to reducing greenhouse gas emissions by 15.8 per cent unconditionally and up to 43.5 per cent with international support by 2030, compared to a business-as-usual scenario, and achieving net zero emissions by 2050 (Ministry of Natural Resources and Environment [MONRE], 2022). The transport sector has been identified as a critical area for decarbonization, and the transition to electric mobility is expected to contribute significantly to national emissions-reduction targets (World Bank, 2024).

Although Vietnam remains an emerging EV market, recent years have seen rapid growth in electric vehicle production and adoption, driven by favourable government policies and rising environmental awareness. With a population approaching 100 million people and accelerating urbanisation, Vietnam is becoming one of the most dynamic EV markets in Southeast Asia (World Bank, 2024). In parallel, the government is establishing a domestic carbon market and developing emissions trading mechanisms to operationalise climate commitments and create market-based incentives for low-carbon technologies (Government of Vietnam, 2026). These regulatory and market developments provide a supportive institutional foundation for the expansion of EV adoption in the coming years.

A notable development in early 2024 was the rapid expansion of electric ride-hailing services. The launch and growth of Xanh SM, operated by GSM under Vingroup, marked a significant shift in the ride-hailing industry by integrating electric vehicles into transportation services. After only a few months of operation, Xanh SM gained considerable market share, demonstrating strong market acceptance of electric mobility solutions. This trend highlights the growing relevance of EV adoption among ride-hailing drivers, who represent a high-usage segment with significant potential to contribute to emission reductions in urban areas.

Drawing on behavioural and technology acceptance theories, prior research has examined various factors influencing technology adoption and purchase intentions, including those related to electric vehicles (EVs). Existing studies commonly identify several key categories of determinants, such as technological attributes (e.g., driving range, charging time, and cost), contextual factors (e.g., government incentives and charging infrastructure), and psychological and social factors (e.g., environmental concern and social influence). However, much of this literature relies predominantly on quantitative approaches and focuses on general consumer populations in developed countries. As a result, there remains a limited in-depth understanding of how specific groups in emerging markets, such as Vietnam, perceive and construct their intentions toward EV adoption.

In this context, ride-hailing drivers represent a distinctive and strategically significant segment in the transition toward electric mobility. Due to their high daily mileage, strong cost sensitivity, and direct exposure to urban environmental conditions, they may interpret the benefits and challenges of EV adoption differently from private consumers. Yet, little is known about how ride-hailing drivers in Vietnam make sense of electric vehicles, what meanings they attach to the idea of switching, and how their lived experiences shape their adoption intentions.

The case of Ho Chi Minh City provides a particularly relevant empirical setting for this investigation. As Vietnam's largest metropolitan area and economic hub, Ho Chi Minh City is characterised by high population density, rapid urbanisation, and severe traffic congestion. Motorcycles and ride-hailing services play a dominant role in daily mobility, making transport emissions a significant contributor to urban air pollution. At the same time, the city has witnessed the rapid expansion of digital ride-hailing platforms and growing policy attention toward green mobility and emission reduction. However, charging infrastructure remains unevenly distributed, and the financial feasibility of switching to EVs remains a pressing concern for many drivers. These contextual dynamics create both opportunities and uncertainties that may shape drivers' perceptions and decision-making processes regarding EV adoption.

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Research Aim and Research Questions

This study adopts a qualitative approach to explore how ride-hailing drivers in Ho Chi Minh City perceive, interpret, and negotiate the factors influencing their intention to adopt electric vehicles. By capturing their subjective experiences, motivations, and perceived barriers within this specific urban context, the study aims to generate contextually grounded insights that deepen understanding of EV adoption among occupational drivers and inform policies promoting sustainable urban mobility in rapidly developing cities. Specifically, the research seeks to answer the following questions:

(RQ1) How do ride-hailing drivers in Ho Chi Minh City perceive electric vehicles and their intention to adopt them?

(RQ2) What motivations and barriers shape their intention to adopt electric vehicles?

(RQ3) How do ride-hailing drivers describe the conditions or supports that would enhance their willingness to adopt electric vehicles?

(RQ4) What managerial and policy measures do drivers perceive as necessary to foster sustainable EV adoption in the ride-hailing sector?

By addressing these questions, the study contributes to the literature on EV adoption in emerging markets. It provides practical recommendations for businesses, platform operators, and policymakers to foster sustainable transportation development in Vietnam.

Literature review

Underpinning theories

This study is conceptually informed by established intention-based and technology adoption theories that explain how individual cognition, social influence, and contextual conditions shape behavioural intention. Rather than serving as a basis for hypothesis testing, these theories function as sensitising frameworks that guide the interpretation of qualitative findings and situate the study within the broader literature on technology adoption.

The Theory of Reasoned Action (TRA) proposed by Fishbein and Ajzen (1975) posits that behavioural intention is the most immediate predictor of actual behaviour. According to this theory, intention is shaped by two key components: attitude toward the behaviour and subjective norm. Attitude reflects an individual's overall evaluation of performing a behaviour, while subjective norm captures perceived social pressure from significant others. Although TRA was originally developed for predictive modelling, its core constructs remain useful for interpreting how personal evaluations and perceived social expectations emerge in participants' narratives.

Building upon TRA, the Theory of Planned Behaviour (TPB) introduced the concept of Perceived Behavioural Control (PBC) as an additional determinant of intention (Ajzen, 1991). PBC refers to individuals' perceptions of their ability to perform a behaviour, taking into account facilitating or constraining conditions. In the context of electric vehicle adoption, perceived financial capability, access to charging infrastructure, and risk considerations may shape individuals' perceptions of their level of control. In this qualitative study, PBC provides a conceptual lens for understanding how drivers narrate their perceptions of feasibility, constraints, and economic vulnerability.

In the field of information systems, the Technology Acceptance Model (TAM) emphasises perceived usefulness and perceived ease of use as central determinants of technology acceptance (Davis, 1989). Perceived usefulness refers to the extent to which a technology enhances performance, while perceived ease of use reflects the degree of effort required to utilise it. Although TAM is commonly applied in quantitative research, its constructs offer interpretive value for examining how ride-hailing drivers describe operational efficiency, income optimisation, and practical convenience when discussing electric vehicles.

Similarly, the Unified Theory of Acceptance and Use of Technology (UTAUT) integrates multiple theoretical streams. It highlights the roles of performance expectancy, effort expectancy, social influence, and facilitating conditions in shaping intention and usage behaviour (Venkatesh et al., 2003). Rather than operationalising these constructs as measurable variables, this study draws on them as conceptual categories that help contextualise the themes emerging from drivers' lived experiences.

Collectively, these theoretical perspectives underscore that an interplay between personal evaluation, social influence, perceived capability, and contextual support shapes behavioural intention. In the present study, these constructs are not treated

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as predefined determinants to be statistically tested but as interpretive anchors that enrich the analysis of how ride-hailing drivers in Ho Chi Minh City construct their intention to adopt electric vehicles. By engaging with established intention-based frameworks while maintaining an inductive analytical orientation, the study bridges theory and context, offering a nuanced understanding of technology adoption within a livelihood-dependent urban mobility setting.

Methodology

Research Design

This study adopts a qualitative research design to gain an in-depth understanding of how ride-hailing drivers in Ho Chi Minh City construct their intention to adopt electric vehicles. A qualitative approach is appropriate when the aim is to explore meanings, lived experiences, and socially constructed realities rather than to test predefined hypotheses or quantify relationships (Creswell, 2013). Qualitative inquiry enables researchers to capture participants' perspectives within their natural contexts and to interpret how individuals make sense of complex phenomena.

The research follows an exploratory orientation, allowing themes and interpretations to emerge inductively from participants' narratives. Inductive qualitative research is particularly suitable for examining underexplored contexts, where theoretical assumptions may not fully capture local dynamics (Patton, 2002). In the context of ride-hailing drivers, whose decisions are shaped in livelihood considerations and platform-based work structures, such an approach facilitates a nuanced understanding of the behavioural and contextual processes shaping EV adoption intentions.

Sampling and Participants

Purposive sampling was employed to select participants who possess direct experience and relevant knowledge of the ride-hailing industry. Purposive sampling is widely used in qualitative research to identify information-rich cases that can provide deep insight into the phenomenon under investigation (Patton, 2002). Eligible participants were active ride-hailing drivers operating in Ho Chi Minh City, including both drivers currently using conventional gasoline vehicles and those who have experience with electric vehicles.

Data collection continued until theoretical saturation was reached, meaning that no substantially new themes emerged from subsequent interviews. Saturation is commonly used as a criterion for adequacy in qualitative sampling, indicating sufficient depth and comprehensiveness of the collected data (Guest et al., 2006).

Table 1

Characteristics of Ride-Hailing Motorbike Drivers

ID	Gender	Age Range	Years of Driving Experience	Current Vehicle Type	EV Experience	Average Daily Working Hours	Average Daily Distance (km)
P1	Male	25–30	2 years	Gasoline motorbike	No	8–10	120
P2	Male	31–35	4 years	Gasoline motorbike	No	10–12	150
P3	Male	36–40	6 years	Gasoline motorbike	No	9–11	160
P4	Female	31–35	3 years	Gasoline motorbike	No	8–9	110
P5	Male	36–40	5 years	Electric motorbike	Yes	9–10	140

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ID	Gender	Age Range	Years of Driving Experience	Current Vehicle Type	EV Experience	Average Daily Working Hours	Average Daily Distance (km)
P6	Male	25–30	2 years	Electric motorbike	Yes	8–10	130
P7	Male	41–45	8 years	Gasoline motorbike	No	10–12	170
P8	Male	25–30	1.5 years	Gasoline motorbike	No	7–9	100
P9	Female	31–35	4 years	Electric motorbike	Yes	8–10	125
P10	Male	36–40	6 years	Gasoline motorbike	No	9–11	155
P11	Male	41–45	9 years	Gasoline motorbike	No	10–12	180
P12	Male	31–35	3 years	Gasoline motorbike	No	8–10	135
P13	Male	36–40	7 years	Electric motorbike	Yes	9–11	145
P14	Female	25–30	2 years	Gasoline motorbike	No	7–9	115
P15	Male	36–40	5 years	Gasoline motorbike	No	9–11	165

Data Collection

Data were collected through semi-structured in-depth interviews. Semi-structured interviews are particularly appropriate for exploratory qualitative research because they allow flexibility while ensuring coverage of key thematic areas (Creswell, 2013). An interview guide was developed based on existing literature on technology adoption and sustainable mobility, focusing on drivers' perceptions of electric vehicles, perceived benefits and risks, environmental concerns, social influences, financial considerations, and expectations regarding government or platform support.

Each interview lasted approximately 30 to 60 minutes and was conducted in Vietnamese to ensure participants could comfortably and authentically articulate their experiences. With participants' informed consent, interviews were audio-recorded and subsequently transcribed verbatim to preserve the richness and accuracy of the data.

Data Analysis

The data were analysed using thematic analysis following the systematic approach outlined by Braun and Clarke (2006). The analytical process involved several stages: familiarisation with the data through repeated reading of transcripts; generating initial codes to identify meaningful segments; organising codes into broader candidate themes; and reviewing and refining themes to ensure coherence and conceptual clarity.

An inductive coding strategy was primarily applied, allowing themes to emerge from participants' narratives rather than being imposed a priori. However, consistent with interpretive qualitative practice, the analysis was informed by existing theoretical insights on behavioural intention and technology adoption to enhance analytical depth while preserving openness

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to emergent meanings (Braun & Clarke, 2006). This balance between inductive sensitivity and theoretical awareness strengthens interpretive rigour.

Findings and Discussion

Attitudinal Construction of EV Adoption

Drivers did not articulate their attitudes toward EVs as stable or pre-existing preferences; rather, attitudes emerged as fluid constructions shaped through everyday practice, peer observation, and ongoing reflection. Instead of holding ideologically driven positions, participants described a process of sensemaking in which EVs were interpreted through accumulated work experiences and informal conversations within driver networks. In this interpretive process, EVs often symbolised modernity, technological progress, and alignment with emerging urban trends. The quiet engine, smooth acceleration, and perceived professionalism were not merely technical features but socially meaningful attributes that enhanced drivers' occupational identity and service image.

As one driver noted, "Driving an electric vehicle feels smoother and quieter. Customers also appreciate it. It gives a more professional image." (Participant 7) Here, the EV becomes more than a vehicle; it serves as a reputational asset that can elevate service quality and customer perception. However, this symbolic value was consistently filtered through pragmatic evaluation. Positive impressions were conditional upon economic feasibility. Drivers did not romanticise innovation; instead, they assessed whether technological advantages translated into tangible benefits for their livelihoods.

As another participant stated, "Gasoline prices keep increasing. If I can save on fuel costs, I would seriously consider switching to an EV." (Participant 12)

This statement illustrates how attitudes are anchored in comparative cost reasoning. EVs were evaluated against the fluctuating realities of gasoline expenses, daily earnings, and operational continuity. Attitude formation, therefore, functioned as an ongoing cost–benefit negotiation rather than an abstract pro-innovation stance. Favorability emerged when drivers perceived alignment between technological attributes and income stability.

Overall, drivers' attitudes toward EVs can be understood as pragmatically constructed and economically embedded. Rather than reflecting fixed beliefs, they were continuously recalibrated through lived experience, market conditions, and peer discourse. Attitude, in this sense, was not a static psychological variable but a dynamic evaluative process shaped by the interplay between symbolic meaning and survival-oriented reasoning.

Economic Rationality and Financial Concerns

Across interviews, financial stability emerged as the central lens through which ride-hailing motorbike drivers evaluated the possibility of adopting electric motorbikes. Participants consistently framed themselves not simply as platform workers but as primary income earners whose daily trips directly support household subsistence. For these drivers, income is calculated on a day-to-day basis; earnings from each completed ride are immediately applied to fuel costs, food expenses, rent, and family obligations. Within this economic structure, switching vehicles is perceived less as a technological upgrade and more as a livelihood decision with tangible financial consequences.

As one driver explained:

"For us, income per day is what matters. If the electric motorbike helps me save more or earn more, I will switch. If not, I cannot risk it." (Participant 3)

This statement reflects a survival-oriented rationality grounded in short-term income cycles. Unlike salaried workers, ride-hailing motorbike drivers operate within a highly fluid earnings system, where income fluctuates with trip frequency, peak hours, and platform incentives. As a result, predictability and continuity of daily revenue become paramount. Drivers carefully compared fuel expenses for gasoline motorbikes with electricity costs, maintenance requirements, and battery-related uncertainties before forming any intention to switch.

The structure of motorbike-based ride-hailing work further intensifies sensitivity to time efficiency. Because drivers rely on continuous mobility to secure trips, any interruption—especially for charging - was interpreted as a direct loss of income:

"If I have to stop to charge during busy hours, I lose trips. Losing trips means losing money." (Participant 15)

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Here, charging time is not viewed as routine maintenance but as an opportunity cost. For motorbike drivers who often work long hours in dense urban traffic, the ability to refuel quickly at ubiquitous gas stations stands in stark contrast to the perceived inconvenience or limited availability of charging infrastructure. The fear of battery depletion mid-shift also amplifies perceived financial vulnerability.

Interestingly, drivers who had already adopted electric motorbikes often reassessed their earlier concerns after gaining practical experience:

"At first, I worried about the purchase price. But after using it for a while, I realised electricity is much cheaper than gasoline." (Participant 5)

Such retrospective reflections suggest that experiential learning gradually reduces perceived financial risk. Once operational savings become observable in daily earnings, confidence increases, and initial hesitation weakens.

Overall, among ride-hailing motorbike drivers, EV adoption intention is embedded within a livelihood-centred economic logic characterised by daily income calculations, sensitivity to time-related opportunity costs, and cautious risk management. Adoption becomes conceivable only when electric motorbikes are perceived as protecting or enhancing income stability rather than threatening it.

Environmental Awareness and Moral Responsibility

Environmental concern emerged in participants' narratives primarily as a moral acknowledgement rather than a decisive motivator of behavioural change. Ride-hailing motorbike drivers demonstrated awareness of worsening air pollution in Ho Chi Minh City, frequently referring to traffic congestion, exhaust fumes, and prolonged daily exposure to polluted air. Given that they spend extended hours navigating dense urban streets, environmental degradation was not an abstract issue but a lived reality affecting their health and physical comfort.

As one participant reflected:

"Of course, electric vehicles are better for the environment. The city is already too polluted." (Participant 9)

In such accounts, electric motorbikes were associated with reduced emissions, cleaner streets, and quieter operation. Drivers recognised the broader social benefits of transitioning away from gasoline-powered vehicles and often agreed that EVs represent a more sustainable urban future. However, this recognition did not automatically translate into an intention to adopt.

Environmental responsibility was consistently reframed within the boundaries of economic survival:

"Protecting the environment is important, but I still need to think about my family first." (Participant 14)

This statement reveals a hierarchy of priorities in which moral concern is acknowledged but subordinated to livelihood security. For drivers whose income is unstable and calculated daily, environmental values alone were insufficient to justify financial risk. Instead, environmental concern functioned as a secondary layer of meaning, strengthening the moral legitimacy of EV adoption when economic conditions were favourable, but rarely overriding cost-related uncertainties.

In this sense, environmental awareness operated as a supportive narrative rather than a primary driver. It enabled drivers to frame EV adoption as socially responsible and ethically appropriate, yet the ultimate decision remained grounded in pragmatic financial calculations. The findings therefore suggest that among ride-hailing motorbike drivers, environmental concern enhances symbolic alignment with sustainability goals but does not independently trigger behavioural commitment in the absence of economic assurance.

Social Influence and Platform Dynamics

Adoption intention was not formed in isolation but was socially mediated through peer networks, passenger feedback, and platform-level dynamics. Ride-hailing motorbike drivers operate within dense social environments where information circulates informally through conversations at rest stops, online driver groups, and daily interactions on the street. Observing peers who had already switched to electric motorbikes provided tangible and relatable evidence that the transition was possible. Rather than relying on official advertisements or technical specifications, drivers placed greater trust in the lived experiences of fellow drivers who faced similar working conditions.

As one participant noted:

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"When I see other drivers using EVs and saying it's good, I feel more confident about switching." (Participant 10)

This statement illustrates how peer adoption functions as social proof. Seeing colleagues successfully operate electric motorbikes reduces perceived uncertainty and transforms abstract possibilities into observable realities. The experiences of early adopters become reference points that shape collective perceptions of feasibility, reliability, and cost-effectiveness.

Passenger reactions also played a symbolic role in reinforcing drivers' attitudes:

"Passengers sometimes compliment electric cars. That makes me feel it's a good choice." (Participant 6)

Although income remains central, positive passenger feedback enhances drivers' sense of professionalism and service quality. Customer compliments provide emotional validation and reinforce the perception that EV use aligns with modern and responsible service provision.

More significantly, ride-hailing platforms were perceived as powerful institutional actors capable of directly influencing adoption patterns:

"If the company gives priority trips or bonuses for EV drivers, many people will switch immediately." (Participant 2)

Here, adoption is framed as structurally responsive to incentive design. Because drivers depend heavily on platform algorithms for trip allocation and bonuses, institutional signals can rapidly shift cost-benefit calculations. Platform incentives reduce perceived financial risk and legitimise EV adoption as an economically rational choice.

Taken together, these narratives demonstrate that EV adoption intention is embedded within a broader ecosystem of social influence and institutional structures. Peer validation, passenger approval, and platform incentives collectively reduce uncertainty and transform EV adoption from an individual economic gamble into a socially supported and strategically viable practice.

Resistance to Change and Perceived Risk

Despite acknowledging the potential benefits of electric motorbikes, many ride-hailing drivers expressed hesitation rooted in habit, familiarity, and perceived uncertainty. Years of operating gasoline-powered motorbikes had cultivated a strong sense of technical confidence and a sense of routine predictability. Drivers were accustomed to the mechanics of refuelling, maintenance practices, and troubleshooting minor mechanical issues. This accumulated experiential knowledge generated a sense of control over their work tools, which in turn supported their income stability.

One driver admitted:

"I have driven gasoline motorbikes for years. I know how everything works. Changing to EV feels unfamiliar." (Participant 11)

This statement reflects more than simple preference. It highlights the psychological comfort derived from mastery and routine. Switching to an electric motorbike was perceived as entering an unknown technological territory where existing skills might not fully apply. The unfamiliarity itself posed a risk.

Battery durability and charging infrastructure were repeatedly mentioned as concrete concerns:

"What if the battery degrades quickly? Replacing it would be very expensive." (Participant 8)

Here, technological uncertainty is translated into financial vulnerability. Unlike gasoline engines, which drivers perceive as repairable and predictable, battery systems were seen as opaque and potentially costly. The fear of high replacement costs amplified perceptions of long-term financial exposure.

Range anxiety further intensified this sense of vulnerability:

"I'm afraid of running out of battery in the middle of a trip." (Participant 1)

For motorbike drivers whose income depends on continuous mobility, the possibility of battery depletion during peak hours threatens both immediate earnings and customer ratings. In a highly competitive urban market, even short disruptions can have cumulative economic consequences.

These narratives suggest that resistance to change is not merely conservatism but rather a rational risk-management

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strategy. Familiar gasoline motorbikes represent stability, while electric motorbikes introduce perceived technical and financial uncertainties. In a livelihood-dependent occupation, uncertainty is directly equated with potential disruption to income. As a result, hesitation toward EV adoption reflects drivers' efforts to protect economic security rather than a rejection of innovation itself.

Integrative Discussion

Taken together, the findings suggest that EV adoption intention among ride-hailing motorbike drivers is constructed through a dynamic negotiation between opportunity and risk. Economic rationality forms the core evaluative framework, while environmental concern provides moral reinforcement. Social influence and institutional support shape perceived feasibility, and resistance to change reflects anxieties related to income disruption and technological uncertainty.

From a theoretical perspective, these findings partially align with the Theory of Planned Behaviour. Attitudes, subjective norms, and perceived behavioural control are all visible in the data. However, unlike conventional TPB applications that treat these constructs as relatively stable predictors, this study shows that they are fluid and contextually embedded. Attitudes are continuously recalibrated through daily income calculations. Subjective norms emerge through peer observation and platform incentives rather than abstract social pressure. Perceived behavioural control is closely tied to charging infrastructure and financial predictability.

Compared with the Technology Acceptance Model, perceived usefulness appears more influential than perceived ease of use. Drivers focus primarily on cost savings and income stability rather than operational simplicity. This suggests that in livelihood-dependent occupations, economic survival may outweigh usability considerations.

Furthermore, the findings resonate with perspectives on livelihoods and risk management. Adoption decisions are embedded in survival-oriented logic, where minimising uncertainty is paramount. EV adoption becomes viable only when economic assurance, social validation, and infrastructural reliability collectively reduce perceived vulnerability to livelihoods.

These insights imply that promoting EV adoption in the ride-hailing sector requires more than technological readiness. Effective strategies must address income security, reduce financial risk, and build institutional trust to normalise EV use within driver communities.

Conclusions and implications

Conclusions

This study sought to understand how ride-hailing motorbike drivers in Ho Chi Minh City form their intention to adopt electric vehicles within the realities of platform-based urban work. Drawing on in-depth qualitative interviews, the findings demonstrate that adoption intention is not a fixed psychological state nor the outcome of a single determinant. Rather, it develops through an ongoing negotiation between perceived opportunities and structural and economic constraints.

At the core of this process lies livelihood-oriented economic rationality. Drivers evaluate EV adoption primarily through its implications for daily income continuity, operational efficiency, upfront investment burden, and long-term cost predictability. Electric motorbikes are assessed as economic assets whose value depends on their ability to secure or enhance earnings. While environmental awareness strengthens the moral appeal of EV adoption, it does not independently drive behavioural commitment. Sustainability becomes persuasive only when aligned with financial stability.

At the same time, several significant barriers constrain adoption intention. High initial purchase costs, uncertainty regarding battery durability, limited charging infrastructure, and concerns about time lost during charging contribute to perceived livelihood vulnerability. Technological unfamiliarity and the absence of guaranteed institutional support further amplify risk sensitivity. These barriers transform EV adoption from a simple technological upgrade into a high-stakes economic decision.

Social ecosystems play a dual role. Peer validation, passenger feedback, and platform incentives can legitimise and normalise EV usage, thereby reducing uncertainty. However, without structural support mechanisms, individual willingness remains fragile.

Overall, EV adoption intention among ride-hailing drivers is framed within a pragmatic survival framework, in which both enabling factors and perceived barriers coexist. Recognising this interplay between opportunity and constraint is essential for

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designing policies and business strategies that lower economic risks, strengthen institutional trust, and create stable conditions for sustainable mobility transitions within platform-based urban transport systems.

Managerial Implications

Based on the findings, several managerial and policy implications can be proposed to effectively foster EV adoption in the ride-hailing sector.

(1) Emphasise Economic Certainty Rather than Environmental Messaging

Since drivers prioritise income stability, EV promotion strategies should foreground clear and transparent cost–benefit information. EV companies and ride-hailing platforms should provide comparative calculations of fuel savings, maintenance costs, and long-term operational benefits. Financial simulations and real-case testimonials from current EV drivers may reduce uncertainty and strengthen positive attitudes.

Environmental campaigns alone are unlikely to generate substantial behavioural change unless economic advantages are clearly demonstrated.

(2) Design Targeted Financial Incentives and Risk-Sharing Mechanisms

High upfront costs and income interruption during charging are perceived as significant risks. Policymakers and EV firms should consider:

- Subsidised purchase or leasing programs,
- Battery warranty extensions,
- Flexible financing schemes tailored to ride-hailing drivers,
- Compensation mechanisms for charging downtime.

Risk-sharing arrangements can reduce psychological resistance and signal institutional commitment to supporting drivers' livelihood security.

(3) Strengthen Charging Infrastructure and Operational Convenience

Range anxiety and charging accessibility directly affect drivers' perceived feasibility of EV usage. Expanding fast-charging networks in high-demand urban areas and integrating charging stations near driver hotspots can significantly enhance perceived reliability.

Providing real-time charging station information within ride-hailing applications may also improve operational confidence.

(4) Leverage platform power to normalise EV adoption

Ride-hailing platforms occupy a pivotal institutional position within the ecosystem. Incentive structures such as priority ride allocation, bonus schemes, reduced commission fees, or visible "green driver" badges can accelerate normalisation.

Peer influence should also be strategically utilised. Platforms can create ambassador programs in which experienced EV drivers share authentic experiences, thereby building trust within driver communities.

(5) Address psychological resistance through gradual transition models

Resistance to change reflects habit, familiarity, and the management of uncertainty rather than outright rejection. Transitional models - such as short-term EV rental trials or hybrid fleet options - can allow drivers to experiment without full commitment.

Providing hands-on training, technical support, and transparent information about battery lifespan and resale value may further reduce perceived technological risk.

Policy implications for sustainable urban mobility

The findings of this study indicate that promoting electric vehicle adoption among ride-hailing drivers requires policy

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interventions that are economically grounded, context-sensitive, and institutionally coordinated. Because drivers construct their adoption intention primarily through livelihood-based calculations, public policies must reduce financial uncertainty while ensuring operational feasibility. Generic environmental campaigns or broad consumer-level incentives are unlikely to generate substantial behavioural change within the ride-hailing sector unless they directly address drivers' income stability and risk exposure.

First, policymakers should design targeted financial support mechanisms tailored specifically to commercial ride-hailing drivers rather than applying uniform subsidies for private consumers. Preferential loan programs, flexible leasing arrangements, partial credit guarantees, and tax reductions for commercial electric vehicle use can significantly lower entry barriers. Since drivers perceive electric vehicle adoption as a high-stakes investment decision, risk-sharing schemes between government agencies, financial institutions, and electric vehicle manufacturers can enhance confidence and reduce hesitation.

Second, infrastructure development must be strategically aligned with drivers' operational realities. The expansion of fast-charging networks in high-demand urban districts, transportation hubs, and driver-congregation points is critical to minimising downtime. For drivers whose income depends on continuous mobility, charging accessibility directly influences perceived feasibility. Infrastructure planning should therefore incorporate ride-hailing traffic data to ensure efficient placement of charging stations. Public and private partnerships can accelerate infrastructure deployment while maintaining long-term sustainability.

Third, institutional collaboration between urban transport authorities and ride-hailing platforms should be strengthened. Platforms play a central role in shaping driver behaviour and can accelerate the diffusion of electric vehicles. Coordinated initiatives such as incentive alignment, preferential dispatch systems for electric-vehicle drivers, and integrated information systems that show charging availability can transform electric-vehicle adoption from an individual risk into a structurally supported transition. Such collaboration also allows policymakers to leverage digital platforms as instruments of sustainable mobility governance.

Fourth, a gradual transition roadmap is preferable to abrupt regulatory mandates. Phased targets for fleet electrification, pilot programs, and voluntary participation schemes can mitigate resistance to change and allow drivers to adapt incrementally. Sudden enforcement measures may intensify perceived economic vulnerability and undermine trust. A structured yet flexible transition pathway can balance environmental ambition with socioeconomic stability.

Fifth, policymakers should enhance regulatory transparency and information reliability to address perceived technological risks. Standardised guidelines on battery warranties, safety certifications, and performance benchmarks can reduce ambiguity in drivers' decision-making. Public dissemination of verified data on electric vehicle durability and operating costs may further build institutional trust and counter misinformation.

Finally, electric vehicle promotion should be embedded within a broader sustainable urban mobility framework. In rapidly urbanising contexts such as Ho Chi Minh City and Vietnam, the electrification of ride-hailing fleets should be integrated with emission-reduction strategies, smart-city planning, and multimodal transportation development. Aligning electric vehicle adoption with long-term urban sustainability objectives ensures policy coherence and maximises environmental impact.

Overall, the transition to electric mobility in the ride-hailing sector requires a systemic, coordinated policy approach that simultaneously reduces financial risk, enhances infrastructure reliability, and builds institutional trust. Policies that acknowledge drivers' economic realities while advancing environmental goals are more likely to achieve durable and scalable outcomes in sustainable urban transportation.

Limitations of this study

This study has several limitations. First, the qualitative design and purposive sample of ride-hailing motorbike drivers in Ho Chi Minh City limit the generalizability of the findings beyond this specific context. While the approach provides in-depth insights, future quantitative studies with larger samples could enhance external validity. Second, the study focuses exclusively on motorbike drivers, which restricts comparisons with other platform-based transport segments such as car drivers or delivery workers. Third, the findings are based on self-reported intentions rather than actual adoption behaviour, and intentions may change over time in response to economic or policy shifts. Longitudinal and comparative research would therefore be valuable to further examine the evolving dynamics of EV adoption in urban mobility contexts.

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The Transformative Potential of the Beauty Industry: From Visual Aesthetics to the Psychological Restoration of the Individual

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ABSTRACT: The beauty industry is evolving from a focus on visual enhancement toward a multidimensional system that supports psychological restoration and identity formation. The aim of this study is to analyze the transformative potential of aesthetic practices in improving individual well-being. Methods include a systematic review of recent interdisciplinary studies and comparative analysis of aesthetic and psycho-emotional outcomes. Results indicate that modern beauty practices—such as skincare programs, makeup, and hairstyling—significantly influence self-esteem, emotional stability, and social integration. Furthermore, the integration of digital technologies and personalized approaches enhances these effects. The findings confirm that the beauty industry functions not only as a commercial sector but also as a socio-cultural and therapeutic mechanism, contributing to holistic personal development and psychological resilience in contemporary society.

KEYWORDS: beauty industry, psychological restoration, self-esteem, visual identity, aesthetic practices, digital beauty technologies.

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Вступ

Індустрія краси у XXI столітті трансформується з традиційного сегмента естетичних послуг у складну міждисциплінарну систему, що поєднує елементи психології, соціології, культури та цифрових технологій. Сучасні beauty-практики виходять за межі фізичного вдосконалення зовнішності, формуючи нові моделі самосприйняття та соціальної інтеграції особистості.

Зростання інтересу до психоемоційного впливу косметичних процедур, догляду за тілом і стилістичних трансформацій зумовлює необхідність наукового осмислення їхнього впливу на відновлення психологічного стану людини. Особливо актуальним є дослідження ролі індустрії краси як інструменту арт-терапії, самовираження та відновлення ідентичності в умовах соціальних і технологічних трансформацій.

Мета дослідження

Метою дослідження є визначення трансформаційного потенціалу індустрії краси як інструменту не лише візуальної естетики, але й психологічного відновлення особистості.

Літературний огляд

Сучасні дослідження демонструють багатовекторність впливу індустрії краси. Зокрема, макіяж розглядається як інструмент формування візуальної ідентичності в медіапросторі (Nazarenko, 2025), тоді як інноваційні освітні підходи у сфері підготовки фахівців підсилюють якість послуг (Hrabko, 2025; Chyzhykova, 2025).

Психологічний аспект підтверджується дослідженнями догляду за шкірою, які демонструють підвищення впевненості та емоційного благополуччя (Iasinska, 2025). Аналогічно, корекція елементів зовнішності, зокрема брів, позитивно впливає на психоемоційний стан (Safronova, 2025).

Важливу роль відіграють культурні та візуальні практики, такі як фотографія та татуювання, що формують ідентичність і зберігають культурну спадщину (Obukhovska, 2025; Matsapura, 2025). Біомеханічні підходи до манікюру сприяють зниженню травматизації та покращенню досвіду клієнта (Popovych, 2025).

Інтеграція VR/AR і генеративного ШІ відкриває нові можливості персоналізації образу (Guk, 2025; Nersisian, 2026). Водночас beauty-ритуали розглядаються як форма арт-терапії та психологічної підтримки (Zhaivoronok, 2025). Стилістичні трансформації безпосередньо впливають на самооцінку та тілесне сприйняття (Pasulia, 2026), а розвиток технік, наприклад нарощування вій, формує нові естетичні канони (Mala, 2025).

Додатково, естетичні композиції, зокрема флористичні, здатні регулювати психоемоційний стан (Chyhryn, 2025), що підкреслює терапевтичний потенціал естетики як такої.

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Результати дослідження

Таблиця 1

Вплив beauty-практик на психологічний стан особистості

Практика	Психологічний ефект	Джерело
Догляд за шкірою	Підвищення впевненості	(Iasinska, 2025)
Макіяж	Формування ідентичності	(Nazarenko, 2025)
Корекція брів	Емоційна стабілізація	(Safronova, 2025)
Стилістичні зміни	Зростання самооцінки	(Pasulia, 2026)
Beauty-ритуали	Арт-терапевтичний ефект	(Zhaivoronok, 2025)

Джерело: розроблено автором.

Дані таблиці демонструють системний вплив різних beauty-практик на психоемоційний стан, підтверджуючи їх терапевтичну функцію.

Рисунок 1

Модель трансформаційного впливу індустрії краси

Джерело: розроблено автором.

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Модель відображає причинно-наслідковий зв'язок між зовнішніми змінами та внутрішнім станом особистості, що узгоджується з результатами досліджень (Guk, 2025; Nersisian, 2026).

Висновки

Індустрія краси в сучасних умовах функціонує як комплексна система, що поєднує естетичні, психологічні та технологічні аспекти. Її трансформаційний потенціал проявляється у здатності впливати на самооцінку, емоційний стан та соціальну інтеграцію особистості.

Результати дослідження підтверджують, що сучасні beauty-практики виходять за межі візуальної естетики, перетворюючись на інструмент психологічного відновлення. Інтеграція цифрових технологій та персоналізованих підходів посилює цей ефект, відкриваючи нові перспективи для розвитку індустрії та міждисциплінарних досліджень.

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Development of the Human Resource Potential of Public Service through the Prism of European Personnel Management Practices

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ABSTRACT: This study substantiates strategic directions for public service human resource development through European personnel management practices and their adaptation to national public administration. Using theoretical methods and comparative analysis of EU practices, the research demonstrates that effective public service development is based on meritocratic principles, continuous professional development, transparent recruitment, competency-based career planning, KPI systems, talent management, and digital tools. European models emphasize systematic competence development, hybrid motivation, workforce planning, and digitalization. The results provide an integrated model incorporating European HRM principles to strengthen institutional capacity, increase administrative efficiency, and improve public service quality through a professional, mobile, and adaptive workforce.

KEYWORDS: human resource capacity, public service, human resource management.

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Вступ

Розвиток кадрового потенціалу публічної служби набув стратегічного значення в умовах євроінтеграційних процесів і трансформації системи державного управління, що зумовлює необхідність переосмислення підходів до управління персоналом відповідно до європейських стандартів. Європейські практики управління персоналом у публічному секторі ґрунтуються на принципах меритократії, безперервного професійного розвитку, прозорості, етичності та орієнтації на результат, що забезпечують підвищення інституційної спроможності державних органів. Адаптація цих підходів у національній системі публічної служби розглядається як ключовий чинник формування професійного, мобільного та компетентного кадрового корпусу, здатного ефективно реагувати на сучасні суспільні виклики. Так, Ilina (2025) досліджувала механізми розвитку людського капіталу в Україні та за кордоном, порівнюючи національні та міжнародні практики. Авторка проаналізувала структуру управління персоналом, підходи до професійного розвитку та інструменти підвищення компетентності працівників державних органів. У дослідженні Sidorova, Dniprov, Yunina, Bobrishova & Mkrtchian (2022) було розглянуто адміністративно-правові принципи публічного контролю за реалізацією державної політики в гуманітарній сфері. Науковці вивчали механізми забезпечення прозорості, відповідальності та ефективності державних органів у сфері надання гуманітарних послуг. Окрім того, Knies, Boselie, Gould-Williams & Vandenabeele (2024) аналізували стратегічне управління людськими ресурсами та його вплив на результативність публічного сектору. Було виділено роль таких контекстуальних чинників, як організаційна культура, законодавче середовище та локальні практики управління, у формуванні ефективності HR-стратегій. Зокрема Andersen, Leisink & Vandenabeele (2023) досліджували практики управління людськими ресурсами в Європі, порівнюючи методи розвитку персоналу в різних країнах. Було визначено ключові тенденції, зокрема впровадження цифрових технологій, оцінюванням компетентностей і системним плануванням кар'єри службовців. У своїй статті Zolak Poljašević, Gričnik & Šarotar Žižek (2025) розглядали управління людськими ресурсами в публічній адміністрації з акцентом на суперечності між потребами реформ і опором змінам. Автори досліджували чинники, які впливають на впровадження реформ, а також способи подолання організаційного опору для підвищення ефективності публічного управління. Натомість Siegel & Proeller (2021) аналізували управління людськими ресурсами в німецькій публічній адміністрації, зокрема структури професійного розвитку та системи оцінювання персоналу. Було досліджено інтеграцію цифрових інструментів і навчальних програм для підвищення компетентності службовців. У дослідженні Shaikh, Ali, Tunio & Naeem (2025) увагу зосереджено на зеленому управлінні людськими ресурсами та його впливі на сталу продуктивність організацій. Було проаналізовано практики впровадження екологічних і соціально відповідальних ініціатив у HR-політиках та їхній вплив на результативність організацій. Водночас Priyashantha (2023) досліджував концептуальні рамки застосування деструктивних технологій у сфері управління персоналом. Було запропоновано модель інтеграції таких інноваційних технологій, як штучний

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інтелект і автоматизація, для підвищення ефективності HR-процесів у державних і приватних організаціях. У статті Thunnissen & Sanders (2021) розглядали навчання та розвиток у публічному секторі, приділяючи увагу безперервному підвищенню кваліфікації службовців. Було проаналізовано методи формального та неформального навчання, програми наставництва та коучингу, які сприяють професійному зростанню та адаптивності персоналу. Окрім того, Van Noordt & Misuraca (2022) досліджували використання штучного інтелекту в публічному секторі ЄС. Автори здійснили огляд практик застосування штучного інтелекту в державних органах, визначили типи технологій, цілі їхнього впровадження та вплив на ефективність управління та прийняття рішень.

Мета дослідження та дослідницькі питання

Метою дослідження є обґрунтування напрямів розвитку кадрового потенціалу публічної служби крізь призму європейських практик управління персоналом і визначення можливостей їхньої адаптації до національної системи державного управління. Для досягнення поставленої мети здійснено аналіз теоретичних підходів до управління персоналом у публічному секторі країн ЄС, узагальнено досвід упровадження європейських моделей розвитку людських ресурсів, виявлено ключові принципи та інструменти формування професійної компетентності публічних службовців, оцінено сучасні тенденції розвитку кадрового потенціалу публічної служби, а також визначено перспективні напрями вдосконалення національної кадрової політики з урахуванням європейських стандартів.

Результати дослідження

Аналіз теоретичних підходів до управління персоналом у публічному секторі країн ЄС демонструє, що формування кадрового потенціалу базується на інтеграції декількох головних аспектів: професійного розвитку службовців, прозорих процедур відбору та просування, етичних стандартів поведінки, а також стимулювання результативності та інноваційності у виконанні службових обов'язків. Європейські практики управління персоналом передбачають системний підхід до людських ресурсів, що охоплює безперервне навчання, моніторинг компетентності та адаптацію функціональних ролей службовців до потреб організацій і суспільства. У публічному секторі країн ЄС застосовуються стратегії управління талантами, що охоплюють планування кар'єри, оцінювання результатів діяльності, розвиток професійних навичок і компетентностей шляхом навчальних програм, тренінгів, менторства та коучингу. Системи оцінювання персоналу, зорієнтовані на критерії результативності та відповідності компетенцій, сприяють підвищенню рівня професійної підготовки та мобільності службовців, що забезпечує ефективність роботи органів публічного управління. Ключові принципи формування професійної компетентності публічних службовців у європейських країнах ґрунтуються на меритократії, прозорості процедур, відповідальності перед суспільством та орієнтації на результат. Системне поєднання формального навчання та практичного розвитку забезпечує набуття службовцями технічних знань, а також

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соціально-комунікативних, аналітичних і управлінських навичок. Використання цифрових платформ для навчання та оцінювання дає змогу інтегрувати індивідуальні освітні траєкторії з потребами організації, підвищуючи гнучкість системи управління персоналом.

Таблиця 1

Приклади інструментів розвитку кадрового потенціалу публічної служби в країнах ЄС.

Країна	Інструмент/механізм розвитку персоналу	Ціль/ефект застосування	Приклад впровадження
Німеччина	Планування кар'єри на основі компетенцій	Підвищення мобільності та компетентності службовців	Створення індивідуальних освітніх траєкторій для державних службовців
Франція	Система KPI (ключових показників ефективності) для оцінювання результатів діяльності	Визначення прогалин у знаннях і навичках	Оцінювання ефективності роботи департаментів муніципалітетів
Швеція	Цифрові платформи для навчання	Безперервний професійний розвиток	Онлайн-курси та тренінги для службовців центральних органів влади
Польща	Гібридні системи стимулювання	Мотивація до результативної діяльності	Поєднання матеріальних і нематеріальних бонусів для команд

Джерело: складено автором на основі власних досліджень.

Сучасні тенденції розвитку кадрового потенціалу публічної служби передбачають застосування інноваційних підходів до мотивації, оцінювання та професійного розвитку. Гібридні системи стимулювання, які поєднують матеріальні та нематеріальні заохочення, використовуються для підвищення продуктивності командної та індивідуальної діяльності. Поєднання різних видів стимулів коригує поведінку службовців відповідно до стратегічних цілей організацій, що забезпечує виконання завдань у межах встановлених стандартів ефективності та якості надання публічних послуг. Моделі розвитку персоналу в публічному секторі передбачають планування кар'єрних траєкторій на основі компетентнісних матриць, що дає змогу прогнозувати потреби в кадрах і можливості професійного зростання службовців. Оцінювання результатів діяльності здійснюється за допомогою систем KPI, які охоплюють якісні та кількісні показники та дають змогу ідентифікувати прогалини в знаннях і навичках, а також визначають потенціал для підвищення кваліфікації. Такі цифрові інструменти, як платформи для електронного навчання, адаптивні тестові системи та аналітичні панелі, забезпечують об'єктивність оцінювання та сприяють ефективному управлінню кар'єрним розвитком службовців. Адаптація європейських практик до національної системи публічної служби враховує специфіку організаційної культури,

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нормативно-правового середовища та кадрової структури державних органів. Інтеграція європейських підходів передбачає використання сучасних методів професійного розвитку, поєднання формального та неформального навчання, систематичне оцінювання компетентностей, а також формування прозорих процедур відбору й просування, що забезпечує підготовку мобільного, компетентного та адаптивного кадрового корпусу. Застосування комплексного підходу до розвитку кадрового потенціалу дає змогу створювати умови для безперервного вдосконалення професійних навичок, розвитку управлінських здібностей і компетенцій, необхідних для ефективного виконання завдань публічного управління. Поєднання стратегічного планування, мотиваційних систем і цифрових технологій у сфері управління персоналом забезпечує підвищення ефективності публічної служби та підтримку високих стандартів якості надання послуг громадянам.

Висновки

Розвиток кадрового потенціалу публічної служби крізь призму європейських практик управління персоналом демонструє, що інтеграція системного підходу до професійного розвитку, прозорих процедур відбору та просування, ефективних мотиваційних механізмів і цифрових технологій сприяє формуванню компетентного, мобільного та адаптивного кадрового корпусу. Запровадження стратегій управління талантами, оцінювання результатів діяльності за допомогою KPI та поєднання формального і неформального навчання забезпечує підвищення професійних й управлінських навичок службовців, а адаптація європейських підходів до національного контексту дає змогу створювати умови для ефективного функціонування органів публічного управління та підвищення якості надання публічних послуг.

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Triple Critique: Formal Logical Audit, Generative Verification of Intellectual History, and Consistency Test with Sinicized Marxism in the New Era – A Review of Liu Tongfang's Marx's Intellectual Measure

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ABSTRACT: This paper examines the testability of Liu Tongfang's arguments in Marx's Intellectual Scale using the text as its sole corpus. It evaluates the work across three dimensions—"logic, intellectual history, and historical consistency"—to assess its verifiability. Sentences defining concepts, establishing boundaries, and describing mechanisms were identified through clause numbering and rule extraction. The strength of reasoning was measured using indicators such as CDI, BAI, NMSI, MES, and SCR. Results indicate: - Cross-domain transfer of "standards" lacks mediating rules, leading to semantic slippage; - Insufficient boundaries and transition criteria for stage divisions risk reducing analysis to value rankings; - Some arguments substitute normative goals for contradiction-mechanism chains, while the transition to intellectual history shows weak integration with contemporary practice interfaces. The conclusion highlights the paper's overall strength but identifies areas requiring conceptual operationalization, explicit boundary conditions, and formalization of the mechanism chain. The framework is transferable for evaluating and rewriting similar texts.

KEYWORDS: Formal Logic Audit; Conceptual Semantic Stability; Stage Boundary Conditions; Era Consistency Verification.

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Introduction

Holistic interpretation has long been a crucial methodological approach in Marxist philosophy, integrating macro-historical processes, social operational mechanisms, and normative value goals into a unified theoretical framework through higher-order categories. However, as academic evaluation standards increasingly emphasize the reviewability and testability of arguments, holistic interpretation has also exposed a series of methodological risks. These include semantic instability in core concepts, the lack of falsifiable boundaries in periodization, the replacement of mechanism explanations with normative declarations, and the difficulty in translating value standards into operational analytical interfaces. Related research indicates that when abstract concepts oscillate between descriptive and normative contexts without clear derivation rules, their explanatory power often relies on rhetorical coherence rather than verifiable logical structures.

In The Measure of Marx's Thought, Liu Tongfang employs "measure" as an overarching concept, positing that it signifies both the spatial extension of social existence and the boundaries of consciousness, thought, and value. Based on this, he constructs a three-pronged argumentative structure: "socio-historical stage—form of productive activity—overarching value criteria." While this research theoretically enhances our grasp of the overall structure of Marx's thought, it simultaneously raises critical methodological questions: When "scale" migrates across different analytical levels, does its conceptual meaning remain stable? Do the associated deductions still meet the fundamental requirements of academic argumentation for logical verifiability and mechanism consistency?Based on this, this paper employs a systematic auditing method to examine the argumentative structure of the text, aiming to clarify its theoretical validity and interpretive boundaries.

Research Aim and Research Questions

Research Aim

This study aims to evaluate whether Liu Tongfang's argument for reconstructing Marx's thought through the concept of "scale" meets the requirements of scientific research—namely, reviewability, reproducibility, and testability—across three dimensions: formal logic, the generative nature of intellectual history, and consistency with Marxism adapted to China's new era.

Research Questions

RQ1: Does the concept of "scale" maintain semantic stability between empirical description and normative evaluation? Does its cross-domain transfer possess traceable derivation rules?

RQ2: Does the division of socio-historical stages proposed in the text meet the minimum requirements of mutual exclusivity and exhaustiveness? Are its boundaries and transition conditions clearly defined?

RQ3: Does the argument consistently follow the explanatory framework of "contradiction

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mechanism—stage transition," or does it substitute mechanism analysis with normative objectives at critical junctures?

RQ4: Can the holistic value standards proposed in the text be transformed into an index-based analytical interface responsive to "people-centered development", "practice-based verification" and "Chinese-style modernization"?

Research Results

The triple audit results reveal: First, the concept drift index indicates significant overlap between descriptive and normative uses of the term "scale" reflecting insufficient conceptual stability. Second, the boundary adequacy index shows that while stage narratives possess macro-level integrative power, their insufficient articulation of boundary conditions and transition criteria hinders the formation of a falsifiable model. Third, the norm-mechanism substitution index reveals that some arguments replace contradictory mechanism analysis with value-oriented goals. Although the mechanism explicitness indicator shows frequent textual references to mechanistic concepts such as productive forces and relations of production, their structural coupling with stage-boundary determination remains weak. Sentence coverage results indicate that the traceability between arguments and original evidence is at a moderate level. Overall, this framework exhibits significant tension between integrative coherence and testability.

Table 1

Dynamics of introducing "Scale" as an analytical category into the sociocultural space of Marxist theory

Analytical Dimension	Description
Gradual transition from empirical description to normative evaluation	The concept of "scale" is initially employed to describe material and spatial dimensions of social production and historical development, and is gradually extended to cognitive, axiological, and normative domains. This transition enables an integrated interpretation of Marx's theory but also introduces the risk of semantic drift when descriptive and evaluative functions overlap.
Implemented through short-term and long-term theoretical articulation	In the short term, "scale" functions as a descriptive tool for analyzing productive forces, production relations, and historical stages. In the long term, it is elevated to a normative framework for evaluating human emancipation, free individuality, and holistic value standards, thereby shaping the overall interpretive architecture of Marx's thought.
Gradual integration into the theoretical system	The integration of "scale" occurs through its repeated application across multiple analytical levels, including social stages, modes of production, and value orientation. However, the absence of explicit cross-domain inferential rules weakens the transparency of this integration process.
Planning new organizational formats of theoretical interpretation	The use of "scale" reorganizes Marxist theory into a three-line structure—social historical stages, production activity, and holistic value standards—forming a comprehensive but highly abstract interpretive model.

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Active use of conceptual and analytical components	The framework actively employs concepts such as productive forces, production relations, contradiction, and free individuality, yet the linkage between these mechanisms and stage boundaries remains insufficiently specified

Source: author's own development

Conclusions

Research indicates that Marx's Measure of Thought demonstrates significant theoretical ambition through its holistic interpretation and integration of value. However, the explanatory efficacy of its core category—"measure"—is constrained by factors such as semantic drift, insufficient delineation of developmental stages, and inadequate explicitness of causal mechanisms. Furthermore, its alignment with the Sinicization of Marxism in the new era remains largely conceptual, lacking clear operational interfaces. To enhance its academic robustness, it is necessary to further strengthen the operational definition of concepts, clarify the criteria for periodization, and systematically elaborate on the explanatory mechanisms of contradictions. The proposed triple-criterion audit framework—"formal logic, intellectual history, and epochal consistency"—offers a reusable methodological pathway for evaluating similar comprehensive philosophical texts and provides a normative direction for deepening holistic interpretations at the level of scientific rigor.

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Beyond the Scoreboard: A Systematic Narrative Review of Sport's Influence on Cultural Norms and Values

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ABSTRACT: This systematic narrative review examines the intersection of sport with cultural norms and values through an analysis of peer-reviewed studies published from 2015 to 2025. Utilising Gramsci's theory of cultural hegemony and Social Identity Theory, it synthesises empirical and conceptual research across various sports and contexts. A systematic search identified 68 relevant studies after screening 150 initial records. Thematic synthesis revealed four main clusters: (1) the role of sport in fostering social cohesion and community while also inciting exclusionary rivalries; (2) the perpetuation of gender stereotypes in sports media versus the challenges of women's participation in male-dominated sports; (3) issues of racial and ethnic representation in sport, highlighting both anti-racist activism and discrimination; and (4) the construction of national identity through sport in the context of athlete migration and globalization. Overall, sport is portrayed as a dual phenomenon that can both reinforce hierarchies and serve as a platform for resistance and social change. The review notes a fragmented methodological landscape, with calls for more intersectional, longitudinal, and non-Western perspectives, advocating for research designs that emphasise power, ideology, and identity while promoting inclusion and addressing structural inequalities.

KEYWORDS: Sports sociology, Cultural hegemony, Social identity, Social cohesion, Gender norms, Race and ethnicity, National identity, Intersectionality.

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Introduction

Sport is widely recognised as a powerful social institution that both reflects and shapes cultural norms and values. Far beyond the playing field, sport functions as a site where identities are constructed, hierarchies are reproduced or contested, and broader struggles over meaning and power are played out (Hartmann, 2024; Santos et al., 2022). In contemporary societies, sports practices, events, and media representations have become central arenas through which ideas about gender, race, nation, class, and morality are negotiated and communicated.

Over the past three decades, and especially in work published between 2015 and 2025, scholars have increasingly examined sport as a cultural and political practice rather than a merely recreational or commercial activity (Batsunov, 2021; Broch, 2022; Rodrigues et al., 2023). This shift has illuminated how sport can simultaneously promote social cohesion and deepen social divisions; challenge dominant ideologies while reproducing them; and generate possibilities for inclusion alongside persistent exclusion and marginalisation (Borges et al., 2025; Hartmann et al., 2022). At the same time, the globalisation of sport has intensified its cultural reach, as transnational media, mega-events, and athlete migration link local sporting cultures to global economic and political processes (Zhenhua & Hamid, 2023).

Theoretically, this review is anchored in Antonio Gramsci's (2004) concept of cultural hegemony, which understands sport as a key arena through which consent to dominant social orders is manufactured and normalised (Acar & Erdoğan, 2025). Viewed through this lens, sport operates as a cultural practice that embeds ideological narratives in everyday rituals, celebrations, and spectacles, making social hierarchies appear natural and inevitable. Complementing this perspective, Social Identity Theory is employed to analyse how sport contributes to the formation of group identities, solidarities, and rivalries, from fan communities to national allegiances (Wu & Cheng, 2025; Jackson & Sam, 2025). Together, these frameworks enable a critical examination of how sport both stabilises and unsettles prevailing power relations.

Additional theoretical contributions from Cultural Studies, Ideological State Apparatus theory, and role identity theory further enrich this analysis. Cultural Studies approaches highlight sport as a contested terrain in which different social groups struggle over meaning and representation, emphasising the agency of athletes, fans, and communities (Harvey, 2021). Althusserian notions of Ideological State Apparatuses help explain how states and elites can mobilise sport to legitimise political authority and project specific national narratives (Acar & Erdoğan, 2025; Black, 2022). Role identity theory and related perspectives deepen understanding of fan identification, loyalty, and commitment, clarifying how individuals' attachments to teams and competitions connect to broader cultural and moral orders (Koo et al., 2025).

Within this broad field, several recurrent thematic concerns have emerged: sport as a source of social cohesion and community-building; sport as a site for the production and contestation of gender and sexual norms; the racialized politics of representation, discrimination, and activism in sport; and the role of sport in national identity formation, particularly in the context of mega-events and global media (Almeida & Ozdemir, 2024; Hartmann, 2024; Wasike, 2022). At the same time, critical scholarship has drawn attention to the "sportification" of global culture, in which the spread of modern sport is unevenly intertwined with political, economic, and military power, producing both cultural homogenization and the reassertion of local particularities (Zhenhua & Hamid, 2023).

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This growing body of work illuminates sport's dual potential to advance United Nations Sustainable Development Goals (SDGs): promoting peaceful societies and inclusive communities (SDG 16) through social cohesion (Moustakas & Robrade, 2022); achieving gender equality (SDG 5) by challenging stereotypes (Fraser & Kochanek, 2023); reducing inequalities (SDG 10) via intersectional inclusion (Pape et al., 2023); and fostering partnerships for global goals (SDG 17) amid athlete migration and mega-events (Storey, 2023). Yet sport can also perpetuate exclusion, aligning with Philippine education policies such as RA 11470 that mandate SDG integration into curricula.

Despite this growing body of work, there remains a need for a systematic and theoretically integrated synthesis of how sport influences and reflects cultural norms and values across different contexts. Existing studies are often fragmented by discipline, region, or thematic focus, and many do not explicitly engage with the underlying power dynamics and ideological processes that shape sporting cultures. There are also methodological gaps, including limited intersectional analyses and insufficient attention to how multiple axes of identity – such as gender, race, class, and nationality—interact in and through sport (Borges et al., 2025).

This review addresses these gaps by systematically examining peer-reviewed literature and selected scholarly book chapters on sport and culture published between 2015 and 2025, using Gramscian cultural hegemony and Social Identity Theory as primary analytical lenses while drawing on complementary theoretical perspectives where appropriate. Adopting a global scope, it explores how sport contributes to social cohesion and exclusion; how it reproduces or challenges gender and racial norms; and how it participates in constructing national identities in an era of intensified globalisation and athlete mobility.

Specifically, this review seeks to answer the following research questions:

1. How have sports influenced cultural norms and values in different socio-cultural contexts between 2015 and 2025?
2. What are the reciprocal effects between sport and culture, particularly in relation to power, identity, and ideology?
3. How do global trends in sport—such as commercialisation, mediatization, and athlete migration—shape and transform local cultures and identities?

By providing a critical, thematically organised synthesis of recent scholarship, this review aims to clarify the dual role of sport as both a reproducer of dominant cultural orders and a potential site of cultural transformation. In doing so, it identifies key methodological and theoretical gaps and proposes directions for future intersectional and comparative research in sports sociology and related fields.

Research Results

Study Design

This study was conducted as a systematic review employing qualitative narrative synthesis, following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA 2020) guidelines. The review integrates systematic and transparent search and screening procedures with interpretive thematic analysis.

A meta-analysis was not undertaken due to conceptual heterogeneity and the predominance of qualitative and theoretically oriented research within the sport–culture literature. The aim was to critically synthesise how

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sport influences, reproduces, and contests cultural norms, values, and identity formations.

Scope and Eligibility Criteria

The review focused on scholarship explicitly examining the relationship between sport and cultural norms, values, and identity processes.

For this study:

Sport was defined broadly to include organised competitive sport, elite sport, community and recreational sport, mega-events, and sport media.

Cultural norms and values were understood as shared beliefs, moral frameworks, symbolic meanings, and identity processes structuring social behaviour within local, national, or transnational contexts.

Inclusion Criteria

Studies were included if they:

1. Were peer-reviewed journal articles published between 2015 and 2025?
2. They were written in English.
3. Explicitly analysed the relationship between sport and cultural norms, values, identity, power, or ideology.
4. Employed qualitative, quantitative, mixed-method, or theoretical approaches within relevant disciplines (e.g., sociology, anthropology, cultural studies, political science, sport management).
5. Treated sport as a primary analytic focus rather than a peripheral context.

A limited number of widely cited scholarly book chapters were purposively included to strengthen the theoretical framework. These were not treated as core empirical cases within the synthesis.

Exclusion Criteria

Studies were excluded if they:

1. Were not peer-reviewed (e.g., opinion pieces, editorials, policy briefs).
2. Focused primarily on performance, physiology, biomechanics, or health outcomes without substantive sociocultural analysis.
3. Mentioned culture only incidentally.
4. Lacked methodological transparency.
5. Did not substantively link sport with cultural norms or values.

Search Strategy

A comprehensive search strategy was implemented across multiple electronic databases, including Scopus, Web of Science, SPORTDiscus, JSTOR, and Google Scholar (used primarily for supplementary searches and citation tracking). Searches were limited to publications between 2015 and 2025 and to English-language records. Search strings combined terms related to sport with terms related to culture, norms, identity, and power,

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using Boolean operators and truncation where appropriate. Example search queries included:

- sport* AND culture*
- sport* AND ("cultural norms" OR "cultural values")
- sport* AND (hegemony OR "cultural hegemony")
- sport* AND ("social identity" OR "national identity")
- sport* AND ("gender norms" OR "racial norms" OR representation)
- The search terms included sport* along with either globalisation or migration.

Search strategies were adapted to the syntax and indexing systems of each database. Backwards and forward citation tracking was conducted to ensure comprehensive coverage of conceptually central works.

Study Selection

The study selection process proceeded in three stages in accordance with PRISMA 2020 guidelines. First, 150 records were identified through database searching and exported to a reference management system. Duplicate records were removed. Second, titles and abstracts were screened against the inclusion and exclusion criteria to remove clearly irrelevant studies. Third, the full texts of potentially relevant articles were retrieved and assessed for eligibility. After screening, 82 reports were retained for full-text assessment. Following a detailed evaluation, 14 full-text articles were excluded due to insufficient conceptual engagement, inadequate methodological transparency, or failure to meet the research objectives. Ultimately, 68 studies were included in the qualitative synthesis. The selection process ensured that sport and cultural norms/values were substantively linked in each included study. A PRISMA flow diagram summarises the identification, screening, eligibility, and inclusion stages.

Data Extraction

A standardised data extraction template was developed to ensure consistency across studies. The following information was recorded:

- Author(s), year, and publication source
- Geographic focus and socio-cultural context
- Type of sport or sporting context
- Study design and methodology
- Theoretical framework(s) employed
- Key concepts related to norms, identity, representation, power, and inclusion/exclusion
- Principal findings concerning how sport influences or reflects cultural norms and values

This structured approach facilitated systematic comparison and thematic integration.

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Quality Appraisal

Given the methodological diversity of the included studies, a qualitative appraisal approach was adopted rather than a rigid scoring system. Each study was assessed for

- Clarity of aims and research questions
- Transparency of research design and data collection
- Analytical rigor
- Coherence between the theoretical framework and findings
- Reflexivity and acknowledgment of limitations

Quality appraisal informed interpretive weighting within the synthesis rather than serving as a strict exclusion threshold.

Synthesis and Analysis

A thematic synthesis approach was employed to integrate findings across studies. Initially, extracted data were coded inductively to identify recurring patterns related to social cohesion, exclusion, gender norms, racial representation, national identity, globalisation, and activism. In a second stage, these codes were organised into broader thematic clusters and interpreted through the primary theoretical lenses of Gramscian cultural hegemony and social identity theory, supplemented by perspectives on intersectionality and cultural studies. Through iterative comparison and abstraction, four overarching thematic clusters were identified:

1. Sport as a site of social cohesion and exclusion
2. The themes of sport, gender norms, and the contestation of hierarchies were identified.
3. Racial and ethnic representation, discrimination, and activism
4. Sport, national identity, and globalisation

The synthesis remains narrative and interpretive, prioritising conceptual depth over quantification. It conceptualises sport as both a mechanism of cultural reproduction and a potential arena for resistance and social transformation.

Table 1

Distribution of Themes showing clusters.

Theme	% of Sources	Count (N=68)
National Identity/Globalization	47%	32
Social Cohesion/Community	32%	22
Gender Norms/Sports	28%	19

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Race/Ethnicity/Sports	19%	13

Source: author(s) own development

Sport, Social Cohesion, and Exclusion

Many studies have highlighted sport's capacity to foster social cohesion, particularly through community-based programmes, grassroots clubs, and school-sport initiatives. These contexts often promote inclusion, civic engagement, and cross-group contact, especially among youth and marginalised communities. Sport is shown to facilitate bonding and bridging social capital, strengthen local identities, and provide shared spaces for interaction.

At the same time, research documents how the same sporting contexts can reproduce exclusionary boundaries and antagonistic rivalries. Club cultures, fan groups, and competitive structures can reinforce class divisions, ethnic segregation, and territorial antagonisms. Some studies underscore how access to participation remains stratified by socio-economic status, gender, and race, challenging simplistic narratives of sport as universally inclusive.

Gender Norms and Contestation

A substantial body of work examines how sport reproduces and contests gender norms. On one hand, sport media and institutional practices often reinforce traditional masculinities and gender binaries, marginalising women's sports, sexualizing female athletes, and policing femininity and masculinity. On the other hand, women's increased participation in traditionally male-dominated sports and the visibility of non-conforming gender identities have been shown to challenge established norms, open spaces for alternative femininities and masculinities, and generate public debate about gender equality.

However, the literature also shows that such challenges are often partial and uneven. Women and gender-diverse athletes may gain visibility while still being constrained by heteronormative and commercial logics, and intersectional analyses reveal how race, class, and sexuality shape who can contest gender hierarchies through sport.

Race, Ethnicity, and Activism

Studies on race and ethnicity highlight sport as a site of both racialised exclusion and anti-racist activism. Research documents persistent patterns of under-representation in leadership roles, racial stereotyping in media portrayals, and experiences of discrimination within clubs and federations. Simultaneously, athletes and fan groups have used sport platforms to contest racism, highlight police and state violence, and articulate broader claims for racial justice.

These dynamics are often analysed through intersectional frameworks, showing how racialization intersects with nationality, religion, and migration status. Yet the review also finds that many studies remain limited to single-axis analyses, with fewer works that engage deeply with multiple, intersecting forms of marginalisation.

National Identity, Globalisation, and Athlete Migration

A fourth cluster concerns sport's role in the construction of national identity within an increasingly globalised sporting economy. Mega-events, national teams, and mediated spectacles provide powerful

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occasions for the performance of national belonging, pride, and unity. Research shows how states and media use sport to promote particular narratives of nationhood, often emphasising homogeneity and harmony while downplaying internal conflicts.

At the same time, athlete migration, dual citizenship, and transnational fandom complicate these narratives, revealing tensions around who "counts" as a legitimate representative of the nation. Studies document ambivalent public reactions to migrant or diasporic athletes, as well as the use of sport to promote more pluralistic, multicultural visions of national identity.

The findings from studies published between 2015 and 2025 confirm sport's dual role as both a mechanism of cultural reproduction and a potential site of cultural transformation. From a Gramscian perspective, many of the reviewed studies demonstrate how sport helps naturalise existing hierarchies—gendered, racialised, and national—by embedding them in emotionally resonant practices and spectacles. Sporting rituals, media narratives, and institutional rules contribute to consent for prevailing social orders, making inequality appear normal, meritocratic, or inevitable.

At the same time, Social Identity Theory helps explain why sport is such a powerful arena for identity negotiation and contestation. Strong in-group identifications around teams, clubs, or nations create opportunities for solidaristic projects and politicised identities, including feminist, anti-racist, and pro-migrant movements that strategically use sport to gain visibility and mobilise support. The literature shows that moments of rupture—athlete protests, controversies around selection, or high-profile incidents of discrimination—can destabilise hegemonic narratives and open space for alternative meanings.

However, the review also highlights significant gaps and limitations in the existing scholarship. Methodologically, the field remains skewed toward qualitative case studies in Western, often Anglophone contexts, with relatively few longitudinal, comparative, or non-Western analyses. Theoretically, many studies reference concepts such as power, ideology, or identity in a relatively loose manner, without fully engaging with or integrating frameworks such as cultural hegemony, intersectionality, or decolonial thought. Intersectional analyses are particularly underdeveloped: while gender, race, and nation are each examined, fewer studies investigate how these axes intersect in shaping experiences and representations in sport.

Conclusions

Overall, the review suggests that future research must move beyond descriptive accounts of sport as "good" or "bad" for society toward more theoretically coherent and methodologically robust analyses of how sport participates in the ongoing making and unmaking of cultural norms and values. This includes stronger integration of critical theories of power and identity, more systematic attention to non-Western and marginalised contexts, and designs capable of tracing change over time in the cultural politics of sport.

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Contemporary Kazakh Cinema: Semiotic Analysis of the Spatial-Objective Environment

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ABSTRACT: This article examines the role of visual and spatial dramaturgy in Kazakhstani cinema as an autonomous communicative phenomenon. It revises traditional approaches to scenography, interpreting the spatial-objective environment as a cognitive tool shaping socio-cultural codes. The study aims to move beyond descriptive art criticism to analyse the cognitive potential of film space and identify the mechanisms by which design encodes cultural meaning. First, using systemic art-historical analysis and visual semiotics, the research draws on selected films and focus group discussions. Second, findings reveal that cinematic environments have evolved from a representative function to a transformative one, actively modelling audience value horizons. Third, this perspective enables deeper decoding of visual messages beyond material description and establishes a theoretical foundation for further dissertation research on the communicative autonomy of film design. Ultimately, the study expands art history's framework for understanding the cognitive potential of scenography and visual communication.

KEYWORDS: spatial-objective environment, cognitive impact, communicative phenomenon, Kazakhstan, visual modelling, film design.

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Introduction

The contemporary state of cinema is characterized by the increasing complexity of visual systems, where the design of the spatial and objective environment ceases to play the role of a passive background. The core problem of this study stems from a contradiction within national art criticism: while visual technologies and screen aesthetics have advanced rapidly, theoretical analysis of scenography remains largely restricted to descriptive approaches. The relevance of this work is dictated by the need to recognize environmental design as an autonomous communicative phenomenon capable of exerting a direct cognitive impact on the audience. The proposed research perspective allows us to consider artistic space not as a sum of objects, but as a tool for projecting meanings, which is becoming critically important in the context of the dominance of media reality and the transformation of cultural paradigms.

A discussion of the results of previously published studies (Amirbekova, 20256; Abikeyeva, 2022; Abazov, 2021; Abazov, 2015) allows us to conclude that traditionally, scholars' attention has focused on the historical and ethnographic aspects or the genre specificity of the frame. However, in light of new identity and cultural transformations, a scientific lacuna arises: the mechanisms by which the "thing world" of the frame constructs sociocultural codes remain insufficiently developed.

Within the semiotic tradition, screen space is viewed as a text possessing a complex system of signs and semantic correlations (Wantoro, 2018). Contemporary film theory also emphasises the role of the visual organisation of the frame in shaping viewer perception and cognitive attitudes (Kılıçaslan, M., & Türkmen, A., 2024). According to the concept of the social production of space (De Rosa, M., 2012), space is not neutral—it is constructed and simultaneously constructs social reality. The integration of these approaches into the analysis of contemporary Kazakhstani cinema defines the novelty of the proposed perspective.

Thus, the shift from description to analysis of the communicative function of the spatial-objective environment allows us to identify the mechanisms by which a film's visual structure influences meaning-making and cognitive perception.

Research Aim and Research Questions

The aim of this study is to theoretically substantiate the design of spatial and objective environments in cinema as a communicative tool with cognitive potential for shaping and transmitting sociocultural codes. The methodological basis of the study was formed by elements of a qualitative analysis of visual material. A preliminary analytical selection and analysis of 15 feature films from Kazakhstan (2021–2025) was conducted based on the criteria of visual dominance of the environment, professional recognition, and genre diversity.

Additionally, a focus group discussion (8 participants) was used to identify viewers' perceptions of the spatial organisation of the frame and its influence on value systems.

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Research Results

The theoretical analysis conducted within this phase of the study allows us to move beyond the traditional descriptive approach to scenography and examine it through the lens of cognitive impact. Within the semiotic tradition, screen space is interpreted as a system of signs that forms a specific structure of perception of historical reality (Özdemir, 2026). Contemporary studies of film language also emphasise the role of the visual organisation of the frame in guiding viewer attention and interpretation (Goharipour, 2019).

Space in this context is not neutral – it functions as a socially and culturally determined structure that participates in the construction of identity discourses.

A preliminary analysis of the selected sample of films allows us to hypothesise that in contemporary Kazakhstani cinema, the spatial-objective environment is increasingly becoming an active mediator of meaning. In some original works (for example, films by A. Erzhanov and E. Baigazin), the environment functions not as an illustration, but as a tool for artistically modelling reality.

The results of the focus group discussion confirm that viewers perceive the visual organisation of space as a significant factor influencing emotional and value attitudes, which requires further in-depth research. A statistical interpretation of the frequency of use of visual tools in the study sample is presented in [Table 1].

Table 1

Preliminary directions for the transformation of the spatial-subject environment (based on the results of the pilot analysis)

Analytical factors	Visual techniques (trends)	Degree of manifestation (according to observations of the pilot analysis)	Cognitive goal of communication
Shift in cultural paradigms	Deconstruction of familiar interior codes	A pronounced tendency	Rethinking cultural values
Change of perception	Use of "sterile" or abstract spaces	A steady trend	Creating distance and focus on meanings
Identity discourses	Symbolism of everyday objects-markers	Episodic manifestation	Broadcasting social and personal meanings
The influence of media reality	Hyperrealism and digital aesthetics of the environment	Isolated cases	Constructing a new visual norm

Source: this original table was compiled by the author based on an analysis of a sample of 15 films (2021-2025).

The data in [Table 1] suggest that one of the most prominent areas of transformation of the spatial-objective environment is the shift in cultural paradigms. The pilot study revealed a tendency toward the activation of the objective world as a meaning-forming element of the film's visual structure.

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In the semiotic tradition, the objective environment is viewed as a significant component of on-screen text, shaping a system of associations and interpretive strategies (Swarnakar, 2025). From the perspective of film language theory, the visual organisation of the frame is capable of controlling attention and directing perceptual processes. In this context, it can be hypothesised that scenography is gradually ceasing to serve a purely background function and is beginning to act as an active mediator of cultural meanings.

Thus, the preliminary results of the pilot analysis suggest that environmental design in contemporary Kazakhstani cinema encrypts sociocultural, spatial, and historical codes as tools for formation and transmission, requiring further empirical verification and offering new perspectives for cinematic semiotics and cultural studies.

Conclusions

Summarising the study, it can be noted that the proposed approach to examining the spatial-objective environment as a communicative phenomenon expands the analytical capabilities of the art historical approach to cinema. Observations obtained during the pilot phase suggest that scenography in contemporary cinema demonstrates a tendency toward a stronger meaning-making function.

A preliminary analysis of 15 Kazakhstani films (2021–2025), supported by focus group discussion, reveals the growing importance of the visual environment in shaping audience interpretations. As shown in Table 1, the data highlight a dominant deconstruction of various interior codes within the material, aligning closely with the proposed hypothesis.

However, this study is still in its early stages and requires an expanded empirical base. Prospects for future work include a more in-depth verification of the identified patterns and a clarification of the mechanisms of the cognitive impact of spatial design within the framework of a master's thesis.

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Sustainable Development and Climate Change Adaptation in Vietnam (2011–2024)

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ABSTRACT: This study aims to analyse Vietnam's sustainable development pathway in adapting to climate change during the 2011 – 2024 period from the perspectives of resilience and green transition, thereby assessing the extent of structural transformation in its growth model. The research employs policy analysis combined with secondary data on greenhouse gas emissions, energy structure, forest area, and disaster-related losses, alongside a longitudinal trend comparison. The results indicate that Vietnam has made significant progress in institutionalising climate adaptation and expanding renewable energy, as reflected in declining emissions intensity per unit of GDP and a rising share of clean energy. However, total greenhouse gas emissions continue to increase, and the growth model remains reliant on carbon-intensive sectors. The findings suggest that incremental adaptation is insufficient to achieve long-term sustainability goals. A systemic transformation approach- emphasising economic restructuring and institutional reform - is necessary to enhance resilience and ensure sustainable development in the context of escalating climate risks.

KEYWORDS: Sustainable development, climate change, resilience, green transition, Vietnam.

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Introduction

Climate Change and the Sustainable Development Challenge

The Sixth Assessment Report of the Intergovernmental Panel on Climate Change confirms that global warming is occurring at an unprecedented rate, with the global average temperature approximately 1.1°C above pre-industrial levels (IPCC, 2021). The report highlights a marked rise in the frequency and intensity of extreme weather events, including heatwaves, heavy precipitation, tropical cyclones, and prolonged droughts. These changes are no longer considered distant environmental risks but immediate systemic threats to socioeconomic stability.

Climate change represents not only an environmental concern but also a fundamental development challenge, affecting food security, livelihoods, infrastructure resilience, and macroeconomic stability (World Bank, 2022). Developing countries are particularly vulnerable due to limited financial resources, institutional constraints, and high dependence on climate-sensitive sectors such as agriculture and fisheries. Without effective adaptation and structural transformation, climate impacts may reverse decades of development gains.

Vietnam as a Highly Vulnerable Country

Vietnam is widely recognised as one of the countries most vulnerable to climate change. With a coastline exceeding 3,260 kilometres and two major deltas - the Red River Delta and the Mekong River Delta - Vietnam faces significant exposure to sea-level rise and extreme weather events. These regions host dense populations and contribute substantially to the national GDP. According to Dasgupta et al. (2007), a one-meter sea-level rise could affect approximately 12% of Vietnam's land area and 17% of its population.

In Vietnam, natural disasters generate substantial economic losses each year, estimated at approximately 1-1.5% of national GDP (World Bank, 2020). Beyond direct physical damages, climate-related disruptions undermine agricultural productivity, increase infrastructure vulnerability, and exacerbate social inequality. These risks underscore the urgency of integrating climate adaptation into Vietnam's sustainable development strategy.

Research Gap and Theoretical Positioning

A growing body of literature has examined the impacts of climate change and adaptation policies in Vietnam. However, most studies focus either on sector-specific vulnerability assessments or on discrete policy evaluations. There remains limited research that systematically analyses Vietnam's development trajectory through an integrated theoretical framework that combines resilience theory and green transition theory.

Resilience theory conceptualises socio-ecological systems as dynamic structures capable of absorbing disturbances, adapting to environmental changes, and undergoing transformative shifts when existing development pathways become unsustainable (Folke et al., 2010). Meanwhile, the multi-level perspective on sustainability transitions explains how structural changes in socio-technical systems enable the shift toward low-carbon and environmentally sustainable development pathways (Geels, 2011). Integrating these frameworks enables a more comprehensive understanding of whether Vietnam's adaptation efforts represent incremental adjustments or deeper structural transformation.

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Addressing this gap is scientifically significant because it enables evaluation not only of policy outputs but also of systemic change. It further contributes to the broader debate on how emerging economies can reconcile rapid economic growth with climate resilience and decarbonization goals.

Research Aim and Research Questions

This study aims to examine Vietnam's sustainable development pathway in adapting to climate change during the period 2011–2024, assessing the extent to which the country has undergone structural transformation from the perspectives of resilience and green transition.

Research Aim

To achieve this aim, the study pursues the following objectives:

(1) To evaluate Vietnam's progress in integrating climate adaptation into sustainable development strategies between 2011 and 2024.

(2) To identify structural constraints that limit the effectiveness of green transition and resilience-building efforts.

(3) To determine the necessary conditions for shifting from incremental adaptation to systemic transformation.

Research Aim and Research Questions

Accordingly, the study addresses three central research questions:

1. What progress has Vietnam achieved in sustainable development adaptation to climate change during 2011–2024?

2. What structural barriers constrain the green transition and resilience-building process?

3. What institutional and economic conditions are required to move from incremental adaptation toward systemic transformation?

Research Results

Forest Area Dynamics and Carbon Sequestration Capacity

Forest protection and restoration represent an important component of Viet Nam's climate change mitigation and sustainable development strategies. National policy frameworks on green growth emphasise the expansion and sustainable management of forest resources as a key mechanism to enhance carbon sequestration and ecological resilience (Prime Minister of Viet Nam, 2012; Prime Minister of Viet Nam, 2021). In addition, Viet Nam's updated nationally determined contribution highlights the role of the land use, land-use change and forestry (LULUCF) sector in achieving national greenhouse gas mitigation targets (UNFCCC, 2023).

During the period 2011–2024, Viet Nam recorded a gradual increase in overall forest cover, although the internal structure of forest resources changed considerably between natural forests and planted forests (See Figure 1).

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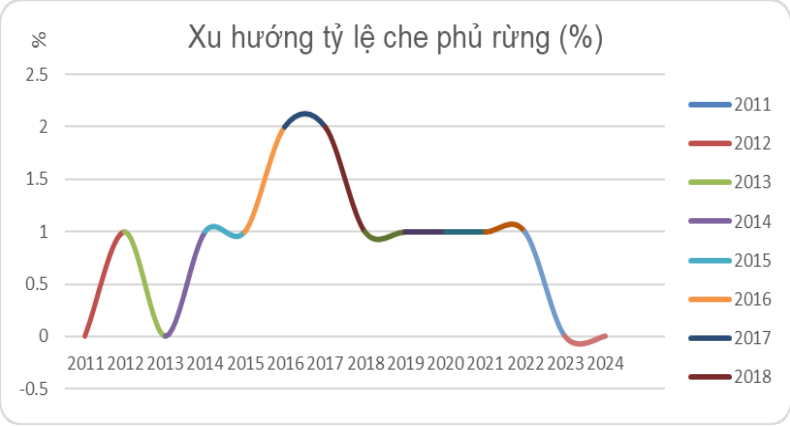
Figure 1

Forest area and forest cover rate in Viet Nam, 2011–2024 (%).



Source: Author's compilation based on data from the Ministry of Agriculture and Rural Development (2012–2024) and Global Forest Watch (n.d.).

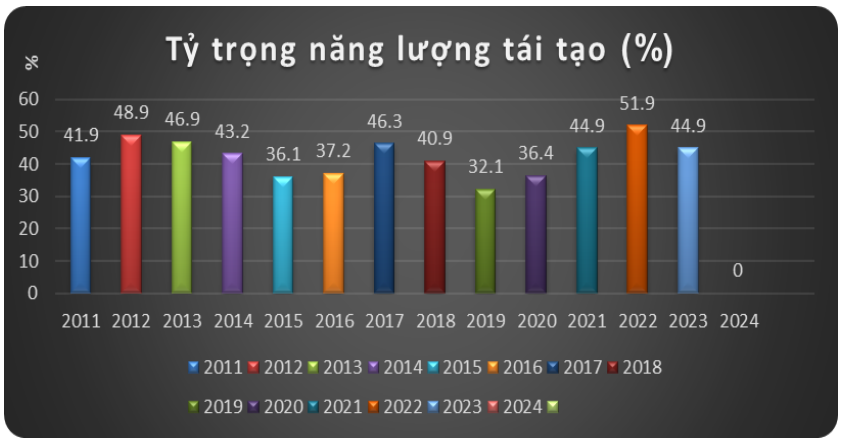
The results indicate that total forest area increased by approximately 1.3 million hectares over twelve years. Nevertheless, the proportion of natural forests declined from around 74% to approximately 67%, while the share of planted forests increased correspondingly. This pattern suggests that forest recovery has largely prioritised quantitative expansion over the restoration of ecological quality. Although forest cover has improved, differences in forest composition and quality remain an important issue for long-term ecosystem resilience and climate mitigation capacity (Global Forest Watch, n.d.; World Bank, 2021).

Energy Structure Transformation and Drivers of Green Transition

The period 2015–2023 witnessed a significant expansion of renewable energy in Viet Nam, particularly in solar and wind power. This development was strongly influenced by feed-in tariff (FIT) mechanisms and policy incentives introduced under the National Green Growth Strategy and subsequent power sector planning frameworks (Prime Minister of Viet Nam, 2012; Ministry of Industry and Trade, 2023) (See Figure 2)**.**

Figure 2.

Share of renewable energy in Viet Nam's total primary energy supply, 2011–2024 (%).



Source: Author's compilation based on data from the Ministry of Industry and Trade (2015, 2020, 2023) and the International Renewable Energy Agency (IRENA, 2021, 2024).

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The share of renewable energy—particularly solar and wind—has increased steadily over the past decade, reflecting accelerated deployment after 2018. According to IRENA's Renewable Capacity Statistics, Viet Nam experienced one of the fastest solar capacity expansions in Southeast Asia during the period 2019–2021 (IRENA, 2021; 2024).

Despite this rapid growth, coal-fired power plants continue to represent a substantial share of the national electricity system. In 2023, coal accounted for roughly one-third of installed power capacity and remained a key source for maintaining electricity supply stability (Ministry of Industry and Trade, 2023). The Updated Nationally Determined Contribution further confirms that fossil fuels still play a significant role in Viet Nam's current energy structure (UNFCCC, 2023).

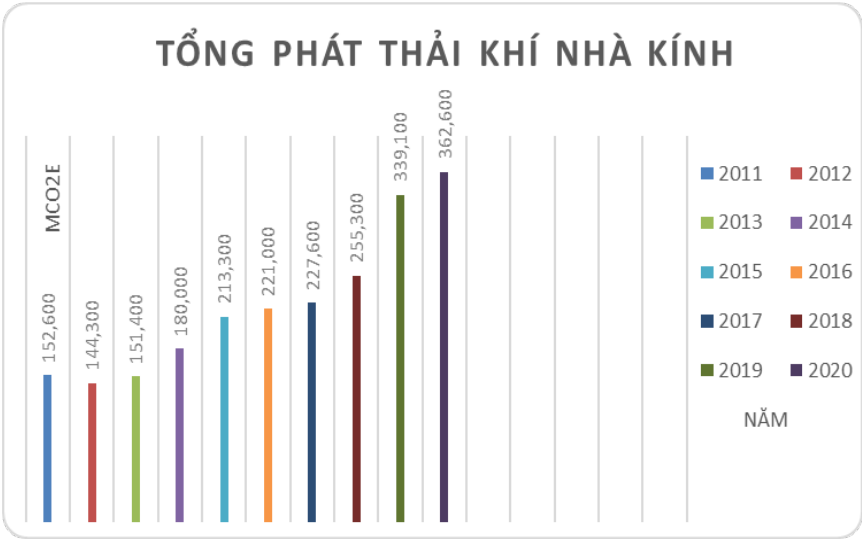
These findings suggest that Viet Nam's green transition is currently situated at the stage of technological expansion rather than systemic restructuring. While renewable energy capacity has grown rapidly, the structural dependence on coal suggests that a comprehensive transformation of the energy system has not yet been fully realised.

Emissions Trends and the Growth-Carbon Nexus

Despite the rapid expansion of renewable energy, Viet Nam's total greenhouse gas (GHG) emissions have continued to increase, largely driven by sustained economic growth and industrialisation (see Figure 3).

Figure 3.

Total greenhouse gas emissions in Viet Nam, 2011–2024 (million tons CO_2e).



Source: Author's compilation based on data from the Ministry of Natural Resources and Environment (2022), UNFCCC (2023), and World Bank (2021).

The results indicate that Viet Nam's Gross Domestic Product (GDP) increased more than threefold from 2011 to 2024, reflecting rapid economic expansion. During the same period, total GHG emissions rose by approximately 66%. However, emissions intensity per unit of GDP declined from approximately 1.85 to 1.01 tons CO_2e per thousand USD of GDP.

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These trends suggest improvements in energy efficiency and carbon productivity. In analytical terms, this pattern reflects relative decoupling, whereby economic growth outpaces emissions growth. Nevertheless, absolute decoupling has not yet been achieved, as total emissions continue to increase alongside economic expansion.

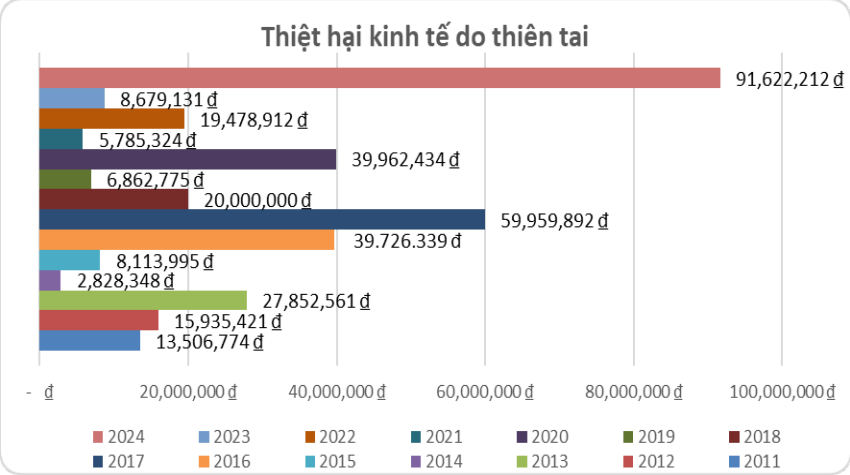
National greenhouse gas inventory reports confirm that the energy sector remains the largest and fastest-growing source of emissions in Viet Nam, reflecting the continued dominance of fossil fuels in the national energy mix (Ministry of Natural Resources and Environment, 2022; UNFCCC, 2023).

From the perspective of green transition theory, these findings indicate that Viet Nam's climate trajectory currently reflects incremental improvements in efficiency rather than a structural transformation of the development model, as economic growth remains closely linked to energy consumption and industrial expansion (World Bank, 2021).

Economic Losses from Natural Disasters and Limits of Adaptive Capacity (see Figure 4)

Figure 4.

Economic losses from natural disasters in Viet Nam, 2011–2024 (billion VND).



Source: Author's compilation based on reports from the National Steering Committee for Natural Disaster Prevention and Control (2011 – 2024).

Economic losses from natural disasters fluctuated considerably during the study period, ranging from approximately 1% to 3% of GDP annually (World Bank, 2021). Major extreme weather events—including typhoons, floods, and landslides – have repeatedly caused severe damage to infrastructure, agricultural production, and local livelihoods.

Although public investment in disaster risk reduction and climate adaptation has increased under national climate policies and strategies (Prime Minister of Viet Nam, 2011; Ministry of Natural Resources and Environment, 2022), the magnitude of economic losses does not show a consistent downward trend.

This pattern suggests that while absorptive and adaptive capacities have improved in certain sectors, systemic resilience remains constrained when confronted with increasingly frequent and intense climate shocks. The persistence of substantial disaster-related losses highlights structural limits in adaptive capacity, particularly in vulnerable coastal and mountainous regions (World Bank, 2021).

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Vietnam's Position in the Green Transition Process

The findings indicate that Viet Nam has made measurable progress in expanding renewable energy capacity, increasing forest cover, and reducing emissions intensity per unit of GDP. However, total greenhouse gas emissions continue to rise, and coal remains a significant component of the national power mix (Ministry of Industry and Trade, 2023; UNFCCC, 2023).

From a multi-level transition perspective (Geels, 2011), sustainability transitions typically evolve from niche experimentation to regime expansion and eventually systemic restructuring. The Vietnamese case suggests that the transition has moved beyond the early experimentation phase and entered a stage of technological scaling, particularly in solar and wind power development. Nevertheless, several structural elements - such as fossil fuel dependence, grid infrastructure constraints, and industrial growth patterns- remain largely unchanged.

This configuration reflects an intermediate transition stage in which new and incumbent energy systems coexist. The persistence of coal-based infrastructure increases the risk of carbon lock-in, potentially constraining long-term decarbonization pathways. Without deeper institutional and structural reforms, technological expansion alone may not be sufficient to achieve a comprehensive systemic transformation.

Resilience: From Absorptive to Transformative Capacity

Applying the resilience framework (Folke et al., 2010), the empirical results reveal differentiated capacities across three dimensions.

First, absorptive capacity has improved through forest expansion and increasing public investment in disaster risk reduction and climate adaptation. National greenhouse gas inventory reports indicate that the land use, land-use change and forestry (LULUCF) sector continues to function as a net carbon sink in Viet Nam, thereby contributing to national mitigation efforts (Ministry of Natural Resources and Environment, 2022).

Second, adaptive capacity is reflected in policy adjustments and institutional responses, including renewable energy incentives and the implementation of national green growth strategies (Prime Minister of Viet Nam, 2012). The rapid expansion of solar and wind power since the late 2010s demonstrates increasing institutional responsiveness to emerging climate and energy challenges.

However, transformative capacity remains limited. Economic growth continues to rely heavily on energy-intensive industrial production and rapidly expanding electricity demand. The absence of absolute decoupling between greenhouse gas emissions and economic growth indicates that the structural drivers of emissions remain embedded in the current development model.

Overall, the findings suggest that while Viet Nam has strengthened absorptive and adaptive capacities, transformative capacity—defined as the ability to restructure socio-economic systems toward low-carbon development fundamentally—has not yet been fully realised.

The Growth–Emission Paradox

The study identifies a pattern of relative decoupling, in which emissions intensity declined substantially while total greenhouse gas emissions continued to increase during the period 2011–2024 (Ministry of Natural Resources and Environment, 2022; UNFCCC, 2023). Empirical estimates indicate that total emissions increased by approximately two-thirds over the study period.

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This outcome reflects a common structural paradox observed in many emerging economies. Economic growth creates fiscal space for green investment and technological upgrading, but it simultaneously expands energy consumption and material demand. In the Vietnamese context, improvements in carbon productivity have not yet offset the scale effects associated with rapid GDP growth.

Consequently, absolute decoupling – defined as a situation in which total emissions decline while economic output continues to grow – has not yet been achieved. This suggests that efficiency improvements alone are insufficient to meet long-term climate targets. Structural transformations in production systems, energy infrastructure, and consumption patterns will likely be required to align economic development with the country's net-zero commitments.

Limits of Incremental Adaptation

Economic losses associated with natural disasters have remained substantial over the past decade. Available data indicate that disaster-related damages in Viet Nam typically range from approximately 1% to 3% of GDP annually, reflecting persistent exposure to climate-related shocks (National Steering Committee for Natural Disaster Prevention and Control, 2012–2024; World Bank, 2021).

Current adaptation measures—including infrastructure reinforcement, early warning systems, and forest restoration—primarily represent incremental adjustments within the existing development framework. While such measures contribute to short-term risk reduction and resilience enhancement, they may not sufficiently address systemic or non-linear climate risks.

In this context, transformative adaptation—involving structural policy reforms such as climate-integrated spatial planning, livelihood diversification, and long-term climate mainstreaming into development strategies—may be necessary to reduce underlying vulnerability.

Viet Nam in Comparative Perspective

In regional terms, Viet Nam has emerged as one of the fastest-growing renewable energy markets in Southeast Asia, particularly in solar power deployment since 2018 (IRENA, 2024).

At the same time, rising per capita emissions and continued dependence on coal-fired power generation distinguish the country from economies that have already initiated deeper decarbonization pathways. This dual dynamic reflects the structural tensions between rapid industrialisation and long-term climate mitigation.

As both a climate-vulnerable country and a rapidly industrialising emitter, Viet Nam occupies a critical position in the global transition landscape. Its capacity to reconcile sustained economic growth with structural decarbonization will carry broader implications for other emerging economies confronting similar development constraints.

Policy implications

The empirical findings indicate that Viet Nam's current transition trajectory remains largely incremental. Moving toward a systemic transformation, therefore, requires policy orientations that address structural drivers of emissions and vulnerability rather than relying primarily on isolated technical interventions.

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A critical priority involves the effective implementation of carbon pricing mechanisms accompanied by robust measurement, reporting, and verification systems. By internalising the environmental costs of emissions, such mechanisms can create stronger incentives for low-carbon investment and facilitate progress toward absolute decoupling of economic growth from greenhouse gas emissions.

Equally important is the restructuring of the national energy system. While the rapid expansion of solar and wind power represents a significant step forward, long-term decarbonization will depend on gradually reducing structural dependence on coal-based electricity generation. Achieving this transition requires coordinated investment in grid modernisation, transmission infrastructure, and energy storage capacity to accommodate increasing shares of variable renewable energy (Ministry of Industry and Trade, 2023).

Forest governance also plays a strategic role in climate mitigation. Current policy outcomes suggest that the growth of planted forests has largely driven forest expansion, whereas natural forests continue to decline in relative proportion. A more balanced policy approach should therefore emphasise ecological restoration and the protection of natural forest ecosystems, which provide higher biodiversity value and greater long-term carbon sequestration capacity.

Strengthening climate resilience further necessitates the systematic integration of climate risk considerations into regional and local development planning. Subnational governance levels remain particularly vulnerable to extreme climate events, highlighting the importance of embedding climate adaptation into spatial planning, infrastructure investment, and livelihood diversification strategies (World Bank, 2021).

Finally, the mobilisation of climate finance—both domestic and international—represents a key enabling condition for large-scale transformation. However, financial expansion alone is insufficient. Ensuring the effective utilisation of climate resources requires improvements in institutional transparency, governance capacity, and policy coordination across sectors.

Taken together, these policy directions suggest that progressing from incremental adaptation toward a transformative green transition will depend on coordinated institutional reform, structural economic adjustment, and sustained innovation within the national development strategy.

Conclusions

Between 2011 and 2024, Viet Nam achieved notable progress in several dimensions of climate-related development. Renewable energy capacity expanded rapidly, forest cover increased, and emissions intensity relative to economic output declined. These developments indicate measurable advances toward a greener development pathway.

Despite these improvements, important structural challenges remain. Total greenhouse gas emissions have continued to rise alongside rapid economic growth, while disaster-related economic losses remain significant. Such patterns reveal that efficiency gains and technological deployment alone have not yet translated into a comprehensive transformation of the development model.

The empirical evidence suggests that Viet Nam currently occupies an intermediate stage in the sustainability transition process. This stage is characterised by relative decoupling between emissions and economic growth, as

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well as incremental forms of climate adaptation, rather than by a fully systemic restructuring of production and energy systems.

Achieving the national commitment to net-zero emissions by 2050 will therefore require bigger structural changes that extend beyond technological upgrades or efficiency improvements. Long-term progress will depend on comprehensive energy system restructuring, economic diversification toward lower-carbon sectors, and the strengthening of transformative institutional capacity.

More broadly, the Vietnamese experience illustrates a fundamental dilemma faced by many developing economies. Rapid industrialisation and economic growth remain essential for improving living standards, yet these objectives must increasingly be reconciled with the urgent demands of climate mitigation and adaptation. Navigating this tension will be central to determining whether emerging economies can pursue sustainable development within an increasingly unstable global climate system.

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The Governance Lag: When Technological Innovation Accelerates Faster Than the Law of Sustainability

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ABSTRACT: This paper focuses on the widening governance gap between technological innovation and sustainability law in India. The sudden growth of digital technologies in the form of artificial intelligence, data centers and cloud computing has brought about new environmental issues that current legal systems are unable to manage. With the help of the doctrinal legal analysis and conceptual modeling, the paper addresses the problem of how technological acceleration tends to exceed the pace of environmental regulation development. The paper identifies gaps in the Indian environmental law and policy in the aspect of sustainability governance of emerging technologies. The constitutional grounds of sustainable technological governance are discussed through the judicial precedents and policy developments. The study states that the increasing gap between innovation and law should be closed with the help of adaptive regulatory systems to provide sustainable technological development in India.

KEYWORDS: Environmental Regulation, Governance Lag, Sustainability Law, Technological Governance.

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Introduction

One of the major characteristics of the twenty-first century is technological innovation. Artificial intelligence, digital infrastructure, and data-driven technologies are rapidly changing the world's economies and governance systems (Brynjolfsson & McAfee, 2014). Although the development of technology opens new prospects for economic development and social advancement, it also brings about tremendous environmental challenges. Large-scale data centers use vast quantities of electricity and water, artificial intelligence systems demand high computation, and e-waste increases with the high rate of replacement of electronic devices (International Energy Agency, 2023; The global e-waste monitor, 2024). The regulation that controls environmental protection in India is mainly the development that occurred in the industrial era in order to deal with the pollution by the factories and heavy industries. Therefore, the current legislation does not necessarily have any clauses directly pertaining to the environmental impact of the digital technological growth (Marchant & Allenby, 2017). This scenario sets a governance gap whereby technological innovation is evolving at a higher rate than the laws and institutions that should govern its effect on the environment.

Objectives

1. To examine legal gaps in Indian laws on environmental and technology in the sustainability effects of new digital technologies.
2. To determine the gap in governance between technological innovation and sustainability regulation in India.

Research Questions

1. What are the environmental sustainability problems that technological innovation can bring about in India?
2. What are the legal loopholes of the regulatory frameworks of the Indian laws relating to emerging technologies and digital infrastructure?
3. What is the solution to closing the technological innovation to environmental sustainability gap in Indian law?

Research gap

The emerging trend of how digital technologies are environmentally sustainable has not been adequately explored in the context of the current environmental and technology law. Though it has been widely researched into how the environment is regulated within the industries, there is a lack of studies that explore the gap in governance affected by the current pace of digital technological innovation and its sustainability consequences.

Methodology

The researcher has used doctrinal legal research methodology to strengthen the study. The major

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sources, like statutes and judicial decisions, are examined with the secondary sources, like the academic literature and policy reports. The structural gap between technological innovation and legal regulation is also explained through conceptual modelling.

Indian Legal Context

The environmental governance in India is also mainly influenced by the constitutional principles and judicial interpretation, as opposed to technology-specialized sustainability regulation. The Supreme Court has interpreted Article 21 of the Constitution to incorporate the right to a clean and healthy environment as it was established in the case of *Vellore Citizens Welfare Forum v. Union of India*[1], *M. C. Mehta v. Union of India*[2] and *Subhash Kumar v. State of Bihar*[3]. However, the recent judicial trends exemplify the changing role of the Indian courts in the governance of sustainability issues. In *Vanashakti v. Union of India*[4], the Supreme Court held that post-facto environmental clearances are unlawful and underlined that retrospective approvals would vitiate the principle of precautions and Article 21 environmental rights. Under the precautionary principle, environmental approval should be obtained before implementation of any project. On the same note, the legal cases over the e-waste regulatory system in India and the directions of the High Court (The Times of India, 2025) to use digital surveillance on waste management show how technological progress and environmental control are increasingly becoming intertwined. Although environmental protection has been included in statutes such as the Environment (Protection) Act 1986 and the E-Waste Management Rules 2016, they were not targeted at the emerging digital technologies. As a result, regulatory frameworks are still divided in terms of dealing with sustainability issues with AI infrastructure, data centers, and digital platforms. This lacuna demonstrates that there is a necessity to have adaptive legal frameworks that unite technological regulation with environmental sustainability.

Conceptual Framework and Models

The conceptual framework of this research shows the structure of relationships between technological innovation, environmental sustainability and regulatory governance. The figures below can graphically illustrate the widening gap between the accelerating technological development and the relatively sluggish progress of the legal frameworks concerned with sustainability. The sources taken are the International Energy Agency (2023) and the United Nations Global E-Waste Monitor (2024).

[1] Vellore Citizens Welfare Forum v. Union of India, AIR 1996 SC 2715.
[2] M. C. Mehta v. Union of India, AIR 1987 SC 965.
[3] Subhash Kumar v. State of Bihar, AIR 1991 SC 420.
[4] Vanashakti v. Union of India, Writ Petition (Civil) No. 1394 of 2023, 2025 SCC OnLine SC 1703.

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Figure 1

Technological Innovation to Law Governance Lag

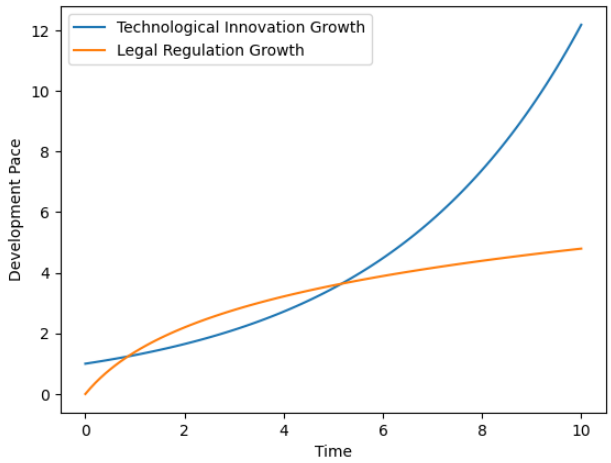

Figure 1 demonstrates the imbalance of structure between the fast increase in technological innovation and the relatively slow development of legal regulatory frameworks. The widening of the two curves is the new governance lag, which denotes the failure to keep pace with technological improvement by legal systems.

Figure 2

Gap Curve Innovation-Regulation

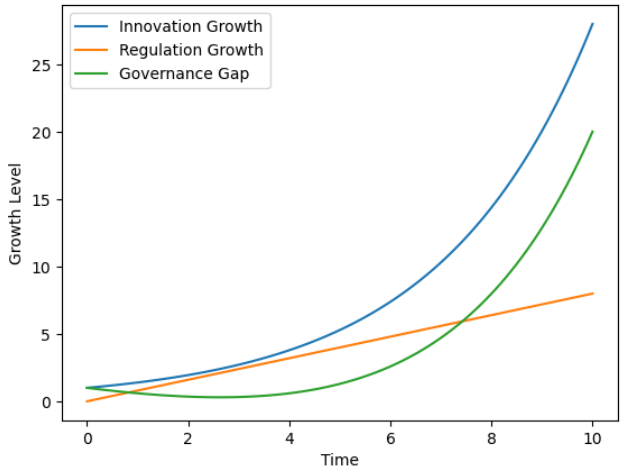

Figure 2 shows that the widening gap of technological innovation and regulation development increases with time as the innovation is exponential, whereas the legal responses are linear. This increasing gap brings about governance issues that make proper regulation of sustainability to be a problem.

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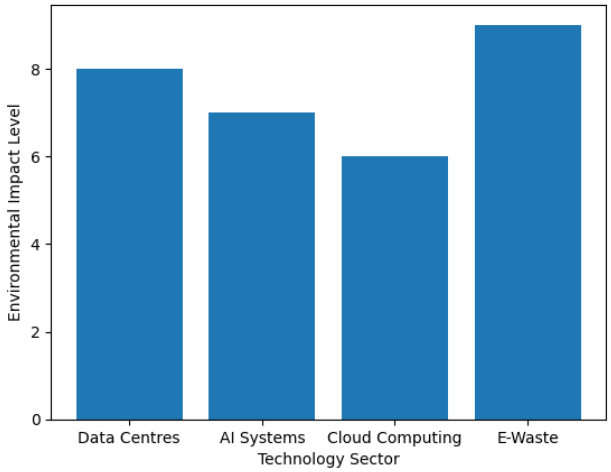
Figure 3

Emerging Technologies' Sustainability Impact



The graph in figure 3 depicts the difference in the degree of environmental influence of key areas of technology as data centers, artificial intelligence systems, cloud infrastructure, and electronic waste. It is indicative of the growing digital technologies' environmental impact and the pressing necessity of sustainability-oriented regulatory frameworks.

Table 1

The Empirical Governance Lag on Digital Sustainability.

Indicator	Evidence of Technological Expansion	Sustainability/Environmental Concern	Regulatory Status
Data Centre Expansion	Global data centre electricity demand reached nearly 460 TWh in 2022	High electricity consumption and water usage for cooling	Limited sustainability regulations in many countries including India
Artificial Intelligence Infrastructure	Training large AI models requires massive computational energy and carbon-intensive data processing	Significant carbon footprint and rising energy demand	AI governance policies exist but environmental regulations remain minimal
Electronic Waste (E-Waste)	Global e-waste generation reached 62 million tonnes in 2022	Toxic waste and resource depletion	India regulates e-waste through E-Waste Management Rules but enforcement gaps remain
Cloud Computing Growth	Rapid growth of cloud infrastructure supporting digital services	Increased energy demand and digital carbon footprint	Sustainability requirements for cloud infrastructure remain limited
Cryptocurrency Mining	High-energy blockchain validation systems	Major electricity consumption and environmental impact	Few environmental regulations governing crypto mining in India

In Table 1, the indicators show that there is a clear gap in governance in balancing technological

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development and sustainability regulation. As the digital technologies keep growing in the sector rapidly, the environmental regulatory measures related to their ecological footprint have been in a state of fragmentation and retaliation, especially in emerging economies such as India.

Findings

Technological innovation in India is improving at an accelerated rate compared to regulatory development. New technologies introduce the environmental risks which are not clearly stated in the current legislation. Regulatory organizations do encounter the issue of coordination in the incorporation of technological policy and environmental regulation. The environmental effects of digital infrastructures are not properly controlled. Policy initiatives focus more on technological development and not on sustainability governance.

Suggestions

In order to overcome the problem of governance lag, policymakers need to establish technology-specific rules of sustainability, establish environmental impact testing of digital infrastructure, and establish precautionary regulatory systems on future technologies.

Conclusion

The rising rate of technological transformation has radically transformed the relationship that existed between development, governance and the environmental sustainability. Digital technologies or artificial intelligence are still in a mid-boom in India, but legal systems governing their environmental impact are predominantly poor and disjointed. It can be regarded as a sign of a structural issue of modern regulatory systems, whereby the law is made as cases arise and technology is being developed exponentially. Although Indian environmental jurisprudence finds its reflection in a few famous decisions, such as the one of Vellore Citizens Welfare Forum v. Union of India and M. C. Mehta v. Union of India, it has established the foundational pillars like sustainable development and precautionary approach, and these dogmas are yet to be implemented in the governance systems on technology holistically. The resolution to such a contradiction is through being foresighted in the regulatory mechanisms of anticipating the technological threats rather than consistently responding to environmental damage after it has occurred. The sustainable innovation governance model is a mix of technological development, environmental responsibility, and relaxed legal rules that will enable India to find a compromise between environmental safety and economic development in the digital age.

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SafeSwipe: A Cloud-Enabled XGBoost Framework for Credit Card Fraud Detection

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ABSTRACT: The abuse of the credit card systems is a significant cause of financial risks that are subjecting both the customers and the banking institutions to a significant level of risk. Conventional fraud detection systems, which are generally based on a preconfigured set of rules, are unable to adapt fast enough to changing fraud techniques. Consequently, they often produce a significant number of false alarms and decrease the effectiveness of the entire prevention procedure. To overcome these limitations, this paper presents a machine learning-based framework, which combines the use of Amazon SageMaker and XGBoost. With the help of historical transaction data classified as legitimate or malicious, the model is taught the ability to identify the slight changes of behavior that can lead to malice. The proposed approach will enable quick, adaptive evaluation unlike fixed rule engines and can dynamically adapt to new fraud patterns. Such models can be created, modified and stored in Amazon SageMaker, using limited infrastructure, in an easy managed manner. Gradient boosting implementations, such as XGBoost provide greater accuracy and lower false positive detection rates. As a result, this combined usage will strengthen payment security and improve the reliability and convenience of transaction processing for all financial organizations and customers.

KEYWORDS: Credit Card Fraud Prevention, Adaptive Machine Learning, Amazon SageMaker Platform, XGBoost Classifier, Dynamic Fraud Detection, Behavioral Pattern Analysis, Secure Transactions.

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I. Introduction

As the number of transactions made electronically is on an upward trend, the problem of credit card fraud has become a burning issue to both individuals and financial organizations. Traditional rule-based systems simply do not keep up with more advanced offenders and their methods of committing fraud, thus they are frequently unable to discover the hidden structure of a fraud. A potential solution is machine learning. As an example, one can refer to the project Fraud Shield, in which the authors state that with the help of cutting-edge analytics and scalable cloud solutions, they can evaluate huge amounts of payment data, increasing the effectiveness of identifying suspicious activity.

Although solutions like Fraud Shield use strong ensemble models such as XGBoost to identify frauds, a more explainable model was used in this project; an implementation of Logistic Regression. Famous due to the ability to estimate the unique aspects that inform a binary classification process, Logistic Regression discloses the Standalone factors that control the classification of a transaction as either legitimate or suspicious.

This not only aids in understanding and explaining the decision-making process but also serves as a solid foundation for developing more complex models in the future.

The aim of the study is to develop an effective system of fraud detection that encompasses both sophisticated learning models with the interpretability of logistic regression that will ensure the flexibility to new methods used in fraud and maintain transparency in the classification outcome.

II. Literature review

Credit card fraud presents substantial financial threats and requires advanced machine learning (ML) and cloud-based detection systems. Conventional techniques are not effective in overcoming the changing patterns of frauds and this necessitates the use of ML models to identify frauds accurately [1], [2].

ML methods such as Random Forest (RF), Logistic Regression (LR), Decision Tree (DT), and XGBoost (XGB) are known to have high interpretations of fraud detection with an accuracy of 98.37 and F1-score of 97.95. The techniques of pre-processing used to improve data quality include feature selection and outlier rejection [3], [4]. Further models such as Hidden Markov Models, Naïve Bayes, and k- Nearest Neighbors are behavioral analysis models that enhance the detection of frauds based on transaction patterns [5].

SMOTE is used in conjunction with ensemble models optimised by Particle Swarm Optimisation (PSO) to address the imbalance between authentic and fraudulent samples in fraud detection. Robust performance is ensured by evaluation metrics like Precision, Recall, F1-score, and Accuracy [7], [8]. Cloud computing provides a means to perform secure, scalable monitoring to minimize data loss and confidentiality problems, however when it comes to fraud detection, systems such as Convolutional Neural Networks (CNN), Support Vector Machines (SVM), and Artificial Neural Networks (ANN) perform much better than traditional ML systems.

During COVID-19, there was a 225% increase in online fraudulent transactions that created more demand for AI-based solutions.ii Therefore, using AWS-based fraud detection systems such as Fraud Detector, A2I, SageMaker, Glue, and Lambda, real-time confirmation of identity and efficient processing of transactions become possible. [9], [10]. On a whole, rule-based methods in fraud detection were the traditional approach, but do not appropriately accommodate the ongoing changes in fraud. iii However, machine learning models are able to predict outcomes based on patterns from previously processed transaction records and therefore have provided increases in accuracy, where as traditional methods were much below what would be considered acceptable [11], [12]. For example, models such as Decision Trees (DT), SVM, and various ensemble methods have demonstrated superior accuracy levels [13], [14].

Sophisticated methods using deep learning techniques, particularly ANNs and CNNs, have been instrumental in advancing fraud detection due to their capabilities for accurately modelling the correlations among many variables (high-

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dimensional data) [15],[16]. In addition to those, recent studies explored the usage of autoencoders and GANs for detecting anomalies in credit card transactions; the results showed promise [17],[18].

Cloud-based systems on platforms such as AWS offer both scalability and cost-effective options for deploying fraud detection systems. Real-time detection can be implemented at a lower overall infrastructure cost through serverless computing and services such as AWS Lambda, SageMaker and Fraud Detector [19]. Implementation of tough regulations like GDPR and PCI DSS has created challenges for companies to ensure that customer data maintains its confidentiality, which is a major focus in today's world [20]. Various machine learning algorithms are used in conjunction with these cloud-based solutions to optimize accuracy and dependability in fraud deterrent processes.

To identify fraud, a number of models based on DT, RF, ANN, LR, and SVM are used. Feature selection techniques such as chi- and Pearson correlationTests help identify important characteristics, which improves model effectiveness as digital marketplaces expand quickly and credit cards become more widely used [21], [22]. Logistic regression minimises false positives while achieving nearly 99% accuracy, according to comparative analyses [21].

The rapid expansion of digital marketplaces and the growing prevalence of credit cards have led to a sharp increase in fraud incidents. For effective fraud detection, more sophisticated methods like approximate reasoning, artificial intelligence, and data mining are required because traditional pattern-matching techniques have proven inadequate [21], [22]. According to recent studies, Transformer models outperform traditional machine learning algorithms like RF, SVM, and XGB in detecting fraud. Their robust and consistent performance is supported by metrics such as Precision, Recall, F1 Score, and ROC AUC [23].

The rare instances of fraudulent transactions lead to a significant class imbalance which makes the problem of accurate detection more difficult. Various boosting methods, like XGB, are used to tackle this problem and hence, the detection accuracy is getting better [24], [25]. Besides that, ML models built with TensorFlow have been found to be very helpful in fraud prediction as they take in past transaction data and thus, the output is an efficient and accurate detection system [26].

Majority of Americans faced credit card fraud in 2021 as per the findings published in 2021. This situation had been the cause for an urgent call to automate fraud detection methods. Out of six supervised machine learning models—Naive Bayes, SVM, RF, KNN, LR, and XGB—SVM was found to have the highest accuracy in detecting fraud transactions [27],[28].

Deep learning methods notably CNNs, have similarly demonstrated considerable potential in fraud detection. Using the European card benchmark dataset, experiments unveiled that accuracy, F1-score, and AUC metrics were substantially improved when deep learning was integrated with data balancing techniques [29],[30].

III. METHODOLOGY

The suggested system utilizes Amazon SageMaker to develop and deploy an XGBoost model for the identification of fraudulent credit card transactions through a range of processes including: preprocessing; training; validating; deploying; and monitoring in real-time.

A. Data Collection and Preprocessing

To train the model, an openly available dataset of credit card transactions would be utilized. Prior to the training stage, preprocessing steps would take place, including:

1. **Data Cleaning**: Removing missing values, duplicates, and inconsistencies.

2. **Feature Engineering:** Extracting significant features, including transaction time, amount, merchant category, and user spending behaviors.

3. **Handling Data Imbalance:** Given the scarcity of fraudulent transactions, SMOTE is utilized to balance the data.

4. **Data Normalization:** Standardizing numerical features to improve model convergence.

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B. Model Training Using XGB on Amazon SageMaker

The algorithm is selected based on the fact that it implements an optimized version of the traditional gradient boosting algorithm (XGBoost), which is known for its accuracy and is able to be executed in a timely manner when performing the task of identifying fraudulent credit card transactions. As an example, the model would be trained using Amazon SageMaker's managed training environment (the managed training environment is known to support high-performance computing) alongside GPU-based instances for faster processing.

Key training steps:

1. **Hyperparameter Optimization:** SageMaker's auto-tuning optimizes learning rate, tree depth, and estimator count.

2. **K-Fold Cross-Validation:** Adopted to prevent excessive fitting to observed data and maintain robust predictive accuracy.

3. **Parallel Processing:** SageMaker distributes computations across multiple instances to reduce training time.

C. Model Evaluation

The below metrics that would be utilized to evaluate how effectively the model identifies fraudulent transactions.

1. **Accuracy:** Quantifies the total predictive accuracy

2. **Precision & Recall:** Measures how well the model will identify fraudulent transactions.

3. **F1-Score:** composite measure of both precision and recall.

ROC-AUC Score: measure of how well the model can distinguish between fraudulent and non-fraudulent transactions.

Once the training has been completed, hosting services provided by Amazon SageMaker would be used to provide access to the trained XGBoost model through a REST API so that real-time access can be accomplished.

Scalable API Integration: A REST API is provisioned to serve the model for real-time fraud detection.

1. **AWS Lambda & API Gateway:** Enables secure and low-latency model inference.

2. **Auto Scaling:** Adjusts computational resources dynamically based on incoming transaction volume.

D. Continuous Monitoring and Model Improvement

In addition, once the model has been deployed, it would be monitored over-time for accuracy through the use of both Amazon SageMaker Model Monitor and Amazon CloudWatch. Key components that would require monitoring include:

1. **Data Drift Detection:** Identifies changes in transaction patterns.

2. **Automated Retraining:** Triggers model updates when performance degradation is detected.

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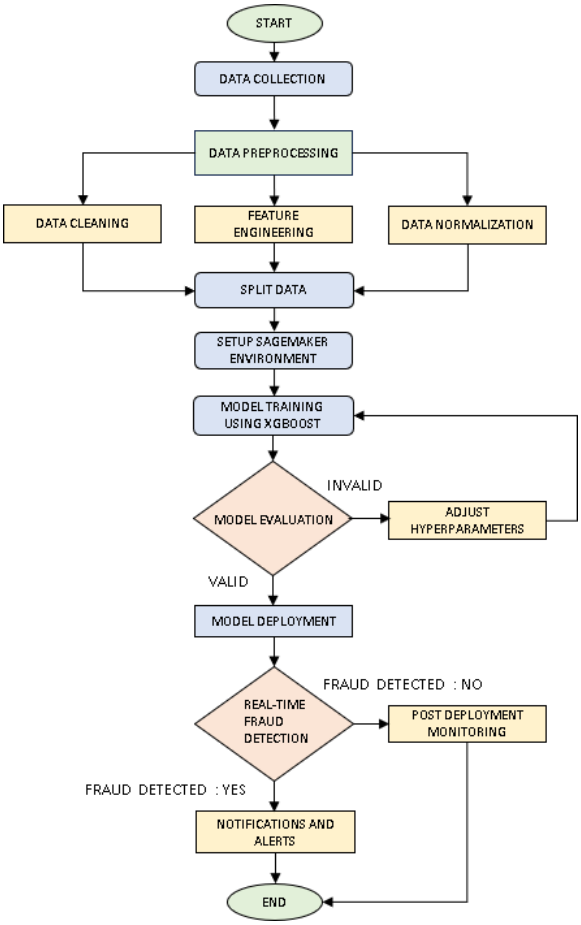
Figure 1

Methodology Flowchart



RESULTS

The training and validation loss curves for classification models (LR, RF, SVM, GB, KNN, and XGB) are shown in Figures 1-7. The loss function used in all models was Log Loss since it is commonly used to assess performance between two binary classes.

Figure 2

Logistic Regression – Loss Curve

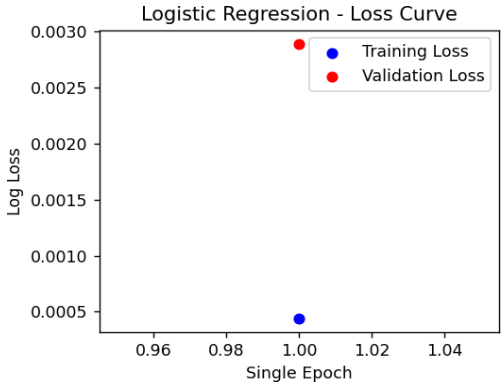


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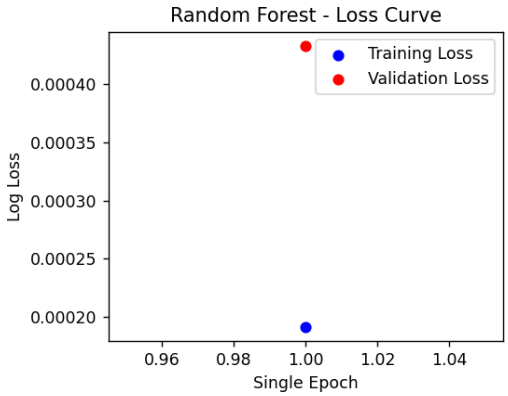
Figure 3

Random Forest – Loss Curve



Analysis of Single-Epoch Trained Models:

For LR, RF, SVM, XGB, and KNN, only one epoch was trained with this model. Therefore, the loss curves for these models only show one point in time, representing the loss after one pass through the training dataset. The loss curves created with only one epoch of training do not give a good indication about how the models are doing with their learning and therefore, any statement made about such points would be nothing more than a guess, and would not be able to be substantiated with much evidence.

Figure 4

SVM – Loss Curve

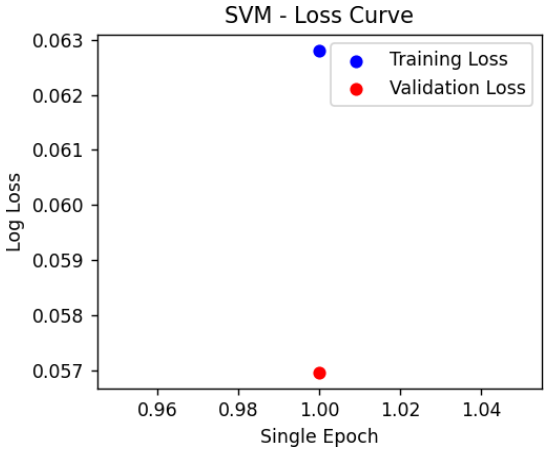
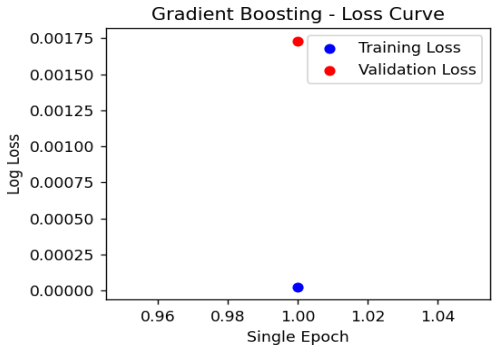


Figure 5

Gradient Boosting – Loss Curve



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Detailed Analysis of XGBoost Loss Curve:

Since the Model trained with XGBoost has undergone a thorough analysis based on multi-epoch training (Figure 7) the loss journey of the training process is well documented.The training loss was lowered very fast in the first epochs and then it became stable, which means that the model was able to find patterns in the data very efficiently. Validation loss followed the same trend and thus the model can be said to generalize well to the new samples. The steady decrease of the validation loss means that the model's predictive performance on new data kept getting better as the training went on. The fact that the gap between training and validation loss is very small is an indication that the model has not overfitted, as the performance on both sets is still very close. Such a convergence is a sign that the model reached a stable state from which it can be expected that further training will give only very small improvements

Figure 6

KNN – Loss Curve

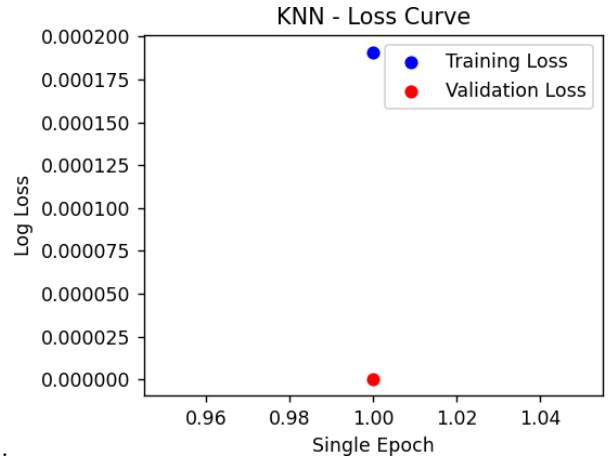

Figure 7

XGBoost – Loss Curve

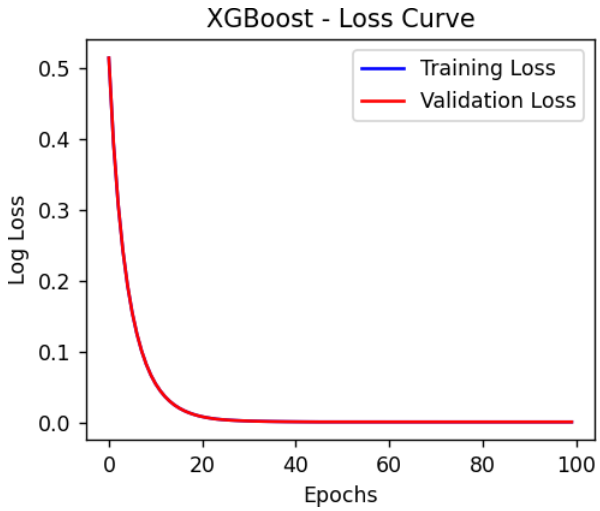

Figure 8 presents a comparative analysis of classification accuracy across six ML models: LR, RF, SVM, GB, KNN, and XGB. The Y-axis quantifies classification accuracy, ranging from 0.0 to 1.0, where 1.0 denotes perfect classification. The X-axis enumerates the respective models.

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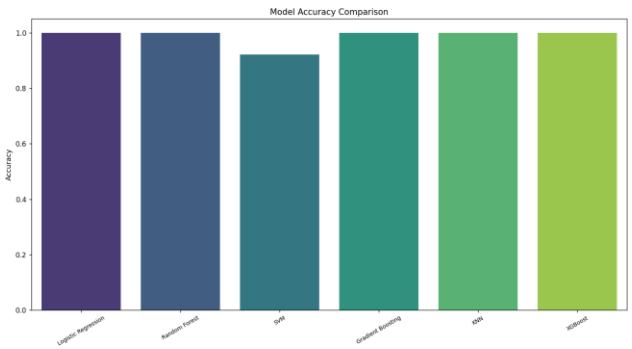
Figure 8

Model Accuracy Comparision



Observed Performance Trends:

Five models, namely LR, RF, GB, and KNN, demonstrated high classification accuracy, close to or scoring 1.0. This indicates that these models have a strong ability to identify patterns in the dataset.

SVM Performance Deviation:

The SVM model showed a fairly less accurate performance as compared to the other models mentioned above. Although SVM results still point to a decent performance, the difference highlights that the model might have struggled to understand and represent the real distribution of the data in the dataset.

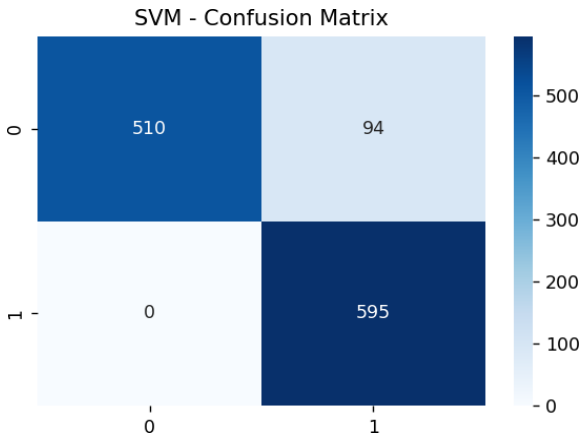
XGBoost Accuracy Anomaly:

A significant difference was noted in the XGB model only that it brought about an accuracy score of 0.492. This result is in conflict with the model's normal performance pattern and thus, it requires further probing to figure out the reasons that are causing it. Possible reasons for this abnormality could be an error in the way the model was implemented, an inconsistency in the data preprocessing, a poor choice of hyperparameters, or even leakage of data, but not necessarily limited to these factors. The next investigation will be directed towards discovering and fixing these possible problems so that the performance evaluation can be accurate and reliable."

Figures 9 to 14 are the confusion matrices for six classification models: LR, RF, SVM, GB, KNN, and XGB. To be specific, XGB, RF, and KNN were able to perform flawless classification. The model made a perfect identification of each instance in the test data set. This outstanding result is the proof of XG's competence in capturing the underlying patterns of the data.

Figure 9

SVM – Confusion Matrix



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The SVM model incorrectly labelled 94 real transactions as fake ones, thus it seems that the model has a tendency to be biased towards the positive class. Such a difference reveals the necessity of examining the model setup in detail which comprises changing the values of the hyperparameters, choosing the kernel, and also checking if there is any imbalance in the classes. In addition, the true negative rate (specificity) of the SVM model that is around 84.4% is lower than that of the other models, as well as the precision value of the positive class (fraudulent transactions) and the recall value of the negative class (genuine transactions) of this model.

Model performance (100%) reveals the SVM's inability to identify negative examples flowed from these limitations indicate that when considering this classification task, the SVM does not appear to be the ideal candidate of choice.

Figure 10

Logistic Regression – Confusion Matrix

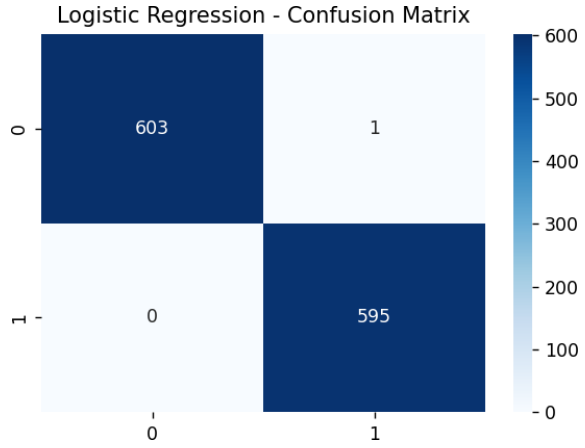
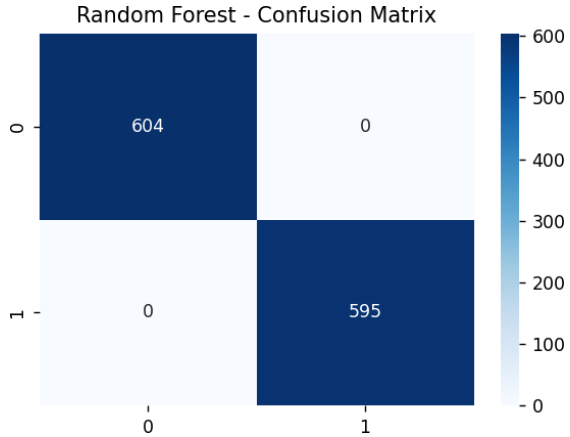


Figure 11

Logistic Regression – Confusion Matrix



The almost perfect performance of RF, KNN, and XGB at the testing phase may suggest that there is an overfitting issue and perhaps some data leakage that causes these models to learn patterns from examples but do not generalize these patterns to new data. To verify the validity of these results, model must use test methods such as k-fold cross-validation and evaluate the performance of the models based on various metrics including accuracy, recall, precision, F1 score, and ROC-AUC. Since the RF, KNN, and XGB models yield almost perfect results, one could conclude that the classification problem is not complicated and that less complex models such as LR would work well; however, the current study is focused on using a more complex method and one that can detect small changes and that is reliable across different situations.

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Figure 12

Gradient Boosting – Confusion Matrix

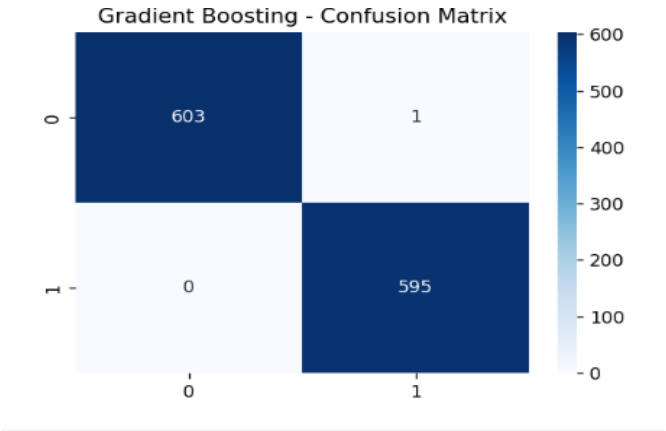
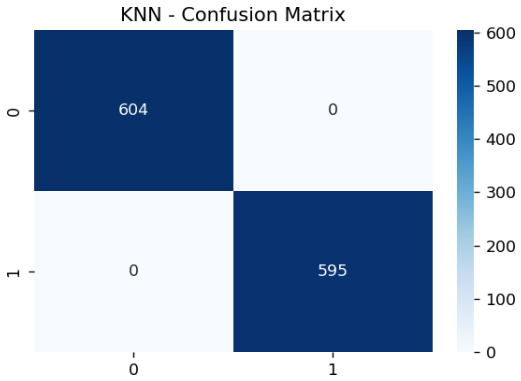


Figure 13.

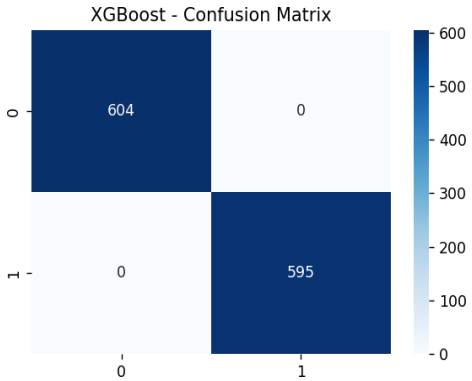
KNN – Confusion Matrix



XGB was used because it is excellent at handling complex relationships and feature interactions, very good at preventing overfitting with efficient regularization techniques and has faster computation speed and scalability with large amounts of data compared to other models such as Random Forest and KNN, which either do not correct errors when making final predictions (Random Forests) or have issues with distance metrics, feature scaling, and irrelevant features (KNN).

Figure 14

XGBoost – Confusion Matrix



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In conclusion, XGB provides ideal classification results and has a competitive advantage with its ability to manage complex data, reduce overfitting, and provide an efficient computation time making it the ideal primary model for the current study. The further validation of the model through evaluation can lead to increased confidence in the use of this model for real-world outcomes.

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Integrating Predictive Analytics and Explainable AI for Lung Cancer Detection within the One Health Framework

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ABSTRACT: Lung cancer is one of the biggest causes of cancer death worldwide, mainly because it often goes undiagnosed until it is too late for effective treatment. Most patients will not have signs or symptoms of lung cancer until well into the disease, when treatment is likely less effective. Once cancer is diagnosed, the chance of survival decreases significantly, and treatment becomes more aggressive, costly, and uncertain. Even with new imaging technologies and improved ways of diagnosing lung cancer, early detection of the disease is still extremely difficult because of the many different genetic, environmental, and lifestyle factors that contribute to lung cancer. For these reasons, we are taking a holistic One Health approach to this research. The focus of this project will be to study and analyze how the interrelationships between health, environmental exposure, and lifestyle choices (e.g., smoking, air pollution, occupational exposure, socioeconomic status) contribute to the development and progression of lung cancer. This study takes into account all of these various elements and moves away from lung cancer research that views lung cancer in only a clinical context to understand it in an ecological and systems-oriented perspective. The main objective of this research is to utilize predictive analytics and machine learning (ML) techniques to analyze health data to determine the factors associated with an increased risk for developing lung cancer. ML and predictive analytics are technologies that allow us to find hidden patterns and non-linear relationships in large, complex data sets. Several different ML algorithms will be used to predict lung cancer, including classification models like Logistic Regression, Random Forest, and Gradient Boosting Machines.

KEYWORDS: Sustainable agriculture, Crop yield prediction, Machine learning (ML), Deep learning, Explainable artificial intelligence (XAI), LIME (Local Interpretable Model-Agnostic Explanations), SHAP (Shapley Additive explanations), Model interpretability, Data quality, Model generalizability.

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Introduction

Recently, advancements in the field of artificial intelligence (AI) and, more specifically, machine learning (ML), have changed how lung cancer is detected and diagnosed at an early stage. For example, Ardila and colleagues (2019) showed that a deep-learning model developed from low-dose CT scans trained on patients could outperform radiologists in detecting early-stage lung cancer, suggesting that AI-assisted screening systems could one day play an important role in clinical practice. Similarly, Coudray and colleagues (2018) used convolutional neural networks (CNNs) to accurately classify different types of lung cancer based on histopathology images, which would improve diagnostic accuracy and facilitate more personalized treatment approaches. Finally, Esteva and colleagues (2019) demonstrated that ML models built from data collected at the time of diagnosis (including medical, demographic and lifestyle) can predict future cancer risk even in people where there are no discernible symptoms of cancer. This highlights the power of predictive analytics to help prevent cancer through early identification of high-risk patients.

In addition to relying on single modalities to create prediction models, there has been increased focus on developing multi-modal approaches in predictive analytic research (i.e., using multiple sources of data as part of a model to improve predictive capabilities) to enhance sensitivity and specificity for detecting cancer early. The development of multi-modal learning frameworks enables AI systems to access complementary information from multiple dataset types to apply cross sectional evaluation methods used to reduce both false-positive and false-negative error rates when detecting early-stage (or pre-symptomatic) cancer. Furthermore, the creation of these integrated datasets will improve predictive modeling performance as well as provide a more holistic understanding of the biology of tumors. Due to recent changes in our understanding of how Artificial Intelligence (AI) can use existing datasets to create a more integrated view, we will conduct a research study on the possibility of predictive machine learning models being created to helps clinicians identify patients who may be at risk for developing lung cancer. We plan on incorporating views of clinical practices and environmental factors from many different sources related to the patient's lifestyle choice and behaviors into AI-based predictive model process. This type of technology could lead to an improved ability to recognize patients with signs of lung cancer earlier and use that information to develop individual treatment plans while minimizing bias when developing collaterally affected areas of public health through proactive health screening methods. Ultimately, we believe the use of AI-based predictive models can ultimately be incorporated into "Evidence-Based Public Health" (EBPH).

These newer studies are using advanced imaging techniques such as radiomics and deep learning to collect complex imaging features compared to traditional approaches that allowed for association of tumor behavior. Wang et al. (2021) also used these approaches in a recently published study to analyze patient records and environmental data to find meaningful predictors and coverage factors that could be used for predicting lung cancer in high-risk populations.

Research Aim and Research Questions

One of the most lethal diseases globally, lung cancer tends to be diagnosed at late stages because it usually has no obvious symptoms in its initial stages. Early detection and accuracy are crucial in reducing patient mortality rates and improving survival rates. Because it can often go undetected until it has progressed significantly, I find lung cancer to be one of the deadliest diseases in the world. Unfortunately, many individuals with lung cancer don't know they have the disease until they experience chronic coughs, chest pain, shortness of breath, or unexplained weight loss that affect their daily activities [11]. Once the patient experiences these symptoms, the malignant disease has often progressed significantly, thus making treatment more difficult and the results less effective. Early detection of lung cancer is important because it greatly contributes to improved long-term survival rates and reduced mortality rates [12]. Traditional methods to diagnose lung cancer include biopsy, imaging (including CT scan and X-ray), and assessment and interpretation of the imaging studies by a highly trained radiologist. However, these types of evaluations can be time consuming, expensive, and primarily depend upon subjective interpretation by radiologists, resulting in significant inter observer variability (different radiologists evaluate the same images very differently). Clinical experience, number of im ages evaluated, and slight differences in the appearance of images can cause frequent delays

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or inconsistencies with regard to a specific diagnosis. Because of these limitations, there is a need for more objective, efficient, and supportive diagnostic testing that can provide the clinician with timely and accurate information about the presence or absence of lung cancer [13][14] .The introduction needs to relate to the problems or issues being recognised and eventually leading the research questions.

B. Research Gap and Contribution Predictive analysis and disease diagnosis have seen significant advancements through machine learning (ML) and explainable AI (XAI). ML models, such as logistic regression, random forests, and deep learning techniques, are widely used to predict disease outcomes, including lung cancer, breast cancer, diabetes, and heart disease, by analyzing clinical data, imaging, and patient demographics [15]. In particular, XAI methods like SHAP and LIME are being applied to enhance the transparency of complex models, helping clinicians interpret predictions and make informed decisions. These techniques are crucial in healthcare, where model interpretability is vital for trust and application in real world settings [16]. Additionally, integrating multi-modal data, such as clinical records, medical images, and genomic data, has improved the accuracy of predictive models, providing a more comprehensive approach to diagnosis and treatment planning. Longitudinal data and real-time monitoring, especially in chronic diseases, have further bolstered the field, allowing for dynamic predictions of disease progression and recurrence, thereby supporting personalized medicine and better patient outcomes. Review proposes a standardized framework to enhance transparency and mitigate bias, including preprocessing protocols and reproducibility checklists tailored to stakeholder needs. By integrating fragmented research efforts and emphasizing usability, this work advances the deployment of XAI in agricultural decision-making, enhancing trust, scalability, and impact in predictive analytics [17]. The integration of advanced machine learning techniques and real-time data collection is transforming the landscape of disease diagnosis and prediction. For instance, machine learning models that utilize medical imaging data, such as CT scans and MRIs, alongside clinical and genetic information, have shown great promise in improving diagnostic accuracy. In lung cancer, deep learning models like convolutional neural networks (CNNs) are used to detect tumors from images with high sensitivity, while genomic data is leveraged to predict susceptibility and guide personalized treatments [18]. Moreover, the combination of predictive analytics and wearable technology has enabled real-time monitoring of patients, offering continuous data streams that can alert healthcare providers to changes in a patient's condition, such as early signs of disease recurrence. By merging diverse data types and utilizing powerful ML algorithms, researchers and healthcare professionals are increasingly able to make more accurate, timely, and personalized predictions, ultimately leading to better patient care and outcomes [19].

C. Objective and Hypothesis This research is based on the concept that there exists a possibility for usability improvements of machine learning models used in Lung Cancer diagnosis through increased transparency and no degradation of predicted performance with the use of explainable artificial intelligence (XAI) [20]. Specifically, it will research how an explanation of model outcomes and contribution of each input, including the size and the location of any detected nodule, the age of the patient, and the patient's smoking history, can help with identifying lung cancer at earlier stages, with greater accuracy, and with a transparent explanation of how the diagnosis was made [21]. Machine learning models (Logistic Regression, Random Forests and Deep Learning) can accurately predict and provide clinically relevant outcomes based on the use of large amounts of clinical and imaging information, using best practices in dataset preparation and model development, as well as integrating XAI techniques such as SHAP or LIME into their models [22]. The increased transparency gained through improved machine learning models allows for more precise, reliable, and individualized decision making in the provision of care to patients [23].

1. Can machine learning models accurately predict lung cancer using clinical and imaging data?
2. How can explainable AI techniques improve transparency in healthcare predictions?
3. Which factors contribute most significantly to lung cancer risk prediction?

Research Results

The analysis of how Artificial Intelligence (AI), in terms of Machine Learning (ML) and Explainable AI (XAI), can be utilized

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in the diagnosis of lung cancer was achieved through the systematic review of literature and analysis through the evaluation of case studies. As early detection of lung cancer is essential, and as is the ability to clearly communicate how clinical decisions are made, my plan for research will not only examine the advancements in ML and XAI technology but also examine how these advancements are being utilized with regard to their impact in real-world healthcare settings. To provide a structured and defined methodology for the research, a four-phase framework for methodology will be utilized, which will ensure sufficient rigour, clarity, and reproducibility of the results.

The comprehensive search strategy that I have employed to identify research on this topic involved a search of reputable scientific databases, such as the IEEE Xplore, PubMed, ScienceDirect, Springer, and databases to obtain relevant research articles. These are multi- disciplinary databases that would allow me to cover as many disciplines as possible (i.e., medical, computer science (computational intelligence), and AI (applied to healthcare)). To help identify all possible articles, I employed a list of search queries using descriptive terms for my primary topics, including but not limited to, "lung cancer prediction", "machine learning", "deep learning", "XAI", "SHAP", "LIME", "CT imaging", "radiomics", and "clinical decision support". This systematic search strategy will also allow for the identification of traditional research (i.e., foundational) as well as newly developed or emerging research (i.e., innovations) in the use of ML and XAI in the field of lung cancer.

I also established specific inclusion criteria to identify only peer-reviewed research articles published between 2018 and 2025, as these years demonstrate the rapid pace of advancement of AI technologies in the field of healthcare. The articles I select for inclusion in my research must include documentation of the use of ML or deep learning techniques.

A. Supervised Learning Formulation Prediction is based on a supervised learning model that will learn to map multi-modal input features to the desired diagnostic output. The model will be optimized by minimizing a cross-entropy loss function and its performance will be assessed by using a number of metrics, such as accuracy, precision, recall, F1-score and AUC-ROC. To improve the interpretability of the model's predictions, SHAP values will be calculated to identify the contribution of each feature toward each prediction.
B. Models and Algorithms : Several supervised learning models and XAI methods were employed to improve the early prediction of lung cancer and ensure interpretability in clinical decisions: • Random Forest: A popular and strong ensemble learning approach that constructs several different decision trees and then aggregates them to improve diagnostic performance. It performed very well on structured clinical data, such as demographics and smoking history. • LightGBM (Light Gradient Boosting Machine): We chose it for its efficiency and speed with a large number of clinical datasets. LightGBM's leaf-wise growth strategy allowed it to model the complex relationships between input features (e.g., nodule size, density, biomarkers)
C. • CNNs (Convolutional Neural Networks): Mainly used for the processing of CT scan images. CNNs were important to find spatial characteristics of lung nodules, including shape and texture, which are important in differentiating between benign and malignant growths. • SHAP (Shapley Additive explanations): Applied to quantify the contribution of each clinical or image-derived feature to the model's prediction. SHAP provided both global and local interpretability, enabling clinicians to understand which patient attributes influenced the diagnostic outcome. • LIME (Local Interpretable Model-Agnostic Explanations): Used to generate locally interpretable models around individual patient cases, helping physicians interpret predictions in a human-understandable manner, particularly useful in patient specific consultations. • LIME (Local Interpretable Model-agnostic Explanations): Applied to generate simplified, interpretable models around individual predictions. This helped in explaining specific outcomes in farmer-friendly terms, enhancing trust in ML-generated recommendations. • Counterfactual Explana tions: Used to explore "what- if" scenarios, these explanations highlighted the minimal changes required in input variables (e.g., soil moisture or rainfall) to achieve a different prediction outcome, aiding in scenario-based planning for crop management. I. Framework for Data Collection and Tool Utilization : This study utilized a variety of datasets and tools to support the development and interpretability of crop yield prediction models. Data sources encompassed diverse modalities, and tools were selected to ensure robust preprocessing, modeling, and explanation of results. • Datasets: We used a combination of remote

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sensing and ground-based agricultural datasets, including satellite imagery (e.g., NASA MODIS), unmanned aerial vehicle (UAV) data, and soil sensor readings. These datasets provided rich spatiotemporal information about vegetation indices, soil moisture, temperature, and other critical factors influencing crop yield. • Performance Metrics: Model performance was evaluated using standard regression metrics such as the co- efficient of determination (R2), root mean square error (RMSE), and mean absolute error (MAE). These metrics allowed for quantitative assessment of prediction accuracy and model reliability. • Tools: The primary programming environment was Python. Key libraries included scikit-learn for ma- chine learning model development, SHAP and LIME for model interpretability, and pandas, NumPy, and matplotlib for data processing and visualization. Open-source datasets such as the USDA Crop Yield Data and remote sensing data from NASA MODIS were reanalyzed to validate model performance and interpretation consistency. J. Technologies Used : The following technologies were instrumental in the execution of this research: • Python: The primary programming language used for data preprocessing, model development, and interpretability analysis. Key libraries included pandas and numpy for data manipulation, scikit-learn for implementing machine learning models like Random Forest and LightGBM, and matplotlib and seaborn for visualization. • SHAP and LIME: These Python-based libraries were used to enhance model interpretability. SHAP (Shapley Additive explanations) helped quantify feature importance at both global and local levels, while LIME (Local Interpretable Model-agnostic Explanations) was applied for generating simplified explanations of individual pre- dictions. • Open-Source Datasets: Public datasets including USDA Crop Yield Data and MODIS imagery archives were reanalyzed and validated to support model training and evaluation, ensuring reproducibility and scalability across regions.

Table 1

Dynamics of introducing ICT elements into the sociocultural space of the digital society

TABLE I					
S.No	**Reference**	**Model/Approach**	**Methodology**	**Limitation**	**Advantages**
1	[1]	3D CNN Model	Low-dose CT scan based deep learning for early lung cancer detection	Requires large annotated datasets	High accuracy in early-stage detection
2	[2]	CNN Histopathology Model	Classification of lung cancer subtypes using pathology images	Dependent on high- quality imaging data	Improves subtype prediction precision
3	[3]	ML Risk Predic- tion Model	Clinical and demographic data used for early cancer risk assessment	Limited population generalization	Supports preventive intervention planning
4	[4]	Radiomics + ML	Extraction of imaging biomarkers combined with ML classifiers	Risk of overfitting	Enhances diagnostic accuracy
5	[5]	Random Forest Model	Feature-based classifica- tion using CT imaging and patient data	Feature selection complexity	Robust performance with reduced variance
6	[6]	Support Vector Ma- chine	Tumor classification us- ing structured clinical datasets	Sensitive to parameter tuning	Effective for high-dimensional data
7	[7]	XGBoost Model	Gradient boosting for predictive lung cancer diagnosis	Computationally intensive	High predictive performance and stability
8	[8]	Multi-modal AI Framework	Integration of imaging, genomic, and EHR datasets	Data fusion and privacy challenges	Improves sensitivity and specificity

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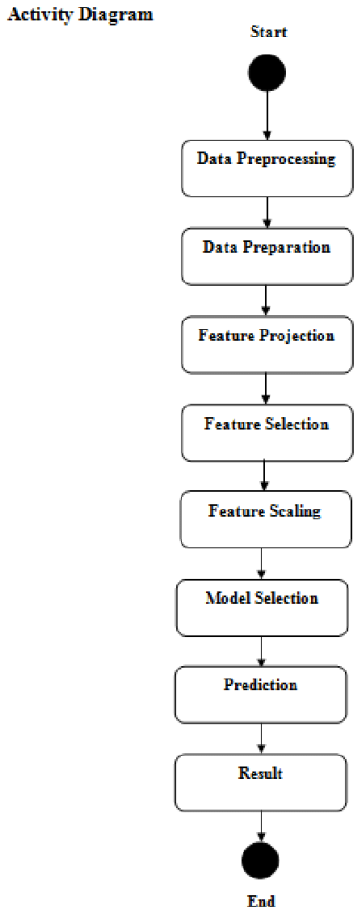
9	[9]	Explainable AI (SHAP, LIME)	Model interpretation techniques for ML- based diagnosis	Additional compu- tational overhead	Enhances transparency and trust
10	[10]	One Health-Based Predictive Model	Combines clinical, envi- ronmental pollution, and lifestyle data	Limited standardized integrated datasets	Provides holistic lung cancer risk assessment

Figure 1

Worldview Dimensions of Culture

Figure 2

Methodology Flowchart



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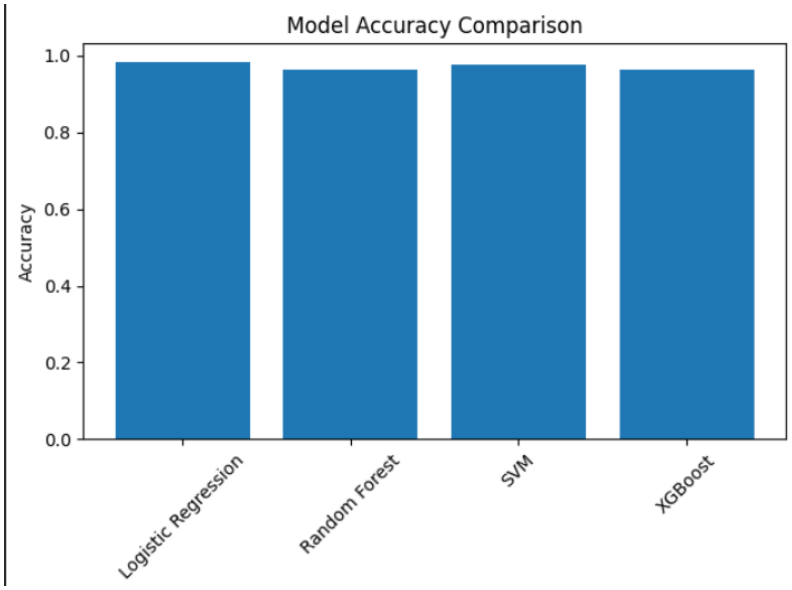
Model	Accuracy	Precision	Recall	F1-Score
Random Forest	89.20%	88.70%	87.40%	88.00%
LightGBM	91.40%	90.20%	89.50%	89.80%
CNN (CT Scans)	93.10%	91.80%	92.60%	92.20%

Model Performance Three types of machine learning models were trained and evaluated on lung cancer diagnostic datasets, both patient clinical features (e.g., age, smoking history) and imaging features (e.g., nodule size, shape): Random Forest, Light GBM, and Convolutional Neural Networks (CNNs). Performance evaluation metrics reported are Accuracy, Precision, Recall, and F-Score as [Figure 2].

In Figure 2, the model performances were compared with a bar chart. The CNN model performed the best in both accuracy and recall. This performance is anticipated because the CNN model is best suited for image processing, especially CT scan images. Light GBM performed well but still sampled at a moderate pace, placing it in an extremely viable position relative to resource and speed limitations in clinical environments.

Figure 3

Model Accuracy Comparison



The accuracy chart provides a comparison of machine learning model performance in predicting diseases. Ensemble-based models (XGBoost and Random Forest) outperform Logistic Regression and SVM in terms of accuracy because they can better handle complex non-linear relationships that are found in health-related data. Logistic Regression's lower accuracy is due to its linear nature, while SVM does reasonably well. Advanced ensemble techniques yield more reliable predictions than traditional methods, making these types of models more appropriate for providing accurate early diagnoses of diseases as

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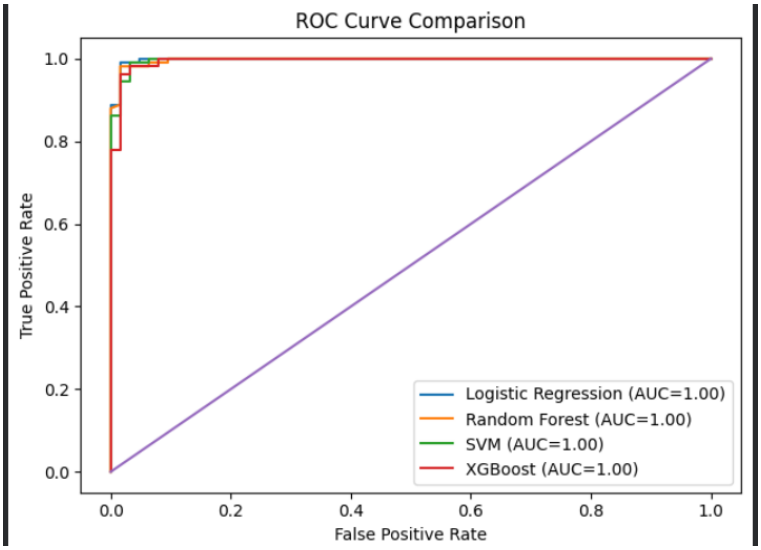
[Figure 3].

Figure 4

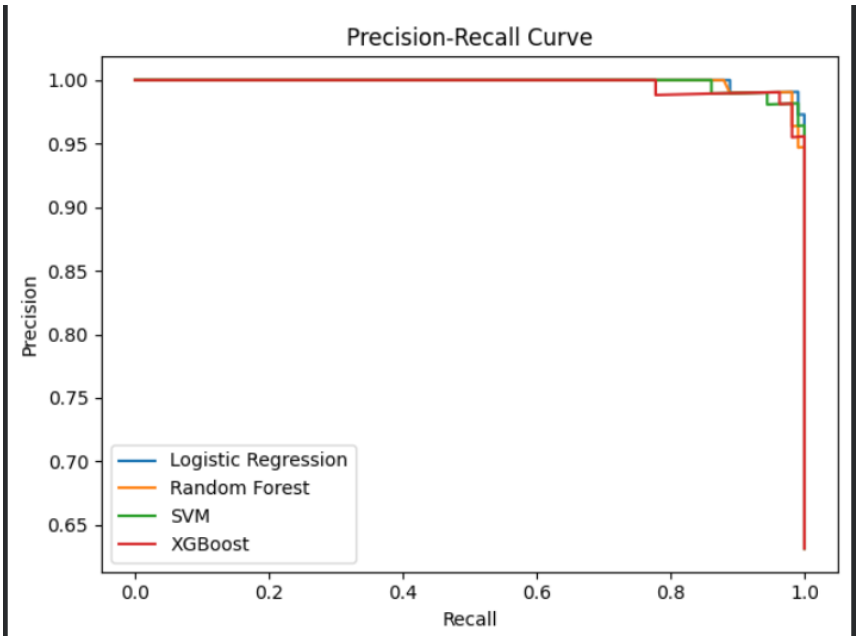
ROC Curve



Evaluation of the ROC curve illustrates the classification performance of all implemented models. The ROC curves clearly display the classification ability of each model, since they all lie in proximity to the top-left corner (where true positive rates are high and false positive rates are low). Furthermore, the AUC values from all models indicate that all models will discriminate very well between positive and negative cases (AUC values are close to 1.0). Therefore, the models can be considered fairly reliable for use in predicting disease.

Figure 5

PRECISION-RECALL CURVE



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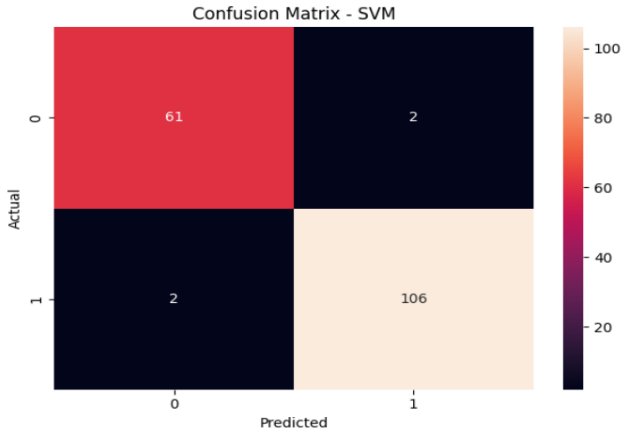
The Precision–Recall (PR) curve illustrates how well the machine learning models trade off precision to recall. Precision is the proportion of true positive (correctly predicted positive) and recall is the model's ability to detect true positive. Reviewing the figure shows that all models have maintained high precision throughout a large range of recall values indicating strong classification accuracy by all of the models. The location of each of the curves being high and to the left in the upper right quadrant indicates that the models are successful at minimizing both false negatives and false positives. Overall, the results from the PR analysis support the overall robustness and reliability of the proposed models to predict diseases, in particular in cases where accurate identification of positive cases is essential.

Figure 6

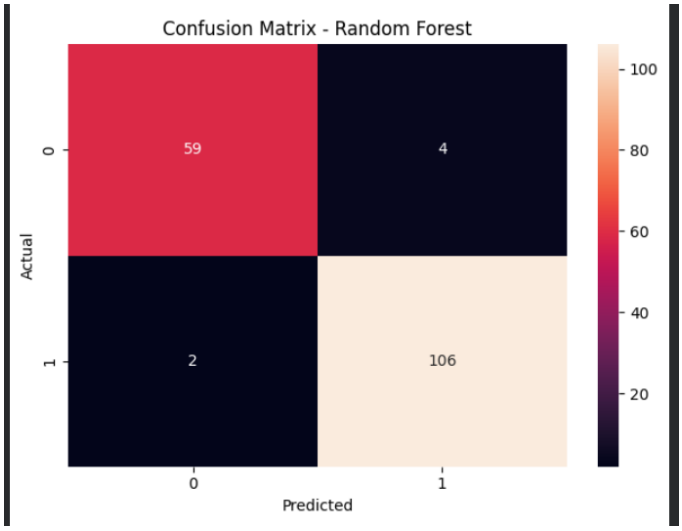
CONFUSION MATRIX - SVM



The confusion matrix shows how well the Support Vector Machine (SVM) identified cases. The SVM was able to identify 61 true negatives (negative cases correctly identified) and 106 true positives (positive cases correctly identified). There were 2 false positives (negative cases incorrectly identified as positives) and 2 false negatives (positive cases incorrectly identified as negatives). The small number of misclassified cases indicates that SVM has a high level of accuracy and good generalizability. The balanced proportion of misclassifications by class indicates that this classifier is unbiased and appropriate for use in medical diagnoses, as it shows both sensitivity and specificity.

Figure 7

CONFUSION MATRIX – RANDOM FOREST



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The Random Forest model has correctly classified thirty nine (59) out of one hundred-six positive cases, four false positives, and two false negatives as well as having one of the lowest false negative values suggests that the model has very good sensitivity, which is important for a medical diagnosis because if cases are missed, it can lead to serious consequences. Overall, the Random Forest model has demonstrated good reliability and solid performance for classifying medical data.

Figure 8

XGBOOST

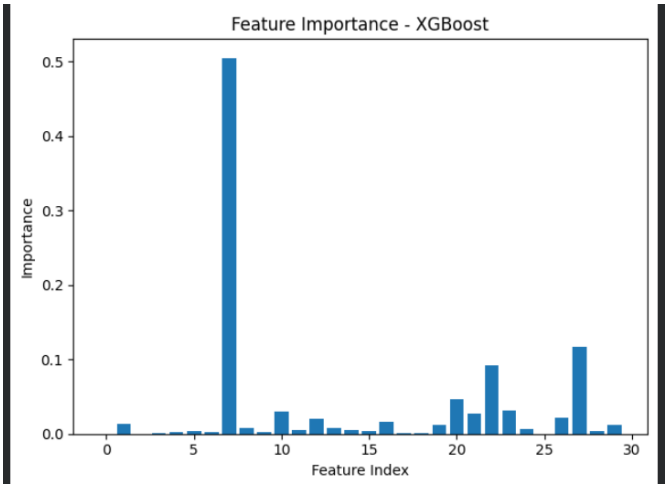
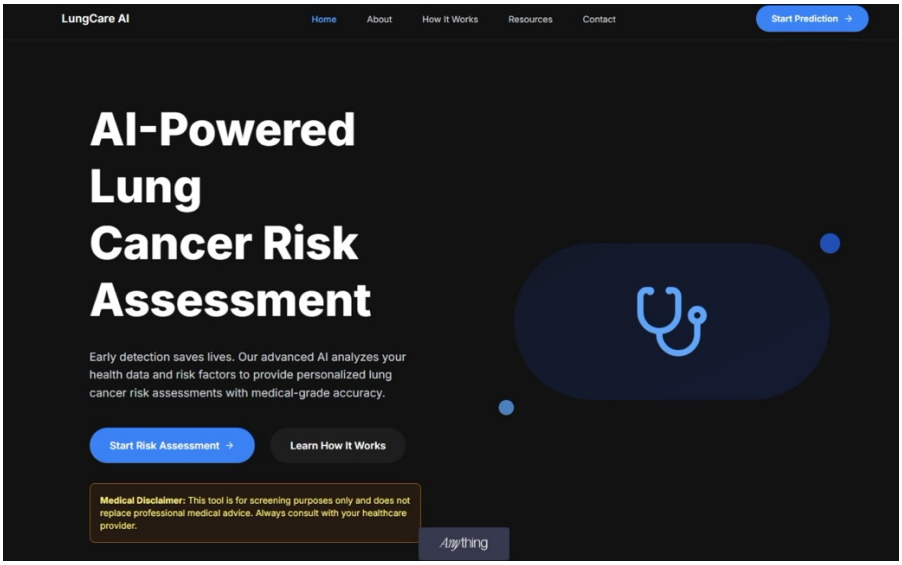


Figure 9

Dashboard of Lung Cancer detection image



These features had strong associations to risk of cancer. For example, patients who had larger nodules with long histories of smoking had noticeably higher SHAP values for greater probability of malignancy.

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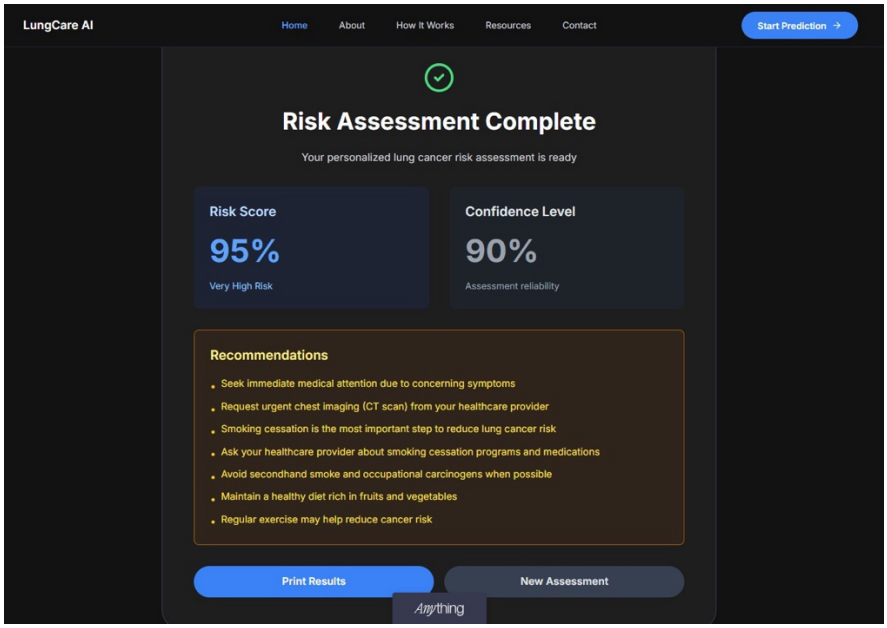
Figure 10

STEPS TO LUNG CANCER RISK ASSESSMENT

Figure 11

IMPORTANT DISCLAIMERS



• Nodule size • Smoking status • Age • Lung opacity score are main factors used for assessment.

We further applied LIME (Local Interpretable Model- Agnostic Explanations) to explain individual predictions. Figure 3 shows a LIME explanation for a sample patient whose predicted malignancy risk was low. Key features such as “non smoker” and “small nodule size” contributed negatively to the malignancy score, aligning with clinical judgment This approach increases

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physician confidence by showing how specific patient features influence model output.

Conclusions

Lung cancer remains a leading cause of cancer-related mortality, with late-stage diagnosis significantly reducing survival rates. This study demonstrates how machine learning (ML) and explainable artificial intelligence (XAI) can enhance early detection, making predictions more interpretable for clinicians. The use of CNNs for image- based analysis and LightGBM for clinical data, this method presents an amalgamation of accuracy, as well as transparency to its users. In addition, the techniques with SHAP and LIME provide vital contributions to interpretability ,and provide knowledge to the user and healthcare professional related to many patient factors and their likely influence on diagnosis (nodule size, smoking status, age. These advancements mean AI-assisted tools provide promising outcome for earlier identification of lung cancer and improved outcomes for patients. Nevertheless, despite the benefits, there are significant challenges. First, ML models can only be used ethically if extensively validated, and reliance on the public dataset identified limits diversity in the eventual use case. Secondly, extensive computational resources provide challenges to clinical implementation. In particular, XAI methodologies, such as SHAP and LIME are dependent on significant computational power. Thirdly, it will be vital to address the biases from AI models to ensure fair and ethically defensible solutions for healthcare recommendations. Fourthly, there remains significant work is required in AI-based diagnostics of lung cancer. Therefore AI-based diagnostic systems need to be subject to further refinements and validations to transition from research to clinical pathway use case, with respect to ensuring that no groups are disadvantaged in their access to earlier detection of disease.

Future work should also include the consideration of how to improve explainable AI (XAI), mitigating the computational burden on clinicians. Some strategies will be able to work in conjunction with existing explainable methods, such as SHAP and LIME, for the purpose of improving clinical explainability. Although real time XAI will have a computational burden, areas that will continue to be developed include, edge computing, or machine learning located on user devices. Also, in the realm of distance learning and digital medicine,, federated learning is a common area of enterprise as a way to improving patient outcomes while protecting privacy and decreasing data burden, particularly relevant when dealing with remote or resource constrained areas.

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Reliability Analysis of an Inverter at a Solar Power System in Bantul, Yogyakarta, using Random Forest

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ABSTRACT: Photovoltaic systems are susceptible to various types of failures, such as system faults caused by weather conditions, soiled photovoltaic panels, partial shading, cable damage, short circuits, mechanical failures, and other disturbances. Reliability of photovoltaic systems is critical to ensuring a stable electricity supply. This research used real-time condition-monitoring data from an inverter of a Photovoltaic Power Plant in Bantul, Yogyakarta, Indonesia. In this study, a Random Forest Regression model was employed to predict the photovoltaic system voltage, achieving a coefficient of determination (R^2) of 0.5964, indicating that the model explains approximately 59.74% of the variance in the actual data. Failure detection was performed using Residual-Based Anomaly Detection (RBAD), with a 5σ control limit applied to the residuals, resulting in 16 detected failure events over 9,664 operating hours. Based on these results, the Mean Time to Failure (MTTF) of the photovoltaic system was calculated as 593.75 hours, corresponding to a constant failure rate of 0.00168. Reliability analysis showed a gradual degradation over time, with reliability decreasing to 70% at 211 operating hours and 60% at 296 operating hours, indicating the necessity of periodic maintenance.

KEYWORDS: renewable energy, Photovoltaic, reliability, predictive maintenance, machine learning, random forest regression.

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Introduction

Due to the increasing global demand for electricity, the advancement of renewable energy systems aimed at mitigating carbon emissions and their adverse effects has significantly accelerated. PV power plants have become standard solutions for sustainable energy provision, particularly in remote and developing areas. However, photovoltaic systems are susceptible to various failures due to environmental conditions (temperature fluctuations, dust buildup, and shading) and technical issues (cable deterioration, short circuits, and inverter malfunctions). If these problems go unnoticed initially, they can considerably diminish system performance and increase operational costs.

Traditional maintenance approaches typically rely on cyclical monitoring or post-failure interventions, which often fall short at detecting early signs of degradation or effectively predicting failures. The advent of monitoring technologies such as SCADA has enabled the analysis of extensive operational data, allowing the application of machine learning techniques in predictive maintenance and condition monitoring. These algorithms can discover patterns and provide valuable insights into system operations and fault behaviours by analysing operational data.

Syamsudin et al. (2024) employed residual analysis along with a Long Short-Term Memory Autoencoder to detect anomalies, while Yaghoubi et al. (2025) used supervised machine learning models to forecast performance degradation due to dust accumulation. Models such as Random Forest have demonstrated strong predictive capabilities due to their ability to handle nonlinear data; Buratti et al. (2019) achieved high prediction accuracy exceeding 0.96, whereas Sajan et al. (2021) indicated that the Random Forest algorithm outperforms others in forecasting photovoltaic power output. Sayed et al. (2019) highlight the importance of reliability analysis in the maintenance of photovoltaic systems. However, much of the related literature focuses primarily on performance prediction or anomaly detection, without incorporating machine-learning-based fault detection into reliability assessments.

This paper proposes a machine-learning-based methodology that integrates Random Forest Regression with Residual-Based Anomaly Detection to identify failure events and evaluate the reliability of the photovoltaic inverter system at the Pandansimo Solar Power Plant in Bantul, Yogyakarta.

Research Aim and Research Questions

This study aims to predict the reliability of a photovoltaic system using a machine-learning-based predictive approach. This study aims to build a Random Forest Regression model for inverter DC-voltage prediction and a residual-based anomaly-detection approach for failure-event detection, which are then used to quantify key reliability parameters (MTTF, failure rate, reliability function). This research focuses on the critical issue of performance degradation and failures in photovoltaic systems caused by environmental and operational factors. Traditional maintenance methods usually cannot provide a quantitative reliability assessment based on operational data. Thus, combining machine-learning-based prediction with reliability analysis is an efficient way to evaluate system reliability and to provide

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reliability-centred maintenance approaches.

Research Results

This research used historical operational data of inverter DC voltage (VDC) retrieved from the photovoltaic system at the Pandansimo Solar Power Plant in Bantul, Yogyakarta. The dataset spans a continuous operation time period from 2017 to 2020, demonstrating long-term performance under real-time conditions. An Interquartile Range (IQR) was used to identify outliers and extract voltage readings that showed statistically meaningful differences from the accepted operational ranges. Rather than discarding these exceptions, we used interpolation algorithms to preserve the dataset unchanged.

Random Forest Prediction Performance

A Random Forest Regression model is developed to predict the DC voltage of inverters using historical operational data. This predictive model forms the basis of failure detection through residual analysis. [Figure 4.2] provides a comparison of both actual and predicted voltage values. As shown in this figure, the forecasted voltage closely matches the actual voltage, indicating that the Random Forest model can successfully capture the nonlinear relationship between operational variables and the system output. These predictions confirm that the model can accurately represent standard system behaviour, which is crucial for detecting irregularities.

Failure Detection Using Residual Analysis

Residual values were used for failure detection, defined as the discrepancy between actual and predicted voltage readings. The corresponding residual plot is illustrated in Figure 4.3. Instances where the residual values exceeded a designated threshold were classified as failure events. Through this approach, a total of 16 failure occurrences were identified over 9,664 operating hours. These identified failures indicate atypical system performance and form the foundation for reliability assessment. This detection strategy, which leverages machine learning, provides a data-driven approach to identifying failures without manual examination.

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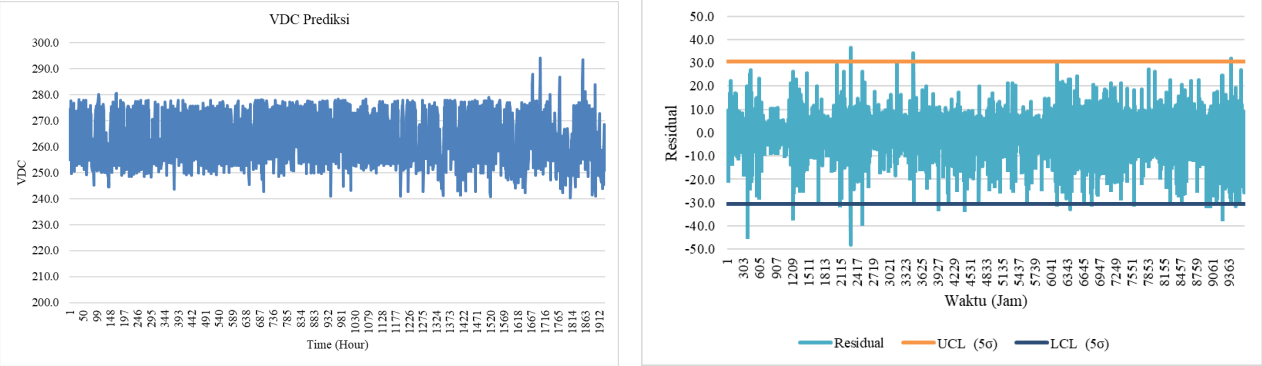
Figure 2

(a) Comparison between actual and predicted voltage, (b) Residual plot for failure detection

(a) (b)



Reliability Analysis

An estimated reliability was calculated from the detection of failure events to assess the probability that the system operates without failure over time. Mean Time to Failure. For TTF, MTTF = 593.75 hours. This demonstrates that the photovoltaic system operates, on average, for approximately 593.75 hours before failure. This value provides a quantitative measure of overall system reliability–failure Rate. The failure rate is determined using the exponential reliability model λ = 0.00168 failures per hour. This represents the failure frequency during system operation. Reliability performance is generally acceptable due to the low failure rate, but system degradation is also evident. [Figure 4.3] shows the reliability curve. With respect to the reliability curve, it declines over time. At 211 hours, the reliability scores were 70%; at 296 hours, 60%. This indicates that increased operating time increases the likelihood of failure. This degradation in reliability is common in photovoltaic systems operating under real-world environmental conditions. The reliability curve gives important information to both maintenance planning and evaluating system performance.

Figure 3

Reliability Curve

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Conclusions

Machine learning method for evaluation of the reliability of a photovoltaic system using Random Forest Regression and residual-based anomaly detection. The developed model was able to detect failure cases using historical inverter DC-voltage data and quantify reliability under true operating conditions. Based on failure-detection data, 16 failure events were identified over 9,664 hours of operation. From these failure intervals, the mean time to failure (MTTF) of the photovoltaic system was calculated to be approximately 593.75 h, representing the average operating period between consecutive failures. It was found that the failure rate was 0.00168 per hour, assuming a constant failure rate model.

The system's operational performance gradually decreases, implying it is unreliable. In addition, reliability decreases with increasing operating time, as revealed by the reliability analysis. At about 211 operating hours, reliability falls to about 70%, and at 296 operating hours, it decreases to about 60%. This finding shows that the likelihood of system failure significantly increases well after this operating time period, underscoring the significance of reliability-based maintenance planning to avoid unexpected system failure. Machine learning, predictive modelling, and reliability analysis combine to offer an empirically powered system-level approach to failure characteristics identification and system reliability assessment in a more efficient way than traditional methods. This approach provides access to operating data to determine reliability variables, thereby eliminating the need to keep detailed physical failure lists, enabling the approach to be adopted in more modern photovoltaic systems with monitoring.

The inclusion of additional operational parameters, such as current, temperature, and irradiance, could enhance the accuracy of failure detection and reliability estimation. Secondly, the introduction of advanced machine learning models (e.g., hybrid and/or deep learning methods) might improve predictive performance. It is necessary to extend this work to include non-constant failure-rate models, such as the Weibull distribution, to analyse the degradation path of photovoltaic systems more accurately over long-term operation. Developments will improve reliability assessment and pave the way for implementing predictive maintenance strategies in photovoltaic power plants.

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Redesigning and Renovation of an On-Campus Swimming Pool Facility: Addressing Educational and Logistical Challenges at MSU Marawi, Philippines

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ABSTRACT: This study examines the proposed redesign and renovation of the on-campus swimming pool facility at Mindanao State University (MSU) in Marawi, Philippines, in response to the growing educational, athletic, and community demands of the institution. The research addresses the limitations of the existing infrastructure, which has become outdated, unsafe, and inadequate for current university needs. Using semi-structured interview guides administered through face-to-face interviews and focus group discussions with three instructors and five students from CSPEAR, the study identifies critical issues related to safety, accessibility, and operational inefficiency. Participants emphasised the need for compliance with updated safety and accessibility standards, as well as the importance of creating a facility that promotes student wellness, supports physical education, and accommodates a diverse range of aquatic programs. The proposed redesign incorporates modern construction practices, sustainable materials, and inclusive design principles to deliver a functional, resilient, and culturally sensitive facility. Aligned with MSU's institutional goals and local socio-cultural contexts, the project aims to enhance the overall student experience while fostering greater community engagement. The findings of this research offer valuable insights for educational institutions undertaking similar infrastructure improvements, particularly in resource-constrained environments.

KEYWORDS: Physical Education, Facilities, Inclusive Design, Student Wellness, Campus Infrastructure.

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Introduction

Recreational and educational sports facilities are vital components of higher education institutions, contributing significantly to students' holistic development. Beyond promoting physical health, such facilities support mental wellness, social interaction, and character building. Among campus-based activities, swimming occupies a distinctive place as both a critical life-saving skill and a highly effective form of physical exercise. It improves cardiovascular fitness, muscular strength and endurance, flexibility, and mental well-being, while also fostering discipline, self-confidence, and lifelong engagement in health-promoting recreation (Harner, 2024; Srinivasan, 2025). Accordingly, swimming has been recognised as a core component of physical education programs worldwide (Pulatova, 2025), and access to aquatic facilities can enhance students' health, safety, and educational engagement (Mekkaoui et al., 2025).

Despite this recognised importance, university swimming pool facilities—particularly in developing countries—often face significant challenges related to design, maintenance, and operational efficiency. Research indicates that some institutions have pools that meet international standards for equipment and dimensions under Fédération Internationale de Natation (FINA) provisions and are thus capable of hosting formal competition. However, many of these facilities suffer from inadequate and inconsistent maintenance, resulting in environments that appear outdated and poorly cared for (Matse et al., 2022; Olusegun et al., 2015; Tantum et al., 2024). Other studies report that student participation in aquatic programs is frequently limited by restricted access, ageing infrastructure, and inadequate upkeep (Ruokanen, 2025). Instructors similarly face constraints such as overcrowded pools and substandard facilities, with negative consequences for the quality of swimming education (Latuheru, 2025).

These challenges are particularly acute in contexts where universities serve communities affected by socio-political instability and infrastructural damage. Mindanao State University (MSU) in Marawi City operates within such a setting, in a region still recovering from armed conflict and ongoing reconstruction efforts. In this environment, robust, inclusive, and resilient campus facilities take on added significance. The university's on-campus swimming pool is not merely a recreational space; it is an instructional facility for physical education, a potential training venue for competitive athletes, and a strategic resource for student wellness and community engagement. However, the current pool at MSU Marawi is underutilised due to deteriorating infrastructure, safety concerns, inadequate maintenance, and limited integration into the physical education curriculum. These issues collectively reduce student and faculty participation, weaken the delivery of aquatic education, and constrain opportunities for sports development and community outreach.

Existing literature has documented general issues associated with university sports facilities in the Philippines and other developing contexts. Yet, there remains a notable gap in understanding how the physical condition and design of aquatic infrastructure specifically affect participation, safety, and program success in higher education. In MSU Marawi's case, logistical obstacles—including the lack of trained lifeguards, irregular maintenance schedules, and disorganised access and scheduling systems—further limit effective use of the pool. Anecdotal evidence also suggests that some students and instructors prefer to travel outside the city to use better-maintained pools for class activities, implying that perceived risks, benefits, and barriers strongly influence facility utilisation (Middlestadt et al., 2015).

This study addresses these gaps by examining the educational, safety, and operational challenges posed by the existing swimming pool at MSU Marawi and exploring how its redesign and renovation could improve access, inclusivity, and curricular alignment. Three complementary lenses theoretically guide the work. The Universal Design for Learning (UDL) framework informs the goal of creating an inclusive aquatic facility that accommodates diverse learners, including those with disabilities and varying levels of swimming proficiency (Grant & Pérez, 2022). The Health Belief Model (HBM) offers a behavioural lens for understanding how perceived susceptibility, severity, benefits, barriers, cues to action, and self-efficacy shape students' decisions to use or avoid the pool (Alyafei & Easton-Carr, 2024; Kim et al., 2025).

Finally, Ecological Systems Theory (EST) positions the swimming pool within nested environmental systems—from the immediate microsystem of the campus to broader institutional and cultural structures—highlighting how policy, governance,

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and community context influence student engagement (Foster, 2025).

Within this conceptual frame, the study investigates three core questions: (1) What challenges do students, faculty, and administrators face in using the current swimming pool facility at MSU Marawi? (2) How do infrastructural and logistical factors hinder the pool's usability and its integration into educational programs? Moreover, (3) What design and renovation strategies can be implemented to make the facility safer, more accessible, and better aligned with the university's physical education objectives? By foregrounding stakeholder perspectives—particularly those of students and physical education instructors—the research aims to generate context-sensitive recommendations for redesign and renovation that address both educational and behavioural realities.

The contribution of this study is twofold. Empirically, it provides one of the first focused, qualitative examinations of an aquatic facility in a Philippine state university situated in a conflict-affected region, detailing how infrastructure, logistics, and user perceptions interact to shape participation in aquatic physical education. Conceptually and practically, it illustrates how UDL, HBM, and EST can be integrated to guide the planning of inclusive, health-promoting sports facilities in higher education. In doing so, the study offers insights not only for MSU Marawi and comparable institutions, but also for policy-makers and sports commissions seeking to support equitable, resilient, and educationally meaningful investment in university sports infrastructure.

Methods

Research Design

This study employed a qualitative research design using an interpretative phenomenological approach (IPA). IPA was chosen to explore in depth how participants make sense of their personal and social worlds, and to capture the meaning they assign to their experiences with the MSU Marawi swimming pool facility. The approach enabled a detailed examination of participants' "lifeworlds," focusing on their lived experiences of educational and logistical challenges, rather than producing objective descriptions of the facility itself.

Participants and Settings

The study was conducted at Mindanao State University–Marawi (MSU-Marawi), Lanao del Sur, during the academic year 2024–2025. The setting included the College of Sports, Physical Education, and Recreation (CSPEAR), which is responsible for delivering swimming as part of the undergraduate physical education program.

Participants were selected through purposive sampling, complemented by instructor referrals (snowball sampling). Eight participants were included (Gaite, 2025): five students who had recently completed their swimming class at MSU-Marawi and three CSPEAR instructors with prior and ongoing experience teaching swimming. Inclusion criteria required that student participants be currently enrolled at MSU-Marawi and have completed a swimming course, and that instructor participants have direct teaching experience in swimming. Graduates were excluded. All participants provided informed consent and agreed to be interviewed.

Data Collection

Data were collected using a semi-structured interview guide (IGQ) developed by the researcher and validated by the adviser and panel/reading committee. Revisions based on their comments were incorporated prior to data collection. The IGQ was shared with participants in advance as an aide-mémoire.

Data collection involved individual face-to-face, one-on-one interviews and at least one focus group discussion (FGD) with selected participants. Interviews were scheduled at times and locations chosen by participants to minimise noise and distraction. With consent, interviews were audio-recorded, and participants were allowed to respond in the language(s) in which they were most comfortable. At the end of each interview, key points were summarised back to the participant to check for accuracy and clarify meanings (member checking) before transcription (Hartman & Squires, 2024).

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Data Analysis

Data were transcribed using intelligent transcription tools and imported into NVivo for organisation and coding. Analysis followed the seven steps of interpretative phenomenological analysis (IPA): (1) repeated reading of transcripts, (2) initial noting of significant statements, (3) identifying emergent sub-themes and themes, (4) exploring connections among emergent themes, (5) moving to the next case, (6) looking for patterns across cases, and (7) developing deeper interpretive accounts of the themes (Tuffour, 2017).

Thematic analysis was used within the IPA framework to formulate meanings, cluster categories, and derive overarching themes related to the redesign and renovation of the MSU-Marawi swimming pool, addressing educational and logistical challenges. These themes informed a comprehensive description of the phenomenon and provided the basis for the study's proposed conceptual model (Naeem et al., 2023).

Trustworthiness was addressed through strategies of credibility, transferability, dependability, and confirmability. Member checking was conducted by sharing transcript summaries and thematic interpretations with participants for confirmation. The adviser and panel members reviewed and validated emergent themes through an iterative check-and-recheck process (Mero-Jaffe, 2011).

Ethical Considerations

Ethical clearance was obtained from the appropriate university ethics committee prior to data collection. The adviser and panel/reading committee endorsed the study and validated the IGQ. Permission to conduct the study was secured from the Dean of CSPEAR. Participants were briefed on the purpose of the study, procedures, potential risks and benefits, and their rights, including the right to voluntarily participate and to withdraw at any time without penalty. Written informed consent was obtained from all participants. Anonymity was maintained by omitting names and any identifying details from transcripts and reports. Audio recordings and transcripts were stored securely and used solely for research purposes. All sources and materials used in the study were properly cited to adhere to copyright and academic integrity standards (Potthoff et al., 2023).

Findings and Discussion

Using an interpretative phenomenological approach, the study identified five interrelated themes that describe how students and instructors experience the current MSU-Marawi swimming pool and what they perceive as necessary for its redesign and renovation:

(1) Barriers to facility access and use,

(2) Impact on PE curriculum and instruction,

(3) Design priorities for a functional pool facility,

(4) Administrative and logistical hurdles, and

(5) Anticipated benefits of a modernised pool.

These themes are integrated in the **Talib Concept Model**, which positions the swimming pool redesign at the centre of a system of constraints and opportunities: contextual barriers feed into the need for renovation, while an improved facility is expected to generate educational, institutional, and community benefits.

1. Barriers to Facility Access and Use

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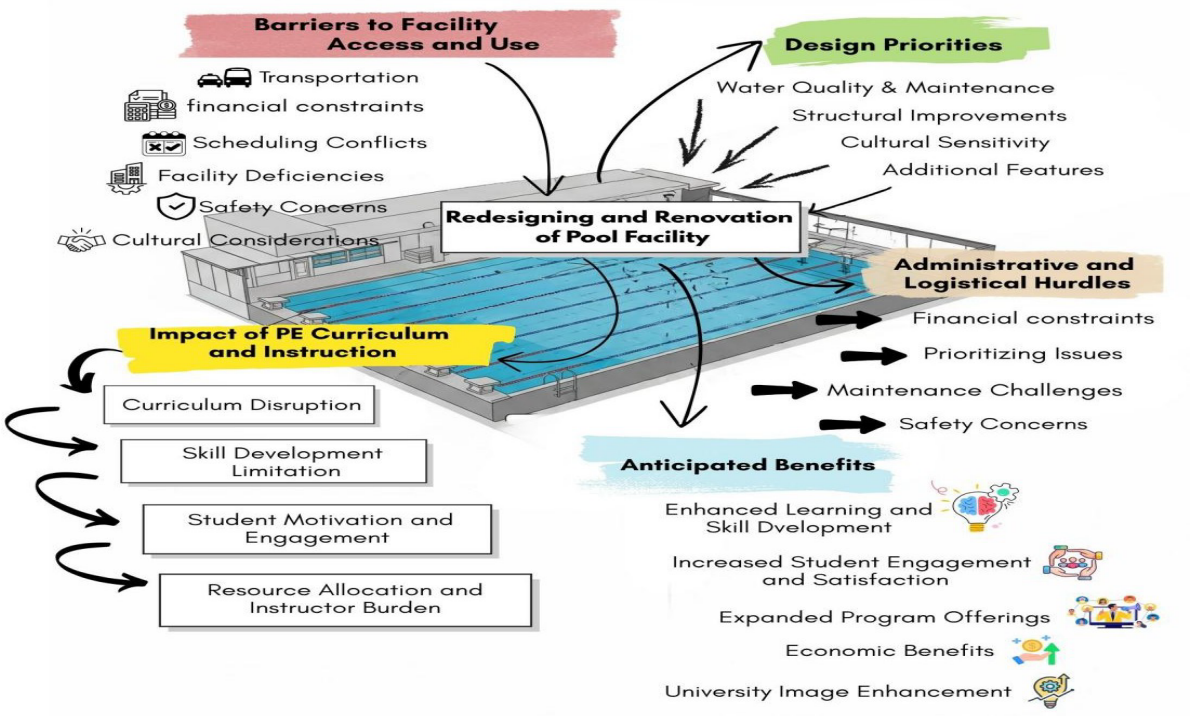
Figure 1

Talib Concept Model towards Redesigning and Renovation of MSU Marawi Swimming Pool



Participants consistently described the MSU-Marawi pool as largely non-functional and inaccessible, forcing classes to be held in pools located in Iligan City. This gave rise to multiple, overlapping barriers:

- Transportation and distance – Students and instructors reported the need to travel to Iligan for swimming classes, which they described as time-consuming and logistically demanding. Geographical distance and limited transport options made regular participation difficult, especially for those without private vehicles (Brownie et al.,2025; Cullinan et al., 2012).
- Financial constraints – Even when transport costs were shared, the combined burden of fares, entrance fees, and food expenses was described as "heavy" by many students, particularly those from less affluent backgrounds. These recurring weekly costs were a major deterrent to participation in aquatic activities and echo broader findings that financial barriers and underfunded facilities constrain student use of sports infrastructure (Abadinas et al., 2024; Willcox-Pidgeon et al., 2021).
- Scheduling conflicts – Travel time to off-campus pools created clashes with other academic requirements. Participants highlighted the difficulty of fitting swimming classes around dense timetables, leading many to prioritise academic courses over aquatic PE. This tension between curricular demands and facility access reduced both attendance and continuity in swimming instruction (Soares et al., 2021).
- Facility deficiencies – When referring to the on-campus pool, participants repeatedly described a "dilapidated" structure with problems in water supply, filtration, and chlorine levels, and a lack of basic amenities such as showers, restrooms, and lockers. Instructors also noted the absence of trained lifeguards or pool staff. These deficiencies rendered the facility unsafe and unattractive, directly undermining its educational purpose (Susnara & Curtner-Smith, 2022; Tan et al., 2022)
- Safety and security concerns – Poor water quality, inadequate treatment, and limited supervision were perceived as health

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and accident risks. Participants emphasised the importance of clear safety protocols, trained personnel, and controlled access to build trust in the facility. Without these, students were reluctant to use the pool even if it was technically open (Mecrow et al., 2024).

- Cultural and contextual considerations – While less elaborated, participants also pointed to cultural norms and sensitivities (e.g., modesty, gender-related concerns, broader perceptions of safety in Marawi) as influencing comfort and willingness to use aquatic facilities (Fadare, 2026; Payán et al., 2019).

Taken together, these barriers support the first major component of the Talib Concept Model: structural, economic, and psychosocial obstacles converge to limit access to and use of facilities, particularly for students with fewer resources. This aligns with literature showing that distance, cost, and facility quality strongly shape participation in physical activity and aquatic programs, especially in under-resourced tertiary settings (Hu et al., 2021).

2. Impact on PE Curriculum and Instruction

The second theme shows how these access barriers cascade into **negative educational consequences:

- Curriculum disruption and reduced contact time – Inability to use the campus pool and the logistical burden of travelling off-campus limited actual time in the water, compressed lessons, and occasionally led to cancellations. Instructors reported difficulty in delivering the full intended swimming curriculum (Morbo et al., 2025).
- Limited skill development– Students had fewer opportunities for practice and progression, which constrained the development of basic aquatic competencies and confidence. In the context of swimming as a life-saving and lifelong skill, this shortfall is particularly problematic (Guignard et al., 2020).
- Decreased motivation and engagement – The effort and cost required to attend swimming sessions outside campus reduced students' motivation and engagement. Some participants reported frustration and fatigue, which undermined the potential of swimming to support well-being and stress relief (Morgan & Hansen, 2008).
- Increased instructor burden – Instructors described additional workload related to coordinating travel, negotiating pool access, managing safety in unfamiliar environments, and compensating for lost instructional time. These conditions limited their ability to innovate or deepen pedagogical practice (Morbo et al., 2025).

In the Talib Concept Model, these effects are captured under "Impact on PE Curriculum and Instruction," emphasising that facility conditions are not neutral backdrops but exert direct influence on teaching quality, learning outcomes, and student engagement.

3. Design Priorities for a Functional Pool Facility

Drawing on their lived experiences, participants articulated clear design and renovation priorities that would address the identified barriers:

- Reliable water quality and maintenance – Regular water supply, effective filtration, and proper chlorination were seen as non-negotiable for both safety and comfort. Participants linked water quality directly to trust and willingness to use the pool.
- Structural and functional upgrades – Repairing the pool shell, decking, and surrounding infrastructure, and providing adequate changing rooms, showers, restrooms, storage, and lockers were repeatedly mentioned as prerequisites for a usable teaching space (Staeger-Wilson et al., 2012).
- Accessibility and inclusive design – Participants implicitly echoed UDL principles by calling for a pool that is accessible to all students, including those with lower swimming skills and (by extension) those with disabilities. They stressed the need for user-friendly entry/exit points, clear signage, and spaces that respect privacy and cultural norms.

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- Culturally sensitive and student-friendly features – While not always labelled as such, comments about comfort, modesty, and feeling "welcome" in the space indicate an expectation that the redesigned facility should reflect local cultural values and student needs, rather than replicate generic designs (Fiharsono et al., 2024).

These priorities map onto the "Design Priorities" node of the model and demonstrate how stakeholder input can translate into concrete, context-sensitive design criteria rather than purely technical specifications (Könings et al.,2017).

4. Administrative and Logistical Hurdles

Participants also highlighted institutional-level constraints that shape whether and how renovation can occur:

- Financial limitations and competing priorities – Budget constraints and the need to balance various institutional demands were acknowledged as major hurdles to upgrading the pool. Some participants perceived aquatic facilities as a lower priority compared to other infrastructure needs (Fadare et al., 2021).
- Maintenance systems and responsibility – The absence of a clear, sustained maintenance plan was identified as a root cause of the pool's deterioration. Participants emphasised that renovation without a management and maintenance framework would only provide a temporary solution (Brown et al., 2006).
- Safety management and governance – Issues such as the absence of lifeguards, lack of formal safety protocols, and inconsistent oversight pointed to broader governance gaps. Participants suggested that clear roles, policies, and coordination mechanisms are essential for safe and sustainable operation (Di Vaio et al., 2021; Sotnikova, 2024).

In the conceptual model, these issues are captured under "Administrative and Logistical Hurdles," underscoring that technical redesign must be accompanied by institutional reform in budgeting, maintenance planning, and safety governance.

5. Anticipated Benefits of a Modernised Pool

Despite current challenges, participants expressed a strong belief in the transformative potential of a renovated, on-campus swimming pool. Anticipated benefits clustered around:

- Enhanced learning and skill development – Ready access to a safe, functional pool would allow full implementation of the aquatic PE curriculum, support systematic skill progression, and better prepare students with essential water-safety competencies (Storm et al., 2017; Wahdi & August, 2025).
- Increased engagement and well-being – A modern, attractive facility on campus was expected to boost student motivation, provide a convenient outlet for stress relief, and support mental and social well-being through regular recreational use (Husain et al., 2024).
- Expanded programs and community outreach – Participants envisioned new offerings such as advanced swimming courses, lifeguard training, and community-based aquatic programs, potentially opening the facility to local barangays and supporting broader peace- and health-promotion efforts in post-conflict Marawi (Simangan, 2024).
- Institutional and economic gains – A renovated pool was also seen as enhancing the university's image, supporting sports development, and potentially generating economic benefits through events, rentals, or partnerships, aligning with national agendas in sport and higher education development.

In the study Concept Model, these outcomes are represented as "Anticipated Benefits," with arrows from the redesigned facility to educational, institutional, and community domains. They highlight that renovation is not an end in itself but a lever for multi-level gains in health, safety, learning, and community engagement.

Taken together, these themes illustrate that redesigning the MSU-Marawi swimming pool is a project that is simultaneously infrastructural, educational, behavioural, and organisational. The findings support the argument that any

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renovation should be guided by (a) stakeholder-derived design priorities (UDL-informed), (b) an understanding of student beliefs and barriers (HBM-informed), and (c) attention to the multiple ecological layers—from individual users to institutional governance and community context (Ecological Systems Theory)—that shape facility use and impact.

Summary

This qualitative study used an Interpretative Phenomenological Approach (IPA) to explore how the redesign and renovation of the on-campus swimming pool at Mindanao State University–Marawi (MSU-Marawi) can address educational and logistical challenges. Eight purposively selected participants (five students who had recently completed a swimming class and three swimming instructors from the College of Sports, Physical Education, and Recreation) were interviewed through semi-structured, face-to-face and focus group discussions during AY 2024–2025.

Interviews were audio-recorded, transcribed, and thematically analysed using IPA. The analysis generated five overarching themes: (1) barriers to facility access and use (transportation, financial constraints, scheduling conflicts, facility deficiencies, safety and cultural concerns); (2) impact on PE curriculum and instruction (curriculum disruption, limited skill development, reduced motivation, increased instructor burden); (3) design priorities for a functional pool (water quality and maintenance, structural and accessibility improvements, cultural sensitivity, added features); (4) administrative and logistical hurdles (funding, low institutional prioritization, maintenance and staffing gaps, environmental safety risks); and (5) anticipated benefits of a modernized pool (enhanced learning, higher engagement, expanded programs, economic gains, and improved university image).

These themes informed the Talib Concept Model, a conceptual framework that illustrates how infrastructural, behavioural, curricular, and institutional factors interact around the swimming pool facility and how targeted redesign can produce multi-level benefits for MSU-Marawi and its surrounding community.

Conclusions

1. Access and equity: The current condition and location-dependent use of off-campus pools create substantial geographic, financial, and temporal barriers, disproportionately affecting students from lower socioeconomic backgrounds and limiting equitable access to aquatic education.
2. Educational impact: The substandard and underutilised on-campus pool has severely compromised the delivery of the PE curriculum, restricting students' opportunities to acquire essential swimming and water-safety skills, lowering motivation, and increasing instructional workload and safety risks.
3. Design requirements: s Any redesign of the MSU-Marawi pool must be holistic, prioritising water quality, structural rehabilitation, safety and supervision, cultural sensitivity (including gender and privacy considerations), and accessibility, consistent with universal design principles.
4. Institutional capacity: Financial constraints, low administrative prioritisation, weak maintenance systems, and insufficiently trained personnel are key institutional barriers. Without reforms in governance, budgeting, and staffing, renovation efforts are unlikely to be sustainable.
5. Transformative potential: A modernised, well-managed campus pool has the potential toenhance learning and well-being, diversify PE and community programs, generate revenue, and strengthen the university's reputation—provided coherent policy, resources, and ongoing management support.

Recommendations

1. Facility and designs: Prioritsze immediate remediation of critical issues (water supply, filtration, disinfection, and basic amenities) and develop a preventive maintenance plan.

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- Redesign the facility using universal design and culturally sensitive principles, including accessible entries, gender-appropriate changing areas, privacy features, and, where feasible, a covered/indoor configuration.

2. Governance, finance, and staffing - Elevate the pool to a strategic institutional priority with a dedicated budget line, transparent financial management, and regular auditing.

- Establish a small, representative pool management committee (administrators, faculty, studeand nts, community liaison) to oversee planning, operations, and maintenance.

- Hire and train certified lifeguards and maintenance personnel, with periodic upskilling aligned to current safety and water-quality standards.

3. Access, scheduling, and curriculum: While renovation is underway, formalise partnerships with nearby facilities on negotiated rates and transport arrangements; adjust PE scheduling to minimise clashes with core academic classes.

- Review and adapt the PE curriculum to allow flexible modalities (e.g., theory modules, alternative activities) without abandoning core aquatic competencies.

4. Engagement and future research - Use the Talib Concept Model as a planning tool for MSU-Marawi and as a reference for other institutions facing similar facility challenges.

- Engage students, instructors, community stakeholders, and relevant government or sports bodies in co-designing pool policies and program offerings.

- Future studies may assess changes in student participation, skill levels, and health/well-being

outcomes before and after pool renovation, and compare experiences across campuses or institutions.

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