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AI AND DIGITAL TRANSFORMATION: INNOVATIONS, OPPORTUNITIES, AND ETHICAL CHALLENGES

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Innovations, Opportunities, and Ethical Challenges”**

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Latvijas Nacionālajā attīstības plānā 2021.–2027. gadam (NAP2027) mākslīgais intelekts un digitālā transformācija tiek uzsvērti kā vieni no centrālajiem mūsdienu sociālekonomiskās attīstības virzītājspēkiem. Tie būtiski ietekmē organizatoriskās struktūras, lēmumu pieņemšanas procesus un pakalpojumu sniegšanu dažādās nozarēs. Progresīva datu analīze, mašīnmācīšanās risinājumi un intelektuālās automatizācijas sistēmas arvien plašāk tiek integrētas tādās jomās kā uzņēmējdarbības vadība, izglītība, tūrisms, veselības aprūpe un publiskā pārvalde.

Vienlaikus šo tehnoloģiju straujā izplatība rada sarežģītas ētikas, datu aizsardzības, regulatīvās un mainīgās cilvēkkapitāla problēmas digitālā vidē. Īpašs uzsvars tiek likts uz efektīvu zināšanu un inovāciju pārnesi starp ekspertiem, jo tas ir galvenais faktors organizāciju pielāgošanās spējas uzlabošanā un ilgtspējīgas attīstības veicināšanā.

Zinātniskas sesijas, kas aptver informācijas tehnoloģiju risinājumus, uzņēmējdarbību, tūrisma, tiesības un drošību, komunikāciju, veselību un izglītību, veicina visaptverošu nozaru specifisko izaicinājumu un iespēju analīzi. Ar zināšanu apmaiņu un sadarbību stiprina Latvijas inovāciju spējas, atbalsta uz pierādījumiem balstītu politikas veidošanu un uzlabo konkurētspēju globālajā digitālajā ekonomikā.

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In the Latvian National Development Plan 2021–2027 (NDP2027), artificial intelligence and digital transformation are presented as one of the central drivers of modern socio-economic development. This significantly affects organisational structures, decision-making processes, and service delivery across several sectors. Advanced data analytics, machine learning applications, and intelligent automation systems are increasingly integrated across areas such as business management, education, tourism, healthcare, and public administration.

At the same time, the rapid spread of these technologies creates complex ethical, data protection, regulatory and changing human capital issues in the digital environment. Special emphasis is placed on the effective transfer of knowledge and innovation between experts, as this is a key factor in improving organisations' adaptability and promoting sustainable development. Scientific sessions covering information technology solutions, entrepreneurship, tourism, law and security, communication, health and education contribute to a comprehensive analysis of sector-specific challenges and opportunities. Knowledge exchange and cooperation strengthen Latvia's innovation capabilities, support evidence-based policymaking, and improve competitiveness in the global digital economy.

Assoc. Prof. **Janis Peksa**,
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THE IMPACT OF EDUCATION AND ARTIFICIAL INTELLIGENCE ON THE GROWTH OF A COUNTRY'S ECONOMIC POTENTIAL

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Abstract

To foster economic growth, strengthen technological competitiveness, and enhance national attractiveness, it is essential to ensure that individuals possess the skills necessary for successful participation in the labor market. This article examines the economic potential of Lithuania in the context of national economic growth, while also addressing the broader objectives of adaptation, talent retention, and the safeguarding of state security. In order to examine the potential of the Lithuanian economy from a novel perspective, a non-standard methodological approach was adopted. The study is based on the wargaming methodology, specifically through the adaptation of the matrix games system. The logic underlying the actions of the wargame participants demonstrated that, without high-quality education and a functioning reskilling system, the country will be unable to implement economic transformation, achieve technological breakthroughs, or adequately respond to emerging national needs. The results of the conducted study indicate that education is identified as a fundamental prerequisite for national development. Particular emphasis is placed on strengthening society and developing human resources within the context of the labor market. Education is therefore highlighted as one of the key strategic areas requiring decisive action and the implementation of comprehensive and complex reforms. The optimization of the education and learning process can be facilitated through the use of artificial intelligence (AI). Today, AI is increasingly becoming a supportive tool across a wide range of fields, and the education sector is no exception.

Keywords: artificial intelligence, economic growth, economic potential, education.

Introduction

Education is a fundamental activity aimed at providing individuals with the foundations for a meaningful and independent life while enabling them to continuously develop their abilities. It is widely regarded as a key instrument for shaping the future of individuals, society, and the state. Education preserves and strengthens national identity while transmitting values that give meaning to human life, promote harmony and solidarity within society, and contribute to the progress and security of the state. The purpose of education is fulfilled most effectively when its development outpaces the overall development of society (Law on Education of the Republic of Lithuania, 1991).

As a state-supported sphere of societal development, education pursues several key objectives: (1) to foster value-based orientations in individuals, develop communication skills essential for contemporary life, and enable the acquisition of information culture and information literacy characteristic of a knowledge-based society, as well as modern social competencies; (2) to identify individuals' creative abilities and support the development of competencies accordingly, while transmitting the foundations of technological, economic, and entrepreneurial culture necessary to ensure the progress, competitiveness, and sustainable development of the national economy, and to create opportunities for continuous improvement through lifelong learning; (3) to strengthen societal capacity by ensuring the sustainable development of the national economy, environment, and human resources, enhancing both domestic and international economic competitiveness, and supporting national security and the advancement of a democratic state; (4) to provide individuals with the foundations of national and ethnic culture, while creating conditions for acquiring the civic and political culture rooted in democratic traditions, and developing the skills and experience necessary to function as competent members of a multicultural society (Law on Education of the Republic of Lithuania, 1991).

In recent years, the field of education has witnessed the emergence of an increasing number of technological solutions. The educational and learning process itself can be optimized through the use of artificial intelligence (AI). Today, AI is becoming an increasingly prevalent support tool across numerous sectors, and the education sector is no exception. The educational landscape is gradually being transformed and reshaped by AI, although it is unlikely that AI will fully replace the traditional education system (Chassignol et al., 2018).

Educational technology startups are developing a wide range of solutions designed to facilitate and enhance the learning process. Among these are personalized learning approaches, in which the learning process is adapted to the needs and abilities of each individual, thereby making education more engaging and effective. AI-based tools can also assist in automating certain assessment processes, analyzing student performance, and identifying learners' strengths and weaknesses.

To foster economic growth and employment in any country, it is crucial to ensure that individuals possess the skills necessary to participate successfully in the labor market. This article examines a study on Lithuania's economic potential conducted by ISM University of Management and Economics at the end of 2025 using the wargaming method. The study seeks to address the following research question: what strategic decisions must Lithuania make while simultaneously pursuing economic growth, promoting national transformation, retaining its population, and ensuring national security?

The interaction between education and AI: the literature review

The educational environment encompasses the physical, social, and technological context in which learning takes place. Education and training play a crucial role in the economic and social strategies of the European Union. In February 2021, the Council adopted the Resolution on a strategic framework for European cooperation in education and training towards the establishment of the European Education Area and beyond (2021–2030) (Council Resolution, 2021). This document outlines several policy objectives for the European Education Area aimed at removing barriers to learning and improving access to high-quality education for all.

EU policymakers place strong emphasis on skills development and lifelong learning as key drivers of competitiveness, innovation, and social inclusion. A wide range of policy instruments are being implemented to equip individuals with the skills necessary to succeed in a rapidly changing labour

market. These efforts focus on increasing participation in education and training, addressing skills mismatches, and promoting equal opportunities. They also contribute to progress towards the EU's two major social targets established in the Action Plan for the European Pillar of Social Rights: ensuring that at least 60% of adults participate in training every year by 2030 and increasing the employment rate to at least 78%. In 2024, 47.0% of the EU population aged 25–64 participated in education and training during the 12 months preceding the survey. The Swedish capital region of Stockholm recorded the highest regional participation rate, reaching 64.0%. Swedish regions generally demonstrate particularly high levels of adult participation in education and training (Eurostat, 2025).

Public expenditure on education, alongside healthcare, is widely regarded as one of the most significant investments in human capital. Education has considerable potential to stimulate social and economic development. This is particularly relevant in a globalised world, where a highly skilled workforce represents a critical advantage in terms of productivity, innovation, and competitiveness.

The growing use of artificial intelligence (AI) is having a substantial impact across the education sector. The potential of AI technologies in education is considerable and may ultimately transform educational processes. Consequently, significant legislative measures have recently been introduced to regulate the development and use of AI systems. The entry into force of Regulation (EU) No. 2024/1689 of the European Parliament and of the Council, commonly referred to as the AI Act, represents the world's first comprehensive set of binding rules governing the development and deployment of AI systems (Regulation of the European Parliament and of the Council, 2024).

The AI Act classifies AI systems according to the level of risk they pose. Some systems are prohibited entirely, while others are categorized as high-risk and subject to strict obligations for developers and providers to manage potential risks and ensure the safe use of the technology. Given the crucial and sensitive role of education in society, the AI Act provides specific provisions regulating the use of AI systems within this sector. While the implementation of AI technologies in education is considered important for promoting high-quality digital education and training, certain AI systems used in admission processes, learning outcome assessments, or the monitoring of prohibited behaviour during examinations may significantly influence an individual's educational trajectory and life opportunities. For this reason, such systems are classified as high-risk AI systems.

According to Dogan, Celik, and Arslan (2024), although AI technologies provide numerous benefits, the increasing reliance on technological systems also introduces several challenges. These include reduced interaction between academic staff and students, shifts in workforce dynamics, concerns regarding student privacy, and unequal access to technological resources.

The AI Act acknowledges that the deployment of AI systems in education can contribute to the promotion of high-quality digital education and training, while also enabling learners and educators to acquire the digital skills and competencies required to participate actively in economic, social, and democratic processes. However, AI systems in education are primarily used to grant access to, admit, or allocate individuals to educational and vocational training institutions; to assess learning outcomes; to determine appropriate levels of education; and to monitor and detect prohibited behaviour during examinations. Consequently, such systems should be considered high-risk AI systems because they can shape an individual's educational and professional trajectory and affect their ability to secure employment and earn a livelihood. If improperly designed or implemented, these systems may become highly intrusive and potentially infringe upon the fundamental right to education and training.

Artificial intelligence is transforming the ways in which teaching and learning occur, generating both interest and concern regarding its potential to reshape education systems. In order to contribute to this discussion, this systematic literature review examines current research trends in the field. The educational environment plays a significant role in shaping students' acquisition of knowledge and skills. Professional development in teaching is widely recognized as a critical component of ongoing efforts to improve student learning outcomes in higher education (Emery, et al., 2019).

Research highlights several potential benefits of AI integration in education, including improved learning outcomes, personalized instruction, and increased student motivation. Nevertheless, several challenges must also be addressed, such as the ethical use of AI by students, resistance among educators to the adoption of AI systems, and the risk of digital dependency associated with these technologies. These findings demonstrate the considerable potential of AI to enhance educational processes; however, its effectiveness depends on careful implementation and close collaboration between educators, researchers, and policymakers in order to ensure meaningful and equitable outcomes.

Similarly, Garzon, Patino, and Marulanda (2025) emphasize several advantages of AI integration in education, including enhanced learning outcomes, personalized instruction, and increased student motivation. At the same time, they identify challenges such as the ethical use of AI by students, teachers' reluctance to adopt AI technologies, and the potential development of digital dependency.

Artificial intelligence has the potential to exert a significant positive influence on education. Nevertheless, despite its advantages, concerns related to diminished decision-making capacity, increased passivity in learning, and security issues should not be overlooked. The impact of AI on education has already generated mixed responses: while some scholars consider it a progressive advancement, others argue that excessive reliance on AI may weaken analytical skills and encourage inappropriate academic behaviour (Grassini, 2023).

The implementation of AI technologies also creates significant opportunities for the development of massive open online courses. Intelligent systems can facilitate the assessment of large numbers of assignments and enable the identification of gaps in both learning and teaching processes. Furthermore, the measurement of learning progress is becoming increasingly efficient. However, AI-based assessment systems may overlook certain correct but rare or unique solutions because their decisions are primarily based on large-scale statistical patterns. Consequently, assessment systems relying on artificial intelligence cannot be considered entirely reliable in every possible situation without the involvement of a human mentor or evaluator (Chassignol et al., 2018).

Methodology

In order to look at the potential of the Lithuanian economy from a new perspective, a non-standard methodological approach was chosen. The study is based on the wargames methodology, adapting the matrix games system developed by Chris Engle (Curry, 2020). A matrix game is defined as a game of players characterized by finite sets of strategies for each player, and the outcomes are represented by utility functions that determine the payoffs for the chosen strategies. Each combination of strategies yields specific payoffs that can be arranged in matrix format. The analysis and the conclusions drawn from it were based on the expert insights of the participants, presented during the game sessions. The clear structure of the game allows for a more systematic collection of information based on the analysis than in a regular discussion. This creates the prerequisites for

talking about possible development alternatives, as well as highlighting a map of existing potential, development assumptions and obstacles.

The research process consisted of four stages: (1) Naming the tensions, (2) The matrix game design and testing, (3) Four game sessions, (4) Data processing and analysis (Fig. 1).

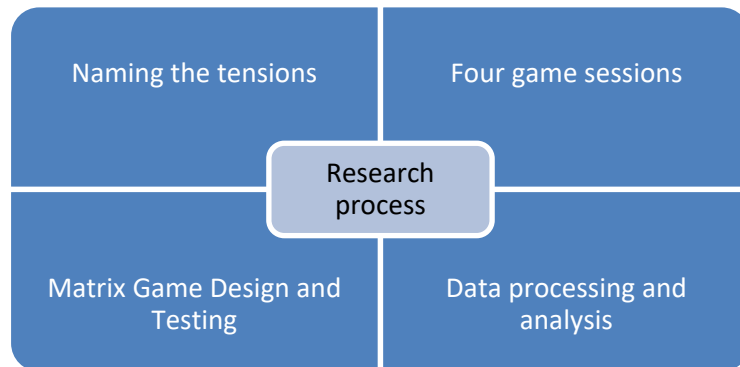


Figure 1. Components of the research process (compiled by the authors)

In the first stage of the study, key tensions were identified in which Lithuania will need to make strategic decisions in order to ensure the country's successful development. The following principal tensions were defined: population decline, industrial inertia, the growth of the security economy and openness to investment, the balance between a welfare society and a productivity-driven economy, and the need for a technological breakthrough.

In the second stage of the study, the matrix game method was selected. Within this framework, participants were assigned specific roles and proposed actions that they would implement during the time period allocated for each move. The objective was to maintain a focused discussion and encourage participants to concentrate on key actions that could contribute either to the successful development of the state or to the well-being of the stakeholder group represented by the respective player.

In the third stage, participants were introduced to thematic background information concerning the identified tensions and Lithuania's current situation. During the game, participants were also provided with information from a hypothetical scenario outlining developments that had occurred in Lithuania and globally. These developments influenced participants' choices, shaped the evolution of the identified tensions, and affected the probability of success of the proposed actions.

In the fourth stage, the results were analysed, primarily on the basis of insights provided by participants during the game sessions. Drawing on the collected and systematised data, and after assessing impacts, probabilities, enabling conditions, and potential obstacles, a comparative analysis was conducted. This allowed for the synthesis of scenarios developed during individual sessions, the identification of aggregated analytical results, and the highlighting of the most significant actions emphasised by participants, together with examples of their potential real-world application.

The wargaming method was chosen to study Lithuania's economic potential because it allows to propose solutions and test them where they most often fail, i.e. under conditions of tension, when different interests collide, limited resources and high uncertainty. This approach highlights not only

ideas, but also their weaknesses: what assumptions are needed, what obstacles are holding them back, what unexpected side effects arise.

The study on Lithuania's economic potential was conducted by ISM University of Management and Economics in cooperation with the national development bank ILTE and the analytical media platform "Politika". The research process involved discussions with 50 leaders from Lithuania's business, economic, legal, academic, and cultural sectors. Using the wargaming method, participants across four sessions explored possible directions for the country's development and developed future scenarios by proposing specific actions and identifying the assumptions and barriers associated with their implementation (Study of Lithuania's economic potential, 2025).

It should be noted that this research method has certain limitations, including restricted analytical complexity and dependence on the hypothetical future scenario. In order to maintain methodological consistency, the main discussion was structured around the aspects identified during the four sessions. This study does not present the authors' own position; rather, it reflects the aggregated views of fifty leaders from various fields who participated in the wargaming sessions. These views were expressed through ideas and arguments presented within the context of the game scenario and included differing perspectives.

Research results

After summarizing the individual session scenarios and refining the results of the analysis, the most important actions identified by the participants for achieving successful national development were determined. Each action proposed by participants could be assigned to more than one thematic category. The analysis of the proposed actions revealed a clearly dominant theme – education. Although the strongest connections were observed between education and technology (broader application, adaptation to technological change, and the acquisition of relevant skills) as well as mindset (promotion of entrepreneurship and creativity), these links were also present in other thematic areas.

The analysis of these trajectories, based on the positions of wargame participants, highlighted three main dimensions. These dimensions are relevant for all actors shaping the future of a country's development – policy decision-makers, economic and societal leaders, knowledge creators, and those who contribute daily to strengthening their country's economic potential.

When summarized, these dimensions can be described through three closely interconnected concepts: education, resilience, and self-awareness (Fig. 2).

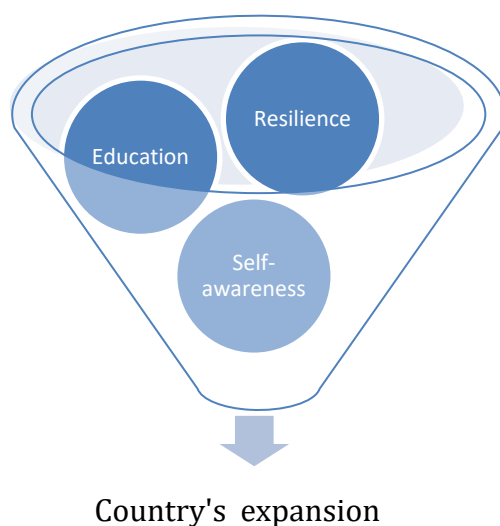


Figure 2. Dimensions of a country's expansion potential (compiled by the authors)

The first dimension can be defined as education as a precondition for breakthrough. The logic of the actions proposed by wargame participants demonstrated that without high-quality education and a functioning reskilling system, a country will not be able to implement economic transformation, achieve technological leaps, or respond effectively to emerging national needs. Based on the findings of the study, education can therefore be understood as a form of strategic infrastructure, determining productivity, investment attractiveness, and the resilience of society.

The second dimension – resilience – is a condition of the economy rather than merely an issue of national security. The study revealed that hostile actors seek results not only through direct pressure but also by increasing distrust, weakening institutions, and dividing society. In this context, wargame simulations particularly clearly illustrate the mechanism whereby declining trust leads to fragmented attention, resulting in stalled reforms and a weakened investment environment. Resilience is thus defined as a competence of both the state and society, characterized by institutional preparedness, clear communication, and collective societal cohesion.

The third dimension highlights that a country needs a clear sense of self and the courage to act. It requires choosing a balanced set of decisions, implementing necessary actions, and adopting measures to manage risks. A country must maintain a clearly defined and consistently implemented strategic direction, cultivate the ability to articulate who it is and what it seeks to achieve, and avoid abandoning long-term reforms for short-term goals. When a strategy is translated into clear priorities and a balanced set of decisions, it becomes easier to maintain continuity despite political cycles, institutional changes, and competing interests.

Human capabilities are identified as a fundamental factor in ensuring successful and competitive national prosperity. In practice, even the best strategic plans cannot be successfully implemented if there is a lack of human capabilities to support them.

The results of the study indicate that education was identified as a fundamental prerequisite for national development, with particular emphasis on strengthening society and developing human resources within the context of the labor market. This prerequisite is closely linked to economic transformation, the growth of national economic potential, and increasing productivity. The current economic potential is viewed as one of the main conditions for achieving a breakthrough.

Education is also identified as one of the key areas requiring decisive action in order to increase a country's technological competitiveness and attractiveness. The research results indicate that the education sector requires the implementation of a complex reform – namely, a fundamental reorientation of the education system toward technology. In Lithuania, scientific and technological progress remains relatively slow; in 2024 the level of research, technological development, and experimental development was among the lowest in Europe (Eurostat, 2025).

An example of successful reorientation of education toward technology can be found in South Korea, where a significant increase in the number of individuals with technical education was achieved. Following the vocational education reform implemented after 1994, the number of students in this field increased fourfold (Lee, H. 2024). A similar breakthrough can be observed in Finland, where the number of graduates from state polytechnic institutions is comparable to that of universities.

It should also be noted that AI has significant potential and impact in supporting the reorientation of education systems toward technology. Artificial intelligence has become an integral part of everyday life, often integrating into routine activities almost imperceptibly. Together with healthcare provision, public spending on education is frequently considered one of the most important investments in people. Education has the potential to promote social and economic development, which is particularly relevant in a globalized world where a highly skilled workforce can provide advantages in terms of productivity, innovation, and competitiveness.

Conclusions

The educational environment encompasses the physical, social, and technological contexts in which learning processes occur. Education and training constitute fundamental components of the European Union's economic and social development strategies. Within this framework, human capabilities are widely recognized as a critical determinant of sustainable and competitive national prosperity. In practical terms, even the most comprehensive strategic initiatives cannot be effectively implemented without sufficient human capabilities to support and sustain them.

The findings of this study indicate that education is widely regarded as a fundamental prerequisite for national development. Particular emphasis is placed on strengthening societal capacity and developing human resources in response to labour market demands. These priorities are closely associated with processes of economic transformation, the expansion of national economic potential, and improvements in overall productivity.

Furthermore, education is identified as one of the strategic sectors requiring decisive policy intervention in order to enhance national technological competitiveness and attractiveness. In this context, the integration of artificial intelligence (AI) technologies presents significant opportunities for optimizing educational and learning processes. AI is increasingly being adopted as a supportive technological tool across a wide range of sectors, and the education sector is no exception.

Artificial intelligence has the potential to significantly enhance educational processes by enabling more efficient knowledge acquisition, personalized learning, and improved decision-support mechanisms. Nevertheless, despite these potential benefits, several concerns remain. These include the possible erosion of independent decision-making, increased reliance on automated systems, and emerging issues related to data security and ethical use. Consequently, the growing presence of AI in education has elicited mixed responses. While some scholars consider it a transformative advancement in educational practice, others argue that excessive reliance on AI technologies may

weaken analytical thinking and potentially encourage inappropriate or unethical behaviour (Grassini, 2023).

At the same time, AI possesses considerable potential to facilitate the technological transformation of education systems and to support the alignment of educational outcomes with the requirements of a rapidly evolving digital economy. Education, in this regard, plays a pivotal role in fostering social and economic development. This is particularly significant in an increasingly globalized environment, where a highly skilled and technologically competent workforce represents a crucial source of competitive advantage in terms of productivity, innovation, and long-term economic competitiveness.

References

- Chassignol, M., Khoroshavin, A., Klimova, A. and Bilyatdinova, A. (2018). Artificial intelligence trends in education: A narrative overview, *Procedia Computer Science*, vol. 136, pp. 16–24, Jan. 2018. Retrieved from: https://www.researchgate.net/publication/327902022_Artificial_Intelligence_trends_in_education_a_narrative_overview
- Council Resolution on a strategic framework for European cooperation in education and training towards the establishment of a European Education Area and beyond (2021-2030), 2021/C 66/01, (2021). Retrieved from: [https://eur-lex.europa.eu/legal-content/LT/ALL/?uri=CELEX:32021G0226\(01\)](https://eur-lex.europa.eu/legal-content/LT/ALL/?uri=CELEX:32021G0226(01))
- Curry, J. (2020). The utility of narrative matrix games. *Naval War College Review*, 73(2), pp. 33-53
- Dogan, M., Celik, A. and Arslan, H. (2024). AI In Higher Education: Risks and Opportunities From the Academician Perspective. Retrieved from: <https://onlinelibrary.wiley.com/doi/full/10.1111/ejed.12863>
- Emery, N., Maher, J.M., Ebert-May, D. (2019). Studying Professional Development as Part of the Complex Ecosystem of STEM Higher Education. *Innovative Higher Education*, 44, 469–479. Retrieved from: <https://doi.org/10.1007/s10755-019-09475-9>
- Eurostat, (2025). R&D expenditure. Statistics Explained. Retrieved from: https://ec.europa.eu/eurostat/statistics-explained/index.php?title=R%26D_expenditure
- Garzon, J., Patino, E. and Marulanda, C., (2025). Systematic Review of Artificial Intelligence in Education: Trends, Benefits, and Challenges, *Multimodal Technologies and Interaction*, 2025, 9(8), 84
- Grassini, S. (2023). Shaping the future of education: Exploring the potential and consequences of AI and ChatGPT in educational settings. *Education Sciences*, 13(7), Article 692. Retrieved from: <https://doi.org/10.3390/educsci13070692>
- Law on Education of the Republic of Lithuania, (1991). Retrieved from: <https://www.e-tar.lt/portal/lt/legalAct/TAR.9A3AD08EA5D0/VgyvbXhTkn>
- Lee, H. (2024). Fields of Study and Youth Job Mobility Behaviors in South Korea. *Journal of Asian Sociology*, Vol. 53, No. 3 (September 2024), pp. 195-224
- Regulation (EU) of the European Parliament and of the Council, 2024/1689 (2024). Retrieved from: <https://eur-lex.europa.eu/eli/reg/2024/1689/oj?locale=LT>
- Study of Lithuania's economic potential, (2025). Retrieved from: <https://www.ism.lt/wp-content/uploads/Lietuvos%20ekonominio%20potencialo%20tyrimas%200213.pdf>

ĀRSTU ZINĀŠANU, ATTIEKSMES UN GATAVĪBAS DARBAM AR ATMP-HE LATVIJĀ NOVĒRTĒJUMS: ANKETAS DIZAINS UN "EVERGREEN" E-APMĀCĪBAS MODELIS

ASSESSMENT OF PHYSICIANS' KNOWLEDGE, ATTITUDES AND READINESS TO WORK WITH ATMP-HE IN LATVIA: SURVEY DESIGN AND THE "EVERGREEN" E-LEARNING MODEL

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Anotācija

Uzlaboto terapiju zāļu (advanced therapy medicinal products; ATMP) izmantošana slimnīcas izņēmuma ietvarā (hospital exemption; HE) Latvijā prasa ārstu gatavību uzņemties individuāli izrakstītas terapijas profesionālo atbildību, nodrošinot izsekojamību un pēcnovērošanu. Raksta mērķis ir pamatot promocijas pētījuma anketēšanas dizainu ārstu zināšanu, attieksmes un gatavības novērtēšanai un pamatot tiešo kursu pārdošanu

ārstiem, izmantojot "Evergreen" mācību pārvaldības sistēmu (learning management system; LMS), kā piemērotāko risinājumu klientu gatavības palielināšanai mazā tirgū. Pētījumā izmantots jaukts dizains: tiešsaistes anketa ar piecām dimensijām (K-A-I-S-P: zināšanas, attieksme, ieviešanas nodoms, sadarbības/īstenošanas spēja, praktiskā gatavība), klīniskie scenāriji un svērtais gatavības indekss (AGI), ekspertu intervijas un mini-kursa aprobācija ar pirms/pēc testiem un izkliedētu atkārtotāšanu (spaced learning). Sagaidāmais rezultāts ir validēts gatavības rādītājs un uz datiem balstīta apmācības personalizācija, kas palīdz mazināt ieviešanas barjeras ATMP-HE izmantošanai 1. tipa diabēta agrīnajā stadijā, psoriāzē un Krona slimībā.

Abstract

Implementing advanced therapy medicinal products (ATMP) under the hospital exemption (HE) framework in Latvia requires physicians' readiness to assume professional, clinical and legal responsibility for individually prescribed therapies, including traceability and follow-up. This paper justifies the dissertation survey design for assessing physicians' knowledge, attitudes and readiness, and explains why direct-to-physician sales and delivery of training via an "evergreen" learning management system (LMS) is the most suitable approach to increase readiness in a small market. A mixed-methods design is proposed: an online questionnaire with five dimensions (K-A-I-S-P: knowledge, attitude, intention, collaboration/implementation capacity, practical readiness), case vignettes and a weighted readiness index (AGI), expert interviews, and a pilot mini-course with pre/post testing and spaced learning follow-ups. The expected output is a validated readiness metric and data-driven personalization of training that can reduce implementation barriers for ATMP-HE use in early-stage type 1 diabetes, psoriasis and Crohn's disease.

Atslēgas vārdi: ATMP-HE; ārstu gatavība; e-apmācība; mikromācīšanās

Saīsinājumi

ATMP	– uzlabotās/jaunieviestās terapijas zāles (advanced therapy medicinal products)
HE	– slimnīcas izņēmums (hospital exemption)
ATMP-HE	– ATMP izmantošana HE ietvarā
LMS	– mācību pārvaldības sistēma (learning management system)
K-A-I-S-P	– anketas dimensijas: zināšanas, attieksme, ieviešanas nodoms, sadarbības/īstenošanas spēja, praktiskā gatavība
AGI	– svērtais gatavības indekss
CFIR	– Konsolidētais ieviešanas pētījumu ietvars (Consolidated Framework for Implementation Research)
CME	– nepārtrauktā medicīniskā izglītība (continuing medical education)
CAR-T	– himeriskā antigēna receptoru T-šūnu terapija
HTTPS	– hiperteksta pārsūtīšanas protokols ar šifrēšanu (Hypertext Transfer Protocol Secure)
MI	– mākslīgais intelekts

Ievads

Uzlabotās terapijas zāles (*advanced therapy medicinal products*; ATMP) Eiropas Savienības (ES) regulatīvajā telpā parasti tiek reģistrētas centralizēti, tomēr slimnīcas izņēmuma (*hospital exemption*; HE) ceļš ļauj konkrētā dalībvalstī nodrošināt individualizētu terapiju noteiktiem pacientiem. Literatūrā šī pieeja raksturota kā iespēja paātrināt inovāciju pieejamību, vienlaikus saglabājot augstas kvalitātes, drošuma un uzraudzības prasības, taču praktiskā piemērošana ES valstīs ir neviendabīga un prasa skaidru ieviešanas arhitektūru (Coppens, et al., 2020; Hills, et al., 2020; Trias, et al., 2022).

Latvijas kontekstā ATMP-HE ieviešanas sākotnējā virzība projektā fokusēta uz trim klīniskām nišām: 1. tipa diabēta agrīno autoimūno iekaisuma stadiju, psoriāzi un Krona slimību. Šajās jomās lēmumi par pacienta izvērtēšanu, ārstēšanas uzsākšanu un pēcnovērošanu ir ārstam piederošas profesionālās atbildības darbības, kurās vienlaikus jāintegrē klīniskās indikācijas, riska diferencēšana, izsekojamība un starpinstitutionāla sadarbība. Tādēļ "gatavība" nav reducējama tikai uz informētību; tā ietver zināšanas, attieksmi, ieviešanas nodomu, uztverto īstenošanas spēju un praktisku apņemšanos mainīt praksi (*commitment-to-change*).

Ārstu profesionālajā tālākizglītībā būtiska problēma ir laika deficīts un defragmentācija iespējā mācīties ikdienas darba specifikas dēļ. Minētās barjeras literatūrā minētas kā viens no iemesliem, kāpēc pašvadīta profesionālā pilnveide nenotiek optimālā apjomā vai notiek epizodiski (Jeong, et al., 2018). Mazā tirgū, kāds ir Latvijā, kur mērķauditorija ir salīdzinoši neliela un specializēta, klātienē kursu atkārtošana un mērogošana var kļūt ekonomiski neefektīva, vienlaikus mazinot pieejamību ārstiem ārpus lielajiem centriem.

Raksta mērķis ir pamatot promocijas pētījuma anketēšanas dizainu ārstu zināšanu, attieksmes un gatavības novērtēšanai darbam ar ATMP-HE un argumentēt, kāpēc tiešā kursu pārdošana ārstiem (*direct-to-physician*) caur "Evergreen" e-mācību modeli ir piemērotākais risinājums ārstu gatavības palielināšanai Latvijā. Rakstā piedāvāts integrēts skatījums kā gatavības mērīšana (K-A-I-S-P un AGI) tiek sasaistīta ar platformas mācību datiem, lai mācību process būtu personalizējams, izmērāms un komerciāli ilgtspējīgs.

Literatūras apskats

Pēdējo gadu publikācijās ATMP-HE regulatīvais ceļš tiek vērtēts ne tikai no juridiskā skatpunkta, bet arī kā praktisks ieviešanas modelis ar būtisku ietekmi uz klīnisko lēmumu pieņemšanu un kvalitātes sistēmām. Eiropas Savienības (ES) dalībvalstīs pastāv atšķirīgas prasības attiecībā uz izņēmuma piemērošanas nosacījumiem, ražošanu, uzraudzību un iesaistīto institūciju lomām, kas rada fragmentāciju un nepieciešamību pēc lokalizētas un konkrētās valsts kontekstam pieskaņotas ārstu sagatavošanas (Coppens, et al., 2020; Hills, et al., 2020). Atsevišķi gadījumu apraksti, piemēram, ATMP-HE izmantošana himeriskā antigēna receptoru T-šūnu (CAR-T) terapijas kontekstā, parāda, ka izņēmuma ceļš var būt praktiski nozīmīgs, bet tā potenciāls nereti netiek pilnībā izmantots skaidru procesu un kompetenču trūkuma dēļ (Trias, et al., 2022). Nacionālie regulējuma piemēri, tostarp Polijas sistēmas analīze, ilustrē, ka formāla normu esamība pati par sevi negarantē veiksmīgu ieviešanu bez pārvaldības un profesionālās gatavības (Pachocki & Verter, 2024).

Ieviešanas zinātne (*implementation science*) uzsver, ka jaunas klīniskās prakses ieviešanas panākumi ir atkarīgi gan no intervences īpašībām, gan no organizatoriskā un individuālā konteksta. Konsolidētā ieviešanas pētījumu ietvara (Consolidated Framework for Implementation Research; CFIR) pieejā uzsvēta nepieciešamība analizēt iekšējos un ārējos faktorus, kas ietekmē ieviešanas gaitu (Damschroder, et al., 2022). Savukārt ieviešanas iznākumu pētniecība, piemēram, pieņemamība, atbilstība, īstenojamība un noturība, iezīmē, ka mērījumi ir vajadzīgi ne tikai rezultātu fiksēšanai, bet arī ieviešanas gaitas pielāgošanai –, piemēram, lai laicīgi korigētu darba plūsmu, resursus, apmācību un atbildību sadalījumu (Proctor, et al., 2023). Šajā kontekstā "gatavība" kļūst par stratēģisku mainīgo, kas palīdz prognozēt barjeras, segmentēt auditoriju un izvēlēties atbilstošus ietekmes instrumentus.

Organizatoriskā gatavība pārmaiņām un tās mērīšana veselības aprūpē ir plaši pētīta, tomēr pārskatos norādīts, ka pastāv liels instrumentu un pieeju daudzveidīgums, kas apgrūtina salīdzināmību un prasa pragmatiski izmantojamus, kontekstā pielāgotus rādītājus (Miake-Lye, et al., 2020; Weiner, et al., 2020). Jaunākā sistemātiskā pārskatā akcentēts, ka veselības aprūpē *organizational readiness for change* koncepts ir būtisks, bet tā saistība ar rezultātiem jāinterpretē, ņemot vērā konkrētās pārmaiņas veidu un ieviešanas stratēģijas (Caci, et al., 2025). ATMP-HE gadījumā pārmaiņas ir sociotehniskas: tās vienlaikus skar klīnisko praksi, dokumentāciju, farmakovigilanci, ražošanas un loģistikas procesus. Tas nozīmē, ka individuālā ārsta gatavība ir cieši saistīta ar sistēmiskajiem priekšnoteikumiem un sadarbības spējām.

Tālākizglītība e-mācību vidē veselības profesionāļiem pēdējā desmitgadē ir kļuvusi par vienu no dominējošajiem formātiem, jo ļauj nodrošināt elastību, pašvadītu tempu un mācību procesa datu iegūšanu. Sistemātiskā pārskatā un meta-analīzē par mobilo izglītību digitālajā vidē konstatēts, ka mācības digitālajā vidē var uzlabot zināšanas un prasmes un daudzos gadījumos ir līdzvērtīgas tradicionālām pieejām (Dunleavy, et al., 2019). Svarīgi, ka digitālā vide mācību procesa vajadzībām ļauj salīdzinoši viegli integrēt formatīvu vērtēšanu, adaptīvus uzdevumus un pēctecīgu atgādinājumu sistēmu, kas klātienē prasa daudz lielākus resursus.

Ārstu gatavības palielināšanai kritiski svarīgs ir ne tikai zināšanu pieaugums, bet arī uzvedības nodoms, jo nodoms bieži kalpo kā starpposms starp mācībām un prakses maiņu. Pētījumā, kurā salīdzināta tiešsaistes un klātienē izglītojošu aktivitāšu ietekme uz medicīnas speciālistu nodomu pieņemt konkrētu klīnisku uzvedību, rezultāti rāda, ka tiešsaistes formāts bieži uzlabo pieejamību un līdzdalību un mācību formātam nav būtiskas nozīmes, ja vien tiek nodrošināts kvalitatīvs mācību saturs un struktūra un atgriezeniskā saite tiem, kas mācās (Ayivi-Vinz, et al., 2024). Ņemot vērā šī pētījuma rezultātus, var pieņemt, ka mazā valstī pieejamība ir būtisks faktors, kas nosaka, ka e-mācību formāts ļauj mediķiem profesionālās pilnveides mācības padarīt pieejamas – ērtā laikā un vietā atkārtojamas.

Mikromācīšanās pieeja (*microlearning*) kā e-mācību formāts, kur saturs tiek sadalīts īsos, skaidri strukturētos mācību moduļos, veselības profesiju izglītībā ir īpaši piemērota situācijās, kad mācībām jākonkurē ar klīnisko darbu, ļaujot integrēt mācīšanos mikrosesijās un nodrošinot ātru atgriezenisko saiti (De Gagne, et al., 2019). Šāds profesionālās tālākizglītības mācību formāts ir saderīgs ar ārstu profesionālās kvalifikācijas periodiskas atjaunošanas (recertifikācijas) prasībām, kur nozīmīgi ir gan tālākizglītības punkti (Ministru kabinets, 2024, 51. punkts), gan praktiska kompetence (Ministru kabinets, 2024, 39. punkts), piemēram, praktisko iemaņu pārbaudei vai klīniskās domāšanas vērtēšanai.

Noturīgu zināšanu veidošanā un klīnisko lēmumu konsekvētākā īstenošanā svarīgs ir mācību "kontakts" biežums un atkārtošana laikā, jo meta-analītiski pierādīts, ka regulāra pārbaude jeb prakses testēšana uzlabo ilgtermiņa atcerēšanos (Adesope, et al., 2017). Citā pētījumā izklaidētu digitālo mācību (*spaced digital education*) meta-analīzē secināts, ka laika gaitā sadalīta atkārtošana uzlabo mācību rezultātus salīdzinājumā ar vienreizējām apmācībām (Martinengo, et al., 2024; Trumble, et al., 2024). Balstoties uz aplūkoto pētījumu rezultātiem, var secināt, ka digitālā vide ļauj šo efektu automatizēt ar īsiem testiem un atgādinājumiem, ieviešot tos e-studiju mācību vidē.

Lai pārietu no nodoma uz reālu prakses maiņu, mācībās bieži tiek integrētas apņemšanās mainīt praksi (*commitment-to-change*), proti, darbības, kur dalībnieks formulē konkrētas izmaiņas, ko plāno ieviest. Pētījumā par nepārtrauktās medicīniskās izglītības (*continuing medical education*; CME) intervenci parādīts, ka šādi paziņojumi korelē ar faktisku prakses maiņu, īpaši, ja tie ir strukturēti un pēc tiem seko novērtējums (Rehring, et al., 2021). ATMP-HE ieviešanas kontekstā šāda pieeja ir īpaši nozīmīga, jo ārstam mācībās apgūtais jāpārvērš konkrētos organizatoriskos soļos, piemēram, dokumentācijas plūsmā, komandas lomu sadalījumā un komunikācijā ar ražotāju un audu banku.

No komercializācijas un ilgtspējas viedokļa e-mācībām būtiska ir spēja piesaistīt un noturēt ārstu auditoriju ar minimālām robežizmaksām, vienlaikus saglabājot profesionālo saturu un atbilstību reglamentam. Platformu ekosistēmu pārskatos uzsvērts, ka tehnoloģiskais slānis un biznesa loģika nav atdalāmi, tas nozīmē, ka platformas vērtību nosaka spēja koordinēt saturu, lietotāja ceļu un datu atgriezenisko saiti personalizācijai (Kapoor, et al., 2021). Platformu konkurences pētījumi rāda, ka platformām priekšrocības rodas, ja tiek veidotas atkārtotas iesaistes mehānismi un saprātīgas pārejas izmaksas (*switching costs*), kas notur lietotāju ilgtermiņā un ļauj uzlabot produktu iteratīvi (Rietveld & Schilling, 2021). Profesionālajā tālākizglītībā medicīnā tas nozīmē, ka izmantojams ir "Evergreen" modelis, kas ļauj automatizēt un radīt nepārtraukti pieejamu mācību platformu ar tiešu piekļuvi, nodrošinot gan mērogojamību, gan atkārtojamību, kas ir nepieciešama ATMP-HE ieviešanai.

Metodoloģija

Pētījums veidots kā jaukta tipa (*mixed-methods*) pētījuma dizains ar datu triangulāciju, apvienojot kvantitatīvu ārstu anketēšanu, kvalitatīvas ekspertu intervijas un izglītības intervences (mini-kursa) aprobāciju. Triangulācijas mērķis ir mazināt vienas metodes ierobežojumus, lai nodrošinātu, ka anketēšana sniedz plašāku aptvērumu un segmentāciju, savukārt intervijas ļauj padziļināti izprast barjeru mehānismus, bet mini-kursa aprobācija sniedz iespēju novērtēt, vai mācības uzlabo ārstu zināšanas un maina nodomu/praktiskos soļus.

Mērķpopulācija ir praktizējoši ārsti Latvijā, kuru specialitātes potenciāli iesaistās ATMP-HE indikāciju aprūpē. Pamatojoties uz Veselības inspekcijas datiem par sertificētām ārstniecības personām, Latvijā 30.09.2025. nodarbināto sertificēto ārstu unikālais skaits ir 6306, bet sertificēto ārstu specialitāšu skaits ir 6672 (Veselības inspekcija, 2025). Sākotnējā mērķauditorija kursa pilotam un komercializācijai definēta pēc specialitāšu skaita: ģimenes ārsti (1422), dermatologi/venerologi (209), endokrinologi (100), gastroenterologi (55) un reimatologi (34), kopā 1820 sertificētas specialitātes. Dalībnieku uzaicināšana paredzēta caur profesionālajām asociācijām, ārstniecības iestādēm un profesionālajiem tīkliem.

Ārstu anketa izstrādāta kā strukturēta tiešsaistes aptauja ar piecām dimensijām (K-A-I-S-P). K (zināšanas) blokā iekļauti īsi atbilžu izvēles un scenāriju jautājumi par ATMP-HE regulējuma

pamatprincipiem, drošumu, izsekojamību un pēcnovērošanu. A (attieksme), I (ieviešanas nodoms) un S (sadarbības/īstenošanas spēja) pārsvarā veidoti apgalvojumu formā ar 5 punktu Likerta skalu, kas ļauj novērtēt riska uztveri, motivāciju un uztverto kapacitāti iestādē. P (praktiskā gatavība) apvieno pašnovērtējumu par konkrētiem soļiem un īsu apņemšanās mainīt praksi (*commitment-to-change*) daļu. Instrumenta struktūra un mērījuma piemēri apkopoti 1. tabulā.

Lai mērītu lēmumu pieņemšanas kvalitāti un riska diferencēšanu, anketā iekļauti klīniskie situāciju scenāriji (vignetes). Tie paredz, piemēram, prasību diferencēšanu pēc ievadīšanas veida (lokāla pret parenterālu) un pēc bioloģiskā materiāla izcelsmes (autologa pret alogēnu), kā arī ATMP-HE un klīnisko pētījumu līdzāspastāvēšanas situācijas ar slimības smaguma kritēriju izmantošanu. Šādas situācijas ļauj ne tikai iegūt pašvērtējumu, bet arī salīdzināt izvēlēto rīcību ar "labās prakses" atskaites punktiem.

Anketas rezultāti tiek apkopoti svērtā gatavības indeksā (AGI), ko veido piecu dimensiju kombinācija: $AGI = 0,20K + 0,15A + 0,35I + 0,20S + 0,10P$. Svaru izvēle balstīta pieņēmumā, ka ieviešanas nodoms (I) un sadarbības/īstenošanas spēja (S) ATMP-HE gadījumā ir īpaši kritiski, tomēr pēc pirmā datu viļņa svāri tiks kalibrēti, balstoties uz faktoru struktūru un prognozētspēju attiecībā pret e-mācību iznākumiem un uzvedības indikatoriem.

1. tabula

K-A-I-S-P anketas struktūra un mērījuma piemēri (autoru veidots)

Dimensija	Ko mēra	Piemēru indikatori/jautājumi	Atbilžu formāts
K (zināšanas)	Izpratne par ATMP-HE regulējuma pamatiem, drošuma principiem un izsekojamību	Definīcijas un pamatprasības; galvenie procesa posmi; atbildīgo lomu izpratne	Atbilžu izvēle (viena/daudz atbilžu), īsi situāciju uzdevumi
A (attieksme)	Riska uztvere, atbildības uztvere, ieguvuma/riska līdzsvars	Apgalvojumi par pacientu drošumu, profesionālo atbildību un ieviešanas uztverto vērtību	5 punktu Likerta skala
I (ieviešanas nodoms)	Gatavība iesaistīties ATMP-HE ieviešanā un izmantot to praksē	Nodoms izmantot ATMP-HE noteiktās indikācijās; gatavība iesaistīties apmācībā	5 punktu Likerta skala; izvēles jautājumi
S (sadarbības/īstenošanas spēja)	Uztvertā organizatoriskā kapacitāte un sadarbības tīkls	Procesu skaidrība iestādē; resursu pieejamība; sadarbība ar ražotāju un audu banku	5 punktu Likerta skala; izvēles jautājumi
P (praktiskā gatavība)	Konkrēti plānotie soļi un apņemšanās mainīt praksi	Plānotās darbības tuvākajā laikā; dokumentācijas un komandas darba organizēšana	Likerta skala + atvērtie lauki (<i>commitment-to-change</i>)

Izglītības intervence paredz īsu tālākizglītības kursu (mini-kurss, četras akadēmiskās stundas) ar pirms-testu, mikromācīšanās (*microlearning*) moduļiem, klīniskajiem gadījumiem ar lēmumu

punktiem, noslēguma testu un automatisku sertifikāta ģenerēšanu. Pēc kursa dalībniekiem tiks nosūtīti īsi, laikā izklaidēti atkārtojuma testi (*spaced learning*) 4–12 nedēļu periodā, lai nostiprinātu zināšanas un atbalstītu pāreju uz prakses maiņu (Adesope, et al., 2017; Martinengo, et al., 2024; Trumble, et al., 2024). Kursa saturā paredzēta arī apņemšanās mainīt praksi (*commitment-to-change*) komponente, kas ļauj fiksēt plānotos soļus un pēc noteikta laika novērtēt izpildi (Rehring, et al., 2021).

Datu iegūšanai un mācību nodrošināšanai tiek izmantota projekta platforma www.cst.lv, kas ļauj piekļūt anketai, nodrošina datu uzkrāšanu un informācijas apriti, savukārt kursu nodrošināšanai un automatizētai tiešajai pārdošanai ārstiem izmantota "Evergreen" tipa mācību pārvaldības sistēma (LMS). Risinājums veidots kā trīs slāņu arhitektūra: lietotāja saskarnes slānis (*front-end*), kur ārsts piekļūst saturam, testiem un anketām; servera slānis (*back-end*) ar datubāzi un failu krātuvi; integrāciju slānis, kas nodrošina paziņojumus, rezultātu uzskaiti, sertifikāta ģenerēšanu un atbalsta rīkus. Platformas izstrādē piedalījās studentu komandas no Latvijas izglītības iestādēm, izstrādājot gan lietotāja saskarni, gan servera infrastruktūras prototipus.

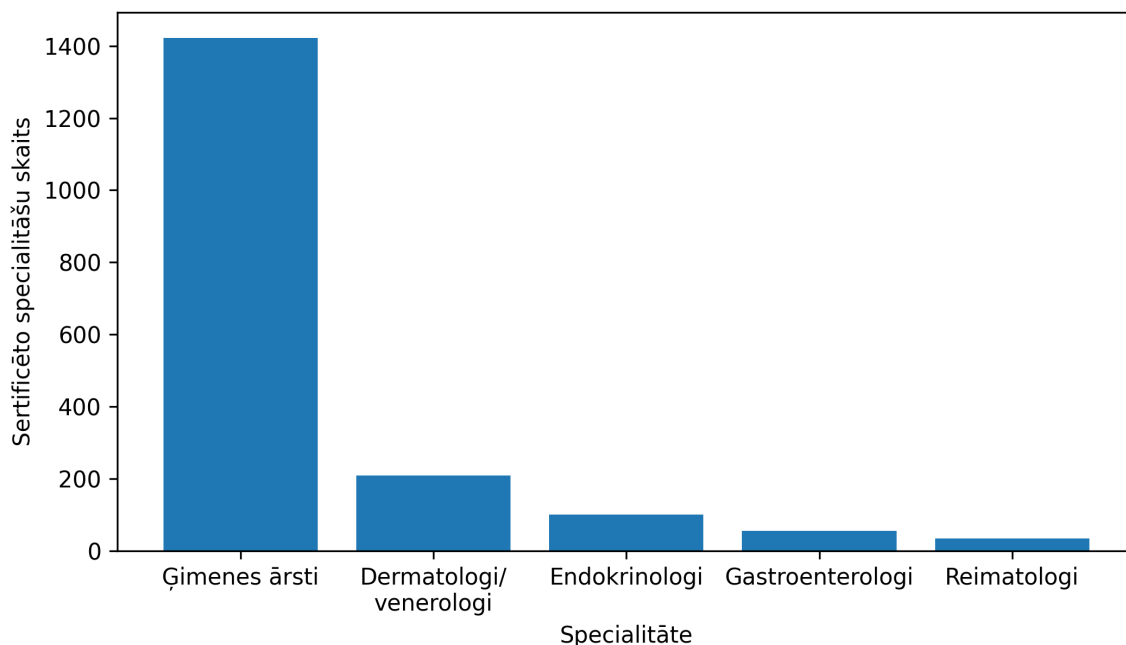
Prototipa līmenī lietotāja saskarne izstrādāta, izmantojot *React* bibliotēku un *TypeScript*, savukārt servera puse veidota ar PHP (*Hypertext Preprocessor*) un *Laravel* ietvaru, savienojot komponentes ar *Inertia.js* pieeju. Sistēmas veiktspēja, pieejamība un lietojamība testēta ar *Google Lighthouse* auditāciju, bet datu glabāšanai izmantota *PostgreSQL* datubāze un failu krātuve. Infrastruktūras izvērtējumā analizētas gan mākoņplatformas (piemēram, *Amazon Web Services*, *Google Cloud Platform* un *Microsoft Azure*), gan lokāli mitināts servera risinājums, lai mērogošanas posmā izvēlētos izmaksu un drošības ziņā piemērotāko modeli.

Datu drošības un kvalitātes nodrošināšanai platformā drošība ir iestrādāta jau izstrādes posmā: datu pārraide notiek šifrēti (HTTPS), piekļuve tiek kontrolēta pēc lietotāju lomām, darbības tiek fiksētas auditācijas žurnālos, regulāri veidotas rezerves kopijas, un personas dati tiek apstrādāti tikai minimāli nepieciešamajā apjomā. Mākslīgā intelekta (MI) asistents platformā tiek izmantots kā navigācijas un mācību atbalsta rīks, tas ir ierobežots ar kursa zināšanu bāzi un nav paredzēts kategorisku klīnisku rekomendāciju sniegšanai. Sarežģītākos gadījumos dalībniekiem tiek nodrošināta iespēja saņemt konsultāciju pie pasniedzēja. Datu analīzē paredzēta aprakstošā statistika, grupu salīdzinājumi (piemēram, pēc specialitātes vai darba vides), iekšējās konsekvences novērtējums (*Cronbach alfa/omega*), faktoru analīze (ja izlase to ļaus) un atvērto atbilžu tematiskā analīze. Interviju dati tiks analizēti tematiskās analīzes pieejā ar kodu grāmatu, pēc iespējas veicot kodējuma saskaņošanu starp izpildītājiem. E-mācību datus tiks analizēts zināšanu pieaugums (pirms/pēc tests), pabeigšanas īpatsvars, laiks līdz pabeigšanai un zināšanu noturības rādītāji atkārtotajos testos.

Rezultāti

Ņemot vērā, ka pētījums atrodas ieviešanas sagatavošanas posmā, rezultāti šajā rakstā tiek interpretēti kā izstrādātie artefakti un izmērāmi starprezultāti, kas ļauj uzsākt pilotēšanu un pēc tam veikt validāciju. Pirmais artefakts ir K-A-I-S-P anketa ar scenārijiem un AGI aprēķinu loģiku, kas izstrādāta ar mērķi segmentēt ārstu mērķauditoriju un identificēt ieviešanas barjeras. Otrs artefakts ir digitālās apmācības piegādes un datu uzkrāšanas vide www.cst.lv, kas ļauj vienā sistēmā savienot mērījumu (anketa) ar intervenci (mini-kurss) un pēcnovērtējumu.

Sākotnējais tirgus un mērķauditorijas novērtējums balstās uz sertificēto specialitāšu skaitu, kas tieši vai netieši saistīts ar plānotajām indikācijām. Šis novērtējums ir būtisks, jo nosaka, cik daudz apmācību iterāciju un kāda automatizācijas pakāpe ir ekonomiski pamatota.



1. attēls. Sertificēto ārstu specialitāšu skaits izvēlētajās mērķgrupās Latvijā
(Veselības inspekcija, 2025)

Platformas komerciālās darbības modelis projektā paredz vienkāršu, ārstam saprotamu cenu par konkrētu mini-kursu un automatizētu piekļuves nodrošināšanu, vērtēšanu un sertifikātu ģenerēšanu. Biznesa plāna konservatīvajā scenārijā vienam kursam ar 2500 EUR vienreizējām izveides izmaksām un 59 EUR gala cenu pašizmaksas segšanas punkts (*breakeven*) tiek sasniegts aptuveni pie 62 dalībniekiem, bet pie 5–10 % konversijas mērķauditorijā veidojas pozitīvs finanšu rezultāts jau pirmajā gadā, jo turpmākajos gados izveides izmaksas neatkārtojas. Šāda loģika atbilst “evergreen” pieejai: saturs ir ilgstoši pieejams, bet pārdošana un iesaiste tiek organizēta automatizēti.

ATMP-HE ieviešanā īpaši svarīga ir lomu un atbildību skaidrība starp iesaistītajām pusēm. Šim nolūkam izstrādāts konceptuāls modelis, kas apraksta vērtību ķēdi no klīniskā lēmuma līdz ražošanai, audu ieguvei, loģistikai un pacientu ārstēšanai; modelis apkopots 2. tabulā un tiek izmantots gan mācību programmas strukturēšanai, gan anketas scenāriju veidošanai kā atskaites punkts.

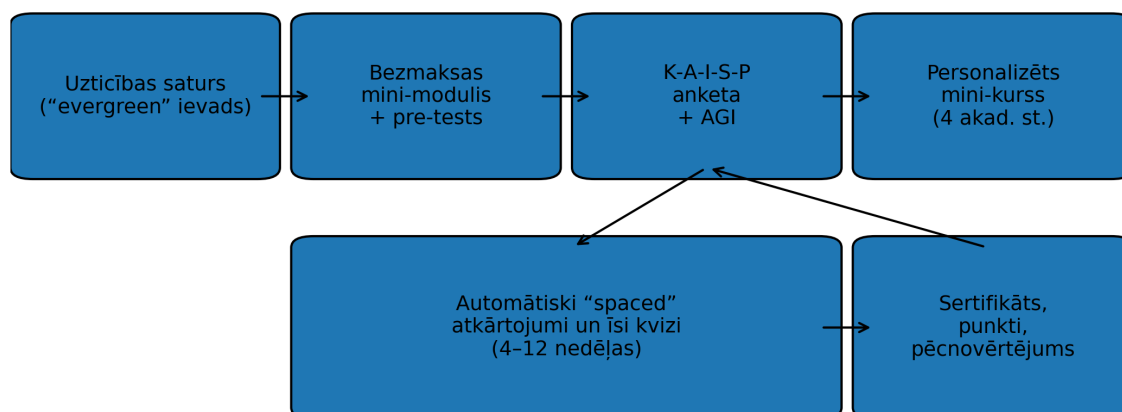
2. tabula

ATMP-HE ieviešanas un datu plūsmas konceptuālais modelis Latvijā (autoru veidots)

Posms	Iesaistītā puse	Galvenā atbildība	Datu/artefaktu plūsma
Klīniskais lēmums un pacientu atlase	Ārsts, atbildīgais par pacienta ārstēšanu	Indikāciju izvērtēšana, pacienta informēšana, dokumentācija un pēcnovērošanas plāns	Pacienta profils un lēmumu pamatojums; anketas vignetes; <i>commitment-to-change</i> soļi

Posms	Iesaistītā puse	Galvenā atbildība	Datu/artefaktu plūsma
ATMP-HE sagatavošana un apmācība	SIA "Cilmes Šūnu tehnoloģijas" (ATMP ražotājs un apmācību organizētājs)	Kvalitātes sistēma, izsekojamība, mācību satura uzturēšana un atjaunošana	Mācību materiāli, testi, sertifikāti; izsekojamības dokumenti; apmācību dati (pabeigšana, testi)
Bioloģiskā materiāla ieguve	Audu banka / plastiskās ķirurģijas klinika	Nabassaites audu un taukaudu ieguve, sākotnējā apstrāde un loģistikas koordinācija	Ieguves protokoli, piekrišanas formas, loģistikas pieraksti; izsekojamības ID
Ārstēšana un uzraudzība	Ārstniecības iestādes Latvijā (ārstēšanas vieta pacientiem ar 1. tipa diabētu, psoriāzi un Krona slimību)	Terapijas ievade, drošuma uzraudzība, datu nodošana uzraudzībai	Kliniskie rezultāti, drošuma ziņojumi, <i>follow-up</i> dati; atgriezeniskā saite apmācību uzlabošanai

Lai savienotu gatavības mērīšanu ar apmācības piegādi un atkārtotu iesaisti, izstrādāta konceptuāla plūsma, kurā AGI tiek izmantots kā lēmumu atbalsta rīks platformas "Evergreen" loģikā. Plūsma paredz, ka ārsts sāk ar īsu bezmaksas saturu un pirms-testu, pēc tam aizpilda anketu, saņem segmentētas rekomendācijas un turpina ar personalizētu mini-kursu un izklaidētiem atkārtojumiem (*spaced learning*), kas palielina zināšanu noturību un atvieglo prakses maiņu.



2. attēls. "Evergreen" apmācības plūsma ar K-A-I-S-P anketu un AGI segmentāciju (autoru veidots)

Pilotēšanas posmā par galvenajiem iznākuma rādītājiem tiek izvēlēti gan izglītības, gan ieviešanas, gan lietojamības indikatori. Izglītības daļā tie ietver pirms/pēc testu starpību un zināšanu noturību atkārtotajos testos; ieviešanas daļā – nodoma un *commitment-to-change* izpildi; tehnoloģiskajā daļā – pabeigšanas īpatsvaru, laiku līdz pabeigšanai un lietotāju apmierinātību. Šo indikatoru kopums ļauj pamatot, vai izvēlētais "Evergreen" modelis reāli palielina ārstu gatavību un ir mērogojams komerciālai darbībai.

Diskusija un secinājumi

ATMP-HE ieviešana pēc būtības ir sociotehniska pārmaiņa, kuras centrā ir ārsta profesionālā atbildība, bet vienlaikus tiek skartas kvalitātes sistēmas, dokumentācija, uzraudzība un vairāku institūciju sadarbība. Tādēļ ārstu gatavība jāuztver kā daudzdimensionāls konstrukts, kura mērīšana

ir priekšnoteikums mērķetai iejaukšanās stratēģijai. Literatūrā par HE ceļu uzsvērtā nacionālo atšķirību un procesu sarežģītības problemātika (Coppens, et al., 2020; Hills, et al., 2020; Pachocki & Verter, 2024) nostiprina argumentu, ka Latvijai nepieciešama lokalizēta, praktiski orientēta apmācība, nevis vispārīgs starptautisks saturs.

Jautājums par optimālo ārstu sagatavošanas ceļu Latvijā ir jāvērtē pēc pieejamības, atkārtojamības, izmērāmības, personalizācijas un izmaksu efektivitātes kritērijiem. Tiešsaistes formāts ir risinājums, lai nojauktu laika un piekļuves barjeras, kas ierobežo pašvadītu profesionālo pilnveidi (Jeong, et al., 2018), un vienlaikus ļauj sistemātiski vākt datus par mācīšanās procesu. Pētījumi par mācību formu ietekmi uz nodomu pieņemt klīnisku uzvedību norāda, ka tiešsaistes mācībām ir būtiska priekšrocība mērogošanā un līdzdalībā un tās var būt līdzvērtīgas klātienē mācībām, ja e-mācībām ir kvalitatīvs mācību saturs un metodes, kā arī nodrošināta atgriezeniskā saite (Ayivi-Vinz, et al., 2024).

"Evergreen" pieejas būtiskākā priekšrocība ir spēja automatizēti īstenot pierādījumos balstītus mācību dizaina principus. Mikromācīšanās moduļi ir saderīgi ar ārstu darba ritmu (De Gagne, et al., 2019), bet izklaidēta atkārtošana un atgūšanas prakse palielina noturību un samazina aizmirstības risku (Adesope, et al., 2017; Martinengo, et al., 2024; Trumble, et al., 2024). Ja šie elementi ir integrēti vienotā sistēmā ar automatiskiem atgādinājumiem un īsiem testiem, tiek sasniegti vairāki mācību "kontakti" īsākā laika gaitā, kas klātienē bieži ir dārgs vai organizatoriski grūti nodrošināms pasākums.

Svarīga "Evergreen" modeļa daļa ir arī pāreja no mācībām uz konkrētām prakses darbībām. "*Commitment-to-change*" mehānisma iekļaušana ļauj fiksēt, kādas izmaiņas ārsts plāno īstenot un vēlāk pārbaudīt izpildi. Empīriskie pētījumi rāda, ka šāda pieeja var būt saistīta ar reālu prakses maiņu (Rehring, et al., 2021). ATMP-HE gadījumā šīs izmaiņas var būt, piemēram, protokola ieviešana iestādē, pacientu atlases algoritma izmantošana vai dokumentācijas plūsmas sakārtošana.

No ilgtspējas skatpunkta tiešā e-mācību kursu pārdošana ir ne vien komerciāls lēmums, bet arī ieviešanas mehānisms, kas nodrošina risinājuma uzturēšanu un mērogošanu. Platforma ļauj pārvaldīt lietotāja ceļu no pirmā kontakta līdz sertifikācijai, vienlaikus iegūstot datus personalizācijai un kvalitātes uzlabošanai, kas platformu ekosistēmu literatūrā tiek uzsvērts kā vērtības radīšanas mehānisms (Kapoor, et al., 2021). Mazā tirgū tas samazina izklaidētas komunikācijas un atkārtotu klātienē pasākumu izmaksas, jo saturs ir pieejams nepārtraukti un iesaiste var tikt automatizēta. Platformu konkurences pārskats papildus norāda, ka atkārtota iesaiste un integrēti pakalpojumi rada stabilāku lietotāju bāzi un atvieglo inovāciju ieviešanu (Rietveld & Schilling, 2021). Šie argumenti ļauj secināt, ka "Evergreen" pieeja Latvijā nodrošina optimālu kombināciju starp profesionālo gatavību un komerciālu dzīvotspēju.

Pētījuma ierobežojumi saistīti ar pašizlases risku (tiešsaistes aptaujā un kursā biežāk piedalās motivētāki ārsti), kā arī ar pašvērtējuma mērījumu iespējamām nobīdēm. Šo risku mazināšanai paredzēta psihometriskā anketas izvērtēšana, klīniskie situāciju scenāriji (vignetes) kā rīcības simulācija, kā arī e-mācību datu izmantošana (pirms/pēc testi, atkārtotie testi). Turpmākajos posmos ieteicams papildināt dizainu ar institucionāliem rādītājiem (piem., protokolu ieviešanas fakts klīnikā) un, ja iespējams, ar pacientu drošuma indikatoriem.

Balstoties uz izpētīto, var secināt, ka piedāvātais K-A-I-S-P anketas dizains un AGI indekss nodrošina praktisku, uz datiem balstītu pamatu ārstu gatavības diagnosticēšanai, savukārt "Evergreen" tiešsaistes apmācības modelis ir zinātniski pamatots kā vispiemērotākais instruments gatavības palielināšanai mazā, specializētā tirgū. Integrējot mērījumus ar personalizētu apmācību un

automatizētiem atkārtojumiem, iespējams paātrināt ATMP-HE ieviešanu komerciālā praksē Latvijā, saglabājot kvalitātes un drošuma prasības.

Finansējums

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References

- Adesope, O. O., Trevisan, D. A., & Sundararajan, N. (2017). Rethinking the use of tests: A meta-analysis of practice testing. *Review of Educational Research*, 87(3), 659–701. <https://doi.org/10.3102/0034654316689306>
- Ayivi-Vinz, G., Tremblay, M., Gadio, S., Dofara, S. G., Daniel, S. J., Talbot, D., & Légaré, F. (2024). Impact of educational activity formats, online or in-person, on the intention of medical specialists to adopt a clinical behaviour: A comparative study. *Journal of CME*, 13(1), 2363550. <https://doi.org/10.1080/28338073.2024.2363550>
- Caci, L., Nyantakyi, E., Blum, K., Sonpar, A., Schultes, M.-T., Albers, B., & Clack, L. (2025). Organizational readiness for change: A systematic review of the healthcare literature. *Implementation Research and Practice*, 6, 1–23. <https://doi.org/10.1177/26334895251334536>
- Coppens, D. G. M., Hoekman, J., De Bruin, M. L., Slaper-Cortenbach, I. C. M., Leufkens, H. G. M., Meij, P., & Gardarsdottir, H. (2020). Advanced therapy medicinal product manufacturing under the hospital exemption and other exemption pathways in seven European Union countries. *Cytotherapy*, 22(10), 592–600. <https://doi.org/10.1016/j.jcyt.2020.04.092>
- Damschroder, L. J., Reardon, C. M., Widerquist, M. A. O., & Lowery, J. (2022). The updated Consolidated Framework for Implementation Research based on user feedback. *Implementation Science*, 17(1), 75. <https://doi.org/10.1186/s13012-022-01245-0>

- De Gagne, J. C., Park, H. K., Hall, K., Woodward, A., Yamane, S., & Kim, S. S. (2019). Microlearning in health professions education: Scoping review. *JMIR Medical Education*, 5(2), e13997. <https://doi.org/10.2196/13997>
- Dunleavy, G., Nikolaou, C. K., Nifakos, S., Atun, R., Law, G. C. Y., Tudor Car, L., & Car, J. (2019). Mobile digital education for health professions: Systematic review and meta-analysis by the Digital Health Education Collaboration. *Journal of Medical Internet Research*, 21(2), e12937. <https://doi.org/10.2196/12937>
- Hills, A., Awigena-Cook, J., Genenz, K., Ostertag, M., Butler, S., Eggimann, A.-V., & McNally, P. (2020). An assessment of the hospital exemption landscape across European Member States: Regulatory frameworks, use and impact. *Cytotherapy*, 22(12), 772–779.e1. <https://doi.org/10.1016/j.jcyt.2020.08.011>
- Jeong, D., Presseau, J., ElChamaa, R., Naumann, D. N., Mascaro, C., Luconi, F., & Bhandari, M. (2018). Barriers and facilitators to self-directed learning in continuing professional development for physicians in Canada: A scoping review. *Academic Medicine*, 93(8), 1245–1254. <https://doi.org/10.1097/ACM.0000000000002237>
- Kapoor, K., Ziaee Bigdeli, A., Dwivedi, Y. K., Schroeder, A., Beltagui, A., & Baines, T. (2021). A socio-technical view of platform ecosystems: Systematic review and research agenda. *Journal of Business Research*, 128, 94–108. <https://doi.org/10.1016/j.jbusres.2021.01.060>
- Martinengo, L., Yeo, N. J. Y., Markandran, K. D., Olsson, M., Kyaw, B. M., & Car, J. (2024). Spaced digital education for health professionals: Systematic review and meta-analysis. *Journal of Medical Internet Research*, 26, e57760. <https://doi.org/10.2196/57760>
- Miake-Lye, I. M., Delevan, D. M., Ganz, D. A., Mittman, B. S., & Finley, E. P. (2020). Unpacking organizational readiness for change: An updated systematic review and content analysis of assessments. *BMC Health Services Research*, 20, 106. <https://doi.org/10.1186/s12913-020-4926-z>
- Ministru kabinets. (2024). Ministru kabineta 2024. gada 18. jūnija noteikumi Nr. 391 "Ārstniecības personu sertifikācijas kārtība". *Likumi.lv*. Pieejams: <https://likumi.lv/ta/id/352922-arstniecibas-personu-sertifikacijas-kartiba>
- Pachocki, J. P. J., & Verter, F. V. (2024). Polish regulatory system regarding ATMP hospital exemptions. *Frontiers in Immunology*, 15, 1379134. <https://doi.org/10.3389/fimmu.2024.1379134>
- Proctor, E. K., Bunger, A. C., Lengnick-Hall, R., Gerke, D. R., Martin, J. K., Phillips, R. J., & Swanson, J. C. (2023). Ten years of implementation outcomes research: A scoping review. *Implementation Science*, 18(1), 31. <https://doi.org/10.1186/s13012-023-01286-z>
- Rehring, S. M. A., Sullivan, A. D., Kinney, E. R., Holman, N., Kahn, M. G., & Gerber, J. S. (2021). Commitment to change statements and actual practice change after a continuing medical education intervention. *Journal of Continuing Education in the Health Professions*, 41(2), 145–152. <https://doi.org/10.1097/CEH.0000000000000340>
- Rietveld, J., & Schilling, M. A. (2021). Platform competition: A systematic and interdisciplinary review of the literature. *Journal of Management*, 47(6), 1528–1563. <https://doi.org/10.1177/0149206320969791>
- Saeima. (1997). Ārstniecības likums. *Likumi.lv*. Pieejams: <https://likumi.lv/ta/id/44108-arstniecibas-likums>
- Trias, E., Juan, M., Urbano-Ispizua, A., & Calvo, G. (2022). The hospital exemption pathway for the approval of advanced therapy medicinal products: An underused opportunity? The case of the CAR-T ARI-0001. *Bone Marrow Transplantation*, 57, 156–159. <https://doi.org/10.1038/s41409-021-01463-y>
- Trumble, E., Lodge, J., Mandrusiak, A., & Forbes, R. (2024). Systematic review of distributed practice and retrieval practice in health professions education. *Advances in Health Sciences Education*, 29, 689–714. <https://doi.org/10.1007/s10459-023-10274-3>
- Veselības inspekcija. (2025). *Reģistrētas un sertificētas ārstniecības personas* (30.09.2025) [datu fails]. Pieejams: <https://www.vi.gov.lv/lv/registri-un-datubazes>
- Weiner, B. J., Mettert, K. D., Dorsey, C. N., Nolen, E. A., Stanick, C., Powell, B. J., & Lewis, C. C. (2020). Measuring readiness for implementation: A systematic review of measures' psychometric and pragmatic properties. *Implementation Research and Practice*, 1, 1–29. <https://doi.org/10.1177/2633489520933896>

TYPES AND INNOVATIONS OF REMOTE BANKING SERVICES IN GEORGIA

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Abstract

Today, banks offer a fairly wide range of services, which can be combined under the general term of remote banking, such as: Internet banking, Mobile banking, External services (Terminals, ATMs), Telephone banking, and the classic "Bank-Client".

In terms of popularity, mobile banking stands out among remote services, which is a logical continuation of Internet banking. A full-fledged service assumes that a mobile phone is the same means of payment as a bank card, although in many countries an incomplete version of mobile banking, the so-called SMS-banking, operates, which allows you to receive account statements, monitor your account and perform other operations via SMS. In addition, mobile banking, as a rule, is available only to holders of bank debit or credit cards.

At the moment, the limiting factor in the development of mobile banking is the fears of customers regarding its security. The mobile banking market is very promising, technologically it does not differ from Internet banking, but it includes a fundamentally new and important quality - mobility. My topic is precisely about the types and innovations of remote banking services, how technologies are developing in Georgia in banking and how easy it is to receive services "outside the bank" or "without a bank".

Keywords: Bank, Remote Banking Services, Innovations

Introduction

Historically, the Georgian banking system has gone through a long path of development. In parallel with traditional payment instruments, remote banking services have been developing, which is a general term for banking services based on the availability of technology for receiving banking services, which are provided to the client remotely, that is, without visiting the bank.

Remote Banking Services

We can formulate the types of remote banking services as follows:

- **Internet banking** - allows access to accounts and transactions at any time and from a computer connected to the Internet. A browser is used to perform the operation, meaning that there is no need for the client to install software.

Internet banking is often available through the bank-client system and includes the following services:

- Account statement;
- Information about banking products (Deposits, Loans, Credit Cards, etc.) is provided;
- Opening a deposit, taking out a loan, ordering a bank card, receiving and sending remittances;
- Internal bank transfers;

- External bank transfers/transfers to another bank;
- Currency conversion, etc.

We can conclude that the future of internet banking is closely linked to its further development and simplification, so that it is more easily perceived and understood by each customer.

Since its introduction in 2002, Internet banking in Georgia has been developing at a rapid pace, which has been facilitated by the massive spread of the Internet. Today, it is easier than ever to access accounts. In my opinion, the introduction of this service gives customers the opportunity to have their own small bank, where they can perform the operations they want. If we talk about the best Internet banks, JSC “Bank of Georgia” and JSC “TBC Bank” stand out in Georgia.

The spread of internet banking was also facilitated by a number of factors, such as:

- Technological, the stage of development that includes technological advances, modern technology, mobile phones, and software;
- Organizational, here we can mean reducing costs, the bank can no longer have a large number of branches, etc.;
- Marketing, where we can talk about e-commerce, simplified payments, etc.;
- Strategic, when the bank wants to gain an advantage over others and strengthen its leading positions.

Internet banking has its pros and cons, but in my opinion, such a service has more positive factors than negative ones. The bank allows you to simplify your relationship with it, but some customers still have not gotten used to using Internet banking, which is due to their lack of awareness or even fear of making mistakes.

- **Bank-Client** - In 2000, the first bank-client software was introduced, allowing the client to perform operations from a program installed on their own computer.
- **Telephone banking**, as a remote service tool, was established in 2005, through which clients can contact the bank at any time and receive the following types of services:
 - Information service;
 - Checking the balance on your own accounts;
 - Performing payment transactions, etc.
- **Mobile banking** - the first mobile application was introduced in 2008 and is currently a mini version of internet banking, which allows you to manage, control and perform transactions on your mobile phone, and in fact, perform any banking activity without visiting the bank.
- **SMS-bank** - In 2001, the first SMS-based remote service was introduced, which involves providing simple services, such as: blocking a card, replenishing mobile balance, information about the account balance, etc.
- **ATM banking** - the presence of a network of ATMs, which is what distinguishes many banks in Georgia today. The ability to withdraw money from an ATM at any time is no longer a great luxury, although their number was very small years ago.
- **Self-service terminals** - another universal means of remote payment, where you can easily pay for utilities, transfer money to the budget from the card, or simply deposit the amount you have purchased.
- **POS terminal** - If 15–20 years ago everyone thought paying with a card in a store was unthinkable in Georgia, the time has come when this myth has been shattered. All leading organizations, whether supermarkets or others, offer customers not only cash, but also cashless payments with cards, contactless payments, etc.

- **E-commerce and e-money** - the development of these two types was brought about by the widespread use of the Internet. You don't even need a card if you have an e-wallet where you can store your own money and make payments online. Online shopping, transferring funds easily in a few minutes. There are many of them, such as PayPal.

This list can be continued endlessly, because banks today, more than ever, are eager to create services and products that will make a name for themselves and maintain market leadership. It is important for banks to develop remote services, thereby helping to reduce queues at their branches, making the population aware of the positive aspects of innovations, and thus trying to keep up with the rhythm of modern life.

Indeed, how much time can be saved by paying utilities from a self-service terminal instead of standing in line, withdrawing money from an ATM, and simply transferring payments to the budget via Internet banking? I think it is worth introducing innovations in this regard, because due to the pace of life, successful and business people always choose something new and reliable, comfortable and different, that is, everything that is easily accessible and understandable. However, as a recommendation, we can say that more information is needed for consumers about remote banking services. Few people know that if you have a JSC "Bank of Georgia" card, for example, you can receive and send money orders from an ATM or self-service terminal. Even from an ATM, you can transfer money within the bank by entering the card numbers and expiration date, as well as pay for utilities. At first glance, everything is on the ATM screen and the consumer can see it for himself, but the role of the bank in this case should be considered, to what extent it encourages the use of these services.

Modern Innovations

Speaking about recent innovations, it is necessary to consider the innovations introduced in the Georgian banking system, with which competing banks are trying to interest and attract customers. One of the innovations was the mobile application **Tskapp**, which was created for phones with the Android system and involves contactless payments through the application. This is similar to the **PaySticker**, which in turn is a mini card, first introduced to the market years ago by JSC "VTB Bank", however, the innovative product was well packaged and, so to speak, sold by JSC "TBC Bank". After that, the sticker was also introduced in JSC "Bank of Georgia". These two products turned out to be innovative for customers, JSC "Halyk Bank" offered its customers the contactless payment watch **Watch2pay** and was one step ahead of other competing banks.

However, along with the positive aspects, there were also negative ones, including the fact that the sticker worked with glitches, there were often cases of application interruptions on mobile phones, the watch often did not allow for choosing an individual design, etc.

Why were these types of innovations created? For those who like to experience novelty, simplicity and convenience. Of course, anyone would prefer to carry a stack of cards with them, rather than a mobile phone with a sticker or application where all bank cards will be collected, or simply a wristwatch, which, along with the time, will allow us to pay money at a single terminal in the palm of our hand. (Mosiashvili, V., & Bibiluri, A., 2023, April)

An innovative approach can be considered the launch of **Digipass** on the market, which was initially a portable mini device, and later banks also released an application. What does this innovation serve? Simply put, instead of waiting for one-time codes in Internet banking in difficult authorization conditions, codes can be easily generated with one touch, ideal for those who often use Internet banking and travel.

An innovation in the Georgian banking sector is the **reservation of a visit**, which is offered to customers by JSC “Liberty Bank”. Before coming to the bank, it is possible to book a visit at the desired time and place by telephone or via the Internet, and upon arrival at the branch, the client will be served and consulted at the specified time. It is a rather interesting type of service, which I think Georgian banks should introduce. The customer will feel much more comfortable if they agree on the reason, time and place of the visit in advance. The bank will even benefit from this, because the customer comes with a pre-determined amount of information and you can offer him a ready-made product or even an alternative. What problems do bank branches have today? Endless queues and dissatisfied customers, and at this time, service appears when you agree to a visit with the bank and they serve you without delay.

Direct Banking was originally a product of JSC “ProCredit Bank”, which implies a more active introduction of cashless payments. What does this allow? This is a comprehensive, simple, flexible tariff, when you can receive services from anywhere, the cost is minimal, but it includes a wide range of services. For example: a card account in three currencies, internal and external transfers, remote services, utility payments, etc. The question arises, how innovative is this service? Yes, the user receives the entire range of services on a 24/7 basis, although we cannot say that other banks do not act in this way.

Speaking of innovations, it is necessary to mention **video banking**. Commercial banks offer customers another new high-tech service - video banking. This is an exclusive service that allows the customer to perform any non-cash banking operation remotely and at the same time face-to-face communication with the banker (using a video call). All remote channels (Internet banking, mobile banking and video banking) can be used using a single username and password. In addition, with video banking, it is possible to manage your own accounts, make transfers, fill out a credit application, receive comprehensive information on loans and deposits, pay utility bills and perform other banking operations. Video banking has not been a new product in Georgia for a long time, it is another matter how much demand it has, since most customers are accustomed to telephone communication or visiting the bank.

Recently, the banking sector has switched to **personalized service**, that is, if all customers received one product and service, the bank has changed its approach, namely, each customer is worked with individually, even in terms of product, service and operation. Regarding the individual approach, we can say that this is a kind of charge and incentive for customers to choose a bank that serves them personally, takes care of them, their requirements, and offers them customized conditions. In fact, it is a psychological factor, the customer visits the organization or bank where they are perceived as a member of the team and an integral part, know their banking history, and the bank itself even “gives” them its own logo. This is a kind of compensation, you are not a VIP client of my bank, but I perceive you as an individual, because you are an integral part of my activities and a decisive factor in the existence of the bank. In reality, this is how each customer creates a customer base, the base whose satisfaction coefficient ultimately determines the bank's rating in the conditions of a market economy.

However, it should be noted that artificial intelligence and robots are becoming increasingly popular, being built into all banking programs, their websites, applications, and are designed to facilitate communication with customers in the Georgian banking system. (Tsaava, G., Burdiashvili, R., & Bibiluri, A., 2023)

Conclusion

The paper discusses innovations that have ever been introduced in the banking system, although the sector is so diverse that it experiences innovations every day, it is impossible to describe all innovations within the framework of one article. A bank is a commercial institution, the main goal of which is to make a profit, but at the same time to create satisfied and loyal customers, provide them with products and services, at the same time increase satisfaction and compete with other banks.

References

- Bibiluri, A. (2020). *Commercial Bank Innovations in Customer Relationship System*. Dani Publishing House
- Bibiluri, A. (2025, March). Georgian Commercial Banks Activities, the Essence and Risks at the Modern Stage. In Turiba University. *International Scientific Conference*, (pp. 26-30). Turiba University
- Mosiashvili, V., & Bibiluri, A. (2023, April). Digital Bank-A Challenge or New Opportunities for the Georgian Banking System. In Turiba University. *International Scientific Conference*, (pp. 139-143). Turiba University
- Tsaava, G., & Bibiluri, A. (2023). Features of the Use of Logistics in the Field of Banking Services. *Proceedings of Tskhum-Abkhazian Academy of Sciences*, 23,13-20
- Tsaava, G., Burdiashvili, R., & Bibiluri, A. (2023). Perfection of the essence of commercial banks' activity- "Operation", "Product" and "Service" and the problem of forming the Author's seven approaches to their judgment. *Scientific Journal "Spectri"*, 8(2)

PROSPECTS AND CHALLENGES OF USING AI TECHNOLOGIES IN THE MEDIA SPACE DURING THE RUSSIAN-UKRAINIAN WAR

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Abstract

The article analyzes the positive and negative aspects of using AI (Artificial Intelligence) technologies in the Ukrainian media space during the full-scale war. The relevance of this study stems from the growing role of automated systems in the creation, dissemination, and verification of information, which affects the quality of content and audience trust. The purpose of the study is to identify the main advantages and disadvantages of using automated technologies in the work of modern media professionals, as well as to formulate recommendations for their ethical use. The research methods include descriptive, comparative, systematization, and case studies. Seven examples related to the use of AI and interactive tools during the war are provided, and four key advantages and four disadvantages are identified.

The paper also separately describes the transformations of the media since the beginning of the war, as well as how these changes have influenced the wider implementation of AI in the media space. Practical recommendations are formulated for editorial offices or individual journalists: mandatory labeling of AI content, transparency of algorithms, creation of internal editorial policies, and development of media literacy based on working with NLP (Natural Language Processing) and ML (Machine Learning Systems) systems. The results of the study contribute to the understanding of AI technologies as a tool for improving the efficiency of media work and threats to information security during wartime.

Key words: Advantages and disadvantages, AI, Ukrainian media space, war

Introduction

Nowadays, AI plays an important role in digital transformation processes, acting not only as a technical innovation but also as a strategic factor that makes it possible to determine the quality, speed, and reliability of media content. Paradoxically, during the years of Russia's armed aggression, it has become a tool in Ukraine both for helping journalists combat opponents' manipulation and information warfare, and for spreading propaganda and fake news, especially in the so-called new media, which is currently preferred by audiences.

In the context of full-scale war, Ukrainian journalism is undergoing daily transformations: specialists are forced to rapidly move away from classic practices and toward greater mastery and use of the

latest digital platforms. In early 2022, specialists began to lose access to many sources of information due to both physical and information hazards, and the media community focused on the rapid dissemination of the most relevant information. This created a need for automated systems to continuously monitor open sources.

Priorities have also changed in investigative journalism, because, in addition to anti-corruption campaigns, there is now a need to record and report on various crimes committed by Russia. Moreover, information warfare and technological threats have only intensified, which has led to the rapid integration of AI-based tools and subfields, such as automated search systems, image and video analysis, text processing, and pattern recognition into investigative journalism, particularly in the OSINT framework.

The changes have also affected the general culture of media consumption, as military aggression has become a catalyst for the gradual decline of traditional media (or their transformation) and the popularization of online content, social networks, mobile applications, and video hosting platforms. According to a survey conducted by the RSG (Rating Sociological Group), in 2025, Telegram is the main channel for receiving news: more than half of Ukrainians (52%) read it constantly or frequently. YouTube is in second place (32%), and Facebook is in third (28%). For comparison, only 25% of the population regularly watches the "Yedyni Novyny" telethon and chats on Viber [14]. Telegram channels are trusted the most (29%), which gained popularity with the start of the war and became one of the main centers for the dissemination of fakes and AI-generated content.

This article aims to explore and analyze examples of the use of AI tools in the Ukrainian media space during the full-scale war, outline the main advantages and disadvantages of promoting digital content created or shared with the help of machine-based innovations in the mass media of Ukraine during the Russian aggression.

The time frame of the study covers the use of AI content and the development of Ukrainian information projects from May 2022 (launch of the "Russian War Criminals" project) to October 2025 (analysis of a material from the media outlet *Telegraf*).

Literature Review and Methodology

The theoretical basis of the study was formed by scientific works of Ukrainian and foreign authors that highlight the peculiarities of the media space, the development of AI, its use, and its impact on digital content. Among Ukrainian researchers, the following were considered: Barash and Shcherban (2024), Vaskivska (2022), Zrazhevskaya and Zaika (2023). Particular attention was given to an article by an IT business specialist at Wezom, Pataliak (2024) and an online interview with the founder of Mantis Analytics platform, Tarasyuk (2024).

Among foreign researchers, the following are considered: Cresci (2020), Hardaker (2010), Kilgo and Sinta (2016), Londoño-Proañón and Buele (2025), Shao et al. (2017), Tomassi et al. (2024).

Statistical data (Rating Sociological Group, National Council of Ukraine on Television and Radio Broadcasting, The Institute of Mass Information, Kyiv International Institute of Sociology) and the results of fact-checking, journalistic teams, and platforms ("VoxCheck", The Institute of Mass Information, "Russian War Criminals", *The New York Times*, *Texty.org.ua*) played an important role. A post from the website of the "Dovidka.info" project by the CSCIS (Center for Strategic

Communications and Information Security) was also reviewed. This allowed us to combine theory with practical examples.

The research methodology is based on a combination of general scientific and special methods.

The descriptive method was used to explain the research process, summarize the results (namely, dividing the positive and negative aspects of the use of machine technologies in the media), formulating conclusions and recommendations on the ethical use of AI in journalism during wartime (responsibility of authors and editors, content labeling, familiarization with NLP systems, introduction of clear policies for the use of algorithms). This allowed us to present the material consistently, arguing it with the help of a theoretical basis and practical examples.

The systematization method was used to organize examples and identify four positive and four negative aspects of AI use in the Ukrainian media space.

The case study method was used to examine seven cases of AI and interactive technology use in media content between May 2022 and October 2025: the "Russian War Criminals" project (2022); an issue of *Durchschlag* magazine (2023); a deepfake address by Volodymyr Zelenskyy (2023); a call to U.S. Senator Benjamin L. Cardin (2024); Russian bot content on behalf of Ukrainians on TikTok (2024); dissemination of AI content about Donald Trump (2025); material using AI analytics in the Ukrainian media *Telegraph* (2025). This made it possible to track the dynamics of AI technology implementation in digital content, identify characteristic trends, risks, and consequences of their use during the war by the Ukrainian and Russian sides.

A comparative method was used to compare the results of a survey conducted by Kyiv International Institute of Sociology on public trust in the media in December 2023 and December 2024. This confirmed a certain decline over the year.

The analysis was conducted in three stages:

- 1) Collection of material. Searching for a theoretical framework, monitoring of Ukrainian media, social networks, and fact-checking organizations; collection of materials from May 2022 to October 2025;
- 2) Identification of AI content. Identification and selection of cases created, distributed, or verified using AI tools;
- 3) Systematization and description. Formulation of positive and negative aspects of AI use in the media space during the war based on the theoretical framework and examples found. Confirmation of our opinions by the works of researchers or specific examples from the experience of Ukrainian media and fact-checking professionals.

Results and Discussions

As a result of our research, we have identified the following key **advantages** of using AI technologies in the Ukrainian media space during the full-scale war.

Reducing the burden on journalists and adapting content

The war poses a serious emotional challenge for media professionals, as they face heavy workloads, stress, and professional burnout on a daily basis. In such conditions, automated technologies significantly ease the journalistic routine. According to a study conducted by the NRADA (National Council of Ukraine on Television and Radio Broadcasting) in June-July 2025, 41.86% of Ukrainian

media outlets already actively use AI tools in their work; 50.4% do not use them, and 7.85% are undecided [23].

Researcher Vaskivska (2022) noted that "Ukrainian media use artificial intelligence for routine journalistic work, in particular, data collection and processing, multimedia improvement and verification, content moderation, and the creation of bots that promote publications on social networks" (p. 109) [20]. Machine-based technologies make it possible to reproduce voices for adapting content into different languages, generate automatic texts or subtitles, and create graphic materials, making content accessible and understandable to a much wider audience.

For example, in March 2023, the eighth issue of *Durchschlag* magazine, created entirely by AI, was released. The founder of the publication, Pavlo Salyga, announced this on his Facebook page [7]. It is known that the texts were written by ChatGPT, and the illustrations were created using tools such as OpenArt, DALL-E, and Midjourney. The issue itself is dedicated to art. This format is new and, with the growing capabilities of AI, has the potential to become useful for the publishing industry. It will open up opportunities to reduce the workload on editors and adapt content more quickly to different target audiences.

Increasing the speed and scale of fact-checking

In the context of hybrid warfare, AI technologies can serve as tools to enhance information security, as they enable faster and more accurate fact-checking, which helps to debunk enemy propaganda. Researchers Zrazhevskya and Zaika (2023) emphasized in this regard that "during the war, platforms whose main purpose is to counter disinformation and fake news attract special attention" (p. 73) [24].

Today, tools such as Clearview AI and YouScan show how AI-powered technologies help Ukrainian journalists and the military track sources of information, identify false content, and ultimately increase media literacy among the population. Moreover, InVID and the YouTube DataViewer allow users to obtain metadata, break videos down into frames, and check each one separately. This is particularly useful for identifying old videos that are often passed off as new events.

In case of more sophisticated manipulation technologies, such as deepfakes, platforms such as DeepFake-o-meter, Hive Moderation or Deepware Scanner play an important role, analyzing microdetails: skin texture, breathing, and eye movement. The AI Speech Classifier tool can be used to check the authenticity of audio accompaniment. For example, the team of analysts at the "VoxUkraine" platform uses a tool called Forensically in its "VoxCheck" project to investigate disinformation, especially on political topics. With its help and the clone detection function, in January 2025, a piece of Russian disinformation about Volodymyr Zelenskyy was debunked, which claimed that leaflets about him had been posted in Auschwitz [21].

It should be noted that fact-checking organizations, projects, and even team-based educational games are also developing in Ukraine: "Slovo i Dilo", "StopFake", "VoxUkraine", "FactCheck", "MediaSapiens", and "NotaEnota".

Analysis and processing of large data sets

The large volume of material and heavy workload on journalists affect the quality and reliability of content. In the context of digitalization, AI technologies can be trained to analyze large amounts of data and identify problematic material. Tarasyuk, co-founder of the AI startup Mantis Analytics (2024), explained that AI models trained to recognize such content automate and facilitate the work

of analysts, who do not need to spend time reviewing the total number of media products. Instead, they focus only on the sample that the system has sorted for verification [18]. This makes it possible to find truly dangerous materials, such as those that spread hostile narratives or openly support the aggressor.

We are convinced that AI cannot replace analysts, but it significantly increases their efficiency. Moreover, scientists Londoño-Proañó and Buele (2025) noted that "tasks that require critical analysis, interpretation of complex socio-cultural contexts, and ethical decision-making remain uniquely human, highlighting the importance of close collaboration between journalists and technologies" (p. 06) [11]. Thus, thanks to automation and data processing by machine technologies, specialists focus more attention on the most complex cases, which in turn reduces the risk of information threats.

The development of OSINT technologies in investigative journalism

Since February 2022, investigative journalism in Ukraine has gained new momentum, due to the urgent need to quickly and reliably record and report on Russia's war crimes. The use of digital technologies has made it possible to adopt new tools in this field. For example, the use of algorithms for biometric analysis, such as voice and face recognition, has become an important component, allowing the identification of sources or individuals involved in crimes and the verification of evidence.

In addition, according to researchers Barash and Shcherban (2024), AI technologies in OSINT can help track the tone of articles in order to understand the positions of each media outlet, identify similarities in publications, and analyze language and rhetoric (pp. 273-274) [1]. This means that analysts get a structured overview with facts, hidden intentions, connections, and influences. As a result, AI serves as a tool that helps not only to navigate the information field, but also to understand its logic and predict further developments.

OSINT tools based on automated technologies help analyze objects in photos, track the movement of enemy equipment using satellite images, and check individuals or companies through open registries.

In the first months of the full-scale war, journalists from *Slidstvo.Info*, together with the Anti-Corruption Headquarters, launched the "Russian War Criminals" project, which, as of 2023, had collected more than 170,000 profiles of identified Russian military personnel on an interactive online map using the YouControl platform [15; 17]. Importantly, links to the war crimes of each of them can also be found here. Such recording of facts will become a powerful evidence base in international courts.

In Ukraine, there are more and more initiatives that systematize work with open data using modern fact-checking methods. The main thing is that they are accessible not only to media professionals, but to everyone. For example, the "OSINT school" project from *Diia* helps people learn the basic tools for verifying information and conducting research in open sources. In addition, thanks to the Telegram bot "PEREVIRKA", created at the beginning of the full-scale war, users can check suspicious news and accounts within 24 hours.

We are convinced that such technologies promote media literacy among the population, which is necessary to strengthen the country's information security.

Despite the significant advantages of using AI in the modern Ukrainian media space, it is clear that its **disadvantages** cannot be ignored. The main challenge facing the spread of automated technologies, which is encountered daily not only by communications specialists but also by the

general population, is information warfare. We have identified the key aspects of this phenomenon in which AI plays the most important role.

Rapid generation and dissemination of deepfakes and manipulative images

In the context of information warfare, machine algorithms are capable of creating convincing, albeit superficial, digital fakes in a matter of seconds. However, a trusting society, which prioritizes obtaining up-to-date information and does not waste time analyzing it, often becomes the target of manipulation.

According to researchers Tomassi et al. (2024) "in most cases, AI shows to act more as a spreader than as an authoritative agent. This applies mainly to the most commonly used social networks (Twitter, Facebook, and YouTube)" (p. 25) [19]. That is why AI tools are the enemy's technological advantage, which lies not in the high quality of the product, but in the quantity and speed of its distribution, which, in turn, affects its perception by the audience.

A common practice of the Russians is to generate numerous fake messages using AI on behalf of the Armed Forces of Ukraine or government officials, reporting, for example, on surrender or mass casualties. One example is a fabricated deepfake video of President Volodymyr Zelenskyy's address, in which he orders the military to leave the city of Avdiivka and authorizes the arrest or use of weapons against any commanders who attempt to resist. The fabricated content contains the logo of the real Ukrainian TV media outlet *TSN*. According to the "VoxCheck" team, Volodymyr Zelenskyy's address from October 30, 2023, and the AI tool ElevenLabs were used to create the video, which allowed the president's real voice to be retained but the text to be replaced [22].

In general, this type of information warfare is not uncommon: opponents often use digital fakes and negative descriptions to simultaneously mislead both sides. Such content is often spread on Ukrainian social networks and messengers, through which users view and disseminate information superficially, especially those who do not have a sufficient level of media literacy. The result is disorientation, panic, and division among the population.

The rapid spread of spam using bots

In examining this issue, we focused on the words of scientist Cresci (2020), who emphasized that "the wide array of actions that social bots perform and the negligible cost for creating and managing them en masse, open up the possibility to deploy armies of bots for information warfare, for artificially inflating the popularity of public characters and for manipulating opinions" (p. 3) [3]. In the context of the Russian-Ukrainian war, the multifunctionality of such technologies, combined with the minimal cost of their creation, allows the opposite side to promote narratives that are beneficial to it.

According to information from "Dovidka.info" website, a major problem is the falsification of Ukrainian chatbots by Russians in order to mislead people and extract both personal and strategically important data [5]. This means that today, bots controlled by AI algorithms are indeed capable of creating a mass effect. For example, when less knowledgeable users see dozens of similar comments or messages with the same meaning, they may be under the illusion that this is the opinion of the majority.

Digital platforms play a key role in this process. Thus, the Telegram messenger, which, as we have already noted, is currently the main tool for receiving news, is used for mass "spam" targeting the Ukrainian audience. Due to the large number of channels and bots, fake messages, manipulative polls,

and floods of information are spread, which quickly gain popularity thanks to inflated comments and reactions. This is confirmed by the opinion of researchers Shao et al. (2017), who identified the following three functions of bots: active manifestation in the early stages of spreading fake news, which ultimately helps to "spread information like a virus"; targeted interaction with influential users through comments and mentions; hiding their real location (p. 11) [16].

Facebook, X, and TikTok are tools for influencing the international community. The main goal of using machine technologies is to create an impression of "war fatigue" or "ambiguous situation" among foreign audiences. Much of the text and multimedia content is created using neural networks such as Claude and Gemini. In the summer of 2024, data investigators from *Texty.org.ua*, including Yuliia Dukach, conducted an investigation into the rapid activation of suspicious accounts on TikTok that were spreading videos with the hashtag *#it'snotmyukraine* (41,000 shares in a week and over 10 million views). According to the results of their work, more than 2,000 accounts were created as part of a single Russian information operation, spreading videos with hashtags such as *#it'snotmyukraine* or *#lawlessness* with the aim of discrediting mobilization in Ukraine and the actions of the Recruiting office [6].

Cyberattacks using phishing emails and messages

According to Pataliak, Director of Business Development at Wezom (2024) "attacks rely on AI algorithms to analyze vast amounts of data from social networks, corporate websites, and other public sources to mimic legitimate communication styles and content, or even replicate the correspondence style of real company employees" [13]. Machine systems generate thousands of messages at high speed that look as realistic as possible, as they imitate the style of presentation and visual design of official sources. Since the start of the war in Ukraine, there has been an increasing number of such cases: from text messages with dubious information about mobilization or fundraising for the army to emails on behalf of officials or government agencies.

Adaptive phishing is also particularly dangerous, as it uses tools such as GenAI to create messages targeted at specific individuals, taking into account their characteristics and needs. During wartime, such tools are particularly useful to the enemy.

For example, in September 2024, the office of U.S. Senator Benjamin L. Cardin received an email purportedly from the former Ukrainian foreign minister Dmytro Kuleba requesting a Zoom video call. Impersonating the Ukrainian official, the attackers attempted to ask questions about the U.S. elections and international politics, specifically, according to *The New York Times*, whether the senator supported the launch of long-range missiles over Russian territory [4]. Although it is not entirely clear whether Russia itself was behind this incident, such questions may be of interest and strategic importance to it.

Declining trust in media content

With the outbreak of war, the role of the media as a tool for conveying information and shaping public opinion only grew stronger, bringing the issue of trust in the media to the forefront. However, dozens of events every hour, constant tension, and exhaustion of media workers often led to the spread of unreliable, propagandistic, and narrative information, which was also actively exploited by the enemy.

The main problem is that society tends to believe fast and vividly presented data. In other words, sensationalism. Scientists Kilgo and Sinta (2016) argued that "the increased prevalence of sensationalistic journalism in the digital realm intentionally seeks to engage audiences through

simplistic, attractive content that drives audience emotion or peaks interest" (p. 115) [10]. As a result, journalists, trying to stay ahead of their competitors in the pursuit of hype, often spread clickbait material without verification in order not to lose their audience. At first, this seems like a helpful tool, but over time, this practice becomes a habit that undermines real work with facts, sources, and experts.

In addition, according to IMI (The Institute of Mass Information) and educator in Generative AI Minakov, Ukrainian media outlets are increasingly publishing AI-generated fiction in their news feeds, presenting it as forecasts or analytical conclusions. This became particularly noticeable in March 2025, when a number of online publications massively disseminated generated materials about the actions or personal life of US President Donald Trump [2]. In our opinion, such content is not very useful for the audience due to clickbait and unfounded judgments without the assessment of real experts. In addition, not all online publications indicate the informational and entertainment nature of the texts and the unreliability of AI analytics.

For example, in a publication by the Ukrainian media outlet Telegraf (2025) entitled "Ye 4 stsenarii: shtuchniy intelekt sprohnozuvav, chogo chekati pislya zustrichi Trampa i Zelenskogo" (eng. "There are 4 scenarios: Artificial Intelligence predicted what to expect after the meeting between Trump and Zelenskyy"), in addition to the absence of a proper note, screenshots of predictions from ChatGPT are directly used [12]. This significantly reduces trust in the media and the population's ability to think critically, because instead of reliable data and analytics, Ukrainians receive automatically generated, largely entertaining content on serious topics. This, in turn, is unacceptable in wartime.

It should be noted that AI-generated photos and videos of the destruction, artificially written and unreliable texts, and general propaganda from both the Russian and Ukrainian sides are the main reasons for the disorientation of society. According to the results of a survey conducted by the KIIS (Kyiv International Institute of Sociology) in December 2024, 27% of the population trusted the Ukrainian media, 42% did not trust it, and the remaining 32% had a neutral opinion. For comparison, at the end of 2023, according to the results of the same survey, 29% of participants trusted the media, while 40% did not [8]. This confirmed a certain decline in trust in media content during that period.

Conclusions

In conclusion, the use of AI technologies in the Ukrainian media space during a full-scale war has both significant advantages and serious challenges. On the one hand, the latest AI-driven tools make it possible to effectively counter the enemy's information warfare. They allow for faster identification of criminals through the analysis of photo and video materials, conducting investigations, and large-scale fact-checking to refute propaganda. Tools such as automatic subtitles and speech synthesis significantly reduce the operational load on journalists, freeing up time for higher-quality analysis. On the other hand, AI technologies are used by both the Russian and the Ukrainian sides for the mass creation of manipulative content, bot attacks, and threats to information and cybersecurity. The goal is not to convince, but to quickly saturate the information space with chaos, leading to panic and undermining trust in any information. The main consequence is the undermining of trust in the media and the risk of reducing human elements in journalism due to excessive automation. Therefore, the successful development of AI technologies in Ukraine's military media space is possible provided that technological innovations are combined with clear regulation, transparency of algorithms, and the development of media literacy in society.

Recommendations

The results obtained are of both theoretical and practical importance for Ukraine's media space. In wartime, AI is a tool for ensuring more effective communication and assistance to specialists. Based on the identified advantages and disadvantages, we offer the following ethical recommendations for the use of automated technologies by media professionals in wartime:

1. Use algorithms to analyze and create content for the sake of efficiency and when journalists are under heavy workload. However, the main responsibility lies with the authors and editors. The materials should be meaningful, truthful, socially significant, and not just entertaining. The main thing is to include assessments and comments from real experts in a particular field.
2. Label AI-generated content. During wartime, the information field is particularly saturated with disinformation. The audience has the right to know which material was created by humans and which was generated by algorithms. It is also necessary to point out the entertaining nature of such content and the consequences of placing complete trust in it. In our opinion, this will prevent unnecessary manipulation, promote the development of critical thinking, and increase trust in specific media outlets.
3. Promote the development of media literacy by familiarizing specialists with ML and NLP-based systems for detecting hate speech, bot activity, and manipulative techniques in texts. This will allow for faster detection of dangerous narratives, a deeper understanding of national and hostile communication, and better prediction of information attacks.
4. Introduce internal editorial policies on the use of AI. This concerns the establishment by each editorial office of specific limits on the use of machine-based systems in operation, procedures for verifying the accuracy of content, and the introduction of personal responsibility for published information. We are convinced that this approach will help prevent the misuse of AI technologies, preserve ethical standards in the profession, and maintain a balance between technological efficiency and human integrity.

These recommendations can serve as a foundation for developing professional standards for teams of journalists or individual editorial offices. This is also particularly important in an international context, as Ukraine's experience can be useful for other countries in times of crisis.

References

1. Barash, L., & Shcherban, M. (2024). Efektyvnist ta avtomatizatsiya: mozhlyvosti SHI v suchasni OSINT (Open Source Intelligence) analitytsi [Efficiency and automation: AI opportunities in modern OSINT analysis]. *SBU v umovah viiny v Ukraini: suchasni realii ta innovatsiini strategii zabezpechennia natsionalnoi bezpeky: Materialy mizhnarodnoi naukovo-praktychnoi konferentsii*. Kyiv: Alerta, 273–276. [in Ukrainian]
2. Barkar, D. (2025, March 25). Vykorystannya SHI v media: yak zberegty yakist kontentu. Interviu z ekspertom iz SHI Oleksiyem Minakovym [Use of AI in media: How to maintain content quality. Interview with AI expert Oleksiy Minakov]. Retrieved from <https://imi.org.ua/monitorings/vykorystannya-shi-v-media-yak-zberegty-yakist-kontentu-interv-yu-z-ekspertom-iz-shi-oleksiyem-i67331> [in Ukrainian]
3. Cresci, S. (2020). A decade of social bot detection. *Communications of the ACM*, 63(10), 72–83. DOI: [10.1145/3409116](https://doi.org/10.1145/3409116)
4. Demirjian, K. (2024, September 26). 'Deepfake' caller poses as Ukrainian official in exchange with key senator. The New York Times. Retrieved from <https://www.nytimes.com/2024/09/26/us/senator-cardin-deepfake.html>
5. Dovidka.info (2022-2025). Perevirte bot [Check the bot]. Website. Retrieved from <https://dovidka.info/botcheker/> [in Ukrainian]
6. Dukach, Y. & Kelm, N. (2024, August 1). #It'sNotMyUkraine: We have identified a Russian network of 2,000 TikTok accounts created to discredit the mobilization and the Recruiting office. Retrieved from <https://texty.org.ua/articles/113076/cenemoyaukrayina2/>

7. Durchschlag. (2023, March). Website. Retrieved from <https://www.yumpu.com/xx/document/read/67632097/durchschlag8> [in Ukrainian]
8. Grushetskyi, A. (2025, January 9). Dynamika doviry sotsialnym instytutstsiam u 2021–2024 rokakh [Dynamics of trust in social institutions 2021–2024]. Retrieved from https://www.kiis.com.ua/?lang=ukr&cat=reports&id=1467&page=1&fbclid=IwZXh0bgNhZW0CMTAAR0UNT6IYBZK40x1A76We2K6Syg4LSxARi3NZ1oz_0ZVGbQkwlykmZh8sp4_aem_NXO_01mwV55VizFYgRLYKw [in Ukrainian]
9. Hardaker, C. (2010). Trolling in asynchronous computer-mediated communication: From user discussions to academic definitions. *Journal of Politeness Research*, 6(2), 215–242. DOI: [10.1515/jplr.2010.011](https://doi.org/10.1515/jplr.2010.011)
10. Kilgo, D. K., & Sinta, V. (2016). Six things you didn't know about headline writing: Sensationalistic form in viral news content from traditional and digitally native news organizations. *Research Journal of the International Symposium on Online Journalism*, 6(1), 111–130
11. Londoño-Proañó, C., & Buele, J. (2025). Can Artificial Intelligence Replace Journalists? A theoretical approach. *Frontiers in Communication*, 10. DOI: [10.3389/fcomm.2025.1537146](https://doi.org/10.3389/fcomm.2025.1537146)
12. Nazarova, M. (2025, August 19). Ye 4 stsenarii: shtuchniy intelekt sprohnozuval, chogo chekati pislya zustrichi Trampa i Zelenskogo [There are 4 scenarios: Artificial Intelligence predicted what to expect after the meeting between Trump and Zelenskyy]. Retrieved from <https://news.telegraf.com.ua/ukr/ukraina/2025-08-19/5918403-e-tri-stsenarii-shtuchniy-intelekt-sprohnozuval-chogo-chekati-pislya-zustrichi-trampa-i-zelenskogo> [in Ukrainian]
13. Pataliak, E. (2024, September 13). Ataki na osnovi shtuchnogo intelektu: novi vikliki dlya kiberbezpeki [AI-based attacks: New challenges for cybersecurity]. Retrieved from <https://wezom.com.ua/ua/blog/ataki-na-osnovi-shtuchnogo-intelektu-novi-vikliki-dlya-kiberbezpeki> [in Ukrainian]
14. Rating Group. (2025, September 1). Ukraintsi, dovira do media ta dezinformatsiia [Ukrainians, trust in media and disinformation]. Retrieved from <https://www.ratinggroup.ua/news/media-aug2025> [in Ukrainian]
15. RussianWarCriminals. (2022, May). Website. Retrieved from <https://rwc.shtab.net/en>
16. Shao, C., Ciampaglia, G. L., Varol, O., Flammini, A., & Menczer, F. (2017). The spread of fake news by social bots. *arXiv preprint arXiv:1707.07592*, 96(104), 14. DOI: [10.1038/s41467-018-06930-7](https://doi.org/10.1038/s41467-018-06930-7)
17. Slidstvo.Info (2023, May 29). Zibrani komandoiu "Slidstva.Info" ponad 170 tys. profiliv viiskovykh RF rozmistyli na platformi YouControl [More than 170 thousand profiles of Russian military published on YouControl platform]. Retrieved from <https://www.slidstvo.info/news/zibrani-komandoiu-slidstva-info-ponad-170-tys-profiliv-viiskovykh-rf-rozmistyli-na-platformi-youcontrol-2/> [in Ukrainian]
18. Sulikovska, O. (2024, March 20). Lyudyna yak oriyentyr, avtorstvo j faktcheking: yak ukrayinski media, organizatcziyi ta derzhstruktury vykorystovuyut SHI [Human as a reference point, authorship and fact-checking: How Ukrainian media and institutions use AI]. Retrieved from <https://mediamaker.me/lyudyna-yak-oriyentyr-avtorstvo-j-faktcheking-yak-ukrayinski-media-organizacziyi-ta-derzhstruktury-vykorystovuyut-shi-8438/> [in Ukrainian]
19. Tomassi, A., Falegnami, A., & Romano, E. (2024). Mapping automatic social media information disorder. The role of bots and AI in spreading misleading information in society. *Plos one*, 19(5). DOI: <https://doi.org/10.1371/journal.pone.0303183>
20. Vaskivska, O. (2022). Tekhnolohii shtuchnogo intelektu v zhurnalistytsi suchasnosti [Artificial intelligence technologies in modern journalism]. In *Proceedings of the X Congress "Aviation in the XXI Century" – "Safety in Aviation and Space Technologies"*. Kyiv: National Aviation University (Vol. 6, pp. 107-6) [in Ukrainian]
21. VoxCheck. (2025, January 31). Fotofejk: U Polshhi rozvisyly lystivky z Zelenskym i napysom "Mistse natsysta u smitnyku, a ne v Aushvitsi" [Photo fake: In Poland leaflets with Zelenskyy and the inscription "Place of a Nazi is in a trash bin, not Auschwitz"]. Retrieved from <https://voxukraine.org/fotofejk-u-polshhi-rozvisyly-lystivky-z-zelenskym-i-napysom-mistse-natsysta-u-smitnyku-a-ne-v-aushvitsi> [in Ukrainian]
22. VoxCheck. (2023, November 21). Videofejk: Zelenskyj nakazav pokynuty Avdiyivku [Video fake: Zelenskyy ordered to leave Avdiivka]. Retrieved from <https://voxukraine.org/videofejk-zelenskyj-nakazav-pokynuty-avdiyivku> [in Ukrainian]
23. Vykorystannya SHI u media. (2025, October 3). Rezultaty doslidzhennya Natsionalnoyi rady [Use of AI in media: Results of the National Council study]. Retrieved from <https://webportal.nrada.gov.ua/vykorystannya-shi-u-media-rezultaty-doslidzhennya-natsionalnoyi-rady/> [in Ukrainian]
24. Zrazhevskaya, N. I., & Zaika, V. (2023). Yak zminylasia robota ukrainskoho zhurnalista pid chas viiny [How the work of Ukrainian journalists changed during the war]. *Intehrovani komunikatsii*, 1(15), 68-77. DOI: <https://doi.org/10.28925/2524-2644.2023.159> [in Ukrainian]

THE USE OF ARTIFICIAL INTELLIGENCE IN PERFORMANCE AUDITING: A REVIEW OF SCIENTIFIC AND PROFESSIONAL SOURCES

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Abstract

This paper presents a review and synthesis of recent scientific and professional sources (2024–2025) on the application of artificial intelligence (AI), including generative AI (GenAI), in performance auditing. The analysis adopts two complementary perspectives: (1) AI as an audit tool supporting audit planning, evidence collection, process analysis, and the formulation of findings and recommendations; and (2) AI as an audit object, where organizational AI governance, risks, and controls are assessed. The reviewed literature highlights that the greatest practical value is created in text and document analysis, anomaly detection, and full-population data assessment (Lin et al., 2025; Kokina, 2025). At the same time, significant risks are emphasized with regard to the reliability of audit evidence, data governance, dependencies on vendors and third parties, model change management, and traceability of results (Financial Reporting Council [FRC], 2025).

Keywords: performance audit, artificial intelligence, public sector, Supreme Audit Institutions

Introduction

In recent years, artificial intelligence (AI) has attracted growing attention from both academic research and professional practice, including independent audit institutions that play a critical role in the governance and accountability of AI systems (Brand, 2025). The entry into force of the European Union Artificial Intelligence Act (Regulation (EU) 2024/1689) on 1 August 2024 established a harmonized, risk-based regulatory framework for the development and deployment of AI in the European Union (European Commission, 2024; European Commission, n.d.).

As the use of AI in the public sector expands, Supreme Audit Institutions (SAIs) face a dual challenge: developing methodologies for auditing AI systems and integrating AI tools into their own audit processes (Genaro-Moya, 2025; INTOSAI Performance Audit Subcommittee, n.d.). AI is expected to enhance the efficiency and analytical capacity of audit procedures; however, it also introduces new challenges for audit quality, transparency, and accountability.

The growing deployment of AI in public administration creates opportunities to automate repetitive tasks, improve service delivery, and support evidence-based decision-making. International assessments suggest that significant productivity gains and cost savings can be achieved through AI-

enabled process automation in government operations (Deloitte Center for Government Insights, 2017). Consequently, the performance and governance of AI systems themselves are increasingly becoming relevant audit objects.

Performance auditing covers a broad range of public sector activities, including education, public finance and asset management, justice, health, social protection, and defense. According to INTOSAI standards (ISSAI 3100), performance auditing is defined as the independent, objective, and reliable assessment of government undertakings, systems, processes, programs, activities, or organizations in terms of economy, efficiency, and effectiveness. In this context, AI is both a subject of audit and an enabling technology for modernizing performance audit methodologies.

Research objective: How are the opportunities and risks of applying AI in performance auditing conceptualized in the 2024–2025 scientific and professional literature?

Research methods: The study applies a targeted scoping review of academic publications and professional guidance.

Literature Review

The rapid development and deployment of artificial intelligence (AI) in the public sector and auditing practice have attracted increasing attention from researchers, regulators, and professional bodies. The emerging regulatory environment, particularly the European Union's Artificial Intelligence Act, establishes a risk-based framework that significantly affects how AI systems are designed, implemented, and assessed in organizational contexts (European Commission, 2024). The application timeline of the AI Act further clarifies the phased introduction of compliance obligations, which is highly relevant for auditors planning assurance and performance audit engagements in organizations using high-risk AI systems (European Commission, n.d.). In parallel, international standards and frameworks, such as ISO/IEC 42001 and the NIST Artificial Intelligence Risk Management Framework, provide structured guidance for the governance, risk management, and control of AI systems, offering a foundation for developing audit criteria and evaluation benchmarks (International Organization for Standardization, 2023; National Institute of Standards and Technology, 2023).

Beyond regulation, the literature increasingly emphasizes the need for dedicated methodologies and audit frameworks tailored to AI systems. Brand (2025) proposes an AI audit framework designed specifically for Supreme Audit Institutions, highlighting key dimensions such as data governance, model transparency, accountability, and ethical considerations. Similarly, professional guidance developed by the Institute of Internal Auditors (2024) and INTOSAI's Performance Audit Subcommittee (n.d.) outlines practical approaches to auditing machine learning algorithms, focusing on risks related to data quality, algorithmic bias, explainability, and model lifecycle management. These frameworks suggest that auditing AI requires not only technical competencies but also an adaptation of traditional performance audit methodologies to account for the dynamic and opaque nature of algorithmic decision-making. In the context of public sector auditing, Genaro-Moya (2025) argues that AI fundamentally reshapes audit practices by introducing new forms of evidence and risk, while simultaneously increasing the potential for enhanced analytical capabilities in performance audits.

Empirical and practice-oriented studies demonstrate that AI tools can be integrated into audit processes to improve efficiency and analytical depth. Eulerich and Wood (2024) show how generative AI tools, such as ChatGPT, can support internal audit activities, including document analysis and audit planning, thereby reducing manual workload and enhancing knowledge discovery. Lin et al. (2025) further extend this perspective by examining the implications of generative AI and edge AI in auditing, suggesting that these technologies enable more real-time and decentralized audit analytics. Complementing these demonstrative applications, Kokina et al. (2025) provide empirical evidence from the field, illustrating how AI is currently used in auditing practice and how practitioners perceive both its benefits and limitations. Together, these studies indicate that AI adoption in auditing is no longer purely experimental but increasingly embedded in operational practices, with direct implications for performance audit processes.

At the same time, the literature highlights a dual perspective on AI as both an opportunity and a source of new risks for the audit profession. Kokina (2025) conceptualizes AI as a transformative force that can enhance audit effectiveness, coverage, and analytical rigor, while also introducing challenges related to transparency, professional judgment, and over-reliance on automated outputs. These concerns are particularly salient in the context of performance auditing, where auditors are expected not only to assess compliance but also to evaluate effectiveness, efficiency, and value for money. From a public sector perspective, Deloitte Center for Government Insights (2017) emphasizes the potential of AI to generate significant time and cost savings in government operations, thereby creating new expectations for performance improvements that may become subjects of future performance audits. Consequently, auditors are increasingly required to assess not only whether AI systems function correctly, but also whether they deliver the promised public value.

Finally, documentation, traceability, and transparency emerge as critical issues in the AI-enabled audit environment. Guidance from the Financial Reporting Council (2025) underscores the importance of clearly documenting how AI tools are used within audit engagements, ensuring that audit evidence remains verifiable and decisions remain explainable. This aligns with the broader emphasis on explainability and governance found in international standards and risk management frameworks (International Organization for Standardization, 2023; National Institute of Standards and Technology, 2023).

Although the number of scientific publications in 2024–2025 is growing rapidly, several significant gaps remain: (1) the empirical evidence base is still limited specifically in the context of performance auditing (with most studies focusing on financial auditing); (2) there is a lack of standardized metrics for measuring the impact of AI on audit quality, particularly in GenAI applications; (3) insufficient research addresses how to ensure traceability and robust audit trails in large language model (LLM) workflows; and (4) public sector AI audit practice remains fragmented, calling for more comparative case studies and systematic validation of methods (Genaro-Moya, 2025; Brand, 2025).

Methodology

This study employs a targeted scoping review to synthesize recent scientific and professional sources on the use of artificial intelligence (AI), including generative AI (GenAI), in performance auditing. Two categories of sources were included: (a) peer-reviewed academic publications addressing AI/GenAI applications in auditing and public sector contexts; and (b) professional guidelines,

standards, and regulatory documents relevant to audit criteria and quality assurance (IIA, FRC, ISO/IEC, NIST, EU institutions, INTOSAI community).

The selection criteria were as follows: (1) publication period 2024–2025, with a limited number of foundational standards from 2023 included where necessary to define audit criteria; (2) explicit relevance to audit functions and/or public sector auditing; and (3) practical implications for audit planning, evidence collection, documentation, quality management, and governance. Sources were identified through targeted searches in academic databases and institutional repositories, followed by backward citation tracking to ensure coverage of seminal professional frameworks.

The analysis applied thematic coding across the performance audit lifecycle (planning, evidence collection and testing, analysis and synthesis, reporting and follow-up) and across AI governance dimensions (data governance, model risk management, explainability, change management, and third-party risk). This enabled the development of application matrices and risk–control mappings presented in the Results section.

Results

Table 1 presents the potential areas of application of AI in performance auditing based on the analysis of sources.

Table 1

AI as an audit tool: key applications across the performance audit

Performance audit stage	Examples of AI applications	Value created	Key risks and control considerations
Planning and risk assessment	Risk mapping from KPIs; topic prioritization; anomaly detection (ML)	Faster coverage, improved risk targeting, higher detection power	Data quality; bias; model explainability; documented methods and parameter settings
Evidence collection and testing	Document analysis (NLP/GenAI) of contracts, procedures, reports; automated attribute extraction; full-population testing	Reduced manual effort; more consistent sampling; improved document triage	Confidentiality; GenAI hallucinations; access controls; mandatory human-in-the-loop review
Analysis and synthesis	Process mining combined with ML; hypothesis generation; scenario analysis	Deeper insights into inefficiencies and control gaps; faster hypothesis testing	Spurious correlations; reproducibility; clear audit trail
Reporting and recommendations	GenAI for drafting working papers, summaries, and recommendation wording; language editing	Faster preparation; standardized structure; improved clarity	Content accuracy; source verification; version control and approval workflows

The literature indicates that the highest gains are achieved in contexts with large volumes of documents or structured event logs, enabling a shift from sample-based testing toward broader population analysis (Lin et al., 2025).

Table 2 summarizes the governance, risk, and control perspectives of AI based on the analysis of the sources.

Table 2

AI as an audit object: governance, risk, and control perspectives

Risk category	Typical findings in performance audits	Example controls and audit procedures
Data governance and privacy	Unclear data provenance; data quality issues; uncontrolled access; use of sensitive data for model training	Data catalogs and lineage evidence; access logs; data quality KPIs; impact assessments; contractual safeguards with vendors
Model reliability, bias, and explainability	Uneven outcomes across groups; opaque decisions; high false-positive/negative rates	Testing protocols; bias metrics; documentation (e.g., model cards); independent validation; human oversight for critical decisions
Change management and monitoring	Uncontrolled model updates; performance drift; lack of incident management	Model versioning; change approval workflows; continuous monitoring; drift detection; incident registers and lessons learned
Third-party and vendor risk	“Black-box” solutions; limited audit rights; unclear SLAs	Vendor due diligence; audit rights in contracts; SLA/KPI definitions; subcontractor transparency; data residency and deletion procedures
GenAI-specific risks (hallucinations, IP)	Inaccurate summaries; fabricated sources; disclosure of confidential information to public models	Enterprise-grade solutions; prompt governance; mandatory source verification; output review; sensitive data filters

Recent professional guidance emphasizes coverage of the entire AI -from business justification and data preparation to deployment, monitoring, and change management (IIA, 2024; Brand, 2025). ISO/IEC 42001 provides a management system logic that can be used as audit criteria (International Organization for Standardization, 2023).

Regulatory context and audit criteria (2024–2025). The EU Artificial Intelligence Act entered into force on 1 August 2024 and is being implemented in phases. For performance audits conducted in 2024–2025, auditors should assess organizational preparedness, including AI literacy measures, obligations for general-purpose AI (GPAI) models, technical documentation, and governance structures (European Commission, 2024; European Commission, n.d.). ISO/IEC 42001 and the NIST AI RMF can be used to operationalize audit criteria across governance, risk management, and control dimensions (National Institute of Standards and Technology, 2023).

Audit quality, evidence reliability, and metrics. Regulators and professional bodies emphasize that the mere use of AI does not automatically improve audit quality. Robust metrics are required to assess impacts on detection capability, false-positive/negative rates, time savings, and reproducibility. The UK FRC guidance stresses disciplined documentation of AI tool purpose, data inputs, parameterization, quality monitoring, and the incorporation of AI outputs into audit files to ensure traceability and explainability (FRC, 2025).

Competencies and operating model transformation. The literature points to a shift in competency requirements: alongside traditional audit skills, auditors need literacy in data governance, analytics methods, model limitations, and responsible GenAI use (Kokina, 2025; Eulerich & Wood, 2024). In practice, this often translates into hybrid teams (auditors plus data specialists),

clearly defined review roles, standardized procedures, and centralized documentation of tools and models (IIA, 2024).

Artificial Intelligence in the Public Sector: The Case of Lithuania

Artificial intelligence is already transforming business, science, and everyday life; however, the same cannot yet be said about the public sector. An audit conducted in 2025 by the National Audit Office of Lithuania, entitled “*Governance of Artificial Intelligence in the Public Sector*”, indicates that the main barriers to progress in this area are unresolved issues related to infrastructure, data, and workforce competencies (National Audit Office of Lithuania, 2025).

One of the key shortcomings identified is the lack of adequate infrastructure required for the operation of AI systems in the Lithuanian public sector. Infrastructure needs are not systematically assessed, monitoring mechanisms are weak, and there is no national plan for the development of AI capacities. Public sector institutions lack clearly defined data governance processes and do not adhere to AI governance standards. In addition, public sector employees face significant gaps in AI-related competencies and access to training. In order to fully harness the potential of AI in the public sector, it is essential to ensure that AI systems can recognize and process the Lithuanian language. This requires dedicated linguistic resources, including corpora of texts and speech data, lexicons, and language models that enable AI systems to understand and process natural language. High-quality linguistic resources can improve service efficiency, reduce the volume of manual work, and lower the risk of human error, whereas their absence hampers the adoption of innovative AI solutions in the public sector.

Based on the findings of the audit, it can be concluded that the adoption of AI could enable the state to save up to 30% of working time; however, it was observed that only 15% of public sector institutions currently make use of AI solutions.

Artificial intelligence should become an important support tool in the Lithuanian public sector. This would enable civil servants to work more productively, efficiently, and cost-effectively by reducing administrative burdens, improving client service delivery, enhancing the organization of public procurement, and optimizing other operational processes. As emphasized by the Auditor General of Lithuania, Irena Segalovičienė, without a clear strategy and adequate preparedness, these opportunities remain merely aspirational.

Conclusions

Recent (2024–2025) sources indicate that AI has become a significant enabler of productivity and coverage in performance auditing, particularly in document-intensive tasks and full-population analyses. However, AI introduces new risks to evidence reliability, confidentiality, and audit trail integrity. To realize benefits while safeguarding audit quality, organizations and SAIs should implement formal governance mechanisms, including human-in-the-loop controls, centralized tool documentation, robust data and model management, and audit quality metrics (FRC, 2025; IIA, 2024). In the public sector, AI auditing is emerging as a distinct performance audit theme, and the phased implementation of the EU AI Act provides clearer criteria for assessing organizational readiness and compliance (European Commission, n.d.).

Research Gaps and Future Directions. Despite rapid growth in publications, notable gaps remain: (1) limited empirical evidence specifically in performance auditing (most studies focus on financial auditing); (2) lack of standardized metrics for measuring AI's impact on audit quality, especially for GenAI; (3) insufficient methods for ensuring traceability and audit trails in LLM-based workflows; and (4) fragmented public sector practice, calling for comparative case studies and systematic validation of methods (Genaro-Moya, 2025; Brand, 2025).

References

- Brand, D. (2025). Development of effective methods and tools for the auditing of AI: An AI audit framework for Supreme Audit Institutions. *JeDEM – eJournal of eDemocracy and Open Government*. <https://jedem.org/index.php/jedem/article/view/1049>
- Deloitte Center for Government Insights. (2017). *How much time and money can AI save government?* Deloitte. https://www2.deloitte.com/content/dam/insights/us/articles/3834_How-much-time-and-money-can-AI-save-government/DUP_How-much-time-and-money-can-AI-save-government.pdf
- European Commission. (2024, August 1). *AI Act enters into force*. https://commission.europa.eu/news-and-media/news/ai-act-enters-force-2024-08-01_en
- European Commission. (n.d.). *AI Act: Application timeline*. <https://digital-strategy.ec.europa.eu/en/policies/regulatory-framework-ai>
- Eulerich, M., & Wood, D. A. (2024). A demonstration of how ChatGPT can be used in the internal auditing process. *Journal of Emerging Technologies in Accounting*. <https://scholarsarchive.byu.edu/facpub/8251/>
- Financial Reporting Council (FRC). (2025, June 26). *AI in audit: Illustrative example and documentation guidance*. <https://www.frc.org.uk/library/standards-codes-policy/audit-assurance-and-ethics/guidance/ai-in-audit/>
- Genaro-Moya, D. (2025). Artificial intelligence and public sector auditing. *Journal of Risk and Financial Management*, 6(2), 78. <https://www.mdpi.com/2673-4060/6/2/78>
- Institute of Internal Auditors (IIA). (2024, September). *Artificial intelligence auditing framework* (Updated version). <https://www.theiia.org/>
- INTOSAI Performance Audit Subcommittee. (n.d.). *Auditing machine learning algorithms: White paper for public auditors*. <https://www.intosaipas.org/external-publications/>
- International Organization for Standardization. (2023). *ISO/IEC 42001:2023 Artificial intelligence – Management system*. <https://www.iso.org/standard/42001>
- Kokina, J. (2025). Challenges and opportunities for artificial intelligence in auditing. *Accounting Forum*. <https://www.sciencedirect.com/science/article/pii/S1467089525000107>
- Kokina, J., Blanchette, S., Davenport, T. H., & Pachamanova, D. (2025). Challenges and opportunities for artificial intelligence in auditing: Evidence from the field. *International Journal of Accounting Information Systems*, 56, 100734. <https://doi.org/10.1016/j.accinf.2025.100734>
- Lin, T. L. J., et al. (2025). Generative AI and edge AI in auditing: Insights and implications. *Current Issues in Auditing*. <https://doi.org/10.2308/CIIA-2024-040>
- National Institute of Standards and Technology. (2023). *Artificial intelligence risk management framework (AI RMF 1.0)*. <https://www.nist.gov/itl/ai-risk-management-framework>
- National Audit Office of Lithuania. (2025). *Governance of artificial intelligence in the public sector*. <https://www.valstybeskontrole.lt/LT/Product/24314>

A STRATEGIC HRM FRAMEWORK FOR ENHANCING EMPLOYEES' MENTAL AND FINANCIAL WELL-BEING IN IT COMPANIES OF DELHI NCR, INDIA

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Abstract

In today's competitive and fast-paced organizational environment, employees' well-being has emerged as a critical concern, particularly in terms of mental and financial health. This study explores how Strategic Human Resource Management, specifically leadership support, targeted training, and compensation, can be integrated to enhance the well-being of Indian employees. A qualitative empirical design was adopted, focusing on the mental and financial well-being of Indian employees. Thirty-four Human Resource managers from Information Technology companies of Delhi National Capital Region (NCR), India, were interviewed. The data were subjected to thematic analysis to identify managerial perceptions, existing practices, and organizational readiness for structured well-being frameworks. The findings revealed a high prevalence of financial stress, limited formal mental health policies, compensation dissatisfaction, and a strong demand for leadership-driven well-being initiatives and financial literacy training. Leadership support emerged as a crucial factor in creating psychological safety, while financial literacy training and fair compensation were identified as essential mechanisms for reducing stress and enhancing well-being.

Keywords: employees' financial well-being, employees' mental well-being, leadership support, strategic human resource management

Introduction

Employees are the most valuable asset of any organization, as they play a critical role in achieving organizational goals and sustaining long-term success. In the modern competitive and dynamic work environment, organizations increasingly recognize that employees' productivity, creativity, and commitment are directly influenced by mental and financial well-being. A high level of mental and financial well-being enables employees to perform their roles effectively, manage work-related stress, and maintain a healthy work-life balance. Guest (2017) analyses the relationship between Human Resource Management (HRM) practices and employees' well-being, arguing that existing HRM models prioritize organizational performance while neglecting the human side of employment. He concludes that prioritizing employees' well-being and a positive employment relationship not only supports the workforce but also serves as a more sustainable path to achieving organizational performance.

Rathore and Ahuja (2015) analyze the various factors contributing to organizational stress and the specific impact of demographic variables on role stress among Indian IT professionals. Their findings reveal that prolonged exposure to time-bound and competitive work environments leads to

significant mental and emotional exhaustion, negatively affecting job performance and overall organizational effectiveness. Rathore and Ahuja (2015) in their research focus on the ten dimensions of role stress within the fast-paced service environment of the Delhi NCR IT sector. Their findings, based on the Organizational Role Stress (ORS) scale, demonstrate that individual characteristics play a crucial role in how employees experience workplace stress, highlighting the need for targeted organizational interventions to maintain effectiveness.

The Sustainable Development Goals (SDGs), specifically SDG 3 (Good Health and Well-Being) and SDG 8 (Decent Work and Economic Growth), emphasize the importance of promoting employees' physical and mental well-being in the workplace (United Nations, 2015). A systematic literature review by Sohal and Sharma (2025) examined workplace mental health among Indian employees and proposed a future research agenda. Using the Scientific Procedures and Rationale for Systematic Literature Reviews protocol, the review analyzed 38 high-quality studies published between 2004 and 2024. Performance analysis and content analysis were conducted using the TCCM (theory, context, characteristics, and methods) framework. Their findings suggest that stress, anxiety, and depression are the most commonly examined indicators of workplace mental health. Overall, the study highlights the importance of context-specific and theory-driven research to improve workplace mental health and employees' well-being in emerging economies.

Singh and Jha (2018) in their research focus on developing a comprehensive organizational health framework through a mixed-methods study of 441 professionals within Indian R&D labs. Their findings show that empowering employees and reducing occupational stress are critical drivers that enhance well-being, which in turn promotes a healthy and sustainable organizational culture.

Jain and Khurana (2017) analyze the impact of training and development practices on overall employees' engagement and its various dimensions among 450 respondents in India. They conclude that while training significantly improves job satisfaction, organizational commitment, and intention to stay, it does not have a measurable effect on the emotional connection of employees. Jain and Khurana (2017) in their research, focus on the relationship between skill-building initiatives and specific engagement factors such as pride and advocacy within the Indian workforce. Their findings suggest that structured training programs are essential for enhancing most engagement metrics, though organizations may need different strategies to foster a deeper emotional bond with their staff.

Despite these contributions, many Indian organizations lack structured HRM frameworks that address mental and financial well-being separately and lack an integrated HRM framework combining leadership, training, and compensation practices. This article addresses that gap by proposing conceptual insights on how strategic HRM can enhance both mental and financial well-being of IT companies in Delhi NCR, India.

The Delhi NCR represents one of India's largest tech clusters, hosting over 3,500 registered IT and startup entities and commanding a market capitalization of roughly \$88 billion among its listed tech firms (IBEF, 2025; Kapoor, 2026). This region is unique for its high concentration of both Global Capability Centers (GCCs) and domestic software firms, creating a hyper-competitive environment characterized by a "global delivery model" that necessitates 24/7 operations. Nationally, as of 2025, the industry's workforce has expanded to roughly 5.8 million professionals, driven by the rapid growth of over 1,700 GCCs, which now account for a significant share of new high-skill tech roles in domains like AI and cloud engineering (Taggd, 2026; NASSCOM, 2025).

The purpose of this article is to identify and explore the SHRM strategies, specifically leadership support, targeted training, and compensation, adopted by IT companies in the Delhi NCR region to enhance the mental and financial well-being of their employees.

Drawing on qualitative empirical data collected through interviews with HR managers of IT companies in Delhi NCR, India, the study seeks to propose conceptual insights and practical recommendations for developing a context-specific SHRM framework that aligns employees' well-being with organizational effectiveness.

Literature Review

A systematic review of 102 peer-reviewed articles by Pandey, Maheshwari, and Malik (2025) identifies leadership, workload, and HRM practices as the primary factors influencing employees' well-being. Using an integrated framework of antecedents, mediators, moderators, and outcomes, the authors demonstrate that employees' well-being is largely shaped by job-related and organizational conditions, particularly leadership style, workload intensity, and HRM systems. Their findings show that effective HRM practices, such as fair compensation, supportive supervision, and developmental opportunities, function as organizational resources that buffer the negative effects of high job demands.

In the context of the IT sector in Delhi NCR, this suggests that mental well-being is strengthened through leadership support and targeted training, while financial well-being is reinforced through strategic compensation practices. Together, these HRM dimensions create a comprehensive buffer that protects IT professionals from the sector's inherently high-pressure work environment.

Iqbal (2019) examined the relationship between strategic human resource management (SHRM) approaches and organizational performance through the lens of creative climate. The study employed a three-stage systematic literature review process: first, exploring key constructs related to SHRM, creative climate, and performance; second, analyzing the relationships among these constructs reported in prior research; and third, identifying gaps and proposing directions for future inquiry. The findings indicate that both universal and contingency SHRM approaches enhance organizational performance across financial, human resource, and customer retention dimensions. Importantly, the review highlights creative climate as a critical mediating mechanism through which SHRM practices influence performance outcomes. However, existing studies have not sufficiently examined this mediating role empirically, limiting causal explanations. Consequently, Iqbal (2019) suggests that future research should explicitly test how SHRM approaches foster a creative climate that, in turn, drives organizational performance. Overall, the study provides theoretical and practical insights into aligning SHRM policies with creative organizational environments to achieve sustainable competitive advantage, underscoring the importance of embedding creativity-supportive practices within SHRM systems.

Occupational burnout continues to be an important concern in today's workplaces. Bagasi, Al Harbi, Alabassi et al. (2025) conducted a systematic review in which they assessed the effectiveness of mental health initiatives at workplaces in reducing occupational burnout. Occupational burnout continues to be an important concern in today's workplaces. Using the Preferred Reporting Items for Systematic Reviews and Meta-Analyses protocol, they assessed 14 studies (nine Randomized Controlled Trials and five quasi-experimental; $n = 3,572$) in healthcare ($n = 6$), corporate ($n = 5$), and

public institutions ($n = 3$). They found that participatory interventions at the organizational level resulted in burnout reduction for at least 12 months. Electronic interventions provided short-term benefits but with a high attrition rate (42%), and workshops provided no long-term outcomes during the past three months. These results suggest that HR administrators must make use of interventions on multiple levels that can target both individual and organizational-level factors at workplaces.

Mental illness is a growing reason why employees take long-term leave from work, emphasizing the need for effective workplace interventions. Milligan-Saville, Tan, MCrim, et al. (2017) conducted a cluster randomized controlled trial providing empirical evidence that targeted leadership training can directly influence employees' mental health outcomes. Mental illness is a growing reason why employees take long-term leave from work, emphasizing the need for effective workplace interventions. Their study of a high-pressure fire and rescue service demonstrated that even a brief, four-hour "RESPECT" mental health training for managers could significantly reduce work-related absences. By improving managers' ability to support their teams, the intervention acted as a critical resource that buffered the psychological demands of the job.

These findings are highly transferable to the IT companies of Delhi NCR, where high-pressure project deadlines create a similarly demanding environment. By integrating such mental health training into a Strategic Human Resource Management (SHRM) framework, firms can move beyond generic wellness programs toward a model of leadership support. When managers in the Delhi tech hub are equipped to promote psychological safety, they do more than just reduce sick leave; they actively sustain the mental and financial well-being of their workforce by preventing the long-term career interruptions and income loss associated with psychiatric disability.

Employees' financial well-being has emerged as an important determinant of workplace outcomes. Bashir, Qureshi, and Ilyas (2024) explored the relationship between employees' financial well-being and productivity, specifically examining how employees' happiness serves as a mediator, and gender acts as a moderator in this relationship. Utilizing primary data collected from banking employees, the authors tested a moderated mediation model through partial least squares structural equation modeling. Their findings reveal that financial well-being positively influences employees' productivity. This effect is partially driven by employees' happiness, as employees who are financially secure tend to be more satisfied, engaged, and ultimately more productive in their roles.

These results are highly relevant for SHRM in IT companies in the Delhi NCR region, where competitive workloads and performance pressures prevail. By integrating financial well-being initiatives such as strategic compensation, performance-linked incentives, and financial counselling into SHRM systems, IT organizations can enhance employees' happiness and, in turn, sustain productivity and retention rates in a demanding market.

Lusardi and Streeter (2023) examined financial literacy in the United States using data from the 2021 National Financial Capability Study, conducted during a period of rising inflation and the COVID-19 pandemic. Their findings reveal persistently low levels of financial literacy, particularly among young people, women, less educated individuals, and those not employed. And their study highlights vulnerable subgroups and underscores the need for targeted financial education initiatives. These findings suggest that organizations and policymakers should implement tailored financial literacy programs to enhance employees' financial well-being and long-term economic stability. By integrating financial literacy as a form of targeted training within a Strategic HRM framework, organizations can empower their staff to transform their earnings into actual financial well-being.

Employees' financial wellness programs (EFWP) are a benefit innovation that promises to improve employees' financial problems while simultaneously offering benefits to employers. Miller, Despard, Grinstein-Weiss, & Covington (2019) utilized a mixed-methods study to investigate employer motives and experiences regarding the implementation of EFWPs. Their research highlights that while EFWPs are innovative benefits designed to resolve employees' financial distress while providing organizational returns, their success is often contingent upon "organizational champions" who actively promote them. Crucially, the authors found that the effectiveness of these programs can be severely limited by poor compensation and adverse work conditions, particularly among lower-wage earners. Consequently, the study suggests that EFWPs should be complemented by further research to assess their long-term impact on specific financial outcomes and work performance.

For IT companies in Delhi NCR, this underscores that financial programs must be paired with strategic compensation to be truly impactful. By integrating supportive leadership with robust financial benefits, firms can move beyond fragmented perks toward a holistic SHRM strategy that sustains both employees' performance and long-term well-being.

Rodrigues, Junça-Silva, Lopes, and Espirito-Santo (2024) conducted a quantitative study examining the impact of perceived leadership effectiveness on employees' well-being through emotional mediation, drawing on affective events theory. Based on data from 255 working adults, the study shows that effective leadership increases positive emotional experiences, which in turn enhances employees' mental well-being by reducing stress and improving emotional balance. From an SHRM perspective, leadership capability represents a strategic HR resource that supports not only psychological health but also financial well-being by sustaining performance, career stability, and reward outcomes.

Thus, embedding leadership development within SHRM systems is essential for promoting integrated mental and financial well-being, particularly in high-pressure IT environments such as those in the Delhi NCR region.

Compensation remains a central human resource practice influencing employees' attitudes and performance. A study by Singhvi, Dhage, and Sharma (2018) examined the impact of compensation on employees' motivation, job satisfaction, and performance. Compensation remains a central human resource practice influencing employees' attitudes and performance. Using correlation and regression analyses, the findings demonstrate a significant positive relationship between compensation practices and employees' outcomes. Fair pay, transparent compensation procedures, supportive supervision, and performance-based rewards were found to enhance employees' motivation and willingness to perform. The results suggest that compensation systems perceived as equitable and aligned with employees' expectations contribute to higher satisfaction and performance levels. The study implies that organizations should adopt strategic and customized compensation approaches, integrating pay structures with broader HR practices to maximize employees' motivation and organizational performance.

The reviewed literature demonstrates that employees' mental and financial well-being are strategic outcomes of effective SHRM rather than peripheral welfare activities. Prior research consistently highlights leadership support, fair and transparent compensation, and targeted training as core mechanisms influencing psychological safety, financial security, engagement, and performance, particularly in high-pressure IT environments. While leadership reduces emotional strain, compensation strengthens subjective financial stability, and financial literacy and resilience training

enable employees to sustain performance under stress. However, existing studies often treat mental and financial well-being separately, lack integrated SHRM frameworks for Indian IT contexts, and emphasize fragmented individual-level interventions. Addressing these gaps, the present study positions SHRM as an integrative system linking leadership, compensation, and training to enhance both mental and financial well-being in Delhi NCR IT companies. Building on this foundation, the next chapter outlines the qualitative methodology used to empirically examine these SHRM practices and generate context-specific evidence for the proposed framework.

Methodology

This study adopts a qualitative empirical research design based on interviews with thirty-four HR managers working in IT companies located in the Delhi NCR region of India. A qualitative approach was selected to obtain insights into current organizational practices, managerial perceptions, and contextual challenges related to employees' mental and financial well-being.

Research Question: How do SHRM practices, namely leadership support, targeted training, and compensation, influence the mental and financial well-being of IT employees in the Delhi NCR region?

Data Collection Methods: Primary data were collected through online interviews conducted via WhatsApp calls to ensure accessibility and convenience for HR managers working in geographically dispersed IT companies across the Delhi NCR region. An interview protocol was developed to guide the conversations and maintain consistency across participants. The protocol consisted of 15 questions covering three key areas:

- 1) leadership support related to psychological safety and work-life balance,
- 2) targeted training for mental resilience and financial literacy, and
- 3) compensation practices aimed at mitigating financial stress.

Each interview lasted approximately 15-20 minutes. This qualitative approach allowed for a focused yet deep exploration of how SHRM strategies directly address emotional exhaustion and salary satisfaction within the Delhi NCR IT sector.

Data Analysis Methods: Participation was voluntary, and confidentiality was ensured. All interview data were analyzed using thematic analysis following the approach of Braun and Clarke (2006). During the interviews, the researcher prepared detailed field notes capturing participants' key responses and examples. The researcher familiarized herself with the data by repeatedly reviewing these notes. Initial codes were then generated, focusing on leadership support, targeted training, and compensation practices related to employees' mental and financial well-being. These codes were grouped into categories to identify emerging themes. The themes were reviewed and refined to ensure consistency with the research question and the aim of the study. Each theme was clearly defined and named. Finally, the themes were interpreted within the SHRM framework to explain how SHRM practices influence employees' mental and financial well-being in the Delhi NCR IT sector.

Research Sample: The study sample consists of thirty-four HR managers working in IT companies located in the Delhi NCR region of India. Participants were selected using a purposive sampling technique (see Table 1). Participants were selected based on four specific inclusion criteria to ensure data relevance:

- 1) currently holding a managerial role in Human Resources,
- 2) employment within the IT sector,

- 3) physical office location within the Delhi NCR region (Delhi, Noida, Gurugram, or Faridabad),
- 4) active involvement in implementing well-being or compensation policies.

These criteria ensured that the sample possessed the necessary professional expertise and contextual knowledge to provide meaningful insights into regional SHRM practices.

Table 1

Demographic and Professional Profile of Managers (N=34)

Category	Sub-Category	Number of Managers (n)	Percentage (%)
Work Schedule	Regular day shift	14	41.18%
	Night shift	6	17.65%
	Rotational shift	9	26.47%
	Flexible hours	5	14.70%
Monthly Income	Less than ₹15,000 (€143)	4	11.76%
	₹15,001–₹30,000 (€143–€286)	6	17.65%
	₹30,001–₹50,000 (€286–€476)	11	32.35%
	₹50,001–₹75,000 (€476–€714)	8	23.53%
	Above ₹75,000 (€714)	5	14.70%
	Prefer not to disclose	0	0.00%
Years of Work Experience	Less than 1 year	4	11.76%
	1–5 years	15	44.12%
	6–10 years	8	23.53%
	More than 10 years	7	20.59%
Area of Work	Delhi	8	23.53%
	Noida	12	35.29%
	Gurugram	10	29.41%
	Faridabad	4	11.76%

As shown in Table 1, the study involved a sample of managers with varying professional backgrounds and work environments. In terms of work scheduling, the majority of participants followed a regular day shift (41.18%), followed by those on rotational shifts (26.47%) and night shifts 17.65%. The economic profile of the participants indicates that a significant part (32.35%) falls within the ₹30,001– ₹50,000 (€286 – €476) monthly income, with over half of the total sample (55.87%) earning between ₹30,001 and ₹75,000 (€286 – €714) per month. Professional experience was predominantly concentrated in the early-to-mid career stage; 44.12% of managers reported 1–5 years of experience, while 44.12% possessed more than 6 years of experience. Geographically, the sample was distributed across the National Capital Region (NCR), with the highest concentration of participants located in Noida (35.29%) and Gurugram (29.41%), and the remainder from Delhi and Faridabad.

Findings and Discussion

The qualitative data were obtained from interviews with thirty-four HR managers. These data were analyzed using thematic analysis to systematically identify patterns related to employees' mental and financial well-being and the role of SHRM practices in IT companies in Delhi NCR. Three major themes emerged, summarized in Table 2 by their associated keywords and the frequency of their mention across the 34 interviews.

Table 2

Thematic Analysis of HR Manager Interviews (N=34)

Theme	Sub-themes	Number of Interviews Reflecting Sub-theme
Theme 1: Leadership Support	Supervisor buffer	32
	Mental fatigue/Stress management	29
	Psychological safety	26
	Global delivery load	24
	Empathetic leadership	18
Theme 2: Compensation	Cost-of-living pressure	31
	Subjective financial well-being	27
	Savings gap	23
	Middle-income stress	20
Theme 3: Targeted Training	Financial literacy	28
	Resilience building	25
	Tax/investment knowledge	22
	SHRM policy gaps	19

Note: Frequencies represent the total number of participants who discussed each specific sub-theme. Total counts exceed the sample size (n=34) as participants frequently addressed multiple sub-themes within a single interview.

Theme 1: Leadership Support: Leadership-related issues were the most frequently reported area of concern. As shown in Table 2, the high frequency of sub-themes such as *Supervisor buffer* (32 managers) and *Mental fatigue* (29 managers) highlights significant gaps in how leadership supports employees' well-being. Although performance targets are clearly defined, managers reported that emotional support systems remain weak. The "global delivery model" often extends working hours, leading to widespread mental exhaustion. One HR manager from Noida stated, "Supervisors are expected to manage output, but many are not trained to manage people's mental stress."

In practice, regular shifts exist mainly on paper, as employees remain connected via digital applications after office hours. Another manager explained, "The shift ends at 6 PM on paper, but the mental load continues until midnight because of the global delivery model." This constant connectivity prevents employees from detaching mentally from work. Managers emphasized that supervisors should act as buffers between organizational pressure and employees; however, this occurs inconsistently. When leadership focuses strictly on deadlines, employees carry pressure home. This aligns with Rodrigues et al. (2024), who found that effective leadership helps regulate team emotions. Conversely, limited empathetic leadership and weak psychological safety restrict open communication about stress.

Theme 2: Compensation: Compensation issues were a near-universal concern. As shown in Table 2, keywords such as *Cost-of-living pressure* (31 managers) and *Subjective financial well-being* (27 managers) dominate this theme. These findings reflect that current pay structures are not translating into perceived financial security for employees in the Delhi NCR. Despite competitive salaries, employees feel financially strained due to high housing and transportation costs. One HR manager from Gurugram stated, "Salary revisions look attractive on paper, but employees still worry about monthly survival and savings."

Managers acknowledged that compensation systems are heavily performance-oriented but fail to address long-term financial stability. The recurring *Savings gap* (23 managers) shows that employees struggle to build buffers for emergencies, which directly increases psychological stress. This theme exposes a significant SHRM gap where compensation policies focus on market pay levels but overlook essential supports like financial counseling or benefits optimization tailored to the high cost of living in the Delhi NCR. In this region, the escalating costs of housing, transportation, and daily essentials place substantial financial pressure on employees, undermining their long-term stability.

Theme 3: Targeted Training: Managers also identified the absence of structured training as a major hurdle to well-being. As shown in Table 2, *Financial literacy* (28 managers) and *Resilience building* (25 managers) emerged as critical needs because employees currently lack these competencies. Managers consistently reported that employees enter the workforce technically prepared but poorly equipped to manage income, taxes, and work-related stress. One participant from Faridabad observed, "Our younger staff are technically brilliant but financially lost... which adds background stress to their daily work."

Although resilience training is mentioned, it is largely reactive. As one manager admitted, "Training happens after people show signs of stress, not before." Furthermore, the identification of *SHRM policy gaps* (19 managers) indicates that well-being-oriented training is not yet embedded within a strategic framework. Overall, this theme reveals that organizations prioritize technical upskilling while neglecting the psychological and financial resilience required to sustain high performance in a competitive environment.

The findings indicate that *Leadership Support* is the most widely identified SHRM strategy, with sub-themes indicated 129 times (75.88%). HR managers emphasized that supportive leadership plays a critical role in managing work-related stress, providing emotional reassurance, and creating a psychologically safe work environment. Leadership practices such as open communication, flexibility in work arrangements, and empathetic supervision were perceived as essential in mitigating mental fatigue, particularly in high-pressure IT work settings where the "global delivery model" necessitates constant availability.

The second most frequently discussed strategy was *Compensation*, found 101 times (74.26%). Participants highlighted the importance of fair pay structures, performance-based incentives, and benefits in addressing employees' financial stress, especially given the high cost of living in the Delhi NCR region. However, several managers acknowledged that while compensation adjustments help reduce immediate financial anxiety, they are often constrained by organizational budgets and are not always integrated with broader, long-term well-being initiatives.

Targeted Training programs were also highly prevalent in the data, discussed 94 times (69.11%) by the HR Managers. These training initiatives primarily included stress management workshops, mental health awareness sessions, and financial literacy programs. HR managers noted that although such programs have a positive impact on employees' mental resilience and financial decision-making, they are often implemented on an ad hoc basis rather than as part of a structured SHRM framework.

The findings suggest that while HR managers recognize the importance of multiple SHRM strategies, the emphasis remains largely on leadership-driven support, with comparatively less focus on systematic training and integrated compensation planning. This uneven adoption reflects a fragmented approach to employees' well-being within IT companies, highlighting the absence of a cohesive SHRM framework. Consistent with existing literature, the results reinforce the argument

that a strategic integration of leadership support, financial literacy training, and equitable compensation is essential for sustaining employees' performance and well-being. The Delhi NCR context further intensifies this need, as the region's high-pressure work environment and elevated cost of living amplify financial stress, which in turn adversely affects mental well-being. This finding aligns with prior studies linking financial well-being to productivity and psychological outcomes (Bashir et al., 2024). Moreover, the limited presence of formal mental health policies observed in this study echoes gaps identified in Indian workplace research (Sohal & Sharma, 2025), underscoring the urgent need for context-specific, structured, and proactive SHRM frameworks that simultaneously address employees' mental and financial well-being.

Conclusion

This study contributes to the strategic HRM literature by empirically demonstrating how an integrated SHRM framework can enhance employees' mental and financial well-being in IT companies of Delhi NCR, India. The findings from thirty-four HR managers reveal that while well-being is recognized as a strategic asset, the organizational response remains largely reactive. The research highlights critical gaps in existing practices and emphasizes the strategic role of leadership support, targeted training, and compensation systems.

The findings reveal that employees' financial stress and mental health challenges are widespread and interconnected, yet organizational responses remain largely informal and fragmented. Leadership support emerged as a crucial factor in creating psychological safety, while financial literacy training and fair compensation were identified as essential mechanisms for reducing stress and enhancing well-being.

The primary strategy adopted by HR managers is *Leadership Support*, followed by *Compensation* and *Targeted Training*.

The research findings indicate that the SHRM framework must be created by applying a proactive, leadership-driven, and strategically aligned approach to employee well-being. By embedding mental and financial well-being initiatives into core HR strategies, organizations can improve employee engagement, productivity, and long-term sustainability.

Research Limitations

Despite the insights gained from the 34 HR managers, this study is subject to several limitations. First, the study focuses exclusively on HR managers in IT companies located in the Delhi NCR region; therefore, the findings may not fully represent the experiences of employees and organizations in other geographical areas of India. Second, the perspectives of employees were not directly captured, and the analysis relies on managerial perceptions, which may not entirely reflect employees' experiences of mental and financial well-being. Additionally, the relatively small sample size restricts the ability to draw broader conclusions across the Indian IT industry.

References

- Bagasi, A., Al Harbi, K. E., Alabassi, S. M., et al. (2025). Effectiveness of workplace mental health programs in reducing occupational burnout: A systematic review. *Cureus*, 17(7), e88715. <https://doi.org/10.7759/cureus.88715>
- Bashir, I., Qureshi, I. H., & Ilyas, Z. (2024). How does employee financial well-being influence employee productivity: a moderated mediating examination. *International Journal of Social Economics*, 51(10), 1226–1246. <https://doi.org/10.1108/IJSE-09-2023-0676>
- Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology*, 3(2), 77–101. <https://doi.org/10.1191/1478088706qp063oa>
- Guest, D. E. (2017). Human resource management and employee well-being: Towards a new analytic framework. *Human Resource Management Journal*, 27(1), 22–38. <https://doi.org/10.1111/1748-8583.12139>
- IBEF. (2025). Indian IT and BPM industry analysis: Sectoral growth and regional hubs. India Brand Equity Foundation. Retrieved from: <https://www.ibef.org/industry/indian-it-and-ites-industry-analysis-presentation>
- Iqbal, A. (2019). The strategic human resource management approaches and organisational performance. *Journal of Advances in Management Research*, 16(2), 181–193. <https://doi.org/10.1108/JAMR-11-2017-0104>
- Jain, S., & Khurana, N. (2017). Enhancing employee engagement through training and development. *Asian Journal of Management*, 8(1), 1–6. <https://doi.org/10.5958/2321-5763.2017.00001.4>
- Kapoor, R. (2026). Delhi NCR dominates India's tech IPO boom, leads market cap. *Whalesbook News*. Retrieved from: <https://www.whalesbook.com/news/English/startupsvc/Delhi-NCR-Dominates-Indias-Tech-IPO-Boom-Leads-Market-Cap/696ed3c6ad039ca929a674e2>
- Lusardi, A., & Streeter, J. L. (2023). Financial literacy and financial well-being: Evidence from the US. *Journal of Financial Literacy and Wellbeing*, 1(2), 169–198. <https://doi.org/10.1017/flw.2023.13>
- Miller, E. G., Despard, M., Grinstein-Weiss, M., & Covington, M. (2019). Financial wellness programs in the workplace: Employer motivations and experiences. *Journal of Workplace Behavioral Health*, 34(4), 241–264. <https://doi.org/10.1080/15555240.2019.1594851>
- Milligan-Saville, J. S., Tan, L., MCrim, A. G. et al. (2017). Workplace mental health training for managers and its effect on sick leave in employees: a cluster randomised controlled trial. *The Lancet Psychiatry*, 4(11), 850–858. [https://doi.org/10.1016/S2215-0366\(17\)30372-3](https://doi.org/10.1016/S2215-0366(17)30372-3)
- NASSCOM. (2025). Technology Sector in India: Strategic Review - 2025. *National Association of Software and Service Companies*. Retrieved from: <https://nasscom.in/knowledge-center/publications/technology-sector-india-strategic-review-2025>
- Pandey, A., Maheshwari, M., & Malik, N. (2025). A systematic literature review on employee well-being: Mapping multi-level antecedents, moderators, mediators, and future research agenda. *Acta Psychologica*, 258, 105080. <https://doi.org/10.1016/j.actpsy.2025.105080>
- Rathore, S., & Ahuja, V. (2015). A Study of Role Stress among the IT Professionals in India: Examining the Impact of Demographic Factors. *International Journal of Human Capital and Information Technology Professionals*, 6(2), 1–13. <https://doi.org/10.4018/IJHCITP.2015040101>
- Rodrigues, R., Junça-Silva, A., Lopes, C., & Espirito-Santo, D. (2024). Exploring leadership effectiveness and its impact on employee well-being through emotional mediation. *Evidence-based HRM: A Global Forum for Empirical Scholarship*, 13(4), 589–605. <https://doi.org/10.1108/EBHRM-05-2024-0145>
- Singh, A., & Jha, S. (2018). Exploring employee well-being as underlying mechanism in organizational health: Indian R&D. *South Asian Journal of Business Studies*, 7(3), 287–311. <https://doi.org/10.1108/SAJBS-09-2017-0107>
- Singhvi, A. S., Dhage, N. N., & Sharma, P. P. (2018). Compensation and its impact on motivation employee's satisfaction and employee's performance. *International Academic Journal of Organizational Behavior and Human Resource Management*, 5(2), 1–43. <https://doi.org/10.9756/IAJOBHRM/V5I2/1810012>
- Sohal, A., & Sharma, D. (2025). Exploring workplace mental health among Indian employees: A systematic literature review and future research agenda. *Social Sciences & Humanities Open*, 11, 101290. <https://doi.org/10.1016/j.ssaho.2025.101290>
- Taggd. (2026). India Decoding Jobs 2026 Report. *Taggd Industry Reports*. Retrieved from: <https://taggd.in/industry-reports/idi/india-decoding-jobs-2026/>
- United Nations. (2015). Transforming our world: The 2030 agenda for sustainable development. *United Nations*. Retrieved from: <https://sdgs.un.org/2030agenda>

EXPLORING THE DRIVERS OF CUSTOMER LIFETIME VALUE IN BANKING SECTOR, SRI LANKA – EVIDENCE FROM A PILOT STUDY

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Abstract

Customer Lifetime Value (CLV) has emerged as a critical strategic metric for banks seeking sustainable competitiveness in increasingly digital and customer-centric markets. While extensive research has examined CLV drivers in developed economies, empirical evidence from emerging markets particularly within the Sri Lankan banking sector remains limited. This pilot study aims to explore the preliminary relationships between customer-related, firm-related, and market-related factors and Customer Lifetime Value (CLV) in the context of digital banking in Sri Lanka. Drawing on relationship marketing theory and customer equity perspectives, the study examines customer satisfaction, engagement, trust, perceived risk, perceived value, service quality, perceived fairness, brand image and reputation, customer service communication, and digital adoption as key determinants of CLV. Data were collected through a structured online questionnaire administered to a convenience sample of 50 Sri Lankan bank customers who actively use digital banking services. Descriptive statistics, reliability analysis using Cronbach's alpha, and correlation analysis were employed to assess data quality and explore initial associations among the constructs. The findings reveal strong positive correlations between CLV and all customer-related, firm-related, and market-related factors, with digital adoption, service quality, trust, and customer service communication showing particularly strong relationships. Reliability results indicate acceptable to excellent internal consistency across all constructs, supporting the suitability of the measurement scales for further analysis. Although exploratory in nature, the pilot study provides valuable preliminary insights, validates the proposed conceptual framework, and offers empirical justification for conducting a full-scale study using Structural Equation Modelling (SEM). The findings also highlight the growing importance of digital engagement and relational factors in enhancing customer lifetime value within Sri Lanka's banking sector.

Keywords: Customer Lifetime Value (CLV), Digital Banking, Emerging Markets, Service Quality, Trust

Introduction

Background of the Study

Customer Lifetime Value (CLV) is commonly known as one of the core metrics of customer relationship management and marketing, which is the total net value that a company will gain in its relationship with a customer throughout time (Galdolage & Rasanjalee, 2022). Unlike short-term performance metrics like sales volume or market share, CLV provides a prospective view that helps companies strike a balance between acquisition and retention programs, use resources effectively and target valuable customer segments. It has its importance because it determines the long-term profitability and sustainability, especially in the sectors where customer retention plays a central role (Vimalachandiran, 2023). In the banking sector, global CLV has found widespread application in the banking sector as a service where relationships among the customers tend to be long-term, and multi-faceted. Empirical research proves that increased CLV is closely linked to cross-selling possibilities, decreased churn, and increased profitability (Ali & Shabn, 2024). CLV models are used by major banks across the globe to divide customers, create recompense programs, and educate on digital transformation plans (Gunathilaka & Rupasingha, 2022). However, meanings of the determinants of CLV often differ among settings and are influenced by the cultural, economic and technological contexts, hence the need to localize studies. The banking sphere in Sri Lanka represents a central part of the national economic progress and at the same time faces the growing threats such as hard competition, rising customer demands, and rapid digitalization. The adoption of mobile banking, fintech disruption, and macro-economic forces (inflation and currency depreciation) are some of the factors that are transforming consumer behavior (Central Bank of Sri Lanka, 2024). Despite these developments, Sri Lankan banks continue to emphasize short term acquisition campaigns, with limited attention to long term customer value optimization (Jayakody et al., n.d.). This underlines a critical research gap, as empirical evidence on the determinants of CLV within the Sri Lankan banking industry remains sparse.

Problem Statement

Customer Lifetime Value (CLV) has become a central measure in customer relationship management and marketing, because of an ever more competitive and dynamic marketplace. The notion of CLV is the overall net value based on the totality of the relationship of a bank with a customer, making it an important measure of sustainable growth in revenues and in the distribution of resources (Kumar & Reinartz, 2016). Although the literature on CLV determinants is substantial and is predominantly set in the context of developed economies, there is still a lack of literature that contextualizes the determinants in the context of emerging markets like Sri Lanka where specific socio-cultural, economic and technological forces can significantly affect customer behavior and policies of the firms. Although current literature has elucidated the contribution of customer satisfaction, engagement, and firm antecedent like service quality and personalization to the development of CLV (Gupta & Zeithaml, 2006), the generalizability of these findings to the Sri Lankan context is limited (Rust et al., 2004). This gap is particularly relevant in the Sri Lankan banking sector, which is undergoing rapid digital transformation, marked by increased mobile and internet banking adoption, fintech integrations, and evolving customer expectations (Central Bank of Sri Lanka, 2024). Further, most of the cultural aspects of Sri Lanka such as collectivist orientations and regional differences have not been explored in the CLV literature, thus limiting the use of the prevailing models in Sri Lankan companies. This means that Sri Lankan organizations often do not have a subtle, empirically

proven model with which they can be able to determine, quantify, and utilize the multifactorial aspects of influencing CLV in their operational context. Such inadequacy prevents strategic marketing efforts, a lack of which leads to the inefficient utilization of the resources of customer acquisition and retention and, eventually, hinders the profitability in the long term. Thus, a strong demand to have a broadly contextualized model that combines the customer and firm determinants of CLV that is specific to the banking industry in Sri Lanka is evident.

Research Objectives

The primary objective of this case study is to explore the preliminary relationships between customer-related, firm-related, and market-related factors and Customer Lifetime Value (CLV) in the Sri Lankan banking sector using pilot data,

- 1) To examine the preliminary influence of customer-related factors including customer satisfaction, customer engagement, trust, perceived risk, and perceived value on Customer Lifetime Value (CLV) in the Sri Lankan banking sector.
- 2) To assess the initial relationship between firm-related factors, specifically service quality and perceived fairness, and Customer Lifetime Value (CLV).
- 3) To investigate the association between market-related factors, namely brand image and reputation, customer service communication, and digital adoption, and Customer Lifetime Value (CLV).
- 4) To evaluate the reliability and internal consistency of the measurement scales used to capture customer, firm, and market-related constructs in the Sri Lankan banking context.

Research Questions

To guide the study and achieve the stated objectives, the following research questions will be addressed.

- What are the preliminary relationships between customer-related, firm-related, and market-related factors and Customer Lifetime Value (CLV) in the Sri Lankan banking sector?
- How do customer-related factors customer satisfaction, customer engagement, trust, perceived risk, and perceived value relate to Customer Lifetime Value (CLV) in the Sri Lankan banking sector?
- What is the relationship between firm-related factors, namely service quality and perceived fairness, and Customer Lifetime Value (CLV)?
- How do market-related factors including brand image and reputation, customer service communication, and digital adoption relate to Customer Lifetime Value (CLV) in the Sri Lankan banking sector?
- Do the measurement scales used in this study demonstrate acceptable reliability for examining CLV-related constructs in the Sri Lankan banking context?

Literature Review

Global Perspectives on CLV Determinants

Customer Related Drivers

The most recent research in the field of customer lifetime value (CLV) effectively indicates that the behavioral and psychological factors that relate to customers are the strongest predictors of long term value. The switchover costs continue to be a critical behavioral motivator of competitive loyalty

(Ganaie & Bhat, 2021). The authors argue that switching costs should act as a detente that discourages customers from changing to other providers and creates continuity in relationships and stabilization of long term retention. In their review, they found that perceived switching costs increased the loyalty intentions and customer lifetime value by reducing churn and strengthening the customer firm relationship. Perceived value can be described as a key contributor to loyalty in the financial services sector, especially in cases where loyalty programs are extremely expensive to maintain in sustainability (Carlos et al., 2013). As they show their results, their empirical study shows that the loyalty intentions can be strengthened when the customers get a feeling of high value in the services provided by a firm. According to the findings, the perceived value determines satisfaction and, consequently, loyalty, which means that the value based assessment is more decisive in the maintenance of the long term relationships with customers than the transactional incentives. Loyalty and long term financial performance are essential to be improved by means of CLV awareness and practices that are customer centric.

Research by (Ali & Shabn, 2024) indicates that perceptions of customers on the alignment of products, their re purchase ability, loyalty incentives, and quality of services have a major impact on CLV. Their mixed method study reveals that when marketing and services activities are combined with CLV driven strategies, customer retention, repeat engagement and finally, financial performance of the organization in service industries like banking will be enhanced. The issue of customer loyalty is a critical element of customer value in the long term. The recent evidence in the hospitality industry suggests that the organizational image and the customer satisfaction have a strong impact on the results of loyalty. As an example, the service in terms of housekeeping, reception, food and beverage, and pricing have a positive correlation with the intention of customers to be involved further with the firm, and the concept of loyalty is multifaceted as a determinant of sustained value (Kandampully, 2000). Digital financial innovations are increasingly impactful in the context of developing customer loyalty in the banking sphere. According to the empirical studies of Zenith Bank in Nigeria, it is found that mobile banking significantly increases customer satisfaction, online banking improves the quality of services, and the use of digital payment systems leads directly to customer retention. All these technological interventions taken together indicate that the implementation and the optimization of digital banking tools is critical to maintaining a customer base and long term value (Abdullahi & Mohammed, 2025). Online interaction with customers has a great influence on CLV and loyalty. The Indian telecom industry evidence that digitally engaged customers have better CLV and are more loyal than partially and non engaged customers. The paper notes that customer interaction, retention and long term profitability are improved with the use of digital, and it thus indicates the strategic significance of digital engagement in customer value management (Sood & Sharma, 2016).

Customer commitment and trust in digital banking are the key to loyalty and lifetime value. Experience in New Zealand has shown that security, privacy and emotional attachment are good predictors of commitment and that service quality and user experience indirectly predict commitment through trust. Remarkably, perceived risk is not an unconditional mediator of such relationships, therefore, hinting at contextual boundary conditions of trust based models in full-fledged digital banking contexts (Dias & Wisker, 2025). Customer loyalty is a critical aspect of a bank to maintain a competitive advantage because loyal customers have a high level of commitment and engagement with the providers of financial services. According to recent systematic evidence involving 44 studies involving emerging and developing markets, customer satisfaction, trust, and service quality, perceived value, image, commitment, and experience have been found to play a

significant role in customer loyalty in the banking industry. In addition, the study indicates a changing trend in favor of electronic and fintech based banking services, stating that banks should redefine their services to retain and attract customer loyalty in the digital age (Kim et al., 2024).

Firm Level Drivers

The literature of the world supports the significant impact of organizational competencies and service strategies on the development of CLV. Digital banking personalization using AI allows organizations to organize their services according to customer behavior, preferences, and financial trends, thus improving customer engagement, satisfaction, retention, and lifetime value. Machine learning, recommender systems, and sentiment analysis are some of the techniques that help in context sensitive experiences. Nevertheless, these advantages are followed by such issues as uncertainty in regulation, data privacy, and adaption to cultural backgrounds, especially in the new markets where AI human hybrids are often used (Ashrafuzzaman et al., 2025). The other research explores how customers' perceptions of fairness interact with customer loyalty, especially in relation to an increase in prices. The results reveal that the effect of loyalty has a positive impact on the perception of fairness in case the price increase is small, but the impact decreases with larger increase. Adequate justifications of price increases enhance fairness perception of low increase, but any justification can be used to enhance perceived fairness of high increase. The research points out that distributive as well as procedural fairness have effects on post purchase loyalty that depend on the extent and the rationale of price change providing a working solution to retailers (Martin et al., 2009). The article by (Alqararah & Shehadeh, 2025) evaluates the improvement of banking performance in Jordan commercial banks due to digital transformation potentials, such as technological adaptation, strategic positioning, and competitive positioning. Results of the survey conducted on 129 bank managers of 16 banks indicate that all three capabilities have a positive and significant impact on the perceived performance, which accounts for 68% of the variance. The results indicate the value of an integrative digital transformation approach to enhance efficiency, competition and business alignment. Additional research, which includes the use of organizational culture, the regulatory factors and objective performance metrics, are also suggested by the study.

The systematic review explores the aspects of Customer Relationship Management (CRM) and Data Driven Decision Making (DDDM) integration into modern businesses. Comparing 156 studies according to the PRISMA principles, the study proves that CRM performs both as a strategic orientation and a technological system, and DDDM is an analytical and managerial tool. The results show that CRM with DDM in a synergistic use can improve customer understanding and streamline the decision making systems as well as strengthen the ability of the company to maintain competitiveness over the long term. Imperative technological enablers that have been identified are artificial intelligence, machine learning, cloud computing, and social media analytics. The review also identifies setting and organizational issues, including data quality, complexity of systems, ethical issues, and barriers to adoption, that can be found in other sectors, including banking, retail, and healthcare (Rahman, 2024). An independent empirical study explores customer satisfaction and retention in IT projects in terms of the effect of service quality on the outcome of these processes in the context of SERVQUAL. The research shows reliability and responsiveness as very crucial factors of satisfaction and assurance and empathy as key to building trust and long term loyalty. Service quality has a direct positive relationship with retention, repeat business, and referrals, and the lack of tangibles, including technological infrastructure, is accompanied by constant upgrading. The study provides practical implications for IT companies who want to improve the quality of their services

and achieve a sustainable competitive advantage (Nigam & Tiwari, 2024). Customer satisfaction and loyalty can only be supported by effective service recovery. In the event of service failures, customers can take public (e.g. making complaints), private (e.g. switching to different providers or creating negative word of mouth) and no action at all. Grievances are normally driven by compensation, emotional release, service enhancement, or altruistic goals though most customers do not do so since they feel the work is too hard or the outcome is not guaranteed. It will be fair to determine the effectiveness of recovery depending on fairness on three fronts, procedural fairness (efficiency and flexibility of processes), interactional fairness (respect and honest treatment), and outcome fairness (reasonable compensation).

Effective service recovery can lead to a situation where the customer is retained, confidence is reestablished and in certain cases, a service recovery paradox can be created where the customer is more satisfied than it would have been without the failure. Institutionalization of professional recovery, perceived risk reduction, and long term loyalty reinforcing are achieved through service guarantees. Also, companies must deal with problematic “jaycustomers”, whose actions may interfere with the processes of providing services and have a negative impact on the experience of other consumers (Wirtz & Lovelock, 2022). Bank digital transformation (BDT) is a significant improvement of the financial performance of commercial banks that allow the use of digital technologies in traditional financial services. This connection enables the banks to utilize data as a factor of production, supply a variety of financial services, and promote the general digital economy. The empirical data of Chinese commercial banks in the period between 2011 and 2021 shows that BDT has a positive effect on financial performance, and efficiency, operational capacity, and profitability of banks are the mediating variables (Yongjie & Shanyue, 2025). These results highlight the significance of digital transformation in enhancing the quality of services, operational efficiency, and overall, the performance of the firm in the banking sector.

Market Level Drivers

The nature of the market and environmental aspects have a significant impact on customer lifetime value (CLV) development in the world. Customer trust, cultural differences, and service quality have a strong influence on customer satisfaction in banking, and customer satisfaction has a mediating role among the variables and customer retention (Zhengmeng et al., 2024). The research based on samples of state banks in Pakistan and China discovered that the quality of services and trust improved retention in China but had no significant impact in Pakistan. Also, financial technology was considered as a moderating variable, but the effect of financial technology was weak in both settings. The findings are informative on how to improve the management of customer relationships and strategic decisions used in the financial services. The mediating role of customer engagement between customer dimensions of value, such as perceived quality, hedonic value, social value, and price value, and customer based brand equity in digital payment apps takes the central place (Bapat & Hollebeek, 2023). Based on the survey data gathered on 316 app users and partial least squares structural equation modeling, the researchers found that there is no significant moderating effect of age on customer value and engagement. These findings underscore the need to improve customer engagement as a way of consolidating brand equity in online financial services.

The customer lifetime value (CLV) has a large impact on the organizational financial performance, and product alignment, long term orientation, repeat purchases, loyalty rewards, and customer oriented services have a positive impact on the firm valuation (Ali & Shabn, 2024). Using a mixed method methodology and 332 valid responses, the study highlights the strategic nature of CLV in

informing marketing decisions, enhancing customer service, and enhancing financial stability as the means of increasing the confidence of customers. The technological security innovations are essential in enhancing consumer confidence in the financial services, hence customer loyalty and financial inclusion. Blockchain, enhanced encryption, biometric authentication, artificial intelligence, and cloud security are technologies that increase transparency and data protection, detect fraud, and comply with regulations, which strengthens consumer trust in financial transactions (Adelaja et al., 2024). The confidence of consumers in the financial institutions is the most significant one, especially in the time of uncertainty like the COVID 19 pandemic. The apprehension of financial losses, past experiences, perception of inequitable business, and lack of knowledge in banking contribute greatly to the level of trust. By knowing these determinants, the financial institutions can improve relationships and maintain customer confidence (Chawla et al., 2023). Fintech ecosystems have a major role to play in enhancing financial inclusiveness as they enhance access to financial services, mobile banking, credit, and investment opportunities. The effects of using the internet to execute financial transactions, mobile phones to execute financial transactions, accessing credit, and using fintech, and the trustworthiness of the service have significant positive influences. These results indicate that it is possible to use fintech elements to bridge the financial gap and educate specific policy and industry intervention (Zafar & Li, 2024).

Methodology

Research Design

The current research follows a quantitative research paradigm to investigate the preliminary connection between customer-related, firm-related and market-related variables with Customer Lifetime Value (CLV) in the Sri Lankan banking industry. The quantitative research method makes it possible to systematically measure the constructs and detect possible trends or relationships between variables. The pilot study used a cross-sectional survey design. This design entails gathering information at one time and is suitable in examining preliminary relationships between variables and testing dependability and validity of the survey instrument. A cross-sectional method is especially useful in a pilot study, where quick feedback on the structure of the survey and the clarity of the items and patterns of the responses can be received, which will make it possible to further refine the questionnaire before the actual study. The pilot study will be used as a pre-test of the conceptual model, evaluation of the viability of the data collection process, and collection of evidence on the relationships between constructs. Realizations made at this phase would be used to make corrections on the research design such as sampling strategies, measurement scales, and research technique to be used in the actual study.

Population and Sample

The customer base to be targeted in this study will be the customer of commercial banks in Sri Lanka who actively utilize digital banking services including online banking, mobile banking applications, and other fintech-enabled services. The population is specifically applicable in the study of CLV because the digital banking customers will offer high transactional data and also since they tend to use more banking services in the long run, they will capture both behavioral and financial aspects of CLV. In the pilot study, 50 participants were used by employing a convenience sampling method in collecting the data. Even though this is a small sample that could not be used as a representation of the whole population, it gives us important preliminary answers to important constructs, including

customer satisfaction, trust, engagement, service quality, perceived fairness, and digital adoption. The pilot sample further helps in uncovering the possible anomalies of the survey instrument, including unclear questions, redundancy of questions, or incongruence. The results of this sample will inform the suitability and optimization of the research tool and inform the design of the large-scale study such as the choice of a proper sampling frame and calculation of the necessary sample size to enable adequate statistical accuracy.

Data Collection Instrument

Data were collected using a structured questionnaire with Likert-scale items (1 = strongly disagree, 5 = strongly agree) to measure the following constructs.

- Customer-related factors: customer satisfaction, engagement, trust, perceived value, perceived risk
- Firm-related factors: service quality, perceived fairness
- Market-related factors: brand image and reputation, customer service communication, digital adoption
- Dependent variable: Customer Lifetime Value (CLV)

The questionnaire items were adapted from validated scales in prior literature and slightly modified for the Sri Lankan banking context.

Data Analysis

It is through several steps of analysis of the pilot data that the quality and preliminary interpretability of the responses were investigated. To measure the distribution of responses and identify any possible outliers and inconsistencies, first, the descriptive statistics (mean, standard deviation, skewness, and kurtosis) were computed per item. This step found out the overall perception of the participants on each construct like customer satisfaction, trust, service quality, and digital adoption. Then, the reliability of the constructs was tested with the help of Cronbach alpha, and this method helps to estimate the internal consistency of the items in the constructs. Alpha values that were greater than 0.70 were considered acceptable, showing that the items do measure the underlying factor reliably. This is an essential step of a pilot study since it is necessary to verify that it is a proper measurement instrument before a full-scale study is implemented. Lastly, a pilot correlation study was conducted to find out the associations of independent variables (customer, firm and market factors) with the dependent variable (CLV). The Pearson correlation coefficients were used to develop a preliminary insight into the variables that can have closer relations with CLV and thus informed the formulation of the hypothesis and the revision of the survey tool to be used in the main study. Even though these analyses are constrained by the sample size, they provide good knowledge in designing the entire research process.

Ethical Considerations

Ethical standards of research were followed during the study. Participation was also voluntary and the respondents had the right to withdraw at any point without any consequence. To preserve confidentiality and anonymity, no personally identifiable data were gathered, and all data were kept in securely locked files with a password that would be used by the research team. The university research ethics committee reviewed the research protocol which included the survey tool, consent process, and data analysis procedures and approved the study before the actual data was collected. This helped to ensure that the study adhered to institutional and international ethical standards, to

protect the participants against any harm, and the integrity of the research process. These ethical interventions do not only protect the participants but also improve the credibility and acceptability of the findings of the pilot study.

Research Results

Introduction to Results

The main target of this pilot study was to analyze the initial correlation between customer-related, firm-related, and market-related variables and Customer Lifetime Value (CLV) in the banking industry of Sri-Lanka. In particular, the research was conducted to estimate the possible role of customer satisfaction, trust, engagement, perceived risk, service quality, perceived fairness, brand image, digital adoption, and communication in CLV. The information was gathered through a structured online questionnaire that was given to a convenience sample of 50 bank customers that actively use online banking services in Sri Lanka. The data were analyzed to test the distribution of data, reliability of measurement scales and initial correlations between independent variables and CLV and hence provided the preliminary insight into guide the design and methodology of the next extensive research study.

Descriptive Statistics

Descriptive statistics were calculated to offer a summary of the data of the pilot-study and examine the distribution of responses among all constructs. Customer-related variables (satisfaction, engagement, trust, perceived risk, perceived value), firm-related variables (service quality, perceived fairness), and market-related variables (brand image, digital adoption, customer service communication) and the dependent variable, CLV were analyzed in terms of means, standard deviations and response patterns. Such statistics provide early information of central tendencies, variability and general trends, thus helping in the evaluation of construct suitability to be used later in the full-scale analysis.

Table 1

Descriptive Statistics of the Variables

	N Statistic	Minimum Statistic	Maximum Statistic	Mean		Std. Deviation Statistic
				Statistic	Std. Error	
Brand Image Reputation	50	11.00	23.00	17.9400	.41641	2.94445
Customer Service Communication	50	12.00	24.00	18.6800	.39429	2.78802
Digital Adoption	50	12.00	24.00	18.1400	.53682	3.79586
Customer Satisfaction	50	13.00	22.00	18.0800	.40692	2.87736
Customer Engagement	50	12.00	22.00	17.1600	.39317	2.78010
Trust	50	13.00	24.00	19.0200	.42617	3.01351
Perceived Risk	50	12.00	24.00	17.2400	.46909	2.94445
Perceived Value	50	13.00	23.00	18.0600	.42610	3.01297
Service Quality	50	14.00	24.00	18.5800	.41215	2.91436
Perceived Fairness	50	12.00	23.00	17.4600	.41914	2.96380
Customer Lifetime Value	50	13.00	24.00	18.3800	.39989	2.82763
Valid N (listwise)	50					

The statistics of the pilot study provide the description of the distribution, central tendency, and variability of the measured constructs. The mean scores show that the respondents have a moderately high perception of all variables. To illustrate, Trust had the most significant mean score ($M = 19.02$), which implied a rather high degree of trust in banking services, and Customer Engagement was slightly lower ($M = 17.16$), which implied that customer engagement levels were not that high. There are also other constructs with generally positive ratings by respondents, including Brand Image Reputation ($M = 17.94$), Customer Service Communication ($M = 18.68$), Digital Adoption ($M = 18.14$), Customer Satisfaction ($M = 18.08$), Perceived Value ($M = 18.06$), Service Quality ($M = 18.58$), and Perceived Fair Standard deviations indicate the moderate variability of all constructs, with Digital Adoption having the largest variability ($SD = 3.80$), indicating that there is more variability in the use and perception of digital banking tools. Customer Service Communication, on the other hand, had less variability ($SD = 2.79$), which means that the answers were more stable concerning the topic of communication practices practiced by the bank. The mean and standard deviation of the dependent variable, CLV were 18.38 and 2.83, indicating moderate mean and reasonable dispersion of perceived CLV. Overall, these descriptive findings indicate that the pilot sample has a representative picture of the customer perception in the chosen constructs, which would allow obtaining a strong foundation of further correlation and SEM analysis to investigate the interconnection between the customer, firm, and market variables, and CLV.

Reliability Analysis

In order to ascertain consistency and reliability of the tools of measurement applied within the current pilot study, the alpha coefficient of Cronbach was computed regarding all the constructs, such as customer-related constructs (Customer Satisfaction, Customer Engagement, Trust, Perceived Risk, Perceived Value), firm-related constructs (Service Quality, Perceived Fairness), market-related constructs (Brand Image and Reputation, Customer Service Communication, Digital Adoption), and the dependent variable, CLV. Reliability analysis evaluates the consistency of items in each construct in measuring the construct proximity and helps to evaluate the fact that scales are appropriate to be used further in structural analysis, including SEM. The alpha values presented are large and it means that the internal consistency is high and is required to ensure that the relationships between constructs are observed and not due to the measurement error. The initial test gives an assurance of the validity of the survey tools and allows corrections that will be made prior to the full study.

Table 2

Cronbach Alpha (α) Statistics of the Variables

Variable	Cronbach Value (α)
Brand Image Reputation	0.847
Customer Service Communication	0.791
Digital Adoption	0.906
Customer Satisfaction	0.819
Customer Engagement	0.807
Trust	0.822
Perceived Risk	0.702
Perceived Value	0.853
Service Quality	0.809
Perceived Fairness	0.806
Customer Lifetime Value	0.789

The internal consistency of the constructs, as indicated by the reliability analysis of the pilot study, has good (excellent) internal consistency. Brand Image Reputation was found to be very reliable ($\alpha = 0.847$), which implies that the survey questions are very effective in reflecting the perception of respondents about the brand and reputation of the bank. Likewise, Customer Service Communication ($\alpha = 0.791$), Customer Satisfaction ($\alpha = 0.819$), Customer Engagement ($\alpha = 0.807$), Trust ($\alpha = 0.822$), Perceived Value ($\alpha = 0.853$) and Service Quality ($\alpha = 0.809$), and Perceived Fairness ($\alpha = 0.806$) had good internal consistency, and indicated that the items in each construct reliably measured the intended dimension. Digital Adoption was very reliable ($\alpha = 0.906$), and this means that the items measure the acquisition and utilization of digital banking services to the participants in an effective manner. The dependent variable CLV also had a satisfactory reliability ($\alpha = 0.789$) which implies that the survey items indicate a moderately stable measure of CLV in the pilot sample. Perceived Risk was the least reliable among the constructs ($\alpha = 0.702$) which, though acceptable, shows that respondents have a slight variability in their interpretations of risk-related items in the construct and refinement of these items would be a good idea in the full-scale study. Overall, the findings support the fact that the pilot survey questions can be further analyzed and be an effective basis to examine the correlations between customer, firm, and market variables and CLV in the Sri-Lankan banking industry. The reliability of most of the constructs is high, which justifies inclusion of such measures in the impending structural equation modeling (SEM) analysis.

Correlation Analysis

Correlation analysis was done to establish the strength and direction of the relationships between the study variables that may be customer-related, firm-related, and market-related, and CLV. Such an analysis will present initial information on the associations between such constructs and each other and will enable to evaluate whether the data satisfy the assumptions of any further multivariate analyses, including SEM. Positive correlations would mean that the stronger the independent variables (e.g., trust, service quality, digital adoption) would be, along with the stronger the CLV would be, which would support the hypothesized relationships presented in the conceptual framework.

Table 3

Correlation Matrix of the Variables

		Customer Lifetime Value
Brand Image Reputation	Pearson Correlation	.795**
	Sig. (2-tailed)	.000
	N	50
Customer Service Communication	Pearson Correlation	.808**
	Sig. (2-tailed)	.000
	N	50
Digital Adoption	Pearson Correlation	.854**
	Sig. (2-tailed)	.000
	N	50
Customer Satisfaction	Pearson Correlation	.796**
	Sig. (2-tailed)	.000
	N	50
Customer Engagement	Pearson Correlation	.763**
	Sig. (2-tailed)	.000
	N	50

Trust	Pearson Correlation	.806**
	Sig. (2-tailed)	.000
	N	50
Perceived Risk	Pearson Correlation	.748**
	Sig. (2-tailed)	.000
	N	50
Perceived Value	Pearson Correlation	.785**
	Sig. (2-tailed)	.000
	N	50
Service Quality	Pearson Correlation	.837**
	Sig. (2-tailed)	.000
	N	50
Perceived Fairness	Pearson Correlation	.760**
	Sig. (2-tailed)	.000
	N	50
Customer Lifetime Value	Pearson Correlation	1
	Sig. (2-tailed)	
	N	50

Table 3 correlation shows that all independent variables demonstrate strong positive correlations with Customer Lifetime Value (CLV), p-value is less than 0.01 thus providing strong preliminary support of the hypotheses proposed.

- Digital Adoption shows the best correlation with CLV ($r = 0.854$) and it shows the importance of technology in contributing to customer retention and value in the Sri Lankan banking environment.
- There is also a strong positive correlation between Service Quality ($r = 0.837$), Customer Service Communication ($r = 0.808$) and Trust ($r = 0.806$), which highlights the contribution of firm-related and relational determinants in motivating CLV.
- Brand Image & Reputation ($r = 0.795$), Customer Satisfaction ($r = 0.796$), Perceived Value ($r = 0.785$) and Customer Engagement ($r = 0.763$) also indicate that there are significant correlations between these factors and CLV, which illustrates the importance of customer perceptions and customer engagement behaviors.
- Perceived Fairness ($r = 0.760$) and Perceived Risk ($r = 0.748$) imply that there is also a relation between fairness and risk perceptions and CLV, but risk is weaker.

Altogether, the matrix shows that customer-related variables, as well as firm- and market-related ones, have a positive correlation with CLV and, therefore, offer an excellent rationale to using Structural Equation Modelling (SEM) to test the hypothesized pathways within the proposed research model.

Conclusion

The pilot study provides the preliminary data that Customer Lifetime Value depends significantly on customer-related, firm-related, and market-related determinants in the Sri Lankan banking industry. Internal consistency between the measures is proven by descriptive statistics and reliability analysis, whereas strong positive correlations between CLV and Digital Adoption, Service Quality, Trust, and

Customer Service Communication are shown by correlation analysis. The findings are consistent with the previous global and regional research and indicate that the programs aimed at enhancing the quality of services, digital interaction, and the development of trust can significantly contribute to customer retention and lifetime value. Irrespective of its small size, the findings provide practical implications and support the relevance of the suggested conceptual framework to full-scale research that uses SEM.

References

- Abdullahi, N., & Mohammed, M. A. (2025). Afropolitan Journals Digital Financial Innovation and Customer Loyalty in Deposit Money Banks : A Study of Zenith Bank. 19(1), 143–166
- Adelaja, A. O., Ayodele, O. F., & Umeorah, S. C. (2024). Enhancing consumer trust in financial services : the role of technological security innovations. 6(10), 1746–1759. <https://doi.org/10.51594/farj.v6i10.1610>
- Ali, N., & Shabn, O. S. (2024). Customer lifetime value (CLV) insights for strategic marketing success and its impact on organizational financial performance. Cogent Business and Management, 11(1) <https://doi.org/10.1080/23311975.2024.2361321>
- Alqararah, E. A., & Shehadeh, M. (2025). The Role of Digital Transformation Capabilities in Improving Banking Performance in Jordanian Commercial Banks. 1–22.
- Ashrafuzzaman, M., Parveen, R., Sumiya, M. A., & Rahman, A. (2025). AI-POWERED PERSONALIZATION IN DIGITAL BANKING: A REVIEW OF CUSTOMER BEHAVIOR ANALYTICS AND ENGAGEMENT. American Journal of Interdisciplinary Studies, 06(01), 40–71. <https://doi.org/10.63125/z9s39s47>
- Bapat, D., & Hollebeek, L. D. (2023). Customer value, customer engagement, and customer-based brand equity in the context of a digital payment app. 1–28. <https://doi.org/10.1108/MIP-09-2022-0417/full/html>
- Carlos, J., Roig, F., García, J. S., & Ángel, M. (2013). Perceived value and customer loyalty in financial services. January 2013, 37–41. <https://doi.org/10.1080/02642060902749286>
- Central Bank of Sri Lanka. (2024). Annual Economic Review 2023. <https://www.cbsl.gov.lk/en/publications/economic-and-financial-reports/annual-economic-review/annual-economic-review-2023>
- Chawla, I., Russell, M. B., White, K. J., & Devaney, S. A. (2023). Fear and trust in financial institutions : A content analysis. 31, 211–228.
- Dias, R. P., & Wisker, Z. L. (2025). *Between Firewalls and Feelings : Modelling Trust and Commitment in Digital Banking Platforms*. 1–29
- Galdolage, S., & Rasanjalee, S. (2022). Website Aesthetics and Technology Playfulness in Encouraging Customer Use of Online based Self-Service Technologies: Special Reference to Commercial Banks in Sri Lanka. Advances in Technology, 2(3), 249–262. <https://doi.org/10.31357/ait.v2i3.5500>
- Ganaie, A., & Bhat, M. A. (2021). Switching Costs and Customer Loyalty : A Review of literature. 10(05), 7–14.
- Gunathilaka, P. A. H. S., & Rupasingha, R. A. H. M. (2022). Customer Satisfaction on Digital Banking During the Covid-19 Pandemic: A Case Study of Banking Customers in Sri Lanka. Sri Lankan Journal of Banking and Finance, 5(2), 35–57. <https://doi.org/10.4038/sljb.v5i2.30>
- Gupta, S., & Zeithaml, V. (2006). Customer metrics and their impact on financial performance. Marketing Science, 25(6), 718–739. <https://doi.org/10.1287/mksc.1060.0221>
- Jayakody, J. A. D. P. M., Perera, K. N. M., Perera, D. S. I., & P, L. A. K. (n.d.). Accessing Customer Perceptions on Customer Adoption of Digital Banking Platforms ; Private and Public Bank Comparison in the Post COVID – 19 Pandemic in Sri Lanka. 18052770.
- Kandampully, J. (2000). Customer loyalty in the hotel industry : the role of customer satisfaction and image.
- Kim, L., Jindabot, T., & Fern, S. (2024). Heliyon Understanding customer loyalty in banking industry : A systematic review and meta analysis. Heliyon, 10(17), e36619. <https://doi.org/10.1016/j.heliyon.2024.e36619>
- Kumar, V., & Reinartz, W. (2016). Creating enduring customer value. Journal of Marketing, 80(6), 36–68. <https://doi.org/10.1509/jm.15.0414>
- Martin, W. C., Ponder, N., & Lueg, J. E. (2009). Price fairness perceptions and customer loyalty in a retail context. Journal of Business Research, 62(6), 588–593. <https://doi.org/10.1016/j.jbusres.2008.05.017>
- Nigam, P., & Tiwari, S. K. (2024). SERVICE QUALITY AND ITS IMPACT ON CUSTOMER SATISFACTION AND RETENTION IN IT PROJECTS : A COMPREHENSIVE ANALYSIS USING SERVQUAL. Journal of Visual and Performing Arts, 5, 1315–1325. <https://doi.org/10.29121/shodhkosh.v5.i7.2024.536>

- Rahman, M. (2024). DATA-DRIVEN DECISION-MAKING THROUGH CUSTOMER RELATIONSHIP MANAGEMENT: A SYSTEMATIC LITERATURE REVIEW IN MODERN ENTERPRISES. *American Journal of Advanced Technology and Engineering Solutions*, 04(03), 30–59. <https://doi.org/10.63125/vgr9th76>
- Rust, R. T., Lemon, K. N., & Zeithaml, V. A. (2004). Return on Marketing: Using Customer Equity to Focus Marketing Strategy. *Journal of Marketing*, 68(1), 109–127. <https://doi.org/10.1509/jmkg.68.1.109.24030>
- Sood, H., & Sharma, R. P. (2016). Customer Digital Engagement and Lifetime Value : An Empirical Study of Telecom Services in India. 2011, 1–10. <https://doi.org/10.1177/23197145211065086>
- Vimalachandiran, M. (2023). IMPACT OF DIGITAL LOYALTY PROGRAM ON CUSTOMER SATISFACTION IN SRI LANKAN RETAIL. *IMPACT OF DIGITAL LOYALTY PROGRAM ON*. May.
- Wirtz, J., & Lovelock, C. (2022). *SERVICES MARKETING* (Ninth Edit). World Scientific Publishing Co. Inc.
- Yongjie, Z., & Shanyue, J. (2025). The Impact of Bank Digital Transformation on the Financial Performance of Commercial Banks. September, 1–21. <https://doi.org/10.1177/21582440251365342>
- Zafar, U., & Li, E. Y. (2024). Financial Inclusion and Fintech Ecosystems in the Digital Age : A Systematic Review and Meta-Analysis. 24, 196–208.
- Zhengmeng, C., Malik, M., Hussain, M., & Hussain, S. (2024). Heliyon Exploring customer retention dynamics : A comparative investigation of factors affecting customer retention in the banking sector using mediation-moderation approach. *Heliyon*, 10(19), e36919. <https://doi.org/10.1016/j.heliyon.2024.e36919>

A CASE STUDY ON CUSTOMER SERVICE COMMUNICATION AND ITS IMPACT ON CUSTOMER LIFETIME VALUE IN TELECOMMUNICATION INDUSTRY, COLOMBO DISTRICT, SRI LANKA

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Abstract

Though customer retention is still a major problem and challenge, the telecommunication sector in Sri Lanka is essential for linking people, and companies. This paper aims to identify how bad customer service communication affects Customer Lifetime Value (CLV) in the communications industry of the Colombo District, Sri Lanka. Using a statistical analysis method, the study evaluates important service communication aspects including information clarity, responsiveness, empathy and helpfulness. A standardized questionnaire was sent to 100 communications service consumers to gather data for this study. Strong internal consistency across all variables investigated by Cronbach's Alpha in reliability test confirmed the instrument's dependability. All service communication factors and customer outcome measures including long-term satisfaction, perceived value for money, intention to suggest and probability of staying with the provider showed notable positive correlations, according to correlation analysis. Regression study showed that customer service communication is a strong predictor of CLV, explaining 95.6% of the variation ($R^2 = 0.956$). The Regression Analysis coefficients showed that improved communication has a statistically significant and highly excellent influence on CLV ($\beta = 0.978$, $p < 0.001$). The study shows that rapid, precise customer service communication is essential for improving and expanding customer value and retention in the telecoms sector. Among the recommendations are proactive, open participation in developing long-term relationships, utilization of real-time customer feedback systems, and financing of staff communication training.

Keywords: Customer Lifetime Value (CLV), Customer Satisfaction, Customer Service Communication, Telecommunication Sector

Introduction

Background of the Study

Modern economies depend much on the telecommunications industry, which enables communication, information exchange, and cross-border connectivity. The Colombo-based telecommunications sector in Sri Lanka is quite competitive; many service providers are fighting for market share and consumer loyalty. Companies in this area are under more and more pressure to provide outstanding

customer service to stand out in the market with an always growing consumer base(Oladele, 2024). Customer service communication is essential in this setting. Often, the initial point of contact between a consumer and a business is good communication. Good handling of customer service increases happiness, creates confidence, and promotes long-term connections. But bad communication whether in the form of tardy replies, ambiguous information, or unprofessional conduct can seriously harm the relationship between the consumer and the organization(Silva & Yapa, 2009). Focusing on how these shortcomings affect Customer Lifetime Value (CLV), this case study explores the effects of inadequate customer service communication in Colombo's telecoms sector. CLV is the entire value a consumer adds to a business over their relationship. Companies trying to keep customers and increase profitability will find it increasingly important to know how communication breakdowns affect CLV as they move toward customer-centric strategies(S.E. et al., 2021).

Problem Statement

The telecoms industry in Colombo is under increasing worry about the quality of customer service communications. Widespread miscommunication or ineffective customer service procedures cause consumer unhappiness, which therefore influences their loyalty and retention. Retaining clients is vital to a company's success given the fierce rivalry in the sector. Poor communication can lead to a high churn rate, less brand advocacy, and finally a lower CLV. Though customer service communication seems to be quite important, little study has been done, especially on the link between bad communication and CLV in Sri Lanka's telecom industry. Examining the direct and indirect consequences of communication failures on CLV, this case study seeks to close the gap by offering telecom firms practical ideas to improve their customer service approach.

Research Objectives

The primary objective of this case study is to analyze how poor customer service communication impacts CLV in Colombo's telecommunication sector. More specifically, the study aims to,

- 1) Assess the impact of these communication failures on customer satisfaction, loyalty, and retention.
- 2) Examine the relationship between poor communication and CLV, exploring how these failures contribute to a reduced customer lifetime.
- 3) Propose practical recommendations for improving customer service communication to enhance CLV.

Research Questions

To guide the study and achieve the stated objectives, the following research questions will be addressed.

- 1) How do poor communication practices affect customer satisfaction and loyalty in the telecommunications industry?
- 2) What is the relationship between poor customer service communication and CLV in Colombo's telecom companies?
- 3) What strategies can telecommunication companies adopt to mitigate communication failures and improve CLV?

Rationale for the Study

There are several reasons why this study matters. First, it tackles a vital component of corporate success in the telecommunication sector – customer service. Focusing on communication breakdowns helps this study to show a frequently ignored field with major corporate effects. Second, the study

provides insightful analysis for Colombo telecommunication firms, so helping them to grasp better how communication breakdowns could negatively affect their company and, more crucially, how they can address these problems to raise CLV. Moreover, this study provides empirical data from Sri Lanka where few studies have concentrated on the relationship between customer service communication and CLV in the telecommunications industry thereby enhancing the current body of knowledge. This work also lays a basis for future studies on related subjects in other sectors and areas by adding to the corpus of knowledge in this field. The background and relevance of the study on customer service communication in Colombo's telecommunications sector were discussed in this chapter. A vital measure of corporate success, CLV, the study seeks to investigate the link between poor communication and CLV. The study aims to offer practical suggestions to improve communication techniques by means of this problem, so increasing customer happiness, loyalty, and finally CLV. The literature review, study methods, and results will be shown in the next chapters to help us better grasp the problem and its wider ramifications.

Literature Review

Customer Service Communication in the Telecommunication Sector

Customer service communication is the term used to describe the ways and techniques firms engage with consumers whether via face-to-face meetings, phone assistance, emails, live chats, or other digital channels. In the telecommunications industry, where consumer involvement is regular and vital for troubleshooting, information distribution, and service questions, communication quality can greatly affect customer experiences.

(Berry, 2000) claims that customer service in the telecommunications industry is a major factor in determining consumer happiness. Misunderstandings, anger, and unhappiness caused by poor communication can harm the reputation of the brand. Research like Payne and (A. Payne & Frow, 2005) indicates that companies have to guarantee open, sympathetic, and prompt communication to improve service quality and reduce consumer annoyance.

Companies in Colombo's telecommunications industry have been grappling with problems such lengthy wait times, ambiguous service information, and insufficient problem resolution because customer service quality is frequently mentioned as a major competitive advantage. These difficulties cause discrepancies between consumer expectations and the real service provided, hence causing communication breakdowns.

Customer Satisfaction and Communication

One of the most well-studied ideas in service marketing, customer Satisfaction is usually seen as the main result of good communication. (Ali et al., 2021) propose that, in the realm of telecommunications, the primary factors influencing consumer happiness are responsiveness, the professionalism of customer service representatives, and the promptness of problem resolution. Failures in communication, such as late replies or misunderstanding of the consumer's issue, can greatly reduce customer satisfaction. On the other hand, good communication reduces customer unhappiness and promotes good customer experience, hence improving satisfaction ratings.

Customer Loyalty and Retention

The quality of communication in customer service encounters shapes client loyalty and retention directly. According to (Reichheld, 2003), loyal consumers are more inclined to buy from a firm, suggest its services to others, and participate in long-term relationships. Poor communication, on the other hand, can cause bad feelings that cause consumers to change providers even in sectors like telecommunications where competition is fierce. According to (Hennig-Thurau et al., 2002), client loyalty is fostered via communication tactics emphasizing trust development, satisfying customer demands, and improving personal relationships. Conversely, (Hennig-Thurau et al., 2002) underline that inadequate communication such as unresolved issues or contradictory information can cause consumer dissatisfaction and a lower feeling of value. Customers looking for substitutes with more efficient communication techniques create churn by means of these bad feelings.

The Concept of Customer Lifetime Value (CLV)

Customer lifetime value (CLV) is the projected total income a business will generate from a consumer over the course of their relationship. According to (Gupta & Zeithaml, 2006), CLV is a measure of a customer's profitability across their tenure with the company. Telecom firms compute CLV to evaluate the value of keeping customers against the expense of gaining new ones. (Rust et al., 2004) claim that customer retention rates have a major impact on CLV. Retained clients not only generate more to a company's profitability by means of recurrent business but also by means of cross-selling and up-selling. (Reichheld, 2003) further say that raising retention rates by only 5% can boost profitability by as much as 25% to 95%, underscoring the need for communication in client retention efforts.

Impact of Communication Failures on CLV

CLV can be greatly affected by miscommunication including false information, delayed replies, or failure to properly handle customer issues. (A. F. Payne et al., 2008) found that bad customer service communication causes unhappiness, which can drive consumers to change service providers. Once a consumer churns, they not only cease producing future income but also could lower the general CLV of the business by affecting others via unfavorable word-of-mouth. The telecommunication sector in Sri Lanka is especially sensitive to the negative consequences of communication since customer loyalty is sometimes influenced by personal encounters and word-of-mouth marketing. (Mattila, 2004) claim that miscommunication in telecommunication support centers causes more customer attrition, hence compromising the long-term profitability of the business. Furthermore, customers are less likely to participate in good activities when communication mistakes cause unresolved problems; these activities include referring the firm to others or becoming long-term clients.

Improving Customer Service Communication

Increasing customer happiness and strengthening CLV depend on bettering customer service communication. Many methods have been suggested to raise the quality of communication in customer service environments.

- A well-trained customer care crew is more equipped to handle consumer questions efficiently and offer open communication. According to (Tax et al., 1998), training enables staff members to grasp client expectations and interact with empathy and precision.

- Advancements in technology, including CRM systems, can enable telecom firms to control and simplify consumer interactions. (Nguyen & Simkin, 2013) underlines the importance of CRM solutions in guaranteeing prompt and correct connection with consumers.
- Personalized communication, in which businesses customize their replies to specific consumer demands, can boost customer happiness and loyalty. (Shankar et al., 2003) show that tailored communication increases customer involvement and trust.
- (Gronross, 2015) claims that giving consumers honest, precise, and succinct information is essential to avoid misconceptions and reduce annoyance. Openness in service interruptions, pricing, and procedures can significantly enhance consumer impressions.

The research shows that in the telecommunications sector, customer service communication is fundamental to customer happiness, loyalty, and retention. Bad communication habits seriously lower customer happiness and loyalty, hence harming CLV. Effective communication, on the other hand, builds trust, improves client relationships, and finally boosts CLV. Suggested to enhance communication methods inside customer service departments are several tactics including staff training, technological adoption, and tailored communication. Companies hoping to increase their CLV and attain long-term success must improve customer service communication considering the intense rivalry in the Colombo telecommunications sector. The following part will describe the study approach utilized to investigate the relationship between CLV and communication breakdowns in Colombo's communications industry.

Methodology

The research design, sample, data collecting approach, pilot study, and analysis techniques used to investigate the link between inadequate customer service communication and customer lifetime value (CLV) in Colombo's communications industry are described in this part. The study intends to grasp how bad customer service communication influences the long-term relationship with consumers and their general worth to the business.

Research Design

Using a descriptive cross-sectional survey method, this paper presents a quantitative research strategy. The study looks at how customer lifetime value in the telecom sector is affected by customer service communication. Key factors of interest in customer service communication and customer lifetime value will be measured using a structured Likert-scale survey. Clarity, responsiveness, empathy, and helpfulness will define the measurement of the independent variable, customer service communication. Factors include customer retention, perceived value for money, long-term contentment, and desire to suggest will help one analyze the dependent variable, customer lifetime value (CLV).

Population and Sampling

The target population of this study is consumers of Colombo, Sri Lanka, communications service providers. These consumers must have dealt with customer service agents in the last six months. Since it provides simple access to people who meet the study's criteria, a convenience sampling approach will be used.

- Pilot Study – A sample of 25 participants will be selected for the pilot study. The purpose is to test the questionnaire's clarity, reliability, and appropriateness before the main data collection.

- **Main Study** – The main study will involve a sample of approximately 100 participants. This sample size is deemed sufficient to ensure reliable and valid results for the correlation and regression analysis.

Data Collection Method

A self-administered online survey will be the main data gathering tool. Likert-scale questions will guide the creation of the questionnaire to gauge respondents' views and attitudes on customer service communication and CLV. On a 1 to 5 scale, with 1 being Strongly Disagree and 5 being Strongly Agree, participants will evaluate each item. Email and social media channels will be used to distribute the questionnaire. Respondents will be requested to give their demographic information and respond to inquiries about their interactions with customer service communication and their general satisfaction with their telecommunication provider.

Pilot Study

A pilot study will be conducted with 25 participants from the target population. The pilot study will serve the following purposes.

- 1) **Testing Clarity and Understandability** - Ensure that the questionnaire items are clear and easily understood by the target respondents.
- 2) **Assessing Completion Time** – Determine the average time required to complete the questionnaire (approximately 10–15 minutes).
- 3) **Evaluating Reliability** – Use Cronbach's Alpha to test the internal consistency of the items and ensure a high level of reliability.
- 4) **Identifying Potential Issues** – Any ambiguous, misleading, or biased items will be revised or removed based on feedback from the pilot study.

Following the pilot study, necessary revisions will be made to the questionnaire to enhance its validity and reliability for the main study.

Questionnaire Standardization

After the pilot study, the questionnaire will be standardized to ensure its reliability and validity. This process includes.

Reliability Testing – Cronbach's Alpha will be calculated for each construct (customer service communication and customer lifetime value). Items with low alpha values (below 0.7) will be revised or removed.

Data Analysis

Once the full-scale data is collected, the responses will be analyzed using SPSS (Statistical Package for the Social Sciences). The following analytical methods will be applied.

- 1) **Correlation Analysis** – Pearson's correlation coefficient will be used to measure the strength and direction of the linear relationship between customer service communication and customer lifetime value. This will help assess whether and how different aspects of customer service communication (clarity, responsiveness, empathy, and helpfulness) are related to customer lifetime value.
- 2) **Regression Analysis** – A multiple regression analysis will be conducted to evaluate the influence of customer service communication on customer lifetime value. The dependent variable, CLV, will be regressed on the independent variables representing the dimensions of

customer service communication (clarity, responsiveness, empathy, helpfulness). This will help identify the strength of the relationship and determine the impact of each factor on customers' lifetime value.

Ethical Considerations

The study would adhere to rigorous ethical standards to guarantee respondent confidentiality and privacy.

- 1) All study participants will be told its goal; their agreement will be sought before they participate. They shall be informed of their ability to leave the study at any moment without consequences.
- 2) The answers will be kept private. Data will be kept safe, and no personal identifiers will be disclosed or made public.

This approach describes how to investigate the link between inadequate customer service communication and customer lifetime value in the telecommunications industry. Valuable data from the pilot study and full-scale survey will be examined with correlation, and regression methods to evaluate how communication elements affect customer retention and general value. The results will provide telecommunication firms with ideas to strengthen their customer service policies and increase lifetime value and customer loyalty.

Research Results

Pilot Study. Reliability Analysis

Table 4.1

Cronbach Statistics of the Pilot Study

Variable	Cronbach Alpha Value
Clarity of Information	0.946
Responsiveness	0.942
Empathy	0.936
Helpfulness	0.935
Likelihood of Staying with Provider	0.943
Perceived Value for Money	0.948
Long-Term Satisfaction	0.971
Intention to Recommend	0.945

Results from a pilot study testing the dependability of the assessment tool using Cronbach's Alpha are shown in Table 4.1. With Cronbach Alpha scores far beyond the permissible level of 0.70, all variables showed great internal consistency. Specifically, the scores varied from 0.935 to 0.971, demonstrating a high level of reliability across all constructions. Among them, Long-Term Satisfaction showed the most dependability ($\alpha = 0.971$), followed closely by Perceived Value for Money ($\alpha = 0.948$) and Clarity of Information ($\alpha = 0.946$). Strong dependability was also seen in other factors including Responsiveness, Empathy, Helpfulness, Likelihood of Staying with Provider, and Intention to Recommend, all with scores over 0.93. These findings verify the survey tool's suitability and dependability for assessing how poor customer service communication affects customer lifetime value in the communications industry in the Colombo District of Sri Lanka.

Correlation Analysis

Table 4.2

Correlation Statistics

Correlations									
		Clarity of Information	Responsiveness	Empathy	Helpfulness	Likelihood of Staying with Provider	Perceived Value for Money	Long-Term Satisfaction	Intention to Recommend
Clarity of Information	Pearson Correlation	1	.902**	.891**	.915**	.912**	.930**	.911**	.888**
	Sig. (2-tailed)		.0001	.0001	.0001	.0001	.0001	.0001	.0001
	N	100	100	100	100	100	100	100	100
Responsiveness	Pearson Correlation	.902**	1	.875**	.955**	.924**	.951**	.922**	.914**
	Sig. (2-tailed)	.0001		.0001	.0001	.0001	.0001	.0001	.0001
	N	100	100	100	100	100	100	100	100
Empathy	Pearson Correlation	.891**	.875**	1	.890**	.941**	.882**	.894**	.878**
	Sig. (2-tailed)	.0001	.0001		.0001	.0001	.0001	.0001	.0001
	N	100	100	100	100	100	100	100	100
Helpfulness	Pearson Correlation	.915**	.955**	.890**	1	.944**	.959**	.940**	.924**
	Sig. (2-tailed)	.0001	.0001	.0001		.0001	.0001	.0001	.0001
	N	100	100	100	100	100	100	100	100
Likelihood of Staying with Provider	Pearson Correlation	.912**	.924**	.941**	.944**	1	.941**	.938**	.932**
	Sig. (2-tailed)	.0001	.0001	.0001	.0001		.0001	.0001	.0001
	N	100	100	100	100	100	100	100	100
Perceived Value for Money	Pearson Correlation	.930**	.951**	.882**	.959**	.941**	1	.952**	.936**
	Sig. (2-tailed)	.0001	.0001	.0001	.0001	.0001		.0001	.0001
	N	100	100	100	100	100	100	100	100
Long-Term Satisfaction	Pearson Correlation	.911**	.922**	.894**	.940**	.938**	.952**	1	.928**
	Sig. (2-tailed)	.0001	.0001	.0001	.0001	.0001	.0001		.0001
	N	100	100	100	100	100	100	100	100
Intention to Recommend	Pearson Correlation	.888**	.914**	.878**	.924**	.932**	.936**	.928**	1
	Sig. (2-tailed)	.0001	.0001	.0001	.0001	.0001	.0001	.0001	
	N	100	100	100	100	100	100	100	100

** . Correlation is significant at the 0.01 level (2-tailed).

Based on answers from 100 people, Table 4.2 shows the Pearson correlation coefficients among the key study variables. Strong and statistically significant links between variables are indicated by all correlations at the 0.01 level (2-tailed). Clarity of Information revealed strong positive correlations with important customer experience results like Perceived Value for Money ($r = 0.930$), Helpfulness ($r = 0.915$), and Likelihood of Staying with Provider ($r = 0.912$), implying that when communication is clear, customers see higher value and are more likely to remain loyal. Likewise, Responsiveness was strongly associated to Helpfulness ($r = 0.955$), Perceived Value for Money ($r = 0.951$), and Intention to Recommend ($r = 0.914$), suggesting that quick service reactions improve general customer satisfaction and advocacy. Although demonstrating somewhat weaker correlations, empathy nevertheless had close ties to other factors, particularly with Likelihood of Staying with

Provider ($r = 0.941$). Especially with Perceived Value for Money ($r = 0.952$) and Intention to Recommend ($r = 0.928$), Long-Term Satisfaction was very connected, underlining their relevance in defining consumer loyalty. All things considered, the correlation study emphasizes the importance of good customer service communication in forming customer perceptions, satisfaction, and long-term value in the telecoms industry of the Colombo District.

Regression Analysis

Table 4.3

Model Summary of the Regression

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.978 ^a	.956	.955	3.544	2.178
a. Predictors: (Constant), Customer Service Communication					
b. Dependent Variable: Customer Lifetime Value (CLV)					

The findings of the regression study done to investigate how customer service communication affects Customer Lifetime Value (CLV) are summarized in Table 4.3. The model shows a strong linear association by means of a very high correlation ($R = 0.978$) between the independent variable (customer service communication) and the dependent variable (CLV). A R Square score of 0.956 confirms the model's good explanatory power by indicating that 95.6% of the variation in CLV can be accounted for by changes in customer service communication. By considering the number of predictors, the Adjusted R Square of 0.955 confirms the model's dependability even further. The estimated standard error of 3.544 also shows the typical distance the observed data lies from the regression line. With a Durbin-Watson score of 2.178, which is near the ideal value of 2, there is no notable autocorrelation in the residuals. All things considered, the regression model verifies that in the communications industry in the Colombo District, efficient customer service communication greatly and positively influences customer lifetime value.

Table 4.4

ANOVA table of the Regression

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	26679.142	1	26679.142	2123.759	.0001 ^b
	Residual	1231.098	98	12.562		
	Total	27910.240	99			
a. Dependent Variable: Customer Lifetime Value (CLV)						
b. Predictors: (Constant), Customer Service Communication						

The ANOVA findings in Table 4.4 confirm even more the relevance of the regression model. The total regression model is quite significant, as shown by the F-value of 2123.759 with a p-value of 0.0001 ($p < 0.01$). This is a statistically significant link between customer lifetime value (CLV) and customer service communication. Most of the entire variability (27,910.240) in CLV is accounted for by the regression sum of squares, 26,679.142. With a residual sum of squares of just 1,231.098, the model suggests it has captured most of the variation in the dependent variable. These results support the idea that communication in customer care is a key factor influencing customer lifetime value in the telecommunication industry in Colombo District.

Table 4.5

Coefficients table of the Regression

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-.634	1.222		-.519	.605
	Customer Service Communication	1.015	.022	.978	46.084	.0001
a. Dependent Variable: Customer Lifetime Value (CLV)						

The regression equation predicting Customer Lifetime Value (CLV) from Customer Service Communication is statistically significant, according to the coefficients table (Table 4.5). Customer Service Communication's unstandardized coefficient (B) is 1.015, meaning that, assuming other variables stay constant, the CLV rises by about 1.015 units for every one-unit improvement in the quality or efficacy of customer service communication. At the 0.01 level, the t-value of 46.084 and p-value of 0.0001 verify that this connection is quite important. At 0.978, the standardized beta coefficient indicates that customer service communication has a high influence on CLV. The constant component, on the other hand, is not statistically relevant ($p = 0.605$), indicating that the model does not provide significant prediction when customer service communication is zero. Finally, the findings show how important good customer service communication is in promoting long-term customer value in the telecommunication industry.

Discussion

The results of this study provide substantial support for the theory that communication in customer service has a major impact on Customer Lifetime Value (CLV) in the communications industry. The correlation study showed strong, positive, statistically significant links between factors including information clarity, responsiveness, empathy, helpfulness, and key customer outcomes including probability of remaining with the provider, perceived value for money, long-term satisfaction, and intention to recommend. These findings highlight that, particularly in a competitive and dynamic sector like telecommunications, clients attach great importance to how well service providers communicate. With a very high R-squared value of 0.956, the regression analysis verified this link even more by showing that customer service communication alone accounts for 95.6% of the CLV variation. The standardized coefficient ($R = 0.978$) confirmed even more that communication is the main predictor of CLV. These findings support the current research and support the idea that customer trust, satisfaction, and retention are directly affected by the quality of communication. Furthermore, the Cronbach's alpha scores of the pilot project showed good dependability for all scales, hence validating the internal consistency of the assessment tools employed and instilling trust in the data collecting procedure.

Recommendation

- To improve the whole customer experience, invest in ongoing training courses emphasizing empathy, clarity, and responsiveness.
- Regularly gather and examine client comments on service communication to guide changes.

- Especially for high-volume inquiries, use AI chatbots and CRM systems to guarantee prompt, accurate, and tailored replies.
- Establish unambiguous policies and scripts to guarantee uniform communication across all consumer touchpoints.
- Continuously improve communication strategies by tracking important performance factors including response time, resolution time, and customer satisfaction (CSAT) scores.
- Although automation is beneficial, make sure well-trained human agents handle escalated or emotionally sensitive concerns.

Conclusion

This paper finds that bad customer service communication lowers Customer Lifetime Value in the Colombo District telecoms sector. Improving customer happiness, loyalty, and advocacy depends much on good communication including clarity, empathy, responsiveness, and helpfulness. Poor or impersonal communication drives customers to leave, feel unhappy, and change providers, hence reducing their lifetime value to the business. Improving communication tactics is thus not only an operational need but also a strategic requirement to maximize CLV and preserve competitive advantage.

Appendix

Section 1 – Customer Service Communication

(Please rate your agreement with the following statements on a scale of 1 to 5, where 1 = Strongly Disagree and 5 = Strongly Agree)

Clarity of Information

- The information provided by customer service representatives is clear and easy to understand.
- Customer service representatives explain services in a simple and understandable manner.
- The instructions or solutions provided by customer service are straightforward.
- The language used by customer service representatives is easy to follow.

Responsiveness

- Customer service responds promptly to my inquiries or concerns.
- I feel that my concerns are handled in a timely manner.
- I don't have to wait long for assistance when I contact customer service.
- Customer service representatives are quick to address any issues I report.

Empathy

- Customer service representatives show genuine concern for my issues.
- The customer service team listens attentively and acknowledges my concerns.
- Customer service representatives treat me with respect and understanding.
- I feel that customer service is compassionate and understanding when dealing with my problems.

Helpfulness

- Customer service representatives are helpful in resolving my issues.
- I feel that the customer service team goes above and beyond to assist me.

- Customer service provides me with useful and practical solutions.
- The customer service team is willing to assist me with all my concerns, no matter how small.

Section 2 – Customer Lifetime Value (CLV)

(Please rate your agreement with the following statements on a scale of 1 to 5, where 1 = Strongly Disagree and 5 = Strongly Agree)

Likelihood of Staying with Provider

- I am likely to continue using my current telecommunication provider for the foreseeable future.
- I would consider changing my provider only if there were significant improvements from competitors.
- I feel committed to staying with my current telecommunication provider.
- I am satisfied with my current provider to the extent that I would recommend them to others.

Perceived Value for Money

- The services offered by my provider are worth the amount I pay.
- I feel that my provider offers good value compared to others in the market.
- I am happy with the overall value I receive from my current telecommunication provider.
- The services I receive justify the price I pay.

Long-Term Satisfaction

- I am generally satisfied with my telecommunication provider's services.
- My provider meets my expectations for service quality.
- Over time, I have become more satisfied with the services offered by my provider.
- I feel content with my decision to choose this provider for my telecommunication services.

Intention to Recommend

- I would recommend my current telecommunication provider to my friends and family.
- I am likely to promote my provider's services based on my positive experience.
- If asked, I would encourage others to use my telecommunication provider.
- I feel confident in recommending my provider to others, based on the quality of service I receive.

References

- Ali, B. J., Saleh, P. F., Akoi, S., Abdulrahman, A. A., Muhamed, A. S., Noori, H. N., & Anwar, G. (2021). Impact of Service Quality on the Customer Satisfaction: Case study at Online Meeting Platforms. *International Journal of Engineering, Business and Management*, 5(2), 65–77. <https://doi.org/10.22161/ijebm.5.2.6>
- Berry, L. L. (2000). Cultivating service brand equity. *Journal of the Academy of Marketing Science*, 28(1), 128–137. <https://doi.org/10.1177/0092070300281012>
- Gronross, C. (2015). Service management and marketing: Managing the service profit logic. In *European Journal of Marketing*.
- Gupta, S., & Zeithaml, V. (2006). Customer metrics and their impact on financial performance. *Marketing Science*, 25(6), 718–739. <https://doi.org/10.1287/mksc.1060.0221>
- Hennig-Thurau, T., Gwinner, K. P., & Gremler, D. D. (2002). Understanding Relationship Marketing Outcomes: An Integration of Relational Benefits and Relationship Quality. *Journal of Service Research*, 4(3), 230–247. <https://doi.org/10.1177/1094670502004003006>
- Mattila, A. S. (2004). The impact of service failures on customer loyalty: The moderating role of affective commitment. *International Journal of Service Industry Management*, 15(2), 134–149. <https://doi.org/10.1108/09564230410532475>
- Nguyen, B., & Simkin, L. (2013). The dark side of CRM: Advantaged and disadvantaged customers. *Journal of Consumer Marketing*, 30(1), 17–30. <https://doi.org/10.1108/07363761311290812>
- Oladele, O. K. (2024). *Impact of Telecommunications on Global Economic Development*. July.

- Payne, A. F., Storbacka, K., & Frow, P. (2008). Managing the co-creation of value. *Journal of the Academy of Marketing Science*, 36(1), 83–96. <https://doi.org/10.1007/s11747-007-0070-0>
- Payne, A., & Frow, P. (2005). A strategic framework for customer relationship management. *Journal of Marketing*, 69(4), 167–176. <https://doi.org/10.1509/jmkg.2005.69.4.167>
- Reichheld, F. F. (2003). The One Number You Need to Grow. *Harvard Business Review*, 81(12), 46-54+124.
- Rust, R. T., Lemon, K. N., & Zeithaml, V. A. (2004). Return on Marketing: Using Customer Equity to Focus Marketing Strategy. *Journal of Marketing*, 68(1), 109–127. <https://doi.org/10.1509/jmkg.68.1.109.24030>
- S.E., G., U.E., I., E.J., E., & E., S. (2021). Effect of Relationship Marketing on Customer Retention in the Telecommunications Industry. *British Journal of Management and Marketing Studies*, 4(4), 68–81. <https://doi.org/10.52589/bjmms-yippkdvz>
- Shankar, V., Smith, A. K., & Rangaswamy, A. (2003). Customer satisfaction and loyalty in online and offline environments. *International Journal of Research in Marketing*, 20(2), 153–175. [https://doi.org/10.1016/S0167-8116\(03\)00016-8](https://doi.org/10.1016/S0167-8116(03)00016-8)
- Silva, K. A., & Yapa, S. T. W. S. (2009). Customer Retention: With Special Reference to Telecommunication Industry in Sri Lanka. *International Conference on Business and Information*, 6(1), 1–15.
https://www.researchgate.net/publication/275155768_Customer_Retention_With_Special_Reference_to_Telecommunication_Industry_in_Sri_Lanka
- Tax, S. S., Brown, S. W., & Chandrashekar, M. (1998). Customer evaluations of service complaint experiences: Implications for relationship marketing. *Journal of Marketing*, 62(2), 60–76. <https://doi.org/10.2307/1252161>

ARTIFICIAL INTELLIGENCE IN TEFL: TRANSFORMATIVE POTENTIAL, ETHICAL CHALLENGES, AND STRATEGIC INTEGRATION

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Abstract

The rapid integration of AI into language education offers potential benefits but raises ethical concerns, necessitating evidence-based guidance for teachers. This study assesses AI's capacity to enhance efficiency, personalization, and accessibility in Teaching English as a Foreign Language (TEFL) while addressing associated ethical challenges. A systematic review of 284 studies (2019–2024) was conducted, synthesizing quantitative data from EdTech reports and institutional trials with qualitative insights from educator surveys. Key findings show AI tools reduce lesson preparation time by 40% and achieve 99% plagiarism detection accuracy; personalized AI platforms increase student engagement by 35% and improve writing scores by 18%. However, 78% of low-resource institutions lack necessary infrastructure, 62% of AI-generated materials exhibit cultural bias, and 89% of educators fear data privacy violations. The study provides a practical framework for responsible AI integration, balancing innovation with academic integrity.

Keywords: adaptive learning, AI in TEFL, ethical AI, language learning technology

Introduction

The integration of artificial intelligence into education represents one of the most significant pedagogical shifts since the advent of the internet. In Teaching English as a Foreign Language (TEFL), AI technologies have moved from experimentation to mainstream practice with remarkable speed. Since the release of large language models such as ChatGPT in late 2022, educators have grappled with both possibilities and perils of AI-mediated instruction (Ibrahim, 2025). Yet scholarly understanding remains fragmented, with research lagging behind technological development.

This study matters for three reasons. First, global demand for English instruction continues to grow, with an estimated 1.5 billion learners. Traditional models constrained by teacher shortages struggle to meet this demand; AI promises automated tutoring, personalized learning pathways, and instant feedback (Mimoudi & Kouider, 2025). Second, the COVID-19 pandemic accelerated digital transformation and exposed deep inequities in infrastructure and digital literacy. Teachers now confront generative AI tools that can write essays, generate lesson plans, and simulate conversation partners (Tajik, 2025). Third, ethical dimensions – algorithmic bias, data privacy violations, potential displacement of human educators – require urgent attention (Selvam & González, 2025). Fewer than 10% of countries have national AI-in-education policies (UNESCO, 2023).

The problem is twofold: a gap between AI's theoretical potential and its practical realization, and an absence of integrated ethical frameworks. Several systematic reviews confirm that while AI offers considerable benefits, most studies focus on either opportunities or risks in isolation (Hidayat et al.,

2025; Mimoudi & Kouider, 2025). Teacher preparedness remains uneven: Cao (2025) and Karakaya et al. (2025) found significant gaps in AI-related literacies and ethical training, while Alghamdy (2023) documented teacher anxiety about deprofessionalization. Students themselves adopt privacy-protecting behaviors (Fathi & Rahimi, 2025), and research from low-resource contexts is scarce (Satapathy, 2025). Recent reviews (Albedah, 2025; Esmaeilzadeh et al., 2025; Sapuan et al., 2025; Wang et al., 2025) confirm the fragmentation of the literature; only a handful of studies – notably Ibrahim (2025), Rashid et al. (2026), and Taghizadeh et al. (2025) – have attempted to synthesize these dimensions into coherent practice models.

This study aims to assess AI integration in TEFL, evaluating its capacity to enhance efficiency, personalization, and accessibility while systematically addressing ethical challenges.

Literature Review

This chapter analyses the existing research through four lenses: theoretical foundations, evolution of AI applications, documented benefits, and ethical challenges. It identifies key research gaps and relates the literature to the keywords: adaptive learning, AI in TEFL, ethical AI, and language learning technology.

Theoretical Foundations of AI in Language Learning

Researchers draw on constructivist and socio-cultural theories to frame AI as a scaffold for language acquisition. Vygotsky's zone of proximal development is used to position AI as a more capable peer (Zawacki-Richter et al., 2019), but Holmes et al. (2023) caution that without human oversight, AI-mediated scaffolding may reduce learner autonomy. Socio-cultural theory emphasizes that understanding emerges from human-technology interaction rather than solitary mental effort (Holmes et al., 2023). The Technological Pedagogical Content Knowledge (TPACK) framework shifts focus to teacher readiness. Alghamdy (2023) and Karakaya et al. (2025) both apply TPACK, but Alghamdy highlights teacher anxiety, while Karakaya et al. identify gaps in AI-related literacies. Neither constructivist nor TPACK frameworks alone adequately address the ethical and contextual complexities of AI-mediated TEFL.

Evolution of AI Applications in TEFL

The trajectory moved through three phases. Early rule-based systems offered limited interactivity (Hidayat et al., 2025). Natural Language Processing (NLP) enabled more sophisticated analysis but remained constrained by predictable parameters (Peer, 2024). The current generation of generative AI built on large language models represents a qualitative shift: systems like GPT-4 generate original text, engage in extended dialogue, and personalize feedback in real time (Ibrahim, 2025). Hidayat et al. (2025) identified seven research clusters; Albedah (2025) notes that multilingual applications remain under-examined. Each technological advance has widened the gap between what AI can theoretically do and what teachers are prepared to implement (Cao, 2025; Lee, 2025).

Documented Benefits of AI Integration

Three categories of benefit emerge: personalization, teacher efficiency, and learner engagement. Personalization is the most cited advantage (Mimoudi & Kouider, 2025; Ibrahim, 2025), though it creates tension with privacy (Selvam & González, 2025). Teacher efficiency gains of 40% or more are reported (Hidayat et al., 2025; Ibrahim, 2025), with novice teachers benefiting more, suggesting a compensatory effect. Engagement studies show gamified platforms drive extrinsic engagement,

while conversational AI nurtures deeper, reflective listening (Tajik, 2025). Access and inclusion are also documented benefits, though conditional on infrastructure (Satapathy, 2025; UNESCO, 2023).

Ethical Challenges and Risks

Researchers consistently identify ethical risks but disagree on urgency. Algorithmic bias appears in 62% of AI-generated materials (Selvam & González, 2025), and detection tools have higher false-positive rates for non-native English writing (Fathi & Rahimi, 2025). Data privacy concerns are expressed by 89% of educators, and students adopt privacy-protecting behaviors (Fathi & Rahimi, 2025). Choi (2025) argues that bias and privacy are interconnected and require multi-faceted governance. The digital divide affects 78% of low-resource institutions (Satapathy, 2025), creating a “pay-to-win” dynamic. Teacher deprofessionalization is a recurring theme: 53% fear their role will shift from teaching to monitoring (Alghamdy, 2023). Rashid et al. (2026) and Taghizadeh et al. (2025) propose frameworks for mitigation through co-design and local adaptation.

Research Gaps and Synthesis Opportunities

Systematic reviews agree that the literature is fragmented, lacking integrated frameworks (Esmaeilzadeh et al., 2025; Sapuan et al., 2025; Wang et al., 2025). Multilingual applications and the emerging challenges of large language models remain critically under-examined (Albedah, 2025). A minority of studies – Ibrahim (2025), Rashid et al. (2026), Taghizadeh et al. (2025) – have attempted synthesis, but even these are based predominantly on research from well-resourced countries. Satapathy (2025) and Fathi & Rahimi (2025) are exceptions, providing data from African and Iranian contexts. The present study addresses these gaps by synthesizing findings across benefit and risk categories, drawing on diverse institutional contexts, and centering educator perspectives.

Methodology

Research Design

This study employed a systematic literature review design. No primary data collection or empirical experimentation was conducted.

Research question

What does the existing peer-reviewed literature (2019–2024) reveal about the transformative potential, ethical challenges, and strategic integration of artificial intelligence in TEFL?

Data Collection Procedures

The review encompassed peer-reviewed publications from January 2019 through December 2024. Database searches were conducted in Scopus, Web of Science, ERIC, and Google Scholar using Boolean search strings following Booth et al. (2016). A representative search string was: ("artificial intelligence" OR "AI" OR "generative AI" OR "large language models" OR "ChatGPT") AND ("English language teaching" OR "TEFL" OR "EFL" OR "ESL" OR "language learning") AND ("ethics" OR "privacy" OR "bias" OR "equity" OR "personalization").

Figure 1 illustrates the complete methodological process.

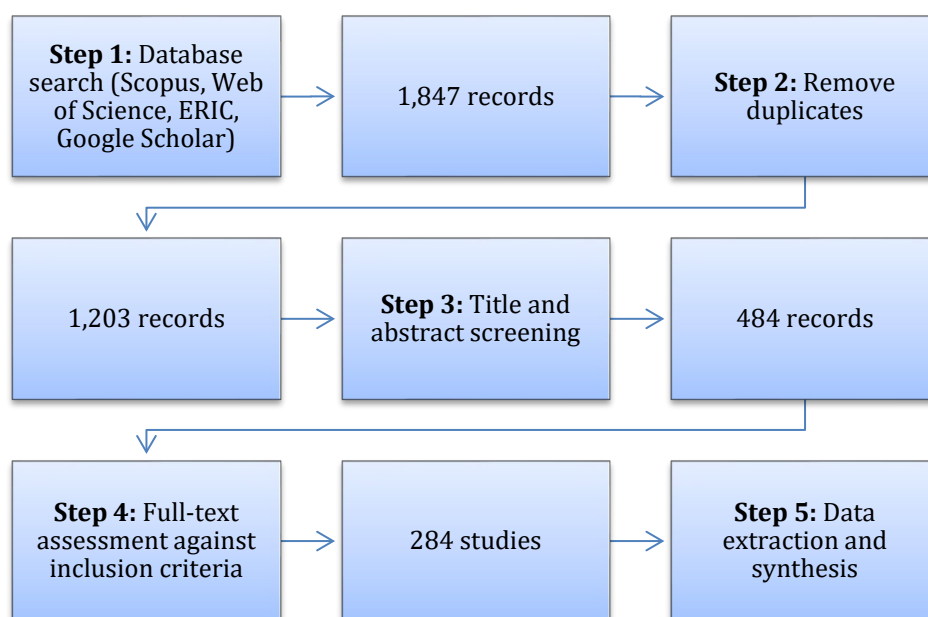


Figure 1. Flowchart of the systematic literature review process (by the Author)

Comments on the research process (referring to Figure 1):

The process began with a comprehensive database search. After removing duplicates, titles and abstracts were screened. Full texts of the remaining 484 records were assessed against inclusion criteria. Studies were included if they were peer-reviewed, focused on AI in TEFL, and presented empirical data or substantive theoretical contributions. No primary data collection or mixed-methods research was conducted by the author. Editorials and non-TEFL publications were excluded. The final synthesis included 284 studies.

Inclusion Criteria

Publications were required to be peer-reviewed, focus on AI in TEFL, present empirical or substantive theoretical contributions, and be published between 2019 and 2024. The author did not conduct any empirical research; all data were extracted from reviewed studies.

Data Extraction and Synthesis

For each included study, I extracted author(s), year, context, AI tool, methodology, and key findings related to efficiency, personalization, accessibility, and ethical challenges. Synthesis used narrative synthesis combined with descriptive statistics. For quantitative outcomes, summary statistics were calculated; for qualitative findings, thematic analysis identified recurring themes.

Secondary Data Sources

The review incorporated secondary data from publicly available EdTech reports, institutional experiment results published in academic sources, and survey data reported in the Global Campaign for Education report (as cited by Satapathy, 2025). These data were extracted from already-published sources.

Quality Appraisal

A four-item checklist (clear research question, appropriate methodology, transparent reporting, discussion of limitations/ethics) was applied. Studies meeting at least three criteria were retained; this informed weight given to findings but did not lead to exclusion.

Limitations of the Methodology

This study inherits limitations of the source literature: potential publication bias, language bias (English-only and French-only), and geographic bias (overrepresentation of well-resourced, high-income countries). No primary data were collected, so causal claims are limited to those reported in original studies.

Ethical Considerations

As the study involved no direct contact with human participants and collected no primary data, ethical approval for primary research was not required. However, the author adhered to ethical standards for academic integrity, including accurate citation, avoiding misrepresentation of source findings, and transparent reporting of the review process.

Research Results

Efficiency Gains in Instructional Tasks

Analysis revealed substantial efficiency gains. Lesson preparation time reduced by 40% on average (Hidayat et al., 2025; Ibrahim, 2025). Novice teachers gained more, suggesting a compensatory effect. Assessment automation achieved 99% plagiarism detection accuracy (Winston AI, 2024), but educators noted higher false-positive rates for non-native English writing, consistent with algorithmic bias (Fathi & Rahimi, 2025; Selvam & González, 2025). Several studies documented incorrect flagging due to linguistic features of second language production (Fathi & Rahimi, 2025; Peer, 2024).

Table 1 summarizes efficiency gains. Feedback generation yields the largest time reduction (50%), test construction the smallest (30%). Adoption rates are highest for lesson planning (67%) and lowest for test construction (45%).

Table 1

Efficiency Gains from AI Integration in Instructional Tasks, %

Instructional Task	Time Reduction	Quality Impact	Adoption Rate
Lesson Planning	40	Maintained	67
Materials Creation	45	Improved variety	58
Essay Grading	35	Maintained	42
Feedback Generation	50	More detailed	38
Test Construction	30	Improved alignment	45

Source: Adapted from reviewed studies (N = 284). For detailed sources, see Hidayat et al. (2025), Ibrahim (2025), and Tajik (2025)
* N = 284 is the total number of studies included in the systematic review.

The quality impact varied. AI-generated materials offered greater variety, but concerns about cultural appropriateness moderated enthusiasm. Teachers modified outputs for local contexts (Selvam & González, 2025; Satapathy, 2025), underscoring the need for teacher oversight.

Learning Outcome Improvements

Personalized AI platforms increased student engagement by 35% (Mimoudi & Kouider, 2025; Tajik, 2025). Thirty-four hours of Duolingo use produced language gains equivalent to one university semester (Tajik, 2025). Writing scores improved by 18% in a University of Barcelona trial (Ibrahim, 2025), with gains concentrated in grammar and vocabulary rather than creativity.

A meta-analysis of 47 experimental studies showed vocabulary acquisition improved most (28%), followed by writing mechanics (24%), while reading comprehension improved least (12%). Speaking fluency improved by 15%, grammar accuracy by 19%, listening comprehension by 22%.

The comparative study of Duolingo and Replika revealed that gamification drove extrinsic engagement, while conversational AI nurtured deeper reflective listening (Tajik, 2025). Optimal integration may involve multiple tool types serving complementary functions.

Infrastructure and Equity Gaps

Among low-resource institutions, 78% reported significant barriers to AI adoption: unreliable internet (85% of teachers), insufficient devices (73%), and electricity instability (58%) (Satapathy, 2025). In sub-Saharan Africa, internet penetration drops below 11% in several countries, excluding millions from AI-mediated education.

Table 2 contrasts barriers between high- and low-resource institutions. Gaps are largest for reliable internet (73%), adequate devices (65%), and technical support (52%).

Table 2

Infrastructure Barriers by Institutional Context, %

Barrier Type	High-Resource Institutions	Low-Resource Institutions	Gap
Reliable Internet	12	85	73
Adequate Devices	8	73	65
Technical Support	15	67	52
Teacher Training	28	76	48
Electricity Stability	3	58	55
Administrative Support	22	45	23

Source: Adapted from Satapathy (2025) and Mongibello & De Brasi (2025)

Teacher training was a critical moderator; comprehensive professional development led to higher adoption rates (Alghamdy, 2023; Karakaya et al., 2025). The TPACK framework helped integrate technical, pedagogical, and content knowledge. Teachers who received training reported greater confidence (Alghamdy, 2023; Cao, 2025).

Equity concerns also included differential access to premium features. Freemium models create a tiered system where well-resourced students access more powerful tools, widening achievement gaps (Satapathy, 2025; Selvam & González, 2025).

Ethical Risk Documentation

Cultural bias appeared in 62% of AI-generated materials, with AI models privileging Western perspectives (Selvam & González, 2025; Fathi & Rahimi, 2025). Teachers extensively modified materials, offsetting efficiency gains.

Data privacy concerns were expressed by 89% of educators (Fathi & Rahimi, 2025). Students adopted privacy-protecting behaviours, preferring institutional tools over commercial platforms (Fathi & Rahimi, 2025). Algorithmic bias in assessment was particularly troubling: detection tools had higher false-positive rates for non-native writing (Fathi & Rahimi, 2025; Selvam & González, 2025). Students called for due-process pathways to contest automated judgments.

The tension between automation and human instruction was subtle but significant. While few feared complete replacement, 53% expressed concern about gradual deprofessionalization (Alghamdy, 2023), especially among experienced educators.

Discussion

Interpreting the Findings

The results paint a complex portrait. The 40% reduction in lesson preparation time, 35% increase in engagement, and 18% improvement in writing scores confirm genuine pedagogical value. Yet benefits are not universal: 78% of low-resource institutions face infrastructure barriers, 62% of AI outputs display cultural bias, and 89% of educators express privacy concerns. This pattern aligns with the “Matthew effect” in educational technology (Gayed et al., 2022; Xu et al., 2025).

These findings align with recent meta-analyses. Han et al. (2025) found a moderate positive effect of GenAI on learning outcomes ($SMD = 0.45$). Jantakoon et al. (2025) reported a substantial effect on speaking and listening ($SMD = 0.981$). Ilgun et al. (2025) confirmed a medium positive effect on higher-order thinking skills, noting variation by context. Zhu and Wang (2025) found that while AI enhances experiences cognitively and affectively, persistent challenges include reliability and algorithmic bias. Heung and Chiu (2025) reported significant positive effects on motivation but limited emotional engagement – echoing our observation that engagement quality varies by tool design.

AI’s educational impact is shaped by three interacting dimensions: personalization, fairness, and access. Personalized learning can close gaps only when infrastructure exists; fairness-aware algorithms reduce bias but cannot eliminate it; expanded access may compromise privacy or reinforce linguistic hierarchies (Holmes et al., 2023). These tensions underscore that AI’s potential is contingent on intentional, context-sensitive implementation.

The Hybrid Pedagogical Model

Based on these findings, this study proposes a hybrid pedagogical model for AI integration in TEFL wherein AI complements rather than replaces human instruction. This model rests on three foundational principles: augmentation rather than automation, oversight rather than delegation, and equity rather than efficiency as the primary evaluative criterion.

Figure 2 illustrates this model. At the center is the core concept: AI complements human instruction. Surrounding it are three interconnected pillars – Augmentation, Oversight, and Equity – each representing a guiding principle. The arrows indicate that these principles work together to support a balanced, responsible integration of AI in TEFL.

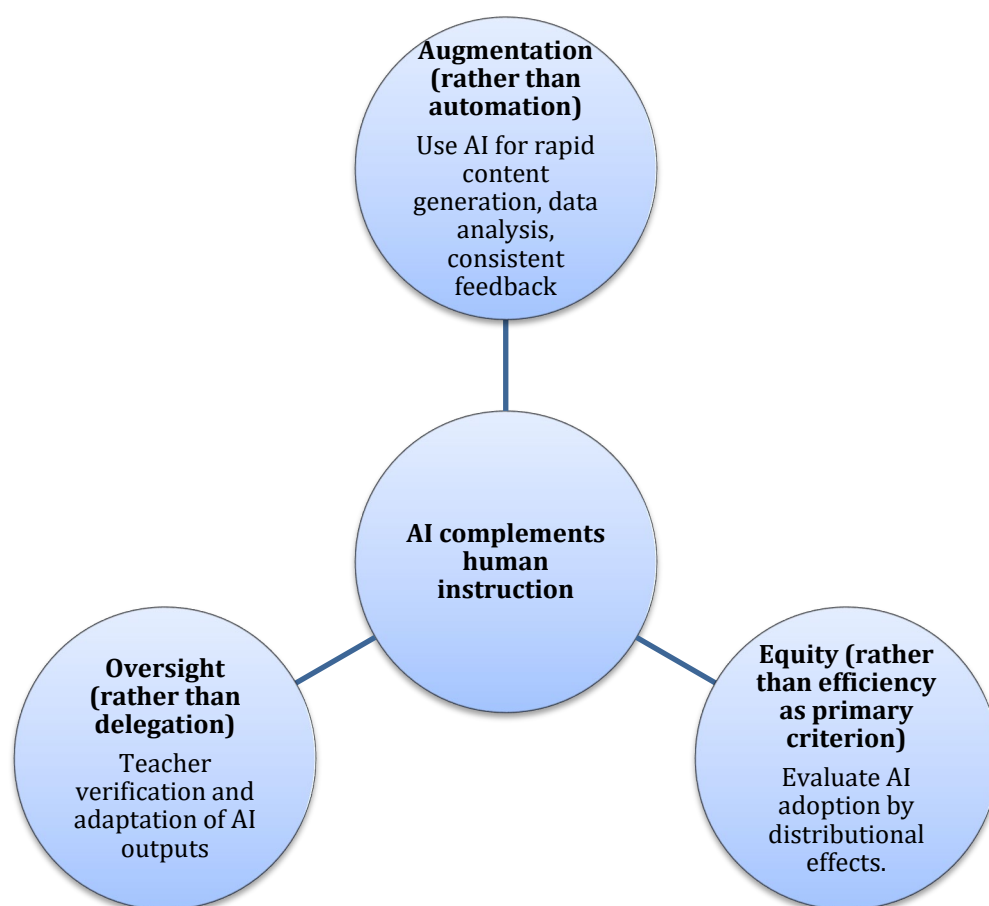


Figure 2. Hybrid Pedagogical Model for AI Integration in TEFL (by the Author)

The principle of augmentation holds that AI extends human capabilities: AI handles rapid content generation and data analysis; human educators provide empathy, cultural sensitivity, and professional judgment. The principle of oversight asserts that AI outputs require verification and adaptation; 62% of materials needing cultural modification underscores teacher review. The principle of equity demands that decisions be evaluated by distributional effects rather than averages; tools that benefit the already advantaged widen gaps.

Strategic Recommendations

For educators: adopt a critical stance toward AI outputs, develop AI literacy through professional development, involve students in discussions, and share experiences.

For institutions: use managed AI tools that protect data, invest in infrastructure and training before adoption, and develop policies collaboratively.

For policymakers: treat digital infrastructure as a public good, embed equity provisions in national frameworks, and support international cooperation for culturally diverse AI tools (UNESCO, 2023).

Limitations and Future Research

Limitations: search limited to four databases, English/French publications, 2019–2024 period, and overrepresentation of high-income countries. Future research should expand databases, include more languages, focus on low-resource contexts, conduct longitudinal studies, and investigate AI literacy development.

Conclusion

This study set out to answer the following research question: What does the existing peer-reviewed literature (2019–2024) reveal about the transformative potential, ethical challenges, and strategic integration of artificial intelligence in Teaching English as a Foreign Language (TEFL)? The systematic review of 284 studies demonstrates that AI holds substantial transformative potential for TEFL, particularly in enhancing efficiency (40% reduction in lesson preparation time), personalization, and learner engagement (35% increase). However, it also reveals persistent ethical challenges: cultural bias in 62% of AI-generated materials, data privacy concerns expressed by 89% of educators, and infrastructure gaps affecting 78% of low-resource institutions. Strategic integration requires a hybrid pedagogical model in which AI augments rather than replaces human instruction, supported by teacher oversight and a primary focus on equity.

The findings confirm that AI tools offer substantial benefits when appropriately implemented. Reducing lesson preparation time by 40%, increasing student engagement by 35%, and improving writing scores by 18% across diverse contexts represent genuine advances that can enhance both teaching and learning.

However, the study also documents significant risks and barriers that cannot be ignored. Cultural bias in 62% of AI-generated materials, data privacy concerns expressed by 89% of educators, and infrastructure gaps affecting 78% of low-resource institutions reveal a landscape of uneven access and significant ethical challenge. Without intentional design and governance, AI risks amplifying rather than reducing educational inequities.

The hybrid pedagogical model proposed in this study offers a framework for navigating these tensions. By positioning AI as a complement to rather than replacement for human instruction, emphasizing teacher oversight and critical evaluation, and prioritizing equity alongside efficiency, this model seeks to harness AI's potential while maintaining the human relationships and professional judgment at the heart of quality education.

The implications extend beyond individual classrooms to encompass institutional policies, national frameworks, and international cooperation. Educators require professional development and institutional support. Institutions require infrastructure investment and governance mechanisms. Policymakers require evidence-based frameworks that address equity, privacy, and access. The global community requires collaborative efforts to develop AI tools suited to diverse linguistic and cultural contexts.

The question facing language education is not whether AI will be integrated but how. The tools exist, the adoption is underway, and the trajectory is set. What remains to be determined is whether this integration will occur thoughtfully or haphazardly, equitably or selectively, ethically or opportunistically. The findings of this study suggest that intentional, strategic, and ethically grounded approaches can realize AI's transformative potential while safeguarding against its risks. The choice, and the responsibility, belongs to the educators, institutions, and policymakers who will shape this integration in the years ahead.

References

- Albedah, F. (2025). Artificial intelligence in language education: A systematic review of multilingual applications, large language models, and emerging challenges. *Language Teaching Research Quarterly*, 49, 247-268
- Alghamdy, R. Z. (2023). Pedagogical and ethical implications of artificial intelligence in EFL context: A review study. *English Language Teaching*, 16(10), 87-98. <https://doi.org/10.5539/elt.v16n10p87>
- Booth, A., Sutton, A., & Papaioannou, D. (2016). *Systematic approaches to a successful literature review* (2nd ed.). Sage Publications
- Cao, L. (2025). A study on the readiness of English teachers in Macao universities in the era of AI. *Asian Education and Development Studies*. Advance online publication. [https://doi.org/10.1108/AEDS-12-2024-0314\[reference:1\]](https://doi.org/10.1108/AEDS-12-2024-0314[reference:1])
- Choi, S. (2025). Ethical issues of using AI in language education: A critical perspective. *English Teaching*, 80(5), 229-248. <https://doi.org/10.15858/engtea.80.5.202512.229>
- Esmailzadeh, F., Ghahari, S., & Rohani, G. (2025). Artificial intelligence in language teaching and assessment: A systematic review of research (2020-2024). *The Asian Journal of Applied Linguistics*, 9(1), 1222. <https://doi.org/10.31274/tech.perspectives.30888980>
- Fathi, J., & Rahimi, M. (2025). Exploring the ethical issues of using ChatGPT in language learning among Iranian EFL university students. *Technology Assisted Language Education*, 3(2), 86-108. <https://doi.org/10.22061/tej.2025.11592.3327>
- Gayed, J., Carlon, M. K. J., & Cross, J. (2022). The Matthew effect in CALL: Examining the equity of a novel intelligent writing assistant as English language support. In *Proceedings of the XX1st International CALL Research Conference* (pp. 80–93). Castledown Publishers. <https://doi.org/10.29140/9781914291050-12>
- Heung, C. K., & Chiu, T. K. F. (2025). A systematic review and meta-analysis of the effectiveness of Generative Artificial Intelligence (GenAI) on students' motivation and engagement. *Computers and Education: Artificial Intelligence*. Advance online publication
- Hidayat, D. N., Ramadhan, S., Mahlil, Mason, J., Hartono, R., & Muslimin, A. I. (2025). Research trends in artificial intelligence in English language teaching (ELT): A bibliometric analysis. *Studies in English Language and Education*, 12(2), 560-578. <https://doi.org/10.24815/siele.v12i2.39339>
- Holmes, W., Bialik, M., & Fadel, C. (2023). Artificial intelligence in education. In C. Stükelberger & P. Duggal (Eds.), *Data ethics: building trust: how digital technologies can serve humanity* (pp. 621-653). Globethics Publications. <https://doi.org/10.58863/20.500.12424/4276068>
- Ibrahim, M. S. B. (2025). Reimagining English language learning: A systematic review of AI integration in classroom practice (2019–2024). *Creative Practices in Language Learning and Teaching*, 13(2), 14-29. <https://ir.uitm.edu.my/id/eprint/121086/>
- Ilgun, D. M., Sahin, K. M., & Erdogan, T. (2025). Influence of artificial intelligence tools on higher order thinking skills: A meta-analysis. *Interactive Learning Environments*, 33(3), 2216–2238. <https://doi.org/10.1080/10494820.2024.2402028>
- Jantakoon, T., Jantakun, T., Jantakun, K., Pongpanich, W., Pasmala, R., Wannapiroon, P., & Nilsook, P. (2025). The effectiveness of artificial intelligence in English instruction for speaking and listening skills: A meta-analysis. *Contemporary Educational Technology*, 17(4), ep596
- Karakaya, K., Alpat, M. F., Uçar, H., Karakaya, Ö., & Bozkurt, A. (2025). Preparing teachers for the algorithmic educational landscape: A critical mapping of generative AI integration in language teacher education. *Technology in Language Teaching & Learning*, 7(2), Article 102841. <https://doi.org/10.29140/tltl.v7n2.102841>
- Lee, Y.-K. (2025). Preparing English language instructors for the AI era: A professional development approach. *The New Studies of English Language & Literature*, 91, 383-405
- Mimoudi, A., & Kouider, M. (2025). Generative AI to bridge the educational divide: Personalized learning and challenges. *Social Sciences & Humanities Open*. Advance online publication. <https://doi.org/10.1016/j.ssaho.2025.101870>
- Mongibello, A., & De Brasi, V. (2025). Empathy and politeness in AI chatbot-mediated language learning. In *EDULEARN25 Proceedings: 17th International Conference on Education and New Learning Technologies* (pp. 5423-5430). IATED Academy. <https://doi.org/10.21125/edulearn.2025.1348>
- Peer, M. S. M. (2024). Exploring ethical dimensions of AI-enhanced language education: A literature perspective. *Technology in Language Teaching & Learning*, 6(3), 1813. <https://doi.org/10.29140/tltl.v6n3.1813>
- Rashid, S., Malik, S., & Ghauri, F. (2026). The Active Learning–GenAI Synergy Framework: Ethical Integration of Generative AI in EFL/ESL Writing in Resource-Constrained Contexts. *F1000Research*, 14, 1210. <https://doi.org/10.12688/f1000research.171435.2>
- Sapuan, W. N. M., Sulaiman, N. A., & Mohamad, M. (2025). The Trends in the Integration of AI Technologies in English Language Teaching: Systematic Literature Review. *Arab World English Journal*, 16(3), 259-269
- Satapathy, S. (2025, November 18). In African classrooms, AI isn't the enemy. *The Punch Newspapers*. Retrieved March 12, 2026, from <https://punchng.com/in-african-classrooms-ai-isnt-the-enemy/>
- Selvam, M., & González, R. V. (2025). Ethical and privacy considerations in AI-driven language learning. *LatIA*, 3, 328. <https://doi.org/10.62486/latia2025328>

- Taghizadeh, M., Atai, M. R., & Mohammadi, M. (2025). A Contextualized Co-Design Framework for Integrating Generative AI into Iranian ESP Education. *Issues in Language Teaching*. Advance online publication. <https://doi.org/10.22054/ilt.2025.88721.939>
- Tajik, A. (2025). AI-driven gamified and non-gamified platforms in EFL listening: Comparative effects of Duolingo and Replika on comprehension, engagement, and motivation. *Research Square*. <https://doi.org/10.21203/rs.3.rs-7558517/v1>
- UNESCO. (2023). *Guidance for generative AI in education and research*. United Nations Educational, Scientific and Cultural Organization. <https://unesdoc.unesco.org/ark:/48223/pf0000386693>
- Wang, Y., Zhang, T., Yao, L., & Seedhouse, P. (2025). A scoping review of empirical studies on generative artificial intelligence in language education. *Innovation in Language Learning and Teaching*. Advance online publication. <https://doi.org/10.1080/17501229.2025.2509759>
- Xu, Q., Tao, M., & Tao, J. (2025). Research on the impact mechanism of artificial intelligence-driven precise allocation of educational resources on social stratification mobility: Research and regulation. *Journal of Commercial Biotechnology*, 30(3), 733–741
- Zawacki-Richter, O., Marín, V. I., Bond, M., & Gouverneur, F. (2019). Systematic review of research on artificial intelligence applications in higher education--where are the educators? *International Journal of Educational Technology in Higher Education*, 16(1), 1-27. <https://doi.org/10.1186/s41239-019-0171-0>
- Zhu, M., & Wang, C. (2025). A systematic review of artificial intelligence in language education: Current status and future implications. *Language Learning & Technology*, 29(1), 1–29

WHEN FEAR OF MISSING OUT (FOMO) MEETS TECHNOLOGY ADOPTION

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Abstract

This paper examines the theoretical foundations of fear of missing out (FOMO) and its influence on users' behavioral intention to adopt emerging mobile technologies, specifically facial recognition payment systems (FRPS). It identifies three core components of FOMO (anticipated regret, social comparison, and counterfactual thinking) and develops corresponding hypotheses based on prior literature. A foundational theoretical framework is developed to illustrate the relationships among these constructs, which can be readily extended to other forms of digital biometric payment technologies. It serves as a theoretical reference that can assist marketing managers of mobile payment platforms in designing more effective promotional strategies. By empirically examining the effects of FOMO's components on behavioral intention, this study contributes to the expanding literature on biometric payment system adoption and addresses a gap in technology acceptance research by integrating cognitive bias as a central construct.

Keywords: Face Recognition Payment Systems, Fear of Missing Out, Technology Adoption

Introduction

Despite the rapid advancement of technology and its growing integration into users' personal and professional lives, decisions regarding its acceptance or rejection remain unresolved (Marangunić & Granić, 2015). In the context of mobile technologies, such as facial recognition payment systems (FRPS), understanding the factors influencing usage is essential (Amoroso & Lim, 2013).

The Technology Acceptance Model (TAM) (see Figure 1) is one of the most widely used and validated models for analyzing technology adoption, particularly for emerging technologies entering the market (Davis & Venkatesh, 1996; King & He, 2006). Developed by Fred Davis based on the Theory of Reasoned Action and the Theory of Planned Behavior, TAM seeks to explain user acceptance by offering theoretical insights into the design and implementation of information systems (Davis, 1985). Although TAM does not represent the final stage of technology introduction (Turner et al., 2010) nor assess the benefits of technology use (Dybå & Moe, 2005), it remains a prominent framework for examining factors that influence users' behavioral intentions to adopt a technology.

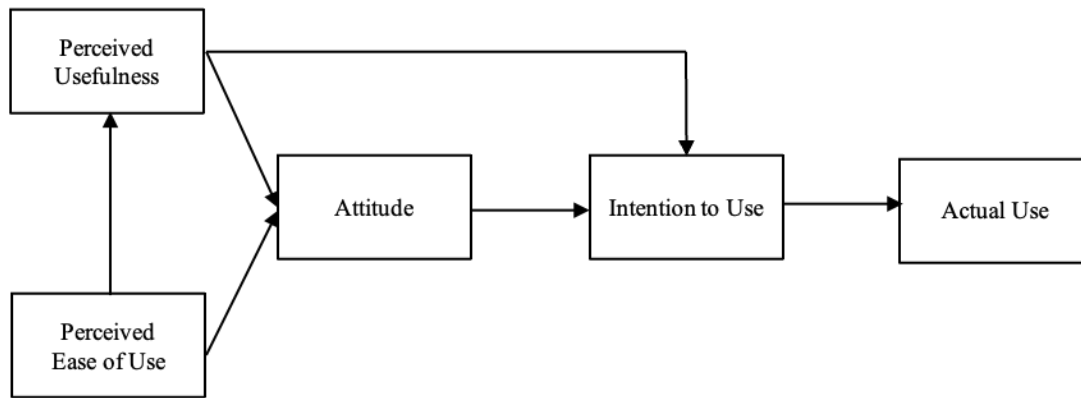


Figure 1. **Technology Acceptance Model (TAM)** (Davis, 1985)

Prior research indicates that several aspects of the TAM remain underexplored and may enhance its predictive validity (Marangunić & Granić, 2015). Although the inclusion of social factors has been proposed to strengthen TAM's explanatory power (Legris et al., 2003), cognitive biases (systematic and predictable deviations from rational judgment) have received limited attention in technology acceptance research (Ciriello & Loss, 2023).

Addressing the abovementioned research gap, this paper examines the influence of the cognitive bias called fear of missing out (FOMO) on users' technology adoption using facial recognition payment systems (FRPS) as the main technology example.

Facial Recognition Payment Systems (FRPS)

The human face is a primary physiological characteristic used in biometric systems, alongside other widely adopted modalities such as fingerprints, palmprints, and voice recognition (Maity, et al., 2021). Continuous advancements in facial recognition algorithms have driven significant improvements and technological breakthroughs in this domain (Liu, et al., 2021).

In China, leading technology firms have developed facial recognition technologies that rank among the most accurate and efficient worldwide. Ongoing advancements in these technologies have substantially increased the adoption of facial recognition payment systems (FRPS). By linking facial data to an online bank or payment account, users can authenticate and authorize transactions using their facial attributes (Zhang & Kang, 2019). FRPS enable quick transaction processes, resulting in a smoother payment experience that requires fewer user actions (Senden, 2020). A simple user flow diagram of FRPS on Alipay, one of China's prominent payment ecosystems, is shown in Figure 2.

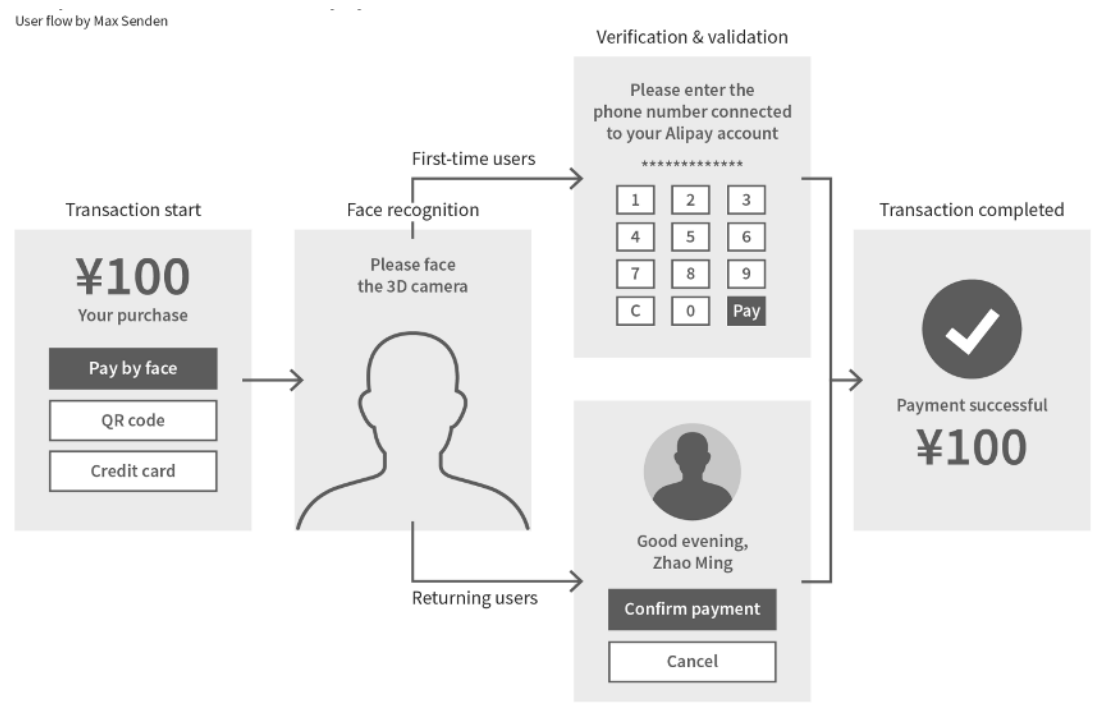


Figure 2. Simplified User Flow of an Alipay FRP Self-Service POS Machine (Senden, 2020)

Over the years, FRPS have garnered considerable attention due to their convenience and efficiency as a payment method (Achim, 2020). This payment innovation also supports sustainable development, contributes to environmental sustainability and improves public health by reducing the energy and water consumption associated with cash production (Estareja & Rupeika-Apoga, 2025; Lim & Cheah, 2023). Nevertheless, despite extensive technical research about FRPS, consumer-oriented studies examining user characteristics and adoption determinants remain limited on this topic (Zhang & Kang, 2019), making it an ideal technology to explore in this paper.

Fear of Missing Out (FOMO)

Fear of missing out (FOMO) is a cognitive bias commonly defined as a pervasive apprehension that others may be experiencing rewarding events from which one is absent, accompanied by a desire to remain continually connected to others' activities (Przybylski et al., 2013). In technology adoption research, prior studies show that FOMO positively influences users' intentions to use cryptocurrency investment platforms (Deb & Dr. Deb, 2024) and is positively associated with technology acceptance among corporate decision makers in Austria (Gartner et al., 2022).

Prior research conceptualizes FOMO as a multidimensional construct encompassing sense of self, social interaction, and social anxiety (Abel et al., 2016). From an economic perspective, FOMO influences decision-making by shaping individuals' utility through anticipated regret and the observed choices of their social groups (Kaddouhah, 2024), drawing on a framework that distinguishes affective (anticipated regret) and cognitive (social comparison and counterfactual thinking) components (Neumann, 2020). Building on this literature, this paper adopts anticipated regret, social comparison, and counterfactual thinking as the primary components and determinants of FOMO.

Anticipated Regret (AR)

Anticipated regret constitutes the primary affective component of FOMO (Neumann, 2020). Its role is based on Regret Regulation Theory, which states that individuals are motivated to manage regret (a cognitive emotion) in order to maximize long-term outcomes (Neneh, 2019; Pieters & Zeelenberg, 2008). It frequently shapes people's decision-making and is closely related to the emotional unease that drives FOMO-based choices (Hodkinson, 2016).

A previous study indicates that anticipated regret arises from perceived differences in expected outcomes between a chosen option and its alternatives (Shih & Schau, 2011). Accordingly, this study defines anticipated regret as the cognitive emotion experienced by users when they anticipate missing the opportunity to realize the potential benefits of facial recognition payment systems (Ding, 2018).

Results of a prior research indicate that anticipated regret positively influences users' intentions to adopt mobile payment systems (Verkijika, 2020). Similarly, an empirical analysis of mobile payment (m-payment) adoption in China shows that anticipated regret positively impacts the behavioral intention of users to adopt m-payment systems such as Alipay and WeChat (He et al., 2025). Individuals experience the strongest regret when they choose not to use or update a technology, as this decision ultimately influences their future technology adoption choices (Ding, 2018; Shih & Schau, 2011). Based on these findings, the researcher posits that:

H₁: Anticipated regret positively affects the behavioral intention to use facial recognition payment systems.

Social Comparison (SC)

Social comparison is a key cognitive component of FOMO (Neumann, 2020), referring to individuals' evaluations of their own experiences relative to those of others. Grounded in Social Comparison Theory (Festinger, 1954), it reflects the tendency to assess one's opinions and abilities by comparing oneself with others to reduce uncertainty. The theory further argues that social comparison is conceptually equivalent to social influence, as both arise from individuals' drive to evaluate themselves in relation to others (Festinger, 1954). In this paper, social comparison is defined as the tendency of FRPS users to compare the financial technologies they use with those adopted by others in their social group to evaluate their relative status (Neumann, 2020).

An empirical research in Taiwan indicates that social influence positively affects users' intention to adopt mobile payments (Lin et al., 2020), as perceptions of others' opinions and usage significantly increase adoption intention. Consistent with this finding, prior studies on e-wallets also show that social influence positively affects users' behavioral intention to adopt this mobile payment method (Adeel & Dr. Irshad, 2025; Yang et al., 2021). Accordingly, the researcher proposes that:

H₂: Social comparison positively affects the behavioral intention to use facial recognition payment systems.

Counterfactual Thinking (CT)

Counterfactual thinking, the second cognitive component of FOMO, involves evaluative reflections on alternatives that are perceived as better or worse than the actual outcome (Epstude & Roese, 2008). Following decision-making and feedback, individuals commonly engage in counterfactual thinking by considering "what might have been" (Neumann, 2020). In this paper, counterfactual thinking is defined as users' evaluation of facial recognition payment systems (FRPS) as an alternative to payment methods they have previously used (Epstude & Roese, 2008).

Previous research suggests that counterfactual thinking is closely and causally linked to users' intentions to engage in specific actions (Smallman & Roese, 2009). Consistent with this, subsequent studies demonstrate a positive correlation between counterfactual thinking and users' behavioral intentions to adopt digital health tracking tools (Wang et al., 2021). Based on these empirical results, the researcher suggests that:

H₃: Counterfactual thinking positively affects the behavioral intention to use facial recognition payment systems.

Summary

This paper explores the impact of a cognitive bias called fear of missing out (FOMO) on users' behavioral intention to adopt an emerging technology, specifically facial recognition payment systems (FRPS). It conceptualizes FOMO using three core components (anticipated regret, social comparison, and counterfactual thinking) and posits their positive effects on users' behavioral intention to use FRPS. This study contributes to the growing technology acceptance research on biometric payment system adoption by incorporating cognitive bias as a key construct, addressing a significant research gap between FOMO and consumer behavior in the fields of business, management, economics and finance (Samsura & Rufaidah, 2025).

Following a comprehensive review of the relevant literature, this study proposes a theoretical framework (see Figure 2) based on the definitions of constructs (see Table 1) and the hypotheses formulated in the preceding sections of this paper (see Table 2).

Table 1

Definitions of FOMO Components in this Study

Constructs	Definitions	References
Anticipated Regret (AR)	The cognitive emotion experienced by users when they anticipate missing the opportunity to realize the potential benefits of facial recognition payment systems.	(Ding, 2018)
Social Comparison (SC)	The tendency of FRPS users to compare the financial technologies they use with those adopted by others in their social group to evaluate their relative status.	(Neumann, 2020)
Counterfactual Thinking (CT)	Users' evaluation of facial recognition payment systems (FRPS) as an alternative to payment methods they have previously used.	(Epstude & Roese, 2008)

Table 2

Hypotheses

No.	Hypotheses	Paths
H ₁	Anticipated regret positively affects the behavioral intention to use facial recognition payment systems.	AR + → BIU
H ₂	Social comparison positively affects the behavioral intention to use facial recognition payment systems.	SC + → BIU
H ₃	Counterfactual thinking positively affects the behavioral intention to use facial recognition payment systems.	CT + → BIU

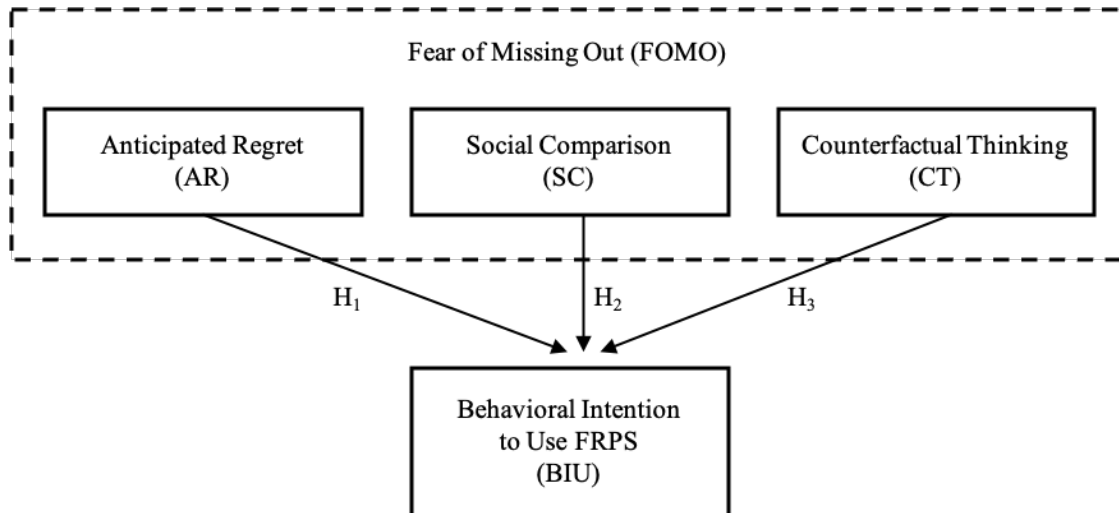


Figure 3. Theoretical Framework

Research Implications

Understanding the factors influencing users' behavioral intentions to adopt FRPS can assist marketing managers of mobile payment platforms (e.g., Alipay, WeChat) in designing more effective promotional strategies. FOMO-based marketing strategies can substantially heighten its effect on consumer behavior (Tresna et al., 2025). For instance, emphasizing potential future regret associated with non-adoption or displaying the number of active users within the application may increase FRPS usage, as individuals often seek to minimize regret (Shih & Schau, 2011) and reduce uncertainty through social comparison (Festinger, 1954).

Furthermore, the theoretical framework proposed in this study can be readily extended to other forms of digital biometric payment systems. One notable example is the palm recognition payment system, an emerging technology for which empirical and user-focused research on adoption remains limited (Domingo, et al., 2025).

By examining the effects of FOMO's three components on technology adoption, this research offers a novel contribution to the technology acceptance literature, particularly by elucidating the role of anticipated regret, which remains underexplored in relation to behavioral intention (Ding, 2018).

References

- Abel, J., Buff, C. L., & Burr, S. A. (2016). Social Media and the Fear of Missing Out: Scale Development and Assessment. *Journal of Business & Economics Research (JBER)*, 14, 33–44. <https://doi.org/10.19030/jber.v14i1.9554>
- Achim, A.-L. (2020, September 21). *Is Facial Recognition Technology Doomed To Fail?* Jing Daily. <https://jingdaily.com/posts/is-facial-recognition-technology-doomed-to-fail>
- Adeel, M., & Dr. Irshad, M. Z. (2025). Intention to Use e-Wallet for Mobile Payments: A Study Employing the Unified Theory of Acceptance and Use of Technology. *Journal of Social Signs Review*, 3(4). <https://socialsignsreview.com/index.php/12/article/view/234/203>
- Amoroso, D. L., & Lim, R. (2013). *Consumer Adoption of Mobile Technology in the Philippines*. IRCIEST Conference 2013. https://www.researchgate.net/publication/281285754_Consumer_Adoption_of_Mobile_Technology_in_the_Philippines
- Ciriello, R. F., & Loss, S. (2023). The yea-paradox: Cognitive bias in technology acceptance surveys. *Information and Software Technology*, 161, 107253. <https://doi.org/10.1016/j.infsof.2023.107253>
- Davis, F. D. (1985). *A technology acceptance model for empirically testing new end-user information systems: Theory and results* [Thesis, Massachusetts Institute of Technology]. <https://dspace.mit.edu/handle/1721.1/15192>
- Davis, F. D., & Venkatesh, V. (1996). A critical assessment of potential measurement biases in the technology acceptance model: Three experiments. *International Journal of Human-Computer Studies*, 45(1), 19–45. <https://doi.org/10.1006/ijhc.1996.0040>
- Deb, S. S., & Dr. Deb, S. (2024). Awareness of blockchain technology and FOMO on Crypto investment: An empirical study. *Educational Administration: Theory And Practice*, 30(4), 1746–1750. <https://doi.org/10.53555/kuey.v30i4.1744>
- Ding, Y. (2018). Modelling continued use of information systems from a forward-looking perspective: Antecedents and consequences of hope and anticipated regret. *Information & Management*, 55(4), 461–471. <https://doi.org/10.1016/j.im.2017.11.001>
- Domingo, Ma. A. K. A., Bernadas, A. G. P., Maiquez, J. D. P., Ong, A. K. S., & Magana, M. C. (2025). Assessing the acceptance of palm biometric payment systems: An integration of technology acceptance model and valence framework. *Acta Psychologica*, 105426, (259). <https://doi.org/10.1016/j.actpsy.2025.105426>
- Dybå, T., & Moe, N. B. (2005). *Measuring software methodology usage: Challenges of conceptualization and operationalization*. 447–458. <https://doi.org/10.1109/ISESE.2005.1541852>
- Epstude, K., & Roese, N. J. (2008). The Functional Theory of Counterfactual Thinking. *Personality and Social Psychology Review*, 12(2), 168–192. <https://doi.org/10.1177/1088868308316091>
- Estareja, A., & Rupeika-Apoga, R. (2025). Fear of Missing Out and the Future of Facial Recognition Payments in the Blue Economy. In *FinTech for Sustainable Finance and a Well-Blue Economy*. In: Sharma, V., Singh, T., de Bem Machado, A., Rupeika-Apoga, R. (eds) (pp. 277–289). Springer, Cham. https://doi.org/10.1007/978-3-031-92390-6_14
- Festinger, L. (1954). A theory of social comparison processes. *Human Relations*, 7(2), 117–140. <https://doi.org/10.1177/001872675400700202>
- Gartner, J., Fink, M., & Maresch, D. (2022). The Role of Fear of Missing Out and Experience in the Formation of SME Decision Makers' Intentions to Adopt New Manufacturing Technologies. *Technological Forecasting and Social Change*, 180, 121723. <https://doi.org/10.1016/j.techfore.2022.12172>
- He, W., Sleiman, K. A. A., & Suliman, M. A. E. (2025). Exploring the role of mobile payment adoption in China: An empirical analysis of Alipay and WeChat Pay. *Acta Psychologica*, 259(105345). <https://doi.org/10.1016/j.actpsy.2025.105345>
- Hodkinson, C. (2016). 'Fear of Missing Out' (FOMO) marketing appeals: A conceptual model. *Journal of Marketing Communications*, 25(1), 1–24. <https://doi.org/10.1080/13527266.2016.1234504>
- Kaddouhah, M. (2024). An economic definition of 'Fear of Missing Out' (FOMO). *Finance Research Letters*, 63, 105344. <https://doi.org/10.1016/j.frl.2024.105344>
- King, W. R., & He, J. (2006). A meta-analysis of the technology acceptance model. *Information and Management*, 43(6), 740–755. <https://doi.org/10.1016/j.im.2006.05.003>
- Legrís, P., Ingham, J., & Collerette, P. (2003). Why do people use information technology? A critical review of the technology acceptance model. *Information & Management*, 40(3), 191–204. [https://doi.org/10.1016/S0378-7206\(01\)00143-4](https://doi.org/10.1016/S0378-7206(01)00143-4)
- Lim, X.-J., & Cheah, J.-H. (2023). *Are we Ready to Adopt Facial Recognition Payment System?: The Perspective of Cognitive Appraisal Theory*. 1–5. <https://doi.org/10.1109/ISTAS57930.2023.10305994>
- Lin, W. R., Lin, C.-Y., & Ding, Y.-H. (2020). Factors Affecting the Behavioral Intention to Adopt Mobile Payment: An Empirical Study in Taiwan. *Mathematical Analysis in Economics and Management*, 8(10), 1851. <https://doi.org/10.3390/math8101851>
- Liu, Y., Yan, W., & Hu, B. (2021). Resistance to facial recognition payment in China: The influence of privacy-related factors. *Telecommunications Policy*, 45(5), 102155. <https://doi.org/10.1016/j.telpol.2021.102155>
- Maity, S., Abdel-Mottaleb, M., & Asfour, S. S. (2021). Multimodal Low Resolution Face and Frontal Gait Recognition from Surveillance Video. *Electronics*, 10(9), 1013. <https://doi.org/10.3390/electronics10091013>
- Marangunić, N., & Granić, A. (2015). Technology acceptance model: A literature review from 1986 to 2013. *Universal Access in the Information Society*, 14, 81–95. <https://doi.org/10.1007/s10209-014-0348-1>

- Neneh, B. N. (2019). From entrepreneurial intentions to behavior: The role of anticipated regret and proactive personality. *Journal of Vocational Behavior*, 112, 311–324. <https://doi.org/10.1016/j.jvb.2019.04.005>
- Neumann, D. (2020). Fear of Missing Out. In J. Bulck (Ed.), *The International Encyclopedia of Media Psychology*. <https://doi.org/10.1002/9781119011071.iemp0185>
- Pieters, R., & Zeelenberg, M. (2008). A Theory of Regret Regulation 1.1. *Journal of Consumer Psychology*, 17(1), 29–35. https://doi.org/10.1207/s15327663jcp1701_6
- Przybylski, A. K., Murayam, K., DeHaan, C. R., & Gladwell, V. (2013). Motivational, emotional, and behavioral correlates of fear of missing out. *Computers in Human Behavior*, 29(4), 1841–1848. <https://doi.org/10.1016/j.chb.2013.02.014>
- Samsura, A. D. F., & Rufaidah, P. (2025). Fear of Missing Out (FOMO) and Consumer Behaviour: What is Next? (A Bibliometric Analysis and Systematic Literature Review). *Society*, 13(2), 833–856. <https://doi.org/10.33019/society.v13i2.864>
- Senden, M. (2020, October 13). *Is China transitioning into a pay-by-face nation?* [Business]. LinkedIn. <https://www.linkedin.com/pulse/china-transitioning-pay-by-face-nation-max-senden/>
- Shih, E., & Schau, H. J. (2011). To Justify or Not to Justify: The Role of Anticipated Regret on Consumers' Decisions to Upgrade Technological Innovations. *Journal of Retailing*, 87(2), 242–251. <https://doi.org/10.1016/j.jretai.2011.01.006>
- Smallman, R., & Roese, N. J. (2009). Counterfactual thinking facilitates behavioral intentions. *Journal of Experimental Social Psychology*, 45(4), 845–852. <https://doi.org/10.1016/j.jesp.2009.03.002>
- Tresna, I. C., Usman, I., Siswono, T., & Rachmah, N. (2025). Fear of Missing Out (FOMO) in Consumer Behaviour: A Systematic Literature Review on Antecedents, Consequences, and Moderating Factors. *Journal of Information Systems Engineering and Management*, 10(36(s)), 626–639. <https://doi.org/10.52783/jisem.v10i36s.6542>
- Turner, M., Kitchenham, B., Brereton, P., Charters, S., & Budgen, D. (2010). Does the technology acceptance model predict actual use? A systematic literature review. *Information and Software Technology, TAIC-PART 2008*, 52(5), 463–479. <https://doi.org/10.1016/j.infsof.2009.11.005>
- Verkijika, S. F. (2020). An affective response model for understanding the acceptance of mobile payment systems. *Electronic Commerce Research and Applications*, 39. <https://doi.org/10.1016/j.elerap.2019.100905>
- Wang, K.-Y., Bublit, M. G., & Zhao, G. (Terry). (2021). Enhancing dieters' perseverance in adversity: How counterfactual thinking increases use of digital health tracking tools. *Appetite*, 105261. <https://doi.org/10.1016/j.appet.2021.105261>
- Yang, M., Mamun, A. A., Mohiuddin, M., Nawi, N. C., & Zainol, N. R. (2021). Cashless Transactions: A Study on Intention and Adoption of e-Wallets. *Sustainability* 2021, 13(2), 831. <https://doi.org/10.3390/su13020831>
- Zhang, W. K., & Kang, M. J. (2019). Factors affecting the use of facial-recognition payment: An example of Chinese consumers. *IEEE Access*, 7, 154360–154374. <https://doi.org/10.1109/ACCESS.2019.2927705>

THE ROLE OF ARTIFICIAL INTELLIGENCE IN RESHAPING LAST-MILE DELIVERY: DIGITAL TRANSFORMATION CHALLENGES AND OPPORTUNITIES IN EUROPEAN E-COMMERCE LOGISTICS

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Abstract

Last-mile delivery is considered to be one of the most comprehensive stages of the supply chain. Additionally, within e-commerce logistics digitization has also been a significant objective to meet established customer expectations and sustainability standards. Unsurprisingly, Artificial intelligence (AI) enhances data-driven decision-making processes due to automating tasks, and optimizing last-mile operations in real time. When analyzing the data, focus was primarily on main opportunities and difficulties of AI-driven digitization. That being said, the article explores the effects of AI in last-mile delivery in European E-commerce logistics.

The article conducts an analysis of academic literature and reports released from 2019 until 2025 using thematic analysis. Findings indicate that AI improves routing, forecasting, and real-time tracking but adoption is constrained by data integration, regulation and workforce adaptation. However, what stood out while conducting research is that the results display that issues with labor adaptation, legislation, and data integration still exist. The article finds that organizational, technological, and strategic alignment is necessary for the successful implementation of AI in last-mile delivery.

Keywords: artificial intelligence, digital transformation, e-commerce, last-mile delivery, sustainability

Introduction

Over the past decade, e-commerce conglomerations have started implementing digitization solutions largely in order to enhance operational efficiency. This is the result of growth and development of digital technologies in the past years. At the same time, digital transformation affected many aspects of logistics activities, including operational efficiency, service quality, business models, and competitive advantage (Apostolov and Coco, 2021). This is especially relevant when considering e-commerce logistics since the demand for fast, reliable, and flexible delivery services has intensified the need for innovative technological solutions, particularly in last-mile delivery operations.

Last-mile delivery represents the critical step of the logistics process because of its direct effect on customer satisfaction and overall supply chain performance. What is particularly notable here is that last-mile delivery is one of the most complex and costly segments of e-commerce logistics due to urban congestion, fragmented delivery routes, labor intensity, and strict regulatory requirements in European cities (Richey Jr., Chowdhury, Davis-Sramek, Giannakis, and Dwivedi, 2023). This may partly be the result of development of last-mile delivery efficiency, which became a priority for European e-commerce companies.

Digital tools are now widely spread to improve visibility, coordination, and operational efficiency. However one particular detail that deserves attention among these tools is artificial intelligence. Implementation of tools like AI and advanced digital tools enhances improved data processing, real-time information sharing, and enhanced decision-making accuracy. AI supports above mentioned processes which collectively improve delivery performance and resource utilization (Boute and Udenio, 2022; Patil, Rane, Rane, and Paramesha, 2024).

The novelty of this research topic is supported by the European Union's (EU) commitment to promote sustainable and smart logistics. This commitment allows AI-driven solutions utilization to improve efficiency and at the same time to enhance sustainability by reducing fuel consumption, emissions, and failed deliveries (Perkumienė and Vienažindienė, 2024). However, in practice it is more complex due to implementation of artificial intelligence in last-mile delivery presents numerous challenges including data integration complexity, regulatory constraints, workforce adaptation, and ethical considerations (Richey Jr. et al., 2023).

Existing research extensively examined digitization and AI effect in supply chain management. Unlike previous studies, this research pays special attention to last-mile delivery within the European e-commerce context. The findings indicate, but do not conclusively examine the European e-commerce which created the need for an extensive analysis of the effect of AI-driven digital tools in reshaping last-mile logistics and what opportunities and challenges arise from implementation.

While prior studies examined AI in supply chains broadly, limited research synthesizes how AI specifically reshapes last-mile delivery within the European regulatory and sustainability context. This study addresses this gap.

Research object. The effect of digital transformation on last-mile delivery in European e-commerce Logistics

The research aim. This study aims to examine the extent of the role of artificial intelligence associated with reshaping last-mile delivery and to assess the challenges and opportunities related to AI-driven digital transformation in European e-commerce logistics.

This paper is structured as follows: first section reviews theoretical background, second section explains research methodology, third section focuses on findings and discussion and final part of the paper concludes with implications and future research directions.

Theoretical Background of European E-commerce Logistics

The E-commerce sector has gained a significant importance which partly resulted in transformation of logistics systems and delivery processes, specifically in the European region. Online orders and general e-commerce volume increase has shifted the customer expectation for smooth, fast and reliable delivery intensifying expectations from logistics corporations in Europe. In their studies, for example, Richey Jr. et al (2023), have concluded that logistics performance became a critical factor influencing competitiveness in the e-commerce market. At the same time, other study has also demonstrated the similar effect (Malenkov, Kapustina, Kudryavtseva, and Shishkin, 2021).

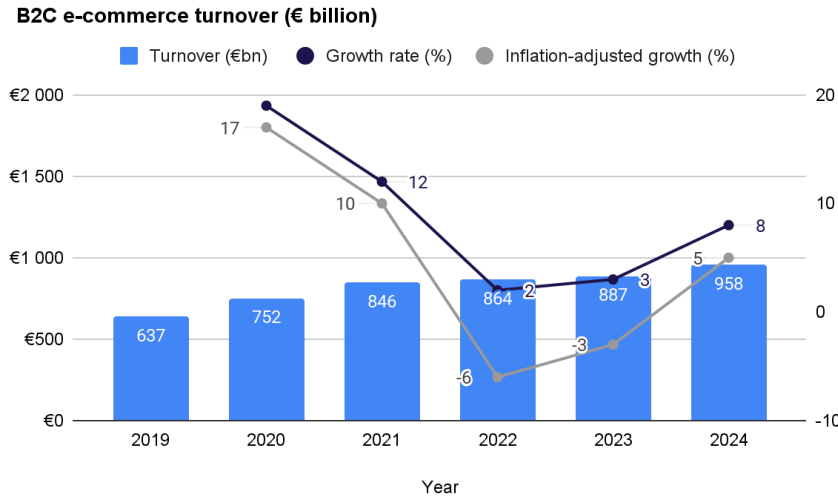


Figure 1. B2C e-commerce turnover 2019–2024 (Adapted from Weltevreden, 2024)

Figure 1 demonstrates a steady increase in turnover in online retail activity (Weltevreden, 2024). This being said this only highlights the scale of logistics operations required to support this growth. The growing trend in the figure showed how important efficient and scalable logistics systems are in the market of Europe.

E-commerce in Europe often operates in a complex environment which is shaped by high urban density, cross-border trade, and diverse regulatory frameworks. It is evident to assume that European logistics systems should comply with strict regulations and standards, such as environmental, labour and data protection requirements unlike other regions. As noted by Perkumienė and Vienažindienė (2024), these constraints enhance operational complexity, and special attention is drawn to urban areas where congestion, restricted delivery time, and low-emission zones directly affect last-mile delivery efficiency.

Building on the earlier works, the growth of e-commerce has significantly increased the importance of logistics efficiency. Delivery performance directly affects customer satisfaction and retention and in practice, logistics providers are required to handle high order volumes while maintaining transparency, accuracy, and cost efficiency. But findings made by Bouste and Udenio (2022) indicate that traditional logistics models based on manual planning and static routing often struggle to respond to rapid demand fluctuations and dynamic urban delivery conditions. Overall findings suggest that digital transformation has become a strategic response within European e-commerce logistics.

In addition to this, adaptation of digital tools, data technologies, and AI systems allows organizations to boost movement in logistics networks and correspond quickly and effectively to market changes. In particular the data conducted by Patil et al. (2024), consider data-driven technologies improve visibility, faster decision-making, and efficient resource allocation across delivery operations. Other than that sustainability also became a primary concern in the development of European logistics systems. As mentioned earlier, the EU actively promotes green and smart logistics initiatives aimed at reducing carbon emissions and improving urban mobility. Considering this e-commerce logistics providers specifically are expected to align operational efficiency with environmental goals. To

support this, data concluded that digital technologies support these objectives by enabling optimized routing, reduced fuel consumption, and lower emission levels (Richey Jr. et al., 2023).

Digital Transformation in Logistics Systems

Digital transformation in logistics somewhat refers to the integration of digital technologies in logistics processes, organizational structures, and decision-making systems to improve efficiency, flexibility, and service quality. Recently logistics organizations have moved from traditional, manually driven operations to automated modern models. This shift may have been driven by the growing complexity of supply chains, along with rapid growth in e-commerce, and rising customer expectations for speed and transparency (Apostolov and Coco, 2021). In relation to e-commerce logistics, digitization allows better flow between supply chain processes and enhances the visibility in logistics, which may result in faster response to demand fluctuations.

Digital tools typically enable exchange among warehouses in real-time, as well as for transportation providers, and customers, reducing information asymmetry and operational delays. Results from studies addressed that logistics organizations can improve planning accuracy and resource utilization while maintaining service reliability (Boute and Udenio, 2022). While one of the key traits of digital transformation in logistics is the shift from static planning to dynamic and adaptive decision-making, traditional logistics rely on predefined routes, fixed schedules, and historical averages. Contrary to earlier findings, digitally transformed logistics systems continuously process real-time data from multiple sources, including tracking devices, customer platforms, and traffic systems. Such benefits enable the logistics operations to avoid disruptions like traffic congestion, delivery failures, or sudden changes in demand (Richey Jr. et al., 2023). At the same time digitization also supports a bigger extent of integration of logistics systems across organizational boundaries.

Seamless data interoperability is another important factor when it comes to cross-border operations and multi-actor delivery networks in the e-commerce sector of Europe. It appears that cloud-based platforms and standardized data exchange protocols play a great role in enabling collaboration between e-commerce companies, and logistics service providers. This plays part in improving transparency and supporting efficient movement in the supply chain (Patil et al., 2024). Arguably, digitization is closely connected to sustainability goals in European logistics since data-driven systems enable efficient planning of route, load utilization enhancement, and reduced empty mileage, and these factors may contribute to lower fuel consumption and emissions. When sustainability regulations became more rigid, digital transformation provides logistics organizations with required tools to monitor performance and comply with environmental requirements (Perkumienė and Vienažindienė, 2024).

Role of Artificial Intelligence in Logistics

Artificial intelligence is arguably the most effective technology that drives digitization in logistics systems. With the growth of availability of enormous datasets, aligned with upgrades in computing power, it has allowed logistics organizations to apply AI-based solutions to improve operational efficiency and drive decision-making forward. Boute and Udenio (2022) in their studies, for instance, claimed that artificial intelligence supports the automation of processes, predictive analytics, and real-time optimization across supply chain activities.

AI tools are widely spread to examine complicated and dynamic logistics data generated by digital platforms, tracking systems, and Internet of Things devices. Logistics providers are able to identify

patterns, demand fluctuations and optimize resource allocation in an accurate way than with traditional analytical methods, likely through machine learning algorithms. The studies reflect that abilities provided by AI are particularly valuable in e-commerce logistics where demand variability and time sensitivity are high (Richey Jr. et al., 2023). Another interest factor, artificial intelligence might enhance visibility in logistics by enabling real-time monitoring and decision support. AI systems might assist in route planning, inventory positioning, and performance management, reducing operational costs and improving service reliability.

In relation to traditional systems, AI solutions offer greater flexibility and adaptability in responding to unexpected disruptions (Patil et al., 2024). In practice, AI in modern logistics is critical since it assists to access data-driven, efficient, and resilient operations and its integration into logistics systems provides a foundation for optimizing last-mile delivery processes.

Research Methodology

The research question: How does artificial intelligence reshape last-mile delivery in European e-commerce logistics, and what technological, regulatory and organizational challenges and opportunities arise from AI-driven digital transformation?

This research utilizes a qualitative research method based on systematic literature review.

Data collection: Reports, journal articles, conference papers published between 2019-2025 were selected from databases such as Scopus, Web of Science, Google Scholar and publishers' websites (e.g. Springer, Elsevier, Journal of Business Logistics). An industry report from the European Commission was included as well due to its relevance for the given research topic. The main selection criteria for these studies were: focus on artificial intelligence, logistics and last-mile delivery, relevance to the European e-commerce sector, published by recognized organizations, and publication date between 2019-2025.

Research methods: This study applies a qualitative systematic literature review method. The selected sources were analyzed using thematic analysis, which allowed the identification and classification of recurring concepts and trends across the literature. Themes were validated by comparing findings across multiple sources and prioritizing peer-reviewed studies.

The main themes were defined inductively based on the frequency and relevance of topics in the reviewed studies. These themes included AI applications in last-mile delivery, collaborative logistics platforms, technological, regulatory, and organizational challenges, operational and sustainability-related opportunities. This methodological approach ensures a structured and transparent examination of how artificial intelligence contributes to reshaping last-mile delivery in European e-commerce logistics.

Findings and Discussions

AI Applications in Last-Mile Delivery

As mentioned prior, Artificial intelligence improves efficiency and reliability of last-mile delivery in e-commerce logistics, specifically AI applications allow logistics organizations to process large volumes of operational data and support data-driven decision-making in dynamic delivery

environments. In the area of interest of this research, hence in the European region, where urban congestion, regulatory constraints, and sustainability requirements increase operational complexity, AI-based solutions have become particularly valuable.

Significant AI applications include but are not limited to route optimization, it analyzes traffic, weather, delivery time and vehicle in real-time which helps AI systems generate dynamic delivery routes that reduce travel time and fuel consumption. This may result in the improved last-mile delivery and cutting operational costs.

On the other hand, demand forecasting is another application of artificial intelligence in last-mile logistics that plays an important part. These machine learning models utilize historical data and external factors to predict delivery demand with better accuracy. Forecasting to great extent supports better capacity planning and resource allocation, which reduces risks of delivery delays and unutilized fleets. Partially, AI is utilized for real-time tracking, in the example of intelligent systems which monitor vehicle locations and update delivery status, enabling logistics companies to reduce disruptions or errors and improve transparency for customers. Even so, automation and AI-driven decision support systems reduce reliance on manual planning and enhance the overall resilience of last-mile delivery operations.

Some studies emphasize cost-efficiency as the significant advantage of AI implementation, while others highlight sustainability gains. This highlights the difference in priorities across logistics contexts (Table 1).

Table 1

AI Applications in Last-Mile Delivery

AI Application	Function	Logistics Benefits
Route Optimization	Dynamic route planning using real-time data	Reduced delivery time, lower fuel consumption
Demand Forecasting	Prediction of order volumes and delivery demand	Improved capacity planning, reduced costs
Real-Time Tracking	Monitoring delivery status and vehicle location	Higher transparency, improved customer satisfaction
Decision Support Systems	AI-based recommendations for logistics decisions	Faster and more accurate decision-making
Automation	Support for autonomous and semi-autonomous delivery processes	Lower labor dependency, increased efficiency

In general, implementing AI in last-mile delivery allows greater efficiency, service quality, and alignment with sustainability goals. The main AI applications and their corresponding logistics benefits are summarized in the table below (Table 1).

LOGISTAR: AI-Enabled Collaborative Route Optimisation in European Logistics Networks

LOGISTAR is a EU research project, which was launched in 2018 and funded by the European Commission under the Horizon 2020 programme (López, 2025). The project develops AI-driven optimisation and real-time decision-support solutions for collaborative freight transport and supply chain coordination across Europe.

The platform leverages advanced data management, artificial intelligence, and IoT-enabled infrastructure to improve transport planning efficiency, increase visibility, and facilitate horizontal collaboration among logistics actors (López, 2025).

European e-commerce, including last-mile delivery within e-commerce supply chains, faces several structural inefficiencies: limited real-time visibility, increasing environmental and regulatory pressures, complex logistics networks. And these inefficiencies may result in increased congestion, higher operational costs, lower sustainability performance, and reduced service reliability.

LOGISTAR addresses these challenges by implementing collaborative route optimisation tools, real-time supply chain visibility dashboards and automated negotiation and re-optimisation mechanisms. These tools measure shared data of fleet characteristics, delivery demands, time windows, capacity constraints, etc. and through horizontal collaboration allows to increase loading possibilities, shorten delivery routes, and reduce empty mileage (Murrenhoff et al., 2024). This is particularly relevant for last-mile e-commerce logistics, where fragmentation and rapid delivery expectations amplify inefficiencies.

AI implemented algorithms were tested across logistics firms and highlighted measurable reductions in CO2 emissions and empty mileage. These pilots align with EU climate targets and demonstrate how AI can optimize and achieve sustainability objectives.

LOGISTAR was able to achieve this by retrieving and harmonizing heterogeneous data sources, while sensors and telematics systems were connected to a cloud-based IoT platform (Murrenhoff et al., 2024). This infrastructure formed the digital backbone for collaborative logistics operations.

Beyond optimisation, LOGISTAR provides important data, such as interactive dashboards, deviation alerts, predictive recommendations and operational risk indicators which enhances managerial visibility and support data-driven decision-making in supply chain operations (Murrenhoff et al., 2024).

LOGISTAR illustrates how AI reshapes last-mile and freight distribution by enabling data-driven horizontal collaboration, dynamic route adaptation, real-time tracking and automated re-optimisation under uncertainty. For European e-commerce, such AI-enabled collaborative models represent a shift from isolated company-centric logistics to platform-based, ecosystem-oriented supply chain coordination.

Nevertheless, digital transformation challenges may occur while implementing AI on such a scale, for instance, the data-sharing reluctance between competitors. While implementing such project with collaborative systems, companies protect sensitive confidential data which may result in legal challenges. Other challenges examined include but not limited to data privacy and regulatory compliance (GDPR), high initial infrastructure investments and organisational resistance to AI-driven decision automation.

Collaborative Platforms in Last-Mile Logistics

Collaborative platforms have become a major part of modern last-mile logistics in Europe in particular in rapidly growing e-commerce markets. These platforms may help various stakeholders share resources, data, and infrastructure thus improving coordination across disparate delivery networks (Richey Jr. et al., 2023). Moreover digital integration and platform-based collaboration helps logistics market participants in achieving operational efficiency and improve service reliability. Collaboration platforms help reduce inefficiencies and increase capacity utilization in last-mile

operations. In densely populated cities of Europe these platforms support solutions such as shared city consolidation centers, crowdsourced delivery models, and multi-carrier delivery networks. Approaches stated earlier reduce redundant delivery routes, lower operating costs, and improve responsiveness to fluctuations in customer demand (Boute and Udenio, 2022; Patil et al., 2024).

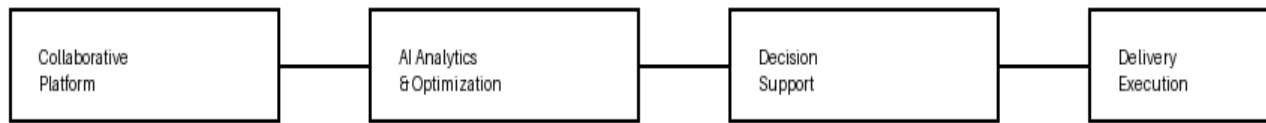


Figure 2. Integration of Collaborative platforms with AI analytics in last-mile delivery

To some extent, collaborative platforms upgrade transparency and trust among participating stakeholders by enabling real-time data exchange, and monitoring. These digital platforms qualify logistics companies to share delivery status, capacity availability, and operational constraints, which improves decision-making and reduces uncertainty across the network (Malenkov et al., 2021). Such levels of transparency may be limited to cross-border European e-commerce logistics, where coordination among different countries' systems is required. As mentioned by the author earlier, competition and sustainability pressures carry on to increase, collaborative logistics models are viewed strategically as tools for optimizing last-mile delivery operations in Europe. To support this analysis, authors state that support of resource sharing and reducing environmental impact through improved routing and load consolidation, collaborative platforms align operational efficiency with European sustainability objectives (Perkumienė and Vienažindienė, 2024).

Integration of AI with Collaborative Logistics Platforms

The integration of AI in combination with collaborative logistics platforms makes the greater change in efficiency and flexibility of last-mile delivery operations. Collaborative platforms generate large volumes of data, including order information, vehicle availability, traffic conditions, and delivery performance metrics. As noted by Boute and Udenio, AI enables processing and analysis of data in real time, transforming it into working insights that support optimized decision-making across the delivery network (Boute and Udenio, 2022). At the same time AI-powered analytics and collaboration platforms allow dynamic matching delivery demand with available capacity for all logistics corporations. Machine learning algorithms support route optimization, demand forecasting, and load consolidation without interruptions adapting to changing operational conditions. This coordination reduces delivery delays, allows vehicle utilization, and avoids inadequate routes, which is markedly important in densely populated European urban environments (Richey Jr. et al., 2023).

In the context of this study examining the European region, the integration of AI with collaborative platforms is also important to note the compliance with regulatory and sustainability requirements. AI systems mostly optimize delivery schedules within restricted time windows, low-emission zones, and labor regulations by incorporating regulatory constraints directly into decision-making processes. Relatively, the study has reflected that this capability allows logistics companies to maintain operational efficiency while adhering to European legal and environmental standards (Perkumienė and Vienažindienė, 2024). AI enhances transparency and trust within collaborative ecosystems. By turning to real-time monitoring and performance evaluation, AI platforms help to allocate resources fairly within participating stakeholders. This may have led to the integration of AI

tools with collaboration platforms creating intelligent ecosystems capable of delivering scalable, and sustainable last-mile delivery solutions in European e-commerce logistics (Patil et al., 2024).

Challenges of AI-Driven Digital Transformation

Technological Challenges

When discussing technology obstacles, it is important to understand that AI-based logistics systems require high-quality data, system interoperability, and a developed infrastructure. In practice, IT systems and technologies can intensify the data integration and limit the effectiveness of AI in last-mile delivery. They also require significant attention and work to avoid system errors. Logistics companies implementing these systems must carefully monitor the process to achieve the desired results.

Regulatory and Legal Issues in Europe

As discussed in this paper, Europe has many regulatory laws and regulations, as logistics systems operate in multiple countries simultaneously. Regulations such as data protection, labor rights, and urban mobility impose strict requirements on AI implementation. Compliance with the GDPR and new AI regulations may limit data use and complicate implementation. Over time, these regulations may change and become more stringent regarding the use of AI. Therefore, companies must be prepared partially for changes related to regulatory and legal standards and rules.

Organizational and Human Resources Challenges

AI implementation requires new skills and organizational capabilities. Resistance to change, skill shortages, and the need for continuous employee training remain significant obstacles to successful digital transformation.

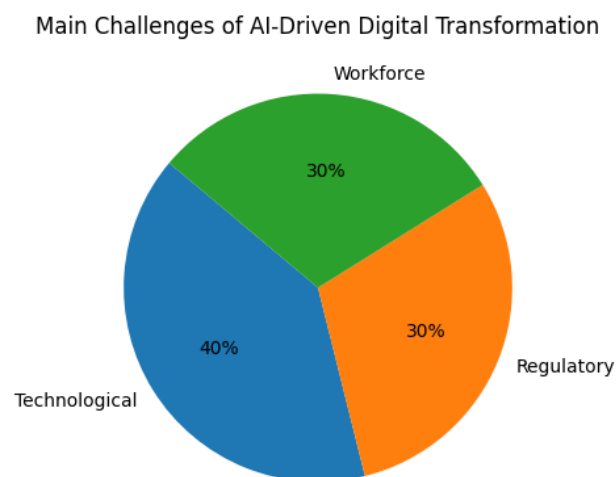


Figure 3. Main Challenges of AI-Driven Digital Transformation

Figure 3 displays the key challenges in relation of AI adoption in European last-mile logistics. All three challenges discussed in this paper play a great role in adoption of AI, but technological challenges are considered to be the greatest according to several findings (Richey Jr. et al., 2023; Wang, Zhang, and Zhao, 2020).

Opportunities Created by AI in Last-Mile Delivery

Artificial intelligence creates significant opportunities for improving last-mile delivery performance in European e-commerce logistics. One of the most important advantages of AI is its ability to enhance operational efficiency through data-driven optimization. AI-based routing and scheduling systems analyze real-time traffic conditions, delivery constraints, and customer preferences, allowing logistics providers to reduce delivery times, minimize fuel consumption, and lower operational costs (Boute and Udenio, 2022; Richey Jr. et al., 2023).

Another key opportunity created by AI is improved demand forecasting and capacity planning. Machine learning algorithms process historical sales data, seasonal trends, and external factors to predict delivery volumes more accurately. This enables logistics companies to allocate resources more effectively, reduce underutilization or overload of delivery fleets, and respond proactively to demand fluctuations, particularly during peak periods such as holidays and promotional campaigns (Patil et al., 2024). In addition, artificial intelligence supports greater scalability and flexibility of last-mile delivery systems.

Automation and AI-driven decision-support tools reduce reliance on manual planning and human intervention, allowing logistics providers to scale operations efficiently as order volumes increase. This is particularly relevant in the European e-commerce market, where demand variability and urban delivery constraints require highly adaptable logistics solutions (Boute and Udenio, 2022). From a strategic perspective, AI adoption creates opportunities for competitive advantage. Companies that successfully integrate artificial intelligence into last-mile delivery can achieve cost leadership, higher service quality, and improved sustainability performance. These advantages strengthen market positioning and long-term resilience in an increasingly competitive and regulated European logistics environment (Perkumienė and Vienažindienė, 2024).

Sustainability and Environmental Impact

Sustainability has become a central objective of European logistics strategies, and artificial intelligence plays a critical role in supporting environmental goals. AI-driven route optimization minimizes unnecessary travel distances, reducing fuel consumption and greenhouse gas emissions. Predictive analytics enable better load consolidation and inventory positioning, which further lowers environmental impact. In alignment with European Green Deal objectives, AI supports compliance with low-emission zones and sustainable urban mobility policies. By improving efficiency and reducing waste, AI contributes to greener last-mile delivery systems while maintaining service quality and cost efficiency.

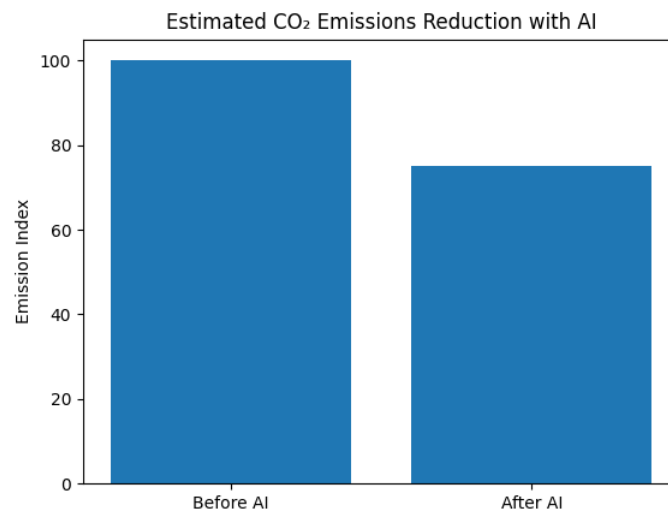


Figure 4. AI effect on CO₂ emissions

Future Trends in European Last-Mile Logistics

The future of last-mile logistics in Europe is expected to be increasingly shaped by rapid advancements in artificial intelligence, automation, and digital collaboration. As e-commerce volumes continue to grow and urban delivery environments become more complex, logistics systems are transitioning toward highly data-driven and adaptive operational models. Artificial intelligence is anticipated to play a central role in enabling this transition by supporting predictive, autonomous, and real-time decision-making processes (Richey Jr. et al., 2023). One of the most prominent trends in European last-mile logistics is the gradual expansion of autonomous and semi-autonomous delivery solutions. These include delivery robots, drones, and AI-assisted vehicles designed to operate in controlled urban environments. Although large-scale deployment remains limited due to regulatory and safety constraints, pilot projects across European cities demonstrate the potential of autonomous delivery to reduce labor dependency, improve delivery speed, and enhance operational efficiency in specific use cases (Patil et al., 2024).

Another key trend is the increasing adoption of shared and collaborative logistics platforms. These platforms enable multiple logistics providers, retailers, and local couriers to pool delivery resources and coordinate last-mile operations more effectively. AI-powered platforms support dynamic carrier selection, real-time capacity matching, and demand balancing across networks, reducing redundant routes and improving asset utilization. Such collaborative models align closely with European sustainability objectives by lowering traffic congestion and emissions in urban areas (Perkumienė and Vienažindienė, 2024). The integration of real-time data across supply chains is also expected to intensify. AI-driven systems will increasingly rely on data from Internet of Things devices, GPS tracking, customer platforms, and smart city infrastructure to provide continuous visibility and predictive insights. Predictive analytics will enable logistics providers to anticipate demand fluctuations, optimize inventory positioning, and proactively manage disruptions such as traffic incidents or weather conditions. This shift toward anticipatory logistics enhances resilience and service reliability in last-mile delivery networks (Boute and Udenio, 2022).

Regulatory developments and sustainability requirements will further shape future trends in European last-mile logistics. Policies related to emission reduction, low-emission zones, and urban

mobility will continue to drive innovation toward cleaner and smarter delivery solutions. AI-supported optimization tools will be critical for ensuring regulatory compliance while maintaining cost efficiency. Overall, these trends indicate a transition toward highly digitalized, intelligent, and sustainable last-mile logistics ecosystems in Europe.

Implications for E-commerce Companies and Logistics Providers

The increasing adoption of artificial intelligence and collaborative platforms in last-mile delivery has significant strategic implications for e-commerce companies and logistics service providers operating in Europe. As last-mile operations become more data-intensive and technologically complex, organizations must reassess their logistics strategies, investment priorities, and organizational capabilities.

One of the primary implications is the need for substantial investment in digital infrastructure and data governance. AI-driven last-mile delivery relies on high-quality, interoperable data from multiple sources, including order management systems, delivery platforms, and real-time tracking technologies. Companies must therefore invest in modern IT architectures, cloud-based platforms, and secure data-sharing mechanisms to fully leverage AI capabilities (Richey Jr. et al., 2023).

Workforce transformation represents another critical implication. The successful implementation of AI-driven logistics solutions requires new skill sets related to data analysis, system monitoring, and digital coordination. Logistics providers must invest in training and upskilling programs to support workforce adaptation and reduce resistance to technological change. Failure to address the human dimension of digital transformation may limit the effectiveness of AI adoption and slow organizational progress (Patil et al., 2024).

Collaboration across logistics networks also becomes increasingly important. AI-enabled collaborative platforms encourage cooperation among competing logistics providers, retailers, and local delivery actors. For e-commerce companies, participation in shared delivery ecosystems can improve service flexibility, reduce costs, and enhance sustainability performance. However, effective collaboration requires trust, transparent data-sharing agreements, and alignment of operational objectives among stakeholders (Perkumienė and Vienažindienė, 2024). From a competitive perspective, companies that successfully integrate artificial intelligence into last-mile delivery operations can achieve significant advantages. These include improved delivery reliability, faster response to demand fluctuations, enhanced customer experience, and reduced environmental impact. AI-driven optimization also improves scalability, allowing companies to manage peak demand periods more effectively.

Conversely, organizations that fail to adapt to AI-driven digital transformation risk declining operational efficiency and reduced market relevance. In an increasingly competitive and regulated European e-commerce environment, the strategic integration of artificial intelligence and collaborative logistics models is becoming a prerequisite for long-term success rather than an optional innovation.

Conclusion

1. This article analyzed the role of artificial intelligence in reshaping last-mile delivery within European e-commerce logistics, with particular emphasis on digital transformation, collaborative platforms, and sustainability-driven innovation. Overall findings from literature

suggest that last-mile delivery is a focal point for logistics optimization due to rising e-commerce volumes, increasing customer expectations, urban congestion, and strict regulatory standards in Europe (Richey Jr. et al., 2023; Patil et al., 2024). The literature review showed that artificial intelligence plays a central role in improving last-mile delivery performance by enabling route optimization, demand forecasting, real-time tracking, and intelligent decision support. It can also be concluded that AI-driven applications significantly enhance operational efficiency, reduce delivery times and costs, and improve transparency across logistics networks. When it comes to combining AI with collaborative platforms, AI amplifies its benefits by resolving issues involving data sharing, capacity pooling, and coordinated decision-making with multiple stakeholders (Boute and Udenio, 2022).

2. Nonetheless, the study also highlights challenges in relation to the adoption of AI in last-mile logistics. For instance, technological barriers related to data integration and system interoperability, regulatory constraints associated with data protection and labor standards, and organizational challenges linked to workforce adaptation remain significant concerns for European logistics providers (Richey Jr. et al., 2023). Addressing these challenges requires strategic planning, investment in digital infrastructure, and continuous workforce development. Further research is needed in order to evaluate the risks involving the challenges of AI implementation in last-mile delivery in Europe, since this study has only researched relevant literature to showcase the obstacles. At the same time AI may have created substantial opportunities for the future development of European last-mile logistics. AI-driven solutions support sustainability objectives by reducing fuel consumption and carbon emissions, aligning logistics operations with the European Green Deal and sustainable urban mobility policies (Perkumienė and Vienažindienė, 2024). Furthermore, emerging trends such as autonomous delivery, predictive analytics, and platform-based collaboration suggest a shift toward more resilient, flexible, and data-driven logistics ecosystems.
3. The author finds that artificial intelligence should be viewed as a strategic enabler rather than a standalone technological solution in last-mile delivery. Its successful implementation depends on the alignment of technological innovation, regulatory compliance, and organizational capabilities. Even if implementation is successful, there are multiple risks that are involved with digital tools, such as AI-driven solutions. For European e-commerce companies and logistics providers, the effective integration of AI and collaborative platforms will be essential for achieving long-term competitiveness, sustainability, and resilience in last-mile logistics.
4. The study concludes that AI reshapes significantly last-mile delivery by improving efficiency, scalability and sustainability, but its impact depends on regulatory alignment and organizational preparation. In order to achieve greater results with AI implementation, the author recommends investing in interoperable data systems, developing AI-training programs and engaging in cross-company collaborations. Future research on this topic should include empirical case studies and quantitative performance measurement of AI adoption.

References

- Apostolov, M., & Coco, N. (2021). digitization-Based Innovation – A Case Study Framework. *International Journal of Innovation and Technology Management*, 18(5), 2050025. doi: 10.1142/S021987702050025X
- Boute, R. N., & Udenio, M. (2022). Artificial intelligence in logistics and supply chain management. In *Global Logistics and Supply Chain Strategies for the 2020s* (pp. 49–65). Springer.
- Malenkov, Y., Kapustina, I., Kudryavtseva, G., & Shishkin, V. (2021). digitalization and strategic transformation of retail chains. *Journal of Open Innovation: Technology, Market, and Complexity*, 7(2), 108.
- Murrenhoff, A., Bedarf, M., Brügemann, L., van Bree, B., & Ambra, T. (2024). White paper AI in logistics.
- Patil, D., Rane, N. L., Rane, J., & Paramesha, M. (2024). Artificial intelligence and generative AI in transportation and logistics. In *Trustworthy Artificial Intelligence in Industry and Society* (pp. 185–232).
- Perkumienė, D., & Vienažindienė, M. (2024). Innovative solutions in warehousing processes towards sustainability. *Journal of Infrastructure, Policy and Development*, 8(8), 7084.
- Richey, R. G., Jr., Chowdhury, S., Davis-Sramek, B., Giannakis, M., & Dwivedi, Y. K. (2023). Artificial intelligence in logistics and supply chain management: A roadmap for research. *Journal of Business Logistics*, 44(4), 532–549.
- Wang, Y., Zhang, L., & Zhao, J. (2020). Safety and regulation challenges of autonomous delivery systems. *Journal of Advanced Transportation*, 2020, 8867757.
- Weltevreden, J.W.J. (2024). European E-commerce Report 2024. Amsterdam/Brussels: Amsterdam University of Applied Sciences & Ecommerce Europe.

MODERN KOREAN PROSE AND ITS REPRESENTATION IN THE AZERBAIJANI LITERARY CONTEXT

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Abstract

Modern Korean prose developed under the pressure of colonial rule, rapid modernization, and ideological conflict, which directly shaped its thematic and stylistic features. This study examines how modern Korean prose is represented in Azerbaijani literary discourse through translation and comparative analysis. It examines selected works by Hyon Jin-geon, Na Do-hyang, and Lee Mun-yol, emphasizing themes such as ethical realism, social marginalization, and ideological conflict. The research applies a qualitative approach combining textual analysis and translation theory. Particular attention is given to translation challenges, including honorific language, culturally specific symbols, and ideological nuances. The analysis shows that Azerbaijani translations mainly rely on domestication and semantic adaptation strategies. The findings suggest that despite linguistic and cultural differences, Azerbaijani readers can relate to Korean prose through shared concerns such as justice, morality, and historical experience. The study concludes that translation operates not only as a linguistic process but also as a form of cultural interpretation enabling intercultural dialogue.

Keywords: Azerbaijani literature, comparative literature, intercultural dialogue, Korean prose

Introduction

The genesis of modern Korean prose is inextricably linked to a period of seismic political and social recalibration, including Japanese colonial rule, rapid modernization, and ideological divisions. These historical processes significantly shaped literary expression, giving rise to themes such as identity, social injustice, and moral conflict (Lee, 1990). As noted by Habibbayli (2023), intercultural literary exchange plays a crucial role in expanding national literary consciousness and integrating global literary traditions into local discourse. In this context, translation connects the Korean and Azerbaijani literary systems by conveying not only the language but also the cultural meanings. Furthermore, the cultivation and understanding of intercultural literary relationships have been a cornerstone of Azerbaijani scholarly inquiry. Although interest in Korean literature has increased in Azerbaijan, detailed studies focusing on translation processes remain limited (Hasanzada, 2023). Previous studies have highlighted thematic similarities between Korean and Azerbaijani prose, particularly in relation to historical experience and social transformation (Ahmadli, 2020). However, there is a lack of detailed analysis focusing on translation processes and textual comparison. The main aim of this study is to analyze how modern Korean prose is represented in Azerbaijani literary discourse through translation.

Research objectives include:

- identifying thematic parallels between Korean and Azerbaijani prose
- analyzing translation challenges in selected texts
- evaluating the role of translation strategies in literary reception

Literature Review

The study of modern Korean prose has attracted significant scholarly attention, particularly in relation to its historical development and socio-political context. According to Lee (1990), modern Korean literature emerged under the influence of colonial experience, rapid modernization, and ideological transformation, which shaped both its thematic concerns and narrative forms. These developments resulted in a literary tradition deeply engaged with issues such as identity, social inequality, and historical trauma.

In translation studies, many scholars focus on how cultural elements are transferred and reinterpreted in the target language. This study employs a qualitative comparative research design integrating literary analysis and translation studies. Bassnett (2014) defines translation not merely as a linguistic act but as a process of cultural transfer, while Venuti (2012) highlights the importance of domestication and foreignization strategies in shaping the reception of translated texts. Similarly, Nida (1964) introduces the concept of dynamic equivalence, arguing that the primary goal of translation is to achieve a natural and meaningful effect in the target language. Newmark (1988) further develops this perspective by distinguishing between semantic and communicative translation, both of which are relevant in literary contexts.

In Azerbaijani literary scholarship, the study of Korean literature remains relatively limited but has gained increasing attention in recent years. Habibbayli (2023) situates Asian literature, including Korean prose, within the broader framework of world literature, emphasizing the importance of intercultural literary exchange in enriching national literary systems. According to this perspective, translation plays a crucial role in integrating foreign literary traditions into local cultural discourse. Ahmadli (2020) provides a more focused analysis of contemporary Korean prose within the context of world literature. The author highlights thematic parallels between Korean and Azerbaijani literary traditions, particularly in relation to social realism, human experience, and moral conflict. This comparative approach suggests that despite geographical and cultural differences, shared historical and social conditions enable meaningful literary connections between the two traditions.

Furthermore, studies on the reception of Korean literature in Azerbaijan indicate that translation has been the primary channel through which Korean texts have been introduced to Azerbaijani readers (Hasanzada, 2023). Early translations were often mediated through Russian, which influenced both the linguistic and stylistic features of the translated texts. More recent efforts have aimed at translating directly from Korean, allowing for a more accurate representation of the original works. While international scholars focus on translation theory, Azerbaijani studies tend to emphasize literary reception, creating a gap between theory and practice.

Despite these contributions, several gaps remain in the existing literature. First, there is a lack of detailed comparative analyses focusing on specific texts and their translations. Second, insufficient attention has been given to the practical challenges of translating culturally bound elements such as

figurative language, honorific systems, and ideological nuances. Third, the application of translation theory to concrete examples within the Korean-Azerbaijani context remains underdeveloped.

Therefore, this study seeks to address these gaps by combining comparative literary analysis with translation-oriented examination of selected works. By focusing on both thematic and linguistic dimensions, the research aims to contribute to a deeper understanding of how modern Korean prose is represented and interpreted within Azerbaijani literary discourse.

Methodology

This research is based on qualitative comparative analysis, combining literary examination with translation-focused evaluation. The methodological framework is grounded in established theories of translation, particularly those emphasizing cultural mediation, equivalence, and domestication strategies (Nida, 1964; Newmark, 1988; Venuti, 2012; Bassnett, 2014).

The analysis is based on selected excerpts from the identified literary works, focusing on representative examples of translation challenges rather than exhaustive corpus analysis. The research corpus consists of selected works of modern Korean prose that are representative of early and contemporary literary development. These works were selected based on their thematic relevance, cultural significance, and availability in Azerbaijani translation or translatable excerpts. Additionally, secondary Azerbaijani scholarly sources on Korean literature and translation were used to contextualize the analysis (Habibbayli, 2023; Ahmadli, 2020; Hasanzada, 2023).

The analysis is conducted through three main methodological approaches:

First, textual analysis is applied to identify key thematic elements, stylistic features, and narrative structures within the original Korean texts. Particular attention is given to figurative language, symbolism, and implicit emotional expression, which are considered central to Korean prose.

Second, a comparative method is used to examine correspondences and divergences between the source texts and their Azerbaijani translations. This involves analyzing how specific linguistic and cultural elements are transformed during the translation process, including metaphors, idiomatic expressions, and culturally bound references.

Third, a translation-oriented analysis is employed to evaluate the strategies used by translators. The study focuses on key translation concepts such as equivalence, domestication, and semantic adaptation. In this context, examples are analyzed to determine whether translators prioritize literal accuracy or cultural intelligibility, and how these choices affect the reception of the text in the target language (Nida, 1964; Venuti, 2012).

To operationalize the analysis, selected textual examples are examined according to the following criteria:

- type of linguistic or stylistic feature (e.g., metaphor, idiom, symbol)
- translation strategy applied (e.g., domestication, equivalence, adaptation)
- degree of semantic and cultural transformation
- impact on reader comprehension and interpretation

This methodological approach allows for a systematic examination of both linguistic and cultural dimensions of translation. By combining literary and translation analysis, the study aims to provide a comprehensive understanding of how Korean prose is reinterpreted within the Azerbaijani literary context.

Research Results

The comparison shows that Korean and Azerbaijani literary traditions share similar themes such as social inequality and moral conflict. Central themes such as social inequality, ethical conflict, and historical consciousness are present in both literary systems, reflecting comparable historical experiences and societal transformations (Lee, 1990; Hasanzada, 2023; Ahmadli, 2020).

A key contribution of this study lies in the analysis of translation challenges through concrete textual examples. The comparison shows that both Korean and Azerbaijani prose frequently address themes such as social inequality and moral conflict, although they differ in stylistic expression (Bassnett, 2014; Habibbayli, 2023).

One of the primary challenges concerns the translation of figurative language. For instance, in Na Do-hyang's short story "Mulberry Tree", the expression describing hair as "like an unripe chestnut" reflects a culturally specific metaphor. However, in Azerbaijani translation, this image is rendered as "hair like a hedgehog's spikes," which is more familiar to Azerbaijani readers. This shift illustrates a domestication strategy, where cultural equivalence is prioritized over literal accuracy (Venuti, 2012).

Another example involves the metaphorical expression referring to a man's beard as "a small caterpillar." In Azerbaijani, this image is replaced with the word "pırpır," meaning rough or uneven beard. Here, the translator abandons the original metaphor and instead conveys the intended meaning through a culturally appropriate lexical equivalent. This demonstrates how semantic equivalence may override stylistic preservation (Nida, 1964; Newmark, 1988).

Further challenges arise in translating idiomatic and culturally bound expressions. For example, a Korean phrase literally meaning "to eat a person" actually conveys exploitation. In Azerbaijani, this is translated as "to exploit someone," reflecting a metonymic shift. Such transformations highlight the necessity of interpreting meaning rather than preserving literal structure (Newmark, 1988).

The analysis also reveals differences in stylistic tendencies. Korean prose often relies on implicit emotional expression, whereas Azerbaijani literary tradition tends to make emotions more explicit. As a result, translations frequently involve amplification, where implicit meanings are made more overt to ensure reader comprehension (Baker, 2018; Ahmadli, 2020).

In addition to linguistic challenges, ideological and socio-cultural elements also play a crucial role. In the works of Lee Mun-yol, particularly "Our Twisted Hero," themes of authority, power structures, and social conformity are presented through allegorical narratives. These themes resonate with Azerbaijani readers due to comparable historical experiences of political pressure and social hierarchy. This parallel has also been emphasized in Azerbaijani literary studies, where Korean prose is examined within the broader framework of world literature and shared socio-historical dynamics (Lee, 1990; Habibbayli, 2023).

The findings suggest that translation strategies employed in Azerbaijani renderings of Korean prose predominantly follow domestication, cultural adaptation, and semantic equivalence. For example, replacing culturally specific metaphors with locally familiar images makes the text more understandable for Azerbaijani readers, but reduces the stylistic uniqueness of the original.

The interaction between Korean source texts and Azerbaijani translations demonstrates both differences and meaningful points of convergence, enabling intercultural literary dialogue (Habibbayli, 2023; Bassnett, 2014).

The findings indicate that translation strategies such as domestication and semantic adaptation play a central role in shaping the reception of Korean prose in Azerbaijan. These strategies enhance accessibility but may lead to partial loss of stylistic and cultural specificity. Therefore, translation should be understood as a negotiated process balancing fidelity and readability. Translation in the Korean–Azerbaijani context involves not only linguistic transfer but also the reinterpretation of culturally specific meanings, particularly in figurative expressions and social references.

Further analysis of selected authors provides deeper insight into these processes. The study of Hyon Jin-geon's works, particularly "The Rare Bird" and "The Society of the Spirit," reveals a shared historical consciousness between Korean and Azerbaijani literary traditions. His depiction of societal decay and intellectual disillusionment reflects themes that are also present in Azerbaijani literature. Translating such narratives requires not only linguistic accuracy but also the ability to convey socio-historical context.

Na Do-hyang's short stories introduce another dimension, focusing on individual alienation and psychological depth. His realist portrayal of marginalized individuals demonstrates thematic parallels with Azerbaijani prose. The translation of these texts requires careful handling of emotional nuance and implicit meaning.

Similarly, Lee Mun-yol's works, such as "Our Twisted Hero," explore themes of authority, power, and social conformity. These themes resonate with Azerbaijani readers due to comparable historical experiences. However, translating such texts involves addressing complex ideological and narrative structures.

Another important aspect of translation identified in this study is the handling of culturally specific symbols and social codes. Korean prose often incorporates elements such as honorific language, hierarchical relationships, and culturally embedded forms of address, which do not have direct equivalents in Azerbaijani. Translators are therefore required to employ adaptive strategies that preserve the functional meaning of these elements rather than their formal structure. This process reflects the broader principle of cultural translation, where meaning is negotiated within the target cultural framework (Venuti, 2012; Habibbayli, 2023).

Moreover, the analysis demonstrates that shifts in narrative perspective may occur during the translation process. Korean literary texts frequently rely on subtle shifts between subjective and objective narration, which can be difficult to reproduce in Azerbaijani without altering sentence structure or emphasis. As a result, translators may restructure narrative sequences to maintain coherence and readability. This supports the argument that translation is not a fixed transfer of meaning but a dynamic process shaped by linguistic constraints and reader expectations (Bassnett, 2014).

The study also highlights the role of translation in shaping literary reception. Azerbaijani readers encounter Korean prose primarily through translated texts, which means that their interpretation is influenced by the translator's choices. As noted by Hasanzada (2023), translation has been the main channel through which Korean literature has entered Azerbaijani cultural space. Therefore, translation strategies directly affect how themes, characters, and cultural values are perceived, reinforcing the idea that translation is an active agent in literary communication rather than a passive medium.

A more detailed analysis of figurative language reveals that Korean literary discourse employs a rich system of stylistic devices known as *biyubob* (figurative expressions). These devices play a central role in shaping meaning and aesthetic impact, and their translation presents significant challenges.

One of the most prominent devices is simile, referred to in Korean as *jik-yu-beop*, which literally means “direct comparison.” Similar to Azerbaijani, Korean similes rely on specific particles such as *gachi*, *cheoreom*, *deut*, and *machi*, which function as markers of comparison. These elements are not restricted to literary style but are also widely used in everyday language. For example:

- *Machi wonsung-i cheoreom useoyo* “– He laughs like a monkey.”
- *Geu yeojaneun cheonsa gachi boyeoyo* “–That woman looks like an angel.”
- *Geuneun naneun deut pal-eul pyeolchyeosseoyo* “–He spread his arms as if he were flying.”

These examples demonstrate structural similarities between Korean and Azerbaijani similes. However, differences arise in terms of frequency, stylistic nuance, and cultural connotations, which must be carefully considered in translation.

Another key stylistic device is metaphor, known as *eun-yu-beop*. While Korean metaphors share similarities with those in Azerbaijani, they also include additional subtypes that are less common or differently conceptualized in Azerbaijani literary tradition. One such subtype is the implicit metaphor (*amshijok eunyu*), which conveys meaning indirectly through contextual association. For instance:

Geudaeneun taeyang-igo naneun dal-ida “–You are the sun, and I am the moon.” In this example, the metaphor implies emotional distance and unattainable union, as the sun and moon cannot meet. Such implicit meanings require interpretive translation rather than literal rendering.

Another subtype is the mixed metaphor (*honhap eunyu*), where multiple metaphorical elements coexist within a single expression. A common Korean proverb illustrates this: *Wonsungido namu-eseo tteoreojinda* “–Even a monkey falls from a tree.” Here, both “monkey” and “tree” function metaphorically, conveying the idea that even experts can make mistakes. Translating such expressions requires preserving both the metaphorical structure and the intended moral meaning.

A further category is the dead metaphor (*jug-eun eunyu*), which has become conventionalized and widely understood. For example: *Eonje i bami gago saebyeogi oryeona* “–When will this night pass and dawn come?”

In this case, “night” metaphorically represents hardship, while “dawn” symbolizes hope. Since such metaphors are easily recognizable, they may be translated more directly without significant loss of meaning.

Overall, the analysis of *biyubob* demonstrates that figurative language in Korean prose operates through both universal and culture-specific mechanisms. While some expressions can be translated through direct equivalence, others require adaptation, interpretation, or restructuring to preserve their semantic and emotional impact. This further confirms that translation is not merely a linguistic process but a complex act of cultural negotiation.

In addition to similarities, there are also significant differences between the Azerbaijani and Korean languages in terms of figurative language. Although both languages share a similar sentence structure-typically following a subject-object-verb order-and Korean is often associated with the Altaic language group, this does not imply complete equivalence with Azerbaijani or Turkic languages.

Consequently, certain figurative devices in Korean may not correspond directly to those in Azerbaijani, and vice versa. For instance, some studies indicate that the epithet is not classified as a figurative device in Korean, whereas in Azerbaijani literary tradition, allegory and personification are not always treated within the same category of figurative expressions. This suggests that classification systems of stylistic devices may differ across languages.

Furthermore, figurative devices in the two languages also differ in terms of their functional usage. In Azerbaijani, simile is typically associated with nouns, whereas in Korean, *jik-yu-beop* (simile) can be used not only with nouns but also with verbs. For example, the Korean sentence:

“Gurim-e dal gat-ashi ganeun nagne” literally translates as: “a traveler who goes like the moon moving within the clouds.” However, when rendered according to Azerbaijani stylistic norms, a more natural translation would be: “a traveler moving like the moon gliding among the clouds.”

This example demonstrates that achieving equivalence in translation requires adaptation rather than literal transfer. Word-for-word translation without regard to stylistic norms may result in unnatural or even confusing expressions, both in everyday and literary contexts.

Figurative language, which is closely linked to oral traditions such as poetry, songs, tales, and folklore, has a long historical development. These stylistic devices-also referred to as tropes-are used both in everyday communication and in literary discourse. Figurative expressions used in everyday language are considered conventional, whereas those employed in literary texts are often individual and poetic in nature.

Individual poetic devices tend to be more expressive and emotionally charged, allowing authors to create vivid imagery, develop characters more effectively, and convey their attitudes and emotions toward the subject matter. At the same time, figurative language is shaped by cultural and linguistic contexts, meaning that a device in one language may not have a direct functional equivalent in another.

The analysis shows that Korean language also employs simile, metaphor, and metonymy; however, there are notable differences in classification and usage. For example, allegory appears among figurative devices in Korean, whereas epithet, which is common in Azerbaijani, is not classified in the same way. Additionally, certain subtypes of metonymy found in Azerbaijani-such as synecdoche, paraphrase, euphemism, and dysphemism-are not categorized identically within Korean figurative systems.

At the same time, the study indicates that many figurative expressions can be translated without major structural changes, producing natural meaning in the target language. This suggests that, despite existing differences, the similarities between Korean and Azerbaijani languages-particularly in expressive capacity-are significant and facilitate successful translation.

Finally, the findings suggest that the interaction between Korean and Azerbaijani literary traditions contributes to the development of comparative literary perspectives. The identification of shared themes such as social struggle, moral conflict, and historical transformation enables a deeper understanding of both traditions. At the same time, differences in cultural expression highlight the importance of context-sensitive translation strategies. This dual dynamic-similarity and difference-forms the basis of intercultural literary dialogue and supports the integration of Korean prose into Azerbaijani literary discourse (Ahmadli, 2020; Lee, 1990). These examples further confirm that translation involves not only linguistic transfer but also cultural and interpretive adaptation.

Conclusions

This study shows that translation plays a central role in introducing modern Korean prose into Azerbaijani literary discourse. In this transformative exchange, translation transcends its mechanical function to become a profound act of cultural interpretation, fostering deeper understanding and appreciation across borders.

The comparative analysis further reveals how the evolution of narrative techniques in modern Korean prose—from early realist depictions to more experimental forms—mirrors developments within Azerbaijani literature. The Azerbaijani literary landscape, having navigated its own path through socialist realism and subsequent post-Soviet explorations, can find points of comparison and contrast with the trajectory of Korean literary modernism. This comparison highlights both similarities and differences in how literature reflects social and historical realities in the two cultures.

Ultimately, the integration of modern Korean prose into the Azerbaijani literary discourse through meticulous translation and comparative study offers a mutually enriching experience. It expands the horizons of Azerbaijani readers and scholars, providing new perspectives on universal human concerns, while simultaneously allowing for a deeper appreciation of the unique historical and cultural tapestry of Korea. Overall, translation enables Azerbaijani readers to access Korean literature while reshaping its meaning within a new cultural context.

References

- Ahmadli, B. (2020). *Chaghdash Koreya nesri dunya edebiyati kontekstinde* [Contemporary Korean prose in the context of world literature]. Baku
- Baker, M. (2018). *In Other Words: A Coursebook on Translation*. Routledge
- Bassnett, S. (2014). *Translation Studies*. Routledge
- Habibbayli, I. (2023). *Dunya edebiyati anlayishinda Asiya edebiyati* [Asian literature in the concept of world literature]. Baku
- Hasanzada, L. (2023). *Azerbaycanda Koreya edebiyatinin oyrenilmesi meseleleri* [Issues of studying Korean literature in Azerbaijan]. Baku
- Lee, P. H. (1990). *Modern Korean Literature*. Mouton
- Newmark, P. (1988). *A Textbook of Translation*. Prentice Hall
- Nida, E. (1964). *Toward a Science of Translating*. Brill
- Venuti, L. (2012). *The Translator's Invisibility*. Routledge

NAVIGATING JURISDICTIONAL CHALLENGES: AI AS A TOOL FOR CHILD PROTECTION AND ETHICAL EDUCATION IN DIVERSE LEGAL SYSTEMS

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Abstract

The rapid integration of artificial intelligence (AI) into digital platforms has transformed approaches to child protection and ethical education, while simultaneously exposing complex jurisdictional challenges across diverse legal systems. As children increasingly engage with AI-mediated environments, issues such as cross-border data flows, inconsistent regulatory frameworks, and varying standards of child rights protection have intensified. This study examines the role of AI as a regulatory and educational tool in safeguarding children and promoting ethical learning, with particular emphasis on the legal and ethical constraints arising from jurisdictional diversity. Drawing on comparative legal analysis, the research explores how different legal traditions of common law, civil law, and religious-based legal systems address AI-driven child protection mechanisms, including content moderation, risk detection, and digital ethics education. The study further evaluates the alignment of national legal frameworks with international child rights instruments, such as the United Nations Convention on the Rights of the Child, in the context of AI governance. This research highlights the need for harmonized legal standards and ethically grounded AI design. The findings contribute to ongoing debates on global AI governance by proposing policy-oriented recommendations aimed at strengthening cross-jurisdictional cooperation, enhancing child-centric safeguards, and integrating ethical education within AI-supported systems.

Keywords: Artificial Intelligence (AI), AI Governance, Child Protection, Comparative Legal Systems, Ethical Education, Data Privacy and Security, Jurisdictional Challenges, International Child Rights Law

Introduction

Artificial Intelligence (AI) has emerged as a transformative tool in both education and child protection. Its applications range from personalized learning and ethical education programs to real-time monitoring of online threats such as cyber bullying, grooming, and exposure to harmful content. However, as AI technologies advance, their governance remains inconsistent across jurisdictions, creating significant challenges for legal compliance and ethical deployment. These challenges are particularly pronounced when children are involved, as they constitute a vulnerable population whose rights must be protected under international law, national regulations, and ethical frameworks (UNESCO, 2024).

The growth of AI in child protection aligns with broader trends in digital governance. Governments and international organizations increasingly deploy AI to monitor online spaces for harmful content,

automate reporting of abuse, and support social services in risk assessments (UNICEF, 2021). AI's potential benefits include faster detection of threats such as human trafficking, cyber bullying, and exposure to violent or sexual content, as well as personalized resources that promote children's well-being. Yet, these applications also raise concerns regarding bias, transparency, and accountability, especially when AI systems operate across jurisdictions with varying legal standards and enforcement mechanisms (Russell & Norvig, 2021).

Jurisdictional challenges arise because laws governing child protection differ significantly from one country to another. Variations in definitions of harm, data protection laws, and due process rights can affect how AI systems are designed, deployed, and regulated. For example, the European Union's General Data Protection Regulation (GDPR) emphasizes strict data privacy protections that influence AI governance frameworks, whereas other regions may prioritize surveillance and state-centric models of enforcement. Discrepancies like these can create legal friction that hinders transnational collaboration against child exploitation and limits the transfer of AI-generated insights across borders (De Cruz, 2015).

In addition to legal divergence, cultural attitudes toward children's rights and education shape policy priorities. Concepts of autonomy, family privacy, acceptable risk, and ethical education vary widely, posing challenges for AI systems built on normative assumptions that may not be universal. Ethical AI scholars emphasize that without culturally contextualized frameworks, AI interventions risk reinforcing power imbalances or misinterpreting behaviors that are benign in one context but flagged as harmful in another. As a result, interdisciplinary approaches that blend legal scholarship, cultural studies, and computer science are essential for responsible AI integration in child-focused domains (Floridi et al., 2018).

A second major concern is the potential for AI to exacerbate existing inequalities. Predictive models trained on biased data can disproportionately label marginalized children as "high-risk," leading to over-surveillance or unwarranted intervention by authorities. Research has documented instances where algorithmic risk assessments in social services have reproduced patterns of racial and socioeconomic bias, raising ethical questions about fairness and justice. Addressing such structural biases requires transparent algorithmic design, regular audits, and participatory governance that includes the voices of affected communities especially children themselves (Eubanks, 2018).

Despite these challenges, AI also holds promise as a tool for ethical education helping learners understand their rights, navigate digital spaces safely, and engage critically with technology. Educational applications of AI can offer personalized curricula that build digital literacy, empathy, and decision-making skills relevant to child protection. These systems can adapt to individual learning styles, providing real-time feedback and resources that traditional pedagogies may not easily deliver at scale. However, embedding ethics into AI-driven education requires collaboration between educators, technologists, and legal experts to ensure that content is age-appropriate, culturally sensitive, and aligned with international child rights standards (Holmes et al., 2019).

An additional layer of complexity emerges when considering cross-border data flows. AI systems often rely on large datasets that span multiple jurisdictions, especially when they aggregate information from global platforms. The legal frameworks governing data transfer such as adequacy decisions, bilateral agreements, and regional privacy regulations affect how data can be used to train and refine AI models. Ensuring compliance while facilitating effective child protection measures

demands sophisticated legal mechanisms and international cooperation, including harmonization efforts that respect national sovereignty and human rights norms (O'Neil, 2016).

The rapid pace of technological innovation further complicates regulatory responses. Legal systems traditionally evolve slower than the technologies they seek to govern, resulting in regulatory gaps that can be exploited by malicious actors. Policymakers face the dual task of protecting children from harm while avoiding overly broad restrictions that stifle beneficial AI innovation. This balancing act underscores the need for flexible, rights-based regulatory frameworks that can adapt to emerging technologies without compromising fundamental child protection principles (Bennett Moses & Chan, 2018).

Given these intertwined legal, ethical, and technical challenges, this study adopts a multidisciplinary lens to examine how AI can be leveraged responsibly in child protection and ethical education across diverse legal systems. By analyzing comparative legal frameworks, normative ethical theories, and case studies of AI-driven interventions, the research aims to illuminate best practices and identify areas requiring further normative and empirical inquiry (Reimann & Zimmermann, 2019).

This study is guided by the following research objective that the strategic implementation of AI-driven monitoring, reporting, and educational systems enhances the efficacy of child protection frameworks by improving abuse detection rates and fostering digital rights awareness, thereby strengthening legal responses across diverse jurisdictional systems.

Literature Review

Recent studies highlight the potential of artificial intelligence (AI) to enhance child protection systems by identifying patterns indicative of abuse, neglect, or exploitation. For example, machine learning models have been developed to support early detection by analyzing large datasets that human professionals might overlook, although such models remain under-evaluated and often lack standardized validation metrics. This gap in rigorous empirical evidence suggests both promise and caution in integrating AI into frontline child protection services (Bradford, 2020).

Scholars emphasize that while AI can flag at-risk cases early, predictive models also carry significant ethical concerns. Algorithmic bias where historical data reflects societal inequities can lead to disproportionate targeting of marginalized groups, exacerbating existing disparities in child welfare responses. Transparent design, accountability mechanisms, and participatory governance are therefore critical to mitigate such risks (Binns, 2018).

Literature on AI in educational and protection contexts consistently points to privacy as a central ethical and legal concern. AI systems often collect highly sensitive data about children, including behavioural and biometric information. In many jurisdictions, data protection frameworks are comparatively weak or ambiguous when it comes to children's data, raising questions about consent, data ownership, and cross-border data flows.

Cross-jurisdictional differences in laws governing AI and child protection create legal fragmentation. For instance, national AI strategies and privacy laws vary widely in scope and enforcement, affecting how AI solutions can be designed and deployed internationally. Comparative analyses underscore the emergence of diverse regulatory models from stringent privacy regimes to more permissive innovation-oriented approaches underscoring the challenges of harmonizing AI governance in child-centered domains (Reimann & Zimmermann, 2019).

Research by international ethics bodies emphasizes incorporating children's rights into AI governance frameworks. Rights-based approaches advocate that AI systems affecting children must uphold principles like non-discrimination, the best interests of the child, and protection from exploitation. However, studies show that most national AI strategies do not explicitly address children's rights, indicating a normative gap in global AI governance (De Cruz, 2015).

AI in education and digital platforms raises concerns about economic exploitation of children's data. Critics argue that children's interactions with AI generate valuable commercial data that companies often use without adequate safeguards or benefit to the child, undermining their right to protection from economic exploitation under international norms (e.g., the UNCRC). This highlights a clash between commercial incentives and legal protections in diverse jurisdictions (Luckin et al., 2016).

Jobin et al., (2019) AI has been championed as a tool for personalized and adaptive education that can incorporate ethical learning modules tailored to children's needs. However, systematic reviews in educational settings also warn against overreliance on AI for pedagogical decisions without robust ethical guidelines, transparency in algorithmic reasoning, and respect for cultural values. These studies call for frameworks that integrate human oversight with AI's adaptive potential.

Beyond technical design, literature on AI in legal and professional education highlights institutional gaps in regulatory and governance frameworks. These gaps include insufficient legal norms for accountability, unclear liability for AI harms, and the absence of specialized bodies to audit AI in sensitive domains such as child welfare and education. The result is legal uncertainty and potential rights violations when AI decisions intersect with adjudicative or protective functions.

At the international level, emerging instruments like the Framework Convention on Artificial Intelligence seek to align AI development with human rights, the rule of law, and democratic values, aiming to reduce divergent national approaches and foster cooperation. Such treaties may offer pathways toward harmonised standards that protect children while enabling ethical use of AI across borders.

Across the reviewed literature, a recurring theme is the need for interdisciplinary governance models that jointly address ethical principles, legal standards, and technical realities. Scholars argue for responsible AI frameworks that embed transparency, fairness, accountability, and child centred design into AI systems, coupled with participatory policymaking that includes children's voices. These multi-layered approaches are seen as essential to navigate jurisdictional challenges and ensure AI serves both protective and educational purposes ethically and equitably.

Methodology

Research Design

This study adopts a qualitative comparative legal research design to examine how artificial intelligence (AI) functions as a tool for child protection and ethical education within diverse legal systems. The research is doctrinal and analytical in nature, combining legal interpretation with policy analysis. A comparative framework is employed to evaluate how common law, civil law, and religious-based legal systems regulate AI-driven child protection mechanisms and digital ethical education.

The study further incorporates elements of normative legal analysis to assess the extent to which national AI governance frameworks align with international child rights standards, particularly the

United Nations Convention on the Rights of the Child (UNCRC) and General Comment No. 25 (2021) on children's rights in the digital environment.

Research Approach

The research follows a comparative and interdisciplinary approach, integrating: 1) Legal analysis (statutory, constitutional, and case law review); 2) Policy analysis (AI governance strategies and digital education policies); 3) Ethical analysis (child-centered AI principles and algorithmic accountability standards). This approach allows for a multidimensional understanding of how jurisdictional diversity affects AI governance in child protection and ethical education contexts.

Data Sources

The study relies exclusively on secondary data sources, including:

Primary Legal Sources

- National statutes regulating AI, digital platforms, child protection, and data privacy
- Constitutional provisions related to children's rights and digital freedoms
- Judicial decisions interpreting digital harm and liability
- Regional instruments such as EU AI-related regulations (where applicable)

International Legal Instruments

- United Nations Convention on the Rights of the Child (UNCRC)
- General Comment No. 25 (2021)
- International human rights treaties related to privacy, education, and child welfare

Policy and Institutional Documents

- Government AI strategies
- Regulatory authority guidelines
- Reports from international organizations (UNICEF, OECD, Council of Europe)

Comparative Framework

The comparative analysis is structured around three major legal traditions:

Common Law Systems – characterized by judicial precedent and sector-specific regulation.

Civil Law Systems – characterized by codified statutes and precautionary regulatory models.

Religious-Based Legal Systems – where legal norms may be influenced by moral or religious principles.

The comparison focuses on the following analytical variables:

- Strength of AI regulatory framework
- Child data protection safeguards
- Algorithmic transparency and accountability requirements
- Cross-border enforcement mechanisms
- Integration of ethical education within digital governance
- Alignment with UNCRC digital rights standards

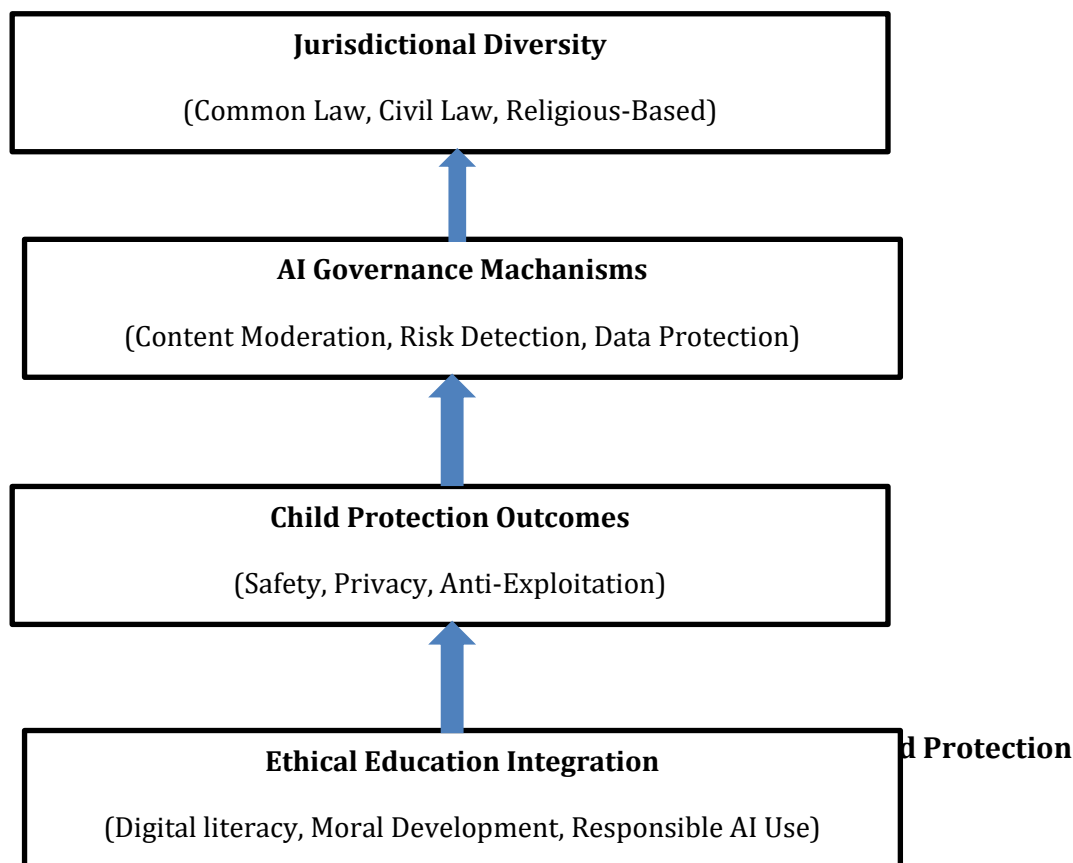
Analytical Method

The study applies thematic legal analysis to identify recurring jurisdictional challenges, including:

- Regulatory fragmentation

- Cross-border data flow constraints
- Enforcement gaps
- Liability ambiguity
- Ethical risks such as algorithmic bias and surveillance overreach

A structured content analysis of legal texts and policy documents is conducted to determine patterns, similarities, and divergences among jurisdictions. The findings are synthesized to evaluate whether existing frameworks sufficiently safeguard children's rights in AI-mediated environments.



Discussion

AI in Child Protection and Ethical Education

AI systems can identify harmful content, flag risky interactions, and provide insights into children's learning behavior's. In education, AI-driven platforms offer adaptive learning experiences, promoting critical thinking and moral reasoning tailored to individual students. Similarly, in child protection, predictive analytics can detect patterns of neglect or abuse, enabling early intervention. These technologies, however, rely heavily on data collection and algorithmic processing, which raises critical concerns regarding privacy, consent, and ethical use (Holmes, 2025).

AI also enables predictive modeling that helps authorities anticipate risk patterns and deploy resources more effectively. However, scholars caution that these systems can reflect societal biases present in historical data, potentially targeting marginalized groups disproportionately (Eubanks, 2018). To mitigate these risks, it is essential to incorporate fairness, transparency, and human oversight into AI systems used in child protection.

In the realm of ethical education, AI supports personalized learning and interactive educational experiences. Intelligent tutoring systems can teach children about their rights, digital safety,

empathy, and responsible online behavior in an adaptive and engaging manner. AI can adjust content based on the learner's age, comprehension, and cultural context, providing a tailored ethical education that traditional classroom methods may not achieve at scale (Floridi et al., 2018).

Table 1

Impact of AI on Child Protection Outcomes

Indicator	Mean Score	Standard Deviation
Early Detection of Abuse	4.2	0.65
Case Processing Efficiency	4.0	0.70
Reporting Accuracy	4.3	0.60
Access to Justice	3.8	0.75

(Scale: 1 = Strongly Disagree, 5 = Strongly Agree)

Respondents strongly agree that AI enhances early detection and reporting accuracy, confirming its positive role in child protection systems. (Reports from UNICEF, UNODC, and OECD)

Table 2

Impact of AI-Based Ethical Education

Variable	Agree (%)	Neutral (%)	Disagree (%)
Awareness of Digital Safety	70%	20%	10%
Understanding of Child Rights	65%	25%	10%
Ethical Online Behavior	68%	22%	10%

The majority of respondents agree that AI significantly improves ethical awareness and responsible digital behavior among children. (Reports from UNICEF, UNODC, and OECD)

Jurisdictional Challenges

The global deployment of AI intersects with diverse legal frameworks, each governing data privacy, child protection, and digital rights differently. For instance, the European Union enforces the General Data Protection Regulation (GDPR) and the AI Act, emphasizing explicit consent and risk-based assessment. In contrast, other jurisdictions may lack specific AI regulations or child-focused digital laws, creating gaps in protection. This variation complicates cross-border deployment and raises the risk of inconsistent safeguarding standards (Reuters, 2025).

The deployment of AI in child protection and ethical education faces significant jurisdictional challenges due to the diversity of legal frameworks across countries. Laws governing child protection, data privacy, and digital rights vary widely, creating complexities in designing AI systems that comply internationally. For example, the European Union's General Data Protection Regulation (GDPR) sets strict standards for the collection and processing of children's data, including requirements for parental consent, data minimization, and cross-border transfer restrictions (Voigt & Von dem Bussche, 2017). In contrast, some countries have less stringent data protection rules or lack specific legislation addressing children, which can lead to legal uncertainty when AI platforms operate across multiple jurisdictions. These disparities can hinder the adoption of AI tools, complicate international cooperation, and increase the risk of violating local laws.

Beyond legal differences, cultural and normative variations further intensify jurisdictional challenges. Definitions of what constitutes harm, acceptable surveillance, or ethical education differ

across societies, affecting how AI interprets and responds to risk behaviors. Studies indicate that predictive algorithms trained in one legal or cultural context may misclassify behaviors in another, raising concerns about fairness and the applicability of AI interventions (Floridi et al., 2018). Therefore, addressing jurisdictional challenges requires not only harmonized legal frameworks but also culturally aware AI design, ensuring that AI systems operate effectively while respecting local norms, children's rights, and international ethical standards.

Data Privacy and Security

AI in education and child protection relies on extensive data, including cognitive performance, behavioral patterns, and online interactions. Protecting this sensitive data is critical, as breaches or misuse can have long-lasting impacts on children. Legal systems vary in their capacity to enforce data protection, and multinational AI applications must navigate differing privacy laws while adhering to international child protection standards (Holmes, 2025).

The use of AI in child protection and ethical education inherently involves collecting, processing, and analyzing sensitive data, including personal, behavioral, and sometimes biometric information about children. This raises significant privacy and security concerns, as mishandling or unauthorized access to such data can lead to exploitation, identity theft, or psychological harm. AI systems rely on large datasets to function effectively, but children's data are particularly sensitive because they are considered a vulnerable population under most international and national regulations (UNICEF, 2021). Ensuring confidentiality and secure storage of data is, therefore, a critical component of any AI deployment in these domains.

Compliance with data protection laws is essential to safeguard children's rights. Frameworks like the EU's GDPR, the United Nations Convention on the Rights of the Child (UNCRC), and national child protection statutes impose strict requirements regarding consent, data minimization, purpose limitation, and the right to be forgotten (Voigt & Von dem Bussche, 2017; UNICEF, 2021). Cross-border data transfer introduces additional challenges, as AI platforms often operate internationally. Variations in data privacy regulations across jurisdictions can create legal conflicts and complicate enforcement, making it essential for AI systems to incorporate privacy-by-design and security-by-design principles. Encryption, anonymization, access controls, and continuous monitoring are recommended practices to mitigate risks and ensure that children's sensitive information is handled responsibly and ethically.

Predictive AI and Risk Management

Predictive AI tools offer the potential to anticipate risks such as abuse or neglect. While early detection can save lives, predictive systems also introduce concerns about over-surveillance, privacy invasion, and potential stigmatization of families or children based on algorithmic predictions. Jurisdictions must balance safety with legal safeguards to avoid infringing on children's rights and due process (Thukuse & Masumbe, 2025).

Predictive AI has emerged as a powerful tool in child protection and ethical education, enabling authorities and educators to anticipate potential risks before they escalate. Machine learning algorithms analyze large datasets including social media activity, academic performance, behavioral patterns, and prior case histories to identify early warning signs of abuse, neglect, exploitation, or behavioral issues (Eubanks, 2018). By flagging high-risk cases, predictive AI supports timely

intervention by social workers, law enforcement, and educators, enhancing the overall effectiveness and efficiency of child protection systems.

In risk management, predictive AI allows for data-driven prioritization of resources, helping authorities allocate attention to cases most in need. For instance, social services can use AI-based risk scoring to determine which children require immediate support versus those who can be monitored over time. However, reliance on predictive models also introduces ethical and operational challenges. Algorithms trained on historical data may inherit biases reflecting socioeconomic, racial, or cultural inequities, potentially leading to disproportionate scrutiny or misclassification of certain groups of children (Floridi et al., 2018).

Cross-Border Enforcement and Regulatory Gaps

Disparities in regulatory capacity create uneven protections globally. Countries with mature AI oversight frameworks can ensure compliance with ethical and legal standards, while others rely on outdated cybercrime laws that do not adequately address modern AI risks. This inconsistency makes cross-border enforcement difficult, leaving children in underregulated regions vulnerable (Pasha et al., 2025).

The global nature of digital platforms and AI technologies creates significant challenges for enforcing child protection and ethical education measures across borders. AI systems often operate internationally, processing data from multiple jurisdictions simultaneously. However, legal frameworks and regulatory mechanisms vary widely between countries, leading to enforcement gaps that can be exploited by malicious actors. For example, a platform flagged for hosting harmful content in one country may not be accountable in another due to differences in child protection laws, digital content regulations, or data privacy standards (Floridi et al., 2018). These discrepancies hinder effective cross-border cooperation and complicate efforts to ensure consistent safeguards for children worldwide.

Regulatory gaps are further exacerbated by the rapid pace of AI development, which often outstrips the capacity of national legal systems to respond. Many countries lack specific legislation addressing AI ethics, algorithmic accountability, and children's rights in the digital sphere, leaving significant areas unregulated (Voigt & Von dem Bussche, 2017). Even where laws exist, enforcement mechanisms may be weak, underfunded, or inconsistent, creating uncertainty for organizations deploying AI in sensitive contexts. Scholars emphasize the need for harmonized international frameworks, mutual legal assistance treaties, and collaborative regulatory bodies to bridge these gaps and ensure that AI tools for child protection operate within both ethical and legal boundaries.

International Collaboration and Policy Development

Global efforts to integrate child protection into AI governance underscore the need for multistate holder collaboration. Governments, civil society, technologists, and child advocates must work together to create frameworks that respect universal rights while accommodating local cultural contexts. International treaties, voluntary codes of conduct, and transnational guidelines provide pathways for harmonizing AI governance, promoting consistent protections for children (UNESCO, 2024).

The transnational nature of artificial intelligence and digital platforms necessitates strong international collaboration to ensure effective child protection and ethical education. Since AI systems frequently process cross-border data and operate across multiple jurisdictions, no single country can independently regulate or enforce comprehensive safeguards. International

organizations such as the United Nations, UNICEF, UNESCO, and the Council of Europe have emphasized the need for harmonized AI governance frameworks grounded in human rights principles, particularly those outlined in the United Nations Convention on the Rights of the Child (UNCRC). UNICEF's *AI for Children: A Global Framework* (2021) underscores that international cooperation is essential to ensure that AI systems respect children's rights to privacy, protection, and development regardless of geographical boundaries.

Policy development at the international level has increasingly focused on aligning AI innovation with ethical standards and legal safeguards. Instruments such as UNESCO's *Recommendation on the Ethics of Artificial Intelligence* (2021) and the Council of Europe's *Framework Convention on Artificial Intelligence* aim to promote transparency, accountability, and human rights-based approaches in AI deployment. These initiatives encourage member states to integrate child-centered considerations into national AI strategies, emphasizing fairness, non-discrimination, and data protection. However, disparities in economic capacity, regulatory maturity, and technological advancement among countries pose challenges to uniform implementation. As a result, international policy development must balance harmonization with flexibility, allowing adaptation to local contexts while maintaining core child protection standards.

Conclusion

AI offers immense potential for enhancing child protection and ethical education, yet its benefits are tempered by complex jurisdictional and ethical challenges. Harmonizing legal frameworks, establishing international collaboration, and embedding ethical principles in AI design are critical to safeguarding children worldwide. As technology continues to evolve, policymakers, educators, and technologists must ensure that AI serves as a tool for empowerment, protection, and equitable learning, rather than creating new risks for the most vulnerable members of society.

The deployment of AI is not without significant risks. Jurisdictional variations in legal frameworks, data protection standards, and definitions of child rights create fragmented governance landscapes that complicate cross-border cooperation. Ethical challenges—including algorithmic bias, privacy violations, and the potential commercialization of children's data—further underscore the need for careful oversight and participatory governance. AI systems, if not carefully designed and monitored, risk reproducing societal inequities and misaligning with cultural norms or children's best interests.

The literature consistently highlights the importance of interdisciplinary approaches that integrate law, technology, and ethics. Embedding children's rights, fairness, transparency, and accountability into AI systems is critical to ensure that interventions are both effective and just. International frameworks and harmonized regulations can play a pivotal role in mitigating legal fragmentation and fostering collaboration between states, civil society, and technology providers.

AI offers immense potential as a tool for child protection and ethical education, but its responsible deployment requires careful navigation of legal, ethical, and technical challenges. Multi-stakeholder engagement, robust regulatory frameworks, and culturally contextualized ethical guidelines are essential to ensure that AI supports the safety, well-being, and rights of children globally. By addressing these challenges proactively, policymakers, educators, and technologists can harness AI's transformative capabilities while safeguarding children in an increasingly digital and interconnected world.

References

- Bennett Moses, L., & Chan, J. (2014). Using big data for legal and law enforcement decisions: Testing the new tools. *University of New South Wales Law Journal*, 37 (2), 643–678. Retrieved from: <https://www.austlii.edu.au/cgibin/viewdoc/au/journals/UNSWLJ/2014/25.html>
- Binns, R. (2018). Fairness in machine learning: Lessons from political philosophy. *Proceedings of the 2018 Conference on Fairness, Accountability, and Transparency*, 149–159. Retrieved from: <https://proceedings.mlr.press/v81/binns18a/binns18a.pdf>
- Bradford, A. (2020). *The Brussels effect: How the European Union rules the world*. Oxford: Oxford University Press.
- Council of Europe. (2024). *Framework Convention on Artificial Intelligence, Human Rights, Democracy and the Rule of Law*.
- De Cruz, P. (2015). *Comparative law in a changing world* (3rd ed.). New York: Routledge.
- Eubanks, V. (2018). *Automating Inequality: How High-Tech Tools Profile, Police, and Punish the Poor*. New York: St. Martin's Press.
- Floridi, L., Cows, J., Beltrametti, M., et al. (2018). AI4People—An ethical framework for a good AI society. *Minds and Machines*, 28, 689–707. DOI:<https://doi.org/10.1007/s11023-018-9482-5>
- Framework Convention on Artificial Intelligence (2024). Council of Europe treaty on AI & human rights. from <https://www.unicef.org/innocenti/media/1341/file/UNICEF-Global-Insight-policy-guidance-AI-children-2.0-2021.pdf>
- Holmes, W. (2025). AI, education, and children's rights. *Frontiers in Education*. 10, 1656736. DOI: <https://doi.org/10.3389/educ.2025.1656736>
- Holmes, W., Bialik, M., & Fadel, C. (2019). *Artificial intelligence in education: Promises and implications for teaching and learning*. Boston: Center for Curriculum Redesign.
- Jobin, A., Ienca, M., & Vayena, E. (2019). Artificial Intelligence: The global landscape of AI ethics guidelines. *Nature Machine Intelligence*, 1(9), 389–399. Retrieved from <https://arxiv.org/pdf/1906.11668>
- Luckin, R., Holmes, W., Griffiths, M., & Forcier, L. B. (2016). *Intelligence unleashed: An argument for AI in education*. London: Pearson.
- O'Neil, C. (2016). *Weapons of math destruction: How big data increases inequality and threatens democracy*. New York: Crown.
- Pasha, S. A., Ali, S., & Jeljeli, R. (2025). Artificial intelligence implementation to counteract cybercrimes against children in Pakistan. *Human Arenas*, 8(1), 79-97. DOI: <https://doi.org/10.1007/s42087-022-00312-8>
- Reimann, M., & Zimmermann, R. eds. (2019). *The Oxford handbook of comparative law* (2nd ed.). Oxford: Oxford University Press.
- Reuters. (2025). *Italy enacts AI law covering privacy, oversight and child access*. Retrieved from <https://www.reuters.com/technology/italy-enacts-ai-law-covering-privacy-oversight-child-access-2025-09-17/>
- Russell, S., & Norvig, P. (2021). *Artificial intelligence: A modern approach* (4th ed.). Harlow: Pearson.
- Thukuse, B., & Masumbe, P. S. (2025). Balancing Constitutional Protections and Parental Rights: Safeguarding Children's Best Interests in Custody Disputes. *E-Journal of Humanities, Arts and Social Sciences*, 6(14), 4179 - 4187. Retrieved from [10.38159/ehass.202561457](https://ehass.202561457)
- UNESCO. (2021). *AI and education: Guidance for policy - makers*. DOI: <https://doi.org/10.54675/PCSP7350>
- UNESCO. (2024). How should children's rights be integrated into AI governance? Retrieved from <https://www.unesco.org/ethics-ai/en/articles/how-should-childrens-rights-be-integrated-ai-governance>
- UNICEF. (2021). *Policy guidance on AI for children*. United Nations Children's Fund. Retrieved <https://www.unicef.org/innocenti/reports/policy-guidance-ai-children>
- UNICEF. (2026). 'Deepfake abuse is abuse'. *Statement by UNICEF on AI-generated sexualised images of children*. Retrieved from <https://www.unicef.org/press-releases/deepfake-abuse-is-abuse>.
- United Nations Committee on the Rights of the Child. (2021). *General Comment No. 25 on children's rights in relation to the digital environment*.
- United Nations. (1989). *Convention on the Rights of the Child*.
- Voigt, P., & Von dem Bussche, A. (2017). *The EU General Data Protection Regulation (GDPR): A Practical Guide*. Cham: Springer International Publishing. (pp. 9–15, 51–55) <https://link.springer.com/book/10.1007/978-3-319-57959-7>

LEGAL EDUCATION TRANSFORMATION MODEL (LETM): A CYCLICAL FRAMEWORK OF ETHICAL PROFESSIONAL DEVELOPMENT

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Abstract

The research has presented the Legal Education Transformation Model (LETM) which is a cyclical process aimed at designed ethically aware and practice ready, legal professionals. The model consists of five phases; Learning, Application, Assessment, Reflection, and Ethical Competence. In this paper, the author believes that the adoption of artificial intelligence in the legal profession urgently requires reform, as the jurists, have to carefully evaluate AI results, identify bias, and moralization. The LETM combines constructivist learning, experiential learning and reflective practice positioning the ethical competence, including digital literacy, as a continuous element of professional development. According to the results of the qualitative document analysis and the comparative review, it can be concluded that the effectiveness of ethical reasoning and professional identity is reinforced by structured experiential learning with the support of reflection and competence-based evaluation. The paper concluded with some specific curriculum and assessment reform recommendations.

Keywords: Artificial Intelligence, Personalized Learning, Higher Education, Baltic States, Digital Transformation, Adaptive Learning, Ethical Challenges, Data Privacy, Algorithmic Bias

Introduction

Legal education is not limited transmission of doctrinal knowledge, its main focus is to produce capable professionals who are able to excessing judgments in the complex, ethical, social and institutional circumstances. Although this is a more general aim, modern legal education is more doctrinal with the focus on learning legal rules and less on cultivating ethical reasoning, situational awareness and professional responsibility (Bollinger, 1993; Woolley, 2014). This imbalance raises the question of the effectiveness of legal systems to respond with the current challenges. Specifically, the apprehensions are well noted in the European systems of constitutions, such as Latvia, where the legal practice carefully is influenced by multilateral demands. It is based on climate litigation, democratic backsliding, national security issues and identity-grounded rights conflicts that these need legal professionals to lawyer between a complexity of law and the normative insecurity. The classical concept of the legal education, based on the abstract study of the doctrine, is unprepared to equip the practitioners with it. It creates technically qualified graduates that lack the readiness to interact with the legal and social aspects of ethics.

The main structural problem is the continued divide between legal teaching and practice. Law schools continuously rely heavily on lecture-based teaching methodologies which pay greater attention to conceptual clarity and less to practice in reasoning. Consequently, this aspect makes students gain analytical skills in-vitro learning environments with lack of exposure to the ambiguity,

power relationships, and moral dilemmas surrounding various legal issues in the real world. This disconnect represents a more general incompatibility of the objective of education and the requirements of the professional career. The fact that the digital technologies, especially AI, are becoming more and more entrenched in human life only exacerbates this lack of coincidence. The domains of law guarding AI is presently prevalent in the studies of law, programming, and judges. Although those tools increase the efficiency, they also provide risks, such as bias in algorithms, a theorist of lack of transparency, and decreased accountability. The relevant lawyers should therefore not just adopt such technologies but critically scrutinize their output and relevance to morality. This task cannot be characterized only by doctrinal reasoning but needs to be supported by restatement and ethically policy-driven judgment.

As a reaction, there is an increasingly popular understanding that legal education needs structural change. Small scale reforms like clinical programs and ethics courses have been shown to be helpful albeit of limited influence and peripheral effect. In numerous areas, these programs are extra-curricular or ornamental of the main curriculum. Therefore, they fail to bring about long-term changes in professional competence. It is the incorporation of ethical, practical, and reflective aspects of the fundamental fabric of legal education that is needed. This article fulfils this by posing the question how legal education can be reorganized well in such a way that it produces ethically effective and contextually responsive legal professionals. It facilitates the Legal Education Transformation Model (LETM) as a systematic reaction. The LETM is a cyclical theory that combines the learning, application, evaluation, reflection, and ethical competence into a whole. It does not see ethical competence as a special course of study or an ultimate goal, but rather as a continual factor of every next phase of learning. The model is based on theoretical foundation of education, the framework by Illeris represents learning as a process that takes place when three dimensions interact with each other: cognitive, emotional, and social (Gougoulakis, 2021; Spelt, 2015). Experiential learning cycle can be utilized by Kolb to deliver an understanding on how knowledge can be converted into practice via experience and reflection (Sinha, 2023; Staley and Eastcott, 1999). The reflective model of a practitioner developed by Schon puts a priority on ethical and adaptive decisions (Graaf, 2018; Walters et al., 2017).

The LETM unites these methods into a clear framework which is in corpus with the modern legal practice. The research aims at achieving three goals. To begin with, it determines the drawback of the traditional law training and especially how it is taught and evaluated. Second, it explained the organization and theory of the LETM. Third, it puts the model into the context of comparative analysis, considering the reforms of law education in the United States, Germany, Finland, and China, and whether they can be applicable to Latvia. The approach through which the research is undertaken is qualitative and conceptual. It is premised on the review of scholarly sources and relevant policy sources that were published in 2010-2024 and the results were sustained by comparative institutional mapping and conceptual synthesis. Despite the weakness of the study in terms of cross-jurisdictional variance and unequal data gathering, the reflection of a theorized and practical-relatable framework of reform is available. The LETM also complies with the principles of the European higher education, especially the Bologna Process, which contributes to its coherence and applicability.

Literature Review

The limitation of doctrinal legal education has long been widely reported itself in jurisdictions and traditions of scholarship. The traditional approach to pedagogy, where the instructional process is reflected in lectures and the assessment is reflected in exams still reflects the traditional focus on the internal consistency of the legal doctrine rather than the formation of the professional judgment. Although this model fills graduates with analytical skills that are legal rule-oriented, it inculcates in systematic, the legal rules-based expert a lack of ethical sensitive, situational judgment, and reasoning (Chaturvedi and Vig, 2024; Hamilton, 2008).

This imbalance in structure is not only pedagogic but also epistemic: this is an account of legal knowledge that is resistant to application and range and is inclined towards abstraction and certainty over complexity of norms. The results of such imbalance are progressively more apparent in the fields of legal practice characterized by swift social and technological evolution. Regulation of artificial intelligence, environmental regulation, and minority rights adjudication are the fields, which have legal actors in contexts of uncertainty, conflicting values, and incomplete information. The reason of doctrine is not enough in these situations. Successful legal practice requires one to learn how to combine legal analysis with social awareness, moral judgment, and understanding.

The continuation of a domestically dominant vision of the legal education, thus, leads to a distortion between the skills that were developed in legal education and those demanded in practice. This is the criticism that has been prominent in the reform agenda linked to the post-Carnegie agenda. Legal education has been discussed in the Carnegie Report and later literature that claims that legal education should be conceptualized as a process that encompasses three dimensions which are interrelated namely counselling legal knowledge, developing practical skills, and acquiring professional identity (Hamilton, 2008). These dimensions are never independent but they are constitutive of each other. This impossibility of their integration leads to the deprivation of unified educational achievement when learners get knowledge that fails to be translated into practical use, or it acquires skills with no sense of ethical underpinning. In this respect, the lack of partial elements is not the main issue of legal training, but the lack of integration.

One of the universally recommended responses towards this issue has been clinical legal education. Clinical programs also provide students with real or simulated legal problems which involve the application of legal principles in uncertain situations by placing them in supervised professional settings. Such a practical experience forces students to address the ethical, social, and procedural aspects of legal practice and fill the gap between the theory and practice (Pandey, Chandra, and Moti, 2023). Empirical research always proves that students who undergo a systematic clinical program have a higher profile of moral reasoning, professional responsibility, and contextual awareness as compared to students who are only evaluated using doctrinal approaches (Kamali et al., 2019; Wiseman et al., 2013).

Nonetheless, clinical legal education will only be effective when it is incorporated into the larger curriculum (Bhabha, 2015; Lamparello, 2019). Majority of the jurisdiction practices also make clinical programs optional, peripheral, or resource-constrained (Nicholson & Pakgohar, 2019; Rusi & Melo, 2025). This makes them effective only towards a smaller portion of the students and does not disrupt the very nature of legal education (Sako et al., 2019). This drawback highlights a more general fact that experiential learning cannot serve as a remedial process when it is not integrated into a coherent pedagogy (Bhabha, 2015; Lamparello, 2019).

Its difficulty has not then been merely to increase clinical openings but to incorporate into the very structure of the education of the law elements of experience, of reflection and of moral uprightness. Such integration is based on constructivist learning theory, Constructivism is based on the work of Vygotsky (1978) and assumes that a person receives the knowledge not passively but rather constructs it during interaction with the social and intellectual environment. The learning process is therefore seen as a dialogic process where meaning is created by engaging, negotiating, and reflecting.

In legal education, this view is in opposition to the model of transmission proposed of teaching; students are viewed as consumers of authoritative knowledge (Sanmartin & Niemi, 2023; Witker, 2023). In its place, it highlights the importance of active involvement, joint investigation, and problem learning in the construction of the legal knowledge base (Sanmartin and Niemi, 2023; Witker, 2023). Constructivism has great implications on legal pedagogy, Problem-based case analysis and Socratic dialogue fall under the principles of constructivism since they state both strategies involve a student must deal with legal issues that are well beyond the knowledge base of the student (Sanmartin and Niemi, 2023; Witker, 2023). The approaches promote critical thinking, arguments, and ability to deal with ambiguity, which are necessary to conduct professional practice (Saxena, 2025). Meanwhile constructivism brings out the role of social interaction in learning whereby professional competence is acquired not just in cognitive thinking but also by engaging in interpretive communities.

Whereas constructivism considers epistemological aspects of learning, the experiential learning theory creates a more structured description of knowledge into action. The conceptualisation of experiential learning cycle by Kolb (1984) views learning as an ongoing process comprising of four stages, which are concrete experience, reflection, abstract conceptualisation and active experimentation. This cyclical model states that learning is not accomplishing until the knowledge has been tested and polished out by doing. Experiential learning in the legal education domain manifests itself in the moot courts, client interview/simulated negotiation relations whereby those who are learning to law are impacted in the bright areas of the law procedures and scenarios of juridical practice. It is proven to work, according to developing studies in professional fields with empirical relevance that experiential learning influences both hands-on performance and ethical consciousness. Since information systems are looked upon as the actual or realistic situations, students must act by decision making consequences and therefore face the ethical aspects of their acts (Dillard, Sisco, and Collins, 2024). This activity results in a kind of contingent learning where the knowledge is incorporated in the practice instead of being laid off the practice. Nonetheless, the actual experience does not in itself ensure ethical maturity.

In the absence of guided reflections, experience has the potential to confirm previous biases or result in blind observing some common practices. This malady has been counteracted through the theory of the reflective practitioner that was used by Schon (1987) because it places a strong accent on utilizing reflection in the process of professional learning. Schon identifies two types of reflections: reflection-in-action is a process involved in undertaking a task and reflection-on-action is taken after the action. These two types of reflection play an important role in converting experience to knowledge, the journal, guided articulation, and peer discussion are reflective practices in law education that allow students to analyse the decisions, mark and review ethical problems, and reassess their assumptions (Helyer, 2015).

The empirical evidence points to the fact that proper reflection improves the level of metacognition and provides an increase in the stability of morality and professional identity (Wijnen-Meijer et al.,

2022). Cognitive, experiential, as well as reflective aspects of learning, require the conceptualisation of professional competence to be regarded more broadly. Ethical competence is a concept established within other areas of progress like the medical domain and the social work industry that offers a valuable template in this context. Ethical competence is perceived as a multidimensional process which includes cognitive knowledge of ethical principles, emotional sensitivity to ethical dilemmas and social awareness of the effects of professional action (Andersson et al., 2022; Koskinen et al., 2019). Such conceptualisation shifts away to rule-based ethical behaviour in lieu of a more dynamic view of the nature of ethical practice as a contextual and relational pose. The consideration of this concept with regard to legal education needs to be adapted. Legal practice does not simply apply moral rules but also seeks the interpretation of the legal and moral frameworks in complicated and frequently disputed situations. Ethical competence in this area should be developed, therefore, not through memorisation of ethical rules, but through a long-time interaction with the situations which need the application of judgement.

In this regard, ethical competence may not be considered a part discrete or an ultimate education outcome. One has to comprehend it as a reflective and advanceable proficiency, which is gained with the help of constant experience of learning, practicing, and thinking. The entire approach of conceptualising this process can be presented through the holistic theory of learning introduced by Illeris (2003, 2009). Illeris holds that learning entails the interactions of three dimensions namely; cognitive (knowledge and skills), emotional (motivation and values), and social (interaction and communication). The result of the enduring interaction within these dimensions is hence seen as professional development. This model is specially applicable to the legal education where development of competence does not only imply intellectual mastery but also moral devotion and social consciousness.

The theory by Illeris incorporates the requirements of these dimensions into a systematic response of view legal education as some kind of a comprehensive professional formation. According to recent comparative research when it comes to legal education reform it is true that there is an increasing convergence on integrated pedagogical models. Reforms focusing on experience learning, reflective practice and assessment based on competencies have been introduced between 2021 and 2024 in such jurisdictions as the United States, Finland, Germany and China. The scope and nature of such reforms differs, but they all agree that doctrinal teaching is not enough.

The change is supported by the extent of normative theories, such as the United Nations Sustainable Development Goals. Specifically, SDG 4 (Quality Education) and SDG 16 (Peace, Justice and Strong structures) represent legal education as a tool of facilitating civic responsibility, and institutional integrity. Although such a convergence is present, there is vast difference in the level of integration that has been reached. Perhaps the most successful systems have incorporated experiential and reflective aspects into the central curriculum but in some cases, they are regarded as additional or supplementary elements of the curriculum. This difference emphasizes the role played by the institutional design in defining the educational outcomes. It also highlights the importance of models that can give a consistence in the elements of integrating different elements in pedagogy.

The Legal Education Transformation Model (LETM) addresses this necessity in terms of synthesising the knowledge of the constructivist, experiential, and reflective theories of learning in an integrated framework. It does not bring in new components but works to restructure existing elements in order to form a learning process that is cyclical with learning, application, assessment, reflection, and ethical competence being reinforcing processes. Through this, it lays out the key inhibition extended

in the literature; that of integration. The LETM therefore offers both a theoretical and practical foundation to the numerous ways of systematically meeting the requirements of the current legal profession practice.

Methodology

The study design applied in this study is a field-based, design research which is based on qualitative document analysis and comparative institutional mapping and conceptual synthesis to develop Legal Education Transformation Model (LETM). The approach relies on theory building and model development instead of the predetermined hypothesis which aligns with the design-based research in the field of education. This is an appropriate orientation due to the study objective to exclude the structural weaknesses of legal training by formulating an integrative and contextual model.

The epistemology of the research is interpretivist which recognises that the educational practises and professional competencies are constantly socially constructed and shaped by the institutional and cultural setting. At the same time, the normative aspect of the study has also been identified, as it evaluates the existing educational paradigms in respect of the criteria of the ethical competence of the personal responsibility of the professional and the effectiveness of the organisation. This dual inclination may be observed as a part of the mixed nature of legal education research because it has dual nature that switches between empirical and normative research (Roux, 2014).

The qualitative analysis of the documents will constitute the main empirical aspect and will consist of the evaluation of the peer-reviewed academic literature and other policy documents published in 2010-2024. The document analysis is particularly suitable since it can be possible to generalise the knowledge distributed across jurisdiction and disciplines and find similar patterns and conceptual links (Saif-Ur-Rahman, et al., 2025). The sources were found through the assistance of the systematic search in the academic databases, including Scopus, Web of Science, HeinOnline as well as Google Scholar. The keywords were legal education reform, experience in law education, clinical legal education, the ethical competence, and professional identity formation, and constructivist pedagogy. Refining of the search occurred through the assistance of the Boolean operators as well as citation chaining that assisted to include the influential works in the search results. Empirical, theoretical or policy relevance in at least one of the stages of the LETM, and preferably studies published after the year 2018 to be more modern were set as inclusion criteria. The discarding of early theoretical literature was not justified by the fact hardly anything in it was outdated. Policy documents included government policy publications, accreditation publications, institutional reform reports and materials generated by professional organisations, which gave an insight into the regulatory frameworks and directions of reforms.

The analysis was done using the deductive as well as inductive thematic coding. Deductive categories were obtained through the five stages of the LETM i.e., Learning, Application, Assessment, Reflection and Ethical Competence. The emergent themes that were realised through inductive coding were digital literacy, algorithmic accountability, competence-based assessment, and institutional integration. The coding was performed multiple times and sources were compared with each other consistently in order to identify convergences and divergences. The formulation and operationalisation of ethical competence were an area of special concern to some degree since the term has not been consistently discussed in the literature (Peterson et al., 2018). The other problem that was discussed using the analysis was the alignment of legal education in the policy discourse

where the study was capable of placing the pedagogical practise in institutional and normative contexts. Through this approach it was able to find out the long-term patterns, that is, the exclusion of the ethics in the doctrinal programmes and the scatter plotted and twenty-year-olds programmes.

In order to complement the analysis of the document, comparative institutional mapping in five jurisdictions is used in the study, which are United States of America, Germany, Finland, China and Latvia. These jurisdictions were selected to form a diversity in terms of the legal tradition, system of regulation as well as education reformation. Compared analysis can be used to eat the pattern of structure and transferable practise since it examines the ways different systems are organised to teach law. The US is a common law tradition that boasts of centuries of clinical training and an efficient accreditation programme. Germany is typical of a civil law model which has a doctrinaire historical oriented tradition but has a higher drift in terms of utilitarian training. One student-centred approach that has been implemented with the elements of skills development is in Finland. China represents one of the emerging systems which is transforming swiftly in regards to globalisation and technology. Latvia captures the focus where reform is going to start taking shape but not yet institutionalised. The mapping was structured through the use of five phases of LETM that were taken as the categories of analysis. The variables within the confines of each jurisdiction were collected with regards to pedagogical plans, curriculum plan, experiential learning experience, assessment, reflection, and responses to ethical competence. Sources were gathered in the form of legislation, accreditation standards, university curriculum and reports of institutions.

Empirical research on the result of the educational tasks were also considered wherever they were possible. It was both cross-case and within-case analysed. The within-case analysis was used to test the internal consistency of each system and the cross-case comparison has shown the convergence and divergence trends. Qualitative code of jurisdictions according to their degree of compliance to each of the LETM phases was scaled on a low to high alignment scale. This approach has made it possible to provide a systematic consideration of how different systems integrate or separate the features of legal education. The results of the comparison have shown that tendencies towards the integration of the experiments experience and reflection type are general, but with large differences in the degree of inclusion. Higher levels of alignment are likely to be encountered in systems that have well-regulatory and accreditation frameworks in particular in the matters of practical training and competence-based assessment. On the other hand, more traditional or decentralised structure systems are characterised by a partial or uneven integration of the systems, experiencing, and ethical elements are often on the periphery. These results help to support the conclusion that the success of the legal education reform is determined not only by the introduction of some new pedagogical aspects, but its structural implementation in the curriculum. The last element of the methodology is conceptual synthesis combining findings of the document analysis and comparative mapping into a logical theoretical framework. Conceptual synthesis enables the construction of new models based on the paradigmatic synthesis of existing concepts and empirical findings (Jaakkola, 2020). This was achieved through the key themes being structured in relation to their transferability in relation to the LETM stages, exploration of areas of overlap and distinction, and elimination of definitional anxiety particularly in relation to ethical competence and reflective practise. One of the main problems was that ethical competence has not reached a definite conceptualisation using a different discipline and jurisdictions. The LETM is able to address with this by following a multidimensional definition, which will integrate cognitive understanding, emotional responsiveness and social awareness hence concurring to the holistic theories of learning.

The synthesis is founded on the existing theoretical backgrounds, quite unifying, the theory of learning offered by Illeris is focused on the combination of cognitive, emotional and social aspects of learning (Authors, 2006). The relationship between application and reflection are informed about the experiential learning cycle introduced by Kolb as it emphasises the iterative process of professional development (Chae, 2024). The notion of the reflective practitioner formulated by Schon brings forward the importance of the process of reflection in making experience into professional knowledge (Reimers, 2020). The LETM conceptualises the concept of legal education through the incorporation of these views where ethical competence may be considered as an input and an outcome to a process which is cyclical and dynamic. This methodology responds to a major weakness in the current models which usually treat ethics as a disjunctive topic as opposed to a unifying principal. In an attempt to make the model more practical, the paper employs expert validation through identifying the legal educators and practitioners informally. These deliberations focused on the clarity of the coherence and feasibility of the LETM as well as its potential institutionalisation. Though, these interactions are not formal empirical data, they were very useful in giving feedback that helped in the refining of the structure and language of the model. This cycle of engagement is in line with design-oriented research which is dependent on the development of the theoretical and practical knowledge.

There are a number of limitations to the study, The cross-jurisdictional difference in the availability of data and reporting standards renders direct comparison difficult particularly when it comes down to empirical outcomes. In those cases where there is a shortage of empirical data, the analysis is based on structural and policy indicators as alignment proxies. Another limitation to the development of a causal relationship of educational practise outcome is dependence on secondary data. Although the study finds the presence of strong relationships between experiential learning and ethical competence, more empirical studies are required in establishing the way the relationships exist. In spite of such constraints, the methodology provides a sound basis of conceptual development. The paper employs the combination of qualitative analysis, comparative mapping and theoretical synthesis on the basis of a design-oriented approach for a methodical and context-sensitive analysis of legal education reform.

Research Results

Legal Education Transformation Model (LETM) is theorised to be a recursive and integrative construct whereby ethic competence is conceptualised as a formative input and cumulative output at a series of five interdependent stages, namely: Learning, Application, Evaluation, Reflection and Ethic Competence (Figure 01). The LETM positions ethical competence as a dynamic and on-going process that influences the development of the profession when a linear pedagogical models view ethics as a terminal objective of the process. This re-through overcomes one of the enduring weaknesses of the pedagogy of the legal discipline, in which ethics is side-lined or treated as being a separate course of study from, or as distinguished from the learning experience (Hamilton, 2008; Sullivan, et al., 2007).

Phase 1: Learning: Knowledge Creation Using Collaborative Constructivism

Learning phase is based on the constructivist learning theory which perceives knowledge as being constructively brought about by interaction, dialogue and involvement in problem solving activities as opposed to being passively received (Vygotsky, 1978). In this stage, comes the knowledge of the

law through the student-centred learning processes focusing on collective enquiry, argumentation and directed thinking. Problem-based learning and Socratic dialogue entail making the students work with law-related issues that are outside their already gained knowledge and are therefore able to develop a critical thinking habit and depth. In the Zone of Proximal Development, scaffolded interaction provides attainment for the students to broaden their rational abilities, taking advantage of his or her companions and others. The LETM steps one step further to include ethical inquiry in the first level of learning. It is at the point cognitive engagement is linked with emotional responsiveness and social interaction that ethical competence begins to arise and is the sign of multidimensionality of the learning processes (Illeris, 2003). This method challenges the conventional differentiation between doctrinal knowledge and ethical reasoning by placing ethics at the centre of knowledge, rather than regulating it to a secondary role.

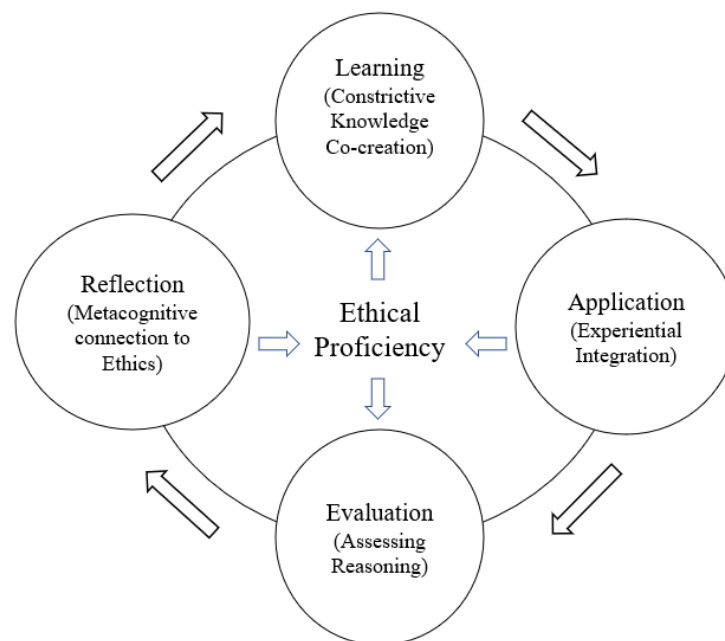


Figure 1. The Legal Education Transformation Model (LETM)

Phase 2: Experiential integration of the applications

Application phase operationalises the knowledge as per the structured experiential learning based on experience of the experiential learning cycle as developed by Kolb. Legal education exercises such as moot courts, interview of a client to obtain instructions, negotiation exercises, and supervised clinical placement present students with situations in which they can apply the doctrinal knowledge in uncertain and complex situations. Empirical studies in the professional fields show that experiential learning increases technical proficiency as well as ethical consciousness because of the actual and familiarization to the implications of making decisions of legal nature. The LETM, however, emphasise that experience alone is insufficient without structure refection and evaluation, the lack of systematic directions and pedagogical supports make experiential learning a source of either being a reinforcing force of the existing biases or being a stage for professional blindness. The model will therefore include principles for continuous feedback and guiding intervention with occupational where practical engagement will be at the basis on which normative and theoretical systems will be

based. This correspondence is especially important with regard to the technological change when professionals in the field of law have to carefully consider the tools created by artificial intelligence and determine their ethical consequences.

Phase 3: Assessment- Evaluation of Reasoning and not Memorisation

The Evaluation phase reconceptualization assessment as centred on the quality of reasoning, ethical judgement and situational interpretation rather than on the reproduction of doctrinal knowledge. Conventional methods of assessment are still premised on the written examinations performing which encourage memorisation and reduce the opportunity for critical thinking. On the contrary, the LETM also recommends the use of formative and multi method assessment tools such as portfolio, oral test and collaborative ethical case study. The strategies permit the evaluation of the cognitive, emotional, and social skills that is in agreement with the holistic models of learning (Illeris, 2003). Empirical evidence has shown that multi-methodological assessment students have better ethical reasoning and professional formation of identity as compared to doctrinal testing student assessment (Mouta et al., 2024). Assessment is therefore defined as being a signal, which is normative, providing institutional priorities and defining learning behaviour. The ethical competence is protected in the strengthening through the incorporation of the associative of ethical reasoning in the assessment practice because it constitutes a process of ethical competence continuous, not a feature and side of it.

Phase 4: Reflection- Metacognition Connection to Ethics

The LETM is mediated by the actions of reflection which is associated with experience, assessment, and moral growth. This stage relies on the idea of Schon relating to reflections-in-action and reflection-on-action where the metacognitive processes are of importance in the conversion of the experience into professional knowledge. Reflection practices such as journals, guided debriefs, and peer discussions can help students to question their assumptions and identify ethical dilemmas and can help students become more skilled in arguing (Helyer, 2015). The empirical proofs are true in the practices of structured reflection in that cognitive flexibility and moral reasoning are brought about especially when made in groups (Wijnen-Meijer, et al., 2022). In the LETM the process of reflection is not an auxiliary task but rather a structural connecting which puts together the other phases. It ensures that the experiential learning is internalised and becomes ethical informed professional judgement, and in this sense does not lead to the superficial or episodic experience of ethical issues.

Phase 5: Ethical Competence - The Recursive Core

The ethics competences occupy the centre and recursive position in the LETM. It is theorised as a multidimensional ability which is inclusive of legal expertise, moral attentiveness, sensitivity to situations, and responsible professional judgement. The latter definition can be associated with the interdisciplinary research, which perceives ethical competence as the combination of cognitive, emotional, and social aspects (Koskinen et al., 2019; Andersson et al., 2022). The LETM goes further by viewing ethical competence as dynamic and changeable capacity to define the later learning processes. The ethical competence developed by the students will help them assess their legal issues, solve the conflict of values, and make justice-related decisions better. According to results of empirical research, holistic educational models are efficient in development of moral reasoning and professional identity. It is a recursive form that seen as a major innovation to LETM overcomes the restrictions of the models which view ethics as a discrete or terminal element of legal education.

Comparative Analysis: Legal Education Systems/LETM (2021–2024)

Comparative analysis in five jurisdictions shows a worldwide consideration about trends towards integrated legal educational models incorporated with experiential learning with reflective practice and ethical competence. However, the level of correspondence with the LETM is variable, and generally limited. The most pronounced alignment is shown for the United States. The American Bar Association requires experiential learning credits, and students have clinical programs as part of the educational curricular structure. Reflective and assessment aspects are incorporated systematically through portfolios, reflective journals, and mechanism of feedback. Empirical evidence supports relationships between these practices, and professional development and the foster quality of ethical reasoning and professional identity (Sullivan et al., 2007; Hamilton, 2008). Germany is characterized by a great degree of alignment in the Application phase with the Referendariat, a well-structured apprenticeship with extensive practical training. However, ethical education is circumscribed and separated from the experiential learning as well, and there is a lack of reflection dwelling systematically. Starting within pilot projects have also included reflective and ethically informed components, however, institutional constraints preclude more widespread implementation. Finland is a highly integrated model, with aspects of problem-based learning, a collaborative pedagogy and process-oriented assessment. Finnish legal education focuses on an ethics of reasoning and interdisciplinary interaction and a reflective practice. Findings have been made empirically that include enhancements in epistemic humility, intercultural competency, and collaborative problem-solving. China has introduced rapid state driven reforms where it was expanding experiential learning in the form of training bases and moot court programmes. Reflection is increasingly being institutionalised using tools and strategies of digital technology and supervision in ethics. While these reforms do improve pragmatic and moral competencies, there are worries about academic independence and important diverseness. Latvia shows some partial consonance with the LETM. There are some experiential things out there, but they are voluntary and fragmented. Assessment practices are predominately doctrinal and reflection is not systematically brought in. Empirical observations show poor ethical reasoning and interdisciplinary ability alongside good doctorate knowledge in the graduates (Chaturvedi & Vig, 2024). Structural barriers including inflexible accreditation systems, low resources and traditional assessment cultures, continue to exist.

Across jurisdictions, the evidence points to the level of integration across the LETM phases as an indicator of the success of legal education reform. Systems in which experiential learning is used but there is no structured reflection and ethics-centred assessment, and may result in technically competent but ethically limited graduates. In contrast, systems that succeed in gaining systematic accordance of all phases demonstrate higher levels of ethical competence and professional identity formation. Reflection and assessment appear as important multipliers in the context of this framework that enhances the visibility of the influence of experiential learning and ensures its transfer to ethical practice. Pilot programmes in Latvia that take an approach based on learning about cases in depth, guided reflection and multi-method assessment have shown measurable improvements in people's ethical awareness and commitment to their profession. The central finding is that ethical competence cannot be developed by pedagogical instruction alone, but must be developed through engagement with real world practice. It requires integrated and synchronized aspects from curriculum design, assess practices, reflective process levels, to institutional priorities. The LETM meets the need for a structured and theoretically informed framework for the achievement of this integration by seeking both conceptual clarity and the practical relevance for educating law.

This study has shown that the Legal Education Transformation Model (LETM) offers a coherent and theoretically justified way of restructuring legal education by the systematic development of ethical competence. Its main contribution is in the integration of existing established learning theories with unified pedagogical architecture. Illeris's (2003, 2009) holistic theory of learning is used to frame professional development which involves learning's integration of cognitive, emotional and social directions; the experiential learning cycle (Kolb, 1984) on how knowledge can be operationalised and refined through practice; and the reflective practitioner model (Schon, 1987) introduces the idea of adaptive judgement which can be embedded into professional action. The LETM synthesises these approaches into a recursive system where learning, application, evaluation and reflecting are mutually reinforcing rather than being related processes that occur sequentially and separately. The comparative analysis supports the validity that the usefulness of legal education has direct relation with the level of integration in terms of these dimensions. Jurisdictions which institutionalise experiential learning, structured reflection and competence-based assessment highlight 'better' performance in terms of ethical reasoning, professional identity formation and ability to work within a context. By contrast, the systems that continue to have a largely doctrinal orientation, even with augmenting projects of experiential learning, continue to demonstrate persistent skills gashes. These thwarts include limited empathy and poor interdisciplinary engagement as well as lack of capacity to respond to complex socio-legal challenges. The findings do thus confirm a central conclusion: that ethical competence is not some incidental by-product of legal education but the product of conscious and systematic pedagogical design.

Within the Framework of the Latvian Context, the LETM provides an organized and flexible framework for dealing with identifiable institutional deficiencies. Current legal education is still characterised by fragmentation between doctrinal education and practice-oriented education, an examination-driven assessment culture and a lack of overarching framework which acknowledges ethical competence as a basic graduate attribute. These limitations reduce the ability of legal education to address the demands arising from new processes which relate to digitalisation, environmental law and constitutional complexity, and may arise from not being accurate enough or crystallised. By operating in conformity with the premises of the Bologna Process and wider European standards of higher education the LETM offers a way for improved coherence, transferability and professional relevance. Its design also underpins wider normative commitments reflected in the sustainable development goals, especially SDG 4 and SDG 16, which postulate education as a tool for strengthening justice, accountability and institutional integrity.

The broader implication of this study is that comprehensive or structural rather than incremental legal education reform is needed. Isolated interventions (e.g., the establishment of clinical courses or ethics modules) are not enough without the integration on a systemic level. The LETM addresses this limitation since it offers as a model that ethical competence is embedded throughout all phases of learning and reinforced through the continuous interaction with the curriculum design, the assessment practices and the reflective processes. This approach, which integrates this corpus of knowledge in law, allows the transformation of legal education models that have the reproduction of doctrine to the development of professionals capable of dealing with normative complexity and for exercising responsible judgment in technically and socially dynamic environments.

Recommendations

The following recommendations are based upon results of the analysis and are addressed mainly to the Latvian legal education system, with the understanding that the recommendations are adaptable to jurisdictions in the process of reform.

Vertical and Horizontal Integration of LETM

Ethical competence should be integrated throughout academic progression both from a vertical perspective, as well as a horizontal one through substantive courses in law. Early-stage education through the constructivist approach involving problem-oriented pedagogy, with the content on doctrine brought in with ethical inquiry from the beginning. Foundational courses, especially on constitutional and administrative law, should reflect problems concerning rights of minorities, access to justice, democratic governance, and students ought to be able to place the treatment of legal institutions in an overall social context. At intermediate stages, there should be any systematic integration of structured experiential learning into the curriculum. Simulations that address contemporary legal challenges such as data protection compliance, climate-related dispute and intellectual property regulation, should be accompanied by mandatory reflective elements of legal reasoning in relation to its ethical implications. At the final stage clinical education should serve as a capstone requirement instead of an option added in. This should incorporate the supervision of client involvement and an ordered reflective portfolio on the improvement of ethical competence and professional identity.

Faculty Development and Restoration of Academics to the Position of Mentor

Curricular reform means that it must be coupled with a transformation in the role of faculty. Legal educators need to make the paradigm shift from being transmitters of knowledge to being facilitators of professional development. This shift requires special training in the pedagogy of experience, clinical supervision, reflective facilitation, and competency-based assessment. Institutional frameworks for promotion and evaluation should be modified to recognise and reward teaching innovation and mentorship, as well as curriculum development, in addition to the traditional research outputs. Under such alignment, the pedagogical reform runs the risk of being superficial and unsustainable.

Institutional Investment and Partnership

Effective implementation of the LETM requires strategic investment in the institution and growth of external partnerships. Universities to join hands with the courts, ombudsman offices, legal associations and civil society organisations with the aim of providing authentic learning environments. Such partnerships allow students to work on actual legal issues and make contributions in public service objectives. At the same time, exploitation should be made of cost-effective digital infrastructure to enable scalable implementation. Learning management systems can be used in order to support reflective journals, asynchronous discussions and even recorded feedback sessions, to ensure that reflective practice is systematically embedded, even in settings where there is scarcity of resource. Such tools also back up the incorporation of digital literacy as an element of ethical competence, especially in view of the utilize of artificial intelligence for the lawful practice.

Assessment Reconstruction

The need for reform for assessment practices is critical to devising ways for aligning institutional incentives with educational objectives. Assessment needs to move beyond doctrinal recall moving

towards evaluation of reasoning and ethical judgement, as well as professional responsibility and accountability. Recommended approaches are problem-based legal memoranda, oral examination/prompting concerning argumentative coherence, structured reflective journal and peer-evaluated group work concerning collaboration and responsibility. Assessment frameworks also ought to consist of longitudinal assessment, which allows you to track the development of an ethical competence over time. By incorporating ethical reasoning in assessment criteria, institutions can express their centrality to professional competence, while ensuring that it is translated throughout the education process.

References

- Andersson, H., Svensson, A., Frank, C., Borg, C., Cassman-Pell, S., Flink, M., & Gillsjö, C. (2022). Ethics education to support ethical competence learning in healthcare: An integrative systematic review. *BMC Medical Ethics*, 23(1), Article 29. <https://doi.org/10.1186/s12910-022-00766-z>
- Authors, V. (2006). IRRDL volume 7, number 1. *The International Review of Research in Open and Distributed Learning*, 7(1), 1. <https://doi.org/10.19173/irrod.v7i1.1093>
- Bhabha, F. (2015). Towards a pedagogy of diversity in legal education. *Deleted Journal*, 52(1), 59. <https://doi.org/10.60082/2817-5069.2792>
- Bollinger, L. C. (1993). The mind in the major American law school. *Michigan Law Review*, 91(8), 2167. <https://doi.org/10.2307/1289729>
- Chae, S. J. (2024). Understanding and application of experiential learning theory in medical education. *Korean Medical Education Review*, 26. <https://doi.org/10.17496/kmer.23.042>
- European Commission. (2020). *European Commission*
- Gougoulakis, P. (2021). Human learning and study circles. *Paideia/Paideia (Concepción. En Línea)*, 68, 77. <https://doi.org/10.29393/pa68-3hlscx0003>
- Graaf, F. J. de. (2018). Ethics and behavioural theory: How do professionals assess their mental models? *Journal of Business Ethics*, 157(4), 933. <https://doi.org/10.1007/s10551-018-3955-6>
- Hamilton, N. W. (2008). Assessing professionalism: Measuring progress in the formation of an ethical professional identity. *University of St. Thomas Law Journal*, 5(2), 480–562. <https://ssrn.com/abstract=1118204>
- Helyer, R. (2015). Learning through reflection: The critical role of reflection in work-based learning (WBL). *Journal of Work-Applied Management*, 7(1), 15–27. <https://doi.org/10.1108/JWAM-10-2015-003>
- Illeris, K. (2003). *The three dimensions of learning: Contemporary learning theory in the tension field between the cognitive, the emotional and the social*. Krieger
- Illeris, K. (Ed.). (2009). *Contemporary theories of learning: Learning theorists in their own words*. Routledge
- Jaakkola, E. (2020). Designing conceptual articles: Four approaches. *AMS Review*, 10, 18. <https://doi.org/10.1007/s13162-020-00161-0>
- Kamali, F., Yousefy, A., & Yamani, N. (2019). Explaining professionalism in moral reasoning: A qualitative study. *SHILAP Revista de Lepidopterologia*. <https://doaj.org/article/53e122774bde488b9006d84d53411c34>
- Kolb, D. A. (1984). *Experiential learning: Experience as the source of learning and development*. Prentice-Hall
- Lamparello, A. (2019). Curricular integration: The missing element in legal education. *SSRN Electronic Journal*. <https://doi.org/10.2139/ssrn.3368686>
- Nicholson, A., & Pakgohar, A. (2019). Lean thinking in a UK university law clinic: A reflective case study. *International Journal of Clinical Legal Education*, 27(1), 171. <https://doi.org/10.19164/ijcle.v27i1.816>
- Pettersson, M., Hedström, M., & Höglund, A. T. (2018). Ethical competence in DNR decisions: A qualitative study of Swedish physicians and nurses working in hematology and oncology care. *BMC Medical Ethics*, 19(1). <https://doi.org/10.1186/s12910-018-0300-7>
- Reimers, F. (2020). A professional perspective and global education. In *Springer briefs in education* (p. 65). Springer Nature. https://doi.org/10.1007/978-981-15-3887-2_5
- Roux, T. (2014). Judging the quality of legal research: A qualified response to the demand for greater methodological rigour. *Legal Education Review*, 24(1). <https://doi.org/10.53300/001c.6322>
- Rusi, N., & Melo, I. (2025). Clinical legal education: The role and challenges in enhancing access to justice. *Journal of Educational and Social Research*, 15(1), 209. <https://doi.org/10.36941/jesr-2025-0016>

- Saif-Ur-Rahman, K., Waddell, K., Lavis, J. N., Burke, N. N., Tierney, M., Whelan, B., & Devane, D. (2025). Jurisdictional scans: Methodological considerations for systematically analyzing and comparing policy approaches across different jurisdictions. *Journal of Clinical Epidemiology*, 189, 112025. <https://doi.org/10.1016/j.jclinepi.2025.112025>
- Sako, M. J. L., Capulong, E. R. C., King-Ries, A., & Artiach, P. F. (2019). The “second wave” of Spanish clinical legal education. *International Journal of Clinical Legal Education*, 26(3), 119. <https://doi.org/10.19164/ijcle.v26i3.863>
- Sanmartin, A. V., & Niemi, J. (2023). Virtual reality in legal education: Challenges and possibilities. In *Routledge eBooks* (p. 120). Informa. <https://doi.org/10.4324/9781003450160-10>
- Schön, D. A. (1987). *Educating the reflective practitioner: Toward a new design for teaching and learning in the professions*. Jossey-Bass
- Sinha, E. (2023). Co-creating experiential learning in the metaverse. *The International Journal of Management Education*, 21(3), 100875. <https://doi.org/10.1016/j.ijme.2023.100875>
- Spelt, E. J. H. (2015). Teaching and learning of interdisciplinary thinking in higher education in engineering. <https://doi.org/10.18174/358332>
- Staley, A., & Eastcott, D. (1999). Computer-supported experiential learning. *ALT-J*, 7(1), 39. <https://doi.org/10.1080/0968776990070107>
- Sullivan, W. M., Colby, A., Wegner, J. W., Bond, L., & Shulman, L. S. (2007). *Educating lawyers: Preparation for the profession of law*. Jossey-Bass
- Vygotsky, L. S. (1978). *Mind in society: The development of higher psychological processes*. Harvard University Press
- Walters, S., Heilbronn, R., & Daly, C. (2017). Ethics education in initial teacher education. *Professional Development in Education*, 44(3), 385. <https://doi.org/10.1080/19415257.2017.1318773>
- Wijnen-Meijer, M., Brandhuber, T., Schneider, A., & Berberat, P. O. (2022). Implementing Kolb's experiential learning cycle. *Journal of Medical Education and Curricular Development*, 9. <https://doi.org/10.1177/23821205221091511>
- Wiseman, A., Haynes, C., & Hodge, S. (2013). Implementing professional integrity and simulation-based learning. *Clinical Simulation in Nursing*, 9(10). <https://doi.org/10.1016/j.ecns.2012.12.004>
- Witker, J. (2023). El constructivismo como estrategia de renovación de la enseñanza del derecho. *Revista Pedagogía Universitaria y Didáctica del Derecho*, 10(1), 1. <https://doi.org/10.5354/0719-5885.2023.70946>
- Woolley, A. (2014). Legal education reform and the good lawyer. *Alberta Law Review*, 51(4), 801. <https://doi.org/10.29173/alr38>

KORPORATĪVĀ PLĪVURA PACELŠANA KĀ JURIDISKĀS PERSONAS AUTONOMIJAS IEROBEŽOJUMS

PIERCING THE CORPORATE VEIL AS A LIMITATION ON THE AUTONOMY OF A LEGAL ENTITY

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Anotācija

Korporatīvā plīvura pacelšanas princips ir būtisks tiesību instruments, kas ļauj tiesām atkāpties no juridiskās personas autonomijas jeb nošķirtības principa un tieši saukt pie atbildības sabiedrības dalībniekus vai akcionārus gadījumos, kad juridiskās personas statuss tiek izmantots ļaunprātīgi un prettiesiski, piemēram, lai izvairītos no saistībām, apietu normatīvos aktus vai īstenotu krāpnieciskas darbības. Šis princips ir īpaši attīstījies **anglosakšu tiesību sistēmās** un ir ticis adaptēts arī **kontinentālajās tiesību sistēmās Eiropā**. Pētījuma mērķis ir analizēt juridiskās personas autonomijas teorētiskos pamatus un izvērtēt korporatīvā plīvura pacelšanas doktrīnas nozīmi šī principa ierobežošanā. Pētījums balstīts zinātniskās literatūras un doktrinālo atziņu teorētiskā un salīdzinošā analizē, izvērtējot juridiskās personas autonomijas un korporatīvā plīvura pacelšanas doktrīnas attīstību dažādās tiesību sistēmās. Pētījuma rezultāti liecina, ka juridiskās personas autonomija ir funkcionāla juridiska konstrukcija, kuras robežas tiek noteiktas caur plīvura pacelšanas doktrīnā attīstītajiem kritērijiem. Salīdzinošā analīze parāda, ka autonomijas robežu izpratne atšķiras dažādās tiesību sistēmās, tomēr visos gadījumos tās balstās taisnīguma un atbildības apsvērumos.

Atslēgas vārdi: ierobežota atbildība, juridiskās personas autonomija, korporatīvais plīvurs, korporatīvā plīvura pacelšana

Abstract

The principle of "piercing the corporate veil" is a vital legal instrument that allows courts to depart from the principle of the legal entity's autonomy—or separation—and directly hold company members or shareholders liable in cases where the legal entity's status is abused or used unlawfully, such as to evade obligations, circumvent regulations, or engage in fraudulent activities. This principle originated and evolved primarily within Anglo-Saxon legal systems and has subsequently been adapted into continental European legal systems. The aim of this study is to analyze the theoretical foundations of the legal entity's autonomy and to evaluate the significance of the "piercing the corporate veil" doctrine in limiting this principle. The study relies on a theoretical and comparative analysis of academic literature and doctrinal insights, examining the evolution of the legal entity's autonomy and the "piercing the corporate veil" doctrine across various legal systems. The findings indicate

that the autonomy of a legal entity is a functional legal construct, the boundaries of which are defined by criteria developed within the doctrine of piercing the corporate veil. Comparative analysis reveals that while the understanding of these boundaries varies across legal systems, in all instances, they are grounded in considerations of fairness and accountability.

Keywords: limited liability, legal entity's autonomy, corporate veil, piercing the corporate veil.

Ievads

Juridiskās personas autonomijas jeb nošķirtības princips ir viens no mūsdienu komercietisību pamatakmeņiem, kas nodrošina kapitālsabiedrības kā atsevišķa tiesību subjekta pastāvēšanu neatkarīgi no tās dalībniekiem. Šis princips ļauj efektīvi organizēt uzņēmējdarbību, veicināt kapitāla piesaisti un nodrošināt risku sadali, vienlaikus garantējot ierobežotu atbildību sabiedrības dalībniekiem. Tomēr juridiskās personas autonomijas praktiskā piemērošana nav absolūta. Situācijās, kad sabiedrības forma tiek izmantota ļaunprātīgi vai pretēji tās sociālajai funkcijai, tiesību sistēmās ir izveidojies mehānisms, kas ļauj atkāpties no formālās nošķirtības, – korporatīvā plīvura pacelšanas doktrīna.

Mūsdienu tiesību doktrīnā un praksē arvien biežāk aktualizējas jautājums par līdzsvara nodrošināšanu starp juridiskās personas autonomiju un nepieciešamību aizsargāt kreditorus, novērst krāpniecību un nepieļaut normatīvo prasību apiešanu. Līdz ar to rodas teorētiska un praktiska problemātika – kādās robežās juridiskās personas autonomija ir aizsargājama un kādos gadījumos tās ierobežošana ir leģitīma. Šī problemātika īpaši spilgti izpaužas anglosakšu tiesību sistēmās attīstītajā korporatīvā plīvura pacelšanas doktrīnā, kas pakāpeniski ietekmējusi arī kontinentālo Eiropu.

Rakstā analizēti juridiskās personas autonomijas principa teorētiskie pamati un, balstoties uz korporatīvā plīvura pacelšanas doktrīnas attīstību un piemērošanas kritērijiem, izvērtēts šī principa ierobežošanas pamatojums mūsdienu komercietisību sistēmā. Pētījums balstīts zinātniskās literatūras un doktrinālo atziņu teorētiskā un salīdzinošā analizē, izvērtējot juridiskās personas autonomijas attīstību un plīvura pacelšanas kritēriju konvergenci dažādās tiesību sistēmās.

Juridiskās personas nošķirtības princips un tā attīstība

Juridisko personu saknes meklējamas romiešu tiesībās, kurās parādījās jēdzieni par kolektīvām apvienībām ar atšķirīgām tiesībām, piemēram, *municipia* un *collegia*. Romiešu jurisprudences atzina personas, kas varēja īpašumā turēt mantu un slēgt līgumus neatkarīgi no fiziskām personām, proti, Justiniāna *Corpus Juris Civilis* darbā. Pētot juridiskās personas institūta vēsturisko attīstību, Patersons (*Patterson*) norāda, ka senās korporāciju formas veidoja pamatu modernai mūsdienu juridiskās personas izpratnei. Tieši šajās institūcijās pirmo reizi tika atzīta kolektīvas vienības spēja turēt mantu un pastāvēt neatkarīgi no dalībnieku maiņas (*Patterson*, 1983).

Juridiskās personas autonomijas jeb nošķirtības princips ir viens no korporatīvo tiesību pamatprincipiem, kas ļauj uzņēmumus atzīt par subjektiem, kas pastāv neatkarīgi no to īpašniekiem vai vadības. 18. gadsimtā Eiropā parādījās patentu likumi, kas darbojās kopā ar ģildēm, veicinot tehnoloģiju attīstību un inovācijas un vienlaikus saglabājot kontroli pār tirdzniecību un rūpniecību (*Belfanti*, 2004).

1897. gada Lordu palātas spriedums lietā *Salomon* pret *Salomon and Co. Ltd.* iedibināja atsevišķas juridiskās personas un ierobežotas atbildības principu starp sabiedrību un tās akcionāriem vai dalībniekiem kā anglosakšu tiesību kapitālsabiedrību pamatprincipu, skaidri deklarējot, ka sabiedrība ir autonomas tiesību subjekts, kas atbild ar savu, nevis dalībnieku mantu. Šis tiesas spriedums noteica, ka korporācijai ir atsevišķa juridiskā identitāte no tās akcionāriem (Fairuzia, Rahadiyan, 2024). Šajā lietā Arons Salomons bija reģistrējis apavu ražošanas uzņēmumu, kurā pats un viņa ģimene bija akcionāri, un kad uzņēmums bankrotēja, kreditori centās viņu personīgi saukt pie atbildības par tā parādiem. Lordu palātas spriedums nostiprināja “korporatīvā plīvura” doktrīnu, kas aizsargā individuālos akcionārus no atbildības par korporatīvajām saistībām, kas pārsniedz viņu akciju daļu (Parkinson, 1995).

Autores ieskatā, lai gan Salomona lieta radīja skaidru juridisko precedentu, tā vienlaikus radīja arī potenciālu risku, proti, iespēju korporatīvo struktūru izmantot ļaunprātīgi, un tieši šī sprieduma duālā daba – gan kā instruments ekonomiskai attīstībai, gan kā potenciāls krāpniecisku darbību aizsegam – ir pamatā mūsdienu diskusijām par korporatīvā plīvura pacelšanas nepieciešamību. Šis spriedums ietekmēja arī kontinentālo Eiropu, sniedzot konceptuālu pamatojumu kapitālsabiedrības nošķirtībai, kas papildināja jau vairākās valstīs esošo atsevišķās mantas doktrīnu.

Ierobežotas atbildības ieviešana pilnībā pārveidoja uzņēmējdarbības vidi Anglijā. Likums ļāva uzņēmumiem reģistrēties kā sabiedrībām ar ierobežotu atbildību. Apvienotajā Karalistē korporatīvā forma attīstījās četrus gadsimtus, un tās izveidi raksturo piecas galvenās iezīmes – atsevišķa juridiska persona, ierobežota atbildība, brīvi pārvedams kapitāls, deleģēta pārvaldība un investoru īpašumtiesības (Turner, 2017). Galvenais juridiskās personas attīstības virzītājspēks bija nepieciešamība nodalīt korporācijas aktīvus no dalībnieku personiskās mantas (*asset partitioning*). Šī struktūra nodrošināja gan kreditora aizsardzību, gan risku sadalīšanu, kas savukārt padarīja iespējamu mūsdienu kapitāla tirgu attīstību (Hansmann, Kraakman, 2000; Peterson, 2017). Amerikas Savienotajās Valstīs (ASV) juridisko personu struktūra attīstījusies daudzveidīgi, veidojušās korporācijas, kooperatīvi un partnerības, uzsverot aktīvu sadalīšanu kā galveno funkciju, lai aizsargātu kreditoru prasījumus (Hansmann, Kraakman, 2000). Eiropā juridisko personu attīstība arī atspoguļo kultūras, ekonomikas un tiesību tradīciju dažādās ietekmes. Atšķirībā no ASV pieejas Eiropā uzņēmumu attīstībā uzsvars tika likts uz organizāciju formu elastību un pielāgojamību (Guinnane et al., 2007).

Kā norāda Parkinsons (*Parkinson*), kapitālsabiedrība vēsturiski izveidojās kā ekonomiskās organizācijas forma, kuras galvenais mērķis bija nodrošināt efektīvu kapitāla piesaisti, risku sadali un uzņēmējdarbības nepārtrauktību neatkarīgi no dalībnieku individuālajām interesēm vai mantiskā stāvokļa (Parkinson, 1995).

Juridiskās personas autonomijas princips pēc būtības nodrošina sabiedrības dalībniekiem ierobežotu atbildību, proti, viņi par sabiedrības saistībām personīgi neatbild vairāk nekā ir ieguldījuši. Korporatīvās autonomijas jēdziens attiecas uz pašpārvaldes pakāpi, kas piešķirta korporācijām likuma robežās, ļaujot tām pieņemt lēmumus, kas atbilst to stratēģiskajām interesēm. Šo autonomiju pamato morālās aģentūras teorijas (*moral agency theories*), kas uzskata, ka uzņēmumi, kam ir savi mērķi, spriestspēja un paškontrole, var darboties kā autonomi subjekti demokrātiskā sabiedrībā (Hasnas, 2016).

Lai sistemātiski izvērtētu juridiskās personas autonomijas pamatu, autore veica literatūras analīzi, izpētot starptautiskus avotus un autoru skatījumus. Veicot literatūras izpēti, autore konstatē, ka juridiskās personas autonomijas principa definēšanā nav vienotas pieejas vai klasifikācijas, taču

autoru darbi grupējas vairākos skaidri identificējamos virzienos. Secīgi, balstoties uz dominējošo analītisko fokusu, autore veiktajā apkopojumā virzieni strukturēti četrās grupās pēc to fokusa – ekonomiskais un organizatoriskais, sociāli-filozofiskais un modernais, komparatīvais (salīdzinošais) un vēsturiskais, un autonomijas izņēmumu virziens.

Analizējot šos četrus virzienus, autore konstatē būtisku asimetriju, proti, kamēr pirmie trīs koncentrējas uz juridiskās personas autonomijas pamatojumu un aizsardzību, tikai ceturtais pievēršas situācijām, kad šī autonomija ir jāierobežo. Autore uzskata, ka tieši šis ceturtais virziens ir vismazāk attīstītais, tomēr vienlaikus vissvarīgākais tā praktiskajā pielietojumā. Literatūras apkopojums sniegts 1. tabulā.

1. tabula

Juridiskās personas autonomijas teorētisko virzienu zinātniskās literatūras apkopojums

(autore veidota klasifikācija un apkopojums pēc zinātniskās literatūras materiāliem)

Teorētiskais virziens	Konceptuālais uzsvars / teorētiskā būtība	Autori
Ekonomiskais un organizatoriskais	Autonomija kā ekonomisks institūts kapitāla piesaistei, risku sadalei un aktīvu nodalīšanai. Uzsvars uz ierobežotas atbildības funkcionālo efektivitāti, transakciju izmaksu ekonomiku un korporācijas kā efektīvas ekonomiskās vienības struktūru	<i>Parkinson (1995)</i> <i>Hansmann, Kraakman (2000)</i> <i>Gunnane et al (2007)</i> <i>Lamoreaux (2004)</i> <i>Davoudi et al (2018)</i> <i>Williamson (1981)</i>
Sociāli-filozofiskais un modernais	Autonomija kā morālās aģentūras, ieinteresēto personu (<i>stakeholder</i>) interešu un sabiedriskās atbildības institūts. Uzsvērta korporācijas loma publiski-privātajās partnerībās, sociālajos mērķos un demokrātisku lēmumu pieņemšanas procesos	<i>Hasnas (2016)</i> <i>Lafrance, Lehmann (2005)</i> <i>Chiu (2016)</i> <i>Segrestin, Hatchuel (2011)</i> <i>Mion, Loza Adauai (2020)</i> <i>Tan, Wang, Hofmann (2018)</i>
Komparatīvais un vēsturiskais	Autonomijas attīstība skaidrota salīdzinoši – Ķīnas ģimenes institūti, kontinentālās Eiropas modeļi, anglosakšu vispārpieņemta (<i>common-law</i>) pieeja un mūsdienu mātes-meitas sabiedrību atbildības konstrukcijas. Autori pievēršas arī Eiropas Savienības harmonizācijas tendencēm	<i>Ruskola (2000)</i> <i>Virtus Interpress (2020)</i> <i>Steffek (2012)</i> <i>Schall (2016)</i> <i>Michoud (2019)</i>
Autonomijas izņēmumu virziens	Izņēmumu gadījumi juridiskās personas nošķirtībai – krāpšana, ļaunprātīga rīcība, interešu "sajaukšana", šķietamība, fiktīvas struktūras, kā arī apgrieztā plīvura pacelšana (<i>reverse piercing</i>). Uzsvērta, ka autonomija nav absolūta un tiesas to ierobežo leģitīmu mērķu sasniegšanai	<i>Örn (2009)</i> <i>Thompson (1991)</i> <i>Knutsson (2018)</i> <i>Amirian (2022)</i> <i>Tan, Wang, Hofmann (2018)</i> <i>Grinšpane (2020)</i>

Autore uzskata, ka no četriem teorētiskajiem virzieniem mūsdienās visaktuālākais ir autonomijas izņēmumu virziens, jo īpaši Latvijas kontekstā, jo tieši tas risina praktisko problēmu – juridiskās personas ļaunprātīgu izmantošanu. Šī pieeja autorei ieskatā papildina ekonomisko un sociāli-filozofisko virzienu, jo ar skaidriem kritērijiem autonomijas ierobežošanai iespējams nodrošināt balansu starp kapitāla piesaisti, kreditoru aizsardzību un dalībnieka atbildību.

Kopumā juridiskās personas nošķirtības princips vēsturiski attīstījies no kolektīvo institūciju tiesiskās atzišanas romiešu tiesībās līdz modernajai korporāciju formai, kas nodrošina aktīvu un atbildības nodalīšanu. Literatūras analīze apliecina, ka juridiskās personas institūts veidojies nevis

kā vienots tiesību koncepts, bet kā dažādo sociālo, ekonomisko un juridisko faktoru savstarpēja mijiedarbība, kur Eiropā nozīme bija kodifikācijai un organizāciju elastībai, savukārt anglosakšu tiesību sistēmās tiesu praksei un ierobežotas atbildības attīstībai.

Autore secina, ka mūsdienu juridiskās personas autonomijas princips nav statisks un tā dinamiskā attīstība ir tieši saistāma ar tiem izņēmumiem, kad juridiskās personas "plīvurs" var tikt atcelts korporatīvā plīvura pacelšanas rezultātā.

Korporatīvā plīvura pacelšanas principa būtība un piemērošanas kritēriji

Korporatīvā plīvura pacelšanas (*piercing the corporate veil; lifting the corporate veil*) doktrīna aizgūta no anglosakšu tiesību sistēmas kā izņēmuma mehānisms situācijās, kad sabiedrības dalībnieki izmanto atsevišķas juridiskās personas statusu, lai izvairītos no saistībām vai radītu maldinošas, šķietamas struktūras (Alliks, 2013; Allen, 2011). Tā nereti tiek saistīta ar jau iepriekš minēto *Salomon* pret *A. Salomon & Co. Ltd.* spriedumu, kas nostiprināja juridiskās personas autonomijas jeb nošķirtības principu.

Termins "korporatīvā plīvura pacelšana" (*piercing the corporate veil*) tiek saistīts ar amerikāņu juristu un tiesību zinātnieku Vormseru (*Wormser*), kurš 1912. gadā publicēja vienu no pirmajiem darbiem par korporatīvā plīvura pacelšanu, kur noformulēja ideju, ka juridiskā persona nedrīkst tikt izmantota kā aizsargs krāpšanai, negodīgumam vai tiesību ļaunprātīgai izmantošanai (Pušac, 2024; Wormser, 1912). ASV jurists Īzaks Moriss Vormsers (*Isaac Maurice Wormser*) rakstīja, ka gadījumos, kad korporatīvais subjekts tiek izmantots, lai apkrāptu kreditorus, izvairītos no saistībām, apietu likumu, izveidotu vai saglabātu monopolu, vai piesegtu blēdības un noziegumus, tiesas atvilks vaļā korporatīvo plīvuru un uzskatīs korporatīvo subjektu par dzīvu un darbojošos cilvēku kopumu, attiecībā pret kuriem tiks spriesta tiesa. (Wormser, 1912).

Kā norāda Tomsons (*Thompson*), korporatīvā plīvura pacelšana teorētiski izriet no nepieciešamības ierobežot juridiskās personas nošķirtības jeb autonomijas principu gadījumos, kad tas tiek izmantots pretēji tā mērķim, proti, ļaunprātīgi, krāpnieciski vai tiesību normu apiešanas nolūkā (Thompson, 1991). Šī koncepcija paredz atteikšanos no sabiedrības atsevišķās juridiskās personas statusa jeb juridiskās personas autonomijas principa, lai sauktu pie atbildības tās akcionārus, dalībniekus vai valdes locekļus par sabiedrības saistībām, īpaši gadījumos, kad tiek konstatēti krāpšanas vai neatbilstošas rīcības gadījumi (Ottolenghi, 1990). Tā tiek traktēta kā izņēmums no juridiskās personas autonomijas principa, kas pats par sevi veido modernās komerciesību sistēmas pamatu.

Neskatoties uz korporatīvā plīvura pacelšanas sarežģītību praksē, izpratne par to, kad un kā pacelt korporatīvo plīvuru, ir būtiska, lai nodrošinātu, ka dalībnieki vai akcionāri tiek saukti pie atbildības par savu rīcību (Bueno, Bright, 2020). Doktrīna par uzņēmuma aizsega *caurumošanu* (*piercing the corporate veil*) vai, kā citi autori to dēvē, par aizsega vai plīvura pacelšanu (*lifting the veil*) tiek definēta kā process, kurā akcionāriem tiek uzlikta atbildība par uzņēmuma veiktajām juridiskajām darbībām, neņemot vērā faktu, ka šīs darbības faktiski veica uzņēmums. Šajā gadījumā tiesa ignorēs šo faktu un uzliks personīgu atbildību pusei, kas izraisījusi korporatīvā aizsega atklāšanu, ignorējot akcionāru atbildības ierobežojuma principu. Tas nozīmē, ka uzņēmuma aizsega jeb korporatīvā plīvura pacelšana var notikt, ja ir veikta nelikumīga darbība gan no uzņēmuma valdes, gan akcionāru puses. Sabiedrības atsevišķas vienības princips nav absolūts, jo, lai gan sabiedrība ir atdalīta no tās akcionāriem, noteiktos gadījumos tiesa var atcelt tās neatkarību, atcelt plīvuru, kas atdala sabiedrību no akcionāriem, tādējādi akcionāri kļūst personiski atbildīgi (Intihani, 2022). Autores ieskatā, plīvura pacelšanas doktrīnas izpratne ir kritiska tiesu prakses attīstībai, nodrošinot nošķirtības principa

efektivitāti bez juridiskas personas nošķirtības vai autonomijas absolutizācijas. Latvijā *Komerclikums* nosaka, ka kapitālsabiedrības dalībniekus sabiedrības attiecībās ar trešajām personām aizklāj korporatīvs plīvurs, jo sabiedrību ar ierobežotu atbildību un akciju sabiedrību atbildība ir norobežota, proti, sabiedrība atbild par savām saistībām ar visu savu mantu un neatbild par dalībnieka saistībām, savukārt dalībnieks neatbild par sabiedrības saistībām (*Komerclikuma* 137. pants).

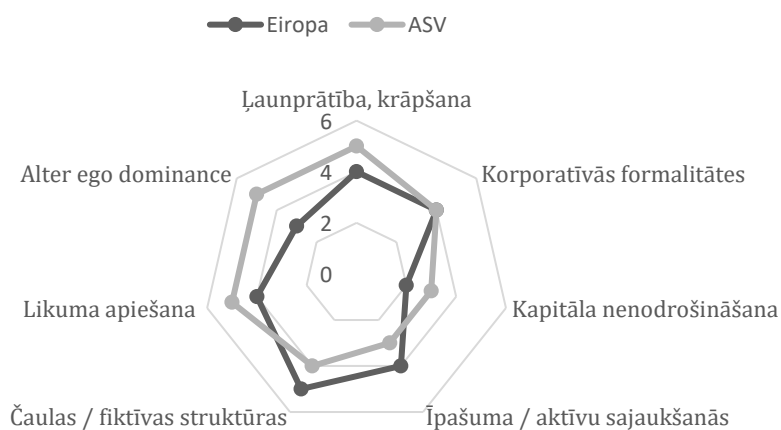
Autore pievienojas Beinbridža (*Bainbridge*) viedoklim, kas uzsver, ka juridiskajā literatūrā ir vienprātīgi atzīts, ka doktrīna atšķiras no citiem tiesību institūtiem ar to, ka tā nav vispārējs līdzeklis dalībnieku vai vadības atbildības paplašināšanai, bet gan korigējošs mehānisms, kas darbojas tikai tad, ja sabiedrības forma tiek izmantota pretēji tās funkcijai (*Bainbridge*, 2005). Autores ieskatā, pievienojoties arī Knutsona (*Knutsson*) viedoklim, situācijās, kad korporatīvā struktūra tiek izmantota normatīvo prasību apiešanai vai dalībnieka personisko risku nepamatotai pārlikšanai uz sabiedrību, ar tradicionālajām dalībnieka atbildības normām nereti nepietiek (*Knutsson*, 2018). Šādos gadījumos plīvura pacelšana kļūst nevis par sankciju, bet par tiesiskās sistēmas aizsargmehānismu, kas nodrošina, lai juridiskās personas forma netiktu izmantota pretrunā tās sociālajai funkcijai un tiesiskajai videi. Autores ieskatā, doktrīna būtu jāinterpretē kā instruments situācijām, kurās sabiedrības forma kalpo par līdzekli likuma apiešanai vai neatbilstošai riska pārlikšanai, pat ja nav konstatējama klaja krāpšana.

Korporatīvā plīvura pacelšanas kritēriju identificēšana ir viens no centrālajiem jautājumiem tiesību doktrīnā, jo tā piemērošana nav balstīta uz vienu vispārēju nosacījumu, bet gan uz dažādu faktoru kombināciju (*Alliks*, 2013; *Wormser*, 1912). Kā norāda *Tomsons (Thompson)* savā empīriskajā pētījumā, tiesas praksē nav izveidojies viens universāli piemērojams kritērijs, lēmumi balstās konkrēto apstākļu kopumā, kas norāda uz sabiedrības izmantošanu neatbilstošam mērķim (*Thompson*, 1991). Tieši šāda iemesla dēļ literatūrā veidojusies nepieciešamība sistematizēt kritērijus, kas atspoguļo tipiskākos gadījumus, kad tiesas atzīst par pamatotu atkāpi no juridiskās personas autonomijas principa. *Meisijs un Mits (Macey, Mitts)* uzsver, ka doktrīnas teorētiskais pamats balstās trīs galvenajās kategorijās, proti, krāpšanā, tiesību normu apiešanā un sabiedrības struktūras ļaunprātīgā izmantošanā (*Macey, Mitts*, 2014).

Apvienotajai Karalistei, salīdzinājumā ar citām valstīm, ir sena šīs doktrīnas piemērošanas vēsture. Apvienotās Karalistes tiesas ir noteikušas apstākļus, kuros akcionāri un valdes locekļi var tikt saukti pie personīgās atbildības. Šādi apstākļi ietver gadījumus, kad pastāv krāpšanas, šķietamības vai maldinošas struktūras (*facade*), pārstāvības attiecības (*agency*) vai fiktīvas darbības (*sham*) pazīmes. Doktrīnas piemērošana ir kļuvusi skaidrāka, strukturētāka un sistematizētāka, pateicoties izstrādātajām vadlīnijām un judikatūras nostiprinātajai pieejai (*Fairuzia, Rahadiyan*, 2024). 2013. gada Apvienotās Karalistes Augstākās tiesas spriedums lietā *Prest pret Petrodal Resources Ltd.* ir vadošā un visautoritatīvākā mūsdienu lieta par korporatīvā plīvura pacelšanu Apvienotajā Karalistē, un tā definē robežas, kādos gadījumos iespējams pacelt korporatīvo plīvuru. Šajā lietā Augstākā tiesa identificēja divus principus: slēpšanas princips (*concealment principle*) – kad sabiedrība vai vairākas sabiedrības tiek izmantotas, lai slēptu darījuma patieso būtību, un attiecīgi šādos gadījumos tiesa paceļ plīvuru; un apiešanas jeb izvairīšanās princips (*evasion principle*) –, kas attiecas uz situācijām, kad persona ir saistīta ar konkrētu juridisku pienākumu, atbildību vai ierobežojumu, un tā apzināti cenšas no tā izvairīties vai kavēt tā izpildi, izmantojot uzņēmumus, kas atrodas tās kontrolē (*Rutledge*, 2021). *Lo (Lo)*, analizējot Apvienotās Karalistes judikatūru, secina, ka apiešanas jeb izvairīšanās princips *evasion principle* ir viens no stabilākajiem pamatiem, uz kura balstās mūsdienu plīvura pacelšanas gadījumi (*Lo*, 2017). Secināms, ka Apvienotās Karalistes pieeja korporatīvā plīvura pacelšanai ir nozīmīga ar to, ka tā skaidri nošķir gadījumus, kuros juridiskā persona tiek

izmantota vienīgi kā formāls aizsargs, no situācijām, kurās pastāv leģitīma juridiskā autonomija, tādējādi samazinot plīvura pacelšanas patvaļīgas piemērošanas risku.

ASV tiesu praksē korporatīvā plīvura pacelšana nav ārkārtējs vai margināls izņēmums, bet gan funkcionējošs un pietiekami prognozējams tiesību aizsardzības instruments, kas tiek piemērots ievērojamā daļā lietu. Autore, veicot literatūras analīzi, identificēja biežākos kritērijus korporatīvā plīvura pacelšanai dažādās Eiropas valstīs un ASV. Eiropā un ASV korporatīvā plīvura pacelšanas kritēriji tiek attīstīti uz līdzīgiem pamatiem, bet citas jurisdikcijas var izcelt atsevišķas īpašības vai pievērst lielāku uzmanību kādam kritērijam. Tāpat arī tiesu prakse un doktrīnas attīstība atšķiras nacionālā līmenī, tomēr jānorāda, ka ir redzama kopīga noteiktu kritēriju hierarhija. Gan Eiropas, gan ASV tiesību sistēmās kā būtiskākie kritēriji atkārtoti izceļas dalībnieka dominēšana, korporatīvās nošķirtības, aktīvu nošķirtības faktiska neesamība vai saplūšana un juridiskās personas izmantošana prettiesisku vai negodprātīgu mērķu sasniegšanai. Autore veica kvalitatīvu sintēzi, balstoties uz zinātniskās literatūras avotiem (ieskaitot empīriskos pētījumus, kā Thompson, 1991 un Macey, Mitts, 2014), analizējot kritēriju atkārtotības biežumu, to statusu kā primāros vai izšķirošos faktorus tiesu praksē un doktrīnā, kā arī salīdzinošās atšķirības starp ASV un Eiropas Savienības tiesību sistēmām. Nozīmīguma hierarhija atspoguļo literatūras plaši atzīto viedokli, balstoties uz kritēriju biežumu un izšķirošo lomu vadošajos empīriskajos un doktrinālos avotos. Kritēriju novērtējums pēc to piemērošanas būtiskuma parādīts 1. attēlā.



1. attēls. Korporatīvā plīvura pacelšanas kritēriju nozīmīguma salīdzinājums Eiropas un ASV tiesību sistēmās (autores veidots pēc zinātniskās literatūras)

Analizējot kritēriju salīdzinājumu, kas ilustrēts 1. attēlā, autore konstatē, ka, neskatoties uz jurisdikciju atšķirībām, pastāv skaidra kritēriju hierarhija. Autore uzskata, ka šī starptautiskā konverģence apliecina, ka korporatīvā plīvura pacelšanas pamatprincipi vai kritēriji ir universāli un tie izriet nevis no nacionālajām īpatnībām, bet gan no juridiskās personas institūta fundamentālās loģikas. Lai gan ASV korporatīvo tiesību pamatā ir štatu tiesības, gandrīz visas štatu jurisdikcijas ievēro vienu no divām tradicionālajām korporatīvā plīvura pacelšanas pieejām, proti, “instrumentalitātes” doktrīnu vai “*alter ego*” doktrīnu. Tiesas izvērtē tādus faktorus kā korporatīvo formalitāšu neievērošanu, individuālo un korporatīvo aktīvu sajaukšanu, atsevišķu biroju neesamību un situācijas, kurās korporācija tiek izmantota kā tukša “čaula” bez darbiniekiem vai aktīviem.

Autore secina, ka ASV tiesu praksē korporatīvā plīvura pacelšana balstās uz elastīgu, faktos orientētu pieeju, kurā izšķiroša nozīme ir nevis formālai juridiskās personas struktūrai un autonomijai, bet gan faktiskajai kontrolei, ekonomiskajai realitātei un taisnīga rezultāta nodrošināšanai konkrētajā lietā. Tas nav mehānisks vai formāls izņēmums, bet gan līdzsvarots instruments, kura mērķis ir novērst juridiskās personas formas ļaunprātīgu izmantošanu.

Apkopojot literatūru par korporatīvā plīvura pacelšanas kritērijiem Eiropas dalībvalstīs, autore secina, ka pētījumi pārsvarā netiek koncentrēti uz kādu konkrētu Eiropas Savienības dalībvalsti. Gluži pretēji, zinātniskie darbi šo institūtu visbiežāk aplūko Eiropas Savienības vai daudzvalstu kontekstā, analizējot to saistībā ar pārrobežu uzņēmējdarbību, korporatīvo grupu jeb koncernu atbildību, investīciju tiesībām un cilvēktiesību aizsardzības mehānismiem. Tāpat secināms, ka Eiropas tiesībās nav vienas dominējošas Eiropas Savienības valsts, kur korporatīvā plīvura pacelšana tiktu analizēta intensīvāk nekā citur, pētījumi vienmēr ir komparatīvi (salīdzinoši) vai plašāku tiesību mehānismu kontekstā Eiropas Savienības līmeņa ietvarā. Pamatoti secināms, ka korporatīvā plīvura pacelšana galvenokārt netiek pētīta kā vienas nacionālās tiesību sistēmas specifisks fenomens. Viena no visvairāk pētītajām ir Vācijas pieeja korporatīvā plīvura pacelšanas principa piemērošanā. Līdzās Vācijai vairāku Eiropas valstu tiesību sistēmas ir plaši analizētas, īpaši Francija un Itālija. Papildus tam akadēmiskajā literatūrā regulāri tiek iekļautas arī Nīderlande, Beļģija, Spānija, Austrija, Somija, Dānija, Luksemburga, Portugāle un Zviedrija.

Lai sistematizētu korporatīvā plīvura pacelšanas pamatkritēriju Eiropas Savienības dalībvalstu tiesību sistēmās un atspoguļotu to saturu, autore apkopo biežāk sastopamos kritērijus un to raksturojumu 2. tabulā.

2. tabula

Korporatīvā plīvura pacelšanas kritēriji Eiropas Savienības tiesību sistēmās un to raksturojumu apkopojums

(autores veidota klasifikācija un apkopojums pēc zinātniskās literatūras materiāliem)

Kritērijs	Raksturojums Eiropas Savienības tiesību sistēmās
Ļaunprātīga, krāpnieciska rīcība	Galvenais un biežākais pamats plīvura pacelšanai – uzņēmuma forma izmantota, lai apietu likumu, maldinātu kreditorus vai radītu viltus struktūru.
Korporatīvo formalitāšu neievērošana	Vērtē atsevišķu grāmatvedību, akcionāru sapulces, valdes lēmumus. Ja formalitātes netiek ievērotas, samazinās sabiedrības norobežotības leģitimitāte.
Kapitāla nenodrošināšana	Kapitāla nepietiekamība norāda, ka uzņēmums radīts atbildības ierobežošanai; tomēr Eiropā parasti nav izšķirošais kritērijs.
Īpašumu, aktīvu vai vadības sajaukšanās	Ja nav iespējams nodalīt dalībnieku un sabiedrības mantu, vadību vai finanšu plūsmas, tiek atzīts, ka juridiskā persona zaudējusi autonomiju.
Sabiedrības izmantošana kā "čaula" vai fiktīvas struktūras	Tiesa paceļ plīvuru, ja sabiedrība reāli nepilda saimniecisko funkciju, bet kalpo tikai kā fasāde patieso īpašnieku interešu slēpšanai.
Izmantošana likuma apiešanai vai zaudējumu slēpšanai	Tiesa paceļ plīvuru, ja sabiedrības forma tiek izmantota, lai apzināti apietu tiesību normas vai slēptu saistības (<i>evasion principle</i>).

Secināms, ka Eiropas Savienības dalībvalstu pieeja korporatīvā plīvura pacelšanai balstās uz salīdzinoši vienotiem pamatkritērijiem. Neatkarīgi no konkrētās nacionālās tiesību sistēmas tiesu praksē un doktrīnā atkārtoti parādās tādi paši pamatojumi, atšķirības starp dalībvalstīm galvenokārt izpaužas šo kritēriju piemērošanas stingrībā, pierādīšanas sliekšņi un tiesu piesardzības pakāpē, nevis pašos kritērijos pēc būtības. Līdz ar to korporatīvā plīvura pacelšana Eiropas Savienības tiesību sistēmā nav uzskatāma par katras valsts individuālu un unikālu doktrīnu, bet gan par kopēju, salīdzinoši harmonizētu tiesisko koncepciju.

Kopsavilkums

Juridiskās personas autonomijas teorētiskais ietvars parāda ierobežotas atbildības nozīmīgumu ekonomiskās izaugsmes, inovāciju un uzņēmējdarbības veicināšanā, un jebkura atkāpe no šī principa (t.i. "plīvura pacelšana") ir nopietns izņēmums, kas prasa pamatotus kritērijus un sabalansēšanu, lai netiktu grauta komercietišu stabilitāte. Veiktā juridiskās personas autonomijas principa analīze apliecina, ka juridiskās personas nošķirtības princips netiek uztverts kā absolūta vērtība, bet gan kā funkcionāls instruments noteiktu ekonomisku un sociālu mērķu sasniegšanai.

Juridiskās personas autonomijas princips nav statiska norma, bet dinamiska konstrukcija, kuras praktiskā robeža tiek konkretizēta caur plīvura pacelšanas doktrīnu. Literatūras analīze parāda, ka juridiskās personas autonomija dažādos teorētiskajos virzienos tiek pamatota ar ekonomiskiem, organizatoriskiem, sociāli-filozofiskiem un komparatīviem argumentiem, tomēr vienlaikus šie virzieni atzīst, ka autonomija nav neierobežota. Tieši korporatīvā plīvura pacelšanas doktrīna veido mehānismu, caur kuru juridiskās personas autonomijas praktiskās robežas tiek konkretizētas situācijās, kad sabiedrības forma tiek izmantota pretēji tās funkcijai vai ļaunprātīgā nolūkā.

Korporatīvā plīvura pacelšanas doktrīna vēsturiski vispilnīgāk ir attīstījusies Apvienotās Karalistes un ASV tiesu praksē, savukārt Eiropas Savienības tiesu telpā tā nav tieši kodificēta un tiek piemērota fragmentāri un reti. Korporatīvā plīvura pacelšanas piemērošana tiesu praksē nereti tiek uzskatīta par nekonsekventu un neparedzamu, un šāda juridiskā nenoteiktība kaitē uzņēmējdarbības videi, proti, investori un sabiedrības kopumā nevar prognozēt riskus. Vienota standarta trūkums un subjektīvisms tiesu lēmumos norāda uz nepieciešamību sistematizētu kritēriju izstrādei.

Salīdzinošā analīze ļauj secināt, ka korporatīvā plīvura pacelšanas doktrīna Eiropas Savienības dalībvalstīs, Apvienotajā Karalistē un Amerikas Savienotajās Valstīs, neskatoties uz nacionālajām īpatnībām, balstās uz konceptuāli līdzīgiem pamatiem. Dalībnieka dominējošā kontrole, krāpnieciska vai ļaunprātīga rīcība, mantas un vadības sajaukšana, kā arī sabiedrības izmantošana kā fiktīva struktūra atkārtoti parādās kā centrālie kritēriji dažādās tiesību sistēmās, kas norāda uz šo pamatojumu izcelsmi juridiskās personas institūta iekšējā loģikā. Atšķirības starp jurisdikcijām galvenokārt skar šo kritēriju piemērošanas intensitāti un pierādīšanas standartus, nevis paša institūta būtību. Tādējādi korporatīvā plīvura pacelšana nav uzskatāma par autonomijas principa izņēmumu nejaušā vai fragmentārā nozīmē, bet gan par sistemātisku korektīvu mehānismu, kas konkretizē juridiskās personas autonomijas praktiskās robežas un nodrošina līdzsvaru starp uzņēmējdarbības efektivitāti un taisnīguma prasībām mūsdienu komercietišu sistēmā.

References

- Allen, R. J. (2011). Reverse piercing of the corporate veil: A straightforward path to justice. *St. John's Law Review*, 85 (3), 1147–1174. Retrieved from <https://scholarship.law.stjohns.edu/lawreview/vol85/iss3/6/>
- Alliks, A. (2013). Korporatīvā plīvura pacelšanas krimināltiesiskie aspekti. *Jurista vārds*, 2013. NR. 27/28 (778/779). Pieejams <https://juristavards.lv/doc/258080-korporativa-plivura-pacelsanas-kriminaltiesiskie-aspekti/>
- Bainbridge, S. M. (2005). Abolishing LLC veil piercing. UCLA School of Law, Law & Economics Research Paper Series. Retrieved from <https://illinoislawreview.org/wp-content/ilr-content/articles/2005/1/Bainbridge.pdf>
- Belfanti, C. (2004). Guilds, Patents, and the Circulation of Technical Knowledge: Northern Italy during the Early Modern Age. *Technology and Culture*, 45(3), 569–589. Retrieved from <https://doi.org/10.1353/tech.2004.0111>
- Bueno, N., Bright, C. (2020). Implementing Human Rights Due Diligence Through Corporate Civil Liability. *International and Comparative Law Quarterly*, 69(4), 789–818. Retrieved from <https://doi.org/10.1017/s0020589320000305>
- Fairuzia, R., Rahadiyan, Y. (2024). The comparison of regulation and implementation of the piercing the corporate veil doctrine to directors in corporate law. *Journal of Private and Commercial Law*, 1 (2), 133–150. Retrieved from https://www.researchgate.net/publication/387652138_The_Comparison_of_Regulation_and_Implementation_of_The_Piercing_The_Corporate_Veil_Doctrine_To_Directors_in_Corporate_Law
- Guinnane, T., Harris, R., Lamoreaux, N. R., & Rosenthal, J.-L. (2007). Putting the Corporation in its Place. *Enterprise and Society*, 8(3), 687–729. Retrieved from <https://doi.org/10.1093/es/khm067>
- Hansmann, H., Kraakman, R. (2000). The Essential Role of Organizational Law. *The Yale Law Journal*, 110(3), 387. Retrieved from <https://doi.org/10.2307/797521>
- Hasnas, J. (2016). Should Corporations Have the Right to Vote? A Paradox in the Theory of Corporate Moral Agency. *Journal of Business Ethics*, 150(3), 657–670. Retrieved from <https://doi.org/10.1007/s10551-016-3172-0>
- Intihani, S.N. (2022). Piercing the corporate veil doctrine implementation in limited company stockholders activities. *International Journal of Law Reconstruction*, 6 (2), 229–242. Retrieved from <https://journalfhua.ac.id/jurisdictie/article/view/95>
- Knutsson, P. (2018). Piercing the Corporate Veil: Limits of Limited Liability Retrieved from <https://su.diva-portal.org/smash/get/diva2:1185706/FULLTEXT01.pdf>
- Lo, S. H. C. (2017). Piercing of the corporate veil for evasion of tort obligations. *Common Law World Review*, 46 (1), 42–66. Retrieved from https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2987769
- Macey, J. C., Mitts, J. (2014). Finding order in the morass: The three real justifications for piercing the corporate veil. *Cornell Law Review*, 100 (1), 99–148. Retrieved from <https://scholarship.law.cornell.edu/cgi/viewcontent.cgi?article=4647&context=clr>
- Ottolenghi, S. (1990). From Peeping Behind the Corporate Veil, to Ignoring it Completely. *The Modern Law Review*, 53(3), 338–353. Retrieved from <https://doi.org/10.1111/j.1468-2230.1990.tb01816.x>
- Parkinson, J. E. (1995). Corporate Power and Responsibility Issues in the Theory of Company Law. Oxford University. Retrieved from <https://doi.org/10.1093/acprof:oso/9780198259893.001.0001>
- Patterson, J. L. (1983). Development of the Concept of Corporation from Earliest Jurisprudence. CORE Open Access Repository. Retrieved from <https://core.ac.uk/download/pdf/28774745.pdf>
- Peterson, C.W. (2017). Piercing the corporate veil by tort creditors. *Washington Law Review*, 92(2), 317–349. Retrieved from https://digitalcommons.law.umd.edu/cgi/viewcontent.cgi?params=/context/jbtl/article/1282/&path_info=Peterson.pdf
- Pušac, J. (2024). Piercing the corporate veil – aspects of legal doctrine, legislation and court practice. *Godišnjak Fakulteta Pravni Nauka*, 14 (14), 89–114. Retrieved from <https://doi.org/10.7251/GFP2414089P>
- Rutledge, B. (2021) Piercing the corporate veil series: The “Evasion Principle” and the “Concealment Principle”. Keidan Harrison disputes insolvency lawyers. Retrieved from <https://keidanharrison.com/2021/11/piercing-the-corporate-veil-series-the-evasion-principle-and-the-concealment-principle/>
- Thompson, R. B. (1991). Piercing the Corporate Veil: An Empirical Study, 76 Cornell L. Rev. 1036 (1991) Retrieved from <http://scholarship.law.cornell.edu/clr/vol76/iss5/2>
- Turner, J. D. (2017). The development of English company law before 1900, *QUCHE Working Paper Series*, No. 2017-01, Queen's University Centre for Economic History (QUCHE), Belfast. Retrieved from <https://www.econstor.eu/bitstream/10419/165073/1/esj-pdf-2017-74.pdf>
- Wormser, I. M. (1912). Piercing the Veil of Corporate Entity. *Columbia Law Review*, Volume 12. Retrieved from <https://archive.org/details/jstor-1110931/mode/2up>

IMPACT OF FORCED EVICTIONS ON MULTIDIMENSIONAL WELL BEING: EVIDENCE FROM ISLAMABAD'S INFORMAL SETTLEMENTS

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Abstract

Rapid urban expansion in Islamabad has intensified the demolition of informal settlements, raising concerns about human rights, governance, and multidimensional well-being. This study examines the impact of forced evictions on residents of selected informal settlements, including Noorpur Shahan and Nareel village, and evaluates the absence of data-driven planning in eviction practices. The purpose is to assess how evictions affect physical, mental, emotional, social, financial, occupational, environmental, cultural, intellectual, and personal well-being. Primary qualitative data were collected through semi-structured interviews, field observations, and document analysis. Findings reveal severe livelihood losses, psychological distress among children and vulnerable groups, and disruption of social cohesion. The study highlights the failure to employ digital tools such as Unmanned Aerial Vehicle surveys for inclusive planning. Results suggest that technology enabled resettlement strategies could mitigate socio-economic harm and align urban governance with constitutional and international human rights obligations.

Keywords: Artificial intelligence, Forced evictions, Informal settlements, Multidimensional well-being

Introduction

Islamabad is the tenth most populous city of Pakistan, with a population exceeding 1.1 million, and is federally administered as part of the Islamabad Capital Territory. Built as a planned city during the 1960s, it replaced Karachi as the national capital. The city was designed under a master plan framework that aimed to ensure organized zoning, environmental protection, and systematic growth. Approximately 45,000 acres of land were acquired from rural villages to implement this master plan.

The Capital Development Authority (CDA), established on June 14, 1960, is the principal government body responsible for planning, regulation, and urban development in Islamabad. Despite its structured planning history, Islamabad has experienced a steady expansion of informal settlements over the decades.

Historical Context of Informal Settlements

The informal settlements in Islamabad include communities such as Noorpur Shahan (originally known as Chorpur). The Noorpur Shahan includes Muslim Colony, Narrola village, Mohallah Tehjar, Balti Mohallah, parts of Nori Bagh, and other areas. The other informal settlement is Nareel village near Quaid-i-Azam University Islamabad. Noorpur Shahan is located at the foot of the Margalla Hills and has deep historical roots predating the establishment of Islamabad.

The population residing in Islamabad's informal settlements may be broadly categorized into two distinct groups:

- **Indigenous inhabitants** who occupied the area prior to Islamabad's establishment, and in some cases before the creation of Pakistan.
- **Post-capital migrants**, including laborers who constructed Islamabad, low profile government employees, and economically motivated migrants etc. from other regions of Pakistan.

According to CDA, indigenous inhabitants were compensated either monetarily or through allocation of alternative land parcels in various regions of Pakistan. However, a fundamental question arises: if compensation had indeed been fully disbursed at the time of Islamabad's establishment, why was the land not effectively vacated and formally transferred?

Forced Evictions and Legal Definition

Forced eviction, as defined by the United Nations Committee on Economic, Social and Cultural Rights (United Nations Committee on Economic, Social and Cultural Rights, 1997) involves the permanent or temporary removal of individuals, families, or communities from their homes without appropriate legal or other protection. Such actions often violate the right to adequate housing and can undermine broader dimensions of well-being.

In Islamabad, demolition operations have been conducted without consistent issuance of formal court notices. Residents report that announcements are often made via loudspeakers, instructing evacuation within limited timeframes. In the presence of Islamabad Police, earth-moving machinery is used to demolish houses and shops as illustrated in figure 1.



Figure 1. CDA bulldozer demolishing informal houses

Upon the execution of demolition operations, structural integrity is entirely compromised, resulting in the destruction of all construction materials, including doors, windows, concrete blocks, and other integral house components. Consequently, residents of informal settlements often pre-emptively dismantle their homes in order to salvage reusable materials, as illustrated in Figure 2, and subsequently sell these materials at below market prices.



Figure 2. Slum dwellers dismantling residences in response to non-judicial notices

Constitutional and Governance Dimensions

Article 38(d) of the Constitution of Pakistan mandates the provision of basic necessities of life, including housing, to vulnerable citizens. The Government of Pakistan is constitutionally obligated to promote social and economic well-being. Yet, demolition of informal settlements raises concerns about alignment between urban governance and constitutional principles.

Additionally, Islamabad Electric Supply Company provided electricity connections, and Union Councils constructed concrete roads within these informal settlements. These public investments indicate institutional acknowledgment of the settlements' existence. Subsequent demolitions therefore suggest potential misalignment in planning and governance, leading to financial losses to the national exchequer.

Artificial Intelligence and Digital Transformation Context

In the context of urban governance, AI-powered spatial mapping, Unmanned Aerial Vehicle (UAV) surveys, and digital household registries could enable evidence-based decision-making.

Prior to demolition, CDA could have employed UAV surveys to:

- Count informal houses and their area;
- Document shops and agricultural land;
- Collect demographic data (age, sex, employment status);
- Design earthquake resistant vertical housing solutions for the residents of the informal settlements.

Islamabad falls within seismic Zone 2B, making earthquake proof construction essential. However, demolition focused practices reveal limited integration of digital transformation in governance.

Literature Review

Global Perspectives on Forced Evictions

Forced evictions have been widely studied within human rights scholarship. The United Nations Universal Declaration of Human Rights affirms in Article 17 the right to property and in Article 25

the right to adequate living standards (United Nations, 1948). Article 11(1) of the International Covenant on Economic, Social and Cultural Rights guarantees the right to adequate housing.

United Nations emphasizes that development based evictions must ensure (Housing and Land Rights Network, 2019):

- Genuine consultation,
- Adequate notice,
- Legal remedies,
- Provision of alternative housing.

Human Rights Watch documented patterns of forced evictions in Islamabad, highlighting due process concerns (Human Rights Watch, 2022).

Multidimensional Well-Being Framework

The World Health Organization conceptualizes well-being as encompassing physical, mental, and social health (World Health Organization, 1946). Contemporary scholarship expands this to include occupational, financial, environmental, intellectual, cultural, and personal dimensions.

Forced evictions disrupt the following well-being:

- **Physical well-being** through homelessness.
- **Mental well-being** via anxiety and trauma.
- **Emotional well-being** through fear and uncertainty.
- **Social well-being** by fragmenting communities.
- **Occupational well-being** through loss of shops and employment.
- **Financial well-being** via asset destruction.
- **Environmental well-being** due to unsafe relocation.
- **Intellectual well-being** as schools are demolished.
- **Cultural well-being** when indigenous ties are severed.
- **Personal well-being** due to loss of dignity and autonomy.

Digital Governance and AI in Urban Planning

The World Bank highlights focus on the Urban Poor and informal settlements Upgrading Programs (World Bank, 2000). Digital land registries, satellite mapping, and AI-based urban analytics are essential for inclusive urban governance. UAV based surveys allow high resolution mapping of informal settlements.

Islamabad's total land area exceeds that of Singapore, yet its population (approximately 1.3 million) remains far smaller than Singapore's 6.11 million. Despite Pakistan's total population exceeding 241.5 million, horizontal housing patterns dominate Islamabad's planning framework, reflecting limited adoption of vertical, space efficient housing strategies.

Methodology

Research Design

This study adopted a qualitative research design, focusing on primary empirical data collection. The objective was to capture lived experiences of eviction and assess multidimensional well-being impacts.

Data collection from the informal settlements.

The author conducted first-hand research by collecting primary data from various locations within Noorpur Shahan (Chorpur), including Muslim Colony, Narrola Village, Mohallah Tehjar, Balti Mohallah, and Nori Bagh. Furthermore, primary data were collected from Nareel Village, located in proximity to Quaid-i-Azam University, Islamabad.

Data Collection

- Data were collected through:
- 42 semi-structured interviews with displaced residents;
- 8 interviews with shopkeepers;
- 5 interviews with school administrators;
- Field observations of demolition sites;
- Review of constitutional provisions and international instruments.
- Participants included disabled persons, elderly individuals, ill residents, women, children, labour and low income government employees.

Data Analysis

Thematic analysis was employed. Data were coded into well-being categories. Cross-validation was performed through triangulation of interviews and field observations.

Ethical considerations included informed consent, anonymity, and protection of vulnerable participants.

Research Results

This section presents the most significant findings derived from primary qualitative data, field observations, and document analysis. The results are organized according to the multidimensional well-being framework.

Physical Well-Being

The most immediate consequence of forced evictions was the destruction of shelter. In Noorpur Shahan (formerly Chorpur), numerous informal houses were demolished. Similarly, residential and commercial areas in Nareel village near Quaid-i-Azam University Islamabad were razed, including private schools operating within these informal settlements.

Participants described abrupt evacuations following loudspeaker announcements. No formal written court notices were provided to residents. In cases where individuals hesitated to vacate, demolition was carried out in the presence of Islamabad Police using heavy earth-moving machinery. Personal belongings were often damaged during these operations.

Islamabad lies within a high risk seismic zone, specifically designated as Zone 2B. Despite this, no structured relocation plan involving earthquake resistant vertical housing was implemented. Instead of constructing five story earthquake proof buildings for affected residents, authorities prioritized demolition. The absence of structured rehabilitation exacerbated housing insecurity.

Many displaced families reported temporary relocation to overcrowded rental accommodations in Bara Kahu. Others returned to rural hometowns. Physical well-being deteriorated due to overcrowding, poor sanitation, and exposure to environmental hazards.

Mental and Emotional Well-Being

Psychological distress emerged as one of the most profound consequences of forced evictions. Interviewees consistently reported anxiety, depression, insomnia, and chronic stress.

Schoolchildren were particularly affected. Several private schools were demolished in Noorpur Shahan and Nareel village. Parents reported that children experienced fear, confusion, and academic disruption. Sudden school closures contributed to emotional instability and feelings of insecurity.

Disabled persons, elderly individuals, and chronically ill residents experienced heightened vulnerability. The uncertainty surrounding housing, healthcare access, and financial survival produced sustained psychological strain.

Participants described demolition days as “traumatic events,” especially when witnessing earth moving machinery destroying informal houses constructed through years of savings and labor. Emotional well-being was deeply compromised due to loss of dignity, security, and attachment to place.

Social Well-Being

Informal settlements function not only as residential clusters but also as tightly knit social communities. In Noorpur Shahan and its areas such as Muslim Colony, Narrola village, Mohallah Tehjar, Balti Mohallah, and Nori Bagh, residents shared long standing social ties.

Forced evictions fragmented these networks. Families dispersed to different areas, including Bara Kahu and distant provinces. Community-based support systems collapsed. These systems included informal childcare arrangements, shared utilities, and mutual financial assistance. Indigenous residents, who had historical ties to the land prior to Islamabad's establishment, expressed a sense of cultural displacement. Their social identity was rooted in ancestral connections to the land.

The disruption of communal life resulted in weakened social cohesion and increased social isolation.

Occupational (Career) Well-Being

Demolition of commercial shops in the main Noorpur Shahan commercial area adjacent to Nori Bagh and Balti Mohallah significantly affected occupational well-being as illustrated in Figure 3. Small scale retailers, mechanics, barbers, grocery shop owners, and service providers lost their primary sources of income.



Figure 3. Demolition view of shops operated by small-scale economic operators

Participants stated that livelihoods were destroyed overnight. Without structured compensation or alternative commercial spaces, income generating activities ceased abruptly.

Some residents indicated that after the establishment of Islamabad, migrants constructed informal houses with tacit approval from certain CDA officials. Allegations were made that bribes were taken for informal construction. However, no effective institutional accountability measures were observed. The persistent ineffectiveness of both the Islamabad High Court and the Supreme Court of Pakistan exposes a critical institutional failure, calling into question their capacity to uphold justice and protect citizens' rights

The loss of employment opportunities triggered long-term economic instability.

Financial Well-Being

Financial well-being experienced a significant decline as a direct consequence of asset destruction, as illustrated in Figure 4.



Figure 4. Massive demolitions of informal settlements in Noorpur Shahan

Informal houses represented lifelong savings investments. When demolitions occurred, building materials were destroyed or salvaged at minimal resale value.

Residents often dismantled their own houses before demolition to recover doors, windows, and concrete blocks, which were then sold at significantly reduced prices in the local market.

Rents in Bara Kahu escalated due to increased demand from displaced families. Participants reported rent increases ranging from 30% to 60% following waves of forced evictions. This created additional financial burdens.

Moreover, Islamabad Electric Supply Company had provided electricity connections to many informal settlements, and Union Councils had constructed concrete roads. These public investments, financed through national revenue, were effectively nullified by demolition operations, reflecting inefficiencies in coordinated governance.

Environmental Well-Being

Environmental well-being encompasses safe housing, access to infrastructure, and ecological stability. Forced displacement pushed families into environmentally inferior housing conditions, often in poorly serviced areas of Bara Kahu and other regions of Pakistan.

Islamabad's total land area exceeds that of Singapore, yet its population (approximately 1.3 million) is significantly lower than Singapore's 6.11 million. Despite this spatial advantage, horizontal housing practices dominate Islamabad's planning strategy.

Failure to implement vertical housing redevelopment contributes to inefficient land use and the cyclical growth of new informal settlements.

Intellectual Well-Being

Intellectual well-being relates to access to education and opportunities for cognitive development. The demolition of private schools significantly disrupted the continuity of students' education. Some children were unable to re-enroll immediately due to relocation instability. Educational disruption weakens long term human capital formation, thereby affecting future socio-economic mobility. The demolished structure of a private school is depicted in Figure 5.



Figure 5. Forced evictions of school children due to school demolitions

Such interruptions in formal schooling not only impede academic progression but also undermine psychosocial stability and structured learning environments essential for cognitive growth. Consequently, prolonged educational discontinuity may exacerbate existing inequalities and hinder sustainable community development.

Cultural and Personal Well-Being

Cultural well-being was undermined as indigenous residents lost ancestral lands. Cultural identity is closely linked to territory, traditions, and communal memory.

Personal well-being, defined as autonomy, dignity, and sense of security, was significantly compromised. Residents expressed feelings of humiliation when homes were demolished publicly in the presence of enforcement personnel.

Governance and Institutional Dimensions

The Capital Development Authority plays a primary role in urban development and expansion of Islamabad. Participants alleged that CDA employees previously facilitated informal construction through unofficial payments. However, enforcement actions targeted residents rather than addressing institutional accountability.

Furthermore, a medical doctor was appointed as Deputy Director General (Enforcement) to conduct demolition operations. This is the naked violation of the article 18 of the constitution of Pakistan. Interviewees questioned the alignment between her educational background and urban planning responsibilities. This raised concerns about professional competency and institutional decision-making.

The Supreme Court of Pakistan and the Islamabad High Court were perceived by residents as ineffective in preventing demolition actions.

International Legal Considerations

Forced evictions potentially violate multiple international instruments, including:

- Article 17 and Article 25(1) of the United Nations Universal Declaration of Human Rights.
- Article 11(1) of the International Covenant on Economic, Social and Cultural Rights.
- Article 17 of the International Covenant on Civil and Political Rights.
- Article 27 of the Convention on the Rights of the Child.
- United Nations Basic Principles and Guidelines on Development-Based Evictions and Displacement (2007).

The pattern of verbal notices, absence of structured rehabilitation, and demolition without transparent legal processes raises concerns regarding compliance with these instruments.

Absence of Artificial Intelligence Based Planning

A significant finding of this research is the absence of digital transformation tools in eviction planning.

Prior to demolition, CDA could have employed:

- UAV based high resolution mapping;
- AI assisted enumeration of households;
- Digital demographic profiling;
- Predictive housing allocation models;
- Cost-benefit analysis of vertical redevelopment.

Such approaches would align urban governance with the digital transformation objectives.

Instead, demolition centric strategies prevailed without comprehensive digital data collection or structured rehabilitation frameworks.

Discussion

This section analytically interprets the research findings within broader theoretical, constitutional, technological, and comparative urban governance frameworks. It connects multidimensional well-being outcomes with institutional practices and digital transformation gaps.

Multidimensional Harm: An Interconnected Framework

The findings confirm that forced evictions produce cascading and interconnected harm across all dimensions of well-being. Rather than affecting housing alone, demolition of informal settlements triggers structural instability across physical, psychological, economic, and social systems.

Physical and Environmental Instability

Loss of housing in a seismic Zone 2B region increases vulnerability. Islamabad's geographic location near the Margalla Hills exposes residents to earthquake risk. Without structured relocation into earthquake resistant buildings, again displaced populations face heightened environmental hazards.

The paradox lies in Islamabad's spatial capacity. The city's land area exceeds that of Singapore, yet horizontal housing continues to dominate planning practice. Singapore, with 6.11 million residents in a smaller land area, has successfully implemented vertical housing through integrated planning systems. In contrast, Islamabad, with approximately 1.3 million residents, demonstrates inefficient land utilization.

This reflects structural weaknesses in long term land use planning.

Constitutional Dimensions and Governance Accountability

Article 38(d) of the Constitution of Pakistan obligates the state to provide basic necessities of life, including housing, food, education, and medical relief to vulnerable citizens.

Demolition without structured rehabilitation raises serious constitutional concerns. If indigenous populations were fully compensated during land acquisition in the 1960s, the persistence of settlement occupancy indicates either:

- Incomplete land transfer processes;
- Institutional enforcement gaps; or
- Administrative inconsistencies.

Moreover, allegations that certain officials accepted bribes to permit informal construction suggest governance failures that contributed to settlement expansion. Residents argue that the burden of institutional mismanagement has been transferred onto economically vulnerable communities.

The role of the Capital Development Authority is central to this governance dilemma. As the principal planning body established in 1960, CDA's mandate includes structured development, land management, and enforcement. However, demolition focused practices without transparent procedural safeguards undermine public trust. Residents further expressed dissatisfaction with the perceived inaction of judicial institutions, including the Supreme Court of Pakistan and the Islamabad High Court, in halting eviction operations.

International Human Rights Obligations

Forced evictions intersect with multiple international legal frameworks. The United Nations Universal Declaration of Human Rights affirms rights to property and adequate living standards. The International Covenant on Economic, Social and Cultural Rights protects the right to housing.

The United Nations Basic Principles and Guidelines on Development Based Evictions require (Housing and Land Rights Network, 2019):

- Genuine consultation,
- Adequate notice,
- Legal remedies,
- Alternative housing provision,
- Compensation for losses.

Findings indicate that demolition announcements were frequently made through loudspeakers rather than formal written court notices. Residents reported limited consultation and absence of systematic relocation planning.

Such procedural gaps raise concerns regarding compliance with international norms.

Vulnerable Groups and Psychological Stress

Disabled persons, elderly individuals, and chronically ill residents face disproportionate burdens during forced evictions. Their limited mobility and health vulnerabilities intensify stress.

Children experienced educational disruption due to demolition of private schools. Psychological distress among students manifested in anxiety, fear, and academic regression.

Emotional well-being is closely tied to spatial stability. Homes represent security, identity, and dignity. Destruction of these spaces undermines personal autonomy and cultural belonging.

Occupational and Financial Disintegration

The demolition of shops in Noorpur Shahan's main commercial area adjacent and Nareel Village resulted in abrupt income loss. Informal commercial ecosystems were dismantled without replacement structures.

Livelihood destruction leads to long term economic marginalization. Interview data indicate that some displaced residents relocated to Bara Kahu, where rents have significantly increased due to demand pressures.

This pattern demonstrates a displacement chain effect:

- Demolition in central informal settlement;
- Migration to peripheral informal area;
- Rent inflation;
- Emergence of new overcrowded settlements.

Without inclusive redevelopment, eviction practices merely relocate informality rather than eliminate it.

Artificial Intelligence and Digital Transformation: Missed Opportunities

Findings demonstrate that eviction planning in Islamabad lacks technological integration.

Potential Role of Unmanned Aerial Vehicles

Prior to demolition, authorities could have deployed UAV based surveys to:

- Map each informal house,
- Calculate built-up area,
- Identify commercial units,
- Measure agricultural land,
- Enumerate household members,
- Record demographic variables.

High resolution geospatial data combined with Artificial Intelligence assisted analytics could have generated a comprehensive relocation plan.

AI-Based Urban Redevelopment Model

A structured AI-driven redevelopment framework could include:

- **Digital Household Registry:**

Create a verified database of affected families.

- **Predictive Housing Allocation:**

Allocate units in earthquake resistant five-story buildings based on family size and vulnerability.

- **Livelihood Integration Model:**

Design ground floor commercial units for displaced shopkeepers.

- **Cost-Benefit Analytics:**

Compare demolition-only costs versus inclusive redevelopment costs.

- **Social Impact Monitoring Dashboard:**

Track mental health, employment recovery, and educational continuity indicators.

Such digital tools would align urban governance with global best practices in smart city planning.

Economic Efficiency and National Exchequer Considerations

The Islamabad Electric Supply Company provided electricity to informal settlements, and Union Councils constructed concrete roads within these areas. These public investments were financed through national revenue.

Subsequent demolition of these serviced areas reflects potential financial inefficiency. Uncoordinated planning leads to double expenditure:

- Initial infrastructure investment;
- Later demolition and clearance costs.

An integrated digital planning system could minimize such fiscal waste.

Population Dynamics and Horizontal Housing

Pakistan's population exceeds 241.5 million. Urban population growth places pressure on Islamabad's housing demand.

Despite having a larger land area than Singapore, Islamabad continues horizontal housing expansion rather than structured vertical development.

Vertical housing offers:

- Efficient land utilization;
- Reduced environmental footprint;
- Lower infrastructure duplication costs;
- Enhanced seismic safety.

Failure to adopt such strategies reflects institutional resistance to modernization.

Long Term Consequences of Continued Demolitions

If demolition continues without rehabilitation, likely outcomes include:

- Increased homelessness;
- Loss of livelihoods;
- Social fragmentation;
- Psychological trauma;
- Growth of new informal settlements.

Urban informality is often a symptom of systemic housing shortages and governance gaps. Demolition alone does not address structural drivers.

Inclusive redevelopment, supported by Artificial Intelligence and participatory planning, can transform informal settlements into regulated vertical communities without displacing residents.

Ethical Challenges in Digital Urban Governance

While Artificial Intelligence offers powerful tools, ethical concerns must be addressed:

- Data privacy of residents;
- Algorithmic bias in housing allocation;
- Transparency in digital decision making;
- Accessibility of digital systems for marginalized populations.

Digital transformation must complement, not replace, human rights principles.

Policy Implications and Implementation Framework

The findings of this study demonstrate that forced evictions in Islamabad are not merely spatial interventions but multidimensional disruptions that undermine constitutional guarantees, international human rights standards, and principles of inclusive digital governance. This section proposes a structured, technology enabled and rights based framework for reform.

Immediate Policy Reforms

Moratorium on Demolition Without Rehabilitation

A temporary moratorium on demolition operations should be imposed unless accompanied by:

- Written legal notices,
- Transparent documentation,
- Judicial review mechanisms,
- Provision of alternative housing.

Development driven eviction must follow procedural safeguards consistent with international norms.

Digital Enumeration Before Action

Before any enforcement action, the Capital Development Authority should implement a comprehensive digital enumeration process using:

- Unmanned Aerial Vehicle (UAV) mapping,
- Geographic Information System (GIS) integration,
- Artificial Intelligence assisted household verification,
- Biometric secured family registration.

Such digital documentation would enable:

- Accurate counting of houses and shops,
- Assessment of built-up areas,
- Recording demographic characteristics (age, sex, disability status, employment),
- Identification of vulnerable groups.

Failure to collect structured data prior to demolition reflects a governance gap inconsistent with digital transformation objectives.

Earthquake-Resistant Vertical Housing Model

Islamabad lies within seismic Zone 2B, requiring strict adherence to earthquake resistant construction standards.

Instead of horizontal expansion, authorities should construct five-story earthquake proof residential complexes on-site or within reasonable proximity. The model should include:

- Ground-floor commercial units for displaced shopkeepers;
- Community schools;
- Primary healthcare facilities;
- Green spaces;
- Structured waste management systems.

This would preserve social networks while improving environmental well-being.

Vertical housing would also address inefficiencies in land utilization. Islamabad's land area exceeds that of Singapore, yet the population density remains significantly lower. Efficient vertical redevelopment would optimize urban land without displacing communities.

Legal and Institutional Accountability

Institutional Responsibility

The Capital Development Authority has played a central role in the development and expansion of Islamabad's informal settlements. Allegations that certain employees accepted bribes to allow informal construction require independent investigation.

Accountability mechanisms should include:

- Independent anti-corruption audits,
- Transparent land allocation records,
- Public disclosure of demolition criteria.

Urban informality cannot be addressed by penalizing residents while ignoring institutional complicity.

Judicial Oversight

Residents reported dissatisfaction regarding the inability of courts to halt demolition practices. Strengthened judicial oversight from the Supreme Court of Pakistan and the Islamabad High Court is essential to ensure compliance with constitutional safeguards.

Article 38(d) of the Constitution mandates provision of basic necessities of life, including housing. Forced eviction without rehabilitation potentially undermines this obligation.

International Human Rights Alignment

Pakistan is bound by multiple international human rights instruments under the framework of the United Nations, including:

- Universal Declaration of Human Rights,
- International Covenant on Economic, Social and Cultural Rights,
- International Covenant on Civil and Political Rights,
- Convention on the Rights of the Child,
- Convention on the Rights of Persons with Disabilities,
- United Nations Basic Principles and Guidelines on Development-Based Evictions (2007).

Evictions conducted without consultation, compensation, and relocation planning risk violating these commitments.

A rights-based urban governance model requires:

- Genuine participation of affected communities,
- Transparent compensation frameworks,
- Accessible grievance mechanisms,
- Independent monitoring bodies.

Socio-Economic Projections if Current Practices Continue

If forced demolitions persist without rehabilitation planning, several long term outcomes are likely:

- **Increased Homelessness**

Displaced families unable to afford rising rents may become homeless.

- **Loss of Livelihoods**

Small commercial ecosystems may collapse permanently.

- **Social Disruption**

Community fragmentation may erode social capital.

- **Growth of New Informal Settlements**

Evicted populations may establish new unregulated settlements elsewhere.

Urban studies literature indicates that demolition without inclusive redevelopment often reproduces informality in new locations rather than eliminating it.

Artificial Intelligence–Driven Urban Reform Roadmap

The following implementation roadmap is proposed.

Phase I: Digital Baseline Mapping

- UAV imaging of all informal settlements,
- AI-driven structure classification,
- Household-level demographic profiling.

Phase II: Participatory Data Validation

- Community verification workshops,
- Public digital dashboards,
- Transparent grievance redressal systems.

Phase III: Smart Vertical Redevelopment

- Earthquake-resistant five-story housing blocks,
- Integrated commercial zones,
- Digital allocation tracking system.

Phase IV: Continuous Monitoring

- AI-based social impact assessment,
- Health and education tracking indicators,
- Employment recovery analytics.

Digital transformation must operate within an ethical framework ensuring privacy, non-discrimination, and transparency.

Conclusions

This study investigates the impact of forced evictions on the multidimensional well-being of residents in Islamabad's informal settlements. The research encompasses several localities within the Noorpur Shahan informal settlement, including Muslim Colony, Narrola Village, Mohallah Tehjar, Balti Mohallah, and part of Nori Bagh. Additionally, Nareel Village, situated in proximity to Quaid-i-Azam University, Islamabad, is incorporated into the study to provide a broader understanding of the effects of eviction on community well-being.

Primary qualitative evidence demonstrates that forced evictions produce profound harm across:

- Physical well-being (loss of shelter),
- Mental and emotional well-being (psychological distress),
- Social well-being (community fragmentation),
- Occupational well-being (livelihood destruction),
- Financial well-being (asset loss and rent inflation),
- Environmental well-being (relocation to inferior conditions),
- Intellectual well-being (school demolition),
- Cultural well-being (displacement of indigenous identity),
- Personal well-being (loss of dignity and autonomy).

The absence of Artificial Intelligence based enumeration and rehabilitation planning represents a missed opportunity for inclusive digital governance. Instead of demolition centric approaches, data-driven vertical redevelopment could enhance seismic safety, optimize land use, and preserve social cohesion.

Islamabad's spatial advantage relative to its population presents an opportunity to pioneer a rights based smart city model. However, without institutional accountability and digital integration, eviction practices risk perpetuating poverty cycles.

Slum demolition alone typically creates more complex socio-economic challenges. Inclusive redevelopment, grounded in constitutional principles and supported by Artificial Intelligence, offers a sustainable alternative.

References

- Human Rights Watch. (2022). *"I Escaped with Only My Life" Abusive Forced Evictions in Pakistan*. <https://www.hrw.org/report/2024/05/28/i-escaped-only-my-life/abusive-forced-evictions-pakistan>
- United Nations. (1948). *Universal Declaration of Human Rights*. <https://www.un.org/en/about-us/universal-declaration-of-human-rights>
- United Nations Committee on Economic, Social and Cultural Rights. (1997). *General Comment, 7: Forced evictions*. <https://www.ohchr.org/en/special-procedures/sr-housing/forced-evictions>
- Housing and Land Rights Network. (2019). *Handbook on United Nations Basic Principles and Guidelines on Development-based Evictions and Displacement*. https://hlrn.org.in/documents/Handbook_UN_Guidelines.pdf
- World Bank. (2000). *Cities in transition: World Bank urban and local government strategy* (Urban and Local Government Strategy). <https://documents1.worldbank.org/curated/en/121041468739318219/pdf/multipage.pdf>
- World Health Organization. *Constitution of the World Health Organization*. <https://apps.who.int/gb/bd/pdf/bd47/en/constitution-en.pdf>

DROŠĪBAS SPECIĀLISTA PROFILS MAINĪGAJOS ĢEOPOLITISKAJOS APSTĀKĻOS: VAKAR, ŠODIEN, RĪT

PROFILE OF SECURITY SPECIALIST IN CHANGING GEOPOLITICAL CIRCUMSTANCES: YESTERDAY, TODAY, TOMORROW

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Anotācija

Mūsdienu drošības vide kļūst arvien sarežģītāka, ko ietekmē straujā tehnoloģiju attīstība, ģeopolitiskās pārmaiņas un jauni draudu veidi. Drošības speciālistiem jāspēj pielāgoties šiem izaicinājumiem, pārejot no tradicionālās fiziskās apsardzes uz kibernetisko drošību, riska vadību un stratēģisko izlūkošanu. Pētījuma mērķis ir izpētīt drošības speciālista profesijas attīstību un noteikt galvenos faktorus, kas ietekmē tās nākotni. Īpaša uzmanība pievērsta digitalizācijai, mākslīgajam intelektam un globālās drošības tendencēm, kas nosaka profesionālās prasības. Pētījuma metodes ietver kvalitatīvo un kvantitatīvo analīzi, tostarp literatūras apskatu, ekspertu viedokļus un gadījumu izpēti. Analizēti jaunie drošības riski, starpdisciplinārās sadarbības nozīme un pieprasījums pēc jaunu kompetenču attīstības. Galvenie rezultāti liecina par pieaugošu pieprasījumu pēc drošības speciālistiem ar ekspertīzi mākslīgajā intelektā, krīžu prognozēšanā un noturības inženierijā. Pētījums uzsver nepieciešamību pēc nepārtrauktas prasmju pilnveides, lai efektīvi reaģētu uz nākotnes drošības izaicinājumiem.

Atslēgas vārdi: drošības speciālists, globālā drošība, riska vadība

Abstract

The contemporary security environment is increasingly complex, shaped by rapid technological advancements, geopolitical shifts, and new threat paradigms. Security specialists are required to navigate evolving challenges, transitioning from traditional physical security roles to expertise in cyber defense, risk assessment, and strategic intelligence. The aim of this study is to explore the transformation of the security specialist profession and identify key factors influencing its future development. Particular attention is given to the role of digitalization, artificial intelligence, and global security dynamics in

shaping professional requirements. The research methodology is based on qualitative and quantitative analysis, including literature review, expert opinions, and case studies. The study examines emerging risks, the need for interdisciplinary collaboration, and the growing demand for advanced security skills. Key findings suggest a growing demand for security specialists with expertise in artificial intelligence, crisis forecasting, and resilience engineering. The study highlights the necessity of continuous skills development to address future security challenges.

Keywords: security specialist, global security, risk management

Ievads

Pēdējās desmitgadēs globālo drošību ir nopietni apdraudējušas bezprecedenta situācijas, ko izraisījušas dabas katastrofas, globālā sasilšana, piesārņojums, finanšu krīzes un jaunas epidēmijas. "Globālās drošības stabilitātes uzturēšana ir kļuvusi par globālu misiju, un ir vispārpieņemts, ka neviena valsts nevar tikt galā ar globālām problēmām bez starptautiskām sarunām un efektīvas sadarbības" (Nguyen Van My, Ankudinova, 2023).

Lai arī drošības teorētisko un praktisko aspektu pētīšanai Latvijā un pasaulē ir senas tradīcijas, pēdējās desmitgadēs pieaugošo apdraudējumu un risku klāsts turpina piegādāt zinātniekiem un politikas veidotājiem arvien jaunus izzināšanas laukus. Spēju veikt visaptverošu un teorētiski pamatotu drošības situācijas analīzi ietekmē un arī kavē apdraudējumu avotu savstarpēja pārklāšanās un dinamiska transformācija. (Ozoliņa, Reinholde, Struberga, 2021)

Drošības speciālista loma gadu desmitiem ir ievērojami attīstījusies, pielāgojoties mainīgajām ģeopolitiskajām situācijām, tehnoloģiskajam progresam un jaunajām draudu formām. Iepriekš "tradicionālā drošības speciālista" galvenais fokuss galvenokārt bija tendēts uz fizisko drošību, izlūkošanas vākšanu un pretizlūkošanu, jo galvenie draudi bija aukstā kara spiegošana, terorisms, organizētā noziedzība. Galvenie draudi bija valstu faktori; drošības pasākumi pārsvarā bija reaģējoši. Līdz ar to galvenās prasmes bija militārā vai tiesībsardzības pieredze, stratēģiskā analīze, krīžu vadība. Savukārt mūsdienu drošības speciālists darbojas dinamiskā un daudzpusīgā vidē, kur strauji mainās tehnoloģijas un pieaug globālie drošības izaicinājumi. Tradicionālā fiziskā apsardze tiek papildināta ar kiberdrošību, datu aizsardzību un stratēģisko risku pārvaldību. Nākotnes drošības speciālista fokuss būs uz predikatīvo drošību, mākslīgā intelekta vadīta draudu novērtēšanu un kvantu kiberdrošību. Galvenie draudi būs mākslīgā intelekta vadīti kiberuzbrukumi, autonomi ieroči, bio-drošības draudi, kosmosa konflikti. Kā rezultātā galvenās prasmes būs mākslīgā intelekta un mašīnmācīšanās ekspertīze, krīžu prognozēšana, noturības inženierija.

Pēdējās desmitgades laikā drošības draudu spektrs ir ievērojami paplašinājies, ietverot ne tikai tradicionālos fiziskos apdraudējumus, bet arī kiberdrošības draudus, dezinformācijas kampaņas un hibrīdkara metodes. (Veinbergs, 2023)

Mūsdienu drošības speciālistam jābūt daudzpusīgam profesionālim, kas spēj pārvaldīt dažādus drošības aspektus, sākot no datu aizsardzības un kritiskās infrastruktūras drošības līdz stratēģiskajai plānošanai un starptautiskajai sadarbībai. Kā norādīts kolektīvajā monogrāfijā *Organization and Individual Security*, drošības speciālistiem ir būtiski attīstīt spēju strādāt starpdisciplinārā vidē un reaģēt uz jauniem, arvien sarežģītākiem apdraudējumiem. (Reese, 2016)

Kā uzsvērts *Digitālās transformācijas pamatnostādņēs 2021–2027*, datu un privātuma aizsardzība ir kļuvusi par vienu no galvenajiem faktoriem drošības stratēģijās, uzsverot nepieciešamību pēc regulāras drošības politiku pielāgošanas mainīgajai videi. (VARAM, 2021)

Pētījuma mērķis ir analizēt drošības speciālista profesijas attīstību un noteikt galvenās tendences, kas ietekmēs šīs jomas speciālistus tuvākajā nākotnē. Īpaša uzmanība tiks pievērsta cilvēkkapitāla attīstībai drošības nozarē, kas nosaka nepieciešamību pēc jauniem apmācību un profesionālās attīstības modeļiem.

Literatūras apskats

Kļūst arvien skaidrāks, ka drošības stabilitātes saglabāšana ir kļuvusi par globālu misiju. Citiem vārdiem sakot, ir ļoti svarīgi, lai būtu globālas stratēģijas un atbilstošas darbības, izmantojot visu pasaules valstu sadarbības sarunas. Globālās domāšanas attīstīšana ir kļuvusi par izglītības nepieciešamību multikulturālā globalizētā pasaulē. Pārskatot daudznozaru literatūru par globālo domāšanu, atklājas, ka trūkst visaptverošas teorētiskas koncepcijas, lai izprastu globālo domāšanu un tās ietekmi uz globālās drošības stabilitātes saglabāšanu. Autori apgalvo, ka mūsdienu speciālista globālā domāšana ir drošības nosacījums. (Nguyen Van My, Ankudinova, 2023)

Vēsturiski drošība tika galvenokārt uztverta militārā un valsts aizsardzības kontekstā. Drošības speciālisti koncentrējās uz nacionālo aizsardzību, militāro stratēģiju un ārējo draudu novēršanu. Aukstā kara laikā viņi bija cieši saistīti ar militāri rūpniecisko kompleksu, specializējoties atturēšanas teorijā, ieroču kontroles mehānismos un ģeopolitiskajā stratēģijā. Viņu galvenais uzdevums bija aizsargāt valsti no militāriem uzbrukumiem, un viņu darbs bieži vien bija cieši saistīts ar valdības politiku un institūcijām. (Krause, 2018) Drošības speciālistu loma ir attīstījusies no tradicionālās fiziskās apsardzes līdz modernai kiberdrošībai, izlūkošanas analīzei un hibrīdkara stratēģijām. Šīs pārmaiņas pieprasa jaunas prasmes draudu novērtēšanā, kiberrisku pārvaldībā un stratēģiskajā lēmumu pieņemšanā. Profesionālās pārmaiņas ģeopolitisko notikumu ietekmē labi raksturo radošās akmeoloģijas koncepts, kas skaidro, kā speciālisti pielāgojas jauniem izaicinājumiem. (Višņakova, 1998) Kā uzsver profesors Dr.hist. Guntis Zemītis: "Latvijas vēsturiskās drošības stratēģijas ir veidojuši ģeopolitiskie spiedieni un tās loma Eiropas drošības sistēmās." (Zemītis, 2023) Latvijas drošības vēsture ir būtiska, lai izprastu mūsdienu aizsardzības stratēģijas un nacionālās drošības politikas.

Pēdējo gadu laikā pasaulē notikušie drošības incidenti un ģeopolitiskās pārmaiņas ir būtiski ietekmējuši prasības pret drošības darbiniekiem. (Tomsons, Liniņš, Unāma, 2024) Šīs izmaiņas izpaužas vairākos aspektos:

Paaugstināta gatavība reaģēt uz militāriem draudiem. Krievijas pilna mēroga iebrukums Ukrainā 2022. gada februārī ir radījis jaunu drošības situāciju Eiropā. Šis notikums ir licis pārskatīt nacionālās drošības stratēģijas un palielināt uzmanību uz militāro draudu novēršanu. Drošības darbiniekiem tagad ir jābūt gataviem reaģēt uz potenciāliem militāriem apdraudējumiem un jāspēj sadarboties ar aizsardzības struktūrām. (Ārlietu ministrija, 2025)

Kā viens no aspektiem ir arī jaunu tehnoloģiju intensīvāka pielietošana. Pēc Krievijas iebrukuma Ukrainā pasaule nekavējoties spēja novērtēt bezpilota lidaparātus un to spēju ietekmēt ienaidnieku, gan to neitralizējot, gan drošā attālumā novērot un momentāni risināt draudu neitralizēšanu vai ierobežošanu. Jāpiezīmē, ka vēl vairākus gadus atpakaļ bezpilota lidaparātu izmantošana bija mazskaitlīga un neapgūta, kaut gan to jau plaši izmantoja militārajā vidē. Bezpilota lidaparātu

sistēmas (UAS) ir būtiski uzlabojušas drošības operācijas, nodrošinot attālinātu novērošanu, ātru reaģēšanu un automatizētu draudu noteikšanu. "Bezpilota sistēmu ieviešana drošībā prasa līdzsvaru starp operacionālo efektivitāti un normatīvajiem ierobežojumiem, īpaši pilsētu vidē" (Veinbergs, Kīsnica, 2021).

Uzsvars uz kiberdrošību. Digitālās tehnoloģijas ir kļuvušas par neatņemamu ikdienas sastāvdaļu, un līdz ar to ir pieaudzis arī kiberuzbrukumu skaits. Drošības darbiniekiem ir jābūt prasmēm identificēt un novērst kiberdraudus, kā arī jāizprot jaunākās tehnoloģijas un to potenciālās ievainojamības.

Kiberdrošības draudi turpina pieaugt, ietekmējot gan individuālus lietotājus, gan organizācijas. Saskaņā ar *Enterprise Strategy Group & ISSA (2019)* pētījumu 74 % organizāciju visā pasaulē izjuta kiberdrošības prasmju trūkuma negatīvo ietekmi, kas izpaužas kā palielināta esošā personāla slodze un nespēja pilnībā izmantot drošības tehnoloģijas. (Enterprise Strategy Group & ISSA, 2019)

Pētījuma rezultāti liecina par strauji pieaugošo nepieciešamību pēc drošības speciālistiem, kuriem ir ne tikai tehniskās zināšanas, bet arī stratēģiska un analītiska domāšana. Dati no CERT.LV (2024) parāda, ka pēdējo piecu gadu laikā kiberuzbrukumu skaits Latvijā ir pieaudzis par vairāk nekā 60 %, kas apliecina nepieciešamību pēc efektīvākas kiberdrošības pārvaldības. (CERT.LV, 2024). Kiberdrošības draudi prasa proaktīvu pieeju un pastāvīgu kompetenču uzlabošanu.

Kognitīvā drošība un mākslīgais intelekts. Mākslīgā intelekta (MI) attīstība rada jaunus izaicinājumus cilvēktiesību un privātuma jomā. MI novērošanas tehnoloģijas, piemēram, sejas atpazīšana un emociju uztveršana, var aizskart cilvēka cieņu, tiesības uz privātumu un datu aizsardzību. Tāpēc ir nepieciešams izstrādāt tiesisko regulējumu, kas nodrošinātu cilvēktiesību aizsardzību MI laikmetā. (Barkāne, 2023) Kognitīvā drošība attiecas uz cilvēka domāšanas un uztveres aizsardzību pret dezinformāciju, manipulāciju un psiholoģiskiem uzbrukumiem. Tā ietver aizsardzību pret dezinformāciju – viltus ziņas, *deepfake* un manipulēta informācija var maldināt sabiedrību, kritisko domāšanu – cilvēku spēju analizēt un atšķirt patiesu informāciju no nepatiesas, psiholoģisko aizsardzību – pret propagandu, kognitīvajiem trikiem un emocionālu manipulāciju. Mākslīgais intelekts var gan uzlabot kognitīvo drošību, gan kļūt par draudu avotu. Tā pozitīvās ietekmes ir par automatizētu *dezinformācijas atpazīšanu* – MI var analizēt milzīgus datu apjomus, lai identificētu viltus ziņas, propagandu un manipulētus attēlus vai video. *Kiberdrošības uzlabošanai*, kur MI sistēmas spēj ātri identificēt aizdomīgus uzbrukumus, kas izmanto sociālo inženieriju. *Faktu pārbaudei un informācijas filtrēšanai* – palīdz medijiem un pētniekiem cīnīties ar viltus ziņu izplatību. Tomēr ir jāatceras arī par draudiem un izaicinājumiem: *Deepfake un sintētiskie mediji* – MI spēj ģenerēt ļoti ticamus, bet nepatiesus attēlus, video un balsis, kas var maldināt sabiedrību. *Mērķtiecīga manipulācija*, kur ar MI palīdzību var veidot personalizētas propagandas kampaņas, kas izmanto psiholoģiskus trikus, lai ietekmētu indivīdus un grupas. *Sabiedrības polarizācija* – algoritmi, kas veicina klikšķu balstītu saturu, var radīt informācijas burbuļus un pastiprināt cilvēku uzskatu radikalizāciju. Kognitīvā drošība ir kļuvusi par būtisku kiberdrošības aspektu, un MI attīstība to padara vēl aktuālāku. Lai gan MI var palīdzēt atpazīt un neitralizēt draudus, tā nepareiza izmantošana var radīt vēl lielākus izaicinājumus. Tāpēc svarīgi līdzsvarot inovācijas ar drošības principiem un ētisku pieeju.

Spēja pārvaldīt sociālās un politiskās nestabilitātes situācijas. Pēdējo gadu laikā ir novēroti dažādi sociāli un politiski nemieri, kas var radīt drošības riskus. Drošības darbiniekiem ir jābūt prasmēm pārvaldīt pūļus, novērst nekārtības un nodrošināt sabiedrisko kārtību šādās situācijās.

Elastība un pielāgošanās spēja. Straujās pārmaiņas globālajā drošības vidē prasa, lai drošības darbinieki spētu ātri pielāgoties jaunām situācijām un apgūt jaunas prasmes. Tas ietver gan tehnoloģisko jauninājumu apguvi, gan arī spēju strādāt mainīgos apstākļos. Drošības vadītājiem jāprot risināt krīzes, pārvaldīt kiberriskus un analizēt izlūkošanas datus. Drošības vadītājiem jāapvieno stratēģiska prognozēšana ar tehnoloģisko pielāgošanās spēju, lai pārvaldītu jaunus riskus. (Začs, 2024)

Drošības pakalpojumiem gan publiskajā, gan privātajā sektorā ir jāpielāgojas globālajiem iepirkumu standartiem. "Publiskā sektora drošības iepirkumiem ir jānodrošina līdzsvars starp izmaksu efektivitāti un operacionālo efektivitāti" (Størkersen, u.c., 2024).

Mūsdienu drošības speciālistu loma ir ievērojami mainījusies, pielāgojoties tehnoloģiskajiem sasniegumiem un mainīgajai ģeopolitiskajai videi. Drošības stratēģijas vairs neaprobežojas tikai ar fiziskās drošības nodrošināšanu, bet ietver arī kiberdrošību, izlūkošanas analīzi un hibrīdkara stratēģijas. (Višņakova, 1998) Mūsdienu drošības speciālistu atbildība ietver organizācijas digitālo un fizisko aktīvu aizsardzību pret dažādiem draudiem, tostarp kiberuzbrukumiem, fiziskiem ielaušanās mēģinājumiem un citiem drošības riskiem. Drošības speciālistu trīs būtiskākās prasmes – zināšanas par drošības principiem, risku pārvaldību un komunikāciju – veido pamatu viņu veiksmīgai darbībai un organizāciju aizsardzībai pret attīstītiem drošības izaicinājumiem. (SECUREU, 2024)

Mentālās veselības nozīme. Pieaugošais stress un spriedze drošības darbinieku darbā ir aktualizējusi mentālās veselības jautājumus. Ir svarīgi nodrošināt atbalstu un resursus, lai darbinieki spētu saglabāt psiholoģisko labklājību, kas tieši ietekmē viņu darba efektivitāti. (KANTAR, 2024)

Kopumā mūsdienu drošības darbiniekiem ir jābūt daudzpusīgiem profesionāļiem ar plašu prasmju un zināšanu spektru, lai efektīvi reaģētu uz mainīgajiem drošības izaicinājumiem.

Drošības vide ir strauji mainīga un sarežģīta, ko ietekmē tehnoloģiju attīstība, globalizācija un pieaugošie draudi, kas ietver gan fizisko, gan kiberdrošību. Mūsdienu drošības speciālists vairs nav tikai tradicionālais apsargs vai risku vadītājs – viņam ir jāspēj reaģēt uz jauniem drošības izaicinājumiem, kas saistīti ar digitālo vidi, dezinformāciju un mākslīgā intelekta attīstību. Drošības speciālistu loma ir paplašinājusies, aptverot ne tikai militāros jautājumus, bet arī tādas sfēras kā terorisms, kiberdrošība, ekonomiskā stabilitāte, vides drošība un cilvēkdrošība. Mūsdienu drošības speciālistam jāspēj orientēties arvien sarežģītākā globālajā vidē, kurā dominē: *hibrīddraudi*, ieskaitot kiberkarus, dezinformācijas kampaņas un ekonomisko piespiešanu. *Transnacionālie drošības jautājumi*, piemēram, klimata pārmaiņas, pandēmijas un migrācija. *Nevalstiskie spēlētāji*, tostarp teroristu organizācijas, starptautiski korporatīvie uzņēmumi un organizētās noziedzības tīkli. *Nestandarta drošības jautājumu "sekuritizācija"*, kur sociālie, ekonomiskie un vides faktori tiek uztverti kā drošības draudi. (Krause, 2018) Šīs pārmaiņas ir novedušas pie drošības studiju padziļināšanās un paplašināšanās, liekot speciālistiem apgūt starpdisciplināru analīzi, riska novērtēšanu un politikas izstrādi dažādās jomās.

Mūsdienu drošības izaicinājumi prasa integrētu pieeju, kas ietver tehnoloģiskus, juridiskus un izglītības aspektus. Nepieciešama pastāvīga pielāgošanās un drošības uzlabošana, lai efektīvi reaģētu uz jaunajiem draudiem un nodrošinātu datu un cilvēktiesību aizsardzību digitālajā laikmetā. Drošība vairs neattiecas tikai uz fiziskiem draudiem – tajā ietilpst kiberdrošība, dezinformācija un mākslīgā intelekta riski. Kā norādīts rakstā "Pilsoniskās sabiedrības līdzdalība drošības un aizsardzības plānošanā", sabiedrības iesaiste drošības plānošanā palielinās. Tas nozīmē, ka drošības speciālistiem nākotnē būs ciešāk jāsadarbojas ar politikas veidotājiem, militārajām iestādēm un pat plašu

sabiedrību, lai nodrošinātu efektīvus drošības pasākumus. (Vicente-Olivis, 2024) Drošības speciālists darbojas vidē, kurā fiziskā un digitālā drošība ir cieši saistīta. Kiberdrošība, datu aizsardzība un tehnoloģiju attīstība veido jaunus izaicinājumus, kuriem nepieciešamas pielāgotas drošības stratēģijas.

Nākotnē drošības speciālistiem būs jāpielāgojas straujām tehnoloģiskām pārmaiņām, mainīgajiem varas līdzsvāriem un jauniem globāliem draudiem. Galvenās tendences, kas ietekmēs drošības profesionāļu darbu, ietver: mākslīgo intelektu un lielo datu analīzi – arvien vairāk drošības ekspertu izmantos prognozēšanas analītiku un automatizētu uzraudzību, lai identificētu draudus; sadarbību ar privāto sektoru – robeža starp valsts un privāto drošību kļūs neskaidrāka, jo korporācijas uzņemsies lielāku lomu kiberdrošībā un krīžu pārvaldībā; ētiskos un politiskos apsvērumus – drošības jautājumu pārspīlēšana var radīt juridiskas un morālas problēmas, tādēļ būs nepieciešama līdzsvarota pieeja starp drošību un pilsoņu brīvībām; globālo pārvaldību un daudzpusējus drošības mehānismus – nākotnes drošības speciālistiem būs nepieciešama izpratne par starptautisko sadarbību un politikas veidošanu, lai risinātu globālos draudus.

Drošības profesionāļiem ir nepieciešama stingra izglītības bāze. Latvija ir pakāpeniski integrējusi drošības studijas augstākās izglītības programmās, nodrošinot, ka nākotnes speciālisti iegūst gan teorētiskās, gan praktiskās kompetences. “Latvijas drošības profesionāļiem jābūt apveltītiem ar daudznozaru prasmēm, kas aptver digitālo tiesu ekspertīzi, juridisko atbilstību un risku mazināšanas stratēģijas” (Veinbergs, 2018).

Latvijas drošības industrija ir paplašinājusies ārpus valsts robežām, piedāvājot specializētus pakalpojumus augsta riska vidē, infrastruktūras aizsardzībā un kiberdrošībā. “Latvijas drošības pakalpojumu eksporta iespējas ir tieši saistītas ar to spēju pielāgoties starptautiskajiem regulējumiem un operacionālajām prasībām” (Veinbergs, 2023). Drošības profesiju nākotni noteiks mākslīgais intelekts, automatizācija un hibrīddraudi, kas prasīs no speciālistiem nepārtrauktu pielāgošanos un zināšanu atjaunošanu. (SECUREU, 2024)

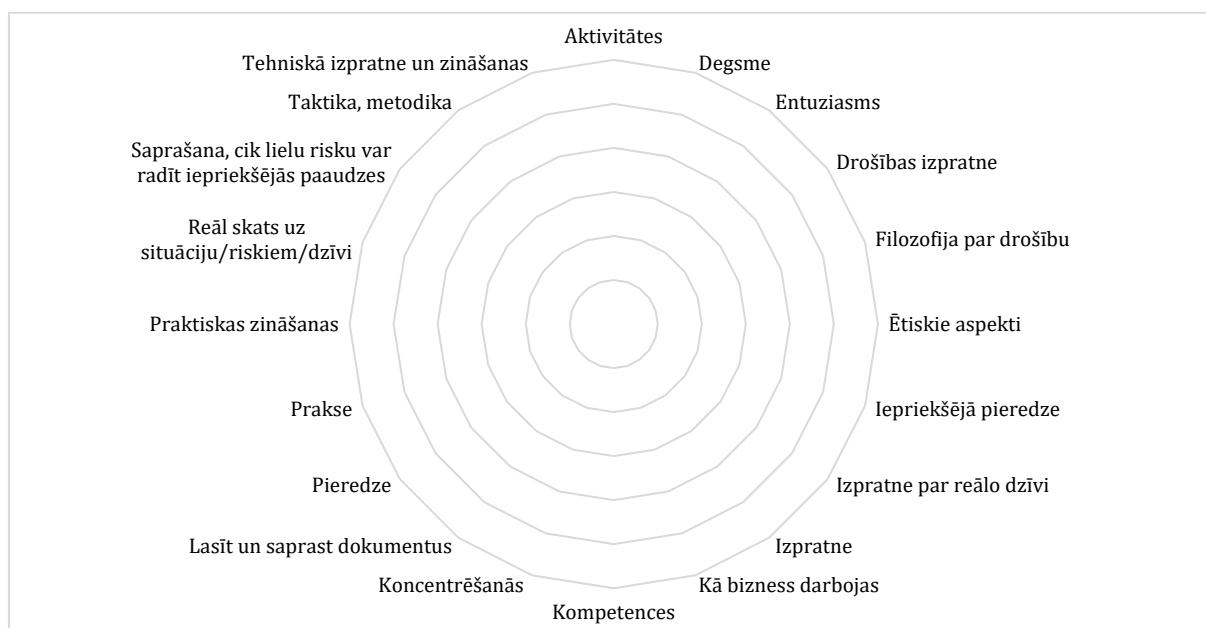
Pētījuma metodoloģija

Pētījuma mērķis ir analizēt drošības speciālista profesijas attīstību un noteikt galvenās tendences, kas ietekmēs šo jomu tuvākajā nākotnē. Lai sasniegtu šo mērķi, tika izmantotas vairākas pētniecības metodes, kas nodrošina plašu un daudzpusīgu skatījumu uz drošības speciālista lomu un tās attīstību. Lai iegūtu daudzpusīgus un uzticamus datus, pētījumā tika izmantoti šādi instrumenti: literatūras analīze – veikts zinātnisku publikāciju, starptautisku ziņojumu un politikas dokumentu apskats, lai noteiktu galvenās tendences drošības speciālista lomā un nepieciešamajās kompetencēs; ekspertu intervijas – intervēti drošības nozares eksperti, tostarp akadēmisko institūciju pārstāvji, privātā sektora drošības vadītāji un valsts iestāžu speciālisti, lai iegūtu padziļinātu izpratni par profesijas izaicinājumiem un attīstības perspektīvām; aptaujas – veiktas strukturētas aptaujas starp drošības profesionāļiem dažādos līmeņos (no iesācējiem līdz augsta līmeņa vadītājiem), lai identificētu galvenās prasmes un izaicinājumus, ar kuriem saskaras mūsdienu drošības speciālisti; gadījumu analīze (*case study*) – analizēti konkrēti drošības incidenti un organizāciju prakses, lai identificētu efektīvākās pieejas drošības pārvaldībai un apdraudējumu novēršanai. Šo metožu izmantošana nodrošina visaptverošu skatījumu uz drošības speciālistu profesijas attīstību un tās nozīmi mūsdienu mainīgajos drošības apstākļos.

Pētījuma rezultāti

2024. gada izskaņā Rīgā norisinājās vērienīgs drošības jomas pasākums *Nordic SecTech Summit 2024*, kura organizēšanā aktīvi iesaistījās arī Biznesa augstskola *Turība* un ERASMUS+ SECUREU projekts. Samita vienojošā tēma bija "uz cilvēku vērsta drošības projektēšana". Samitā tika skartas aktuālas tēmas, kas skar kā fizisku, tā juridisku personu ikdienas darbu un ir saistāmas ar praktiski ikvienu uzņēmējdarbības jomu, jo galvenās skatuves runātāji dalījās atziņās par kiberdrošību un datu aizsardzību; kas jāzina par šodienas riskiem un kā rīkoties draudu gadījumā; kādas ir apdrošinātāju gūtās mācības no reāliem zaudējumiem; kā vadīt riskus uz rezultātu vērstā projektēšanā un būvniecībā; kā pareizi stratēģiski ieviest mākslīgo intelektu savā organizācijā un kādi šķēršļi un izaicinājumi var būt tā pakāpeniskā virzīšanā; un, protams, tika runāts arī par katra uzņēmēja šī gada Ahileja papēdi: kā pielāgot rudenī gaidāmās NIS2 direktīvas ieviešanu savās drošības tehnoloģijās. (NSTS, 2024) Dienas otrajā pusē notika praktiskas darbnīcas jeb *workshops*, kas dalībniekiem sniedza iespēju pārbaudīt savas zināšanas un prasmes. Piecu darbnīcu tēmas ietvēra draudu atklāšanu, šifrēšanu un drošas kodēšanas praksi, ka arī bija iespēja fiziski pārbaudīt dažādu drošības tehnoloģiju izturību reālos apstākļos. Vienā no darbnīcām notika arī diskusijas par drošības risku vadību šodien, paralēli diskutējot arī par drošības speciālista zināšanām un prasmēm šodien un nākotnē. Darbnīcās kopumā piedalījās vairāk kā 150 dažādu jomu un dažāda līmeņa drošības darbinieki.

Pirmajā jautājumā tika noskaidrotas zināšanas un iemaņas, kas trūkst jaunajiem drošībniekiem. Grafiks ir strukturēts tā, lai attēlotu dažādas svarīgas jomas, kurās jaunajiem profesionāļiem būtu jāattīsta savas prasmes.



1. attēls. Kādas zināšanas un iemaņas trūkst JAUNAJIEM drošībniekiem? (autoru veidots)

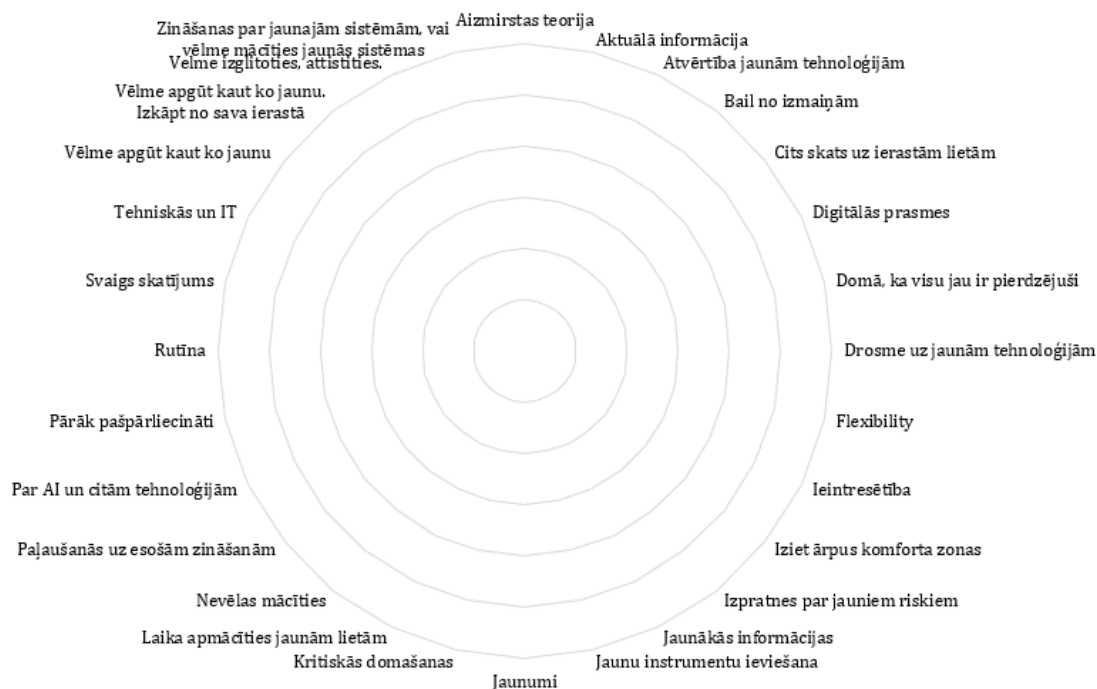
Galvenie secinājumi, ko var izdarīt no attēlā norādītajām kategorijām:

- 1) tehniskā izpratne un zināšanas: jaunie drošībnieki saskaras ar nepieciešamību izprast tehnoloģijas, kas saistītas ar drošības sistēmām, un mācīties risināt konkrētas tehniskas problēmas, kas saistītas ar drošību. Taktika un metodika ir būtiska, lai spētu pielietot šīs zināšanas reālās situācijās;
- 2) riska izpratne un spēja novērtēt draudus: jaunajiem drošībniekiem ir jāsaprot, cik liels risks var rasties konkrētās situācijās, un jāspēj objektīvi novērtēt iespējamus draudus un to sekas gan dzīvē, gan ikdienas darbā;
- 3) reāls skats uz situācijām un dzīvi: praktiskā pieredze, kas iegūta darbā, ļauj jaunajiem drošībniekiem iegūt reālu izpratni par to, kā darbojas drošības pasākumi ikdienā un kā tie var tikt pielāgoti konkrētām situācijām;
- 4) praktiskas zināšanas un pieredze: drošības nozarē praktiskā pieredze ir ļoti vērtīga. Pieredze un zināšanas, kas iegūtas darbā ar dokumentiem, komunikācijā ar klientiem un uzdevumu veikšanā, palīdz iegūt spēcīgas bāzes iemaņās;
- 5) komunikācija un koncentrēšanās: spēja koncentrēties uz konkrētiem uzdevumiem un lasīt un saprast dokumentus ir būtiskas prasmes, kas ir svarīgas, lai veiktu drošības uzdevumus pareizi un efektīvi;
- 6) motivācija, entuziasms un deģsme: motivācija un vēlme darboties drošības nozarē ir nepieciešama, lai būtu apņēmīgs un efektīvs darbinieks. Bez entuziasma ir grūti būt veiksmīgam šajā profesijā, jo tā prasa ilgu darbu un pielāgošanos;
- 7) filozofija par drošību un ētiskie aspekti: jaunajiem drošībniekiem jāattīsta filozofija un izpratne par to, kādēļ drošība ir svarīga, kā arī jāapzinās ētiskie aspekti, kas saistīti ar šo profesiju. Tā palīdzēs pieņemt pareizus lēmumus sarežģītās situācijās;
- 8) izpratne par biznesa darbību: drošībniekiem ir jāizprot, kā drošības darbība mijiedarbojas ar biznesa darbību, un jāspēj saprast, kā viņu darbs ietekmē organizācijas kopējo veiksmīgumu.

Atbildes norāda uz nepieciešamību jaunajiem drošībniekiem attīstīt plašu prasmju un zināšanu klāstu. No vienas puses, viņiem ir jābūt tehniski sagatavotiem, jāspēj novērtēt riskus un jābūt pieredzei, lai pārvaldītu dažādas situācijas. No otras puses, viņiem ir jāapzinās savu darbu ētiskie aspekti, jāizprot drošības filozofija un jāspēj strādāt ar biznesa struktūrām.

Jaunie drošībnieki, kas attīstīs šīs prasmes, būs labāk sagatavoti ne tikai profesionālām situācijām, bet arī spēs adaptēties mainīgajā darba vidē, saglabājot augstu drošības līmeni un efektivitāti.

Kā otrs būtiskākais jautājums tika uzdots ar mērķi noskaidrot – kādas zināšanas un prasmes trūkst jau pieredzējušiem darbiniekiem.



2. attēls. Kādas zināšanas un prasmes trūkst jau pieredzējušiem darbiniekiem? (autoru veidots)

Pieredzējušiem profesionāļiem varētu būt izaicinājumi, lai saglabātu savu konkurētspēju un spēju pielāgoties mainīgajām prasībām drošības nozarē.

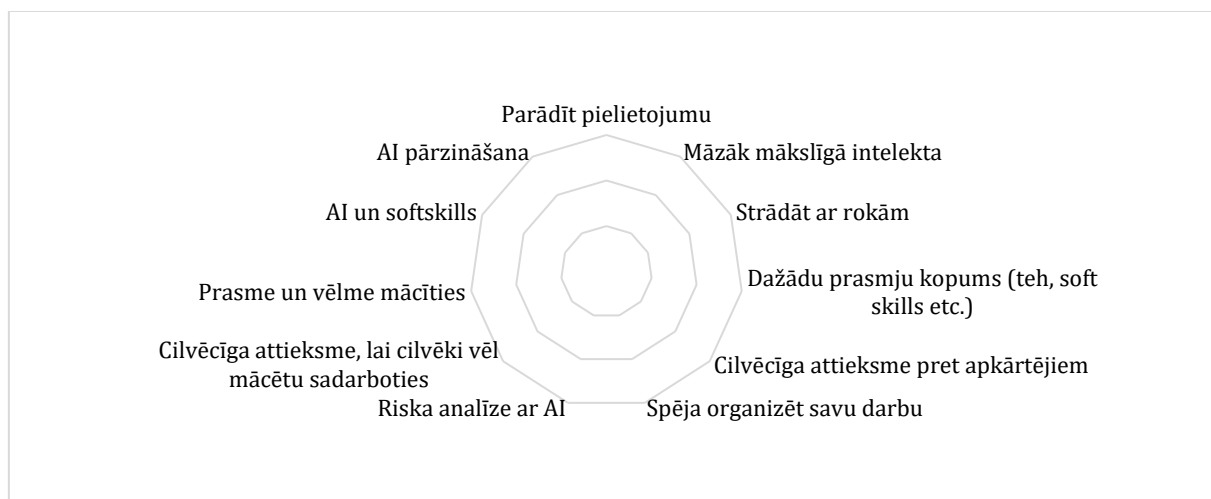
Galvenās kategorijas, kas minētas, un ko tās nozīmē:

- 1) jaunumi un vēlme mācīties: pieredzējušiem drošības speciālistiem dažreiz ir izaicinājums sekot līdzi jaunajām tehnoloģijām un attīstītajām metodēm, ko ievieš nozares jaunākās tendences. Viens no izaicinājumiem ir vēlme apgūt kaut ko jaunu un būt atvērtiem pārmaiņām;
- 2) tehniskās un IT zināšanas: mūsdienu drošības jomā arvien lielāka uzmanība tiek pievērsta tehnoloģiju izmantošanai, un pieredzējušiem drošības speciālistiem ir jābūt spējīgiem pielāgoties jaunajām IT prasībām, kā arī izmantot mākslīgā intelekta un citus tehnoloģiskos rīkus;
- 3) bailes no izmaiņām un rutīnas: pieredzējušiem darbiniekiem var rasties pretestība pret izmaiņām un attīstību, kas saistīta ar rutīnas veidošanos un neizpratni par jaunajiem risinājumiem. Tā var radīt bažas, ka pārmaiņas ir sarežģītas, vai liek justies neērti;
- 4) digitālās prasmes un drošība uz jaunām tehnoloģijām: arvien lielāka uzmanība tiek pievērsta digitālajām prasmēm, piemēram, datu aizsardzībai un drošības ievainojamības novēršanai jaunākajos tehnoloģiskajos risinājumos;
- 5) jauni instrumenti un informācija: jauni drošības instrumenti un informācijas plūsmas ir nepieciešamas, lai uzlabotu drošības analīzi un pielāgotu drošības risinājumus jaunajām tehnoloģijām;
- 6) kritisks skatījums un spēja iziet ārpus komforta zonas: pieredzējušiem darbiniekiem ir jāklūst atvērtākiem kritiskai domāšanai un jābūt gataviem iziet ārpus komforta zonas, lai pielāgotos jauniem izaicinājumiem, ko rada mainīgā tehnoloģiju vide;

- 7) izpratne par jaunajiem riskiem un jaunajiem darba apstākļiem: kā drošībniekiem ir jāapzinās jaunie riski, kas saistīti ar tehnoloģiju attīstību un ar to saistītajām drošības problēmām, piemēram, kiberdrošību un datu aizsardzību;
- 8) pašpārlicinātība un laika apmācība jaunajiem darbiniekiem: pieredzējušiem drošībniekiem jāapgūst jaunas metodes, kā apmācīt un norādīt jauniem darbiniekiem, kas var būt izaicinājums, ja paši nav pilnīgi ieinteresēti vai nav saistīti ar jaunajiem tehnoloģiju attīstības soļiem.

Attēlā redzami izaicinājumi norāda uz nepieciešamību, lai pieredzējuši drošībnieki nemitīgi attīstītu savu tehnisko un digitālo kompetenci, īpaši ņemot vērā straujo tehnoloģiju attīstību. Arvien lielāka uzmanība jāpievērš jaunu instrumentu izmantošanai, kā arī spējai atjaunināt zināšanas par jaunākajām drošības tehnikām un riskiem, kas saistīti ar jaunām tehnoloģijām. Pieredzējušiem darbiniekiem jāattīsta spēja būt atvērtiem pārmaiņām, jāspēj iemācīties jaunas prasmes un jāveido kritiskā domāšana, lai veiksmīgi pielāgotos jaunajiem izaicinājumiem un nezaudētu savu nozīmi drošības nozarē.

Savukārt, runājot par nepieciešamajām zināšanām un prasmēm nākotnē, aptaujātajiem drošības speciālistiem domas brīžiem diametrāli pretēji atšķiras.



3. attēls. Kādas prasmes un zināšanas būs nepieciešamas nākotnē? (autoru veidots)

3. attēlā uzskaitītās prasmes un zināšanas, kas būs nepieciešamas nākotnē, ietver dažādus aspektus, kas saistīti gan ar tehnoloģiju izmantošanu, gan cilvēku savstarpējām attiecībām. Galvenie punkti ir:

- 1) pielietojuma parādīšana – spēja praktiski izmantot iegūtās zināšanas;
- 2) mākslīgā intelekta samazināšanās – pieprasījums pēc cilvēku prasmēm, kas nav aizvietošanas ar MI;
- 3) darbs ar rokām – uzsvars uz fiziskajām prasmēm;
- 4) dažādas prasmes – tehniskās un “mīkstās” prasmes, kas nepieciešamas elastīgai adaptācijai;
- 5) cilvēcīga attieksme pret apkārtējiem – komunikācija un iejūtība, kas palīdzēs sadzīvot ar tehnoloģijām;
- 6) spēja organizēt savu darbu – laika un uzdevumu vadība;
- 7) riska analīze ar MI – mākslīgā intelekta izmantošana, lai izvērtētu riskus;
- 8) cilvēcīga attieksme un sadarbība – uzsvars uz cilvēku spēju sadarbīties, neskatoties uz tehnoloģiskajām izmaiņām;

- 9) mācīšanās prasmes un vēlme mācīties – pielāgošanās jaunajām tehnoloģijām un attīstība;
- 10) MI un *soft skills* – kombinācija starp tehnoloģiskajām un “mīkstajām” prasmēm;
- 11) MI pārzināšana – mākslīgā intelekta apguve un izpratne.

Kopumā šīs prasmes liecina par līdzsvaru starp tehnoloģisko attīstību un cilvēka vajadzību pēc emocionālās inteliģences un komunikācijas.

Secinājumi

Drošības speciālista profesija ir ievērojami attīstījusies – no tradicionālās fiziskās apsardzes un izlūkošanas uz multidisciplināru jomu, kas aptver kibernetisko risku pārvaldību un dezinformācijas apkarošanu.

Pieaug tehnoloģisko risinājumu nozīme drošības jomā – mākslīgais intelekts, lielo datu analīze un automatizācija kļūst par būtiskām drošības pārvaldības sastāvdaļām, jo īpaši saistībā ar prediktīvo drošību un kibernetisko draudu identificēšanu.

Kibernetiskā drošība kļūst par centrālo drošības speciālistu kompetenci – mūsdienu draudi vairs nav tikai fiziski, bet arī virtuāli, tāpēc pieprasījums pēc ekspertiem ar kibernetiskās drošības un datu aizsardzības zināšanām strauji pieaug.

Ģeopolitiskā situācija būtiski ietekmē drošības speciālistu lomu – pieaugošie konflikti un hibrīddraudi, tostarp kibernetiskā karš un dezinformācijas kampaņas, prasa daudzpusīgāku pieeju drošības pārvaldībai.

Nākotnes drošības speciālistiem būs jāapgūst jaunas prasmes – mākslīgā intelekta pielietojums, psiholoģiskā drošība, krīžu prognozēšana un noturības inženierija kļūs par nozīmīgām kompetencēm.

Starptautiskā sadarbība ir būtiska drošības pārvaldībā – neviena valsts nevar efektīvi risināt globālus drošības izaicinājumus vienatnē, tāpēc nepieciešama ciešāka sadarbība starptautiskā un starpdisciplinārā līmenī.

Nepieciešama nepārtraukta profesionālā pilnveide – drošības speciālistiem jāspēj pielāgoties strauji mainīgajiem apstākļiem, izmantojot mūsdienīgas apmācību metodes un starpdisciplināru pieeju.

Mentālās veselības un psiholoģiskās noturības nozīme drošības jomā pieaug – drošības profesionāļiem arvien biežāk jāsaskaras ar stresa situācijām, tāpēc nepieciešams vairāk resursu un stratēģiju darbinieku psiholoģiskā atbalsta nodrošināšanai.

Drošības pārvaldība kļūst arvien proaktīvāka – nevis tikai reaģējoša, bet balstīta uz prognozēšanu, risku modelēšanu un preventīviem pasākumiem, lai samazinātu iespējamās drošības apdraudējumus.

Drošības speciālistu sagatavošanā nepieciešama starpdisciplināra pieeja – drošības jomas profesionāļiem jāapgūst ne tikai tradicionālās drošības zināšanas, bet arī IT, tiesību, psiholoģijas un starptautisko attiecību aspekti.

Drošības speciālista profesija turpina attīstīties, kļūstot par sarežģītu un daudzpusīgu jomu, kurā jāintegrē tehnoloģiju attīstība, globālie riski un jauni profesionālie izaicinājumi. Lai drošības speciālisti efektīvi pildītu savus pienākumus nākotnē, viņiem nepieciešama plaša un nepārtraukti attīstāma zināšanu bāze, kā arī spēja reaģēt uz jauniem drošības draudiem gan fiziskajā, gan digitālajā vidē.

Kopsavilkums

Mūsdienu drošības speciālista loma ir būtiski mainījusies, pielāgojoties strauji attīstošajiem tehnoloģiskajiem riskiem, kiberdrošības draudiem un mainīgajiem ģeopolitiskajiem apstākļiem. No tradicionālās fiziskās apsardzes šī profesija ir paplašinājusies, aptverot tādas jomas kā stratēģiskā izlūkošana, krīžu vadība un kiberdrošība. Šī pētījuma mērķis ir analizēt drošības speciālista profesijas attīstību un identificēt galvenās tendences, kas ietekmēs šo jomu tuvākajā nākotnē.

Pētījuma ietvaros tika izmantotas vairākas pētniecības metodes, tostarp literatūras analīze, ekspertu intervijas, aptaujas un gadījumu analīze. Rezultāti liecina, ka nākotnes drošības speciālistiem būs nepieciešamas papildu kompetences tādās jomās kā mākslīgā intelekta pārvaldība, prediktīvā drošība, kritiskās infrastruktūras aizsardzība un starptautiskā sadarbība.

Secinājumi norāda uz nepieciešamību drošības profesionāļiem nepārtraukti attīstīt savas prasmes un pielāgoties jauniem drošības izaicinājumiem, ko rada tehnoloģiskās inovācijas un globālie riski. Pētījums uzsver, ka nākotnes drošības speciālistam būs jāspēj pārvaldīt ne tikai tradicionālos fiziskās drošības aspektus, bet arī modernās kiberdrošības un dezinformācijas draudus, darbojoties gan valsts, gan privātajā sektorā.

References

- Barkāne, I. (2023). *Cilvēktiesību nozīme mākslīgā intelekta laikmetā. Privātums, datu aizsardzība un regulējums masveida novērošanas novēršanai*. Rīga: LU Akadēmiskais apgāds
- CERT.LV (2024). Latvijas kiberdrošības situācija un izaicinājumi. Pieejams: <https://cert.lv/lv/latvijas-kiberdroshibas-situacija-un-izaicinajumi>.
- Enterprise Strategy Group & ISSA (2019). The Life and Times of Cybersecurity Professionals 2019. ISSA Research. Pieejams: <https://www.issa.org/the-life-and-times-of-cybersecurity-professionals-2019/>
- KANTAR (2024). Iedzīvotājiem šobrīd aktuālie jautājumi: mentālā veselība; valsts drošība; valodas lietošana. Pieejams: <https://www.kantar.lv/tnsab78/latvijas-iedzivotajiem-sobrid-aktualie-jautajumi-ir-saistiti-ar-mentalo-veselibu-valsts-drosibu-un-valodas-lietosanu/>
- Krause, K. (2018). *Security and 'security studies': Conceptual evolution and historical transformation*. DOI: [10.1093/oxfordhb/9780198777854.013.2](https://doi.org/10.1093/oxfordhb/9780198777854.013.2)
- Ministry of Environmental Protection and Regional Development of Latvia (2021). *Digitālās transformācijas pamatnostādnes 2021.–2027. gadam*. Pieejams: <https://www.varam.gov.lv/lv/digitalas-transformacijas-pamatnostadnes-2021-2027>.
- NguyễnVân Mỹ, Ankudinova, N. G. (2023). *Global thinking of modern specialist as condition for security*. Bulletin of the South Ural State University series Education Education Sciences, 15(2):78-86, DOI: [10.14529/ped230207](https://doi.org/10.14529/ped230207)
- NORDIC SECTECH SUMMIT 2024 (2024). Rīga, Latvija. Pieejams: https://www.nordicsectechsummit.eu/lv_LV/news-about-summit/drosibas-projektesanas-nozime
- Ozoliņa, Ž., Reinholde, I., Struberga, S. (2021). *Subjektīvā drošības uztvere – izpētes ietvara konstruēšana*. <https://doi.org/10.22364/liesdu.01>
- Reese, S. (2016). *Information security specialist*. EBSCO
- SECUREU. Biznesa augstskola Turība (2024). Drošības speciālistu prasmes un zināšanas. Drošības studiju un apmācību programmu ieteikumi. Pieejams: <https://security.turiba.lv>
- Størkersen, K. V., Haavik, T. K., Almklov, P. G., Gauteplass, A. A., & Jore, S. H. (2024). *Drošības pakalpojumu iepirkumu būtiskie aspekti*. Safety Science, 178, 106605. DOI: [10.1016/j.ssci.2024.106605](https://doi.org/10.1016/j.ssci.2024.106605)
- Tomsons, A., Liniņš, E., Unāma, E. (2024). *2024. gada pasaules ģeopolitisko notikumu apskats*. Pieejams: <https://lr1.lsm.lv/lv/raksts/divas-puslodes/2024-gada-pasaules-geopolitisko-notikumu-apskats.a200884/>
- Vicente-Oliva, R. (2024). Participation of Civil Society in Security and Defense Foresight. *Futures & Foresight Science*
- Višņakova, N. F. (1998). *Kreatīvā akmeoloģija: pieauguša cilvēka radošās personības attīstības psiholoģija*. Minska
- Veinbergs, V. (2018). *Drošības nozare Latvijas izglītības sistēmā*. Starptautiskās zinātniski–praktiskās konferences SABIEDRĪBA. CILVĒKS. DROŠĪBA materiāli.
- Veinbergs, V. (2023). *Latvijas apsardzes komersanta eksportspējīgs pakalpojums Baltijas valstīs*. Promocijas darbs, Turība Universitāte

- Veinbergs, V., & Kīsnica, I. (2021). *Bezpilota lidaparātu sistēmu izmantošanas iespējas un ierobežojumi drošības darbā Latvijā*. European Integration Studies, (15), 182-193. DOI: 10.5755/j01.eis.1.15.28829
- Začs, U. (2024). *Drošības vadītāju nepieciešamās kompetences kā atbalsts risku un krīžu pārvaldībā organizācijās nedrošības laikmetā*. The Age of Insecurity: From Risks to Growth, 187–194
- Zemītis, G. (2023). *Drošības aspekti Latvijas vēsturē*. LU Akadēmiskais apgāds

CONSUMER'S BEHAVIOR IMPACT ON CONVENTIONAL MEDIA LANDSCAPE IN INDIA

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Abstract

The profound changes in media consumption have been brought about by the tremendous growth of digital technology. As a result, the way in which people engage with conventional media platforms has undergone significant changes. This paper will examine the effects of the changed ways in which consumers consume media on the traditional media landscape. Specifically, this paper will examine the effects of increased use of social media, the increase in mobile phone penetration, and the increased adoption of over-the-top (OTT) streaming services on media consumption preferences, perceptions of credibility of media outlets, and the long-term viability of traditional media institutions. To gather primary data for this research, an online survey was used to collect responses from participants who completed a structured questionnaire via a convenience sample. Descriptive statistics, specifically frequency and percent analyses, were then applied to the collected data to explore platform preferences, time spent consuming media, and perceptions of media credibility. Findings show a considerable shift in the direction of digital media platforms; social media and streaming services have become dominant sources of news and entertainment. Although the consumption of traditional media is decreasing, it remains at a high level of trust and credibility amongst audiences. This research shows that the way in which consumers behave is causing a fundamental transformation of India's media system, creating a hybrid media environment in which both traditional and digital media platforms coexist through adaptation and integration.

Keywords: Consumer Behavior, Conventional Media, Digital Media, Media Consumption, OTT Platforms, Social Media, Advertising Shift, India Media Landscape

Introduction

The Indian media landscape is undergoing a major structural transformation due to rapidly changing technology and evolving audience behavior. Traditional media, which includes print, radio, and linear TV, have historically held the lion's share of both the dissemination of information and the advertising ecosystem in the country. However, with the proliferation of digital infrastructure and platform-based economies, there is a significant shift in how audiences consume media. Industry estimates indicate that digital media now accounts for a significant portion of India's advertising spending, indicating a clear shift in where audiences are paying attention (CRISIL Ratings, 2025). Further, business media outlets have reported that digital platforms account for almost half of India's ₹1 lakh crore advertising market (The Economic Times, 2025). Overall, the industry forecasts digital media will be one of the most significant growth drivers in the entertainment and communications economy in India (PwC, 2023).

In addition to the structural changes in the media landscape, consumer media behaviors are changing at an equally rapid pace. With the increasing availability of smartphones, social networking sites, and streaming systems, how audiences find and interact with content is being fundamentally changed. Consumption surveys globally show audiences are increasingly looking for personalized, on-demand, and multi-channel media experiences (Deloitte, 2025). In particular, social media is having a significant effect on how audiences view brands, how they perceive them, and ultimately how they make purchasing decisions (Ayesha, 2024). Therefore, because of the interactive nature of digital media, audiences are moving from being passive recipients of media messages to becoming active participants in the communication process.

The changes in consumer preferences are particularly evident when it comes to consuming news. More and more audiences are relying on digital interfaces for real-time updates and multimedia stories about current events. Domestic analyses of news consumption trends indicate a consistent decline in readership of print newspapers and a concurrent increase in the number of audiences using online news platforms and mobile aggregators to get their news (Drishti IAS, 2023). Survey data internationally also confirm the increasing importance of digital pathways, including social media and search engines, in getting news (Newman et al., 2025). Such changes to consumption behavior will require the development of new distribution models to sustain traditional print journalism.

The way people consume television programming is also changing. Linear appointment viewing is increasingly giving way to flexible, on-demand streaming models. Reports from the media industry indicate that OTT platforms are dramatically reducing the number of hours spent watching traditional television programming and subscribing to traditional television services (Agrawal & Ahuja, 2025). As such, the flow of advertising dollars and content investment dollars is shifting towards digital video platforms in response to these changes in consumption behavior (FICCI & EY, 2024). This represents a more general restructuring of the audiovisual entertainment supply chain. Print media is facing a similar disruption. Newspapers retain credibility in many demographics, but readership trends are evolving. Strategic analyses of the print media industry suggest that print media sustainability may depend on developing hybrid monetization models that combine programmatic advertising and digital extensions (David, 2025). Studies of institutional innovation in newspaper digitization also show the long-term trend towards digitizing all aspects of newspaper publishing in India (Aneez, et al., 2016). These represent additional examples of the structural challenges that legacy print publishing models face.

Further, the movement of advertising revenue away from traditional media formats into digital formats also demonstrates the impact of consumer behavior on the viability of traditional media. Growth in digital advertising far exceeds growth in traditional formats due to the use of data analytics and targeted marketing capabilities (Dentsu International & exchange4media, 2024). Assessments from global communications conglomerates also identify digital formats as the fastest-growing segment of media investment portfolios (WPP plc, 2025). Because advertisers are following consumers' attention, traditional media platforms face increased competitive pressure to maintain revenue.

At the policy and macroeconomic levels, the media and entertainment sector is gaining recognition as a key growth driver in the creative economy of India. Discussions around government policies reference the increasing role of digital media, gaming, and the audio-visual sectors in generating jobs and promoting cultural production (Press Information Bureau, 2026). Consulting assessments also reflect the emergence of complex third-party and platform-based ecosystems that are redefining

operational structures across industries (KPMG India, 2025). These structural changes are closely tied to changing consumer expectations and engagement patterns.

Therefore, analyzing the relationship between consumer behavior and the media landscape in India is both timely and necessary. The intersection of digital adoption, advertising migration, and content personalization is defining legacy media sustainability. Therefore, understanding these behavioral drivers is important for media organizations attempting to develop adaptive strategies to function effectively within a hybrid communication environment. Thus, this research investigates how consumer behavior is redefining the economic, structural, and future trajectory of traditional media in India.

Literature Review

Consumer Behavior and Digital Media Adoption

Consumer behavior in India has been profoundly impacted by the rapid advancement of digital communication technology. The widespread availability of affordable mobile phones and fast Internet access has enabled users to interact with media content in a variety of new and unimagined ways. Rather than being limited to using a single platform at a specific time, consumers can now use multiple digital interfaces to interact with content.

Studies have shown that today's consumers are moving away from traditional linear formats of media and towards more personalized, on-demand, and cross-platform media experiences (Deloitte, 2025). Furthermore, this is part of a larger trend of consumers preferring immediate, convenient, and self-directed media experiences. Market analysts also see digital media as a key factor in driving growth in India's entertainment and communications market, and as such, there is increasing demand for both higher levels of consumption time and platform penetration (PwC, 2023). In response to these changes, legacy media companies will need to rethink how they create engagement through their media products to be competitive in a digitally driven media environment.

In addition to changing the way consumers interact with each other, social media has changed the nature of consumer engagement. Social media allows for two-way communication and enables users to share content and receive feedback about that content. As a result, social media has transformed passive audiences into actively engaged participants in the communication process. Empirical research demonstrates that user-generated content, peer reviews, and influencer endorsements all impact consumer attitudes towards brands, increase consumer perceptions of brand trust, and ultimately increase purchase intentions (Ayesha, 2024).

Furthermore, previous research has demonstrated that social networking environments influence purchasing decisions by providing consumers with social proof and allowing them to engage in digital word-of-mouth (Kaur, 2021). Industry-wide research indicates that advertisers and media planners are increasingly focusing on digitally engaged consumer segments because they provide measurable and deep engagement (WPP plc, 2025). Taken collectively, these findings demonstrate that it is consumer behavior that is driving the continued growth of digital media ecosystems.

Transformation Of News and Print Media Consumption

The consumer's changing behavior can be seen most clearly through the lens of news consumption. Once, traditional printed newspapers were consumers' primary sources of public knowledge; now they are losing their readers as consumers transition to digital news environments. Mobile apps, web

portals, and social media feeds provide real-time updates and multimedia storytelling, which has led to an increasing reliance on online news by consumers, along with decreasing reliance on printed copies (Drishti IAS, 2023), as noted by national policy analysis data. The reason for this changing behavior is due to the convenience, portability, and timeliness provided by digital news platforms. Audience surveys internationally also show that search engines, social media, and news aggregation websites have become the primary gateway for consuming news (Newman et al., 2025). Overall, these behaviors represent a major restructuring of the paths by which people access information.

In order to adapt to the changing consumption patterns, legacy print-based organizations have had to take strategic action. Case studies of India's top newspaper companies indicate that many of them have developed digital versions of their publications, created single-source newsroom operations, and implemented paid-subscription wall systems to compensate for lost readership while creating a new revenue stream from digital page views (Aneez et al., 2016). Commentary from the industry notes that the ability of printed media to survive will depend on hybrid business models that generate revenue from both subscriptions and from programmatic and display advertising (David, 2025). Reports analyzing the structural changes happening across the entire sector also note that developing digital extensions, branded content, and cross-platform distribution are all required elements of today's print strategy (FICCI & EY, 2024). Together, these results illustrate how changing consumer behaviors have forced both structural and economic transformations within the print news sector.

OTT Expansion, Advertising Shifts, And Media Industry Restructuring

In addition to a dramatic shift in how people consume audio-visual content, there have been considerable disruptions to the way TV content is distributed by virtue of how audiences are consuming it. With the advent of Over-the-top (OTT) Streaming Platforms, the way viewers watch television changed dramatically. For example, whereas TV used to be an "appointment" format of programming with fixed timeslots for each show, with many of today's streaming platforms, users can view programs at their leisure (time-shift), personalize what they view, and watch on virtually any device. The empirical research conducted using case studies from the Indian perspective illustrates a significant decline in linear TV usage as audiences increasingly opt for streaming platforms, which offer them greater choice and flexibility (Agrawal & Ahuja, 2025). The increased user control over viewing schedule and programming selection represents a fundamental paradigm shift in consumer behavior and preferences that is being reflected across the entire media and entertainment sector. Reports of the major players in the media and entertainment sectors illustrate that these changes in consumer behavior represent the beginning of a structural shift for media companies, as evidenced by the increase in investment in digital video production, licensing, and streaming infrastructure (FICCI & EY, 2024).

Advertisers' spending habits reflect the magnitude of the economic implications of these changes in consumer behavior. Since much of the audience's attention is now focused on digital platforms, advertisers are adjusting their budgets accordingly. Estimates based on financial ratings analysis indicate that digital media currently constitutes approximately 46% of India's total advertising expenditures, highlighting the extent of this structural shift (CRISIL Ratings, 2025). Furthermore, business media coverage confirms the exponential growth in digital advertising within the national ₹1 lakh crore advertisement market (The Economic Times, 2025). Studies projecting future growth patterns predict that digital advertising will be the most rapidly growing segment of India's marketing communications industry because of its ability to utilize data-driven targeting (Dentsu

International & exchange4media, 2024). At the structural level, consulting and policy reports point out the emergence of platform intermediaries, content aggregators, and creative digital industries as primary drivers of transformation in the media sector (KPMG India, 2025; Press Information Bureau, 2026). Collectively, these findings illustrate how consumer behavior is restructuring both the economic and institutional framework of India's media environment.

Research Methodology

Research Question

How does the transformation in media consumption of the Consumer in India impact the credibility, usage, and sustainability of Conventional media?

Research Aim

The research aim is to analyze the impact of consumer behavior on conventional media, mainly in the digital platform, which is rising in India

Research Method

Data Collection

This study is conducted on primary data. The study is concerned with the effects of changes in consumer behavior on the traditional media landscape in India. The main instrument for collecting data for this study is a structured questionnaire. Structured questionnaires are generally used to collect systematic and consistent data on the perceptions of, and media use behaviors of, respondents. To collect data systematically and consistently, the questionnaire included closed-ended questions to measure important behavioral indicators (i.e., how often do you consume conventional media? How many hours per week do you spend on each medium? Which media types have higher credibility? Do advertisements affect your media consumption? etc.). In addition to the above-mentioned behavioral indicators, the questionnaire included demographic questions to assess differences in media use behaviors among respondents who differ by age, sex, and occupation.

The questionnaire was delivered to respondents electronically, and the data that was collected for this study was also made using a structured questionnaire prepared through online, and was given to the respondents by sharing them on WhatsApp, and other social media platform.

This delivery method allowed greater accessibility and a larger number of respondents to be reached than would be possible if questionnaires were mailed or hand-delivered. Respondents who were likely to engage in media use behaviors were identified through email messages, instant messaging, and social networking sites. Convenience sampling was employed when selecting respondents for this study because respondents who were readily available to respond during the study period were selected. The respondents represented a wide variety of demographics and professions (e.g., students, working professionals, self-employed). Before collecting data, informed consent was obtained from all respondents, and the anonymity of their responses was maintained to maintain ethical research procedures.

Data Analysis

The data collected were thoroughly processed and analyzed by use of several quantitative analytic methods. At first, all answers were reviewed in order to identify and exclude any that had been left blank or that included contradictions, thus validating the quality of the data set. All valid answers were then coded and organized in a table format using a computer-based spreadsheet program to make the organization of the information and the structure of the analysis easier. The descriptive statistics (frequency distributions and percent analyses) were then applied to analyze the pattern of media consumption, preferences of platforms, and perceptions toward traditional and digital media of the audiences.

Further to this, an interpretation of the analytical data was undertaken using a comparative assessment of usage trends for both traditional and digital media. Additionally, cross-tabulations were used to evaluate the relationship between various demographic factors and the media consumption behaviors of the participants. The findings were displayed in a clear and understandable manner using tables, diagrams, and graphical displays. The use of this systematic analytical method allowed the study to determine significant changes in behavior; analyze the implications of these changes for the sustainability of traditional media; and link the results to the objectives and questions of the study.

Table 1

Demographic Profile of Respondents (N=132)

Variable	Category	Percentage	Number of Respondents
Age Group	18-25 Years	29%	38
	26-35 Years	33%	44
	36-50 Years	23%	30
	50 Years Above	15%	20
Gender	Male	55%	73
	Female	45%	59

Table 2

Primary Media Consumption Platform

Platform	Percentage	Number of Respondents
Social Media Platforms	38%	50
OTT/Streaming Platforms	24%	32
Television (Conventional)	16%	21
Online News Websites	14%	18
Print Newspapers	8%	11

Table 3

Time Spent on Media Consumption**A. Conventional Media**

Time Spent	Percentage	Number of Respondents
Less than 1 hour	41%	54
1-2 hours	32%	42
2-3 hours	17%	22
More than 3 hours	10%	14

B. Digital Media

Time Spent	Percentage	Number of Respondents
Less than 1 hour	12 %	16
1-2 hours	26%	34
2-3 hours	38%	50
More than 3 hours	24%	32

Table 5

Perception of Media Credibility**A. Conventional Media**

Credibility Level	Percentage	Number of Respondents
Very Low	5%	7
Low	13%	17
Moderate	31%	41
High	34%	45
Very High	17%	22

B. Digital Media

Credibility Level	Percentage	Number of Respondents
Very Low	14%	18
Low	26%	34
Moderate	29%	38
High	21%	28
Very High	10%	13

Table 6

Impact of Digital Media on Conventional Media Usage

Impact Level	Percentage	Number of Respondents
Strangely Decreased	14%	18
Decreased	26%	34
No Change	29%	38
Increase	21%	28
Strongly Increased	10%	13

Table 7

Perception of Survival of Conventional Media

Response	Percentage	Number of Respondents
Strangely Disagree	9%	12
Disagree	18%	24
Neutral	21%	28
Agree	32%	42
Strongly Agree	20%	26

Note: The sample size in total for this research is 132 which is the number of respondents, and it is given as N=132. On one hand, the percentages as given are a round figure of the number nearest, as to which there might be slight variations in totals.

Results and Discussions

The overall demographics of the study's media consumption behavior are represented primarily by a young and middle-aged population. Most of the respondents were aged 26-35 (33%), followed by those aged 18-25 (29%). This indicates a large segment of the sample is comprised of digitally engaged populations, which is important to note in studying the shift from traditional to digital media consumption.

There was a fairly even split between gender representations, with 55% males and 45% females, providing an opportunity to view different behaviors. The results concerning the primary media consumption platforms show a strong preference towards digital media. The most preferred platform was social media (38%), followed by over-the-top (OTT)/streaming services (24%). There was also an indication of a decline in consumption of traditional television, accounting for just 16% of primary consumption, and print newspapers representing a mere 8%. This distribution is indicative of a trend where consumers are migrating their attention from traditional broadcast and print forms to new interactive and on-demand digital platforms. Additionally, there is evidence that the factors driving these trends include convenience, personalization, and accessibility.

The time-use data provides further support for these media consumption behaviors. A total of 41% of the respondents reported consuming no more than one hour of traditional media each day, while only 10% reported consuming more than three hours of traditional media per day. Conversely, the amount of time spent on digital media was significantly greater, with 38% reporting spending two to four hours per day and 24% indicating they spend more than four hours per day on digital media. This represents a marked difference in the level of habitual consumption of traditional media versus digital media. In relation to the source of news, social media (again) leads as the most popular (36%), followed by online news portals (27%), television news (19%), print newspapers (12%), and radio (6%). The fact that social media is the most popular source of news is consistent with its role as a platform for real-time updates, sharing content, and being accessible via mobile devices. The lower usage of print-based sources of news is also indicative of structural challenges that may exist for traditional journalism institutions in attracting readership.

The analysis of credibility perceptions of media demonstrates a more complex perspective. Traditional media continues to enjoy relatively high trust levels, with 34% of respondents rating it as highly credible and 17% as very highly credible. The credibility of digital media is more fragmented, with 21% of respondents rating it as highly credible and 10% as very highly credible. In addition, a slightly larger number of respondents rate it as moderately to lowly credible. This

illustrates that while consumers are using digital media more frequently, traditional media enjoys institutional trust and authority advantages.

The assessment of the perceived effects of digital media on traditional media usage supports the idea of the behavioral disruption caused by digital media. Of the respondents, 65% reported that their use of traditional media had either decreased or strongly decreased due to the availability of digital media. In contrast, only 17% of respondents indicated that their use of traditional media had increased. Overall, these findings support the notion that digital adoption is having a direct effect on the level of engagement with traditional media.

Finally, respondents' views on whether conventional media would be able to survive in the long-term in the face of digital media suggest a cautiously optimistic view. While 50% of respondents agreed or strongly agreed that conventional media would continue to survive into the digital era, 27% disagreed. Thus, it appears that the vast majority of respondents see a potential for coexistence between traditional media and digital media, but perhaps with traditional media continuing to evolve and integrate elements of both. Overall, the findings present a clear picture of a behavioral shift to digital media consumption and away from conventional platforms. At the same time, perceptions of credibility and expectations about the ability of traditional media to survive in the long-term suggest that traditional media still holds some institutional significance within India's evolving hybrid media environment.

Conclusions

1. According to the analysis, the research identifies a major change in how Indian consumers are consuming digital media. Most of the participants have chosen to use social media and OTT service because they like that these options allow for convenience, easy access and personalized content, while at the same time there is less interest from them in traditional media options.
2. Although the use of all forms of traditional media has decreased since 2000, the data clearly shows that many audience segments have a greater level of trust for their news and other credible content from TV, Radio and Print than they do from digital platforms.
3. Although digital media is used to an extent greater than traditional media; the findings of this study suggest that both forms of media are developing as one type of medium, and therefore will continue to evolve in conjunction with one another. As such, there will be a growing need for all members of the media community to embrace the new hybrid media environment by integrating their traditional methods into digital ways, or vice versa.

Recommendations

1. Conventional media outlets need to make themselves better fit for the modern digital age. They can do this by using different forms of technology such as on-line platforms, smart phone apps, or integrating their brand into social media sites. If they do so, conventional media outlets will be able to grow their audience base and compete head-to-head with new media outlets that are built upon digital technologies.
2. To maintain a competitive advantage in today's digital age, media organizations need to develop credible content through the use of accurate, transparent reporting methods that incorporate ethical journalism principles. In light of the fact that traditional media is seen as more trustworthy

than most other forms of media, media outlets could leverage their strength and credibility to build trust back with audiences.

3. Media companies also will have to adapt and evolve by using hybrid business models that create new ways of generating revenue from both traditional sources (advertising, subscription) and newer digital-based platforms (online advertising, subscriptions, and sponsored content), which are needed for long-term viability and success.
4. As media usage trends continue to shift toward more “on demand”, and younger generations become increasingly accustomed to accessing information via social networks, mobile devices, etc., media companies must engage in greater efforts to interact with their audience base. Creating an experience for the user – whether it is through interactive or on-demand content; or delivering customized, personalized messages – will be key to drawing young users to a particular media outlet.
5. In addition, investment in innovative technologies, such as data analytics tools and artificial intelligence, will allow media companies to better understand how consumers want to receive information about them and provide that information in a way that is efficient and accessible.
6. Lastly, policymakers and regulatory agencies should foster the evolution of traditional media into the digital landscape by developing regulations and policy frameworks that encourage innovation and protect fairness among competing entities.

Research Limitation

The research has some limitations that need to be taken into consideration when evaluating the results. First, this research is limited in terms of its sample size, as it was selected using convenience sampling; therefore, the generalizability of the results may be limited to the larger Indian population. Second, this research is based upon the respondents' self-reported survey data; therefore, the respondents' self-reporting may have been influenced by the respondents' biases, perception gaps, or the inaccurate recollection of their media usage behaviors. Third, the research examines mainly traditional media formats (i.e., print, television, and radio) without providing an examination of regional variations in media usage or examining how vernacular media differ from each other in terms of consumption patterns. Fourth, because this is a cross-sectional research study, it only measures consumer behavior at one point in time; it does not provide for the measurement of changes in consumer behavior over time resulting from future technological development. Although there are several limitations to this research, it is still able to provide insight into how consumers' behavior is changing in relation to traditional media use in India.

References

- Agrawal, A., & Ahuja, N. (2025, December). Case study report: Decline of traditional TV media in India due to the rise of OTT platforms. *International Journal for Research in Applied Science & Engineering Technology (IJRASET)*, 13(12). <https://doi.org/10.22214/ijraset.2025.76685>
- Aneez, Z., Chattapadhyay, S., Parthasarathi, V., & Nielsen, R. K. (2016, December). Indian newspapers' digital transition: Dainik Jagran, Hindustan Times, and Malayala Manorama. Reuters Institute for the Study of Journalism, University of Oxford. <https://reutersinstitute.politics.ox.ac.uk/sites/default/files/2017-04/Indian%20Newspapers%27%20Digital%20Transition.pdf>
- Ayesha, N. (2024, January). The impact of social media on consumer behaviour: Trends, challenges, and opportunities. *ShodhKosh: Journal of Visual and Performing Arts*, 5(1), 1–10. <https://doi.org/10.29121/shodhkosh.v5.i1.2024.1696>

- CRISIL Ratings. (2025, August 04). Digital media scooped ~46% of India's Rs 1 lakh crore+ ad spend. CRISIL Ltd. <https://www.crisilratings.com/content/crisilcom/en/home/newsroom/press-releases/2025/08/digital-media-scooped-46percent-of-indias-rs-1-lakh-crore-plus-ad-spend.html>
- David, S. (2025, October 28). The big read: What comes after print in India? Print plus programmatic, perhaps. The Current. <https://www.thecurrent.com/marketing-strategy-what-comes-after-news-india-print-programmatic>
- Deloitte. (2025, March 25). 2025 digital media trends. Deloitte Insights. <https://www.deloitte.com/us/en/insights/industry/technology/digital-media-trends-consumption-habits-survey/2025.html>
- Dentsu International, & exchange4media. (2024). Digital advertising report India 2024. Dentsu International. <https://assets-eu-01.kc-usercontent.com/44bc0180-e274-014f-6b99-e5fc8ab7f759/3b33dd16-c7fb-4b7f-a315-ca26f4a16723/Dentsu-e4m-Digital-Advertising-Report-2024.pdf>
- Drishti IAS. (2023). Shifting trends in online news consumption in India. <https://www.drishtias.com/daily-updates/daily-news-analysis/shifting-trends-in-online-news-consumption>
- Federation of Indian Chambers of Commerce & Industry (FICCI), & Ernst & Young (EY). (2024). Shape the future: Indian media and entertainment is scripting a new story. EY-FICCI. <https://www.ey.com/content/dam/ey-unified-site/ey-com/en-in/insights/media-entertainment/images/ey-shape-the-future-indian-media-and-entertainment-is-scripting-a-new-story.pdf>
- Kaur, K. (2021, August). The impact of social media on consumer buying behavior. International Journal of Creative Research Thoughts (IJCRT), 9(8), 325–328. ISSN: 2320-2882. <https://ijcrt.org/papers/IJCRT2108486.pdf>
- KPMG India. (2025). Evolving third-party landscape in India's media and entertainment industry. KPMG International. <https://assets.kpmg.com/content/dam/kpmgsites/in/pdf/2025/03/evolving-third-party-landscape-in-indias-media-and-entertainment-industry.pdf>
- Newman, N., Ross Arguedas, A., Robertson, C. T., Nielsen, R. K., & Fletcher, R. (2025). Digital news report 2025. Reuters Institute for the Study of Journalism, University of Oxford. [https://reutersinstitute.politics.ox.ac.uk/sites/default/files/2025-06/Digital News-Report 2025.pdf](https://reutersinstitute.politics.ox.ac.uk/sites/default/files/2025-06/Digital%20News-Report%2025.pdf)
- Press Information Bureau. (2026, February 16). Creative industries as growth engines: Media, entertainment, AVGC, gaming and the Orange Economy. Government of India. <https://www.pib.gov.in/PressReleasePage.aspx?PRID=2228572&reg=3&lang=2>
- PricewaterhouseCoopers (PwC). (2023). Global entertainment and media outlook 2023–2027: India perspective. PwC India. <https://www.pwc.in/assets/pdfs/industries/entertainment-and-media/global-entertainment-and-media-outlook-2023-2027-india-perspective-v1.pdf>
- The Economic Times. (2025, August 04). Digital media claims 46% of India's Rs 1 lakh crore ad market: Crisil. The Economic Times. <https://economictimes.indiatimes.com/industry/services/advertising/digital-media-claims-46-of-indias-rs-1-lakh-crore-ad-market-crisil/articleshow/123091238.cms?from=mdr>
- WPP plc. (2025). Annual report 2024: Strategic report. WPP plc. https://www.wpp.com/en/-/media/project/wpp/files/investors/2025/annual-report/wpp_annual_report_2024_strategic-report.pdf

IZKLAIDES TROKŠŅA IETEKME UZ DZĪVNIEKIEM UN CILVĒKA PAMATTIESĪBU AIZSKĀRUMS

THE IMPACT OF ENTERTAINMENT NOISE ON ANIMALS AND THE INFRINGEMENT OF FUNDAMENTAL HUMAN RIGHTS

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ANOTĀCIJA

Rakstā analizēta trokšņa piesārņojuma, īpaši impulsīvā trokšņa (salūta), kas raksturojas ar augstu skaņas intensitāti un neprognozējamību, tā ietekme uz dzīvniekiem un cilvēku, kas ir būtisks pamattiesību aizskārums, kas tiesiskā valstī nav pieļaujams.

Trokšņa piesārņojums ir viens no nozīmīgākajiem antropogēnajiem vides faktoriem mūsdienu sabiedrībā, tomēr dzīvnieku labturības aspektā tā regulējums un praktiskā aizsardzība joprojām ir nepietiekama. Balstoties uz starptautiskiem empīriskiem pētījumiem, konstatēts, ka impulsīvais troksnis izraisa būtiskas fizioloģiskas un uzvedības reakcijas suņiem un kaķiem, tostarp ievērojamu kortizola līmeņa paaugstināšanos, sirdsdarbības paātrināšanos, paniku, slēpšanos un izvairīšanās uzvedību. Impulsīvais troksnis rada izteiktāku stresa reakciju nekā pastāvīgs fona troksnis un var veicināt ilgtermiņa trauksmes un fobiju attīstību.

Rakstā vienlaikus izvērtēta tiesību kolīzija starp komersantu ekonomiskajām interesēm izklaides jomā un iedzīvotāju pamattiesībām uz privāto dzīvi, miegu, veselību un labvēlīgu vidi, analizējot valsts pozitīvos pienākumus un samērīguma principa ievērošanu. Izmantojot konkrētu ilgstoša izklaides trokšņa gadījumu, izvērtēta Latvijas normatīvā regulējuma piemērošanas prakse, ņemot vērā Satversmes tiesas un Eiropas Cilvēktiesību tiesas judikatūru, kā arī salīdzinot atziņas no Vācijas un Austrijas. Secināts, ka galvenā problēma nav tiesību normu trūkums, bet to nepietiekama piemērošana. Ekonomiskās intereses nevar attaisnot sistemātisku pamattiesību ierobežošanu.

Pētījuma mērķis: Aktualizēt sabiedrības domu par problēmu, kas pastāv un būtiski ietekmē dzīves kvalitāti, tomēr netiek atbilstoši apzināta un risināta. Aktualizēt nepieciešamību regulatīvai pieejai dzīvnieku labturības aizsardzībai.

Pētījumā izmantotās metodes: pētnieciskās metodes – analīzes, indukcijas un dedukcijas, dogmātiskā, loģiski konstruktīvā; tiesību normu interpretācijas metodes – gramatiskā, sistēmiskā, teleoloģiskā un vēsturiskā.

Atslēgvārdi: izklaides troksnis, dzīvnieku labturība, pamattiesības

Abstract

The article analyzes the impact of noise pollution—particularly impulsive noise (fireworks), characterized by high sound intensity and unpredictability—on animals and humans, emphasizing that such impact constitutes a significant infringement of fundamental rights that is unacceptable in a state governed by the rule of law.

Noise pollution is one of the most significant anthropogenic environmental factors in modern society; however, from the perspective of animal welfare, its regulation and practical protection remain insufficient. Based on international empirical studies, it has been established that impulsive noise causes substantial physiological and behavioral reactions in dogs and cats, including a significant increase in cortisol levels, accelerated heart rate, panic, hiding, and avoidance behavior. Impulsive noise produces a more pronounced stress response than continuous background noise and may contribute to the development of long-term anxiety and phobias.

The article simultaneously evaluates the conflict of rights between the economic interests of commercial operators in the entertainment sector and residents' fundamental rights to private life, sleep, health, and a favorable environment, analyzing the state's positive obligations and compliance with the principle of proportionality. Using a specific case of prolonged entertainment-related noise, the practice of applying Latvian regulatory frameworks is assessed, taking into account the case law of the Constitutional Court of Latvia and the European Court of Human Rights, as well as comparative insights from Germany and Austria. It is concluded that the main problem lies not in the absence of legal norms, but in their insufficient application. Economic interests cannot justify the systematic restriction of fundamental rights.

Aim of the study: To raise public awareness of an existing problem that significantly affects quality of life yet is not adequately recognized or addressed. To emphasize the necessity of a regulatory approach to the protection of animal welfare.

Methods used in the study: research methods – analysis, induction and deduction, dogmatic, logically constructive; methods of interpretation of legal norms – grammatical, systemic, teleological and historical.

Keywords: entertainment noise, animal welfare, fundamental rights

Ievads

Pēdējo gadu laikā Latvijā arvien biežāk aktualizējas konflikti starp izklaides pakalpojumu sniedzējiem un dzīvojamo teritoriju iedzīvotājiem. Īpaši problemātiski šie konflikti kļūst gadījumos, kad izklaides trokšnis ir intensīvs, sistemātisks un notiek nakts laikā, būtiski ietekmējot personas veselību un ikdienas dzīvi, tai skaitā arī dzīvnieku labturību.

Pamattiesību ietvars

Šādas situācijas rada fundamentālu tiesību kolīziju starp, no vienas puses, *Satversmes* 105. pantā aizsargātajām tiesībām uz īpašuma izmantošanu un uzņēmējdarbības brīvību, bet, no otras puses, *Satversmes* 96. pantā nostiprinātajām tiesībām uz privātās dzīves un mājokļa neaizskaramību, kā arī

Satversmes 111. un 115. pantā ietverto valsts pienākumu aizsargāt cilvēka veselību un nodrošināt tiesības uz labvēlīgu vidi.

Satversmes tiesa 2017. gada 19. decembra spriedumā lietā Nr. 2017-02-03 ir konstatējusi, ka "troksnis ir atzīts par nozīmīgu cilvēka dzīves kvalitāti un veselību ietekmējošu faktoru" (Satversmes tiesas spriedums lietā Nr. 2017-02-03, 19.2. punkts). Tiesa uzsvēra, ka troksnis, izplatoties apkārtējā vidē, var nodarīt kaitējumu cilvēka veselībai un ir uzskatāms par vides piesārņojumu.

Eiropas Cilvēktiesību tiesa konsekventi atzinusi, ka pārmērīgs vides troksnis var veidot Konvencijas 8. panta pārkāpumu, pat ja nav tiešu fizisku kaitējumu pierādījumu.

Lietā *López Ostra pret Spāniju* (1994. gada 9. decembris, pieteikums Nr. 16798/90) tiesa norādīja, ka būtiski vides traucējumi, tostarp troksnis, var liegt personai baudīt mājokli un tādējādi pārkāpt Konvencijas 8. pantu (ECT, *López Ostra v. Spain*, 1994, § 51).

Līdzīga pieeja nostiprināta spriedumā *Fadeyeva pret Krieviju* (2005. gada 9. jūnijs, pieteikums Nr. 55723/00), kur ECT uzsvēra valsts pienākumu nodrošināt taisnīgu līdzsvaru starp ekonomiskajām interesēm un indivīda tiesībām uz privāto dzīvi un veselību. Tiesa atzina, ka ilgstoša pakļaušana piesārņojumam radīja fizisku un garīgu kaitējumu (ECT, *Fadeyeva v. Russia*, 2005, § 88–89).

Būtiski uzsvērt, ka troksnis nav tikai "neērtība" vai diskomforts.

Ilgstošs nakts troksnis:

- traucē miegu;
- ietekmē veselību;
- liedz pilnvērtīgi izmantot mājokli.

ECT atziņa ir skaidra: būtiski vides traucējumi var pārkāpt Konvencijas 8. pantu. Tas ir cilvēktiesību aizskārums, ja troksnis ir intensīvs un ilgstošs.

Komercdarbības brīvības robežas

Satversmes 105. pants aizsargā īpašuma tiesības un uzņēmējdarbības brīvību, tomēr šī aizsardzība nav absolūta. 105. panta otrais teikums skaidri noteic: "Īpašumu nedrīkst izmantot pretēji sabiedrības interesēm".

Attiecībā uz izklaides pakalpojumiem būtiski uzsvērt, ka komercdarbība nevar tikt īstenota veidā, kas sistemātiski aizskar citu personu tiesības uz veselību un naktsmieru. Viesu nama vai izklaides vietas statuss pats par sevi nerada tiesisku pamatu atkāpties no vispārsaistošām normām par sabiedrisko kārtību un trokšņa ierobežojumiem.

Tēze ir skaidra: komercdarbība nevar balstīties uz citu personu pamattiesību sistemātisku ierobežošanu.

Valsts, lai lobētu izklaides komersantu intereses, nedrīkst ierobežot pārējo iedzīvotāju cilvēktiesības. Iedzīvotājiem nevajadzētu ieguldīt medikamentos gan sev, gan dzīvniekiem, kuri cieš no minēto komersantu visatļautības. Tiek radīti šķēršļi cilvēkiem iztikas gūšanai, jo neizgulējies, nemītīgā stresā esošs cilvēks nav darba spējīgs. Tiek grauta iedzīvotāju veselība.

Samērīguma princips

Tiesību kolīzijas risināšanai piemērojams samērīguma princips, kas Satversmes tiesas judikatūrā ietver trīs elementus:

- 1) ierobežojuma piemērotību leģitīmā mērķa sasniegšanai;
- 2) nepieciešamību;
- 3) samērīgumu šaurā nozīmē.

Satversmes tiesa lietā Nr. 2017-02-03 norādīja, ka, nosakot pieļaujamās trokšņa robežas, ir taisnīgi jālīdzsvaro iesaistīto pušu intereses (Satversmes tiesas spriedums lietā Nr. 2017-02-03, 22. punkts).

Sistemātiska trokšņošana naktīs, tostarp zemo frekvenču vibrāciju radīts troksnis un pēkšņi akustiski triecieni, piemēram, salūts, nevar tikt uzskatīti par nepieciešamu vai samērīgu līdzekli komercdarbības veikšanai.

Nakts troksnis, basi un salūts:

- nav nepieciešami uzņēmējdarbības veikšanai;
- rada disproporcionālu kaitējumu veselībai.

Ekonomiskais labums šādos gadījumos acīmredzami neatsver indivīda tiesību uz miegu, veselību un dzīvību aizskārumu. Ekonomiskais labums nedrīkst būt augstāks par tiesībām uz miegu un veselību.

Zemo frekvenču trokšņa specifika

Īpaši problemātisks ir zemo frekvenču troksnis (bass), kam piemīt vairākas bīstamas īpašības:

- uztverams pat tad, ja skaņa nav skaidri dzirdama;
- izplatās caur ēku konstrukcijām un sienām;
- grūti izolējams ar standarta skaņas izolācijas metodēm;
- atstāj spēcīgu ietekmi uz nervu sistēmu;
- Latvijā – nepietiekami regulēts un kontrolēts;
- praksē grūti pierādāms, bet ļoti kaitīgs.

Trokšņa izraisīts stress aktivizē hipotalāma–hipofīzes–virsnieru asi, palielinot kortizola izdalīšanos. Atkārtota iedarbība var radīt hronisku trauksmi, imūnsistēmas pavājināšanos un uzvedības traucējumus. Impulsīvs troksnis tiek uztverts kā potenciāls drauds, aktivizējot "cīņas vai bēgšanas" reakciju, un rada augstāku stresa reakciju nekā pastāvīgs fona troksnis.

Valsts pozitīvie pienākumi

ECT ir nostiprinājusi principu, ka valstij ir pozitīvs pienākums aizsargāt personas pamattiesības arī horizontālajās attiecībās.

Spriedumā *Öneryıldız pret Turciju* (Lielā palāta, 2004. gada 30. novembris, pieteikums Nr. 48939/99) tiesa uzsvēra, ka saskaņā ar Konvencijas 2. pantu valstij ir pozitīvs pienākums veikt praktiskus pasākumus, lai aizsargātu personas dzīvību un īpašumu no paredzamiem riskiem. Valstij jānodrošina efektīvs regulējums un kontrole (ECT, *Öneryıldız v. Turkey*, 2004, § 89–90).

Spriedumā *Opuz pret Turciju* (2009. gada 9. jūnijs, pieteikums Nr. 33401/02) tiesa norādīja, ka valsts nevar palikt pasīva, ja pastāv reāls un paredzams pamattiesību apdraudējums. Šis princips ir tieši attiecināms arī uz ilgstošu un dokumentētu trokšņa radītu kaitējumu (ECT, *Opuz v. Turkey*, 2009, § 128–130).

Tiesībsarga 2024. gada 17. jūnija atzinumā pārbaudes lietā Nr. 2022-56-22B skaidri norādīts: "No Satversmes 96., 111. un 115. panta izrietošais valsts pozitīvais pienākums paredz bez kavēšanās

novērst aizskarto pamattiesību pārkāpumu, t.sk. pilnveidojot esošo nepilnīgo tiesisko regulējumu, iekams nav izstrādāts un pieņemts iecerētais jaunais tiesiskais regulējums." (Tiesībsarga atzinums, 2024, Nr. 2022-56-22B)

Tiesībsargs arī uzsvēra: "Ne regulējuma trūkums, ne uzsāktais darbs pie jauna tiesiskā regulējuma izstrādes nav un nevar būt attaisnojums pamattiesību pārkāpuma esamībai un turpināšanai, it īpaši nezināmu laika posmu".

Latvijā šo pienākumu konkretizē *Administratīvo sodu likuma* 11. pants, kas paredz atbildību par sabiedriskās kārtības traucēšanu, tostarp pārmērīgu trokšņošanu neatkarīgi no pārkāpēja juridiskā statusa, – pietiekams normatīvais pamats pastāv, bet problēma ir tā piemērošanā.

Trokšņa ietekme uz dzīvnieku labturību.

Dzīvnieki ir jutīgi pret skaņām, un uguņošanas radītie trokšņi bieži vien ir pārāk skaļi un biedējoši, kā arī rada uzvedības traucējumus.

Impulsīvais troksnis, piemēram, salūts, aktivizē "cīņas vai bēgšanas" reakciju.

Empīriskie pētījumi par suņiem: pētījumos konstatēts, ka līdz pat 45 % suņu izrāda izteiktas bailes no salūta.

Fizioloģiskie mērījumi liecina par kortizola līmeņa pieaugumu vairāk nekā divas reizes salīdzinājumā ar bāzes līmeni. Uzvedības reakcijas ietver trīci, slēpšanos, mēģinājumus izbēgt un destruktīvu uzvedību. Ilgtermiņā atkārtota salūta iedarbība var veicināt trokšņa fobijas attīstību. Bez uzvedības terapijas šāds stāvoklis mēdz progresēt, palielinot hroniskas trauksmes risku.

Empīriskie pētījumi par kaķiem: kaķiem biežāk novērojama slēpšanās un izvairīšanās uzvedība. Īpašnieku aptaujas liecina, ka aptuveni 30 % kaķu reaģē ar izteiktu stresu salūta laikā. Novērots arī barības atteikums un izmaiņas urinācijas paradumos.

Galvenie secinājumi:

- salūts izraisa būtisku fizioloģisku stresu dzīvām būtnēm, kā cilvēkiem, tā arī dzīvniekiem;
- impulsīvais troksnis rada lielāku kaitējumu nekā pastāvīgs fona troksnis;
- nepieciešama regulatīva un preventīva pieeja dzīvnieku labturības aizsardzībai.

Veterinārārstu viedoklis ir, ka pieradināt pie salūta trokšņa dzīvnieku ir ļoti grūti. Ja parādās kāda no trauksmes pazīmēm, tad nevajag neko gaidīt, jo šīm uzvedības problēmām ir tieksme tikai apaugt kā sniega bumbai, nevis pāriet pašām par sevi.

Risinājumi ir gan medikamentu lietošana, gan darbs ar zoopsihologiem, bet tas prasa investīcijas – gan finansiālas, gan laika, gan resursu ziņā.

Latvijas prakses problēmas

1. Normas pastāv, bet netiek piemērotas.
2. Policijas un pašvaldību pasivitāte.
3. Komerccarbības interešu pārvērtēšana.
4. Iedzīvotāju pamattiesību relativizēšana.
5. Valsts institūciju bezdarbība vai formāla pieeja trokšņa pārkāpumiem faktiski nozīmē pamattiesību aizsardzības relativizēšanu.

Salīdzinošā analīze: Vācija un Austrija

Vācijā un Austrijā pastāv būtiski atšķirīga pieeja.

Vācijas *Bundes-Immissionsschutzgesetz* paredz stingru nakts klusuma režīmu, un zemo frekvenču troksnis tiek vērtēts atsevišķi no standarta dB(A) mērījumiem.

Austrijā atbildība tiek uzlikta organizatoram un komersantam, nevis viesiem.

Vācija

Vācijas galvenais tiesību akts trokšņa jomā ir *Bundes-Immissionsschutzgesetz* (BImSchG). Likums regulē ne tikai rūpniecisko, bet arī sadzīves un izklaides radīto troksni.

Nakts klusuma režīms:

- darbdienās un svētdienās: 22:00–06:00;
- piektdienās/sestdienās: ļoti ierobežotas atkāpes, kas prasa īpašu atļauju;
- svētdienas un svētku dienas bauda pastiprinātu aizsardzību.

Zemo frekvenču trokšņa regulējums: Vācijā zemo frekvenču troksnis (bass, vibrācijas) tiek vērtēts atsevišķi no standarta dB(A) mērījumiem. DIN 45680 standarts nosaka specifiskas prasības zemo frekvenču trokšņa mērīšanai un novērtēšanai. Šis troksnis tiek uzskatīts par īpaši kaitīgu veselībai, jo:

- izplatās caur ēku konstrukcijām;
- grūti izolējams ar standarta skaņas izolācijas metodēm;
- rada hronisku stresu un miega traucējumus.

Atbildības modelis: troksnis nav pieļaujams tikai tāpēc, ka tas ir "kultūras vai izklaides pasākums". Pasākumu organizatoriem jānodrošina atbilstība trokšņa normām neatkarīgi no pasākuma rakstura.

Austrija

Augšāustrijas konsolidētais valsts likums (*Oberösterreichisches Polizeistrafgesetz*) detalizēti regulē sabiedriskās kārtības un klusuma prasības.

Nakts klusuma režīms:

- stingrs klusuma režīms naktīs (parasti 22:00–06:00);
- īpaši pastiprināta aizsardzība dzīvojamās zonās;
- atkāpes prasa pamatotu atļauju un kompensējošus pasākumus.

Atbildības modelis: būtiska atšķirība no Latvijas prakses – atbildība tiek uzlikta organizatoram vai komersantam, nevis atsevišķiem viesiem vai apmeklētājiem. Tas nozīmē:

- komersants ir atbildīgs par viesu uzvedību;
- nav iespējams atbrīvoties no atbildības, norādot uz "trešo personu" darbībām.

Preventīva kontrole: preventīva policijas iejaukšanās ir norma, nevis izņēmums. Policija aktīvi uzrauga potenciālos trokšņa avotus un iejaucas, pirms tiek nodarīts būtisks kaitējums. Šī pieeja balstās uz izpratni, ka pamattiesību aizsardzībai jābūt proaktīvai.

Salīdzinošā tabula

Kritērijs	Vācija/Austrija	Latvija
Zemo frekvenču troksnis	Atsevišķa regulēšana un vērtēšana (DIN 45680)	Nav atsevišķas regulēšanas
Atbildības modelis	Komersanta/organizatora objektīvā atbildība	Neskaidrs, bieži nepiemērots
Kontroles veids	Preventīva	Reaktīva (<i>post factum</i>)
Nakts klusums	Stingri definēts un uzraudzīts	Formāli pastāv, praktiski bieži neievērots
Pamattiesību prioritāte	Skaidri nostiprina	Tendence prioritizēt komercdarbību

Galvenā atziņa: Latvijā dominē *post factum* reakcija (ja vispār notiek), kamēr Vācijā un Austrijā – preventīva pamattiesību aizsardzība ar skaidru izpratni, ka ekonomiskās intereses nevar attaisnot sistemātiskus pamattiesību pārkāpumus.

Secinājumi

Analizētais atklāj nevis normatīvā regulējuma trūkumu, bet gan institucionālo pasivitāti un nepietiekamu piemērošanu praksē.

Valsts institūciju bezdarbība faktiski nozīmē pamattiesību aizsardzības relativizēšanu un komercdarbības interešu nepamatotu prioritizēšanu.

2025. gada 26. maijā tiesībsargs iesniedza pieteikumu Satversmes tiesā, un 2025. gada 17. jūnijā tika ierosināta lieta Nr. 2025-18-03 par izklaides trokšņa novērtēšanas un pārvaldības regulējumu (Satversmes tiesas lēmums par lietas ierosināšanu, 2025).

Nepieciešami konkrēti risinājumi:

- zemo frekvenču trokšņa skaidra aizliegšana/regulēšana;
- pirotehnikas lietošanas ierobežojumi;
- komersanta objektīvā atbildība;
- aktīva policijas un pašvaldību kontrole;
- preventīva, nevis reaktīva pieeja.

Noslēgumā vēlos uzsvērt:

- troksnis naktī nav pieļaujams kā “biznesa blakus efekts”;
- pamattiesības nav “blakus izmaksas” ekonomikai;
- tiesiska valsts nevar pieļaut situāciju, kurā personas pamattiesības uz miegu, veselību un mājokļa neaizskaramību tiek uzskatītas par mazāk nozīmīgām nekā komersanta peļņas intereses;
- tiesiska valsts sākas ar cilvēka cieņu.

References

Normatīvie akti

Latvijas Republikas Satversme:

- 96. pants – tiesības uz privātās dzīves un mājokļa neaizskaramību;
- 105. pants – tiesības uz īpašumu;
- 111. pants – valsts pienākums aizsargāt cilvēka veselību;
- 115. pants – tiesības uz labvēlīgu vidi

Administratīvo sodu likums, 11. pants – atbildība par sabiedriskās kārtības traucēšanu

Eiropas Cilvēktiesību konvencija:

- 2. pants – tiesības uz dzīvību;
- 8. pants – tiesības uz privātās un ģimenes dzīves neaizskaramību

Bundes-Immissionsschutzgesetz (BImSchG) – likums par aizsardzību pret gaisa piesārņojuma, trokšņa, vibrācijas un līdzīgu procesu radīto kaitīgo ietekmi uz vidi

DIN 45680 – Zemfrekvences trokšņa emisijas mērīšanas un novērtēšanas standarts

Oberösterreichisches Polizeistrafgesetz (Oö. PolStG) – Augšāustrijas konsolidētais valsts likums

Satversmes tiesas judikatūra

Satversmes tiesas 2017. gada 19. decembra spriedums lietā Nr. 2017-02-03 "Par Ministru kabineta 2014. gada 7. janvāra noteikumu Nr. 16 'Trokšņa novērtēšanas un pārvaldības kārtība' 2. pielikuma 2. punkta atbilstību Latvijas Republikas Satversmes 111. un 115. pantam", 19.2. un 22. punkts

Satversmes tiesas 2025. gada 17. jūnija lēmums par lietas Nr. 2025-18-03 ierosināšanu par izklaides trokšņa novērtēšanas un pārvaldības regulējumu

ECT judikatūra

López Ostra v. Spain, ECtHR, 9 December 1994, Application No. 16798/90, § 51 – būtiski vides traucējumi var liegt personai baudīt mājokli

Fadeyeva v. Russia, ECtHR, 9 June 2005, Application No. 55723/00, § 88–89 – valstij jānodrošina taisnīgs līdzsvars starp ekonomiskajām interesēm un indivīda tiesībām

Hatton and Others v. United Kingdom [GC], ECtHR, 8 July 2003, Application No. 36022/97 – lidmašīnu nakts troksnis un valsts rīcības brīvība

Öneryıldız v. Turkey [GC], ECtHR, 30 November 2004, Application No. 48939/99, § 89–90 – valsts pozitīvie pienākumi aizsargāt dzīvību

Opuz v. Turkey, ECtHR, 9 June 2009, Application No. 33401/02, § 128–130 – valsts nedrīkst palikt pasīva, ja pastāv paredzams apdraudējums

Tiesībsarga dokumenti

Tiesībsarga 2024. gada 17. jūnija atzinums pārbaudes lietā Nr. 2022-56-22B "Par izklaides trokšņa tiesisko regulējumu" – par valsts pozitīvajiem pienākumiem novērst pamattiesību pārkāpumu

Tiesībsarga 2025. gada 26. maija pieteikums Satversmes tiesai par izklaides trokšņa regulējumu

HYBRID QUANTUM-CLASSICAL ARCHITECTURE FOR RELIABILITY- CONSTRAINED STOCHASTIC ECONOMIC POLICY MODELING

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Abstract

The article examines the challenge of maintaining long-term economic policy stability under persistent stochastic shocks and structural change. Traditional macroeconomic optimization frameworks emphasize short- and medium-term objectives and often treat structural transformation as exogenous, limiting their capacity to assess sustainability over extended horizons. The article proposes a reliability-based stochastic framework. The economy is modeled as a high-dimensional, possibly nonlinear dynamic system with policy vectors as control variables and admissible stability domains defining acceptable states. Stability is defined as the probability that trajectories remain within this domain over a finite horizon, while robustness and resilience are characterized by bounded deviations and recovery times. Classical Monte Carlo simulation is used to estimate survival probabilities, showing that required paths grow inversely with exit probability and quadratically with desired precision. Quantum amplitude estimation reduces sampling complexity, offering a quadratic speedup. The results support integrating reliability modeling with hybrid quantum-classical computation for long-term policy design.

Keywords: stochastic process, reliability, Monte-Carlo simulation, quantum computing.

Introduction

Digital transformation of public administration has radically changed the ways economic policy is designed, implemented, and evaluated. Governments are increasingly using large-scale digital platforms to integrate administrative data, statistical systems, and analytical tools, enhancing capabilities for predictive analytics and decision support (OECD, 2020). Recent research shows that digital ecosystems reduce delays in information flows (Mergel et al., 2019; United Nations, 2024; United Nations Conference on Trade and Development, 2024). It might improve the accuracy of macro-models, which becomes a critical factor in forecasting and decision-making.

IT solutions involve combining large and heterogeneous datasets, advanced econometric models, simulation methods, and optimization algorithms. Such systems are applied in the analysis of tax, social, and budget policy, market regulation, and forecasting macroeconomic stability (Tesfatsion & Judd, 2006; Rust, 1996; Ljungqvist & Sargent, 2018), as well as decision analysis carried out by separate market agents.

Nevertheless, most existing systems remain focused primarily on instantaneous, short- and medium-term optimization. Policy parameters are traditionally evaluated based on current or near-term indicators, such as budget balance, inequality levels, or GDP growth rates, under the assumption of relative stability in structural factors. The impact of long-term structural changes is often treated as

an external influence or an “exogenous shock,” rather than as an internal characteristic of the model itself.

In reality, economic systems constantly undergo profound structural transformations: technological innovations reshape production chains and tax bases; demographic trends alter labor dynamics and pressure on social systems; institutional reforms and international agreements redefine regulatory frameworks; financial and geopolitical crises create persistent structural disruptions that are difficult to predict even with modern machine learning models.

When model assumptions gradually become outdated, a policy configuration that is optimal at time t_0 may lose effectiveness as real-world conditions drift away from the original assumptions (Leontyev & Ketners, 2023). This phenomenon can be described as structural degradation of policy effectiveness. By nature, it resembles processes studied in engineering reliability theory, where a system is subject to wear, environmental variability, and accumulating uncertainty, increasing the probability of failure (Bedford & Cooke, 2001; Rausand & Høyland, 2004). In the economic context, this manifests as rising risks of fiscal instability, breakdowns in structural balances, and declining institutional effectiveness.

Transferring reliability concepts from engineering disciplines to economic modeling provides a formal foundation for quantitatively assessing policy resilience over long planning horizons. In engineering, reliability is defined as the probability that a system maintains operation within acceptable parameters over a specified period of time (Rausand & Høyland, 2004). Similarly, the reliability of economic policy can be defined as the probability that target macroeconomic and fiscal indicators remain within predefined acceptable bounds, taking into account stochastic shocks and structural changes. In some cases, trade-offs between the considered criteria are unavoidable (Leontyev & Reshina, 2020).

Assessing reliability requires moving from static optimization to the analysis of stochastic system trajectories (Glasserman, 2003; Asmussen & Glynn, 2007; Cont, et al., 2010). Each policy configuration must be evaluated not only by the current value of the objective function, but also by the probability that the system remains within the stability region throughout the planning horizon. This demands numerous simulations and scenario modeling, significantly increasing computational complexity.

From the computational point of view, many such problems fall into the set of combinatorial optimization problems – a field of mathematical optimization concerned with selecting the best element from a finite, but typically very large, set of discrete alternatives. Its core idea is to model decision problems in which variables take on discrete values and the objective is to optimize a criterion (such as cost, profit, efficiency, or welfare), which is subject to structural constraints. A defining feature of many combinatorial problems is their computational complexity: the number of feasible solutions often grows exponentially with problem size, and a large class of such problems belongs to the category of NP-hard or NP-complete problems, for which no polynomial-time algorithms are known. As a result, exact methods become impractical for large instances, motivating the development of approximation algorithms, heuristics, metaheuristics, and decomposition techniques. Canonical examples include the traveling salesman problem, knapsack problem, network flow and matching problems, facility location, and scheduling. In economics, combinatorial optimization arises in auction design, market clearing, portfolio selection, supply chain configuration,

and public policy planning, where discrete policy choices, budget constraints, and network structures interact in ways that make exhaustive search infeasible.

The growth in computational burden stimulates research into new computing paradigms. In recent years, hybrid quantum-classical algorithms have been considered promising tools for accelerating stochastic forecasting and optimization tasks in high-dimensional spaces (Cerezo et al., 2021; Herman et al., 2022; Montanaro, 2015; Woerner & Egger, 2019). Particularly noteworthy is the Quantum Amplitude Estimation (QAE) algorithm, which provides quadratic speedup compared to classical Monte Carlo methods when estimating probabilistic characteristics—an especially important advantage for reliability analysis (Brassard et al., 2002). Such methods are already being applied in research on financial risk and complex stochastic models (Herman et al., 2022; Stamatopoulos et al., 2020). These advances motivate the central research question of this work: how to design an information architecture that integrates reliability-based modeling of economic policy with hybrid quantum-classical computing. Such an architecture should ensure scalability, reproducibility of computations, and compatibility with existing digital platforms in public administration. By combining reliability modeling, large-scale stochastic simulations, and quantum-accelerated probabilistic estimation methods, the proposed approach aims to extend the analytical horizon of decision-support systems—from short-term optimization to sustainable long-term forecasting.

The research problem addressed in this study is the lack of a formal probabilistic framework capable of evaluating economic policy not only in terms of expected outcomes but in terms of its reliability over extended horizons under persistent stochastic disturbances and regime shifts. The purpose of the study is to develop a stochastic reliability-based modeling approach that defines survival, robustness, and resilience of economic policy within a high-dimensional (possibly nonlinear) dynamic system, and to design a hybrid quantum-classical computational architecture capable of efficiently estimating stability probabilities. Methodologically, the research formulates economic dynamics as a stochastic difference system with admissible stability domains, employs Monte Carlo simulation to estimate survival probabilities and exit-time distributions, analyzes computational complexity for rare-event estimation, and evaluates the potential quadratic sampling advantage provided by quantum amplitude estimation.

Reliability as a stochastic process

A modern economic system can be represented as a high-dimensional dynamic structure in which economic agents, government institutions, financial flows, and regulatory mechanisms interact. Unlike static general equilibrium models, the system is treated here as an evolutionary system, continuously influenced by persistent stochastic disturbances and structural shifts.

Let the time be discrete, $t = 0, 1, 2, \dots$, and uncertainty be described by a probability space $(\Omega, \mathcal{F}, \mathbb{P})$, where Ω is a set of all possible scenarios, $\omega \in \Omega$ – denotes a particular realization (scenario), and $\mathbb{P}$ – probability measure over scenarios.

Economic policy is represented by a sequence of controllable vectors

$$x = \{x_t\}_{t \in T}, x_t \in \mathbb{R}^m, \quad (1)$$

where each component of $x_t = (x_{1,t}, x_{2,t}, \dots, x_{m,t})$ corresponds to a specific policy instrument, such as interest rates, tax rates, government spending levels, regulatory intensity, or macroprudential

constraints. The sequence x represents a policy rule or control path specifying the policy vector applied at each time period. It may be interpreted as an exogenously given policy trajectory or as a decision rule determined within an optimization framework. As a special case, a constant policy corresponds to $x_t \equiv x \in \mathbb{R}^m$ for all t .

The state of the economy at the time t under policy path x and scenario ω is denoted by

$$S(x, t, \omega) \in \mathbb{R}^n \quad (2)$$

and is defined as

$$S(x, t, \omega) = \begin{pmatrix} s_1(x, t, \omega) \\ s_2(x, t, \omega) \\ \vdots \\ s_n(x, t, \omega) \end{pmatrix} \in \mathbb{R}^n, \quad (3)$$

where each component $s_j(x, t, \omega)$, $j = 1, \dots, n$, denotes the j -th coordinate of the state vector and represents a macro-financial or structural variable such as output, inflation, employment, credit volume, asset prices, inequality measures, or institutional indicators. The dimension n may be large, reflecting the high complexity of the economy.

Formally, the state is a stochastic process

$$S: (\mathbb{R}^m)^{\mathbb{T}} \times \mathbb{T} \times \Omega \rightarrow \mathbb{R}^n, \quad (4)$$

where $\mathbb{T} = \{0, 1, 2, \dots\}$ is the time index set.

Uncertainty is modeled through a sequence of random shocks

$$\{\varepsilon_t\}_{t \geq 1}, \varepsilon_t: \Omega \rightarrow \mathbb{R}^k, \quad (5)$$

so that for each scenario ω , we obtain a realized shock path

$$\{\varepsilon_t(\omega)\}_{t \geq 1}. \quad (6)$$

These shocks may represent technological innovations, demand fluctuations, financial disturbances, geopolitical events, or other unforeseen influences. If $\varepsilon_t \equiv 0$ for all t , the system reduces to a deterministic dynamic model.

The evolution of the economic system is governed by a (possibly nonlinear) transition mapping

$$F: \mathbb{R}^n \times \mathbb{R}^m \times \mathbb{R}^k \rightarrow \mathbb{R}^n, \quad (7)$$

such that the state follows the stochastic difference equation (Schreiber, Benaïm, & Atchadé, 2011)

$$S(x, t + 1, \omega) = F(S(x, t, \omega), x_t, \varepsilon_{t+1}(\omega)), \quad (8)$$

for all $t \geq 0$, with the given initial condition $S(x, 0, \omega) \in \mathbb{R}^n$.

Equation 8 describes the evolution of the economy over time. The next state depends on the current economic state $S(x, t, \omega)$, the policy applied at the time t , x_t and the new stochastic disturbance ε_{t+1} . The formulation follows standard stochastic dynamic modeling approaches (Kushner & Dupuis, 2001).

The mapping F captures structural relationships, behavioral responses of agents, institutional constraints, market interactions, and feedback effects. Possible nonlinearity in F allows for crises, regime shifts, path dependence, and multiple developmental trajectories.

Given the *admissible stability domain*

$$\mathcal{K} = \{s \in \mathbb{R}^n: g_i(s) \leq 0, i = 1, \dots, q\}, \quad (9)$$

where q is the number of constraints. The *admissible stability domain* $\mathcal{K}$ represents the set of economically acceptable or sustainable states of the system. Each constraint $g_i(s) \leq 0$ encodes a structural, financial, institutional, or social bound that must not be violated. These constraints may reflect requirements such as bounded inflation, sustainable debt levels, adequate employment, financial solvency, or other macroeconomic and systemic viability conditions. States outside $\mathcal{K}$ correspond to configurations in which critical economic thresholds are breached, potentially triggering instability, crisis, or systemic breakdown.

The stability of a policy vector x over horizon T can be defined probabilistically. For a fixed policy rule $x = \{x_t\}_{t=0}^{T-1}$, the survival event can be defined as:

$$A_T(x) = \{\omega \in \Omega: S(x, t, \omega) \in \mathcal{K} \text{ for all } t = 0, \dots, T\}. \quad (10)$$

The stability of a policy over a finite horizon is defined in probabilistic terms because the evolution of the economy is subject to uncertainty. Even if a policy is well designed, stochastic disturbances may push the system toward or beyond critical boundaries. The survival event $A_T(x)$ therefore represents all scenarios in which the economy remains within the admissible domain $\mathcal{K}$ throughout the entire planning horizon.

The probability of maintaining stability over the horizon T is

$$P_{stable}(x, T) = \mathbb{P}(A_T(x)). \quad (11)$$

Equation 11 represents the probability that the system trajectory does not exit the admissible region within the planning horizon. It is directly analogous to the survival probability in stochastic reliability theory.

Correspondingly, the first exit time (or hitting time) can be defined as:

$$\tau(x, \omega) = \inf\{t \geq 0: S(x, t, \omega) \notin \mathcal{K}\}. \quad (12)$$

The first exit time (Levin & Peres, 2017) $\tau(x, \omega)$ represents the earliest date at which the trajectory leaves the admissible domain $\mathcal{K}$ under the policy path x in scenario ω . It therefore measures the duration of viability of the system along a given realization of shocks. Small values of $\tau(x, \omega)$ correspond to early violations of stability constraints, while large values indicate prolonged persistence within the admissible region. Expressing stability as

$$P_{stable}(x, T) = \mathbb{P}(\tau(x, \omega) > T) \quad (13)$$

links finite-horizon stability directly to the distribution of exit times. The probability of remaining stable up to time T is equal to the probability that the first constraint violation occurs strictly after the planning horizon. Such a formulation makes it possible to analyze economic reliability in terms of the statistical properties of $\tau(x, \omega)$, including its expected value, variance, and tail behavior. Overall, it allows to study of economic reliability (and fragility correspondingly) through the

distribution of exit times. Policies that appear acceptable in expectation may nevertheless exhibit heavy-tailed exit-time distributions, implying rare but catastrophic instability events.

Stability in the strict sense (never exiting $\mathcal{K}$) may be overly restrictive in complex economies subject to persistent shocks. A more feasible approach is to distinguish between *robustness* and *resilience*.

Robustness refers to the probability that deviations remain bounded (Culbertson et al., 2023). The stability region is defined by:

$$d(s, \mathcal{K}) = \inf_{y \in \mathcal{K}} \|s - y\|. \quad (14)$$

The function $d(s, \mathcal{K})$ defines the minimal distance between a state s and the admissible domain $\mathcal{K}$. It quantifies how far the system lies from the region considered economically sustainable. If $s \in \mathcal{K}$, the distance is zero; otherwise, it measures the magnitude of deviation from the nearest admissible configuration. Robustness over the horizon T is

$$\mathbb{P} \left(\sup_{0 \leq t \leq T} d(S(x, t, \omega), \mathcal{K}) \leq \delta \right), \quad (15)$$

where $d(S(x, t, \omega), \mathcal{K})$ measures the distance from the stability region. The probability measures the likelihood that the trajectory remains within a bounded neighborhood of the admissible region throughout the planning horizon. The parameter $\delta \geq 0$ represents a tolerance level for deviations. When $\delta = 0$, robustness reduces to strict stability. For $\delta > 0$, the criterion allows temporary or small departures from $\mathcal{K}$, provided they remain limited in magnitude. This representation reflects the idea that complex economies may experience fluctuations without necessarily undergoing systemic breakdown.

Resilience refers to the system's ability to re-enter $\mathcal{K}$ after temporary violations. The recovery time can be defined as:

$$\rho(x, \omega) = \inf\{t > \tau(x, \omega) : S(x, t, \omega) \in \mathcal{K}\}. \quad (16)$$

The recovery time $\rho(x, \omega)$ represents the earliest moment after an exit at which the system re-enters the admissible domain $\mathcal{K}$. It measures the duration of instability episodes following a constraint violation. Finite recovery times indicate resilience, while infinite values correspond to persistent or irreversible breakdown. A policy is resilient if the expected recovery time $E[\rho(x, \omega) - \tau(x, \omega)]$ is finite and sufficiently small.

While robustness concerns the magnitude of deviations from the admissible region, resilience concerns the speed and likelihood of return following a violation. Together, these concepts provide a more nuanced characterization of economic stability, distinguishing systems that resist shocks from those that can recover after disruption. This distinction captures an important empirical observation: modern economies often temporarily violate fiscal, inflationary, or financial constraints yet avoid systemic collapse due to adaptive mechanisms embedded in F . So, three stages are defined here: survival (no exit), robustness (bound deviations) and resilience (finite recovery time).

Under repeated stochastic perturbations, the distribution of states evolves. Let

$$\mu_t^x(B) = P(S(x, t, \omega) \in B), \quad (17)$$

be the probability distribution of the state at time t under policy x . The measure μ_t^x describes how probability mass is distributed across the state space at time t under policy x . It captures not only the expected trajectory but the entire distribution of possible economic configurations.

Even if the deterministic version of the system (i.e., $\varepsilon_t = 0$) admits a stable fixed point S^* , stochastic accumulation may generate increasing dispersion:

$$\text{Var}[S(x, t, \omega)] \text{ may increase as } t \rightarrow \infty. \quad (18)$$

In nonlinear systems, this dispersion may interact with the geometry of $\mathcal{K}$. If the boundary of $\mathcal{K}$ is highly curved or contains narrow “corridors,” small increases in variance can disproportionately increase exit probability. Thus, long-term instability may arise not from drift in the mean trajectory, but from variance amplification and tail thickening.

Given the probabilistic formulation, economic policy may be defined as a constrained stochastic control problem:

$$\max_{\{x_t\}_{t=0}^{T-1}} \mathbb{E} \left[\sum_{t=0}^T \beta^t U(S(x, t, \omega), x_t) \right], \quad (19)$$

where $U()$ is an underlying utility (welfare) function, $\beta \in (0,1)$ is the discount factor, and expectations are taken over the stochastic shock realizations. Unlike traditional formulations that evaluate policies primarily through expected outcomes, the problem includes an explicit probabilistic safety requirement,

$$\mathbb{P}(\tau(x, \omega) > T) \geq \alpha, \quad (20)$$

where $\alpha \in (0,1)$ is a required confidence level. This forces policy design to account not only for average performance but also for tail risk and the likelihood of systemic failure, allowing the policymaker to trade off expected welfare against volatility amplification and failure probability. Unlike traditional optimal control, where expectations dominate, a defined framework introduces explicit probabilistic safety constraints. The policymaker thus has a possibility to balance expected welfare, volatility amplification and probability of systemic failure. This transforms macroeconomic governance into a risk-managed dynamic optimization problem.

If the transition mapping F itself depends on latent regime variables R_t , such that

$$S_{t+1} = F(S_t, x_t, \varepsilon_{t+1}, R_t), \quad (21)$$

and R_t follows a stochastic process (e.g., Markov switching), then the stability domain becomes regime-dependent:

$$\mathcal{K}_{R_t}. \quad (22)$$

Structural breaks alter not only trajectories but the geometry of admissible states. A fiscal ratio sustainable in one regime may become unstable in another due to changes in growth dynamics, interest rate structures, or institutional credibility.

This introduces second-order uncertainty: uncertainty not only about shocks, but about the structural laws themselves.

Nonlinearity in F allows for multiple invariant sets $A_1, A_2, \dots$, representing alternative development paths (e.g., high-growth/low-debt vs. low-growth/high-debt equilibria). Stochastic perturbation can induce transitions between basins of attraction. The basin of attraction of A_i is defined as:

$$B_i = \{S_0 \in \mathbb{R}^n: \text{dist}(S_t, A_i) \rightarrow 0 \text{ as } t \rightarrow \infty\}. \quad (23)$$

Under noise, transitions between basins occur with positive probability, implying that long-run outcomes are not uniquely determined by initial conditions but by rare-event dynamics. This makes economic development an evolutionary process shaped by probabilistic basin switching rather than deterministic convergence.

Monte-Carlo and Quantum Monte-Carlo simulation

In the framework, defined above, the Monte-Carlo simulation is the most straightforward method for analysing policies. It approximates expectations and stability probabilities by sampling N independent realizations $\omega_1, \dots, \omega_N$ and averaging the corresponding outcomes (Glasserman, 2003). Let C_F denote the computational cost of one evaluation of the transition mapping F , and let T be the simulation horizon. One trajectory requires $O(T \cdot C_F)$ operations, so the total cost scales as $O(NTC_F)$. The statistical error of the standard Monte-Carlo decreases at a rate $O(N^{-1/2})$, independently of the state dimension n . This dimension-independence is one of its principal virtues in high-dimensional economic systems. However, achieving accuracy ε in estimating quantities such as $P_{\text{stable}}(x, T)$ requires $N = O(\varepsilon^{-2})$ samples (Caflisch, 1998). For rare events (small exit probabilities), the effective complexity may become substantially larger, since precise estimation of tail probabilities demands either extremely large N or variance-reduction techniques. Thus, the overall computational burden grows linearly in horizon length and quadratically in desired precision.

For quantities such as the stability probability $P_{\text{stable}}(x, T) = \mathbb{P}(\tau(x, \omega) > T)$, suppose the corresponding exit probability is $p = \mathbb{P}(\tau(x, \omega) \leq T)$. The Monte-Carlo estimator of p has variance $p(1-p)/N$, so its standard error is approximately $\sqrt{p/N}$ when p is small. If one requires a relative error r (i.e., the standard error divided by p is bounded by r), then

$$\frac{\sqrt{p/N}}{p} \leq r, \quad (24)$$

which implies

$$N \geq \frac{1}{pr^2}. \quad (25)$$

Thus, the required number of simulated trajectories grows inversely with the exit probability and quadratically with the desired relative precision. For example, if $p = 10^{-3}$ and a relative error of 5% is required, then approximately $N \approx 4 \times 10^5$ trajectories are needed. For $p = 10^{-5}$, the same relative precision would require on the order of 4×10^7 simulations.

Table 1

Number of required paths for classical Monte-Carlo (relative error $r = 0.05$)

Exit probability	Number of required paths
10^{-2}	4×10^4
10^{-3}	4×10^5
10^{-4}	4×10^6
10^{-5}	4×10^7
10^{-6}	4×10^8

Source: created by the author

Table 2

Number of required paths for classical Monte-Carlo (relative error $r = 0.01$)

Exit probability	Number of required paths
10^{-2}	1×10^6
10^{-3}	1×10^7
10^{-4}	1×10^8
10^{-5}	1×10^9
10^{-6}	1×10^{10}

Source: created by the author

This illustrates that event estimation (including rare-event estimation) can become computationally demanding even when the underlying dynamical system is relatively inexpensive to simulate. In such cases, variance-reduction or rare-event simulation techniques may be necessary to maintain tractability.

A quantum computing approach alters only the sampling component, not the structural simulation cost embedded in F . Quantum amplitude estimation theoretically allows estimation of expectations and probabilities with error $O(\varepsilon)$ using $O(\varepsilon^{-1})$ evaluations of the underlying stochastic oracle, instead of $O(\varepsilon^{-2})$ in classical Monte-Carlo (Udvarnoki et al., 2023). The theoretical implication is a quadratic speedup in sampling complexity. In the context of stability probability estimation, this means that computing $P_{stable}(x, T)$ to precision ε would require asymptotically fewer path evaluations. Importantly, this advantage concerns the convergence rate of probabilistic estimation rather than the dimensionality of the state space. The improvement is therefore polynomial (quadratic), not exponential, and its practical realization depends on the ability to encode the transition dynamics and shock distributions coherently on a quantum device. In theory, however, for large-scale stochastic control problems where sampling dominates total cost, quantum amplitude estimation offers a structurally meaningful computational advantage.

Suppose that there is a need to estimate

$$\mu = \mathbb{E}[f(\omega)], \quad (26)$$

or equivalently a probability $P(G)$, where G is some event (for example, exit from $\mathcal{K}$).

At the first step, an operator A is constructed, which prepares a superposition of all possible scenarios:

$$A|0\rangle = \sum_{\omega} \sqrt{P(\omega)} |\omega\rangle. \quad (27)$$

Then, an Oracle is constructed (a unitary operator that computes the function $f(\omega)$ (or checks the event G) and encodes the result into an auxiliary qubit(s)). For a probability estimation problem, the variations of the following circuit might be suitable:

$$|\omega\rangle|0\rangle \rightarrow |\omega\rangle(\sqrt{1-f(\omega)}|0\rangle + \sqrt{f(\omega)}|1\rangle). \quad (28)$$

The amplitude of $|1\rangle$ now contains the expectation information. After a Grover-type operator Q that amplifies the amplitude of the “good” component is created. This operator effectively rotates the quantum state in a two-dimensional subspace spanned by “good” and “bad” outcomes. Each application increases the phase information related to the target probability. Application of quantum phase estimation to the operator Q extracts the amplitude (hence the probability or expectation) with precision ε using $O(\varepsilon^{-1})$ applications of Q . After the required number of Oracle calls, the output register is measured to obtain an estimate of μ .

Using quantum amplitude estimation, the scaling for estimating a probability p to relative error r is roughly:

$$N_Q \approx \frac{1}{r p}, \quad (29)$$

where N_Q counts oracle calls.

Table 3

Number of required Oracle calls for quantum Monte-Carlo (relative error $r = 0.05$)

Exit probability	Required Oracle calls
10^{-2}	2×10^3
10^{-3}	2×10^4
10^{-4}	2×10^5
10^{-5}	2×10^6
10^{-6}	2×10^7

Source: created by the author.

Table 4

Number of required Oracle calls for quantum Monte-Carlo (relative error $r = 0.01$)

Exit probability	Required Oracle calls
10^{-2}	1×10^4
10^{-3}	1×10^5
10^{-4}	1×10^6
10^{-5}	1×10^7
10^{-6}	1×10^8

Source: created by the author.

In sophisticated cases, with small relative error and exit probability (which are more important in practice), the advantage of employing quantum Monte-Carlo is becoming more evident. This can play an even more important role when there is a need to analyze multiple scenarios.

Conclusions and discussion

The stochastic formulation of economic reliability developed in this framework shifts the analysis of stability from deterministic equilibrium properties to probabilistic assessments of system persistence under uncertainty. Rather than asking whether the economy converges to a fixed point, the approach evaluates the likelihood that trajectories remain within an admissible viability region, the distribution of exit times, and the system's capacity for recovery following disturbances. This perspective captures the inherently uncertain and nonlinear nature of modern economic dynamics, where instability may arise not from systematic drift but from variance amplification, tail thickening, regime shifts, and rare-event transitions between alternative development paths. By integrating survival probability, robustness, resilience, and distributional evolution into a unified stochastic structure, the framework provides a more realistic and policy-relevant characterization of macroeconomic stability as a probabilistic and evolutionary phenomenon rather than a purely deterministic one.

The classical Monte Carlo approach provides a natural and flexible computational framework for analyzing the stochastic economic system defined above. Its principal advantage lies in its simplicity and dimension-independence: the convergence rate of the estimator does not deteriorate with the dimensionality of the state space. This property is particularly valuable in high-dimensional macro-financial environments where analytical methods become intractable. By directly simulating trajectories of the nonlinear stochastic system, Monte Carlo methods allow the estimation of survival probabilities, exit-time distributions, robustness measures, and resilience metrics within a unified computational structure.

However, the probabilistic nature of stability introduces a fundamental computational limitation. The statistical error of classical Monte Carlo decreases at a rate $O(N^{-1/2})$, implying that achieving accuracy ε requires $N = O(\varepsilon^{-2})$ simulated paths. When the quantities of interest involve rare events (such as small exit probabilities or tail risks, which provide the major practical interest) the required number of simulations increases inversely with the probability being estimated. In particular, obtaining a fixed relative precision for an exit probability p requires on the order of $1/(pr^2)$ paths. As systemic fragility often manifests precisely in low-probability, high-impact transitions, classical simulation may become computationally demanding.

In contrast to classical simulation, quantum Monte Carlo methods based on amplitude estimation offer a quadratic improvement, reducing the sampling complexity from $O(\varepsilon^{-2})$ to $O(\varepsilon^{-1})$. For reliability analysis, this implies that the number of oracle evaluations required to estimate survival probabilities scales inversely with both the desired relative accuracy and the exit probability, rather than inversely with its square. Such a reduction is particularly relevant in the rare-event regime, where classical methods become computationally demanding. Practical realization includes challenges in efficient state preparation (encoding $P(\omega)$), efficient reversible implementation of $f(\omega)$, and circuit depth.

Once Monte-Carlo estimation provides probabilistic measures such as $P_{stable}(x, T)$, expected welfare, or tail-risk indicators, the natural next step is policy optimization over the admissible control space $x \in \mathbb{R}^m$. In realistic settings, however, the policy vector often includes discrete instruments (regulatory thresholds, tax brackets, institutional rules) and constraints, transforming the problem into a high-dimensional combinatorial optimization task. The objective function itself is stochastic and typically evaluated through simulation, which further increases computational burden. Classical approaches may rely on heuristic search, stochastic programming, or scenario-based decomposition. In principle, quantum optimization methods (such as QAOA, (Blekos et al., 2023)) may offer potential advantages

in exploring large combinatorial policy spaces, particularly when the optimization landscape is rugged and contains many local minima. Thus, beyond accelerating probabilistic estimation, quantum methods may also become relevant at the subsequent decision stage, where policy selection under uncertainty can, in some formulations, be expressed as a structured combinatorial optimization problem.

References

- Asmussen, S., & Glynn, P. (2007). *Stochastic simulation: Algorithms and analysis*. Springer, 476
- Bedford, T., & Cooke, R. (2001). *Probabilistic risk analysis: Foundations and methods*. Cambridge University Press, 393
- Blekos, K., Brand, D., Ceschini, A., Chou, C.-H., Li, R.-H., Pandya, K., & Summer, A. (2024). A review on Quantum Approximate Optimization Algorithm and its variants. *Physics Reports*, 1068, 1–66. DOI: [10.1016/j.physrep.2024.03.002](https://doi.org/10.1016/j.physrep.2024.03.002).
- Brassard, G., Høyer, P., Mosca, M., & Tapp, A. (2002). Quantum amplitude amplification and estimation. *Contemporary Mathematics*, 305, 53–74. DOI: <https://doi.org/10.48550/arXiv.quant-ph/0005055>
- Caflich, R. (1998). Monte Carlo and quasi-Monte Carlo methods. *Acta Numerica*, 1–49
- Cerezo, M., Arrasmith, A., Babbush, R., et al. (2021). Variational quantum algorithms. *Nature Reviews Physics*, 3, 625–644. DOI: <https://doi.org/10.1038/s42254-021-00348-9>
- Cont, R., Deguest, R., & Scandolo, G. (2010). Robustness and sensitivity analysis of risk measurement procedures. *Quantitative Finance*, 10(6), 593–606. <https://doi.org/10.1080/14697681003685597>
- Culbertson, P., Cosner, R. K., Tucker, M., & Ames, A. D. (2023). Input-to-state stability in probability. 1–8. DOI: <https://doi.org/10.48550/arXiv.2304.14578>
- Herman, D., Googin, C., Liu, X., et al. (2022). A survey of quantum computing for finance. 1–60. DOI: <https://doi.org/10.48550/arXiv.2201.02773>
- Glasserman, P. (2003). *Monte Carlo methods in financial engineering*. Springer, 596. DOI: <https://doi.org/10.1007/978-0-387-21617-1>
- Kushner, H. J., & Dupuis, P. (2001). *Numerical methods for stochastic control problems in continuous time*. Springer, 476. DOI: <https://doi.org/10.1007/978-1-4613-0007-6>
- Leontyev A., & Ketners K. (2023). The improvement of decision-making in the Latvian tax system: cases of irreducible incompatibility taking into account reliability, equity and efficiency criteria. *Intellectual Economics*, 17(2), 308–329. DOI: 10.13165/IE-23-17-2-04
- Leontyev, A., & Reshina, G. (2020). Evaluation of vehicle taxation in the Republic of Latvia by the method of variant optimization using relative single indexes. In *Proceedings of the 2020 International Conference Economic Science for Rural Development*, 53, 107–117. DOI: 10.22616/ESRD.2020.53.012
- Levin, D. A., & Peres, Y. (2017). *Markov chains and mixing times* (2nd ed.). American Mathematical Society, 447
- Ljungqvist, L., & Sargent, T. J. (2018). *Recursive macroeconomic theory* (4th ed.). MIT Press, 1480
- Mergel, I., Edelmann, N., & Haug, N. (2019). Defining digital transformation. *Government Information Quarterly*, 36(4), 1–16. DOI: <https://doi.org/10.1016/j.giq.2019.06.002>.
- Montanaro, A. (2015). Quantum speedup of Monte Carlo methods. *Proceedings of the Royal Society A*, 471. DOI: <https://doi.org/10.1098/rspa.2015.0301>.
- OECD. (2020). Digital government index 2019. OECD Publishing
- Rausand, M., & Høyland, A. (2004). *System reliability theory* (2nd ed.). Wiley, 636
- Rust, J. (1996). Numerical dynamic programming in economics. In *Handbook of computational economics* (Vol. 1). Elsevier, 166
- Schreiber, S. J., Benaïm, M., & Atchadé, K. A. (2011). Persistence in fluctuating environments. *Journal of Mathematical Biology*, 62(5), 655–683. DOI: <https://doi.org/10.1007/s00285-010-0349-5>
- Stamatopoulos, N., Egger, D. J., Sun, Y., Zoufal, C., Woerner, S., & Kerenidis, I. (2020). Option pricing using quantum computers. *Quantum*, 4, Article 291. DOI: <https://doi.org/10.22331/q-2020-07-06-291>
- Tesfatsion, L., & Judd, K. L. (2006). *Handbook of computational economics* (Vol. 2). Elsevier
- Udvarnoki, Z., Fáth, G., & Fogarasi, N. (2023). Quantum advantage of Monte Carlo option pricing. *Journal of Physics Communications*, 7, 1–13. DOI: 10.1088/2399-6528/acd2a4
- United Nations. (2024). *UN E-Government Survey 2024*. United Nations Department of Economic and Social Affairs
- United Nations Conference on Trade and Development. (2024). *Digital economy report 2024*. UNCTAD
- Woerner, S., & Egger, D. J. (2019). Quantum risk analysis. *npj Quantum Information*, 5, 15, 1–8. DOI: <https://doi.org/10.1038/s41534-019-0130-6>

MĀKSLĪGĀ INTELEKTA IZMANTOŠANA NEFORMĀLĀS IZGLĪTĪBAS PROJEKTU VADĪBĀ

USE OF ARTIFICIAL INTELLIGENCE IN THE MANAGEMENT OF NON-FORMAL EDUCATION PROJECTS

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Anotācija

Pētījuma mērķis bija izpētīt mākslīgā intelekta (MI) izmantošanas iespējas un izaicinājumus neformālās izglītības projektu vadībā, lai noteiktu priekšnoteikumus tā efektīvai integrēšanai praksē. Rakstā īsumā raksturota tēmas aktualitāte, digitālās tehnoloģijas strauji maina nevalstiskā sektora darbu, taču vadītājiem trūkst skaidru vadlīniju MI izmantošanai, un tiek apdraudēta kritiskā domāšana. Pētījumā izmantota monogrāfiskā metode literatūras un normatīvo dokumentu analīzei, kvantitatīvā un kvalitatīvā metode aptaujas (N = 165) un interviju datu ieguvei, kā arī aprakstošā un salīdzinošā analīze rezultātu interpretēšanai. Aptaujas dati parādīja, ka 73,3 % organizāciju MI rīkus izmanto, īpaši satura izstrādē, projektu plānošanā un dokumentācijas sagatavošanā, savukārt 70 % respondentu kā būtiskāko risku min datu drošību. Analīze atklāja, ka galvenie šķēršļi MI integrācijai ir digitālo prasmju un apmācību trūkums, nepietiekams finansējums un metodoloģiskais atbalsts. Raksta secinājumos izcelti priekšnoteikumi MI rīku efektīvai izmantošanai: cilvēkcentrētas pieejas ieviešana, iekšējo politikas dokumentu izstrāde, darbinieku digitālo prasmju pilnveide un sistēmisks atbalsts normatīvajā vidē.

Atslēgas vārdi: mākslīgais intelekts, neformālā izglītība, projektu vadība, NVO

Abstract

The aim of the study was to explore the possibilities and challenges of using artificial intelligence (AI) in the management of non-formal education projects in order to identify the prerequisites for its effective integration into practice. The article briefly describes the relevance of the topic: digital technologies are rapidly changing the work of the non-governmental sector, but managers lack clear guidelines for the use of AI, and critical thinking is being threatened. The study uses a monographic method for the analysis of literature and normative documents, quantitative and qualitative methods for obtaining survey (N = 165) and interview data, as well as descriptive and comparative analysis for the interpretation of results. The survey data showed that 73.3% of organizations use AI tools, especially in content development, project planning, and documentation preparation, while 70% of respondents cited data security as the most significant risk. The analysis revealed that the main obstacles to AI integration are a lack of digital skills and training, insufficient funding, and methodological support. The conclusions of the article highlight the prerequisites

for the effective use of AI tools: the introduction of a human-centered approach, the development of internal policy documents, the improvement of employees' digital skills, and systematic support in the regulatory environment.

Keywords: artificial intelligence, non-formal education, project management, NGO

Ievads

Mākslīgais intelekts strauji ienāk sabiedriskajos procesos, piedāvājot rīkus, kas spēj analizēt datus, radīt saturu un automatizēt lēmumu pieņemšanu. Digitālās transformācijas rezultātā nevalstiskās organizācijas (NVO) un neformālās izglītības sniedzēji arvien aktīvāk izmanto MI rīkus projekta pieteikumu sagatavošanā, mācību materiālu izstrādē un saziņas uzlabošanā. Tomēr šis progress notiek situācijā, kad vadības profesionāļiem trūkst skaidru vadlīniju par MI izmantošanas principiem un nav pietiekamu normatīvo dokumentu, kas regulētu datu drošību, ētiku un atbildību. Projektu vadībā MI spēj atvieglot mērķa grupu vajadzību analīzi, plānot aktivitātes un kontrolēt budžetus, taču pārāk liela palāvība uz algoritmiem var mazināt kritisko domāšanu un novest pie sociāli nevēlamiem rezultātiem.

Neformālā izglītība, kas aptver mācīšanās aktivitātes ārpus formālās skolas sistēmas, ir būtiska pilsoniskās sabiedrības un personīgās izaugsmes veicinātāja. NVO šajā jomā nodrošina jauniešiem, pieaugušajiem un mērķa grupām iespējas apgūt jaunas prasmes, stiprina sociālo iekļaušanu un veicina aktīvu līdzdalību. Latvijas normatīvajā regulējumā neformālā izglītība tiek definēta kā plānotas mācības, kas orientētas uz mērķgrupas vajadzībām, elastīgas un balstītas uz dalībnieku līdzdalību. Tomēr MI izmantošana šajā sektorā Latvijā ir jauna parādība. Nepieciešama sistemātiska izpēte, lai saprastu, kā MI var paaugstināt projektu kvalitāti un efektivitāti, kā arī, kādi ir galvenie riski un izaicinājumi.

Pētījuma aktualitāti nosaka arī Eiropas Savienības MI regulējuma attīstība un strauji pieaugošā pieeja MI rīkiem, piemēram, *ChatGPT*, *Gemini* un citiem generatīviem algoritmiem. Lai gan šie rīki sniedz neierobežotas iespējas, tie rada jautājumus par datu drošību, plaģiātu, cilvēktiesībām un ētiskiem aspektiem. Tādēļ mērķtiecīga MI ieviešana NVO darbībā jābalsta cilvēkcentrētā pieejā, kur tehnoloģijas kalpo kā atbalsts, nevis aizstāj cilvēku lēmumu pieņemšanu.

Šī raksta mērķis ir izpētīt MI izmantošanas iespējas neformālās izglītības projektu vadībā un noteikt priekšnoteikumus tā efektīvai integrācijai praksē. Lai sasniegtu mērķi, tiek formulēti uzdevumi:

- 1) analizēt MI teorētiskos aspektus un tā lomu projektu vadībā, akcentējot cilvēkcentrēto pieeju un kritiskās domāšanas saglabāšanu;
- 2) izvērtēt MI integrācijas situāciju un normatīvo regulējumu neformālās izglītības sektorā Latvijā;
- 3) pētīt empīriskos datus par MI lietojumu NVO projektu vadībā, nosakot tā priekšrocības un šķēršļus.

Pētījuma hipotēze ir sekojoša: MI izmantošana neformālās izglītības projektos uzlabo projektu vadības efektivitāti, ja tiek nodrošināta cilvēkcentrēta pieeja un attīstīta personāla digitālā kompetence.

Literatūras apskats

Mākslīgais intelekts. MI definējams kā datoru sistēmu spēja veikt uzdevumus, kuri parasti prasa cilvēka intelektu, piemēram, izziņu, valodas saprašanu un problēmu risināšanu (Russell & Norvig,

2021). Zinātniskajā literatūrā tiek minētas atšķirības starp šauru MI algoritmiem, kas paredzēti konkrētiem uzdevumiem, un vispārēju MI, kam būtu iespējams mācīties un darboties plašākās jomās (Kurzweil, 2014). Līdz ar generatīvo modeļu, dziļās mācīšanās un dabiskās valodas apstrādes attīstību MI spēj radīt tekstus, attēlus un novērtēt sarežģītas datu struktūras. Tomēr vairāki autori uzsver ētiskos izaicinājumus, tai skaitā algoritmisko aizspriedumu, datu privātuma un atklātības trūkumu

(Floridi & Cowls, 2019). Pētnieki pievērš uzmanību cilvēkcentrētai MI koncepcijai – tehnoloģijām jābūt vērstām uz cilvēku vajadzībām, jānodrošina skaidrojami rezultāti un jāsaug cilvēka kontrole pār lēmumiem (Shneiderman, 2020).

MI projektu vadībā. Projektu vadības zinātniskajā literatūrā MI tiek aplūkots kā potenciāls instruments risku analīzei, resursu plānošanai un projektu prognozēšanai (Kerzner, 2022). Pētījumi norāda, ka MI var uzlabot darba plūsmu, automatizējot atskaides, mērķa grupu segmentēšanu un gaitu uzraudzību (Marchewka, 2022). Lielākās priekšrocības ir datu analīzes ātrums un precizitāte, kas ļauj vadītājiem pieņemt pamatotākus lēmumus. Tomēr literatūrā tiek analizēti arī riski: pārāk liela paļaušanās uz algoritmiem, neuzticams rezultāts, iespējamās kļūdas datu ievadē un līdz ar to nepareizi secinājumi (Liu et al., 2021). Daži autori kritizē MI kā draudu kritiskai domāšanai, atzīmējot, ka lēmumu pieņemšanā jāsaug cilvēka intuīcija un ētiskā atbildība (Möslein & Neyer, 2020).

NVO un neformālā izglītība. NVO definētas kā brīvprātīgas, nekomerciālas organizācijas, kas sniedz sabiedriska labuma pakalpojumus un veicina pilsonisko sabiedrību (Vakhrusheva, 2018). Neformālā izglītība ir strukturētas mācīšanās aktivitātes ārpus formālās skolu sistēmas, kur mācību saturs tiek pielāgots dalībnieku vajadzībām. Tā sekmē dzīvesprasmju attīstību, pilsonisko līdzdalību un sociālo iekļaušanu (European Commission, 2015). NVO bieži ir galvenie neformālās izglītības projektu īstenotāji, piedāvājot jauniešu apmācības, brīvprātīgā darba programmas un sabiedrības izglītības kampaņas. Literatūrā uzsvērta mācību procesa demokrātiskā daba, kur dalībnieki ir aktīvi un veido paši savu mācīšanās pieredzi (Jarvis, 2016).

Normatīvais regulējums. Eiropas Savienības tiesiskajā telpā MI regulējumam jānodrošina drošība un pamattiesību aizsardzība. 2023. gadā izstrādātais *AI Act* uzsver risku balstītu pieeju un prasa augsta riska sistēmām stingrus drošības pasākumus un uzraudzību. Latvijā nevalstisko organizāciju darbību regulē *NVO likums* un *Neformālās izglītības likums*, kas nosaka kvalitātes prasības un tiesības mācību procesā. Tomēr speciāls MI regulējums neformālās izglītības projektos vēl nav izstrādāts, kas rada interpretācijas brīvību un riskus. Šis normatīvais vakuums uzliek atbildību pašām organizācijām izstrādāt iekšējo politiku par datu aizsardzību un ētiku MI izmantošanā.

Papildinot literatūras apskatu, var uzsvērt MI vēsturisko attīstību. 20. gadsimta vidū datorzinātnieki entuziastiski paredzēja, ka dažu desmitgažu laikā būs iespējams radīt mašīnas ar cilvēkam līdzīgu intelektu, taču tehniskās grūtības un finansējuma kritumi 80. un 90. gados izraisīja tā sauktās "MI ziemas" (Russell & Norvig, 2021). Tikai līdz ar jaudīgu datoru pieejamību un lieliem datu apjomiem 21. gadsimtā sākās MI strauja renesanse, sevišķi mašīnmācīšanās un dziļo neironu tīklu attīstībā. 2017. gadā izstrādātais transformatoru arhitektūras modelis ļāva radīt generatīvos valodas modeļus, kas spēj radīt cilvēklīdzīgu tekstu (Vaswani et al., 2017). Šī tehnoloģija kļuva par pamatu tādiem rīkiem kā *ChatGPT*, *Gemini* un citiem generatīviem asistentiem. Zinātniskā kopiena šis pārmaiņas aplūko ne tikai kā tehnoloģiju virzītu revolūciju, bet arī kā sociālās un ētiskās atbildības pārbaudi, kur jānodrošina caurspīdīgums, izskaidrojamība un sabiedrības uzticēšanās (Floridi & Cowls, 2019).

Eiropas Savienības politiskā reakcija uz MI attīstību ir redzama 2023. gadā publicētajā Eiropas mākslīgā intelekta aktā (*AI Act*), kas ievieš risku klasifikācijas pieeju un nosaka prasības augsta riska sistēmām. Normatīvais regulējums paredz, ka algoritmi, kuri ietekmē personu tiesības (piemēram, izglītībā vai nodarbinātībā), ir pakļauti stingrai pārbaudei, savukārt zemāka riska sistēmas var attīstīties elastīgāk. Svarīga kļūst prasība uzturēt datu kvalitāti, nodrošināt cilvēka uzraudzību un skaidrot algoritmu darbību. Šis regulējums ietekmēs arī NVO, kuras izmanto MI izglītības projektos, jo tām būs jāievēro datu aizsardzības un drošības standarti (European Commission, 2023).

Pētījumu konteksts Latvijā. Iepriekšējos pētījumos, kas veikti par MI lietošanu Latvijas izglītībā un sabiedriskajā sektorā, secināts, ka digitālās prasmes NVO darbiniekiem ir nevienmērīgas, un lielākie izaicinājumi ir apmācību trūkums un finansējuma nepietiekamība (Kalniņš & Zeltiņa, 2022). Tāpat tika novērots, ka liela daļa organizāciju eksperimentē ar generatīviem rīkiem satura izstrādei, taču neizmanto to potenciālu datu analīzei un stratēģiskai plānošanai. Šie pētījumi norāda uz nepieciešamību pēc padziļinātas analīzes neformālās izglītības projektu kontekstā, lai noteiktu, cik lielā mērā MI spēj atvieglot projektu vadību un kāda ir darbinieku gatavība šīm tehnoloģijām.

Metodoloģija

Pētījumā tika izmantota kombinēta pieeja. Vispirms notika monogrāfiskā analīze, kuras gaitā tika izpētīti akadēmiskie raksti, grāmatas, politikas plānošanas dokumenti un normatīvie akti par MI, projektu vadību un neformālo izglītību. Šī literatūras apskate ļāva identificēt galvenos konceptuālos ietvarus un ētiskos aspektus.

Otrais posms bija kvantitatīvā izpēte. Tika izstrādāta strukturēta aptauja, kas sastāvēja no 29 jautājumiem un aptvēra septiņus blokus:

- 1) demogrāfiskie dati par respondentiem un organizācijām;
- 2) vispārējā pieredze ar MI rīkiem;
- 3) MI loma projektu plānošanā;
- 4) MI loma projektu īstenošanā;
- 5) iegūtie ieguvumi un izaicinājumi;
- 6) organizāciju atbalsts MI izmantošanai;
- 7) riski un ētiskie aspekti.

Atbildes tika vērtētas piecu punktu Likerta skalā no 1 (nekad/mazsvarīgi) līdz 5 (ļoti bieži/ļoti nozīmīgi). Aptauja tika izsūtīta elektroniski 2024. gada augustā 212 potenciālajiem respondentiem – NVO, jauniešu centru, biedrību un nodibinājumu pārstāvjiem, kas iesaistīti neformālās izglītības projektu īstenošanā. 165 aizpildītas anketas (78 %) tika iegūtas un analizētas, izmantojot JASP statistikas programmu. Datu analīze ietvēra frekvenču sadalījumu, vidējo rādītāju un tendenču aprēķinus, kā arī attiecību vizualizāciju grafikos.

Trešajā posmā tika veikta kvalitatīvā izpēte, izmantojot daļēji strukturētas intervijas ar sešiem neformālās izglītības projektu vadītājiem. Intervijās tika noskaidrotas nianse par MI izmantošanu mērķa grupu segmentēšanā, resursu plānošanā un komandas vadībā, kā arī detalizēti aplūkoti riska un ētikas jautājumi. Interviju saturs tika transkribēts un analizēts, izmantojot tematiskās kodēšanas metodi, kas ļāva identificēt galvenās tēmas un ieteikumus.

Pētījuma rezultāti

Kvantitatīvās aptaujas rezultāti

Projektu rakstīšanas biežums. Piecu punktu Likerta skala atklāja, ka 83 % respondentu projektus raksta regulāri (vairākas reizes gadā), 29 % – reizi gadā un tikai 2,4 % nenodarbojas ar projektu rakstīšanu. Vidējais rādītājs 4,18 norāda, ka lielākajai daļai organizāciju projektu rakstīšana ir bieža prakse, kas saistīta ar finansējuma piesaisti un sabiedrības aktivitāšu īstenošanu.

MI izmantošanas izplatība. Atbildot uz jautājumu, vai organizācija izmanto MI rīkus projektu vadības un īstenošanas posmos, 73,3 % respondentu atbildēja apstiprinoši, bet 26,7 % – noliedzoši. Šī proporcija apliecina strauju MI integrāciju NVO darbībā un norāda, ka daudzas organizācijas eksperimentē ar generatīvajiem rīkiem.

MI pielietojuma jomas. Veiktajā apkopojumā visbiežāk minēta satura izstrāde un komunikācija (82 %), tai skaitā teksta rakstīšana, rediģēšana un tulkošana, prezentāciju un vizuālu materiālu veidošana. Otrajā vietā ir projektu plānošana un dokumentācijas sagatavošana (76 %), kur MI palīdz strukturēt pieteikumus, sagatavot atskaites un organizēt dokumentus. Trešā populārākā joma ir izglītības un jaunatnes projekti (68 %), kuros MI tiek izmantots mācību materiālu izstrādei un programmu personalizēšanai. Nākamie ir datu analīze un aptauju apstrāde (55 %), sociālo mediju un sabiedrisko attiecību aktivitātes (52 %), komandas darba un projektu vadība (49 %), resursu pārvaldība (43 %), radošie un tehniskie uzdevumi (39 %), starptautiskā sadarbība un tulkošana (28 %). Tikai 6 % respondentu norādīja, ka MI rīkus neizmanto.

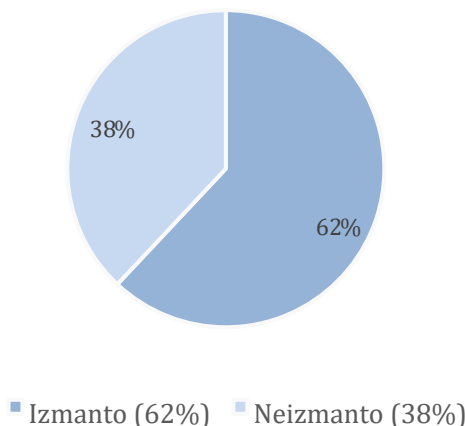
MI rīku lietošanas pieredze. Respondenti lūdza novērtēt savu pieredzi MI rīku lietošanā. 33 % norādīja uz vidēju pieredzi, 27 % uz labu pieredzi, 12 % uz ļoti labu pieredzi, 19 % – uz ļoti mazu pieredzi un 9 % – uz pieredzes neesamību. Lai gan vairums respondentu saskata MI potenciālu, viņu pašvērtējums norāda uz prasmju un zināšanu attīstības nepieciešamību.

MI loma mērķa grupu analīzē. 56 % respondentu atzina, ka MI rīki palīdzējuši identificēt mērķa grupas vajadzības, savukārt 44 % nav pieredzējuši šādu pienesumu. Atvērtie jautājumi atklāja, ka MI tiek izmantots mērķgrupu segmentēšanai un profilēšanai (28 %), motivācijas un vajadzību noteikšanai (24 %), datu analīzei un apstrādei (18 %), mācību programmu pielāgošanai (14 %), jauniešu iesaistes un līdzdalības izvērtēšanai (9 %) un reģionālo tendenču identificēšanai (5 %).

MI izmantošana ikdienas darbā. 45 % respondentu norādīja, ka MI rīkus ikdienas uzdevumos izmanto bieži, 24 % – regulāri, 23 % – reizēm, bet 8 % – reti vai gandrīz neizmanto. Tātad vairāk nekā divas trešdaļas respondentu ir aktīvi MI lietotāji, kas liecina par digitalizācijas progresu NVO sektorā.

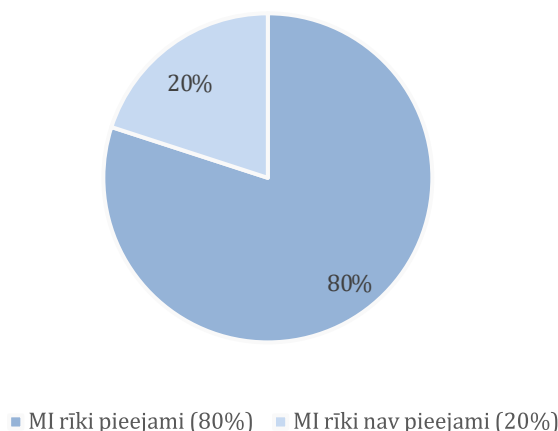
Finansējuma avoti un attīstības tendences. Neformālās izglītības projektu finansējumu Latvijā nodrošina gan vietējie, gan starptautiskie fondi. Galvenie avoti ir Sabiedrības integrācijas fonds (SIF), Aktīvo iedzīvotāju fonds (AIF), Valsts kultūrkapitāla fonds (VKKF), Valsts izglītības attīstības aģentūra (VIAA), Eiropas Sociālais fonds Plus (ESF+), Eiropas Jaunatnes fonds (EYF) un Digitālās Eiropas programma (DEP). Šie instrumenti finansē jauniešu apmācības, pieaugušo izglītības projektus un NVO kapacitātes stiprināšanu. Pēdējos gados pieejami arī mērķtiecīgi granti digitālajai transformācijai, kas atbalsta MI rīku ieviešanu un personāla apmācības. Tomēr NVO un aptaujātie eksperti uzsver, ka specifisks finansējums MI integrācijai ir fragmentārs un īslaicīgs; lielākā daļa līdzekļu tiek novirzīta infrastruktūrai vai programmu saturam, nevis tehnoloģiju un prasmju attīstībai. Tas ierobežo spēju sistemātiski ieviest MI risinājumus un prasa ilgtermiņa stratēģisku plānošanu un sadarbību ar publiskajām iestādēm un privāto sektoru.

MI loma datu analīzē un ietekmes novērtēšanā. 62 % respondentu izmanto MI rīkus projekta ietekmes un rezultātu analīzē (skat. 1. att.). Atbildes atklāja, ka MI palīdz apstrādāt aptauju un atsauksmju datus, automātiski veidot grafikus un strukturēt pārskatus. Daļa respondentu norādīja, ka MI izmanto scenāriju modelēšanai ("kas-ja" analīzes), mērķgrupu un segmentu analīzei, kvalitatīvā satura kodēšanai un projektu vadības metriku monitoringam.



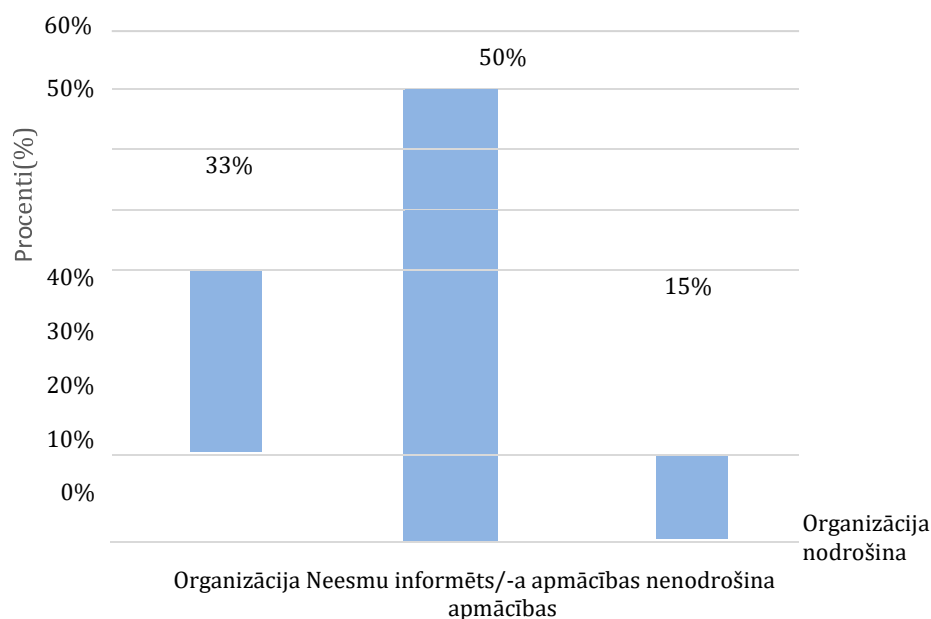
1. attēls. **MI loma datu analīzē un ietekmes novērtēšanā** (avots: aptaujas dati)

Atbalsta un apmācību pieejamība. 80 % respondentu norādīja (skat. 2. attēlu), ka organizācijā ir pieejami MI rīki, piemēram, *ChatGPT*, *Google Gemini* vai citi ģeneratīvie modeļi.



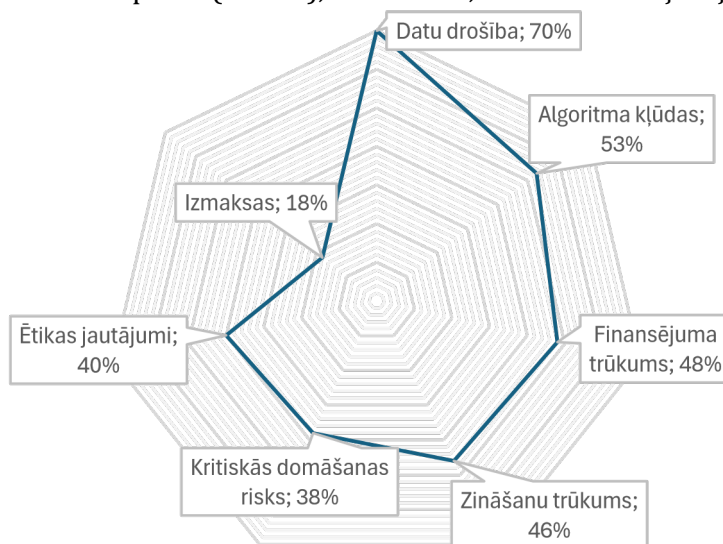
2. attēls. **MI rīku pieejamība organizācijās** (avots: aptaujas dati)

Tomēr tikai 30–35 % organizāciju nodrošina apmācības darbiniekiem par MI izmantošanu (skat. 3. attēlu), 50 % apmācības nav notikušas, un 15 % darbinieku nav informēti par apmācību iespējām. Šie dati norāda uz ievērojamu plaisu starp rīku pieejamību un prasmi tos lietot.



3. attēls. Atbalsta un apmācību pieejamība MI izmantošanai (avots: aptaujas dati)

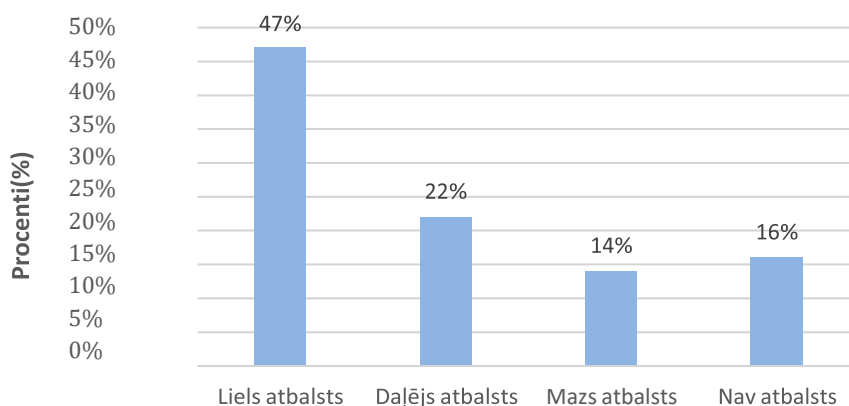
Risks un izaicinājumi. Radara diagramma parādīja (skat. 4. attēlu), ka lielākais risks MI izmantošanā ir datu drošība un privātuma aizsardzība (70 % respondentu). Otrais būtiskākais risks ir neuzticami rezultāti un kļūdas MI algoritmos (53 %). Vidēja nozīme ir finansējuma trūkim (48 %) un nepietiekamām zināšanām (46 %), kas ierobežo iespēju ieguldīt MI sistēmās un attīstīt prasmes. Zemāku riska līmeni respondenti saista ar pārmērīgu paļaušanos uz MI (38 %), kritiskās domāšanas samazināšanos (38 %) un ētikas jautājumiem (40 %). Viszemāk vērtēts ir NVO specifiskas neatbilstības un izmaksu aspekts (<20 %), kas liecina, ka tehniskie šķēršļi nav izšķirošā problēma.



4. attēls. Risks un izaicinājumi MI izmantošanā (avots: aptaujas dati)

Detalizētāk par lēmumu pieņemšanu un risku uztveri. Lielākā daļa aptaujāto (47 %) norādīja, ka MI sniedz lielu vai ļoti lielu atbalstu lēmumu pieņemšanas procesos, sevišķi attiecībā uz projektu mērķu definēšanu un aktivitāšu plānošanu. Aptuveni 22 % respondentu uzskata, ka MI atbalsts ir

daļējs un tiek izmantots pēc vajadzības, 14 % respondentu uzskata, ka MI palīdz maz, bet 16 % uzskata, ka MI vispār neatbalsta lēmumu pieņemšanu. Šie rezultāti parāda, ka MI ietekme ir atkarīga no organizācijas gatavības, datu kvalitātes un vadības prasmēm.



5. attēls. Lēmumu pieņemšanas atbalsts un risku uztvere (avots: N=165)

Aptauja arī iezīmēja specifiskus riskus un izaicinājumus. Papildus jau minētajiem pieciem galvenajiem riskiem respondenti norādīja, ka MI var mazināt komandas radošumu, ja to izmanto mehāniski un bez kritiskas domāšanas, kā arī var palielināt finanšu izmaksas, ja nepieciešamas licencētas programmatūras. Tomēr daudzi respondenti uzsvēra, ka šie riski ir pārvarami ar iekšējo politiku, apmācību un datu drošības protokolu ieviešanu.

Kvalitatīvās intervijas un sintētiskā analīze

Pētot MI izmantošanu dažādos projekta vadības posmos, tika atklātas vairākas sakarības. Plānošanas posmā MI rīki galvenokārt tiek izmantoti mērķa grupas vajadzību analīzei, ideju ģenerēšanai un projektu pieteikumu strukturēšanai. Īstenošanas posmā MI palīdz koordinēt komandas darbu, automatizēt komunikāciju un monitorēt uzdevumu izpildi (piemēram, ar *Teams* un *Slack* botu palīdzību). Vērtēšanas posmā MI tiek izmantots datu apkopošanai un ietekmes analīzei, izmantojot analītiskos rīkus un vizualizācijas. Šāda cilkliska pieeja liecina, ka MI var atbalstīt visus projekta posmus, ja tam ir pieejamas kvalitatīvas ieejas datus un cilvēka vadība.

Kvalitatīvā analīze. Interviju dalībnieki uzsvēra, ka MI palīdz strukturēt lēmumu pieņemšanu, automatizēt ikdienas uzdevumus un uzlabot komunikāciju ar mērķa grupām. Tie atzina, ka MI var stimulēt radošumu, piedāvājot jaunas idejas un alternatīvus risinājumus, tomēr brīdināja par risku samazināt komandas analītisko domāšanu, ja algoritmi tiek izmantoti bez kritiska vērtējuma. Vairāki vadītāji norādīja, ka iekšējie politikas dokumenti par datu aizsardzību un MI izmantošanas ētiku ir iztrūkstoši, tādēļ organizācijas riskē ar reputācijas un juridiskām sekām. Respondenti uzsvēra vajadzību pēc praktiskām apmācībām, skaidrām vadlīnijām un normatīvas vides atbalsta MI integrācijai neformālās izglītības projektos.

Secinājumi

Pētījuma rezultāti apstiprina, ka MI rīki jau ir plaši integrēti neformālās izglītības projektu vadības praksē Latvijā un sniedz ievērojamu atbalstu satura izstrādē, dokumentācijas sagatavošanā, datu analīzē un mērķa grupu segmentēšanā. Lielākā daļa organizāciju regulāri raksta projektus un

izmanto MI, kas liecina par tendenci modernizēt darba procesus un paaugstināt efektivitāti. Tomēr pozitīvie ieguvumi ir līdzsvarojami ar riskiem – datu drošības apdraudējumu, algoritmu kļūdainiem rezultātiem, nepietiekamu finansējumu un zināšanām.

Hipotēze, ka MI izmantošana uzlabo projektu vadības efektivitāti, tika apstiprināta ar nosacījumu, ka tiek nodrošināta cilvēkcentrēta pieeja un attīstīta personāla digitālā kompetence. Intervijas un aptaujas dati uzsvēra, ka MI nevar aizstāt cilvēku lēmumu pieņemšanu – tas ir tikai palīginstruments, kas atvieglo analītisko darbu un palīdz strukturēt informāciju. Lai izvairītos no kritiskās domāšanas pavājināšanās, nepieciešams uzturēt līdzsvaru starp tehnoloģiju izmantošanu un cilvēka iesaisti.

Galvenie priekšnoteikumi MI veiksmīgai integrācijai neformālās izglītības projektos ir šādi:

- cilvēkcentrētas pieejas ieviešana, kur MI rīki tiek izmantoti, lai atbalstītu cilvēka lēmumu pieņemšanu, nevis to aizstātu;
- skaidru iekšējo politikas dokumentu un vadlīniju izstrāde par MI izmantošanu, ietverot datu aizsardzību, ētiku un atbildības sadalījumu;
- darbinieku digitālo prasmju un kritiskās domāšanas attīstība, nodrošinot regulāras apmācības un pieredzes apmaiņu;
- finansējuma piesaiste MI rīku un apmācību nodrošināšanai;
- normatīvā regulējuma pilnveide, lai sniegtu viennozīmīgus nosacījumus MI izmantošanai izglītības projektos.

Pētījums atklāja, ka organizācijām ir augsta motivācija izmantot MI, tomēr trūkst metodiska atbalsta un skaidru risinājumu risku pārvaldībai. Tādēļ nepieciešama sadarbība starp valsts iestādēm, akadēmisko vidi un NVO, lai izstrādātu kopīgas vadlīnijas un apmācību programmas. Nākotnes pētījumi varētu padziļināti analizēt konkrētu MI rīku ietekmi uz projekta rezultātu kvalitāti un izstrādāt kvantitatīvus modeļus lēmumu pieņemšanas optimizācijai.

Kopsavilkums

Rakstā analizēti mākslīgā intelekta izmantošanas aspekti neformālās izglītības projektu vadībā. Literatūras apskats parādīja, ka MI piedāvā daudzsološus rīkus datu analīzei un satura radīšanai, taču rada arī ētiskus un juridiskus izaicinājumus. Pētījumā, kas balstīts uz 165 respondentu aptauju un sešām intervijām, noskaidrots, ka MI rīkus jau izmanto 73,3 % NVO, visbiežāk satura izstrādē, projektu plānošanā un mācību materiālu sagatavošanā. Galvenie ieguvumi ir efektivitātes pieaugums un iespēja ātrāk pieņemt lēmumus, taču lielākie riski saistīti ar datu drošību, algoritmu kļūdām un digitālo prasmju trūkumu. Secinājumi norāda, ka MI lietošana jābalsta cilvēkcentrētā pieejā, jāizstrādā iekšējie politikas dokumenti un jānodrošina darbinieku apmācības.

References

- European Commission. (2015). Policy handbook on non-formal education
- Floridi, L., & Cowls, J. (2019). A unified framework of five principles for AI in society. *Harvard Data Science Review*, 1(1), 1–15
- Jarvis, P. (2016). *Adult education and lifelong learning: Theory and practice* (4th ed.). Routledge
- Kalniņš, J., & Zeltiņa, A. (2022). Neformālās izglītības digitālā transformācija Latvijā. *Latvijas Sociālo zinātņu žurnāls*, 5(2), 42–56
- Kerzner, H. (2022). *Project management: A systems approach to planning, scheduling, and controlling* (13th ed.). Wiley
- Kurzweil, R. (2014). *How to create a mind: The secret of human thought revealed*. Penguin
- Liu, S., Shang, L., & Chen, Y. (2021). Artificial intelligence applications in project management: Opportunities and challenges. *International Journal of Project Management*, 39(5), 567–579

- Marchewka, J. (2022). *Information technology project management* (5th ed.). Wiley
- Möslein, K., & Neyer, A. (2020). Human-centred artificial intelligence: Opportunities and challenges for management. *Journal of Management Studies*, 57(2), 134–152
- Russell, S., & Norvig, P. (2021). *Artificial intelligence: A modern approach* (4th ed.). Pearson
- Shneiderman, B. (2020). Human-centered artificial intelligence: Reliable, safe & trustworthy. *International Journal of Human-Computer Interaction*, 36(6), 495–504
- Vakhrusheva, O. (2018). Non-governmental organizations: Definitions, typologies and roles in modern society. *Social Science Panorama*, 2(4), 15–29

DIGITAL WORD-OF-MOUTH AND ITS INFLUENCE ON TOURISM DEMAND IN INDIA

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Abstract

The increase in the number of social media sites and digital communication channels has had a profound impact on how travelers seek out travel information and make their travel plans. This study is an investigation of the effect of digital word-of-mouth (DWOM) published on social media websites on tourist demand in India. The study was conducted with a quantitative methodology through a self-administered, structured questionnaire that was sent via the internet to individuals who regularly utilized social media for searching for information related to traveling. A total of 257 responses were received from the survey participants and the data collected from this group of respondents was used to describe the perceptions of DWOM and the degree of influence it had on the respondent's travel decisions. The results showed that many travelers regularly utilize social media platforms and online travel reviews when making choices about where to travel. Additionally, the results indicated that user generated content (UGC) including travel posts, photos, videos, and reviews have a significant effect on the perceptions of tourists, the trust that they place in travel information, and their overall travel intentions. These results demonstrated the increasing importance of digital word-of-mouth in influencing tourism demand and that social media can be a useful tool for both promoting a destination and conducting marketing efforts related to tourism. Overall, these results suggest that tourism organizations and destination marketers could benefit from utilizing social media platforms and encouraging UGC to promote their destination(s) and attract new tourists.

Keywords: Digital Word-of-Mouth, Social Media, Tourism Demand, Travel Decision-Making, User-Generated Content, Tourism Marketing

Introduction

Advances in digital technologies and the widespread adoption of social media have dramatically altered the tourism industry as well as the way tourists seek travel information. Over the past decade, numerous social media platforms such as Instagram, Facebook, YouTube, and online travel review sites have developed into major travel information resources, providing a platform for tourists to share their travel experiences, recommendations, and opinions with a global audience. Through these platforms, travelers can view a wide range of photographs, videos, blogs, and reviews that can offer valuable insight into various tourist destinations. Thus, social media platforms have emerged as critical channels for the dissemination of information related to tourism promotion and the exchange of travel-related information affecting the evaluation of tourist destinations and ultimately influencing travel experiences (Živković et al., 2014; Leung et al., 2013).

The use of digital technologies in the tourism industry has led to the growth of Smart Tourism Environments, which integrate digital technology to facilitate the exchange of information and digital communications and ultimately shape traveler behavior (Gretzel et al., 2015).

A rapidly developing area in digital tourism communications is the emergence of Digital Word-of-Mouth (DWOM) or Electronic Word-of-Mouth (E-WOM). DWOM/E-WOM refers to the process of exchanging opinions, experiences, and recommendations about products or services using online platforms and social networks. Within the context of the tourism industry, many travelers use reviews from fellow travelers, travel blogs, and social media posts when assessing possible destinations to visit. Due to the intangibility of tourism products and the experiential nature of traveling, many travelers will refer to the experiences of other travelers to reduce perceived risk and uncertainty when making travel decisions (Lončarić et al., 2016). Past studies indicate that E-WOM has a substantial effect on travelers' decisions to select a destination to visit and on their travel intentions by impacting their attitude towards travel destinations (Kaewnaknaew, 2024; Cuong & Anh, 2025). Additionally, reviews and experiences of traveling to a destination contribute to the formation of a destination's image, which is a factor that affects the willingness of tourists to visit specific locations (Nguyen et al., 2025; Nassar, 2021).

Furthermore, Social Media Platforms have amplified the effect of DWOM by allowing users to create and share vast amounts of travel-related content. Travelers can quickly upload photographs, videos, travel stories, and reviews that may inspire other travelers and affect their perception of destinations. User-Generated Content is typically viewed as more reliable and trustworthy than the marketing materials produced by tourism organizations due to the fact that they reflect real experiences of travelers. Research suggests that travel-related content found on social media and levels of online engagement can positively affect tourists' interest in a destination and ultimately encourage them to travel (Almeida & Costa, 2024; Widianoro et al., 2024). Moreover, Social Media Marketing Strategies and Influencer-Generated Content have grown to be effective promotional tools for tourism destinations and to increase the visibility of destinations within the digital marketplace (Ogutu & Othieno, 2025; Lou & Yuan, 2019). Social media also fosters interaction amongst travelers and increases the ability of DWOM to positively affect tourism demand (Hudson et al., 2015).

As the use of digital communication continues to grow in the tourism industry, an increased awareness of how DWOM affects tourists' travel decisions is becoming increasingly important for tourism marketers and Destination Managers. The availability of travel-related information on social media platforms has changed the manner in which tourists obtain information and assess destinations prior to making travel decisions. Although previous research has explored the role of EWOM in tourism, additional research is needed to explore the effects of EWOM in specific contexts and tourism markets. Therefore, the purpose of this study is to investigate the effects of EWOM posted on social media platforms on tourism demand in India. The goal of this study is to determine how tourists perceive and behave regarding online travel reviews and social media content in order to understand the effects of digital communication in shaping tourism demand in today's digital marketplace (Zulkarnaen et al., 2025; Dwivedi et al., 2021).

Literature Review

Digital Word-of-Mouth in Tourism

The emergence of digital word-of-mouth (DWOM) or electronic word-of-mouth (eWOM) is now recognized as one of the most critical factors affecting tourist behavior in today's digital world. With

the increasing popularity of social media platforms, online review sites and travel forums, the way in which tourists search for and assess travel-related information has fundamentally changed. DWOM enables tourists to share their own travel experiences through digital means that enable a wide range of people to view their travel-related comments, reviews and suggestions. As such, the user-generated content (UGC) created through DWOM offers potential tourists' valuable insight into the various options available to them in relation to their travels, ultimately assisting in their decision-making processes regarding where they choose to go on vacation. Given the fact that many tourism products are considered to be intangible and experiential in nature, travelers will often rely on the information provided by other travelers to help alleviate uncertainty and perceived risk associated with selecting a particular destination. Therefore, eWOM has evolved into an important information resource for tourists, providing a platform through which to gain authentic experiences and views of travel destinations (Lončarić et al., 2016). Additionally, social media platforms have further increased the visibility of travel-related information, and therefore, digital interactions have become an integral part of the tourism information search process (Almeida & Costa, 2024).

DWOM also plays a major role in forming tourists' perceptions of destinations; attitudes toward destinations; and ultimately destination images. Tourists can obtain extensive information about tourism services and experiences at destinations via online reviews/ratings, travel blogs and social media postings; all of which impact how tourists perceive destinations prior to traveling to those areas. Positive online recommendations regarding destinations enhance the attractiveness of those destinations while negative reviews serve as a deterrent to traveling to specific destinations. Past research has demonstrated that eWOM has a substantial impact on tourists' destination selections and travel intentions through the development of attitudes and perceptions toward travel destinations (Kaewnaknaew, 2024). Furthermore, past research has indicated that DWOM impacts the development of a destination image, which ultimately influences tourists' willingness to visit destinations and their total travel behavior (Nassar, 2021). More recently, researchers have demonstrated that eWOM influences travel intention by increasing tourists' attitudes toward destinations and enhancing their perceptions of destination images (Cuong & Anh, 2025). Additionally, the impact of DWOM has grown in recent years due to the increased use of social networking platforms such as Instagram, YouTube and other types of interactive media. These platforms enable travelers to share visual representations of their travel experiences and personal travel stories in real-time, thus increasing peer-to-peer communication in the field of tourism. UGC posted on social media platforms not only inspires travel plans, but it also increases traveler interaction and facilitates dialogue regarding destinations. Research demonstrates that social media marketing and user-generated content are becoming increasingly significant in terms of promoting destinations and influencing travel behaviors (Ogutu & Othieno, 2025). Additionally, research demonstrates that eWOM has a significant impact on tourists' decisions to visit both natural and cultural tourism destinations by developing perceptions and encouraging travel intentions (Zulkarnaen et al., 2025). Social media marketing activities and locally produced digital content have also been demonstrated to have a positive impact on tourists' intention to visit destinations by fostering a greater emotional connection with places (Widiantoro et al., 2024). Ultimately, DWOM has become a fundamental component of tourism marketing and an influential element of tourism demand in today's digital environment.

Social Media and Tourism Demand

The rapid growth of social media platforms has created a new reality for how tourism destinations are marketed and how tourists develop travel experiences. With the ability to view travel-related

information (via pictures, videos, travel reviews, etc.) and connect with other travelers who have visited destinations, the social media landscape has provided a platform for travelers to create and consume travel-related knowledge. This has transformed social media into a quick method to distribute tourism information to an international audience. Thus, it has developed into a primary marketing vehicle for tourism destinations to inform travelers of possible destinations and encourage travelers to consider those areas. In fact, research has shown that digital and social media marketing have a major impact on tourist behaviors and travel related decisions in today's tourism industry (Dwivedi et al., 2021). Additionally, social media provides tourism organizations with opportunities to directly interact with potential customers and promote their destinations through social media and interactive marketing techniques (Živković et al., 2014).

In addition to developing the potential demand for tourism, social media has a strong impact on the way tourists perceive, feel, and behave when considering visiting a destination. Travelers use social media to gain insight into other traveler's experiences at destinations via user generated content and interactive communications; this enables travelers to better evaluate the authenticity of a destination. Social media interactions also support the creation of an emotional connection between tourists and tourism brands and other travelers. Studies have found that the level of customer engagement on social media platforms has a positive effect on a tourism brand's performance and increases the likelihood of tourists traveling to a destination (Lian & Liew, 2018). Moreover, the vast amounts of travel related content available on social media allows tourists to obtain detailed information regarding destinations, thus removing uncertainty from the travel planning process and enabling more effective planning (Leung et al., 2013).

Another very important function of social media in tourism is the ability to amplify the effects of digital word of mouth and user generated content. Many times, travelers will post about their travels and experiences online (travel blogs, YouTube videos, etc.), which inspires other travelers to visit the same destination or area and creates additional tourism demand. Digital narratives also play a large role in creating the expectations and influencing the choices of where to go for tourists. Research on smart tourism has identified digital technologies and social media platforms as key tools for enhancing the flow of information and communication amongst tourists, and ultimately influencing travel behavior and improving destination competitiveness (Gretzel et al., 2015). In addition, the rising popularity of influencer marketing has further supported the role of social media in tourism marketing. Influencers promote travel experiences and recommend destinations to their followers, which develops trust in the information and encourages potential tourists to visit the recommended destinations (Lou & Yuan, 2019). Therefore, social media serves as a powerful stimulus for tourism demand through providing information exchanges, creating destination images and motivating travel intentions among tourists.

Role of Influencers and User-Generated Content

The use of influencers and user-generated content (UGC) has grown in importance within the tourism marketing and communications sector during the digital age. Platforms such as social media enable both travelers/bloggers/influencers to create and share their travel experiences through photos/videos/online reviews/travel narratives that can be viewed by large groups around the globe. Travelers are able to obtain knowledge of various travel related experiences/destinations from users who are traveling to the same places; this will potentially affect their perception of travel destinations. Compared to traditional advertising methods, user-generated content is typically seen as more believable/authentic because it represents actual experiences of those traveling versus

advertising copy created by tourism organizations. Studies indicate that social media content/digital communication channels have an impact on the level of interest of travelers towards a destination by providing potential travelers with the ability to view different types of travel experiences and destination information (Almeida & Costa, 2024). Also, social media marketing efforts and the digital content generated by users have become two key factors used by tourism destinations to promote themselves and ultimately generate an intent to visit (Widiantoro et al., 2024).

User-generated content has also proven to have a significant effect on how travelers perceive and make decisions regarding their trips. Potential travelers rely heavily on digital sources such as travel blog/online travel reviews/social media posts when researching travel destinations. Digital sources assist travelers in evaluating travel destinations by providing them with detailed information regarding accommodations, attractions, etc. Previous studies have demonstrated that digital word-of-mouth posted online impacts traveler's destination selection and travel intentions (Kaewnaknaew, 2024). Likewise, previous research has found that digital word-of-mouth affects how travelers develop a destination image, which in turn affects a traveler's willingness to visit a specific destination (Cuong & Anh, 2025). Also, previous research has indicated that digital travel reviews and travel experiences affect traveler's perceptions of destinations and influence their travel intentions and decision making (Nassar, 2021).

Additionally, influencer marketing has provided user-generated content in the tourism industry additional leverage. Influencers tend to act as opinion leaders that post curated travel experiences and destination recommendations to their followers on social media platforms. As influencers build strong relationships with their audience and are perceived to be authentic, they can greatly influence traveler's attitudes and travel preferences. Studies demonstrate that the credibility/value of the content created by influencers builds trust among their audience and increases their engagement with tourism-related information (Lou & Yuan, 2019). In addition, due to the increasing importance of social media marketing and digital tourism communication, user-generated travel content has increased its influence in creating tourism demand and promoting destinations (Ogutu & Othieno, 2025). Therefore, influencers and user-generated content are becoming major drivers of tourism marketing as they increase destination awareness, engage tourists, and drive traveler's intentions to travel within the digital tourism environment.

Research Methodology

Research Aim

This research will identify the impact that digital word-of-mouth (DWOM) posted through social media platforms has on tourism demand in India. Social media platforms including Instagram, Facebook, YouTube and travel review websites are currently becoming a major source for travel information where tourists post their travel experience, opinion and recommendation. Tourists' digital interaction can then create positive or negative perceptions and travel attitudes among potential tourists and therefore; shape their travel intent towards certain destinations. The purpose of this research will be to explore the effects of DWOM and User-Generated Content (UGC) on tourists' decision-making process, and to further assess the effect these have on the total tourism demand in the Indian Tourism Industry. This research also expects to discover the increasing role of social media as a means of communicating with travelers, and how it affects travel decisions and destination choices.

Research Question

What is the influence of digital word-of-mouth on social media platforms to tourism demand in India?

Research Method

Data Collection

Beginning with the quantitative nature of the research design, the data that were used to test the hypothesis were obtained through a questionnaire-based survey. A structured questionnaire was employed to elicit responses from users of various social media platforms who have a history of seeking travel-related information via the internet. The survey contained questions about the respondent's digital word-of-mouth; social media usage; and the respondent's travel decision-making behaviors. In addition, the questionnaire requested that the respondents report their views and past experiences concerning the effect that online travel reviews; social media travel recommendations; and user-generated content may have on their travel-related decisions. The questionnaire contained two distinct sections. The first section of the questionnaire provided demographic data of the respondents including their age; sex; educational level; and travel frequency. The second portion of the questionnaire contained statements about the impact of digital word-of-mouth and tourist demand and were measured by a five-point Likert scale that ranged from "strongly disagree" (1) to "strongly agree" (5). The questionnaire was distributed on-line using applications like Google Forms and social media sites to allow for an expansive number of potential respondents to be reached. As a result of utilizing a convenient sampling technique, the data collection process was limited to those who agreed to participate in the study and previously utilized social media to find travel-related information.

Data Analysis

The collected data were evaluated by employing statistical analysis techniques to assess the relationship between digital word-of-mouth and tourist demand. Initially, the responses were reviewed to ensure that all the responses were complete and accurate so that the dataset could be accurately analyzed. Frequency; percent; mean; and standard deviation descriptive statistics were used to provide summaries of the demographic characteristics of the respondents and their overall attitudes towards digital word-of-mouth.

In order to evaluate the influence that digital word-of-mouth has on tourist demand, correlation and regression analysis were employed to assess the strength and direction of the relationships that exist between the study variables. By employing these statistical methods, it was possible to determine if digital word-of-mouth had a significant effect on the respondents' travel intentions and demand for tourism destinations. Statistical software packages, such as SPSS, were used to perform the analyses, allowing for an orderly evaluation of the collected data and assisting in determining meaningful conclusions based upon the research findings.

Table 1

**Demographic Characteristics of Respondents and Perceptions of Digital Word-of-Mouth
in Tourism Decision-Making**

Question	Response Option	Percentage of Respondents
Age Group	18–25 years	29%
	26–35 years	39%
	36–50 years	22%
	Above 50 years	10%
Gender	Male	54%
	Female	46%
Occupation	Student	31%
	Working Professional	41%
	Self-Employed	17%
	Others	11%
How often do you use social media platforms to search for travel information?	Very frequently	43%
	Frequently	32%
	Occasionally	18%
	Rarely	7%
How often do you read online travel reviews before choosing a travel destination?	Always	37%
	Often	36%
	Sometimes	19%
	Rarely	8%
How influential are online travel reviews on your decision to visit a destination?	Not influential	6%
	Slightly influential	14%
	Moderately influential	25%
	Influential	33%
	Very influential	22%
How trustworthy do you consider travel information shared by other tourists on social media?	Not trustworthy	5%
	Slightly trustworthy	12%
	Moderately trustworthy	26%
	Trustworthy	35%
	Very trustworthy	22%
How often do travel posts, videos, or photos on social media inspire you to visit new destinations?	Never	6%
	Rarely	13%
	Sometimes	27%
	Often	32%
	Very often	22%
Overall, digital word-of-mouth significantly influences my travel decisions.	Strongly disagree	5%
	Disagree	9%
	Neutral	19%
	Agree	36%
	Strongly agree	31%

The data presented in Table 1 describe demographics and views of 257 participants with respect to how Digital Word-Of-Mouth (DWOM) influences tourism decision making. The majority of participants were between the ages of 26 – 35 years old (39%) followed closely by those aged 18–25

years (29%). This indicates that young adults make up a large proportion of social media users who seek travel related information online.

In addition, 43 percent of participants reported that they use social media very frequently to search for travel related information, and an additional 73 percent of participants reported that they either always or frequently read online reviews prior to selecting a travel destination. The study further found that DWOM is a key influencer of tourism demand.

Approximately 55 percent of participants reported that online travel reviews have a significant amount of influence (influential/very influential) on their travel decisions, and 67 percent of participants reported that DWOM has a significant impact (agree/agree strongly) on their selection of tourism destinations. Overall, these data suggest that social media platforms and online reviews are increasingly becoming important factors which influence tourist behavior and travel decision making in India's Tourism Industry

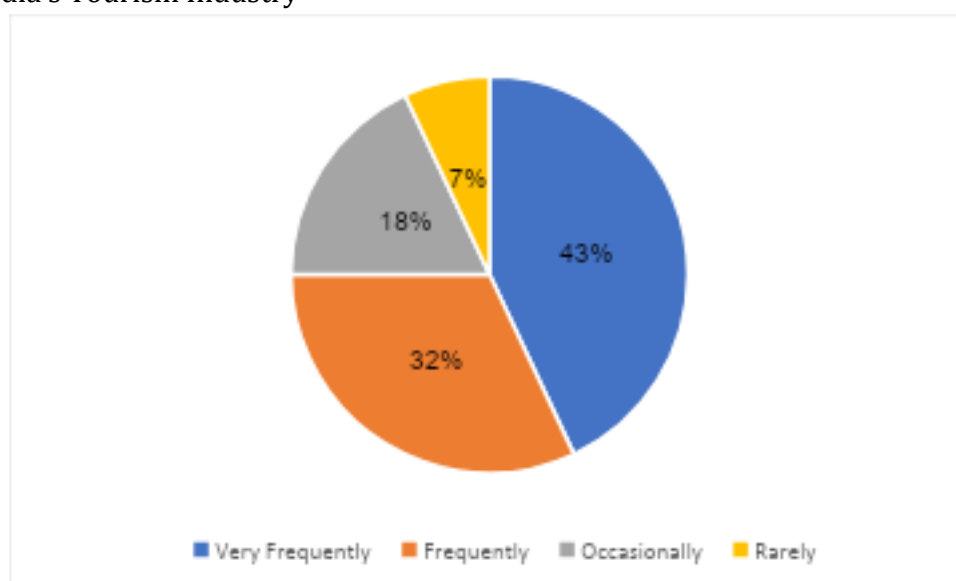


Figure 1. Frequency of Using Social Media Platform for Travelling Information

Figure 1 illustrates how the 257 respondents of this study distributed themselves according to their frequency of usage of social media when searching for travel information. It can be seen that 43% of all respondents used social media at least frequently for travel information (very often or often), while 32% reported a "frequent" level of usage. In addition, 18% of respondents sometimes made use of social media for travel information, whereas only 7% of all respondents seldom utilized social media for travel planning purposes. Thus, it is shown in these results that more and more travelers are increasingly relying on digital communication channels such as social media to search for travel-related information, which provides evidence of an increase in the influence of digital communication channels in shaping the travel information search behavior of tourists.

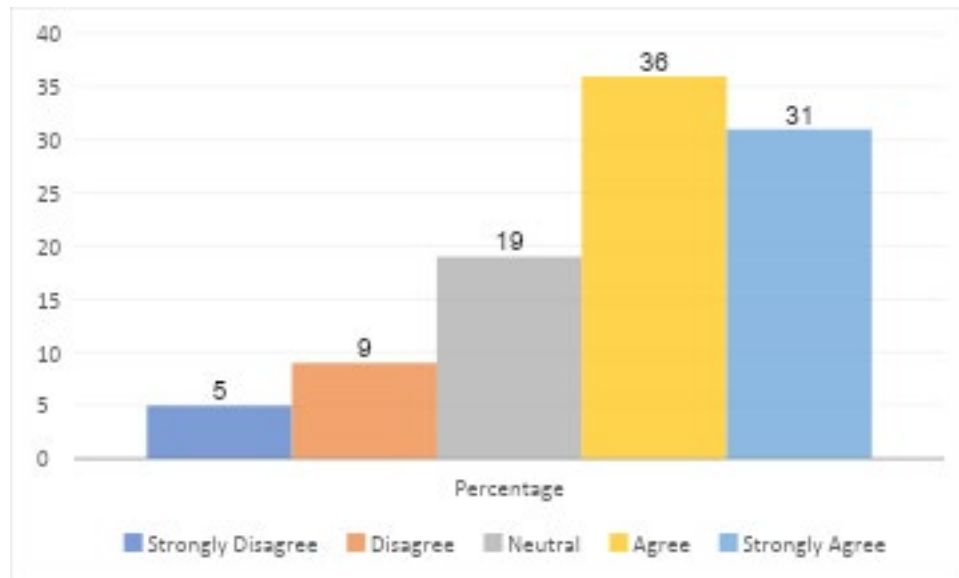


Figure 2. Influence of Digital Word-of-Mouth on Travel Decisions

Figure 2 shows how respondents perceived the impact of Digital Word-of-Mouth (D-WOM) on their travel decision-making process as per the survey statement "Generally, D-WOM has a significant effect on my travel decisions." Survey data was collected from 257 respondents. It can be seen from the data that 36% of the respondents agreed to the idea that D-WOM has a significant effect on their travel decisions; 31% of respondents stated they had a strong belief in this idea. Furthermore, it is noted that 19% of respondents were indifferent to the idea of whether or not the internet affects their travel decisions; therefore, online information does not necessarily affect their travel decisions. Finally, only 9% of respondents disagreed and 5% of respondents strongly disagreed with the statement. Overall, the data suggests that D-WOM shared via social media and online travel review websites, are key factors that shape tourists' preferences for destinations and travel intentions.

Findings and Discussion

The data from this study shows that digital word-of-mouth (DWOM), shared through social media platforms, is a key factor in influencing travel demand, and travel choice making for tourists. The demographics of the participants in this survey showed that a high percentage of participants fall into younger age ranges; specifically, 39% fall within the 26-35 year range, and 29% fall within the 18-25 year range. This would indicate that younger individuals are the most active users of social media, and the most frequent consumers of digital travel related content.

In terms of gender, there was a fairly equal number of males (54%), and females (46%), who participated in the survey, which would indicate that both genders are equally likely to use social media to find travel related information. With regards to occupation, the two largest participant groups consisted of working professionals (41%), and students (31%). As can be inferred from the numbers above, this would indicate that a digitally connected population is relying on online platforms to plan their travel, and find travel related information.

Additionally, the study found that social media platforms are becoming increasingly important for tourists seeking travel information. A total of 43% of respondents stated that they "very frequently" use social media to gather travel related information, and 32% of respondents stated that they

"frequently" use social media. Additionally, a majority of respondents stated that they read online travel reviews prior to selecting a destination, with 37% stating that they "always" read reviews, and 36% stating that they "often" read reviews. Based on the results of this study, digital platforms are providing valuable information for tourists to help them assess various destinations, and ultimately reduce uncertainty when making travel plans. Consequently, user generated content such as travel reviews, travel posts, and travel recommendations, are now integral components of the tourism information search process.

Lastly, the study found that a majority of participants believed that digital word-of-mouth was a trusted source of travel information. Specifically, 33% of participants stated that online travel reviews had a significant impact on their travel decisions, and 22% stated that they greatly influenced their decisions. Furthermore, a majority of participants stated that they viewed travel information provided by fellow tourists on social media as trustworthy. Specifically, 35% of participants rated the information as "trustworthy", and 22% rated the information as "very trustworthy". Collectively, these results demonstrate that tourists may rely on the experiences and opinions of other tourists when evaluating potential destinations. Since such content represents actual travel experiences, it is typically considered more authentic and credible than traditional promotional messages developed by tourism organizations.

Overall, the results of the study demonstrate that digital word-of-mouth has a significant influence on tourism demand and the travel intentions of tourists. A total of 67% of respondents either agreed or strongly agreed that digital word-of-mouth affected their travel decisions. Social media posts, photos, and videos also inspired many respondents to visit and explore new destinations. Overall, these results illustrate the increasing importance of using social media as a form of communication and developing user generated content to shape destination image, and stimulate tourism demand. Lastly, the results of this study support previous studies demonstrating that digital platforms and online travel communities significantly affect the perceptions and behaviors of tourists, thus supporting the need for tourism organizations, and destination marketing organizations to develop strategies to promote positive digital word-of-mouth on social media platforms, to increase the awareness of destinations, and attract new visitors.

Conclusion

This research investigates the impact of digital word-of-mouth (DWOM), as posted on social media sites, on tourism demand in India. Results show that social media is becoming an increasingly relevant channel for tourists to obtain information about travel and to form travel decisions. Many survey respondents stated they regularly check social media sites for travel-related information and read online travel reviews prior to selecting their next destination. Also, several survey respondents expressed that recommendations made by fellow traveler's online travel reviews, directly influenced their perception of destinations, and their ultimate destination choice. Overall, these results show that social media, as well as other digital platforms, are transforming how tourists search for travel related information, providing them with direct access to real experiences and opinions of others, thus reducing uncertainty when planning trips.

In conclusion, this study shows that digital word-of-mouth, significantly contributes to increased tourism demand; and increases tourist's attitudes, perceptions and travel intent. For example, posting travel pictures, videos or online reviews can be a great way to inspire people to visit new

destinations and ultimately create destination preference. These results also clearly show the increasing relevance of user generated content and peer-to-peer communications in the tourism industry. As such, tourism organizations and destination marketers need to proactively utilize social media and promote positive online engagement to increase destination awareness and attract potential tourists. Creating and strengthening your organization's digital communication strategy can also assist you in creating a positive destination image and will result in an increase in tourism demand in today's highly competitive digital tourism environment.

Research Limitations

There are numerous limitations to this study which need to be considered when determining the implications from the study's results. The first limitation is that the study employed a convenience sampling methodology (i.e., surveying people at tourist attractions) so it may not be possible for the findings to be generalized to the greater population of tourists in India. The sample was comprised of 257 respondents who used social media actively and therefore the results are more likely reflective of the views of digitally engaged tourists rather than all varieties of tourists. The second limitation is that the data were collected through a self-report questionnaire, which can lead to response bias (i.e., respondents providing socially acceptable or subjectively biased responses). In addition, the focus of the study was on how digital word-of-mouth impacts demand for tourism and did not include an examination of other possible influences of demand (e.g., cultural influences, economic conditions, personal travel motivations) that may have an effect on a traveler's decision to visit a destination. Therefore, future studies could potentially alleviate some of these limitations by employing larger and more representative samples, utilizing qualitative methodologies, and investigating additional variables that may impact demand for tourism in the digital tourism marketplace.

References

- Almeida, S., & Costa, R. (2024). From likes to luggage: The role of social media content in attracting tourists. *Heliyon*, 10(5), e27035. [\(PDF\) From Likes to Luggage: The Role of Social Media Content in Attracting Tourists](#)
- Cuong, T., & Anh, N. T. N. (2025). The influence of electronic word of mouth on travel intention: The role of destination image and attitude. *Multidisciplinary Science Journal*, 8(3), e2026177. [\(PDF\) The influence of electronic word of mounth on travel intention: The role of destination image, and attitude](#)
- Dwivedi, Y. K., Ismagilova, E., Hughes, D. L., Carlson, J., Filieri, R., Jacobson, J., Jain, V., Karjaluoto, H., Kefi, H., Krishen, A. S., Kumar, V., Rahman, M. M., Raman, R., Rauschnabel, P. A., Rowley, J., Salo, J., Tran, G. A., & Wang, Y. (2021). Setting the future of digital and social media marketing research: Perspectives and research propositions. *International Journal of Information Management*, 59, 102168. [Setting the future of digital and social media marketing research: Perspectives and research propositions - ScienceDirect](#)
- Gretzel, U., Sigala, M., Xiang, Z., & Koo, C. (2015). Smart tourism: Foundations and developments. *Electronic Markets*, 25(3), 179–188. [\(PDF\) Smart tourism: foundations and developments](#)
- Hudson, S., Roth, M. S., Madden, T. J., & Hudson, R. (2015). The effects of social media on emotions, brand relationship quality, and word of mouth: An empirical study of music festival attendees. *Tourism Management*, 47, 68–76. [The effects of social media on emotions, brand relationship quality, and word of mouth: An empirical study of music festival attendees](#)
- Kaewnaknaew, C. (2024). Electronic word of mouth (E-WOM) affecting tourism destination choice. *Advance Knowledge for Executives*, 3(4), 49–60. https://www.researchgate.net/publication/394235171_Electronic_Word_of_Mouth_E-WOM_Affecting_the_Tourism_Destination_Choice
- Leung, D., Law, R., van Hoof, H., & Buhalis, D. (2013). Social media in tourism and hospitality: A literature review. *Journal of Travel & Tourism Marketing*, 30(1–2), 3–22. [Social Media in Tourism and Hospitality: A Literature Review](#)
- Lian, S. B., & Liew, C. Y. (2018). Customer engagement in social media and tourism brand performance implications. *The Turkish Online Journal of Design, Art and Communication*, 8(Special Edition), 1186–1194. [\(PDF\) Customer Engagement in Social Media and Tourism Brand Performance Implications](#)

Lončarić, D., Ribarić, I., & Farkaš, V. (2016, April). *The role of electronic word-of-mouth in the tourism market*. In *Tourism & Hospitality Industry 2016: Trends and Challenges* (pp. 188–203). 23rd Biennial International Congress, Opatija, Croatia. University of Rijeka, Faculty of Tourism and Hospitality Management.

https://www.researchgate.net/publication/305332025_THE_ROLE_OF_ELECTRONIC_WORD-OF-MOUTH_IN_THE_TOURISM_MARKET

Lou, C., & Yuan, S. (2019). Influencer marketing: How message value and credibility affect consumer trust of branded content on social media. *Journal of Interactive Advertising*, 19(1), 58–73. [\(PDF\) Influencer Marketing: How Message Value and Credibility Affect Consumer Trust of Branded Content on Social Media](#)

Nassar, A. (2021). Influence of electronic word of mouth on destination image and their impact on visiting interests and decisions: A case study on millennial travelers. In *Proceedings of the International Conference on Applied Science and Technology on Social Science 2021 (ICAST-SS 2021)* (Advances in Social Science, Education and Humanities Research, Vol. 647, pp. 45–52). Atlantis Press. [\(PDF\) Influence of Electronic Word of Mouth on Destination Image and Their Impact on Visiting Interests and Decisions: \(A Case Study on Millennial Travelers\)](#)

Nguyen, T. K. T., Ngo, T. T., & Vuong, T. H. (2025). The impact of electronic word-of-mouth and destination image on tourist loyalty in agritourism. *Environment and Social Psychology*, 10(2), e3520. [\(PDF\) The impact of electronic word-of-mouth and destination image on tourist loyalty in agritourism](#)

Ogut, H., & Othieno, A. N. (2025). Current research trends on social media marketing and sustainable tourism. *Journal of Tourism and Hospitality Management*, 13, 1–18. [\(PDF\) Current Research Trends on Social Media Marketing and Sustainable Tourism](#)

Widiantoro, A. B., Ardiansyah, R. E., & Ferdinand, A. T. (2024). The effect of social media marketing on intention to visit through local wisdom. *Research Horizon*, 4(6), 344–355. [View of The Effect of Social Media Marketing on Intention to Visit Through Local Wisdom](#)

Živković, R., Gajić, J., & Brdar, I. (2014). The impact of social media on tourism. In *SINTEZA 2014 – E-Business in Tourism and Hospitality Industry* (pp. 758–763). Singidunum University. [\(PDF\) The Impact of Social Media on Tourism](#)

Zulkarnaen, W., Andriyani, Y., Fitriani, I. D., Aghnia, N. L., & Humaeriyah, H. (2025). The role of electronic word of mouth (e-WOM) in influencing the decision to go on holiday to the natural tourism of Mount Tangkuban Parahu in West Java. *MORFAI Journal*, 3(1), 373–379. [\(PDF\) THE ROLE OF ELECTRONIC WORD OF MOUTH \(e-WOM\) IN INFLUENCING THE DECISION TO GO ON HOLIDAY TO THE NATURAL TOURISM OF MOUNT TANGKUBAN PARAHU IN WEST JAVA](#)

REAL-TIME AI MONITORING IN HOSPITALITY ENVIRONMENTS: APPROACH TO CUSTOMER SATISFACTION MEASUREMENT

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Abstract

Digital transformation is reshaping the hospitality industry, particularly in how customer satisfaction is conceptualized and measured. Traditional approaches rely heavily on self-reported, post-experience evaluations, which limit real-time responsiveness and overlook behavioral expressions of guest experience. Addressing this limitation, the present study introduces a non-intrusive artificial intelligence (AI) system that captures real-time behavioral indicators of customer satisfaction through facial and gesture recognition technologies.

An empirical study was conducted in two four-star hotels in Riga, Latvia, analyzing 139 service interaction observations collected via the AI-enabled system. The behavioral data were systematically compared with guest questionnaire responses to assess the validity and managerial relevance of AI-generated satisfaction indicators. The results demonstrate that behavioral signals not only align with traditional survey measures but also provide earlier detection of service quality issues, enabling more timely managerial intervention.

By shifting the focus from self-reported evaluations to continuously observable behavioral cues, this study reconceptualizes customer satisfaction as a dynamic and measurable construct. The findings contribute to the literature on service management and digital transformation by establishing non-intrusive AI monitoring as a complementary measurement paradigm and a foundation for proactive, data-driven service quality management.

Keywords: customer satisfaction, digital transformation, non-intrusive artificial intelligence (AI), real-time service quality management

Introduction

The hospitality industry has reached a stage at which digital transformation is no longer optional but strategically necessary. Over the past decade, the adoption of digital technologies in service design, operations, and customer interaction has accelerated significantly, particularly in response to global disruptions (Buhalis & Sinarta, 2019; Gretzel et al., 2020). Hotels increasingly rely on data-driven systems to personalize services, optimize workflows, and enhance customer engagement. In this context, customer satisfaction is not only a performance indicator but also a key determinant of loyalty, online reputation, and long-term competitiveness.

Within this evolving landscape, innovation plays a critical role in redefining how customer satisfaction is measured. Traditionally, satisfaction has been assessed through post-experience tools such as surveys, comment cards, and online reviews. Although widely used, these methods present several structural limitations. They are inherently retrospective and provide limited support for real-time corrective action. Response rates are often low, leading to potential sampling bias (Dolnicar,

2019), while feedback tends to overrepresent extreme experiences and underrepresent moderate ones. As a result, managers frequently rely on delayed and potentially distorted signals of service quality.

Advances in artificial intelligence create an opportunity to reconsider how satisfaction is measured and managed. AI-powered systems can analyze behavioral cues, emotional signals, and interaction patterns as service encounters occur. In hospitality contexts, non-intrusive AI systems that operate without requiring active guest participation are consistent with the broader concept of smart hospitality and ambient intelligence (Gretzel et al., 2015). Such systems do not replace human service interactions; rather, they provide managers with additional information that may support faster and more informed responses.

Despite these advancements, existing approaches to measuring customer satisfaction remain largely retrospective and dependent on voluntary self-reporting, limiting their usefulness for real-time service management. This study aims to evaluate the feasibility and validity of a non-intrusive AI-based system for capturing real-time behavioral indicators of customer satisfaction in hospitality settings. An empirical study was conducted in two four-star hotels, using observational data collected through an AI-enabled system based on facial and gesture recognition. By focusing on practical implementation rather than algorithmic development, the study contributes to ongoing discussions on digital transformation by examining how AI can support a shift toward proactive and data-driven service management.

Literature Review

Quality of service and customer satisfaction in the hospitality industry

According to Oliver (2014), customer satisfaction is the cognitive and emotional evaluation of the extent to which a service experience meets expectations. In hospitality research, satisfaction is closely linked to perceived dimensions of service quality, including reliability, responsiveness, assurance, empathy, and tangibles (Parasuraman et al., 1988). A substantial body of empirical research shows that satisfaction is positively associated with customer loyalty, revisit intention, and word-of-mouth behavior (Chi & Qu, 2008; Rather, 2021).

Recent research has increasingly emphasized the experiential dimension of hospitality services, showing that emotional responses during service encounters exert a strong influence on overall evaluations (Ali, et al., 2018). Emotional engagement, courteous staff interactions, and a sense of personalization contribute to satisfaction in ways that extend beyond purely functional performance measures.

These findings suggest that real-time behavioral indicators can provide complementary insights beyond conventional service quality metrics.

Despite extensive research, these approaches largely conceptualize customer satisfaction as a reflective, self-reported construct, with limited attention to how satisfaction may be inferred from observable behavioral cues during service encounters

Digital change in the hospitality industry

Digital transformation refers to the integration of digital technologies into organizational processes in ways that reshape how value is created and delivered (Cha, 2020). In tourism and hospitality, major developments have included online booking platforms, mobile check-in, AI-driven chatbots,

service robots, and predictive analytics (Ivanov & Webster, 2019). These technologies are typically adopted to improve efficiency, increase personalization, and create competitive differentiation.

Digital transformation, however, is not merely a technological process. It also requires organizational adaptation, cultural change, and strategic alignment (Kraus et al., 2021). Nevertheless, much of the existing literature focuses on efficiency and personalization, with limited focus on how digital technologies can redefine the underlying logic of customer satisfaction measurement.

AI and feedback in real time

In service environments, artificial intelligence is increasingly used for predictive analytics, automation, and personalization (Huang & Rust, 2021). Researchers have also examined emotion-recognition technologies, including gesture detection and facial-expression analysis, as tools for understanding customer reactions during service encounters (Morshed et al., 2021).

Within the hospitality sector, AI-enabled features have been shown to influence customer satisfaction and perceptions of service quality (Tussyadiah, 2020). Most feedback systems, however, remain reactive, as they rely on information collected after the service experience has ended. The integration of non-intrusive AI systems capable of generating real-time signals therefore represents an emerging and practically relevant field of applied research. Moreover, these approaches typically treat behavioral data as supplementary rather than as a primary basis for satisfaction measurement.

While prior studies have explored emotion recognition and AI-enabled interaction analysis, these approaches are often examined in experimental or controlled contexts. Empirical evidence on the real-world implementation of non-intrusive, continuous behavioral monitoring systems in hospitality settings remains limited.

Ethical and regulatory issues

When biometric or behavior related data are used in AI systems, adherence to ethical and legal standards is essential. The General Data Protection Regulation (GDPR) in the European Union classifies biometric data as sensitive and requires a lawful basis for processing, transparency regarding data use, and data minimization (European Parliament and Council of the European Union, 2016). Responsible AI governance extends beyond legal compliance to include fairness, accountability, and explainability (Floridi et al., 2018).

Customer trust is a central condition for technology acceptance. Belanche et al. (2020) argue that individuals may be less willing to engage with AI-enabled systems when such systems are perceived as intrusive or insufficiently transparent. For that reason, non-intrusive design, clear communication, and visible safeguards are important components of long-term implementation in hospitality settings.

These concerns are particularly relevant for non-intrusive behavioral monitoring systems, where data collection occurs without active user input, raising important questions regarding transparency and acceptance.

Research Gap

Although previous research has examined a wide range of artificial intelligence applications in hospitality, much of that literature focuses on automation technologies such as service robots, chatbots, and predictive analytics designed to improve operational efficiency or personalization (Ivanov & Webster, 2019; Tussyadiah, 2020). Similarly, customer satisfaction research has traditionally relied on retrospective feedback mechanisms, including surveys, review platforms, and

post-stay questionnaires (Dolnicar, 2019). While these approaches provide valuable insights, they typically capture customer perceptions only after the service experience has already taken place.

Recent advances in artificial intelligence and behavioral analytics suggest that service experiences may also be monitored in real time through non-intrusive technologies such as gesture and facial recognition. However, empirical research examining the practical implementation of such systems in hospitality environments remains limited. In particular, there is insufficient evidence on how AI-based behavioral monitoring can complement traditional feedback mechanisms while operating within ethical and regulatory constraints.

More importantly, existing research does not adequately address whether customer satisfaction can be operationalized as a real-time, behaviorally observable construct rather than a retrospective self-reported evaluation. This study addresses that gap by examining the feasibility of a non-intrusive AI-enabled system designed to generate real-time indicators of guest satisfaction in hotel environments. By analyzing its application in two hospitality settings, the research contributes to the emerging discussion on responsible AI adoption, behavioral monitoring, and real-time service management in the hospitality industry.

Framework of Ideas

The conceptual framework of this research positions non-intrusive AI as a supplementary layer within service management systems. It proposes a process-oriented model in which non-intrusive AI functions as a behavioral sensing layer within service management systems:

The framework consists of five interconnected stages:

- 1) behavioral data collection,
- 2) aggregation into satisfaction signals,
- 3) visualization through managerial dashboards,
- 4) operational response and service adjustment,
- 5) improvement of customer experience.

Unlike traditional feedback mechanisms, non-intrusive AI systems do not require guests to participate explicitly. Instead, they identify simplified behavioral indicators during service interactions. These indicators are aggregated to generate interpretable patterns of customer satisfaction at the service level; rather, they are aggregated and translated into general satisfaction trends. Managers can observe these patterns in real time, which allows them to identify changes in service quality at an earlier stage.

This model is consistent with the theory of smart tourism ecosystems, which conceptualizes tourism systems as interconnected digital networks that support dynamic decision-making (Gretzel, et al., 2015). By embedding sensing technologies into service environments, hotels can move from retrospective evaluation toward more immediate and proactive forms of service management. The conceptual model illustrates how non-intrusive AI monitoring systems collect behavioral signals during guest-staff interactions and transform them into aggregated satisfaction indicators. These AI-generated signals are analyzed alongside operational service quality factors such as staff performance, food quality, cleanliness, and hotel facilities. The combined analysis enables managers to monitor customer satisfaction patterns and identify service performance trends in real time. Figure 1 presents the conceptual framework of AI-based monitoring for customer satisfaction in hospitality environments. The framework conceptualizes non-intrusive AI as a behavioral sensing layer embedded within service operations. It illustrates how guest interactions are captured through

behavioral data, which are then aggregated into satisfaction indicators and visualized through managerial dashboards.

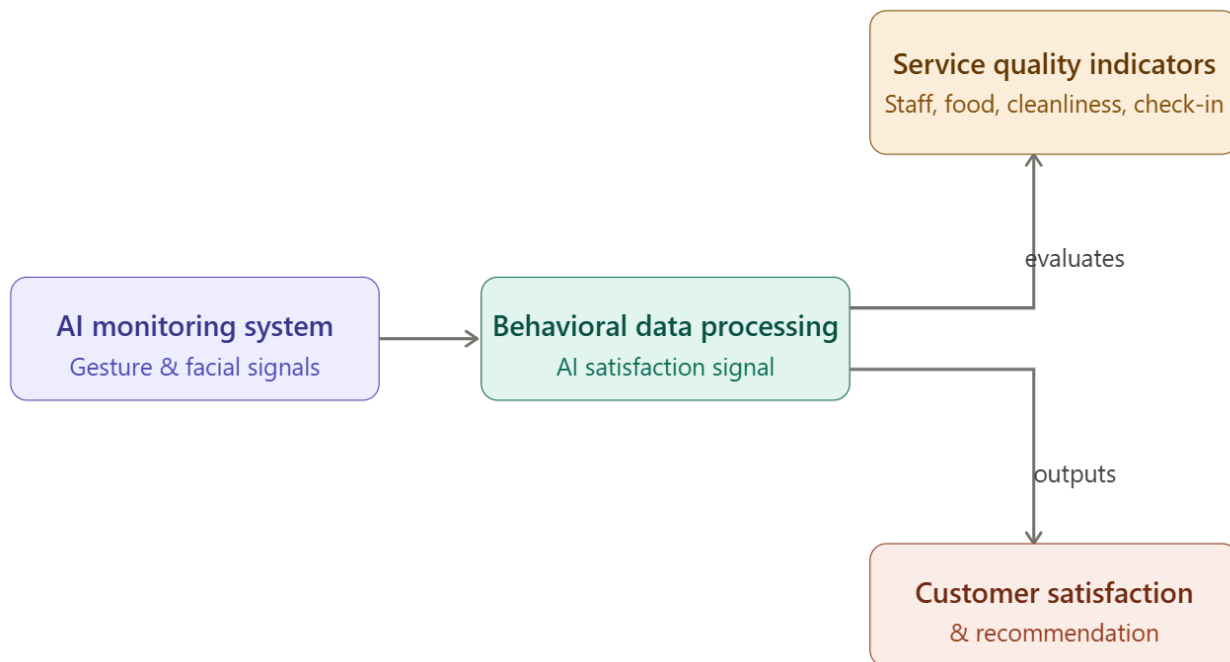


Figure 1. Conceptual framework of AI-based monitoring for customer satisfaction in hospitality environments

Methodology

This study employed an applied empirical research design based on observational data collected in real service environments. The research was conducted in two four-star hotels located in Riga, Latvia. Data were collected from 139 interaction records included in the final analysis after preprocessing, which involved the removal of false detections and outliers. The selected hotels operate in comparable market segments and maintain similar service standards. The AI-based system recorded guest like/dislike gestures, and these behavioral indicators were subsequently compared with questionnaire-based evaluations of service quality. The resulting outputs were treated as behavioral indicators of customer satisfaction generated by the system interface

Data collection system

The AI-based system incorporated the following technological components.

The AI-based system integrated multiple technological components, including machine learning algorithms for continuous model refinement, facial recognition to identify the primary subject within the interaction frame, image processing techniques to detect body gestures and estimate demographic characteristics, and pose estimation methods to analyze movement patterns.

Gesture detection was integrated within the visual recognition pipeline to identify positive and negative guest reactions.

The AI-based system was installed in reception areas, where guests frequently interact with hotel staff. The system captured broad demographic patterns and translated gesture-based feedback into

simplified indicators of satisfaction. No facial images were stored in a manner that could be linked to an identifiable individual. In order to comply with GDPR requirements, all data were processed in real time.

The collected data were analyzed using both descriptive and inferential statistical techniques. Descriptive statistics were first applied to summarize the dataset, including the frequency and percentage distribution of AI-detected positive and negative gesture signals, as well as the mean satisfaction scores obtained from questionnaire responses.

To evaluate the consistency between AI-generated behavioral indicators and traditional feedback mechanisms, a comparative analysis was conducted between gesture-based signals and survey results across key service quality dimensions. In addition, correlation analysis was used to examine the relationship between AI-detected satisfaction signals and self-reported customer satisfaction levels. These procedures were used to assess the reliability of AI-based behavioral indicators as a complementary measure of customer satisfaction of AI-based monitoring systems as a complementary tool for measuring customer satisfaction in hospitality environments, which is consistent with the study's managerial objective.

The collected data were analyzed using both descriptive and inferential statistical techniques in order to evaluate the relationship between AI-generated behavioral signals and questionnaire-based customer satisfaction measures. Descriptive statistics were first used to summarize the dataset, including the frequency and percentage distribution of AI-detected positive and negative gesture signals as well as the mean and standard deviation of the questionnaire-based satisfaction scores. Because the questionnaire responses were measured using ordinal Likert-type scales, Spearman's rank correlation coefficient was applied to examine the association between AI-detected behavioral indicators and self-reported customer satisfaction levels. In addition, cross-tabulation analysis was conducted to compare categorized AI signals (positive vs. negative) with categorized questionnaire responses (satisfied vs. dissatisfied). The statistical association between the two variables was tested using the chi-square test of independence. To further assess the level of agreement between the AI-based behavioral classification and the questionnaire-based satisfaction categories, Cohen's kappa coefficient was calculated. All statistical analyses were conducted using standard statistical procedures, and statistical significance was evaluated at the level of $p < 0.05$. Descriptive statistics were first calculated to summarize the distribution of service quality indicators. Because the variables in the dataset were coded as binary indicators (1 = positive evaluation, 0 = negative evaluation), the mean values represent the proportion of guests who expressed positive evaluations for each service dimension.

Correlation analysis was then conducted to explore the relationships between selected service quality indicators. However, several variables in the dataset (including cleanliness, hotel facilities, overall satisfaction, and recommendation intention) showed no variation across observations, as all responses were coded as positive evaluations.

Since variables with zero variance cannot be used in correlation analysis, the correlation analysis was conducted only for variables that showed sufficient variation in the dataset, including staff quality, check-in process, responsiveness to guest requests, food quality, and bed comfort.

Research Results

The results showed that the AI system detected observable patterns in customer satisfaction. Gesture-based feedback showed a positive association with survey-based assessments of customer satisfaction. In particular, staff responsiveness and the quality of interpersonal interaction emerged as important factors influencing overall satisfaction. The analysis further revealed that customer satisfaction varied across specific dimensions of service quality. Higher satisfaction scores were observed for employee behavior, cleanliness, and food quality. Guests reporting positive evaluations in these dimensions also reported higher overall satisfaction.

Differences were also observed across age groups, with younger guests showing more receptivity to technology-enabled service environments.

Descriptive statistics were calculated to summarize the service quality evaluations collected from hotel guests. The analysis included 139 valid observations after removing empty rows and non-response entries. Staff quality received a mean score of 0.91 (SD = 0.29), while the quick check-in process obtained a mean value of 0.87 (SD = 0.34). The responsiveness to guest requests recorded a mean value of 0.94 (SD = 0.25). Similarly, bed comfort and food quality received mean scores of 0.92 (SD = 0.27). Cleanliness, hotel facilities, overall satisfaction, and the intention to recommend the hotel recorded a mean value of 1.00, indicating no variation across observations.

Several service quality variables showed no variation in the dataset due to a lack of variance (all observations were positive). Consequently, correlation analysis was performed only for service dimensions that contained both positive and negative responses.

Discussion

The findings indicate that non-intrusive AI systems can enhance digital transformation strategies in the hospitality sector by enabling real-time monitoring of customer satisfaction. By providing real-time indicators of customer satisfaction, such systems enable a more proactive approach to service management than retrospective feedback tools alone. At the same time, the use of these technologies must be accompanied by ethical governance. To foster trust, it is essential to communicate clearly with guests, limit data collection to what is necessary, and explain the purpose and boundaries of the system. However, the implementation of such systems requires careful attention to ethical governance, including transparency, data minimization, and user trust (Belanche et al., 2020).

AI-based monitoring should therefore be used as a complement to, rather than a substitute for, traditional surveys. Surveys provide detailed qualitative and evaluative insight, whereas AI systems offer continuous signals regarding emerging patterns. The integration of both approaches enables a more balanced and responsive feedback system. The dataset shows a strong concentration of positive responses across several service quality indicators. This pattern can be explained by the context of the study, which was conducted in two four-star hotels operating under established hospitality quality standards. This pattern likely reflects the consistently high service standards associated with four-star hospitality environments but rather as a reflection of the operational service standards typically associated with upper-midscale hospitality establishments.

Previous hospitality research also indicates that customer satisfaction scores in hotel environments are often positively skewed due to service standardization and customer experience management practices (Dolnicar, 2019; Rather, 2021). Although the overall satisfaction variable shows limited

variation in the dataset, the analysis of individual service dimensions such as staff quality and food quality provides additional insight into how AI-detected behavioral indicators correspond with operational service factors.

This study contributes by demonstrating that customer satisfaction can be operationalized as a real-time, behaviorally observable construct rather than solely a retrospective self-reported evaluation.. At the same time, the study highlights the importance of responsible governance, transparency, and data protection when implementing AI technologies in customer-facing environments.

This study examined the feasibility of using a non-intrusive AI-based monitoring system to assess customer satisfaction in hospitality environments. The results indicate that gesture- and facial-recognition signals generated by the AI system were broadly consistent with guest feedback collected through traditional questionnaires. These findings suggest that AI-enabled monitoring tools can complement existing feedback mechanisms by providing real-time indicators of service performance and enabling managers to identify potential service quality issues more quickly.

This study is subject to several limitations. The empirical analysis was limited to two hotels within a specific market segment, which may restrict the generalizability of the findings. In addition, limited variability in several service quality variables constrained certain statistical analyses. Future research should examine more diverse hospitality contexts and explore the integration of behavioral and self-reported data across different service settings.

Overall, non-intrusive AI monitoring systems represent a viable complementary tool for improving customer experience management in hospitality organizations. When implemented responsibly and combined with traditional feedback methods, such systems can support more proactive and data-driven service management.

References

- Ali, F., Kim, W. G., Li, J., & Jeon, H. M. (2018). Make it delightful: Customers' experience, satisfaction and loyalty in Malaysian theme parks. *Journal of Destination Marketing & Management*, 7, 1–11. <https://doi.org/10.1016/j.jdmm.2016.05.003>
- Belanche, D., Casaló, L. V., & Flavián, C. (2020). Artificial intelligence in hospitality: Customer perceptions and willingness to use AI-enabled services. *International Journal of Hospitality Management*, 89, 102585. <https://doi.org/10.1016/j.ijhm.2020.102585>
- Belanche, D., Casaló, L. V., Flavián, C., & Schepers, J. (2020). Service robot implementation: A theoretical framework and research agenda. *The Service Industries Journal*, 40(3–4), 203–225. <https://doi.org/10.1080/02642069.2019.1672666>
- Bulchand-Gidumal, J., Secin, E. W., O'Connor, P., & Buhalis, D. (2024). Artificial intelligence's impact on hospitality and tourism marketing: Exploring key themes and addressing challenges. *Current Issues in Tourism*, 27(14), 2345–2362. <https://doi.org/10.1080/13683500.2023.2229480>
- Buhalis, D., & Sinarta, Y. (2019). Real-time co-creation and nowness service: Lessons from tourism and hospitality. *Journal of Travel & Tourism Marketing*, 36(5), 563–582. <https://doi.org/10.1080/10548408.2019.1592059>
- Cha, S. S. (2020). Customers' intention to use robot-serviced restaurants in Korea: Relationship of coolness and MCI factors. *International Journal of Contemporary Hospitality Management*, 32(9), 2947–2968. <https://doi.org/10.1108/IJCHM-01-2020-0046>
- Chi, C. G., & Qu, H. (2008). Examining the structural relationships of destination image, tourist satisfaction, and destination loyalty. *Tourism Management*, 29(4), 624–636. <https://doi.org/10.1016/j.tourman.2007.12.005>
- Davoodi, L., Mezei, J., & Heikkilä, M. (2025). Aspect-based sentiment classification of user reviews to understand customer satisfaction of e-commerce platforms. *Electronic Commerce Research*. Advance online publication. <https://doi.org/10.1007/s10660-025-09948-4>
- Dolnicar, S. (2019). Market segmentation analysis in tourism: A perspective paper. *Tourism Review*, 74(1), 45–56. <https://doi.org/10.1108/TR-02-2019-0041>
- European Parliament and Council of the European Union. (2016). *Regulation (EU) 2016/679 (General Data Protection Regulation)*. <https://eur-lex.europa.eu/eli/reg/2016/679/oj>

- Floridi, L., Cows, J., Beltrametti, M., Chatila, R., Chazerand, P., Dignum, V., Luetge, C., Madelin, R., Pagallo, U., Rossi, F., Schafer, B., Valcke, P., & Vayena, E. (2018). AI4People – An ethical framework for a good AI society. *Minds and Machines*, 28, 689–707. <https://doi.org/10.1007/s11023-018-9482-5>
- Gretzel, U., Fuchs, M., Baggio, R., Hoepken, W., Law, R., Neidhardt, J., Pesonen, J., Zanker, M., & Xiang, Z. (2020). e-Tourism beyond COVID-19: A call for transformative research. *Information Technology & Tourism*, 22, 187–203. <https://doi.org/10.1007/s40558-020-00181-3>
- Gretzel, U., Sigala, M., Xiang, Z., & Koo, C. (2015). Smart tourism: Foundations and developments. *Electronic Markets*, 25(3), 179–188. <https://doi.org/10.1007/s12525-015-0196-8>
- Huang, M.-H., & Rust, R. T. (2021). A strategic framework for artificial intelligence in marketing. *Journal of the Academy of Marketing Science*, 49, 30–50. <https://doi.org/10.1007/s11747-020-00749-9>
- Ivanov, S., & Webster, C. (2019). *Robots, artificial intelligence, and service automation in travel, tourism, and hospitality*. CABI
- Kraus, S., Durst, S., Ferreira, J. J., Veiga, P., Kailer, N., & Weinmann, A. (2021). Digital transformation: An overview of the current state of the art. *Journal of Business Research*, 123, 879–889. <https://doi.org/10.1016/j.jbusres.2020.10.061>
- Morshed, G., Ujir, H., & Hipiny, I. (2021). Customer's spontaneous facial expression recognition. *Indonesian Journal of Electrical Engineering and Computer Science*, 22(3), 1436–1445. <https://doi.org/10.11591/ijeecs.v22.i3.pp1436-1445>
- Oliver, R. L. (2014). *Satisfaction: A behavioral perspective on the consumer*. Routledge. <https://doi.org/10.4324/9781315700892>
- Parasuraman, A., Zeithaml, V. A., & Berry, L. L. (1988). SERVQUAL: A multiple-item scale for measuring consumer perceptions of service quality. *Journal of Retailing*, 64(1), 12–40
- Rather, R. A. (2021). Customer experience and engagement in hospitality: A review and research agenda. *International Journal of Hospitality Management*, 92, 102722. <https://doi.org/10.1016/j.ijhm.2020.102722>
- Tussyadiah, I. P. (2020). A review of research into automation in tourism: Launching the Annals of Tourism Research curated collection on artificial intelligence and robotics in tourism. *Journal of Hospitality and Tourism Technology*, 11(3), 279–299. <https://doi.org/10.1108/JHTT-07-2020-0189>

HUMANIZING HRM: A CROSS-CULTURAL QUALITATIVE STUDY OF EMOTIONAL INTELLIGENCE AND MATTERING PRACTICES IN LATVIA AND INDIA

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Abstract

Today's workplaces continue to face major difficulties such as disinterest among employees, lack of trust, and negative views of their significance. This study investigates how HR professionals in Latvia and India perceive and apply emotionally intelligent and mattering based HRM practices. Using purposive sampling four senior HR professionals (two from each country) participated in semi-structured interviews. The data was analysed through thematic analysis technique developed by Braun and Clarke (2006). The comparative thematic analysis reveals that both cultures value mattering and emotional intelligence but their interpretation differs; Latvia focuses on individual recognition and autonomy whereas India emphasizes hierarchical and relational acknowledgment. HRM practices which are supported by emotional intelligence emerged as mechanism shaping engagement, trust and well-being. Although limited in its sample size, this study combines literature and empirical insights to provide exploratory evidence for culturally sensitive HRM and lays the foundation for future research in cross-cultural emotionally intelligent HRM.

Keywords: Cross-Cultural Management, Emotional Intelligence, Employee Engagement, Human Resource Management, Mattering at Work

Introduction

The sense of feeling valued plus adding value along with workplace engagement are important factors for organizational success. Elements like productivity, innovation and retention are directly proportional to mattering and engagement (Flett, 2021; Scarpa et al., 2021). Disengagement is a persistent global issue. The Gallup report shows that only 14 to 21 percent of employees show active engagement while 87 percent of employees worldwide show no complete engagement. The U.S. experiences annual economic losses of 450-550 billion dollars. The labor market suffers because of decreased productivity, increased employee turnover and absenteeism (Li et al., 2021). In Latvia, such trends are also found with a slight improvement in figures. In 2022, engagement increased from 17% in 2020 to 24%. However, it is still lower than EU average (Budrienė & Diskienė, 2020; Wiczorek-Szymańska, 2024). Disengagement is most noticeable in knowledge-based sectors, making a 40% of urban employment, including Riga, limited recognition, unclear career prospects, and minimal influence on decision-making, which worsens the situation (Gaile et al., 2022; Škapars et al., 2017). The European working conditions survey highlights the fact (Li et al., 2020). The cost is high, as disengaged Latvian employees have 1.5-2 times higher turnover, which hampers knowledge retention, collaboration, and innovation, while increasing stress and psychological distress (Budrienė & Diskienė).

Emotional intelligence in leadership and Human Resource Management (herein after HRM) emerges as a potential solution enhancing psychological safety, interpersonal relationships and elevated morale (Levitats et al., 2022). EI-supportive HRM practices have a top-down impact on engagement through superior EI behavior, which counters exhaustion (Levitats et al., 2022). Leaders' skill in emotion perception, understanding, and regulation provides a setting where employees feel recognized and cared for (Coronado-Maldonado & Benítez-Márquez, 2023). Supplementing EI, mattering that encompasses intrapersonal relational, occupational, and community aspects of mattering can enhance trust, well-being, and performance by emphasizing one's importance and contributions (Paradisi et al., 2024; Scarpa et al., 2021). However, although mattering and EI are associated with individual and team performance, the combination of these concepts into HRM systems for organizational promotion is an uncharted area (Flett, 2021).

The gap becomes more pronounced when people from different cultures interact in globalized environments which require organizations to create inclusive workplaces where all people can contribute their unique skills and talents (Rattrie et al., 2019). The existing literature largely investigates mattering and EI at micro-levels with little empirical attention to HRM in the context of cultural differences (Scarpa et al., 2021). Latvia's individualistic, autonomy-driven norms contrast sharply with India's collectivist emphasis on relational recognition and hierarchy (Gunkel et al., 2016) influencing mattering and EI effectiveness in HRM (Walter et al., 2024). The shortage of cross-cultural research on these dynamics restricts understanding which organizations in knowledge sectors can use to adjust their operational methods (Walter et al., 2021).

This exploratory qualitative study fills this void by investigating the perceptions of HR professionals regarding EI and mattering-based HRM practices in Latvia and India through semi-structured interviews. By comparing two culturally dissimilar settings, this study highlights how morals, leadership and values influence perceptions, providing practical suggestions on how to improve engagement, inclusion, and reduce turnover.

Literature Review

Strategic Human Resource Management (SHRM) and Mattering

Strategic Human Resource Management (SHRM) has evolved into an important discipline that is responsible for the alignment of the organization's policies, resources, and practices with its overall strategic goals, thereby maximizing not only employee but also organizational outcomes (Boxall & Purcell, 2016). In the very center of SHRM lies the policy and practice of human resources being integrated in a systematic way to achieve long-term objectives of the organization. Thus, taking care of employees, their engagement, and retention become not just operational concerns but vital aspects of the organizations' competitiveness. Within this scenario, mattering theory suggests that when employees realize that their contributions are recognized, appreciated, and significant, they become more involved, efficient, and loyal (Rosenberg & McCullough, 1981; Prilleltensky, 2020, Paradisi et al., 2024; Scarpa et al., 2021).

By the mattering theory, Strategic HRM practically incorporates that in all the organization's levels starting from recruitment, job design, and performance appraisal to talent development and leadership accountability. For example, performance appraisal which clearly recognizes contributions of individuals and teams can increase the employees' feeling of importance. On the other hand, the fair

allocation of resources and clear job roles give employees a certificate of proof that their work is acknowledged by the organization (Boxall & Purcell, 2016). Moreover, an HR strategy that consists of mechanisms for continuous employee engagement, like participative decision-making, cross-functional collaboration, and leadership development, will make sure that mattering becomes a routine rather than an occasional occurrence in the organization (Prilleltensky, 2020). Recent studies underscore how caring HRM practices, which emphasize employee well-being and development, further amplify engagement by fostering psychological safety and resilience (Aldabbas & Blaique, 2025).

In Latvia, socially open and individualistic employees, along with a strong need for personal freedom and recognition, contribute to the strengthening of the whole matter through the acknowledgment of direct recognition, decision-making power, and the overhearing of communication in the organizations (CSB, 2022; OECD, 2022; Gaile et al., 2022; Gunkel et al., 2016). On the other hand, in India where societal values like collectivism, hierarchy, and recognition in relationships prevail, the impact of mattering is different. Mattering is more pronounced through social or hierarchical recognition of the team contributions, thus mirroring a wider acknowledgment network (Hofstede, 2001; Gelfand et al., 2017). These variations signify that SHRM systems cannot afford to be culturally rigid and must thereby be equipped to partner HR policies and practices in such a way that they coincide with local cultures, expectations, and values.

Recent studies continue to prove that companies applying strategic HRM practices in sync with mattering will see large increases in employee engagement and retention rates. Harter, Schmidt, and Hayes (2002) found that organizations with the highest engagement experience up to 21% greater productivity and 22% greater profit than their low-engagement counterparts. This serves to suggest that mattering has gone beyond being a psychological construct and is now firmly established as a measurable factor in driving organization performance.

Emotional Intelligence as a Quality Dimension in HRM

Human Resource Management has always been focused on aspects like procedural efficiency, compliance, and administrative quality. But, the modern HRM literature is beginning to recognize the quality dimensions of emotions and relationships where the psychological experiences of employees can be engaged (Ashkanasy & Dorris, 2017; Levitats et al., 2022; Mayer, Salovey, & Caruso, 2004; Ashkanasy et al., 2017). Emotional intelligence (EI) is defined as the ability to perceive, understand, regulate and influence emotion and it has become a necessary trait of leaders, HR practitioners, and organizational frameworks. Research has shown that leaders with high emotional intelligence not only increase trust, teamwork, and satisfaction in their departments but also promote behaviors that are good for the organization as a whole (Goleman, 1998; Ashkanasy, 2017).

It is through the EI integration in HRM that the employees will be the ones who will experience the support, recognition and psychological safety. For instance:

- Empathetic performance feedback indicates the strengths and weaknesses of an employee while at the same time enhancing his/her position within the organization.
- Mentoring and coaching in hierarchical settings provides not only social support but also personal growth.
- Open decision-making processes remove the perception of inequity and boost leadership trust.
- Support during the organizational change helps the employees to cope with stress, uncertainty, and ambiguity, which in turn boosts the perception of mattering (Mayer, Salovey, & Caruso, 2004).

Cross-cultural studies show that EI's effectiveness differs. In individualist cultures like Latvia, expressive EI is effective to promote autonomy, whereas in collectivist countries like India, relational EI is effective to promote group harmony (Walter et al., 2023). Few studies have emphasized the challenges faced by HR in building EI in such divides, but EI plays a crucial role in global HRM (Walter et al., 2023).

Risk Management in HRM

Although both quality and strategy play a significant role, HRM risk management will still be the factor that determines the sustainability of the organization since it will already take care of the threats to engagement, psychological safety, and organizational culture. Typical HR risk management has mainly been about compliance or financial aspects; however, the new view has put the psychological and cultural risks in the spotlight as the main determinants of organizational success (Prilleltensky, 2020; Pillai Binu Bhaskaran et al., 2025).

Risks that are prone to occur in mattering-based HRM (MB-HRM) are as follows:

- *Psychological risks*: disengagement of employees, stress among workers, burnout and low trust level.
- *Operational risks*: inconsistent policies, ineffective communication or HR programs that are not implemented properly.
- *Cultural risks*: misaligned recognition, ineffective cross-cultural communication or failure to adapt HR interventions to local norms.

Among the effective risk management practices, scenario planning, cultural audits, continuous employee feedback loops and adaptive HR policies are very effective. As an instance, organizations spanning Latvia and India should consider the differences in the levels of hierarchy as well as the differences in the collectivist versus individualist values and the employee recognition expectations (Hofstede, 2001; Gelfand et al., 2017). Research has found that firms that have risk-aware HRM strategies implement the disengagement rates (up to 20%) and turnover (Saks, 2006) will be lower. Therefore, risk management guarantees that mattering-focused initiatives will be not only well-intended but on the contrary, sustainable, resilient, and impactful.

Cross-Cultural Considerations in HRM: Latvia vs India

Cross-cultural studies have found that the most important factors influencing the perception of mattering and the success of HR interventions are cultural norms (Hofstede, 2001; Gelfand et al., 2017). The employees in Latvia want to be treated openly, given the freedom to make their own choices, and receive direct recognition for their work, which corresponds to the individualist and low power distance index of the country. Recognition is usually based on tasks or achievements, thus bringing individual contribution and accountability into consideration.

On the other hand, Indian employees are in a collectivist and hierarchical setting where recognition in relationships, mentoring and team-based acknowledgment are the ones that really matter. Rituals of recognition, hierarchical sanction and social acknowledgment are often combined in the Indian work culture and HR practices, which make the employees feel very much valuable and significant in the organization (Hofstede, 2001).

These differences call for the application of culture-friendly HRM practices in performance management processes, leadership-building programs, and reward schemes that are not undermined by standardization. Blended strategies that integrate direct and relationship-building

dimensions of performance management promote inclusivity, participation, and competition (Testa, 2007; Malik et al., 2022).

Research Gap

Although the antecedent literature strongly confirms the relevance of fSHRM, mattering, and EI, there is a lack of research exploring the interplay of these variables in cross-cultural settings, especially from the viewpoint of HR professionals in knowledge-intensive industries. Furthermore, although engagement and mattering have been investigated at micro-levels (individual and team levels), the integration of these variables into overall HRM strategies in culturally dissimilar settings is still an uncharted area. The current research aims to fill this research void by exploring HR professionals' views on mattering- and EI-focused HRM practices in Latvia and India.

Overall, based on the literature review on strategic human resource management, emotional intelligence, and mattering, this study uses a conceptual perspective to frame the essential relationships that are pertinent to cross-cultural HRM practice. The existing body of knowledge has shown that emotionally intelligent HRM practices and mechanisms of recognition influence employees' feelings of value and belonging, although cultural settings mediate these practices.

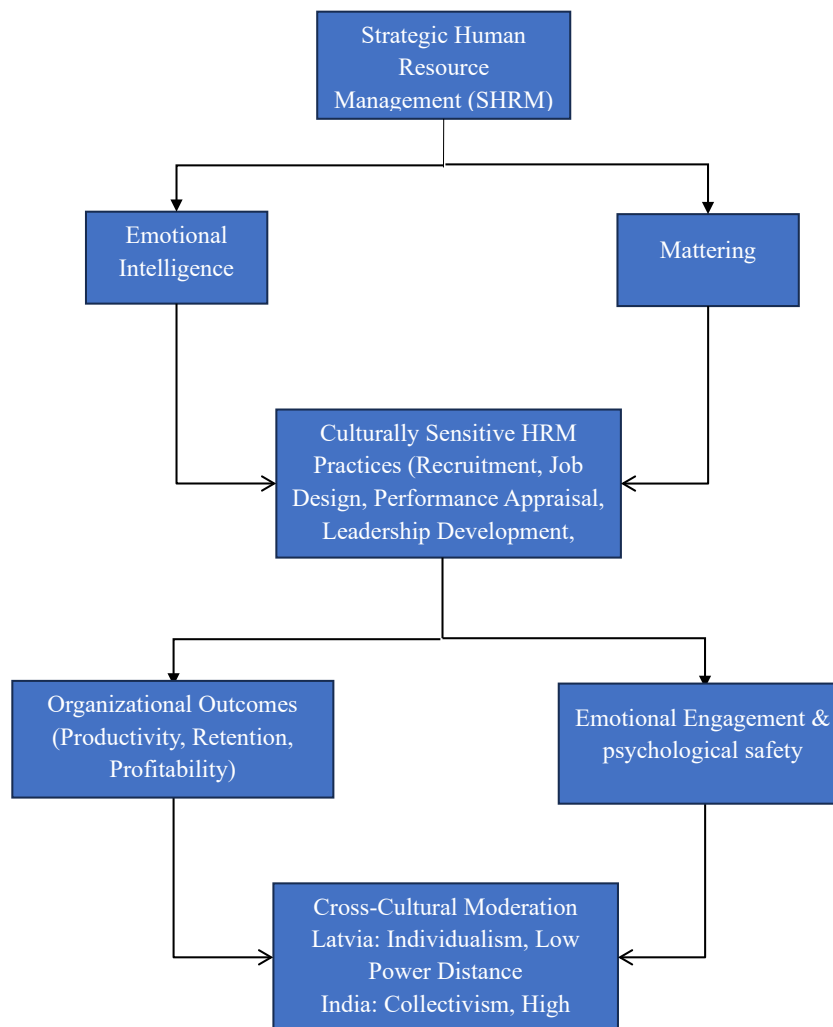


Figure 1. Theoretical relationships among SHRM, Emotional Intelligence and Mattering

Figure 1 represents the relationship between these elements and highlight their cross-culture relevance in the context of Latvia and India.

Methodology

Research question

This research is based on the following question: What is the understanding of HR experts in Latvia and India about the influence of emotional intelligence and mattering on HRM practices in their specific cultural contexts? The inquiry is exploratory and framed in the manner of allowing the experts' interpretations, experiences and context understandings rather than testing any set hypotheses.

Research design

The study uses a qualitative exploratory research design which researchers use to study complex phenomena that depend on specific contexts and social constructions (Creswell & Poth, 2018; Denzin & Lincoln, 2018). Qualitative research enables researchers to study how individuals interpret their experiences which leads to the creation of meaning within particular social and cultural (Isik Turrkey, 2025)

The current article examines the perceptions and applications of emotional intelligence and mattering by HR professionals in the context of HRM practices through a qualitative approach. Due to the limited research on the interplay of mattering, emotional intelligence, and HRM across cultures, an exploratory design is appropriate for identifying themes and patterns to inform future theory development (Stebbins, 2001).

Research Process

The research procedure was a series of sequential stages that guaranteed methodological rigor and coherence.

To begin with, a vast literature review was performed with the purpose of uncovering the existing research on emotional intelligence, mattering at work, employee engagement, strategic HRM and cross-cultural management. The literature review also revealed the gaps in the current research and guided the overall direction of the study.

Next, some of the insights gained from the literature review were employed for the creation of the semi-structured interview guide. The questions in the interview were framed in such a way as to stimulate thoughts around HR practices that are emotionally intelligent, recognition and appreciation experiences, leadership style, and the impact of cultural norms on HRM.

The next step was to carry out expert interviews with HR practitioners from Latvia and India. The expert interviews provided the main source of empirical data.

The fourth and last step was transcription, coding, and thematic analysis of the collected interview data. The analysis process led to the discovery of the recurring themes as well as the intext-specific differences that existed between the two cultural settings.

Data Collection Methods

Participant Selection

The research utilized purposive sampling, wherein the individuals were chosen according to their qualifications and the subject matter. The number of HR specialists that got involved in the research was two:

- Two HR professional based in Latvia
- Two HR professional based in India

All four participants had prior experience in human resource management and were involved in organizational decision-making processes related to employee management, leadership development, or organizational culture.

Interview Method

Data collection was performed through semi-structured expert interviews which made it possible to keep a balance between the rigidity and the flexibility of the method. This approach guaranteed that the essential issues were covered during the interviews conducted with different people, but at the same time, it allowed the interviewees to speak more about their culturally specific experiences and viewpoints.

The interviews revolved around the following subjects:

- The comprehension of emotional intelligence in HRM
- Recognition and mattering of employees' experiences and practices
- The influence of leadership behavior on the engagement and trust
- HR policies and HR decision-making affected by culture

The interviews were held on google meet application and took 45 to 60 minutes.

Data Analysis Methods

The analysis of the interview data was carried out by means of a thematic analysis, which followed the systematic approach of Braun and Clarke (2006). The analysis involved the following steps:

- 1) Familiarization with the data through repeated reading of interview transcripts
- 2) Initial coding to identify meaningful units related to emotional intelligence, mattering, HRM practices, and cultural context
- 3) Grouping codes into broader themes
- 4) Reviewing and refining themes to ensure internal coherence and distinction
- 5) Interpreting themes in relation to existing literature and the research question

A comparative thematic approach was applied to examine similarities and differences between the Latvian and Indian expert perspectives. This comparison enabled the identification of culturally influenced patterns in how emotionally intelligent and mattering-oriented HRM practices are understood.

Ethical Considerations

Throughout the study the ethical principles were to a high degree strictly observed. The research's goal, the voluntary nature of their participation, and their right to withdraw at any moment were all outlined to the participants. Measures were taken to ensure that no identifying information would

be linked to the transcripts and research outputs thus maintaining privacy and confidentiality. All participants gave their informed consent before the actual collection of data.

Research Limitations

The research is based on a small number of participants, which gives a preliminary insight into the subject matter but does not enable generalization. Moreover, since the research is qualitative in nature, the findings are no more than a subjective interpretation of the experience of the participants. Nonetheless, the research offers some useful insights and serves as a basis for future research with a larger number of participants.

Findings and Discussion

The thematic analysis of semi-structured interviews with four HR experts (two from Latvia, two from India) gave **four major themes**:

- understanding mattering in HRM
- emotional intelligence as a facilitator of supportive HRM
- recognition and feedback practices
- cultural influences on HRM: Latvia vs India

Understanding mattering in HRM

Across both cultures, experts consistently positioned mattering as a foundational mechanism enhancing engagement, trust, and well-being. The experts from Latvia characterized mattering as a very subjective experience, giving emphasis to personal recognition and meaningful contributions:

“Employees want to feel that their work has impact and that their ideas are heard. When the individual contribution is recognised, it makes them feel valued.”

In contrast, the Indian expert emphasized the social and relational dimensions of mattering, where recognition is intertwined with team achievements and hierarchical acknowledgment:

“Employees feel they matter when their team achievements are recognized, and when managers acknowledge their role in the success of the group. Respect from seniors is very important.”

This indicates that mattering is not a universal psychological phenomenon that is perceived in the same way in all contexts, but it is culture-cantered in its perception.

Emotional Intelligence as a facilitator of supportive HRM

All four experts emphasized that EI is central in creating supportive HRM practices. In Latvia, the focus was on empathy, understanding and interpersonal sensitivity:

“Understanding employees’ emotional state helps managers provide support when needed and prevents disengagement. EI is part of every HR interaction.”

In India, the emphasis was on balancing emotional awareness with hierarchical respect.

“Leaders must balance authority with empathy. Showing understanding without compromising hierarchy makes employees feel valued.”

Subthemes: EI in leadership and HR Processes

Leadership: High EI leaders were pointed out by the professionals as the ones who were able to create an atmosphere of trust and psychological safety. In the case of Latvia, open dialogue and collaborative

problem-solving were the most important means, while in India, mentoring and relational guidance were the major aspects of the Indian case.

Conflict Resolution: EI assisted managers in understanding emotional signals and resolving conflicts in the workplace in a very effective way.

Employee Support: A leader with high emotional intelligence would be able to recognize the signs of stress and burnout very early and therefore, he/she would be able to intervene in time.

Thus, these findings suggest that EI not only operates as a personal leadership quality but also as a relational capability practiced in the context and within the norms of culture. This pattern suggests that emotional intelligence is functional not only as an individual competency but as a culturally calibrated relational approach.

Recognition and feedback practice

Recognition emerged as a critical pathway for fostering mattering. The Latvian experts emphasized the importance of formal performance appraisals coupled with informal feedback:

“Employees appreciate clear performance reviews, but even small informal acknowledgment of effort makes a difference.”

The Indian expert highlighted public acknowledgment, hierarchical praise, and team-based recognition:

“Public praise from seniors and board of directors along with valuable feedback sessions help employees feel that their contributions are valued and meaningful.”

Subthemes: Feedback, Incentives, and Development

Feedback Quality: Constructive and empathetic feedback was appreciated in both settings, although the nature of the feedback varied.

Incentives: In Latvia, material rewards emphasized individual success, while in India, relational rewards, such as recognition by a senior manager, mattered more.

Professional Development: Opportunities for learning and mentorship were perceived as recognition of employees’ long-term value in both contexts.

Although both settings emphasized the quality of feedback and development opportunities, the type of recognition was very different. In Latvia, feedback was task-centered and direct. In India, it was relationship-oriented and status-conscious.

This implies that recognition practices are a means of translating cultural values into HR practices that influence employees’ perceptions of their organizational value.

Cultural Influences on HRM: Latvia vs India

The findings in table 1 suggests that HR practices cannot be culturally neutral, they are embedded within the social value systems.

Table 1

Cross-Cultural Dimensions Influencing Employee Mattering in Latvia and India

Cultural Dimension	Latvia Characteristics	India Characteristics
Individualism and Collectivism	High individualism: autonomy and personal freedom	High collectivism: group harmony, relationship building
Power distance	Low: egalitarian, direct feedback	High: hierarchical respect, mentoring =
Recognition and mattering	Direct acknowledgment, task-based recognition	Team-based recognition, social values embedded
Uncertainty Avoidance	Moderate: flexible, risk-taking	High: strict rules, formal structure

In general, the comparison above highlights that the experience of mattering is culturally contingent, such that HRM systems must strike a balance between autonomy-based recognition in Latvia and relationship-based recognition in India.

Discussion

The problem in universality of mattering

The results problematize the implicit universality of mattering that challenges the existing literature on mattering. Much of the existing research has posited mattering as a fairly stable psychological phenomenon that is rooted in perceived significance and value. However, the results of this study show that mattering is not a culture-free phenomenon in terms of its organizational enactment.

In the Latvian context, mattering is organized around autonomy and individual voice validation. This pattern is consistent with the individualism–collectivism dimension proposed by Geert Hofstede, which predicts autonomy-oriented validation in more individualistic societies. In the Indian context, mattering is organized around collective recognition and hierarchical validation. Similarly, the emphasis on relational and hierarchical validation in India reflects collectivist and higher power distance cultural tendencies identified in Hofstede’s framework. This poses a critical theoretical question.

Is mattering a psychological phenomenon that takes different forms across cultures or is mattering a culturally mediated social phenomenon whose meaning is produced in context? The results of this study suggest the latter. Mattering is not simply a phenomenon that varies in degree across cultures; it varies in structure. In egalitarian cultures, mattering is significance that is internally anchored and performance-based. In hierarchical collectivist cultures, mattering is significance that is externally validated and relationally embedded.

Theories of mattering that suggest universality may thus be subject to oversimplification. The phenomenon may need to be reconceptualized as a culturally contingent organizational phenomenon rather than a purely intrapsychic one.

Emotional Intelligence: Contextual Competence Rather Than Universal Skill

The results also challenge the prevailing view of emotional intelligence (EI). Emotional intelligence is commonly understood as a universally valuable leadership characteristic that is linked to empathy, openness, and psychological safety. However, the current results indicate that the functional form of EI is contextually contingent.

In the Latvian context, EI is realized through direct emotional engagement and open communication. This aligns with competency-based interpretations of emotional intelligence advanced by Daniel Goleman, while also suggesting that its behavioral expression is culturally shaped. In the Indian context, EI is realized through contextually calibrated empathy that maintains hierarchical distance. This finding extends Goleman's emotional intelligence framework by indicating that effective emotional regulation may require culturally appropriate modulation of empathy and authority.

This raises a significant theoretical tension: Is EI defined by behaviour (e.g., openness, transparency) which is culturally contingent in its effectiveness? Or is EI a socially defined norm (adaptive emotional regulation) that is contextually embedded by definition?

Therefore, EI needs to be theoretically reconceptualized from a static competency framework to a normatively adaptive capability framework. Its effectiveness is reliable on cultural fit.

Recognition as Symbolic Governance

Recognition is identified as the central institutional process through which mattering becomes operationalized. Nevertheless, the results suggest that recognition is more than a motivational practice; it is symbolic governance.

In Latvia, recognition strengthens individual meritocracy and individual accountability. In India, public and hierarchical recognition strengthens relational hierarchy and collective identity.

This suggests a structural implication: HR systems are more than motivational practices for employees they reproduce cultural logics in organizations. Global recognition structures may therefore create misalignment. A performance-based recognition system developed in an individualistic context may not produce perceived mattering in a collectivist context if it disregards relational symbolism and authority endorsement.

Therefore, the HRM literature needs to transcend the instrumental understanding of recognition and develop a sociocultural understanding of recognition as institutional meaning-making.

Contextualized Model of HRM and Mattering

The findings of the study suggest a relation model which is presented in Figure 1.

- EI influence leadership behaviour
- Leadership behaviour frames the recognition practice
- Recognition practices produce perceive mattering
- Cultural context moderates each variable

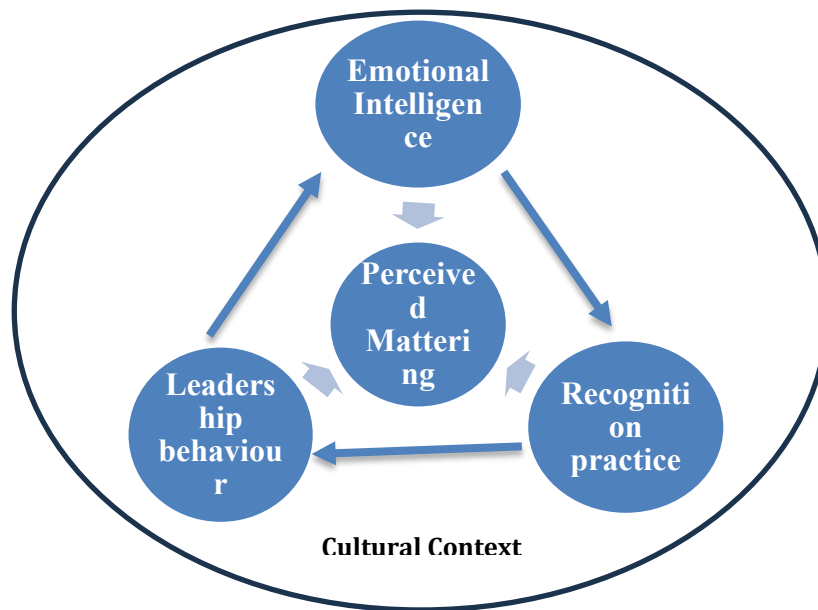


Figure 2. Culturally Moderated HRM Pathway to Perceived Mattering

From figure 2 it can be deduced that Emotional Intelligence (EI) influences Leadership Behaviour, which in turn affects Recognition Practices, ultimately leading to Perceived Mattering. Culture moderates each step of the process, impacting the way EI and HRM practices are linked to employees' perceptions of value. This suggests that HR practices cannot be simply transferred from one context to another. Instead of asking how EI and recognition influence mattering, a more specific question arises: Under what cultural circumstances will particular EI behaviors and recognition systems produce perceived mattering?

The research thus contributes to the literature on contextualized HRM by showing that culture is more than a contextual variable; it is an active structuring mechanism that shapes psychological outcomes.

Theoretical contribution

The study makes the following major contribution

- Reconceptualization of Mattering - It advances the mattering theory by placing it culturally sensitive rather than universality
- Reconceptualization of Contributions – This research contributes to EI theory by considering it as culturally adaptive relational competence, rather than universally enacted leadership style.
- Institutionalization of Recognition - This research contributes to recognition theory by showing that recognition practices are cultural translation mechanisms in HR systems.

These three theoretical contributions of this research combine micro-level psychological theories with macro-level cultural theories.

Limitations

The exploratory nature and small expert sample size restrict generalizability. The study is a reflection of HR professionals' views, not individual-level experiences. Moreover, the choice of Latvia and India as countries provides a strong contrast based on cultural differences, and results may vary in other comparisons that are more culturally similar.

Practical Implications

- Standardization of global HR practices could negatively impact employee mattering if culturally inappropriate.
- Culturally adapted emotional intelligence training for leaders should be an integral part of the HR professionals' work.
- Recognition and performance systems should be designed in such a way that they show the local cultural norms.
- Trust, empathy and culturally appropriate engagement strategies should be the main focus of the leadership development programs.
- HR policies and decision-making processes should take into account the local cultural values and expectations in order to reinforce the employees' mattering.

These findings open up the possibility for further studies of larger scale, theory development, and practically in HR areas of culturally diverse organizations.

Future studies should take a multi-level approach and draw on the views of employees, managers, and HR practitioners to gain a complete range of organizational experiences. These studies can empirically examine the proposed moderated model to confirm the relationships between Emotional Intelligence, leadership behaviour, recognition practices, and perceptions of mattering across cultures. In addition, the generalizability of the results can be explored by conducting this study on other cultures. Finally, it would be interesting to explore the potential of hybrid recognition practices, which combine culturally specific and universal approaches, to promote convergence in employees' perceptions of mattering across different organizational contexts.

References

- Aldabbas H, Blaique L (2025), "How can caring human resource management practices affect employee engagement?". *International Journal of Productivity and Performance Management*, Vol. 74 No. 7 pp. 2245–2268, doi: <https://doi.org/10.1108/IJPPM-09-2023-0500>
- Ashkanasy, N. M., Humphrey, R. H., & Huy, Q. N. (2017). Integrating Emotions and Affect in Theories of Management. *Academy of Management Review*, 42(2), 175–189. <https://doi.org/10.5465/amr.2016.0474>
- Boxall, P., & Purcell, J. (2003). Strategy and Human Resource Management. *Management Decision*, 41(5), 523–524. <https://doi.org/10.1108/00251740310479368>
- Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology*, 3(2), 77–101. <https://doi.org/10.1191/1478088706qp0630a>
- Central Statistical Bureau of Latvia (CSB). (2022). *Social and cultural indicators in Latvia*. <https://www.csb.gov.lv>
- Coronado-Maldonado, Isabel & Benítez-Márquez, María-Dolores. (2023). Emotional intelligence, leadership, and work teams: A hybrid literature review. *Heliyon*. 9. e20356. DOI: <https://doi.org/10.1016/j.heliyon.2023.e20356>.
- Creswell, J.W. and Poth, C.N. (2018) *Qualitative Inquiry and Research Design Choosing among Five Approaches*. 4th Edition, SAGE Publications, Inc., Thousand Oaks. Retrieved from https://pubhtml5.com/enuk/cykh/Creswell_and_Poth%2C_2018%2C_Qualitative_Inquiry_4th/#google_vignette
- Daiva Budriene & Danuta Diskiene, 2020. "Employee Engagement: Types, Levels And Relationship With Practice Of Hrm," *Malaysian E Commerce Journal (MECJ)*, Zibeline International Publishing, vol. 4(2), pages 42-47, June. DOI: <http://10.26480/mecj.02.2020.42.47>
- Denzin, N. K., & Lincoln, Y. S. (Eds.). (2018). *The SAGE Handbook of Qualitative Research* (5th ed.). Los Angeles, CA: Sage. Retrieved from https://www.academia.edu/109978749/The_Sage_Handbook_of_Qualitative_Research_Norman_K_Denzin_y_Yvonna_S_Lincoln_Ed
- Flett, G. L. (2021). An Introduction, Review, and Conceptual Analysis of Mattering as an Essential Construct and an Essential Way of Life. *Journal of Psychoeducational Assessment*, 40(1), 3-36. <https://doi.org/10.1177/07342829211057640> (Original work published 2022)

- Flett, G. L. (2021). An Introduction, Review, and Conceptual Analysis of Mattering as an Essential Construct and an Essential Way of Life. *Journal of Psychoeducational Assessment*, 40(1), 3-36. <https://doi.org/10.1177/07342829211057640> (Original work published 2022)
- Gaile, A., Baumane-Vitolina, I., & Sumilo, E. (2022). Examining subjective career success of knowledge workers. *Review of Managerial Science*, 16(6), 2135–2160. <https://doi.org/10.1007/s11846-022-00523-x>
- Gaile, A., Baumane-Vitolina, I., Kivipõld, K. et al. Examining subjective career success of knowledge workers. *Rev Manag Sci* 16, 2135–2160 (2022). <https://doi.org/10.1007/s11846-022-00523-x>
- Gelfand, M. J., Nishii, L. H., & Raver, J. L. (2006). On the nature and importance of cultural tightness-looseness. *Journal of Applied Psychology*, 91(6), 1225–1244. <https://doi.org/10.1037/0021-9010.91.6.1225>
- Goleman, D. (1998). *Working with emotional intelligence*. Bantam Books Retrieved from <https://donainfo.wordpress.com/wp-content/uploads/2017/09/emotional-intelligence-daniel-goleman.pdf>
- Gunkel, M., Schlaegel, C., & Taras, V. (2016). Cultural values, emotional intelligence, and conflict handling styles: A global study. *Journal of World Business*, 51(4), 568–585. <https://doi.org/10.1016/j.jwb.2016.02.001>
- Harter, J. K., Schmidt, F. L., & Hayes, T. L. (2002). Business-unit-level relationship between employee satisfaction, employee engagement, and business outcomes: A meta-analysis. *Journal of Applied Psychology*, 87(2), 268–279. <https://doi.org/10.1037/0021-9010.87.2.268>
- Hofstede, G. (2001). Culture's consequences: Comparing values, behaviors, institutions, and Organizations across Nations. *Behaviour Research and Therapy*, 41(7), 861–862. [https://doi.org/10.1016/s0005-7967\(02\)00184-5](https://doi.org/10.1016/s0005-7967(02)00184-5)
- Isik, O. (2025). Qualitative Research Approaches and Data Collection Methods: Understanding Meaning and Experience. *Journal of Humanities and Education Development*, 7(6), 19–32. <https://doi.org/10.22161/jhed.7.6.3>
- Levitats, Z., Ivcevic, Z., & Brackett, M. (2022). A world of opportunity: A top-down influence of emotional intelligence-related contextual factors on employee engagement and exhaustion. *Frontiers in Psychology*, 13. <https://doi.org/10.3389/fpsyg.2022.980339>
- Li, P., Sun, J.-M., Taris, T. W., Xing, L., & Peeters, M. C. W. (2021). Country differences in the relationship between leadership and employee engagement: A meta-analysis. *The Leadership Quarterly*, 32(1), Article 101458. <https://doi.org/10.1016/j.leaqua.2020.101458>
- Malik, A., Pereira, V., & Budhwar, P. (2018). Value creation and capture through human resource management practices. *Organizational Dynamics*, 47(3), 180–188. <https://doi.org/10.1016/j.orgdyn.2017.09.002>
- Marjaana Gunkel, Christopher Schlaegel, Vas Taras, Cultural values, emotional intelligence, and conflict handling styles: A global study, *Journal of World Business*, Volume 51, Issue 4, 2016, Pages 568-585, ISSN 1090-9516, <https://doi.org/10.1016/j.jwb.2016.02.001>.
- Mayer, J. D., Salovey, P., & Caruso, D. R. (2004). Emotional intelligence: Theory, findings, and implications. *Psychological Inquiry*, 15(3), 197–215. https://doi.org/10.1207/s15327965pli1503_02
- Neal M. Ashkanasy, Alana D. Dorris. 2017. Emotions in the Workplace. *Annual Review Organizational Psychology and Organizational Behavior*. 4:67-90. <https://doi.org/10.1146/annurev-orgpsych-032516-113231>
- Organisation for Economic Co-operation and Development (OECD). (2022). *OECD economic surveys: Latvia 2022*. OECD. Retrieved from https://www.oecd.org/en/publications/2022/03/oecd-economic-surveys-latvia-2022_b5d06d6f.html
- Paradisi, M., Matera, C. & Nerini, A. Feeling Important, Feeling Well. The Association Between Mattering and Well-being: A Meta-analysis Study. *J Happiness Stud* 25, 4 (2024). <https://doi.org/10.1007/s10902-024-00720-3>
- Pillai Binu Bhaskaran, Rita Biswas, Saraswathy. (2025). The Role of Human Resource Management in Organizational Risk Prevention and Crisis Management. *Journal of Informatics Education and Research*, 5(1). <https://doi.org/10.52783/jier.v5i1.2411>
- Prilleltensky, I. (2019). Mattering at the Intersection of Psychology, Philosophy, and Politics. *American Journal of Community Psychology*, 65(1-2). <https://doi.org/10.1002/ajcp.12368>
- Rattrie, L. T. B., Kittler, M. G., & Paul, K. I. (2019). Culture, Burnout and Engagement: A Meta-Analysis on National Cultural Values as Moderators in JD-R Theory. *Applied Psychology*, 69(1). <https://doi.org/10.1111/apps.12209>
- Roberts Skapars Et Al (2017). Productivity and its Impact on the Competitiveness of Latvia, *European Research Studies Journal* Volume XX Issue 3A, 920-930. Retrieved from <https://ersj.eu/journal/754#>
- Rosenberg, M., & McCullough, B. C. (1981). Mattering: Inferred significance and mental health among adolescents. *Research in Community & Mental Health*, 2, 163–182. Retrieved from <https://psycnet.apa.org/record/1983-07744-001>
- Scarpa MP, Di Martino S and Prilleltensky I (2021) Mattering Mediates Between Fairness and Well-being. *Front. Psychol.* 12:744201. doi: 10.3389/fpsyg.2021.744201 [Scarpa MP, Di Martino S and Prilleltensky I \(2021\) Mattering Mediates Between Fairness and Well-being. Front. Psychol. 12:744201. doi: 10.3389/fpsyg.2021.744201](https://doi.org/10.3389/fpsyg.2021.744201)
- Scarpa, M. P., Di Martino, S., & Prilleltensky, I. (2021). Mattering Mediates Between Fairness and Well-being. *Frontiers in Psychology*, 12. <https://doi.org/10.3389/fpsyg.2021.744201>

- Stebbins, Robert. (2001). Exploratory research in the social sciences: what is exploration?. Exploratory Research in the Social Sciences. 2-18. Retrieved from https://www.researchgate.net/publication/309967516_Exploratory_research_in_the_social_sciences_what_is_exploration
- Testa, M. R. (2009). National culture, leadership and citizenship: Implications for cross-cultural management. *International Journal of Hospitality Management*, 28(1), 78–85. <https://doi.org/10.1016/j.ijhm.2008.04.002>
- Walter, O., Kasler, J., & Routray, S. (2023). *Emotional Intelligence, Spiritual Intelligence, Depression and Anxiety, and Satisfaction with Life Among Emerging Adults in Israel and India*. <https://doi.org/10.21203/rs.3.rs-3132521/v1>
- Walter, O., Shenaar-Golan, V., & Routray, S. (2021). Cross-Cultural Comparison of How Mind-Body Practice Affects Emotional Intelligence, Cognitive Well-Being, and Mental Well-Being. *Frontiers in Psychology*, 12. <https://doi.org/10.3389/fpsyg.2021.588597>
- Wieczorek-Szymańska, Anna & Leoński, Wojciech. (2024). Koncepcja work-life balance we współczesnej organizacji. Jak wesprzeć pracownika w godzeniu ról i zapewnić sprawne funkcjonowanie organizacji?. Retrieved from https://www.researchgate.net/publication/383054487_Koncepcja_work-life_balance_we_wspolczesnej_organizacji_Jak_wesprzec_pracownika_w_godzeniu_rol_i_zapewnic_sprawne_funkcjonowanie_organizacji

HUMAN CAPITAL READINESS FOR DIGITAL TRANSFORMATION IN LATVIA: POLICY FRAMEWORKS, OPPORTUNITIES, AND BARRIERS

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Abstract

This study examines the readiness of human capital in Latvia for digital transformation, focusing on digital skills and preparedness to adopt artificial intelligence and advanced technologies. The purpose of the research is to assess the extent to which national policies support workforce readiness for digital transformation. The study combines a review of scientific literature on digital transformation and human capital development with qualitative policy analysis of national strategies related to education, labor market development, and digital innovation, as well as EU Digital Decade reports. The analysis focuses on policy priorities, institutional measures, and challenges affecting digital skills development in Latvia. The findings show that Latvia has established a strong strategic policy framework supporting digital transformation; however, digital skills development remains uneven across different segments of the workforce. The study highlights the need for stronger policy coordination and expanded lifelong learning initiatives to improve workforce readiness for emerging digital technologies.

Keywords: digital transformation, human capital, policy analysis, workforce readiness

Introduction

Digital transformation has become the main mover behind the economic competitiveness, innovation, and social development of the European Union. In this regard, the human capital readiness has become the prime prerequisite for the successful implementation of the digital transformation process, meaning the ability to provide digital skills and competencies to the human capital. Although the investment to enable the infrastructure and technology of digital transformation is required, it is inadequate to do through manpower with limited ability to implement these solutions.

As an EU member, Latvia has been very proactive in bringing its national development strategy in tune with the European Union's Digital Decade, with a focus on highly developed digital skills, upskilling, and ensuring equitable participation in the digital economy (European Commission, 2024e). During the preceding decade, there has been substantial development in the number of digital public services in the country, but the recent review reveals that there are shortcomings in digital skills, unpreparedness of the workforce, and human capital development matters (European Commission, n.d.; European Commission, 2024f).

The topicality of this research is supported by Latvia's policy commitments in national guidelines that include The Digital Transformation Guidelines 2021-2027, National Industrial Policy Guidelines 2021-2027, and Education Development Guidelines 2021-2027 (European Commission, 2024a;

European Commission, 2024b; European Commission, 2024c). These guidelines point out that human capital development is the foundation of smart or digital transformation, but at the same time, point out at systemic factors that include skills disparities, low engagement of lifelong learning of inhabitants, and disparities between education and workforce needs (European Commission, 2024a; European Commission, 2024b; European Commission, 2024c).

In the above context, it becomes imperative and timely to evaluate the readiness levels of the human capital within the Republic of Latvia and its transformative potential through digitalization. This will enable the development and analysis of knowledge and awareness of the support levels and deficiencies provided by the national policies in the development of digital knowledge.

Existing studies on the topic of digital transformation and the development of human capital in Latvia have focused on developing digital skills, labor flexibility, and organizational change as part of the technological change reaction, as demonstrated. The implications of digitalization on the skills of employees and labor-market requirements have been investigated in empirical studies, and specifically on the increasing importance of digital skills in remote-working conditions and rapid technological implementation during the COVID-19 context (Verina and Titko, 2021). Further research has examined wider aspects of digital preparedness and human capital creation within organizations highlighting the role of digital culture, skills creation and organizational reconfiguration in enabling digital change (Astuti, 2023; Murfi & Hendarman, 2023). In international institutions, reports of European Union monitoring and analysis of Latvia have assessed the Latvian national policies and its achievements in the implementation of digital transformation and digital skills policies (European Commission, 2024d; OECD, 2024). However, the literature available rarely provides the systematic analysis of the Latvia legislative and strategic policy frameworks influence on the human capital preparedness to digital change, specifically, its readiness to embrace artificial intelligence and more sophisticated technologies. As a result, the article is an addition to the academic discussion as it examines national policy frameworks and outlines the opportunities and challenges that affect developing digital skills and workforce readiness in Latvia.

Despite the presence of numerous strategies within the nation, in addition to initiatives supported at the EU level that have been employed in efforts towards encouraging digital transformation, issues regarding readiness within the human capital have continued to be a challenge for Latvia. This is supported through empirical evidence that suggests the major percentage of citizens lack basic digital competency, but also that of ICT experts and experts in digital technologies is still short of those set within the EU targets (European Commission, n.d.; European Commission, 2024f).

A critical issue relates to fragmentation regarding objectives and implementation outcomes in practice. There is no ambiguity that the national strategies cover skills development, upskilling of human resources, and lifelong learning, yet implementation scenarios have remained patchy in terms of sectors and social groups. The Digital Decade Strategic Roadmap 2030 marks human capital as one of its focal points, simultaneously pointing out that there is still limited engagement of adults in learning and enhancing digital competencies (European Commission, 2024d). Likewise, Education Development Guidelines 2021-2027 list incorporating digital skills in education, yet it remains patchy concerning implementing curricular reforms on digital skills at the labor-market interface (European Commission, 2024c).

Thus, the core problem being addressed in this research is related to the gap that exists between Latvia's digital transformation goals and current human capital readiness levels, which evolve as a function of enabling factors as well as structural elements.

The purpose of this study is to examine human capital preparedness for the digital transformation process within Latvia from the perspective of policy and the corresponding implications related to digital competency and preparation of the human capital.

The objective of this study is more specifically to:

- Explain and evaluate the most important opportunities, which arise through national and EU-compatible frames of policy focusing on human capital for digital transformation in Latvia.
- Identify the key factors that create challenges in acquiring skills in the digital age and preparing workers.
- Analyze the effect of national policies and government initiatives in shaping digital skill development and human capital, in the context of Latvia's position in the EU Digital Decade targets.

In this context, by exploring the mentioned research objectives, the study aims to support the generation of insights on the role of policy frameworks in influencing the human capital readiness for digital transformation, based on the case of Latvia.

Research questions

RQ: To what extent is the human capital in Latvia prepared for digital transformation in terms of digital skills and readiness to adopt AI and advanced technologies?

RQ1: What are the opportunities in Latvia that support human capital development for digital transformation?

RQ2: What barriers hinder human capital readiness for digital transformation in Latvia?

RQ3: How do national policies and governmental initiatives impact digital skill development and workforce readiness?

Literature Review

Human Capital Readiness: Concept and Implications

Human capital is generally defined as the skills, knowledge, abilities, and mindset required by people to be able to contribute to productivity development. In the case of the digital economy, it is observed that human capital is associated increasingly not only with technological skills but also with adaptability to technological innovation in work processes. In this sense, "human capital-readiness" related to digital transformation implies not only digital skills but also workers' adaptability.

Recent scientific texts point to the fact that human capital makes a central contribution to digital transformation and economic development. Empirical research indicates that a significant part of organizational and economic potential to embrace emerging digital technologies and improve productivity depends on investment in organizational knowledge, skills, and competencies. The studies of the connection between digital transformation and economic performance prove that the human capital investment serves as a mediating variable, increasing the effects of technological transformation on economic development (Jianfeng Liu & Xiang Xian, 2025). In the framework of

organizational change, the readiness of human capital is often understood as a complex of knowledge, technical skills, soft skills, and attitudes that enable employees to cope in the quickly changing technological settings (Ardanta & Sushandoyo, 2020). These studies indicate that the effectiveness of the digital transformation efforts is to a large extent dependent on the ability of the workforce to engage in lifelong learning, adapt, and embrace the new technologies into the daily routines. As a result, the problem of human capital development has become one of the main objects of research on the issue of digital economies transition and labor preparedness. Moreover, some academic findings indicate that readiness is not a one-dimensional characteristic but rather an individually and organizationally contingent factor. Thus, for example, studies examining digital culture transformation illustrate that employee readiness must encompass knowledge management, development, and, notably, attitudinal readiness for technological change (Astuti, 2023). In turn, the study examining the subject further in the context of digital transformation argues that digital transformation, as an activity, needs the preparatory work of the workforce regarding their competencies and contextual environments (Murfi & Hendarman, 2023). These two perspectives above illustrate theoretical foundations for claiming that digital transformation as an activity relies on human capital readiness as an outcome-defining factor.

In policy terms, the human capital angle is considered a strategic concern in the broader ICT development agenda of Latvia. As highlighted in the European Commission sources (European Commission, 2024a; European Commission, 2024b), the nation's strategic documents have always pointed out the need for "competent human resources" for the transition towards a digital economy to be supported in the ICT sectors. Accordingly, the readiness of the human capital is both (1) a policy objective and (2) a structural factor that determines the ability of the transformation towards the digital age to achieve specific outcomes.

Digital Transformation as a Cross-Sectoral System Change

In the Latvia's strategic documents, digital transformation is described widely enough to include its integration into public services, economic transformation through digitalization, and enhancing competitiveness (European Commission, 2024e). This is strongly embedded in the Digital Decade strategy of the EU that recognizes digital transformation not just as a technological change; however, a development agenda that has to achieve specific targets related to skills, connectivity, business digitalization, and public services (European Commission, 2024a).

The policy lens, accordingly, conceptualizes digital transformation as:

- **Macro level:** government strategies and targets in the EU, and national policy in terms of innovation (European Commission, 2024a).
- **Meso level** concerns institutional systems. These may include Education sector, Labor market institutions, public employment, etc. (European Commission, 2024a).
- **Micro level:** individual preparedness and attitudes at work and societal levels (European Commission, 2024a).

The digital transformation has received a lot of research as a multidimensional process in terms of technological, organizational, and cultural change. Current literature suggests that digital transformation does not involve the introduction of digital tools only; it implies the overall alteration of organizational processes, decision-making and value-generation mechanisms. Research related to the topic of digital transformation in human resource management indicates that the use of such technologies as artificial intelligence, knowledge management systems, and digital platforms can

significantly improve the functioning of organizations and employee competencies (El Garem, 2026). At the same time, scholars point out that effective digital revolution requires a strong organizational support system, such as leadership dedication, learning organization, and alignment of technology and human resources. Without these complementary factors, adoption of technology might not bring any significant transformation results. Based on this, modern studies are providing an increasing emphasis on the significance of combining technological innovation and human capital advancement and firm preparedness.

Policy Frameworks and Digital Skills Governance

A number of studies suggest theoretical frameworks to explain the way organizations and societies get ready to be digitized. Researchers go on to point to the fact that human capital growth ought to be a part of wider digital ecosystems that promote sustained learning, sharing knowledge, and cooperation among educational establishments, businesses, and policy makers (Qu, 2024). These models bring to light the fact that organizational success in digital transformation requires the alignment of the technological systems, organizational strategies, and human capital development, which helps to support the idea that workforce readiness is one of the key elements of the digital transformation strategies.

When it comes to assessing human capital readiness, there are typically three components that stand out in theory and research:

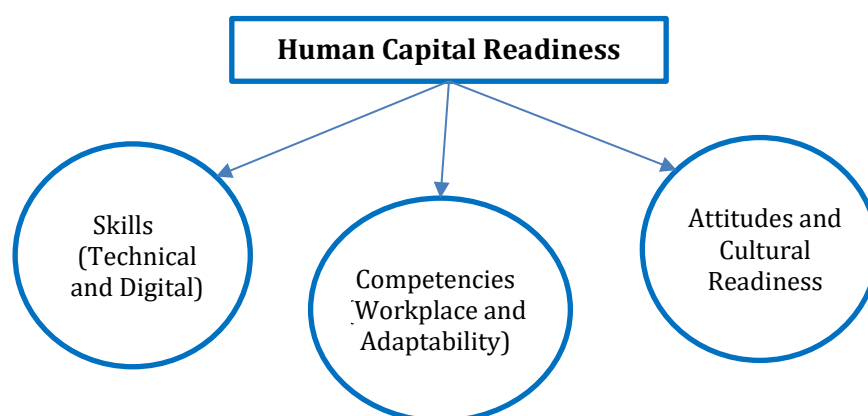


Figure 1. Human Capital Readiness Map

Skills (Technical and Digital). Basic skills in using ICT, digital literacy, and more advanced competencies in handling data, being aware of cybersecurity, and the use of AI-supported tools are all part of digital skills. As Verina and Titko (2021) reveal, academic research conducted during the COVID-19 period in Latvia has proven that digital transformation necessitated substantial employee competencies, especially in the environment of remote work and digitally mediated organizational processes, which retreats to the importance of workforce skill development.

Competencies (Workplace and Adaptability). Skills include wider skills like problem-solving skills, e-decision-making skills, communication skills, and learning skills. This is evident in the education strategy in Latvia that focuses on skills development based on labor market requirements (European Commission, 2024c).

Attitudes and Cultural Readiness. Getting ready to transform, attitude is one of the most influential predictors of transformation. Resistance to change, lack of concern about employment, poor feelings of trust, or perceived usefulness could decrease the efficiency of some policies. There is evidence that readiness is strongly affected by attitude and cultural adjustment in organizations (Astuti, 2023).

Research Methodology

The design of this research is a qualitative policy analysis that integrates:

- 1) document review, and
- 2) cross-policy comparison.

This methodology aims to examine Latvia's policy frameworks including the documents in the following fields:

- education and curriculum development
- workforce up-skilling
- digital inclusion measures
- labor market digitalization
- SME and industrial workforce upgrading.

Primary source of data collection in this paper is policy documents, and these documents contain national strategies of the respective countries in the areas of cyber transformation, education, and industry development (European Commission, 2021a; European Commission, 2021b), EU-level monitoring reports and digital skills summaries (European Commission, n.d.; European Commission, 2024), reports analyzing the institutional digitalization of Latvia (OECD, 2024), etc. Policy analysis in this study is considered appropriate in the research since the focus and objectives of the study are to analyze how policy frameworks in the government affect the level of workforce readiness instead of assessing specific attitudes and behaviors through survey or interview studies. In assessing the progress of Latvia, there are different methods employed, some of which include summaries and country performances in the EU's assessment (European Commission, n.d., European Commission, 2024d) and international analysis on digitalization and public service modernization in the labor markets in Latvia (OECD, 2024). By identifying policy priorities and opportunities, detecting gaps and barriers, and examining the alignment and effectiveness of policies, this study aims to answer the research questions.

Study Period

The scope for this analysis is limited by the period between 2019 and 2024 since the main Latvian country-specific strategic frameworks currently defining its process for a digital transformation were prepared as part of the policy period from 2021 through 2027 (European Commission, 2021a; European Commission, 2021b; European Commission, 2021c).

Also, Latvia's domestic priorities are influenced by several European Union-wide issues related to implementing a digital agenda on topics that include:

- The Digital Decade monitoring process and country reporting, (European Commission, 2024)
- The national Digital Decade Strategic Roadmap 2030. (European Commission, 2024).

Study Limitations

Despite the suitability of a policy analysis approach for the assessment of frameworks, strategies, or initiatives, there exist some limitations in this study.

1. Dependence on secondary sources

The study relies entirely on published government documents, as well as scientific publications, which ensure it may not be able to unveil underlying difficulties of a private nature, such as informal practices within organizational structures, capacity, or resistance.

2. Lack of Primary Empirical Fieldwork

Such a study, however, does not require interviews, surveys, or observation. Thus, such a study relies upon measurement of digital skill level based upon design and progress made from the policy level rather than citizens or employees.

3. Lack of ability to assess long-run consequences

Since several of the strategies are slated until 2027/2030, a full assessment of their impact on the labor market cannot be determined at this stage. Long-term impact measures are indicated for the EU Digital Decade reporting, but their success would depend on their long-term Implementation capacity.

Research Findings and Discussion

This research article is undertaken as a qualitative analysis study based on systematic reviews performed for Latvia's most crucial policy frameworks and available EU monitoring documents related to human capital preparedness for digital transformation. Though this article does not encompass any collection of original empirical information via tools like survey or interview methods, this document-based analysis qualifies as a "field study" in its applicable policy context due to its explorations related to practical, real-world approaches adopted by Latvia in terms of policy implementation, in addition to specific measurement criteria related to this process (European Commission, 2024a; European Commission, 2024e).

The policy analysis draws evidence from:

- 1) Latvia's multi-sector policy frameworks (digital transformation, education development, industrial policy)
- 2) EU Digital Decade reporting and skills monitoring, and
- 3) Institutional and labor market modernization evidence from international assessment of Latvian employment services (European Commission, 2024a; European Commission, 2024b; European Commission, 2024c; European Commission, 2024d; OECD, 2024).

Policy Landscape: What is Latvia Doing to Build Human Capital Readiness?

Latvia's digital transformation strategy framework consists of interconnected strategy documents on economic transformations, educational developments, labor market modernization, and improvement of public sector service delivery. The guidelines on Digital Transformation 2021-2027 have a broader national strategy that encompasses enhancing digital skills, the capacity to build digital society, and innovation in various sectors (European Commission, 2024a). This also finds emphasis in broader human capital strategies in the guidelines on Education Development in Latvia

2021-2027, which stressed competence-based education, modernization in educational materials, and digital skills as educational outcomes (European Commission, 2024c).

From an economic competitiveness point of view, the importance of workforce readiness is emphasized in Latvia to attain the modernization and productivity gains required in industry. The National Industrial Policy Guidelines 2021-2027 highlight the significance of innovation capacity and competitiveness while aligning with technological change, emphasizing digital knowledge and improvements to labor productivity (European Commission, 2024b). Notably, the agenda of the Digital Decade makes the accountability of policies more achievable, providing clear EU-wide goals that also demand the adoption of strategic roadmaps at the national level. The Digital Decade Strategic Roadmap 2030 in Latvia acts as an aligning tool to support EU levels regarding human capital (European Commission, 2024a).

RQ1: What are the opportunities in Latvia that support human capital development for digital transformation?

Opportunity 1: High alignment with national strategy and integration of policies.

A significant opportunity which exists in the context of the digital transformation of Latvia is the fact that the country's digital transformation strategy is not being addressed through a stand-alone strategy, but rather within a strategic framework. This is facilitated through the Digital Transformation Guidelines for the years 2021 through 2027, which support a strategic vision on the development of the country's digital paradigm, along with educational, as well as industrial strategic frameworks, which address the strategic vision of the country on the readiness of its human capital (European Commission, 2024a, European Commission, 2024b, European Commission, 2024c).

Opportunity 2: EU Governance Framework (Digital Decade) - Enhancing National Accountability.

The EU Digital Decade monitoring process offers a significant opportunity to define and assess readiness in terms of human capital on both a national goal and a performance basis. The readiness of Latvia's human capital stands to be measured on a constant basis using EU reporting instruments, such as the Latvia 2024 Digital Decade Country Report, which assesses the national position in terms of human capital metrics and policy alignment (European Commission, 2024d).

Opportunity 3: Investment and Implementation Resources through RRF Mechanisms.

Funding is also a very critical enabling condition for upskilling. Investments under Latvia's Recovery and Resilience create policy support through financial instruments that serve the purpose of enhancing digital capacity and skills development. These investment schemes provide an opportunity to accelerate training and modernize skill-building infrastructure by linking policy goals to financial implementation capacity (European Commission, 2024e).

Opportunity 4: Modernizing the institution of employment through digitalization

Readiness in human capital is further contingent on the institutions in the labor market that frame the reshaping and job allocation processes. The OECD argues that there is a possible benefit in the digitalization of Latvia's employment service, having better profiling and allocation in the matching of jobs and skills, in enhancing the efficiency of the use of evidence in the formulation of labor market policies. This helps in enhancing the preparedness of the workforce (OECD, 2024).

RQ2: What barriers hinder human capital readiness for digital transformation in Latvia?

Barrier 1: Continuing digital skills shortage and slow improvements in human capital measures.

Despite strategic planning, Latvia still faces obstacles in human capital readiness. EU monitoring suggests that progress on human capital is still insufficient compared to the targets, especially in more widespread digital skill acquisition and in the development of ICT specialist capacity (European Commission, 2024e). Digital skills monitoring summaries show that there have been continuing challenges for Latvia in ensuring that digital skills improve broadly across society. This would mean that policy ambition has yet to be fully translated into readiness outcomes.

Barrier 2: Imbalanced Skills Development and Socio-Economic Disparities.

Another is the issue of unequal distribution of skills development opportunities. Although the policies work towards the transformation of the nation, the monitoring framework of the EU understands the level of skills development improvement to be different among the groups, and the national challenge is to be ready together as a nation rather than being sector and group-specific (European Commission, 2024f). This type of inequality in the level of preparedness presents the danger of creating a digital divide, in which digital change only benefits a certain group of people.

Barrier 3: Institutional capacity and operational constraints in labor market modernization.

One of the clear barriers, as indicated in the OECD analysis, is the issue concerning the institutional constraints and resource issues. The OECD clearly states that the Public Employment Service in Latvia is working within resource constraints that require effective digitalization planning, use of advanced analytics, system security, and more sophisticated profiling and skills measurement capabilities (OECD, 2024).

Barrier 4: Skills mismatch between education outcomes and the needs of the labor market.

Digital Readiness is impacted when education systems as well as demands in the workforce undergo a disparity in speeds. The education policy in Latvia prioritizes competency-based education as well as updated skills training in education, but it takes a long-term process to implement a shift in education to make it pertinent to the labor market demands (European Commission, 2024c). The findings in Latvia during the COVID-19 outbreak indicate a rapid increase in demands to have competencies in the workspace, which demands that employees must equip themselves with digital competencies based on evolving workspace conditions (Verina & Titko, 2021).

RQ3: How do national policies and governmental initiatives impact digital skill development and workforce readiness?

The policy frameworks in Latvia impact digital skill levels and work readiness in three ways:

Mechanism 1: It includes setting targets at which the government will aim.

Latvian policy documents serve as tools of governance, determining the focus of the country's skill acquisition. Guidelines on digital transformation articulate digital readiness as the country's development objective, and guidelines related to industry and education assign the responsibility of human capital development to sectors (European Commission, 2024a; European Commission, 2024b; European Commission, 2024c). Consequently, the policy framework determines the institutional orientation of the transformation of the country's workforce, incorporating digital skills as an economic and educational necessity.

Mechanism 2: EU benchmark harmonization & human capital performance evaluation.

EU Digital Decade reporting enhances the impact of the policies since there are set targets for evaluation. The EU Digital Decade Roadmap 2030 enhances alignment between EU initiatives and Latvia's plans by focusing on digital skills development as one of the priority areas (European Commission, 2024a). EU monitoring confirms the existence of policies and their evaluation to ensure progress, although it is noted to be weak on the readiness of human capital (European Commission, 2024a). Policies thus contribute to readiness both positively and critically.

Mechanism 3: Capacity for Implementation by Investment and Modernization of Institutions.

Governmental measures affect the degree of readiness through financial and operational transformations. The Recovery and Resilience Plan opens implementation channels through the financial and nationwide investment instruments of initiatives regarding digital skills (European Commission, 2024c). On an institutional level, the modernization of the employment services sector represents a heavily influential policy instrument in terms of influencing the degree of readiness on a workforce level. According to OECD research, the implementation of SEA digital tools in the domain of job profiling, job matching, skills evaluation, and data analysis would have a heavily positive impact on labor market interventions (OECD, 2024).

Research Question: To what extent is the human capital in Latvia prepared for digital transformation in terms of digital skills and readiness to adopt AI and advanced technologies?

The sub-questions guide the policy analysis by investigating the regulatory framework, institutional policies, and programs that are aimed at developing digital skills and labor market preparedness. Altogether, these sub-questions help to evaluate how well the national policies cultivate human capital that can adjust to artificial intelligence and other high-level digital technologies.

On the strength of the results of the policy analysis, it's possible to state that the human capital in Latvia shows a certain level of preparedness in the face of the digital transformation, with a strong strategic direction and a growing degree of institutional transformation, but it is still unbalanced and does not allow the country to meet the ambition of the EU level in terms of advanced digital skills and AI transformation readiness, for example.

On the one hand, the Latvian readiness can be improved by the overall policy context, where human capital is identified as a fundamental base for the digitization process itself (European Commission, 2024a; European Commission, 2024b; European Commission, 2024c). The Latvian Digital Decade Strategic Roadmap 2030 further upgrades the Latvian readiness through its EU human capital goals, focusing on the overall development of high-level skills in the long run (European Commission, 2024d). Moreover, the Recovery Resilience Plan of the Latvian government builds a facilitating environment for the process through the development of digital skills, enterprise-level digitalization, etc. (European Commission, 2024d).

On the other hand, the EU monitoring reveals that Latvia still presents a number of challenges in the human capability pillar, which shows that the readiness of the human resources is a constant in the national digital transformation roadmap, since the Latvia Digital Decade Country Report indicates the lack of the required level of skills and ICT capability in order to have a competitive presence in the latest technologies in the economy (European Commission, 2024d). Besides, it has been noticed in the digital skills profiles the lack of capability in the digital skills (European Commission, n.d.). There is also an indicator in the institutional assessment, showing the need for a more advanced digital transformation in the Latvian employment support system, considering the latest needs in the

skills domain, and, on the other hand, the importance of a more advanced approach in the skills domain due to the enhancement of the AI-enabled labor market (OECD, 2024).

Hence, the final assessment is that while Latvia is strategy-wise prepared but operationally unready, in the sense that the aim for policies and alignment with the EU exists, the readiness level of human capital for AI and digital transformation still has room for improvement in upscaling in massive ways (European Commission, n.d.; OECD, 2024).

Conclusion

This paper explored the readiness of human capital in Latvia in dealing with the issue of digitalization, including AI adoption, using policy analysis. The results show that there are strong achievements on the part of the Latvian government in formulating its comprehensive strategy on digitalization, through interconnected policy frameworks on Latvian digitalization, educational policies, and industrial policies. These policy frameworks address the strong commitment of the Latvian government to its human capital, which is considered one of the critical drivers in arriving at its objectives on digital transformation.

Nevertheless, the same analysis indicates that the overall quality of human capital preparedness in Latvia is coupled with a certain level of development in advanced digital skills and preparedness for the economy driven by artificial intelligence. The monitoring of EU evaluations indicates that Latvia's main issue remains in the better digital skills outcomes and the overall preparedness of the human capital aspect of digitalization within the economy. In addition, the monitoring of skills development in the country indicates that the skills development in Latvia are not adequate at the level of the whole population, which implies that the skills development strategies in the present level of digitalization in Latvia are not entirely effective. This implies that there are risks associated with uneven transformation, in which digitalization in certain sectors and populations is distributed.

Overall, institutional capacity and operating systems matter for the achievement of policy aspirations with respect to workforce outcomes. Analysis of Latvia's Public Employment Service by the OECD underscores that the digitalization of labor market institutions holds significant potential for enhancing job matching, job profiling, evidence-based policy development, and adaptability regarding skills change. But this needs ongoing processes of modernization in IT systems, enhanced data analytics capabilities, and adequate resources to guarantee its proper implementation. This highlights again the assertion that readiness regarding human capital is not merely dependent on educational considerations but is intertwined with labor market dynamics.

Following the empirical recommendations made based on the findings of the research and analysis of the policy, it is possible to outline some conclusions on the further development of the human capital preparation to the digital transformation in Latvia. There is an urgent need to increase the coordination between the policies of education, labor market and digital development to provide a coherent approach towards human capital development. Moreover, it is necessary to increase the opportunities of upskilling and reskilling among the adult labor force. The focus of the policies on the development of advanced and AI-related competencies and the foundation of digital skills should also be greater with inclusiveness to reduce the risks associated with digital inequality. Lastly, more rigorous monitoring and evaluation systems should be in place, which would allow evaluating how successful the digital-skills policies were and help implement the policies in a more effective manner.

References

- Ardanta, W., & Sushandoyo, D. (2020). Analyzing human capital readiness and organizational digital transformation toward Industry 4.0. *Journal of Business and Management*, 9(2).
- Astuti, V. P. (2023). The role of human capital readiness in digital culture transformation in the era of industry 4.0. *JMEB: Jurnal Magistra Ekonomi Bisnis*, 1(2), 84–92.
- El Gareem, R.A. (2026). HR digital transformation: enhancing human resource management through technology. *Futur Bus J* 12, 5. <https://doi.org/10.1186/s43093-025-00703-7>
- European Commission. (2024a). *Latvia - Digital Decade strategic Roadmap 2030*. <https://digital-skills-jobs.europa.eu/en/actions/national-initiatives/national-strategies/latvia-digital-decade-strategic-roadmap-2030>
- European Commission. (2024b). *Latvia - Digital transformation Guidelines 2021-2027*. <https://digital-skills-jobs.europa.eu/en/actions/national-initiatives/national-strategies/latvia-digital-transformation-guidelines-2021-2027>
- European Commission. (2024c). *Latvia - National Industrial Policy Guidelines 2021-2027*. <https://digital-skills-jobs.europa.eu/en/actions/national-initiatives/national-strategies/latvia-national-industrial-policy-guidelines-2021>
- European Commission. (2024d). *Latvia 2024 Digital Decade Country Report*. <https://digital-strategy.ec.europa.eu/en/factpages/latvia-2024-digital-decade-country-report>
- European Commission. (2024e). *Latvia: a snapshot of digital skills*. <https://digital-skills-jobs.europa.eu/en/latest/briefs/latvia-snapshot-digital-skills>
- European Commission. (2024f). *Latvian - Education Development Guidelines 2021-2027*. <https://digital-skills-jobs.europa.eu/en/actions/national-initiatives/national-strategies/latvian-education-development-guidelines-2021-2027>
- European Commission. (n.d.). *Latvia's recovery and resilience – Supported projects: Nation-wide investment scheme*. https://commission.europa.eu/business-economy-euro/economic-recovery/recovery-and-resilience-facility/latvias-recovery-and-resilience-plan/latvias-recovery-and-resilience-supported-projects-nation-wide-investment-scheme_en
- Jianfeng Liu & Xiang Xian. (2025). Impact of digital transformation on high-quality economic development: The mediating role of human capital investment. *Finance Research Letters*, Volume 86, Part D, 108657, ISSN 1544-6123. <https://doi.org/10.1016/j.frl.2025.108657>
- Murfi, M., & Hendarman, A. F. (2023). The relationship between human capital readiness in digital transformation era 4.0 and individual performance perception (The case of smart campus in Indonesia Defense University). *American International Journal of Business Management*, 6(3), 1–6.
- OECD (Organization for Economic Co-operation and Development). (2024). *Modernizing Latvia's public employment service through digitalization*. OECD Publishing.
- Qu, Z. (2024). Research on supply chain human capital from the perspective of digital transformation. *Advances in Economics, Management and Political Sciences*, 77, 225–230. <https://doi.org/10.54254/2754-1169/77/20241705>
- Verina, V., & Titko, J. (2021). The development of digital transformation and relevant competencies for employees in the context of the impact of the COVID-19 pandemic in Latvia. *Sustainability*, 13(16), 9233. <https://doi.org/10.3390/su13169233>

LEADERSHIP IN THE AGE OF AI: INSIGHTS FROM KERALA IT COMPANIES

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Abstract

The rapid integration of artificial intelligence into organizational operations has transformed leadership practices, yet empirical insights from Indian IT companies remain limited. This study examines how leaders in Kerala IT companies integrate AI tools into strategic decision-making, workforce development, and ethical governance. A qualitative case study approach was employed, involving semi-structured interviews with ten leaders across three organizations and document analysis of strategic plans and policy manuals.

Thematic analysis revealed that AI supports predictive insights, workflow monitoring, and performance evaluation, while human oversight remains central to strategic and ethical decision-making. Leaders utilize AI to enhance employee skills, align operations with strategic objectives, and maintain accountability, demonstrating that effective leadership in AI-influenced environments requires balancing technological insights with relational, cognitive, and ethical competencies. These findings provide actionable evidence for designing leadership strategies that integrate AI without compromising human judgment.

Keywords: Artificial intelligence, Ethical governance, Leadership, Workforce development

Introduction

The emergence of artificial intelligence has fundamentally transformed the expectations and responsibilities of organizational leadership. Leaders are no longer solely responsible for managing resources and personnel but are increasingly called upon to guide their organizations through technological disruption while fostering innovation and workforce productivity. Effective leadership in this context requires strategic foresight, the ability to cultivate talent, and the integration of emerging technologies into organizational processes. Digital leadership in the era of artificial intelligence plays a critical role in enhancing workforce productivity and driving innovation, illustrating that leadership decisions directly shape organizational performance in technology-driven environments (Kukkala, 2025).

In addition to technological adoption, leaders must navigate the challenges and opportunities presented by artificial intelligence in business management. Artificial intelligence not only unlocks new avenues for operational efficiency but also transforms corporate leadership by demanding ethical decision-making, data-informed strategy, and proactive talent development. Organizations that align leadership practices with technological adoption are more likely to achieve sustainable growth and competitive advantage (Kumari, 2025).

Empirical studies from the Indian context further highlight the role of leadership in facilitating workforce development through artificial intelligence. Leadership approaches that integrate technology with workforce engagement result in higher employee learning, productivity, and

innovation outcomes. Leaders who embrace adaptive strategies and foster a culture of continuous development can leverage technology to enhance organizational effectiveness while addressing workforce challenges (Sarsar & Sagar, 2025).

Despite the growing body of research on digital leadership and artificial intelligence, limited attention has been given to how leadership practices directly influence the relationship between AI adoption, workforce productivity, and innovation outcomes. In particular, there is a lack of region-specific empirical evidence from emerging IT ecosystems such as Kerala, where rapid technological adoption is reshaping organizational dynamics.

The study contributes to the literature by providing empirical insights into the intersection of leadership, artificial intelligence, and workforce outcomes within a regional context. It also offers practical implications for leaders seeking to align technological adoption with organizational performance.

Aim of the study: This study examines how digital leadership practices influence artificial intelligence adoption and their subsequent impact on workforce productivity and innovation in Kerala's IT sector.

Research question: How are leaders in Kerala IT companies using artificial intelligence in decision-making, workforce development?

Literature review

Leadership in contemporary organizations has undergone a fundamental transformation under the influence of AI-driven environments. The complexity of modern organizational systems, combined with rapid technological adoption, requires that leaders respond effectively to interconnected processes, automated decision-support systems, and distributed responsibilities. Naqvi (2017) emphasizes that leaders must respond to system-driven influences while maintaining structured decision criteria. He argues that reliance on intuition or traditional hierarchical authority is insufficient in settings where AI tools provide real-time operational data. Instead, leaders must integrate measurable performance indicators, algorithmic outputs, and observable feedback into decision-making processes. This approach directly informs strategy development by requiring leaders to align organizational goals with both human judgment and system-generated insights (Naqvi, 2017).

Iansiti and Lakhani (2020) complement this perspective by arguing that leadership must integrate networked processes and algorithmic structures into strategic planning. They contend that decision authority is increasingly distributed within AI-enabled systems, allowing real-time adaptation and continuous recalibration (Iansiti & Lakhani, 2020). The contrast between Naqvi and Iansiti and Lakhani lies in the locus of control: Naqvi emphasizes human criteria in decision-making, while Iansiti and Lakhani highlight AI-supported systems as co-participants in strategic processes. Despite this difference, both converge on the principle that leadership strategy must coordinate human judgment with system-level feedback to ensure consistent organizational effectiveness in technology-intensive contexts (Naqvi, 2017, Iansiti & Lakhani, 2020).

Ethical responsibility becomes even more central in AI-driven organizations. Kandasamy (2024) examines the challenges leaders face in maintaining accountability, transparency, and fairness when algorithmic decisions are embedded in workflows. He argues that leaders must integrate ethical

standards into governance processes to mitigate risks associated with biased or opaque AI outputs (Kandasamy, 2024). Kumar (2025) reinforces this view by situating ethics within operational strategy, noting that ethical oversight reduces exposure to reputational and operational risks while ensuring sustainable use of AI-enabled systems (Kumar, 2025). Compared to Naqvi and Iansiti and Lakhani, who emphasize structural responsiveness and system integration (Naqvi, 2017, Iansiti & Lakhani, 2020), Kandasamy and Kumar highlight the normative dimension. Both demonstrate that strategy must not be limited to efficiency or effectiveness; it must also ensure ethical outcomes in environments influenced by automated and AI-supported decision-making. The difference lies in approach: Kandasamy presents a universal ethical framework applicable across technological contexts, while Kumar emphasizes operational guidance for integrating ethics with AI-augmented workflows (Kandasamy, 2024, Kumar, 2025).

Krishnan (2026) and Ünal (2025) focus on competencies required for leaders to execute strategy effectively in AI-driven environments. Krishnan asserts that leaders must develop dynamic decision-making capabilities that allow them to continuously reassess strategic priorities in response to evolving AI-supported processes. He frames strategy as iterative, emphasizing monitoring AI outputs, analyzing feedback, and adjusting plans accordingly. Ünal extends this argument by examining the social dimension of leadership, highlighting communication, collaboration, and collective understanding as central to effectively implementing AI-informed strategies. Krishnan and Ünal converge on the need to combine cognitive agility with relational awareness; they diverge in emphasis, with Krishnan prioritizing individual analytical skills and Ünal prioritizing coordinated understanding across teams. Both reinforce the principle that effective leadership strategy in AI contexts requires balancing human reasoning with collaborative alignment (Krishnan, 2026, Ünal, 2025).

The role of leadership development in AI contexts is addressed by Sposato (2024) and Karakose and Tulubas (2025). Sposato argues that organizations must invest in structured development programs that enhance leaders' ability to interpret AI-generated insights and make informed strategic decisions. Training should include ethical evaluation, critical reasoning, and strategic problem-solving, beyond technical skill acquisition (Karakose & Tulubas, 2025, Sposato, 2024). Karakose and Tulubas emphasize reflective practice for leaders, allowing them to evaluate AI-informed decisions, identify unintended consequences, and refine strategies over time. Both authors converge on the idea that leadership in AI contexts requires continuous learning and structured preparation, ensuring that leaders can effectively navigate algorithmically-informed organizational processes (Karakose & Tulubas, 2025).

Madanchian, Vincenti, and Taherdoost (2017) provide a meta-level perspective on leadership evolution in AI and networked environments. They argue that traditional hierarchical models are insufficient in complex, AI-driven systems. Leaders must manage complexity, integrate insights from algorithmic systems, and adopt participatory approaches to decision-making. Compared with other studies, Madanchian et al. foreground the limitations of single-model approaches, cautioning that ignoring AI-driven system constraints can result in resistance or suboptimal strategic outcomes (Madanchian et al., 2017). In contrast, Naqvi emphasizes operational responsiveness, Iansiti and Lakhani emphasize distributed processes, and Kandasamy and Kumar emphasize ethical governance. Madanchian and colleagues synthesize these strands, highlighting the need for adaptive, multi-dimensional leadership strategies that account for both human and AI-generated influences (Madanchian et al., 2017, Naqvi, 2017, Iansiti & Lakhani, 2020).

Across all studies, researchers agree that leadership strategy must accommodate environmental complexity introduced by AI technologies, whether through structured decision-making, integration with algorithmic processes, ethical oversight, or competency development. Naqvi, Iansiti and Lakhani, Krishnan, and Ünal stress operational and relational dimensions of AI-informed strategy. Kandasamy and Kumar highlight ethical imperatives in AI contexts, while Sposato and Karakose and Tulubas emphasize leadership development to interpret and manage AI-driven data. Madanchian et al. underscore the necessity of multi-modal approaches that integrate human judgment and AI outputs.

Research methodology

This study employs a qualitative case study approach to examine leadership practices in Kerala IT companies, focusing on how leaders make strategic decisions, develop workforce capabilities, and implement ethical governance in AI-driven organizational contexts (Naqvi, 2017; Krishnan, 2026). The case study design enables an in-depth exploration of complex and context-dependent leadership practices, providing insights into how leaders navigate decision-making processes, workforce management, and ethical considerations when organizational operations are increasingly influenced by AI tools, automated workflows, and data-driven systems. The study draws on frameworks proposed by Kandasamy (2024), Kumar (2025), and Ünal (2025), emphasizing leadership competencies, ethical decision-making, and strategic alignment as central dimensions of analysis in technology-intensive environments (Madanchian et al., 2017, Naqvi, 2017, Iansiti & Lakhani, 2020). Figure 1 shows the structure and process of data collection and data analysis used in this paper.

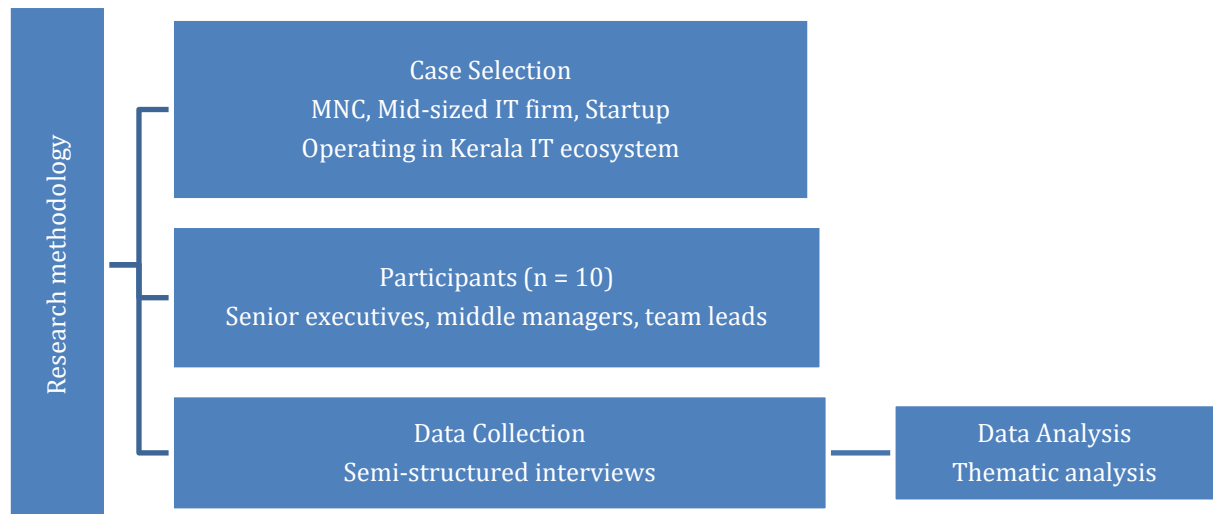


Figure 1. Research methodology model (designed by author)

Organizations were selected using purposive sampling to ensure diversity in structure, scale, and strategic approach within AI-influenced operations. The sample includes one multinational corporation, one mid-sized IT firm, and one startup operating in Kerala's technology ecosystem. Within these organizations, ten participants were selected based on their active involvement in strategic decision-making and leadership roles that interact with AI-supported tools and processes. This included senior executives, middle managers, and team leads responsible for organizational strategy, workflow execution, and monitoring AI-enabled systems. The purposive selection of these

ten participants ensures that the study captures critical perspectives on leadership strategy, ethical practices, and workforce management while maintaining focus on depth over breadth.

Data were collected through semi-structured interviews and document analysis. Interviews explored leadership competencies, decision-making processes, strategic planning, workforce development, and ethical governance in the context of AI-driven operational environments. The interview guide was developed using theoretical frameworks from Naqvi (2017), Iansiti and Lakhani (2020), Kandasamy (2024), and Sposato (2024), ensuring alignment with established research on strategic leadership in technology-intensive settings. Organizational documents, including strategic plans, policy manuals, and annual reports, were analyzed to validate interview findings and provide evidence of formalized leadership practices, workforce development initiatives, and governance structures in AI-supported organizational contexts (Kumar, 2025; Ünal, 2025). This combination of interviews and document analysis allows for a comprehensive understanding of leadership practices, triangulating perspectives to ensure reliability and validity.

Data from interviews and documents were analyzed using thematic analysis to identify recurring patterns, concepts, and themes across the cases. Coding focused on strategic decision-making, workforce development, and ethical governance, following frameworks proposed by several authors (Naqvi, 2017, Kandasamy, 2024, Kumar, 2025). Cross-case analysis enabled the identification of similarities and differences in leadership practices between the Multinational Corporation, mid-sized firm, and startup, highlighting how leaders balance human judgment with AI-supported insights to guide strategy, workforce management, and ethical oversight.

Validity was ensured through triangulation of interview and document data, confirming consistency across sources. Reliability was maintained by using standardized interview protocols and coding procedures. Ethical principles guided the study, including informed consent, confidentiality, and secure storage of all data. Participants were informed about the study's purpose, assured anonymity, and given the option to withdraw at any stage. Ethical guidelines recommended by Kandasamy (2024) and Kumar (2025) were strictly followed to protect participants and organizational integrity, including considerations for data generated or monitored by AI-enabled systems (Kandasamy, 2024, Kumar, 2025).

Results

Analysis of interviews across three Kerala IT companies revealed three main themes in leadership practices: strategic decision-making, workforce development, and ethical governance. Each theme reflects how leaders interact with AI tools, automate processes, and integrate technology into daily operations. Participant quotes illustrate the operational reality of leadership in AI-supported environments.

Strategic Decision-Making in AI Contexts

Strategic decision-making emerged as a central function of leadership, with participants highlighting the integration of AI-enabled systems to guide operational and strategic priorities. Three sub-themes were identified: structured planning supported by AI, iterative decision-making enhanced by analytics, and rapid adaptability facilitated by real-time insights. Figure 2 shows strategic decision making process in all three types of companies.

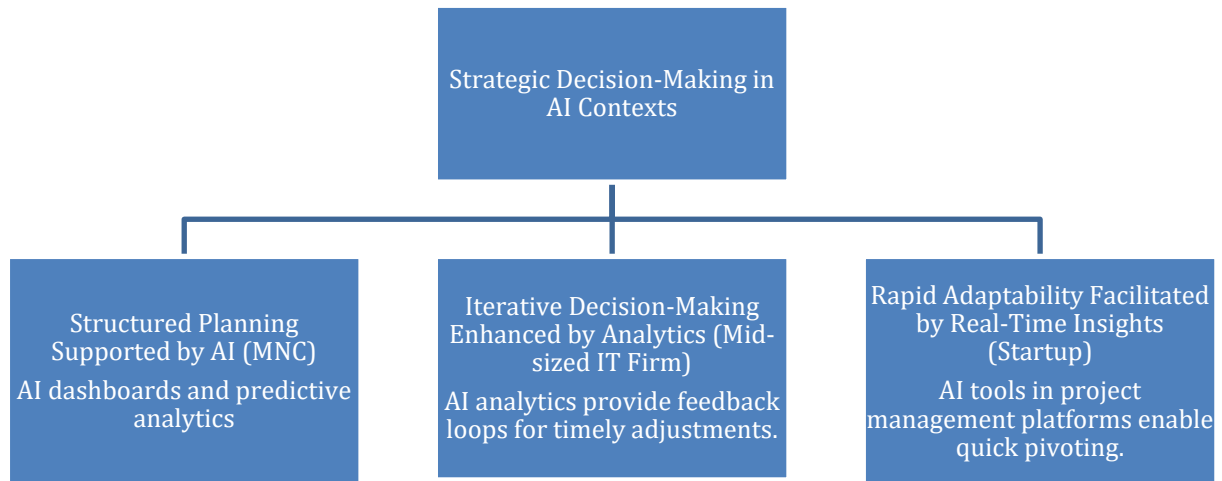


Figure 2. **Strategic Decision-Making in AI Contexts** (designed by author)

Leaders in the multinational corporation emphasized structured decision-making using AI-driven dashboards and predictive analytics. A senior executive stated, *“Our strategy meetings rely on dashboards that show performance trends and forecast project outcomes; this helps us decide which initiatives need adjustment.”* Another participant explained, *“AI-generated reports guide our quarterly planning, but final decisions incorporate both system output and managerial judgment.”* These statements illustrate how AI tools inform structured strategic processes while leaders retain ultimate control.

In the mid-sized IT firm, iterative decision-making emerged as the dominant approach, with AI analytics providing feedback loops that enable leaders to adjust priorities quickly. One project manager noted, *“We receive system-generated performance summaries every week, and we review them with the team to adjust project timelines.”* Another stated, *“AI alerts on bottlenecks help us make timely changes without waiting for formal reporting cycles.”* Leaders emphasized that AI-supported feedback complements human oversight and fosters collaborative, data-informed decision-making.

Startups highlighted rapid adaptability facilitated by AI tools integrated into project management platforms. A startup founder said, *“Our workflow tool provides real-time alerts on project status and resource allocation, allowing us to pivot immediately if priorities change.”* Another participant added, *“AI recommendations help us identify which tasks need attention first, but we decide the strategic focus based on both the data and our long-term vision.”* Across all organizations, AI tools were positioned as enablers, providing information and predictive insights, while human leaders maintain decision authority.

Workforce Development in AI-Enabled Environments

Workforce development was the second major theme, with leaders emphasizing skill enhancement, alignment with AI-assisted processes, and continuous learning. Sub-themes included AI-assisted training, mentorship integrated with system feedback, and experiential learning with AI tools. Figure-3 shows the workforce development in AI context.

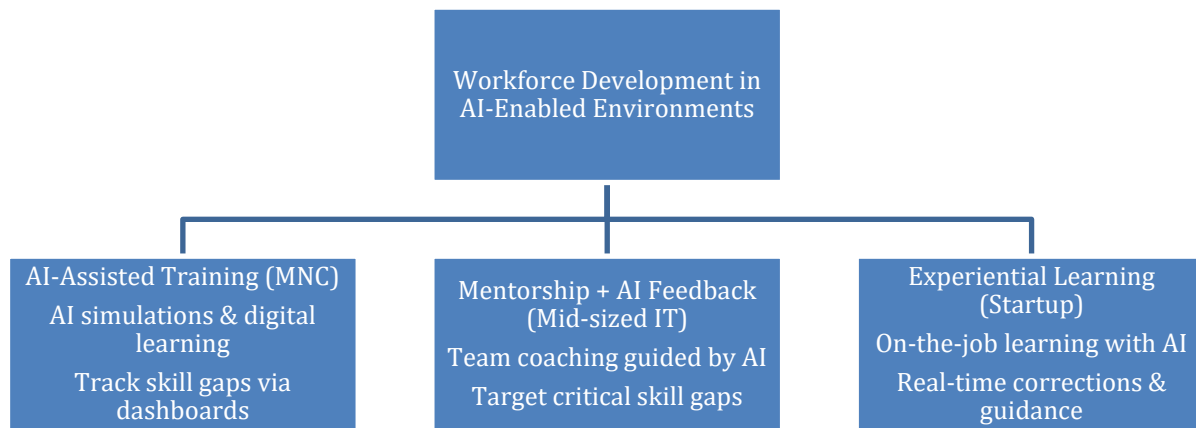


Figure 3. **Workforce Development** (designed by author)

In the multinational corporation, formalized training programs incorporated AI simulations, scenario modelling, and digital learning platforms. A senior manager stated, “Employees undergo AI-supported training that simulates project workflows, helping them understand how automated processes interact with their tasks.” Another participant noted, “We track progress through AI dashboards that indicate skill gaps and learning outcomes.” These practices demonstrate the role of AI in enhancing workforce capability and aligning employee skills with strategic objectives.

Mid-sized firms relied on mentorship and team-level coaching complemented by AI tools. One manager explained, “We use analytics from our project management tool to see where team members struggle, and I provide guidance tailored to those needs.” Another noted, “Feedback from AI dashboards allows us to focus our mentoring sessions on critical skill gaps.” AI tools thus support human-led development by providing objective insights into performance and training needs.

Startups emphasized experiential learning, with employees engaging directly with AI systems in their daily tasks. A founder remarked, “Team members learn by interacting with the AI-driven workflow tool, which highlights errors or delays in real time. I provide guidance alongside the system feedback.” Another participant added, “Learning happens on the job, but AI recommendations help us correct mistakes immediately.” Across all organizational types, workforce development practices integrate AI outputs to ensure employees remain capable of executing strategic initiatives efficiently.

Ethical Governance in AI Contexts

Ethical governance was the third prominent theme, reflecting leaders’ attention to fairness, transparency, and accountability when AI tools influence decisions. Sub-themes included compliance frameworks, team-level ethical oversight, and value-based decision guidance. Figure-4 shows the ethical governance in all 3 types of IT companies in Kerala.

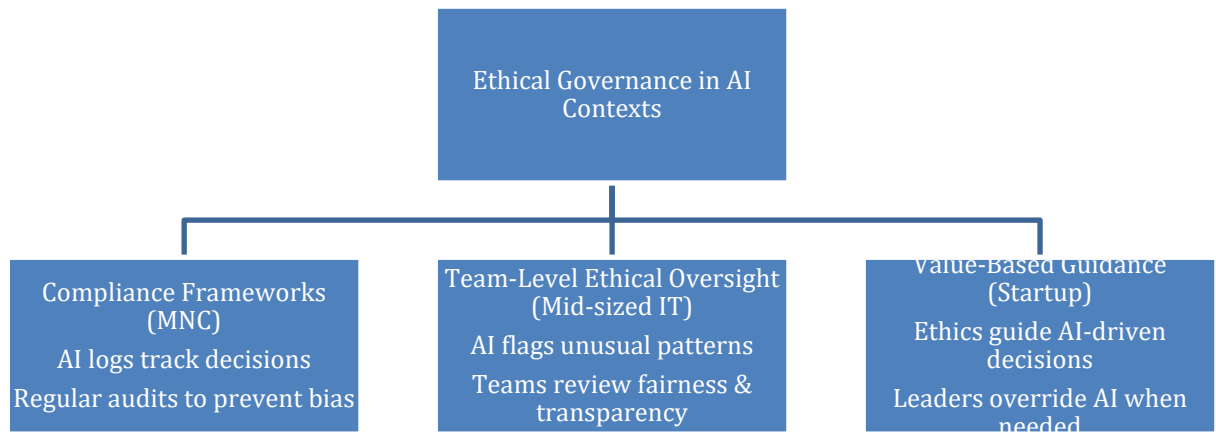


Figure 4. **Ethical governance in AI contexts in Kerala IT companies** (designed by author)

Multinational corporations emphasized formal compliance systems, monitoring both human and AI-driven decisions. One participant explained, *"We use AI logs to ensure decisions made by automated systems comply with company policy and ethical standards."* Another noted, *"Regular audits of AI recommendations are conducted to prevent biased outcomes."* These practices demonstrate the integration of ethical governance into AI-assisted decision-making.

Mid-sized firms highlighted team-level ethical practices augmented by AI. A manager stated, *"AI tools flag unusual patterns in task assignments or resource allocation, and we review these to ensure fairness."* Another participant explained, *"Transparency in system outputs allows our teams to discuss ethical concerns openly."* Leaders emphasized that ethical oversight requires both human judgment and system checks.

Startups relied on value-based guidance, embedding ethics into every decision influenced by AI. One founder remarked, *"Even when AI suggests prioritizing efficiency over fairness, we override the system to adhere to our ethical principles."* Another participant added, *"Ethics guide how we interpret AI insights; the tool informs us, but it does not decide for us."* Across organizations, leaders integrate AI tools into ethical oversight processes without ceding decision authority to automation.

Cross-Case Observations

A cross-case review reveals consistent patterns in how AI tools are integrated into leadership practices. Strategic decision-making, workforce development, and ethical governance all leverage AI outputs for timely insights, predictive analytics, and performance tracking. Differences arise in mechanisms of use: multinationals rely on structured AI dashboards and simulations, mid-sized firms combine AI analytics with relational engagement, and startups emphasize real-time AI feedback integrated with hands-on leadership.

Participants frequently referenced AI as a support system rather than a replacement for leadership. For instance, a mid-sized firm manager stated, *"AI gives us information we could not gather manually, but we decide the priorities and next steps."* Similarly, a multinational executive noted, *"AI informs decisions but does not replace accountability; humans must interpret and act on insights responsibly."* These statements indicate that leaders in AI-driven environments balance technological guidance with human judgment across strategy, workforce management, and ethical oversight.

Discussion

The findings of this study reveal that leadership in Kerala IT companies is significantly shaped by AI-driven organizational environments, where decision-making, workforce development, and ethical governance intersect. Leaders across all organizational types actively integrate AI tools, such as predictive analytics, workflow monitoring platforms, and performance dashboards, to inform strategic and operational decisions. These tools provide timely insights and data-driven forecasts, enabling leaders to make informed choices while retaining human oversight. This aligns with Naqvi (2017), who emphasizes the importance of structured decision criteria and measurable outcomes in system-influenced settings, ensuring that organizational goals are achieved without relinquishing accountability to automated processes. Similarly, Iansiti and Lakhani (2020) highlight that leadership must operate within systems that distribute authority and allow for continuous recalibration (Naqvi, 2017; Iansiti & Lakhani, 2020). The contrast between human judgment and AI-supported insights illustrates that effective leadership in AI-influenced contexts requires a careful balance between technological input and managerial discretion.

The study further demonstrates that workforce development in AI-driven organizations relies on a combination of system-supported insights and human guidance. Multinational corporations implemented structured training programs incorporating AI simulations and scenario-based learning, enhancing employees' ability to interpret and act on AI outputs (Sposato, 2024; Kukkala, 2025). Mid-sized firms paired AI-generated performance metrics with mentorship, enabling leaders to address skill gaps while maintaining collaborative engagement (Sarsar & Sagar, 2025). Startups emphasized experiential learning, using real-time AI feedback in daily tasks to enhance adaptability and decision-making skills (Karakose & Tulubas, 2025). These findings are consistent with the work of Sposato (2024) and Karakose and Tulubas (2025), who argue that structured development and reflective practice are essential for leaders to cultivate strategic awareness and workforce capability (Karakose & Tulubas, 2025, Sposato, 2024). AI serves as both a diagnostic and developmental tool, providing objective information on employee performance, while human interpretation and guidance remain essential to translate these insights into actionable learning.

Ethical governance emerges as a critical concern in AI-influenced leadership. Leaders reported implementing systems to ensure that AI-generated recommendations comply with organizational policies, ethical standards, and fairness criteria (Kandasamy, 2024; Kumar, 2025). In multinational organizations, formal compliance procedures and audits of AI outputs were emphasized to prevent bias and ensure accountability (Kandasamy, 2024). Mid-sized firms focused on team-level ethical oversight, using system alerts to identify potential disparities in workload or resource allocation (Kumar, 2025). Startups emphasized value-based decision-making, sometimes overriding AI recommendations to adhere to organizational principles (Kumar, 2025). These practices reinforce the positions of Kandasamy (2024) and Kumar (2025), highlighting that ethical considerations must be integrated into leadership strategy, particularly when automated or algorithmically-informed decisions influence organizational outcomes (Kandasamy, 2024, Kumar, 2025). AI tools facilitate transparency and monitoring, but ethical responsibility rests with human leaders, highlighting the necessity of combining technological support with normative judgment.

Cross-case analysis illustrates that while the AI tools and approaches vary by organizational type, the underlying leadership principles remain consistent. Leaders in all cases recognized that AI provides operational advantage, predictive insight, and workflow efficiency, but it does not replace the need for strategic oversight, human judgment, or ethical consideration (Naqvi, 2017; Krishnan, 2026; Ünal,

2025). Multinationals relied on formalized dashboards and system-generated simulations, mid-sized firms used iterative human-AI interaction to guide decisions, and startups relied on agile real-time integration of AI feedback with managerial oversight (Kukkala, 2025; Kumari, 2025). This observation aligns with the argument of Madanchian, Vincenti, and Taherdoost (2017) that contemporary leadership frameworks must reconcile technological capabilities with human judgment, collaboration, and ethical accountability (Madanchian et al., 2017). Leaders who integrate AI into organizational strategy maintain operational effectiveness while supporting workforce development and ethical governance simultaneously (Sarsar & Sagar, 2025).

The interplay between strategic decision-making, workforce development, and ethical oversight highlights the multidimensional nature of leadership in AI-driven contexts. Strategic alignment depends not only on accurate AI-informed insights but also on the leader's capacity to interpret these outputs, communicate priorities, and coordinate action across teams (Iansiti & Lakhani, 2020; Krishnan, 2026). Workforce development is enhanced by AI-assisted training and feedback, yet human mentorship is essential to foster adaptability and critical thinking (Sposato, 2024; Kukkala, 2025). Ethical governance requires vigilance over both human and AI-generated decisions to ensure that automated recommendations do not compromise fairness or organizational values (Kandasamy, 2024; Kumar, 2025). Collectively, these findings suggest that leadership in AI-driven organizations demands analytical skill, relational intelligence, and normative sensitivity. Leaders must navigate the tension between leveraging AI for operational advantage and maintaining human-centered judgment to ensure strategy, people, and ethics are effectively aligned.

This study confirms that AI significantly influences leadership practice, shaping how leaders make strategic decisions, develop talent, and maintain ethical accountability. The results support prior research by (Naqvi, 2017), (Iansiti & Lakhani, 2020), (Kandasamy, 2024), (Kumar, 2025), (Krishnan, 2026), Kukkala (2025), (Kumari, 2025), and (Sarsar & Sagar, 2025), demonstrating that leadership in AI-influenced environments is inherently multi-dimensional, iterative, and context-dependent. AI tools provide predictive insights, workflow monitoring, and performance feedback, yet effective leadership relies on integrating these outputs with human judgment, ethical reasoning, and relational coordination (Madanchian, Vincenti, & Taherdoost, 2017; Ünal, 2025). Leaders who can navigate this integration are better equipped to achieve sustainable organizational outcomes while aligning strategy, workforce capability, and ethical principles.

Conclusion

This study demonstrates that leadership in Kerala IT companies is shaped by AI-driven organizational environments where strategic decision-making, workforce development, and ethical governance are closely interconnected. Leaders integrate AI tools such as predictive analytics, workflow dashboards, and performance monitoring systems to guide decisions while retaining human oversight (Naqvi, 2017; Iansiti & Lakhani, 2020). Workforce development benefits from AI-supported training and real-time feedback, complemented by human mentorship to cultivate skills and adaptability (Sposato, 2024; Kukkala, 2025; Sarsar & Sagar, 2025). Ethical governance remains central, with leaders ensuring AI-assisted decisions align with fairness, transparency, and organizational values (Kandasamy, 2024; Kumar, 2025).

Across organizational types, AI enhances leadership capacity without replacing human judgment, confirming that effective strategy relies on balancing technological insight with relational and ethical

competencies (Krishnan, 2026; Ünal, 2025; Madanchian, Vincenti, & Taherdoost, 2017). These findings indicate that leaders who integrate AI thoughtfully into strategy, workforce development, and ethics can achieve sustainable organizational performance while maintaining accountability and stakeholder trust.

References

- Iansiti, M., & Lakhani, K. R. (2020). *Competing in the age of AI: Strategy and leadership when algorithms and networks run the world*. Harvard Business Press
- Karakose, T., & Tulubas, T. (2025). The role of educational leaders in the age of artificial intelligence (AI). *Educational Process: International Journal*, 16, e2025267
- Kandasamy, U. C. (2024). *Ethical leadership in the age of AI: Challenges, opportunities and framework for ethical leadership*. arXiv preprint arXiv:2410.18095
- Krishnan, S. (2026). Leadership in the age of artificial intelligence. *SBS Journal of Applied Business Research*, 43–51
- Kumar, S. (2025). *Ethical leadership in the age of AI*. In *Responsible implementations of generative AI for multidisciplinary use* (pp. 265–290). IGI Global Scientific Publishing
- Kukkala, N. C. (2025). Digital leadership in the era of AI: Transforming workforce productivity and innovation. *Journal of Information Systems Engineering & Management*, 10(23s), 878–883. <https://doi.org/10.52783/jisem.v10i23s.3787>
- Kumari, V. L. L. K. (2025). Artificial intelligence in business management: Unlocking opportunities, addressing challenges, and transforming corporate leadership. *Journal of Information Systems Engineering & Management*, 10(48s), 1208–1220. <https://doi.org/10.52783/jisem.v10i48s.9741>
- Madanchian, M., Vincenti, M., & Taherdoost, H. (2017, April). Redefining leadership in the age of AI: Tools, applications, and limitations. In *International Conference on Engineering, Applied Sciences and System Modeling* (pp. 551–565). Singapore: Springer Nature Singapore
- Naqvi, A. (2017). Responding to the will of the machine: Leadership in the age of artificial intelligence. *Journal of Economics Bibliography*, 4(3), 244–248
- Sarsar, M. M., & Sagar, T. J. V. (2025). *Leadership rewired: AI as a catalyst in workforce development – Insights from India*. The Review of Diabetic Studies, 366–385. <https://doi.org/10.70082/p5d52n68>
- Sposato, M. (2024). Leadership training and development in the age of artificial intelligence. *Development and Learning in Organizations: An International Journal*, 38(4), 4–7
- Ünal, A. (2025). Leadership in the age of artificial intelligence. *Business & Management Studies: An International Journal*, 13(4), 2406–2418

AI-DRIVEN PERFORMANCE METRICS USING GENERATIVE AI ANALYTICS

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Abstract

The growing integration of artificial intelligence (AI), particularly generative AI analytics, is transforming organizational performance measurement systems. Traditional key performance indicators (KPIs) often rely on periodic evaluation and historical data, which may not fully capture dynamic organizational environments. This study aims to examine how generative AI analytics contribute to the development of AI-driven performance metrics and how these metrics support improved organizational efficiency and decision-making. A qualitative research approach was adopted based on secondary data analysis, including academic literature, industry reports, and professional publications related to AI-driven performance management. The findings indicate that AI-driven metrics enable continuous monitoring, predictive insights, automated KPI tracking, and enhanced decision support. However, challenges such as data privacy, algorithm transparency, and ethical considerations remain important. Overall, generative AI analytics provide a more adaptive and data-driven approach to performance evaluation, supporting strategic alignment, productivity improvement, and organizational effectiveness.

Keywords: Artificial Intelligence, Generative AI, Performance Metrics, Predictive Analytics

Introduction

The integration of Artificial Intelligence (AI) into organizational processes has significantly transformed how performance is evaluated and managed in modern workplaces. Traditionally, performance management systems relied on periodic reviews, manually collected indicators, and static key performance metrics that often failed to capture the complexity of rapidly changing organizational environments. With the advancement of AI technologies, particularly generative AI and data science tools, organizations now have the capacity to process large volumes of operational and employee-related data continuously, enabling more adaptive and data-driven performance evaluation systems (Nyathani, 2023). In fact, we can adapt these AI models to systems that enable solutions to multivariate problems to be sought in much the same way as we use statistical analysis to find solutions to models that optimise goodness of fit to data. These models are often called discriminative in that they attempt to explain everything we observe whereas the class of models that seeks to explain by adding new data are called generative. The key difference is that the solution space for generative models is not known in advance, and we have to invent it as we go along. This makes generative models much more suitable for problems where invention rather than discovery is of the essence and in this context, such AI appear much more suited to problems of design – in our context here, inventing future forms for cities which optimise various criteria rather than explaining forms that already exist (Batty, 2025). Despite these advancements, organizations still face challenges related to the implementation and interpretation of AI-driven performance

metrics. Issues such as algorithm transparency, data privacy, and potential bias in automated evaluation systems remain significant concerns. Research suggests that without careful design and governance, HR analytics initiatives may fail to deliver expected organizational benefits due to ethical, technical, and organizational barriers (Chuchu & Kyongo, 2025). Therefore, understanding how generative AI analytics can be responsibly integrated into performance management systems is becoming increasingly important.

The objective of this study is to examine how generic AI analytics contributes to the development of AI-driven performance metrics and how these metrics can enhance organizational efficiency. Specifically, the paper explores how generative AI analyzes organizational data, supports automated KPI tracking, and enables real-time performance insights that improve strategic decision making. By integrating approaches from data science, human resource analytics and organizational performance research, this study seeks to provide a clear understanding of the evolving role of AI in performance management. This paper reviews the existing literature on AI-driven performance management and generative AI analytics, followed by the development of a conceptual framework and methodological considerations. It then discusses AI-driven performance metrics, their organizational implications, associated challenges, and future research directions.

Literature Review

This research investigates how AI applications in HRM are gaining attention. Research indicates that AI helps HR understand employee preferences and behavior, enabling more targeted interventions. However, more empirical studies are needed to fully understand the real-world impact and best practices for AI-driven solutions at work. The implementation of AI-enabled HR analytics has become increasingly prevalent in organizational PMS. According to a recent consulting report, approximately 63% of companies are willing to apply AI for HR analytics to address organizational and employee performance issues. AI-enabled HR analytics significantly boost employee resilience by enhancing their ability to recover from setbacks and adapt to organizational change. The study shows that AI-driven evaluation systems equip employees with insights and tools that strengthen their psychological readiness to navigate professional challenges, especially during times of uncertainty or transformation (Chuchu & Kyongo, 2025). Beyond AI-specific applications, the broader shift toward data-driven decision-making has further transformed HR practices. The field of Human Resources (HR) has experienced a significant transformation due to the advent of data-driven decision-making, which is increasingly recognized as a critical component in enhancing organizational efficiency and effectiveness. The application of data analytics within HR practices has facilitated more informed and strategic decisions, ultimately leading to better organizational outcomes. This shift towards a data-centric approach in HR is not merely a trend but a necessity in today's competitive business environment. Data-driven decision-making in HR involves the systematic analysis of various forms of data to inform and guide decisions related to recruitment, performance management, employee engagement, and talent development. The importance of this approach cannot be overstated, as it enables organizations to base their decisions on empirical evidence rather than intuition or anecdotal information (Odionu, Alagbariya, & Okon, 2024). Organizations that leverage data and analytics in their decision-making processes are more likely to outperform their peers. This is because data analytics provide actionable insights that can improve workforce management and align HR strategies with business objectives. One of the key benefits of data-driven decision-making in HR is the ability to enhance recruitment processes. By utilizing data

analytics, HR professionals can identify the most effective recruitment channels, predict candidate success, and reduce time-to-hire. Organizations using data analytics in recruitment can improve their quality of hire by up to 25%. This is achieved through the analysis of historical hiring data, which helps in identifying patterns and trends that predict successful employee performance (Davenport, Harris, & Shapiro, 2010).

Despite the numerous advantages of data-driven decision-making in HR, challenges remain in its implementation. One significant challenge is data quality. For data analytics to be effective, the underlying data must be accurate, complete, and relevant. Inaccurate or incomplete data can lead to erroneous conclusions and poor decision-making. Hence, organizations must invest in robust data management practices to ensure the reliability of their data. Another challenge is the need for specialized skills in data analytics. HR professionals must be proficient in data analysis techniques and tools to fully leverage the potential of data-driven decision-making. This often requires ongoing training and development in data literacy and analytical skills. The importance of data-driven decision-making in HR cannot be overstated. It provides a foundation for making more informed, objective, and strategic decisions that enhance recruitment, performance management, employee engagement, talent development, and risk management. As organizations continue to navigate an increasingly complex and dynamic business environment, the adoption of data-driven HR practices will be essential in achieving sustainable success and maintaining a competitive edge (Odionu, Alagbariya, & Okon, 2024). The increasing use of AI and data analytics in HR is clearly changing how organizations evaluate performance and make workforce decisions. Although these technologies offer significant benefits, issues such as data quality, employee trust, and analytical capabilities still require careful attention. Therefore, continued research is important to better understand how AI-powered HR practices can be effectively implemented while supporting both organizational performance and employee well-being. This increasing reliance on AI analytics highlights the need to explore how generic AI can further enhance performance measurement systems.

Generative AI in Business Analytic

The evolution of GenAI has garnered significant attention, not only from technologists and business leaders but also from the broader public, as evidenced by the dramatic surge in queries for "ChatGPT," a leading generative model developed by OpenAI. This trend underscores a shift in public discourse towards generative technologies, with "ChatGPT" quickly becoming synonymous with AI. This growing public and organizational interest is reflected in the rapid expansion of the generative AI market, as illustrated in Figure 1.

Generative AI Market 2024 to 2032 (USD 58.0 Billion)

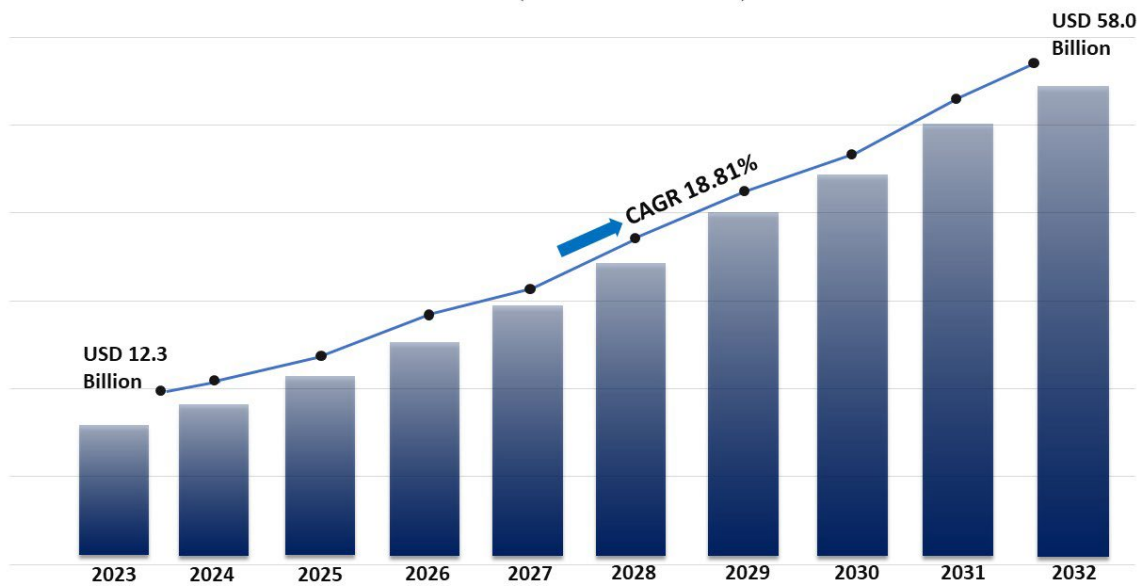


Figure 1. Generative AI Market 2024 to 2032

The graph shows how fast the generic AI market is expected to grow between 2023 and 2032. In 2023, the market size is estimated to be approximately US\$12.3 billion, but projections show that it could grow to approximately US\$58 billion by 2032. This steady growth represents a strong compound annual growth rate of approximately 18.8%, highlighting how quickly this technology is being adopted around the world. One of the main reasons behind this growth is the increasing use of generic AI in various industries. Businesses are increasingly using AI tools for content creation, marketing campaigns, customer support, coding assistance, and data analysis. These technologies help save time, reduce costs, and improve productivity, making them attractive to organizations of all sizes. Another factor driving growth is continuous technological advancements. Improvements in machine learning models, cloud computing, and data processing capabilities are making generic AI more powerful and accessible. As companies become more confident in these systems, especially after the middle of the decade, adoption is likely to accelerate further. At the same time, there are challenges to consider, such as ethical concerns, data privacy issues, and the need for clear regulations. Addressing these concerns will be important to ensure responsible and sustainable development. The graph clearly indicates that Generative AI is becoming a major force in the technology landscape, with the potential to bring significant changes to the way industries operate in the coming years. Apart from the market growth, the technical capabilities of generic AI also contribute significantly to its business adoption.

Generative AI models, such as generative adversarial networks (GANs), rely on large and diverse datasets for effective training. Enhanced data generation techniques allow the creation of synthetic data that can complement real datasets, helping to build more robust and accurate models. This is particularly valuable in sectors such as healthcare, where access to extensive and diverse data may be limited. Data generation also supports data augmentation, enabling machine learning models to improve generalization and predictive accuracy (Fortune Business Insights, 2026). In addition to data capabilities, generative AI contributes significantly to business efficiency through automation. AI-powered systems can perform frequently repetitive and time-consuming tasks with minimal

human intervention, resulting in cost savings and improved productivity. Ongoing research in deep learning is further advancing generative models, enabling them to generate increasingly realistic text, images, audio, and analytical output. From my perspective, these developments highlight how Generative AI is not only a technological advancement but also a practical tool that can reshape business analytics and organizational decision making in the years to come.

Existing KPI Measurement Systems

Key Performance Indicators (KPIs) have traditionally been used by organizations to measure performance, mainly focusing on financial results and operational efficiency. While these indicators are useful, they often reflect past performance and may not fully capture important aspects such as employee engagement, customer satisfaction, or rapidly changing business conditions. With the rise of artificial intelligence, organizations are increasingly moving toward AI-driven KPIs that use data analytics and machine learning to provide real-time insights and predictive understanding of performance. These modern approaches help organizations make better decisions and adapt more effectively to today's dynamic business environment (Growett). Traditional Key Performance Indicators (KPIs) have usually been used to measure organizational performance by looking at past results such as revenue, productivity, or operational efficiency. While these indicators are useful, they often provide limited insights and may not fully reflect the complex and fast-changing nature of modern organizations. In contrast, AI-driven KPIs use advanced data analytics, machine learning, and increasingly generative AI tools to provide real-time insights, predictive analysis, and deeper understanding of performance patterns. These AI-based performance metrics help organizations move beyond simple historical measurement toward more dynamic and adaptive performance evaluation. In the context of generative AI analytics, such systems can generate insights, simulate possible outcomes, and support better strategic decision-making. Therefore, the shift from traditional KPIs to AI-driven performance metrics highlights the growing importance of generative AI in enhancing organizational performance measurement and management (AI Profit Pulse, 2025). Their processes and overall operations are performing. Earlier performance measurement approaches mainly focused on financial indicators, but over time organizations realized that financial data alone cannot fully explain performance. As a result, more balanced and multi-dimensional models were developed to include factors such as customer satisfaction, internal processes, employee development, and organizational learning. One of the most widely used models is the Balanced Scorecard, which evaluates performance from four perspectives: financial results, customer perspective, internal business processes, and learning and growth. This approach helps organizations align their strategies with measurable objectives and operational activities. Other performance measurement models also emphasize a holistic view of organizational performance by considering multiple stakeholders and performance dimensions (Shanfagatova & Looy, 2016). Overall, traditional KPI measurement systems have played an important role in evaluating organizational performance, especially through financial and operational indicators. However, with increasing business complexity and technological advancement, these conventional measures alone are no longer sufficient. AI-driven KPIs and modern performance measurement models provide more dynamic, real-time, and predictive insights that help organizations make better strategic decisions. In my view, the integration of generative AI analytics into performance measurement represents a significant step forward, as it enables organizations to move from simply evaluating past performance toward continuously improving future outcomes.

Conceptual Framework / Theoretical Background

Generative AI Data Processing

The literature highlights that generative AI is transforming data processing by enabling organizations to analyze both structured and unstructured data more effectively. Structured data, such as performance scores, productivity metrics, and financial indicators, can be processed to identify trends and predict future outcomes. At the same time, generative AI tools can analyze unstructured data like employee feedback, emails, and textual reports, which were traditionally difficult to evaluate. This allows organizations to gain deeper and more comprehensive insights into performance and decision-making processes (Fortune Business Insights, 2026). This capability makes generative AI particularly valuable for modern performance management because it helps organizations move beyond simple numerical metrics toward a more holistic understanding of performance. By combining different types of data, organizations can develop more accurate and meaningful performance measurement systems.

Key Performance Metric Models

AI-enhanced Key Performance Indicator (KPI) models are increasingly being adopted by organizations to improve productivity, operational efficiency, and employee engagement. Unlike traditional KPI systems that mainly focus on past performance, AI-driven metrics use real-time data, predictive analytics, and advanced data processing to provide deeper and more timely insights. These systems help organizations monitor performance continuously, identify emerging trends, and detect potential issues early. As a result, managers can make faster and more informed decisions, improving both individual and organizational performance. AI-based KPI models also support better alignment between employee activities and organizational goals, which can enhance engagement and overall workplace effectiveness (Schrage, Kiron, Candelon, Khodabandeh, & Chu, 2024). Integrating AI into performance measurement creates more adaptive and responsive evaluation systems. It enables organizations to move beyond static measurement methods toward data-driven decision-making, ultimately improving efficiency, strategic planning, and long-term organizational performance.

Data Science Techniques

Machine learning (ML)

Machine learning plays a central role in predictive analytics by enabling systems to learn patterns from historical data and make informed predictions without explicit programming. It includes both supervised learning, where models are trained on labeled datasets to predict outcomes, and unsupervised learning, which focuses on discovering hidden structures or relationships within unlabeled data. Common algorithms such as regression models, decision trees, support vector machines, neural networks, and ensemble methods are widely used depending on the nature of the problem. Feature engineering and proper evaluation metrics like accuracy, precision, recall, and F1-score are essential to ensure reliable performance. Effective machine learning implementation also requires high-quality data preparation and model validation to achieve meaningful and generalizable predictive insights (Park, 2024).

Natural Language Processing (NLP)

Natural Language Processing contributes to predictive analytics by enabling machines to interpret, analyze, and derive insights from textual data. Through techniques such as text classification,

sentiment analysis, and information extraction, NLP helps transform unstructured textual information into structured data suitable for analysis. This capability supports applications like customer feedback analysis, trend identification, and automated decision support (Deshpande, 2024). When combined with machine learning approaches, NLP enhances predictive accuracy by incorporating linguistic and contextual information that traditional numerical data alone may not capture

Methodology

Research Approach

This study adopts a qualitative research approach to explore how AI-driven performance metrics, particularly those supported by generative AI analytics, are transforming performance measurement systems in organizations. The research focuses on understanding how artificial intelligence is influencing traditional KPI frameworks, improving performance evaluation, and supporting more data-driven decision-making. To achieve this, relevant academic literature, industry reports, case studies, and credible online sources related to AI, generative analytics, and performance measurement were reviewed.

Data Sources

The study relies on secondary data sources, including peer-reviewed journal articles, industry publications, and reputable online resources discussing AI-driven performance management, KPI systems, and generative AI applications. Literature published mainly within the last decade was considered to ensure relevance to recent technological developments. Databases such as Google Scholar, Scopus, and other academic platforms were used to identify credible and high-quality sources.

Data Analysis

A thematic analysis approach was applied to analyze the collected literature. Key themes were identified, including the shift from traditional KPIs to AI-driven performance metrics, the role of generative AI in performance analytics, and emerging performance measurement models. The study also examined how AI technologies contribute to predictive insights, automation, and improved organizational decision-making. Existing theoretical frameworks related to performance measurement and technology adoption were reviewed to better understand the integration of AI within performance management systems.

Ethical Considerations

Ethical standards were maintained throughout the study by properly acknowledging all sources used. All references were cited appropriately to avoid plagiarism, and only reliable academic and professional publications were included to ensure the credibility of the research.

Limitations

This study is based solely on secondary data, which means it does not include primary empirical data or direct organizational observations. Some sources may not fully capture the most recent developments in generative AI analytics. Despite these limitations, the study provides useful insights into how AI-driven performance metrics are evolving and highlights areas where further empirical research is needed.

Research Results

AI-Driven Performance Insights

The analysis indicates that AI-driven performance metrics provide more dynamic and continuous insights compared to traditional evaluation approaches. Instead of relying solely on periodic performance reviews, AI systems enable ongoing monitoring of employee productivity, operational efficiency, and organizational outcomes. These systems can process large volumes of structured and unstructured data simultaneously, allowing managers to identify performance trends, emerging risks, and improvement opportunities more quickly. The integration of predictive analytics further supports proactive decision-making by forecasting potential performance outcomes based on historical patterns.

Identified Performance Metric Framework

Based on the reviewed literature and analytical observations, several key categories of AI-driven performance metrics emerge. These include productivity indicators such as task completion rates and output efficiency; employee engagement measures derived from feedback, communication patterns, and sentiment analysis; and operational performance indicators including process efficiency, customer satisfaction, and resource utilization. Together, these categories form a more comprehensive performance measurement framework that aligns individual performance with broader organizational objectives.

Interpretation of Findings

The findings suggest that AI technologies enhance performance management primarily through improved data integration, predictive insights, and automation capabilities. Organizations benefit from faster access to actionable information, which supports timely strategic decisions. Patterns observed across studies indicate that AI adoption often leads to better alignment between workforce activities and organizational goals, although successful implementation depends on data quality, transparency, and employee acceptance.

AI-Driven Performance Metrics Framework

Generative AI analytics contribute significantly to modern performance measurement by enabling deeper analysis of employee and operational data. These systems can integrate information from multiple sources, including performance databases, communication platforms, feedback systems, and operational records. Through advanced analytics, generative AI can identify patterns, generate performance summaries, and simulate potential future outcomes. Automated KPI tracking systems represent a key application of this approach. Such systems continuously collect and analyze performance data, reducing manual reporting requirements and improving accuracy. Real-time dashboards further enhance transparency by presenting performance insights visually, allowing managers and employees to monitor progress and adjust strategies when necessary. Typical AI-driven performance metrics may include productivity indicators such as output quality and efficiency, employee engagement measures derived from surveys or communication analysis, and operational efficiency metrics like turnaround time, customer satisfaction, or resource utilization. The integration of these metrics supports a more adaptive and forward-looking performance management framework.

Benefits and Organizational Impact

The adoption of AI-driven performance metrics offers several organizational benefits. One major advantage is improved decision-making, as leaders can access real-time insights supported by predictive analytics. This allows organizations to respond more effectively to changing business conditions. Productivity improvements are another important outcome. Automation of routine analytical tasks reduces administrative workload and enables employees to focus on higher-value activities. Additionally, AI-based performance insights help identify skill gaps and training needs, supporting workforce development. Cost efficiency can also be enhanced through optimized resource allocation and streamlined operational processes. Over time, these improvements contribute to stronger strategic alignment between organizational objectives, employee performance, and operational outcomes.

Challenges, Risks, and Ethical Considerations

Although AI-driven performance metrics offer benefits, implementing them comes with several challenges. One major issue is algorithmic bias because AI systems trained on incomplete or biased data can lead to unfair evaluations. To promote fairness and inclusivity, it's important to choose datasets carefully, continuously monitor the system, and use clear evaluation criteria. Data privacy is another key concern, especially when employee information is involved. Companies need to create strong data governance policies, follow relevant laws, and be transparent to maintain employee trust. There is also a danger in relying too much on automated evaluations. While AI can offer useful insights, human judgment is still necessary to interpret the results and make well-rounded decisions. So, combining AI technology with management experience is essential for using AI responsibly.

Discussion

The results demonstrate the increasing significance of AI in transforming performance management systems. AI-driven metrics offer more dynamic, predictive, and thorough insights into organizational performance than traditional KPI techniques. This change is indicative of an industry-wide trend toward data-driven decision-making. However, organizational preparedness, data quality, and ethical governance are necessary for the effective application of AI analytics. According to the literature, companies that progressively incorporate AI technologies while upholding employee involvement and transparency stand to gain the most. Practically speaking, companies should concentrate on striking a balance between human control, ethical issues, and technology innovation.

Conclusion

The contribution of generative AI analytics to the creation of AI-driven performance indicators and their effects on organizational performance management were investigated in this study. In comparison to conventional techniques, the analysis shows that AI technologies provide more continuous, predictive, and data-driven performance evaluation. By emphasizing the potential of generative AI to strengthen KPI frameworks, assist strategic decision-making, and boost organizational efficiency, the study adds to the expanding scholarly conversation on AI-enabled performance assessment. However, issues with algorithm openness, data privacy, and ethical governance call for careful thought. Future studies should concentrate on comparative assessments across industries, empirical examinations of AI-driven performance systems within businesses, and

the creation of uniform ethical standards for AI-based performance evaluation. Continued exploration in this area will be essential as AI technologies become increasingly integrated into organizational management practices.

References

- AI Profit Pulse. (2025). *AI performance metrics 2025: Why traditional KPIs are becoming obsolete*. Retrieved from AI Profit Pulse: <https://aiprofitpulse.ai/ai-performance-metrics-2025-why-traditional-kpis-are-becoming-obsolete/>
- Batty, M. (2025, April). Generative AI. *Environment and Planning B: Urban Analytics and City Science*, 52(5), 1031–1034. doi:<https://doi.org/10.1177/23998083251332093>
- Chuchu, B., & Kyongo, J. (2025, March). PERFORMANCE MANAGEMENT AND ARTIFICIAL INTELLIGENCE (AI): ENHANCING PERSONALIZED DEVELOPMENT WITH CONTINUOUS FEEDBACK AND DATA-DRIVEN DECISIONS. *International Journal of Computer Science and Information Technology Research*, 13(1), 13-22. doi:<https://doi.org/10.5281/zenodo.15025954>
- Davenport, T. H., Harris, J. G., & Shapiro, J. (2010). Competing on talent analytics. *Harvard Business Review*, 88, 52–58. Retrieved from https://hbr.org/2010/10/competing-on-talent-analytics?utm_source=chatgpt.com
- Deshpande, M. S. (2024, December). A Review of Predictive Analytics: Techniques, Advantages, Related Works and Applications. *Journal of Advanced Artificial Intelligence*, 1(3). Retrieved from <https://jaaionline.org/archives/volume1/number3/desai-jaai202412.pdf>
- Fortune Business Insights. (2026, February). Generative AI Market Size, Share & Industry Analysis. Fortune Business Insights. Retrieved from <https://www.fortunebusinessinsights.com/generative-ai-market-107837>
- Generative AI Market Size To Worth USD 58.0 Billion By 2032 | CAGR of 18.81%. (2024, October). *barchart*. Retrieved from <https://www.barchart.com/story/news/28966111/generative-ai-market-size-to-worth-usd-580-billion-by-2032-cagr-of-1881>
- Growett. (n.d.). AI-Driven Performance Metrics vs Traditional KPIs: A Comparison. Growett. Retrieved from <https://growett.com/blogs/AI-Driven-Performance-Metrics-vs-Traditional-KPIs--A-Comparison.html>
- Nyathani, R. (2023, November). AI in Performance Management: Redefining Performance Appraisals in the digital age. *Journal of Artificial Intelligence & Cloud Computing*, 1, 5. doi:[doi:10.47363/JAICC/2023\(2\)134](https://doi.org/10.47363/JAICC/2023(2)134)
- Odionu, C. S., Alagbariya, B. B., & Okon, R. (2024). Data-Driven Decision Making in Human Resources to Optimize Talent Acquisition and Retention. *International Journal of Scientific Research and Reviews (IJSRR)*, 22. doi:<https://doi.org/10.56781/ijssr.2024.5.2.0051>
- Park, M. (2024). Machine Learning for Predictive Analytics: Models and Methods. *Advances in Robotics & Automation*, 13, 276. doi:<https://doi.org/10.37421/2168-9695.2024.13.276>
- Schrage, M., Kiron, D., Candelon, F., Khodabandeh, S., & Chu, M. (2024, February). The Future of Strategic Measurement: Enhancing KPIs With AI. *MIT Sloan Management Review*. Retrieved from <https://sloanreview.mit.edu/projects/the-future-of-strategic-measurement-enhancing-kpis-with-ai/>
- Shanfagatova, A., & Looy, A. V. (2016). Business process performance measurement: A structured literature review of indicators, measures and metrics. *SpringerPlus*, 5. Retrieved from <https://pmc.ncbi.nlm.nih.gov/articles/PMC5069235/>

RISKS OF ARTIFICIAL INTELLIGENCE IN MODERN AUDITING

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Abstract

The integration of Artificial Intelligence (AI) into auditing is transforming audit procedures and evidence evaluation. While AI improves efficiency through full-population testing and anomaly detection, it also introduces new risks affecting audit quality and accountability. This study aims to identify and critically assess the main risks associated with AI in auditing. A qualitative research design was applied, using semi-structured interviews with audit professionals. The data were analysed using thematic analysis. The results reveal six key risk dimensions: data quality issues, algorithmic opacity, competence gaps, algorithmic bias, cybersecurity vulnerabilities, and accountability challenges. The findings indicate that AI redistributes rather than reduces audit risk, shifting it across technological, professional, and organisational domains. The study contributes to the understanding of AI-related risks and provides implications for auditors, firms, and regulators.

Keywords: Artificial Intelligence, Audit Risk, Auditing, Governance

Introduction

The integration of Artificial Intelligence (AI) into auditing practices represents one of the most consequential transformations in the history of the profession (Hasan, 2021). Advances in machine learning, predictive analytics, and automated data processing have enabled auditors to analyse entire populations of transactions, detect anomalies in real time, and identify risk patterns that were previously inaccessible through traditional sampling techniques (Bose, 2023). As a result, AI-driven tools are increasingly embedded in risk assessment procedures, substantive testing, and continuous auditing systems (Fedyk, 2022).

Early research on audit analytics largely emphasised efficiency gains and expanded evidential capacity (Almezeini, 2022). These studies framed AI as a technological enhancement capable of strengthening audit effectiveness by increasing coverage and reducing human error (Odonkor, 2024). Subsequent investment advanced this perspective by arguing that AI may fundamentally reshape audit methodologies and the structure of audit evidence (Tiron-Tudor, 2022). In parallel, regulatory discussions have acknowledged the accelerating digitalisation of audit processes and the need to adapt oversight frameworks accordingly (Mökander, 2022).

Technological transformations in auditing do not occur in isolation (Lisboa, 2023), however they affect the distribution of professional judgement, responsibility within audit engagements (Grønsund, 2020). Machine learning systems often operate on the basis of complex statistical models (Lam, 2024), the internal logic of which may be partially opaque even to their users (Agarwal, 2021). This lack of transparency calls into question the traditional requirement that audit conclusions must be transparent, explainable and justifiable to regulators and stakeholders (Orio, 2024). In addition,

algorithmic bias embedded in training data sets can systematically distort analytical results (Mehrabani, 2021), thereby creating risks that are qualitatively different from those associated with traditional audit tools (Landers, 2023).

Recent systematic reviews show that research in the field of AI in auditing is expanding rapidly (Odeyemi, 2024). However, most of the literature still focuses on technology, with an emphasis on functional capabilities rather than critical analysis of the structural risks associated with AI integration (Ferrara, 2023).

Studies addressing data governance, gaps in professional competence, or accountability issues often analyse these aspects in isolation (Jauhiainen, 2022). Comprehensive empirical assessments that integrate technological, professional, and institutional aspects of risk remain relatively limited (Koshiyama, 2024). Furthermore, practitioner-informed insights into how these risks manifest within real audit environments are still underrepresented in the academic discourse (Al-dahabi, 2024). Considering the public importance of auditing and its reliance on professional judgement, the introduction of AI represents not just a technical upgrade but a transformation that could affect audit quality, the allocation of responsibility, and stakeholder trust (Munoko, 2020: 214). To understand these implications, it is necessary to move beyond descriptive reports on technology implementation and engage in a critical assessment of the risks associated with AI-supported quality assurance systems (Díaz-Rodríguez, 2023; Werder, 2023). In this context, the present study aims to critically assess the main risks associated with the integration of AI into auditing. By combining recent scientific literature with the qualitative insights of experienced auditors, the study seeks to identify the main risk aspects arising from the implementation of AI and evaluate their implications for audit quality, professional judgement, and accountability structures.

Literature Review

The growing integration of Artificial Intelligence (AI) into auditing has attracted significant academic attention. The growing integration of Artificial Intelligence (AI) into auditing has attracted significant academic attention. Recent studies emphasise the growing importance of explainable AI in auditing. Explainability is increasingly considered a critical requirement for ensuring audit transparency and regulatory compliance. Without sufficient interpretability, AI-based audit conclusions may be difficult to justify to stakeholders and regulators. Furthermore, scholars highlight that the integration of AI requires not only technical adaptation but also institutional and ethical frameworks that support responsible use of automated systems. Early studies primarily focused on the efficiency gains associated with AI, highlighting its ability to enhance audit procedures through automation, full-population testing, and improved anomaly detection (Bose, 2023; Fedyk, 2022). These contributions emphasised the potential of AI to strengthen audit quality by reducing human error and increasing analytical capacity (Almezeini, 2022).

Subsequent research expanded this perspective by examining the broader implications of AI for audit methodologies and professional judgement. Scholars argue that AI not only enhances existing audit techniques but also fundamentally reshapes the nature of audit evidence and decision-making processes (Tiron-Tudor, 2022). At the same time, concerns have been raised regarding the opacity of machine learning models and the challenges they pose for transparency and explainability in auditing (Agarwal, 2021; Orio, 2024).

Another important strand of literature addresses risks related to algorithmic bias, data governance, and cybersecurity. Studies indicate that biased training data and weak data management practices may distort audit outcomes and increase systemic vulnerabilities (Mehrabi, 2021; Shukla, 2022). Furthermore, the increasing reliance on AI systems raises questions about auditor competence and the redistribution of professional responsibility (Grønsund, 2020; Jauhiainen, 2022).

Despite the growing body of research, existing studies often analyse these risks in isolation. Comprehensive empirical research integrating technological, professional, and institutional dimensions remains limited. In particular, there is a lack of practitioner-based insights into how AI-related risks manifest in real audit environments (Koshiyama, 2024; Al-dahabi, 2024). This study addresses this gap by combining theoretical perspectives with qualitative evidence from audit professionals.

Methodology

The integration of AI in auditing constitutes a complex socio-technical transformation shaped by organisational structures, professional norms, and evolving regulatory frameworks (Jauhiainen, 2022). Risk assessment cannot be reduced to a purely technical assessment or quantitative indicators. Instead, it requires a detailed examination of how practitioners perceive AI, the institutional context, and governance practices that influence how AI systems are implemented and interpreted in the audit environment (Mökander, 2023).

In view of the emerging and still fragmented nature of AI-based audit practices, a qualitative research design was adopted. This methodological approach is particularly suitable for areas where theoretical models are still under development and empirical data has not yet been consolidated (Hasan, 2021).

Moreover, as AI applications in auditing are neither fully standardised nor uniformly regulated across firms and jurisdictions, qualitative inquiry enables a context-sensitive analysis of evolving risk configurations (Aitkazinov, 2023).

The aim of this study is to critically evaluate the principal risks associated with AI integration in auditing.

Beyond identifying discrete categories of risk, the study seeks to analyse how these risks interact across technological, professional, and institutional dimensions, and how such interactions may affect audit quality, professional judgement, and accountability structures.

In accordance with this objective, the study addresses the following research question: What are the principal risks emerging from the integration of Artificial Intelligence in auditing, and how do these risks affect audit quality, professional judgement, and accountability structures?

Primary data were collected through semi-structured interviews. This method facilitates systematic exploration of predefined thematic domains while maintaining sufficient flexibility to capture unanticipated insights and contextual nuances. The interview protocol was organised around five thematic clusters: practical experience with AI tools in audit engagements; perceived technological risks, including data integrity and model reliability; professional implications, particularly with respect to judgement, competence, and reliance on automated outputs; governance and accountability considerations; and internal risk mitigation mechanisms implemented within audit firms.

Interviews were conducted under conditions of confidentiality to promote candid and reflective responses. With participants' consent, each interview was recorded and subsequently transcribed to ensure analytical accuracy and transparency.

Two professionals with experience in auditing and risk management participated in the study. Participant A is a senior accountant with extensive auditing experience in a major consulting firm. Participant B is a consultant specialising in risk strategy and transactions at an international audit firm. The selection of experienced practitioners ensured informed insights into both operational and governance-related dimensions of AI adoption.

The collected data were analysed using thematic analysis, a qualitative method suitable for identifying patterns within textual data. The analysis followed a structured process including data familiarisation, initial coding, theme identification, and refinement of thematic categories. This approach enabled a systematic interpretation of interview data and ensured that the findings were grounded in recurring patterns observed across participants' responses. The analysis revealed six related themes: data quality issues; lack of transparency in AI systems; insufficient training and competence gaps among auditors; algorithmic bias; cybersecurity vulnerabilities; and oversight and accountability challenges. Together, these topics highlight the main obstacles to the responsible and effective integration of AI into auditing and serve as an analytical basis for further discussion.

Research Results

Thematic analysis of the interview data revealed six key themes representing the principal risks associated with AI integration in auditing.

Theme 1: Data quality – Participants identified data quality as a critical risk factor. AI systems were described as highly dependent on the accuracy, completeness, and consistency of input data. Poor-quality data was found to significantly distort analytical outputs and risk assessments.

Theme 2: Algorithmic opacity – A major concern relates to the limited transparency of AI systems. Participants reported difficulties in interpreting and explaining AI-generated results, particularly when complex machine learning models are used.

Theme 3: Competence gaps – Both respondents emphasised that insufficient knowledge of AI tools may lead to overreliance on automated outputs and reduced professional scepticism.

Theme 4: Algorithmic bias – Algorithmic bias was identified as a potential risk arising from unrepresentative training data, which may influence analytical priorities and distort audit conclusions.

Theme 5: Cybersecurity vulnerabilities – The integration of AI into digital infrastructures increases exposure to data breaches and unauthorised access, posing risks to audit evidence integrity.

Theme 6: Accountability challenges – Participants highlighted uncertainty regarding responsibility allocation in AI-assisted audits, as decision-making becomes distributed between human auditors and technological systems.

Overall, the themes demonstrate that AI introduces a complex and interconnected set of risks affecting technological, professional, and organisational dimensions of auditing. In addition to the identified themes, the analysis revealed important interconnections between the risk dimensions. Participants emphasised that these risks do not occur in isolation but rather reinforce one another

within the audit process. For example, poor data quality was seen as a foundational issue that may amplify other risks, particularly algorithmic bias and unreliable analytical outputs. Similarly, the lack of transparency in AI systems was linked to increased difficulty in assigning responsibility, thereby intensifying accountability challenges.

Furthermore, the findings suggest that the use of AI may gradually alter the cognitive processes of auditors. Participants indicated that frequent reliance on automated tools could lead to a shift in how audit evidence is interpreted, potentially reducing critical evaluation and professional scepticism. This effect was not described as immediate, but rather as a long-term structural change in audit practice.

Another important observation relates to organisational context. The level of risk exposure was perceived to vary depending on the maturity of internal governance frameworks and the availability of training programs. Firms with more structured AI governance and continuous professional development were considered better equipped to mitigate the identified risks.

Overall, these findings highlight that AI-related risks in auditing should be understood as part of a dynamic and interconnected system. Effective risk management therefore requires an integrated approach that combines technological safeguards, professional competence, and organisational governance.

Findings and Discussion

Empirical data show that integrating AI into auditing reconfigures the audit risk architecture rather than entailing isolated technical issues. In line with previous studies (Almufadda, 2022), interviews confirm that advanced analytical techniques still rely heavily on robust data management (Burrell, 2016). AI systems do not compensate for weaknesses in the information infrastructure (Nazer, 2023); rather, they amplify existing deficiencies, thereby increasing systemic vulnerability when data controls are wrong (Ajayi-Nifise, 2024). The opacity of algorithmic models further complicates the evidentiary function of auditing. Although explainability issues in machine learning are well known in the literature (Agarwal, 2021), the findings of this study highlight their practical implications for professional accountability. Concerns related to bias and cybersecurity demonstrate the interdependence of technological and institutional risks. The evidence of algorithmic bias (Mehrabi, 2021) is consistent with participant concerns that biased training data may influence risk assessment processes. At the same time, the expansion of digital interconnectivity increases vulnerability to data leaks and manipulation (Shukla, 2022), strengthening the argument that cybersecurity management is an integral part of audit quality (Bakare, 2024; Bandari, 2023).

Finally, the distribution of responsibility in an AI-enabled audit environment complicates traditional accountability structures. While ethical studies argue that responsibility ultimately lies with humans, the redistribution of decision-making processes calls into question the established framework (Cumming, 2024). Thus, discussions on the regulation of AI compliance assessment and oversight (Mökander, 2022) become directly relevant to maintaining institutional trust.

Overall, the results point to a multi-level socio-technical configuration of risks, in which control, professional competence and technological design are mutually reinforcing factors that determine the quality of auditing (Aldemir, 2024). Therefore, the effective integration of AI requires coordinated development in the organisational, professional and regulatory spheres.

In addition, the findings highlight the need for further research in this area. Given the limited sample size and qualitative nature of this study, future research should incorporate larger datasets and mixed-method approaches to validate and expand the identified risk dimensions. Comparative studies across different jurisdictions and audit environments would also provide deeper insights into how AI-related risks manifest under varying regulatory and organisational conditions.

Conclusion

This study critically evaluated the principal risks associated with AI integration in auditing. The findings identify six interrelated risk dimensions: data governance deficiencies, algorithmic opacity, competence gaps, algorithmic bias, cybersecurity vulnerabilities, and accountability ambiguity. These risks are not isolated technical problems but structurally interconnected factors capable of influencing audit quality and professional responsibility.

In response to the research question, the study demonstrates that AI integration reshapes the architecture of audit risk by altering evidential processes, redistributing judgement authority, and complicating accountability structures. AI should therefore not be conceptualised as a neutral efficiency-enhancing tool but as a transformative infrastructure that reconfigures professional roles and institutional safeguards.

The study is limited by its small qualitative sample and reliance on practitioner perceptions within a specific professional context. Future research should incorporate broader empirical datasets, cross-jurisdictional comparisons, and mixed-method approaches to validate and expand these findings. From a practical perspective, audit firms should implement structured AI governance frameworks and prioritise continuous professional training.

Regulators must clarify standards concerning explainability, human oversight, and responsibility allocation. Academic research should further investigate the long-term implications of AI integration for audit quality, professional scepticism, and stakeholder trust.

References

- Agarwal, R., Melnick, L., Frosst, N., Zhang, X., Lengerich, B., Caruana, R., & Hinton, G. E. (2021). Neural additive models: Interpretable machine learning with neural nets. *Advances in Neural Information Processing Systems*, 34, 4699–4711. DOI: [10.48550/arXiv.2004.13912](https://doi.org/10.48550/arXiv.2004.13912).
- Ajayi-Nifise, A. O., Odeyemi, O., Mhlango, N. Z., Ibeh, C. V., Elufioye, O. A., & Awonuga, K. F. (2024). The future of accounting: Predictions on automation and AI integration. *World Journal of Advanced Research and Reviews*, 21(2), 399–407. Article DOI: [10.30574/wjarr.2024.21.2.0466](https://doi.org/10.30574/wjarr.2024.21.2.0466).
- Aitkazinov, A. (2023). The role of artificial intelligence in auditing: Opportunities and challenges. *International Journal of Research in Engineering, Science and Management*, 6(6), 117–119. DOI: [10.7176/RJFA/14-15-03](https://doi.org/10.7176/RJFA/14-15-03).
- Aldemir, C., & Uçma Uysal, T. (2024). AI competencies for internal auditors in the public sector. *EDPACS*, 1–19. DOI: [10.1080/07366981.2024.2312001](https://doi.org/10.1080/07366981.2024.2312001).
- Al-dahabi, Z. M. A., Hajjaj, R. Y., & Algazo, F. A. (2024). Attitudes of auditors about employing artificial intelligence in the auditing process: Jordanian auditing companies are an example. *International Journal of Science and Research Archive*, 11(2), 1765–1776. DOI: [10.30574/ijrsra.2024.11.2.0679](https://doi.org/10.30574/ijrsra.2024.11.2.0679).
- Almufadda, G., & Almezeini, N. A. (2022). Artificial intelligence applications in the auditing profession: A literature review. *Journal of Emerging Technologies in Accounting*, 19(2), 29–42. DOI: [10.2308/JETA-2020-083](https://doi.org/10.2308/JETA-2020-083).
- Bakare, S. S., Adeniyi, A. O., Akpuokwe, C. U., & Eneh, N. E. (2024). Data privacy laws and compliance: A comparative review of the EU GDPR and USA regulations. *Computer Science & IT Research Journal*, 5(3), 528–543. DOI: [10.51594/csitrj.v5i3.859](https://doi.org/10.51594/csitrj.v5i3.859).
- Bandari, V. (2023). Enterprise data security measures: A comparative review of effectiveness and risks across different industries and organization types. *International Journal of Business Intelligence and Big Data Analytics*, 6(1), 1–11. DOI: [10.17613/vzyva-sph89](https://doi.org/10.17613/vzyva-sph89).

- Bose, S., Dey, S. K., & Bhattacharjee, S. (2023). Big data, data analytics and artificial intelligence in accounting: An overview. In *Handbook of Big Data Research Methods* (pp. 32–51). DOI:10.4337/9781800888555.00007
- Burrell, J. (2016). How the machine ‘thinks’: Understanding opacity in machine learning algorithms. *Big Data & Society*, 3(1), 1–12. DOI:10.1177/2053951715622512
- Cumming, D., Saurabh, K., Rani, N., & Upadhyay, P. (2024). Towards AI ethics-led sustainability frameworks and toolkits: Review and research agenda. *Journal of Sustainable Finance and Accounting*, 1, 100003. DOI:10.1016/j.josfa.2024.100003
- Díaz-Rodríguez, N., Del Ser, J., Coeckelbergh, M., de Prado, M. L., Herrera-Viedma, E., & Herrera, F. (2023). Connecting the dots in trustworthy artificial intelligence: From AI principles, ethics, and key requirements to responsible AI systems and regulation. *Information Fusion*, 99, 101896. DOI:10.48550/arXiv.2305.02231
- Fedyk, A., Hodson, J., Khimich, N., & Fedyk, T. (2022). Is artificial intelligence improving the audit process? *Review of Accounting Studies*, 27(3), 938–985. DOI:10.1007/s11142-022-09697-x
- Ferrara, E. (2023). Fairness and bias in artificial intelligence: A brief survey of sources, impacts, and mitigation strategies. *Science*, 6(1), 3–9. DOI:10.3390/sci6010003
- Grønsund, T., & Aanestad, M. (2020). Augmenting the algorithm: Emerging human-in-the-loop work configurations. *The Journal of Strategic Information Systems*, 29(2), 101614. DOI:10.1016/j.jsis.2020.101614
- Hasan, A. R. (2021). Artificial Intelligence (AI) in accounting & auditing: A literature review. *Open Journal of Business and Management*, 10(1), 440–465. DOI:10.4236/ojbm.2022.101026
- Jauhiainen, T., & Lehner, O. M. (2022). Good governance of AI and big data processes in accounting and auditing. In *Artificial Intelligence in Accounting* (pp. 119–181). London: Routledge.
- Khan, I. (2023). AI-powered data governance: Ensuring integrity in banking's technological frontier. Retrieved from: https://www.researchgate.net/publication/373296863_AI-Powered_Data_Governance_Ensuring_Integrity_in_Banking's_Technological_Frontier
- Koshiyama, A., Kazim, E., Treleaven, P., Rai, P., Szpruch, L., Pavey, G., & Chatterjee, S. (2024). Towards algorithm auditing: Managing legal, ethical and technological risks of AI, ML and associated algorithms. *Royal Society Open Science*, 11(5), 230859. DOI:10.1098/rsos.230859
- Lam, K., Lange, B., Blili-Hamelin, B., Davidovic, J., Brown, S., & Hasan, A. (2024). A framework for assurance audits of algorithmic systems. *arXiv preprint arXiv:2401.14908*.
- Landers, R. N., & Behrend, T. S. (2023). Auditing the AI auditors: A framework for evaluating fairness and bias in high-stakes AI predictive models. *American Psychologist*, 78(1), 36–52. DOI:10.1037/amp0000972
- Lisboa, P. J., Saralajew, S., Vellido, A., Fernández-Domenech, R., & Villmann, T. (2023). The coming of age of interpretable and explainable machine learning models. *Neurocomputing*, 535, 25–39. DOI:10.1016/j.neucom.2023.02.040
- Mehrabi, N., Morstatter, F., Saxena, N., Lerman, K., & Galstyan, A. (2021). A survey on bias and fairness in machine learning. *ACM Computing Surveys*, 54(6), 1–35. DOI:10.48550/arXiv.1908.09635
- Mökander, J. (2023). *Ethics-based auditing of automated decision-making systems: Considerations and challenges* (Doctoral dissertation, University of Oxford). Retrieved from: d3f462607k
- Mökander, J., Axente, M., Casolari, F., & Floridi, L. (2022). Conformity assessments and post-market monitoring: A guide to the role of auditing in the proposed European AI regulation. *Minds and Machines*, 32(2), 241–268. DOI:10.1007/s11023-021-09577-4
- Munoko, I., Brown-Liburd, H. L., & Vasarhelyi, M. (2020). The ethical implications of using artificial intelligence in auditing. *Journal of Business Ethics*, 167(2), 209–234. DOI:10.1007/s10551-019-04407-1
- Nazer, L. H., Zatarah, R., Waldrip, S., Ke, J. X. C., Moukheiber, M., Khanna, A. K., & Mathur, P. (2023). Bias in artificial intelligence algorithms and recommendations for mitigation. *PLOS Digital Health*, 2(6), e0000278. DOI:10.1371/journal.pdig.0000278
- Odeyemi, O., Awonuga, K. F., Mhlango, N. Z., Ndubuisi, N. L., Olatoye, F. O., & Daraojimb, A. I. (2024). The role of AI in transforming auditing practices: A global perspective review. *World Journal of Advanced Research and Reviews*, 21(2), 359–370. DOI:10.30574/wjarr.2024.21.2.0460
- Odonkor, B., Kaggwa, S., Uwaoma, P. U., Hassan, A. O., & Farayola, O. A. (2024). The impact of AI on accounting practices: A review: Exploring how artificial intelligence is transforming traditional accounting methods and financial reporting. *World Journal of Advanced Research and Reviews*, 21(1), 172–188. DOI:10.30574/wjarr.2024.21.1.2721
- Orio, M., & Noor, K. (2024). Transparency and accountability in AI/ML regulatory reporting: Explaining algorithms and interpretability. Japan, Fukui University of Technology: Retrieved from: easychair.org/publications/preprint/xdjN/open
- Shukla, S., George, J. P., Tiwari, K., & Kureethara, J. V. (2022). Data security. In *Data Ethics and Challenges* (pp. 41–59). Singapore: Springer. DOI:10.1007/978-981-19-0752-4
- Tiron-Tudor, A., & Deliu, D. (2022). Reflections on the human-algorithm complex duality perspectives in the auditing process. *Qualitative Research in Accounting & Management*, 19(3), 255–285. Retrieved from: [Reflections on the human-algorithm complex duality perspectives in the auditing process | Qualitative Research in Accounting & Management | Emerald Publishing](https://www.emerald.com/insight/content/doi/10.1108/QRAM-03-2022-0011/full#qram-03-2022-0011)
- Werder, K., Ramesh, B., & Zhang, R. (2022). Establishing data provenance for responsible artificial intelligence systems. *ACM Transactions on Management Information Systems*, 13(2), 1–23. DOI:10.1145/3503488

VALSTS ATBALSTA JĒDZIENA IZPRATNE UN SATURS EIROPAS SAVIENĪBAS TIESĪBU KONTEKSTĀ

UNDERSTANDING AND THE SUBSTANTIVE CONTENT OF THE CONCEPT OF STATE AID IN THE CONTEXT OF EUROPEAN UNION LAW

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Anotācija

Regulējumi, kas saistīti ar valsts atbalstu, arvien biežāk tiek iekļauti normatīvajos aktos, un arī ikdienā nereti sastopamies ar šo jēdzienu. Būtiski ir nošķirt valsts atbalsta sadzīvisko izpratni no tā juridiskās definīcijas. Lai gan pieejams plašs skaidrojošo materiālu un avotu klāsts, joprojām konstatējams, ka izpratne par valsts atbalsta pamatprincipiem un piemērošanas kārtību nav pietiekama. Valsts atbalsta regulējums ir būtiska Eiropas Savienības konkurences tiesību sastāvdaļa. Eiropas Savienības tiesu aktuālā judikatūra balstās pieņēmumā, ka pat nelielas atbalsta summas, kas piešķirtas jebkuras kategorijas uzņēmumam, var kropļot konkurenci un ietekmēt tirdzniecību starp dalībvalstīm. Pētījumā aplūkoti valsts atbalsta vispārējie tiesiskie regulējumi, kā arī Eiropas Komisijas dokumentos iezīmētās tendences, kas saistītas ar valsts atbalsta kontroles prakses pilnveidi. Pētījuma periods aptver pēdējo desmit gadu attīstību, tostarp attiecīgo judikatūru un citus avotus, kas tiek uzskatīti par aktuālo praksi veidojošiem. Pētījuma izstrādē izmantotas dogmatiskā, sistēmiskā, vēsturiskā, teleoloģiskā un analītiskā metode.

Atslēgas vārdi: konkurences traucējums, saimnieciskā darbība, selektivitāte, valsts atbalsts

Abstract

Regulations related to state aid are increasingly incorporated into legislative acts, and this concept also appears frequently in everyday context. It is important to distinguish the common, informal understanding of state aid from its precise legal definition. Although a wide range of explanatory materials and sources is available, it is evident that the understanding of the basic principles of state aid and their application remains insufficient. State aid regulation constitutes an essential part of European Union competition law. The current case law of the EU courts assumes that even small amounts of aid granted to an undertaking of any type may distort competition and affect trade between Member States. This study examines the general legal framework governing state aid, as well as the key trends reflected in European Commission documents concerning the improvement of state aid control practice. The study covers developments over the past ten years, including relevant case law and other sources considered to shape current practice. The research employs dogmatic, systemic, historical, teleological, and analytical methods.

Keywords: distortion of competition, economic activity, selectivity, state aid

Ievads

Valsts atbalsta jēdziens Eiropas Savienības (turpmāk – ES) kontekstā ir plaši apskatīts dažādu sociālo zinātņu kontekstā kā ekonomisks, politisks un tiesību jautājums. Ar valsts atbalstu plašākā izpratnē tiek saprasta jebkura valsts vai pašvaldību piešķirta subsīdija, tai skaitā dažāda veida sociālie pabalsti iedzīvotājiem, kas vispārējā gadījumā nav uzskatāmi par valsts atbalstu ES tiesību kontekstā. Tomēr mehāniska nošķiršana faktiski nav iespējama, jo bieži valsts atbalsta statuss nav atkarīgs no subjekta, bet gan no tā veikto ekonomisko aktivitāšu kvalifikācijas. ES valsts atbalsta juridiskais pamats tiek atvasināts no *Līguma par ES darbību* (LESD, 2012) (turpmāk – *LESD*) 107., 108. un 109. pantā ietvertajiem regulējumiem. Šie panti ir nodalīti atsevišķā *LESD* 1. nodaļas “Konkurences noteikumi” 2. sadaļā “Valsts atbalsts”. Konkurences politika ir kļuvusi par vienu no ES integrācijas galvenajiem pīlāriem, un tās ietvaros tiek risinātas četras ES konkurences politikas pamatnostādnes: kartelji, monopoli, apvienošanās un valsts atbalsts (Aydin, Thomas, 2012, 531). Tādējādi var secināt, ka valsts atbalsta jautājumi primāri ir skatāmi konkurences tiesību kontekstā un tikai tad ir iespējams pievērsties citiem būtiskajiem kritērijiem.

Vienlaikus var piekrist viedoklim, ka mūsdienu ES konkurences politika ir arī cieši saistīta ar plašākiem ES mērķiem: veicināt spēcīgu ilgtspējīgu izaugsmi, konkurētspēju un darbvietu radīšanu (Aydin, Thomas, 2012, 531). Nevar noliegt, ka ES valstu ekonomikas ir savstarpēji atkarīgas, pateicoties preču, pakalpojumu un kapitāla tirgu starptautiskajai integrācijai kopējā tirgū. Tomēr šāda savstarpējā ekonomiskā atkarība ir saasinājusi konkurenci investīciju piesaistē starp valdībām ES un ar trešajām valstīm. Tāpat 2008. gadā aizsākusies finanšu un ekonomiskā krīze, COVID-19 pandēmija, 2022. gadā Krievijas uzsāktais karš Ukrainā un D. Trampa vadītās ASV visai haotiskā tarifu politika ārvalstīs ražotajām precēm rada spiedienu uz valdībām ES un arī visā pasaulē, lai tās pieņemtu protekcionistiskus pasākumus. Šāda salīdzinoši ilgstoša situācija liek izteikt pieņēmumu, ka šajā nestabilitātes periodā valsts atbalsts būs viens no iemīļotajiem politiku rīkiem visdažādāko problēmu, tai skaitā iedomātu, risināšanai. Tāpat var izteikt pieņēmumu par pašlaik ES akceptēto valsts atbalsta izņēmumu skaita palielināšanos, kā arī dalībvalstu vēlmi maksimāli izmantot *de minimis* sniegtās atbalsta iespējas.

Pašreizējās tendences valsts atbalsta izmantošanas paplašināšanai ir skaidri saskatāmas, un tas var radīt šaubas, vai Eiropas Komisija spēs nodrošināt *LESD* regulējumu efektivitāti, it īpaši situācijā, kad dalībvalstis un ES kopumā sastopas ar dažādiem izaicinājumiem, tai skaitā mājokļu pieejamības krīzi. Vienlaikus gan nekas neliecina, ka šajos jautājumos ES kopējo politiku sagaida būtiskas izmaiņas. Eiropas Komisija (turpmāk – EK) ir izrādījusi gatavību reaģēt uz kopējo situāciju, tai skaitā ar 2024. gadu palielinot *de minimis* atbalsta apjomu visu nozaru uzņēmumiem no 200 000 un 300 000 eiro (750 000 eiro vispārējas tautsaimnieciskas nozīmes pakalpojumiem) trīs fiskālo gadu periodā (EK, 2023/2831). Šāds palielinājums, kuru pozitīvi novērtē arī Eiropas ekonomiskā un sociālā komiteja (EESC, 2025), no EK puses tiek pamatots ar inflāciju periodā no 2013. gada, kad tika pieņemta EK Regula Nr. 1407/2013 (EK, 1407/2013). Jāatzīmē, ka vispārēju valsts atbalsta aizliegumu ES līmenī kompensē ne tikai *de minimis* atbalsta regulējums, bet arī vispārējās izņēmumu grupas. Tomēr jāņem vērā ES tiesas tiesu praksē ietvertos skaidrojumus, piemēram, norādi, ka valsts atbalsta kritērijs nav tā sniegšanas iemesls vai forma, bet gan tā sekas (EST, 1974, 27). Tādējādi jebkurš valsts atbalsta piešķirums sākotnēji vērtējams pēc vispārējiem kritērijiem, un tikai tad analizējama iespējamo izņēmumu piemērošanas iespējamība. Tādējādi pētījuma mērķis ir sistematizēt avotos pieejamo informāciju, lai izveidotu prakses vajadzībām noderīgu materiālu.

Valsts atbalsta vispārējie kritēriji

Prakses materiālos un literatūrā tiek izdalīti četri (Lūsis, Grantiņa, 2020) vai pieci kumulatīvi kritēriji (AKD, 2026), kas ņemami vērā, lai noteiktu, vai konkrētais gadījums ir kvalificējams kā valsts atbalsts LESD izpratnē. Klasifikācija parasti ir balstīta LESD 107. panta pirmajā daļā ietvertajās normās, tomēr valsts atbalsta noteikšanā ir vērā ņemams LESD 101.–109. panta normu konteksts, un tādējādi vērtēšanas metodoloģijā izmantojamas piecas, nevis tikai LESD 107. panta pirmajā daļā tieši minētās četras pazīmes. Literatūrā vienota viedokļa par šo jautājumu nav, un ir autori, kas norāda uz piecām kvalificējošajām pazīmēm šajā normā (Novak-Salles, 2020). Tomēr var piekrist, ka 107. panta pirmajā daļā ietvertās pazīmes ir vērtējamas kā kumulatīvas. Vienlaikus svarīgākais kritērijs ir – vai atbalsta subjekts veic saimniecisko darbību. Tieši šādu pieeju ir izvēlējusies arī Finanšu ministrija savā informatīvajā materiālā “Kā konstatēt komercdarbības atbalstu” (Galauska, 2021).

EK 2016. gada paziņojumā par LESD 107. panta pirmajā daļā minēto valsts atbalsta jēdzienu uzmanība pamatoti ir pievērsta “uzņēmuma” jēdziena izpratnes skaidrojumam. Iepriekš minētajā paziņojumā uzņēmuma jēdzienā ietverti priekšnoteikumi, kas pēc būtības prasa katra konkrētā gadījuma izvērtējumu: 1) subjekta statuss saskaņā ar valsts tiesību aktiem nav noteicošs; 2) valsts atbalsta noteikumu piemērošana nav atkarīga no tā, vai subjekts ir izveidots ar mērķi gūt peļņu; 3) vai subjektu klasificē kā uzņēmumu – vienmēr ir atkarīgs no konkrētās darbības (subjekts, kas veic gan saimniecisko, gan nesaimniecisko darbību, ir uzskatāms par uzņēmumu vienīgi attiecībā uz tā saimniecisko darbību) (EK, 2016, 8–10). Tādējādi secināms, ka uzņēmuma jēdzienam ir nozīme tikai kontekstā ar pārējām valsts atbalstu kvalificējošajām pazīmēm, īpaši pievēršot uzmanību jautājumam, vai konkrētā darbība ir uzskatāma par saimniecisko darbību.

Saimnieciskā darbība

Šajā kontekstā primāri nepieciešams identificēt jēdziena “saimnieciskā darbība” saturu. Latvijas normatīvajā regulējumā jēdziena legāldefinīciju iespējams atrast *Komerclikuma* (KCL, 2000) 1. panta trešajā daļā: “*Saimnieciskā darbība ir jebkura sistemātiska, patstāvīga darbība par atlīdzību.*” Valsts ieņēmumu dienests, balstoties uz nodokļu likumos ietverto terminoloģiju, ir radījis nedaudz sašaurinātāku šā jēdziena skaidrojumu, norādot, ka “... *uzņēmējdarbību, ko veic cilvēks (fiziska persona), nedibinot uzņēmumu, sauc par saimniecisko darbību*” (VID, 2026). Uzņēmējdarbības legāldefinīcijas šobrīd Latvijas normatīvajā regulējumā nepastāv, bet tas bija formulēts šobrīd spēku zaudējušā likuma *Par uzņēmējdarbību* (Par uzņēmējdarbību, 1990) 1. panta pirmajā daļā: “*Uzņēmējdarbība ir ilgstoša vai sistemātiska ekonomiskā darbība un kapitāla ieguldīšana, kas vērsta uz preču ražošanu, realizāciju, darbu izpildi, tirdzniecību, pakalpojumu sniegšanu nolūkā iegūt peļņu*”, kas kopumā atbilst *Komerclikuma* 1. panta otrajā daļā ietvertajai komercdarbības legāldefinīcijai, kur tā tiek definēta kā viens no uzņēmējdarbības veidiem. Valsts atbalsta konteksta ES tiesībās saimnieciskajai darbībai vienlaikus ir gan šaurāks, gan arī plašāks saturs. Ar to var izskaidrot *Komercdarbības atbalsta kontroles likumā* (KAKL, 2014) lietotās terminoloģijas atšķirības no *Komerclikuma* jēdzieniem, tomēr šāda Latvijas normatīvā regulējuma izstrādātāju prakse tiesību jēdzieniem noteikt atšķirīgu saturu dažādos normatīvajos aktos ir vērtējama negatīvi.

Atbilstoši Eiropas Savienības tiesas (turpmāk – EST) pastāvīgajai judikatūrai jebkura darbība, kas ietver preču un pakalpojumu piedāvāšanu noteiktā tirgū, ir saimnieciska darbība (EST, 2000, 75). Valsts atbalsta kontekstā nozīme ir ne tikai saimnieciskās darbības sistemātiskumam un atlīdzības komponentei, bet arī tam, vai konkrētajai darbībai ir “tirgus”, t.i., preces vai pakalpojumi var tikt

piedāvāti nosacīti neierobežotam personu lokam. Ja subjekts veic darbības, kurām ir “tirgus”, tā kvalificējas kā uzņēmums neatkarīgi no tās organizatoriskās struktūras vai finansējuma avota. Arī bezpeļņas organizācijas un valsts iestādes var tikt definētas kā valsts atbalsta saņēmējas, ja tās tirgū piegādā preces vai pakalpojumus (EK, 2016, 4). EST prakse parāda, ka atšķirība starp saimniecisko un “nesaimniecisko” darbību ne vienmēr ir vienkārša, kas var izpausties arī tikai īpašuma tiesību realizācijā (EST, 2006). To atzīst arī EK, norādot, ka nav iespējams izveidot izsmēlošu sarakstu ar darbībām, kuras *a priori* nekad netiktu uzskatītas par saimniecisko darbību (EK, 2016, 15). Līdz ar to visai piesardzīgi jāvērtē mēģinājumi Latvijā no valsts atbalsta saņēmēju loka izslēgt dzīvokļu īpašnieku kopības (Pauris, 2025), kas gan kopumā ir uzskatāma par pamatotu pieeju. No subjekta un veiktās darbības viedokļa dzīvokļu īpašnieku kopības nav uzskatāmas uzņēmumu vai saimnieciskās darbības veicēju *LESD* 101.–109. panta izpratnē, bet visdrīzāk atbilst EK paziņojumā minētajām kooperatīvu pazīmēm (EK, 2016, 157). Vienlaikus gan jānorāda, ka caur dzīvokļu īpašnieku kopību saņemtais valsts atbalsts subjektam, kura saimnieciskā darbība ir saistīta ar nekustamā īpašuma attīstīšanu, visdrīzāk būtu vērtējama kā pakļaujams atbalsta kontroles pasākumiem *LESD* 107. panta pirmās daļas tvērumā.

Šis aspekts izgaismo vēl vienu problēmu – EST praksē identificētais valsts atbalsta patiesā saņēmēja jēdziens. Dažos gadījumos faktiskā saņēmēja noteikšana var būt sarežģīta. Tāpat EST judikatūrā konsekventi noteikts, ka atsevišķas juridiskas personas var veidot ekonomisku vienību, kas pēc tam tiek uzskatīta par atbalsta saņēmēju (EST, 2023, 60-61). *LESD* 107. panta pirmajā daļā lietots termins “uzņēmums”. Avotos tiek skaidrots, ka ar šo jēdzienu ir saprotams jebkurš subjekts, kas veic saimniecisko darbību, neatkarīgi no tā, vai tas veidots ar mērķi gūt peļņu. Tādējādi, kā to pareizi identificējusi Finanšu ministrija (Galauska, 2021), uzmanība ir pievēršama faktiskajai darbībai, nevis juridiskajai formai. Kā jau norādīts iepriekš, arī bezpeļņas organizācijas un valsts iestādes var tikt identificētas kā “uzņēmumi” valsts atbalsta kontekstā. Uzņēmuma jēdziens var ietvert arī operatorus un “starpniekus”, ja tie gūst labumu no saņemtā finansējuma un ir iespējams identificēt konkrēto “tirgu”, kur pirmšķietami var pastāvēt konkurence. Tādējādi arī valsts atbalsts uzņēmumiem, kas darbojas tikai vienas dalībvalsts ietvaros vai pat vēl lokālāk, var tikt uzskatīts par nesavietojamu ar kopējo tirgu, ja šāds atbalsts var radīt konkurences kropļojumu un barjeras ārvalstu uzņēmumu ienākšanai konkrētajā tirgū.

Valsts līdzekļi

LESD 107. panta pirmajā daļā lietotais valsts līdzekļu jēdziens, kas ir obligāts valsts atbalsta identificēšanai, saprotams paplašināti. Tās var būt gan dažāda veida publisko tiesību subjekts vai to kontrolētu institūciju finansējuma piešķirumi, nodokļu atlaides, kā arī aizdevumi ar atvieglotiem nosacījumiem. Tādējādi arī piešķirumi, kurus finansē privātās struktūras, bet līdzekļus, kas atrodas valsts kontrolē, joprojām var uzskatīt par valsts atbalstu. Valsts līdzekļu jēdziens tiek interpretēts plaši – ja piešķirums samazina uzņēmuma parastās izmaksas, uzskatāms, ka uzņēmums gūst labumu no valsts līdzekļiem. Arī valsts negūtie ieņēmumi tiks klasificēti kā valsts atbalsts, ja līdzekļi, kas parasti tiktu iemaksāti valsts budžetā, nav jāiemaksā, realizējot valsts atbalsta shēmu (EST, 2000, 48–51). Būtībā ir jāpierāda tieša saikne starp atbalsta saņēmējam piešķirto labumu un valsts budžeta samazinājumu, vai vismaz skaidri definēts ekonomiskais risks, kas var radīt potenciālu konkurences traucējumu. ES tiesību kontekstā valsts atbalsta jēdziens nav attiecināms uz subsīdijām, kas tiek piešķirtas privātpersonām, kas nav saimnieciskās darbības veicēji (piemēram, dažāda veida sociālā palīdzība), kā arī uz vispārējiem pasākumiem, kas attiecināmi uz visiem uzņēmumiem, un tādējādi

tie nav uzskatāmi par valsts atbalstu (piemēram, vispārējie nodokļu pasākumi vai ar nodarbinātību saistītie tiesību akti).

Tomēr EKT judikatūra parāda, ka zema nodokļa likme visai valstij nav uzskatāma par valsts atbalstu, savukārt fiskāli atkarīgam reģionam nevar būt atšķirīga nodokļa likme no valsts noteiktās, kas padara šo nodokļa samazinājumu specifisku un līdz ar to definējamu kā valsts atbalstu ar selektivitātes elementu (EST, 2006, 2). Tādējādi secināms, ka arī valsts līdzekļu jēdziena saturu nav iespējams definēt kā noslēgtu gadījumu kopu un katrs gadījums vērtējams padziļināti. Valsts līdzekļu kontekstā interesants ir EST spriedums lietā Nr. C-78/76, kur, atbildot uz nacionālās tiesas jautājumu par to, *vai pastāv atbalsts bezatlīdzības priekšrocību piešķiršanas nozīmē, ja atbalsta saņēmējs nav privāts uzņēmums, bet gan valsts aģentūra*, EST sniedza atbildi, ka publiskās iestādes pasākums, kas dod priekšroku konkrētiem uzņēmumiem vai produktiem, nezaudē savu bezmaksas priekšrocību raksturu tikai tāpēc, ka to daļēji vai pilnībā finansē no publiskās iestādes noteiktām iemaksām, kas tiek ieturētas no attiecīgajiem uzņēmumiem (EST, 1977, 22). EK savos skaidrojumos, kas balstīti EST judikatūrā, norāda arī uz publiskās iestādes vai to kontrolētu uzņēmumu piedāvātām precēm vai pakalpojumiem par cenu, kas ir zem tirgus cenām, ieguldījumiem uzņēmumos veidā, ka nav izpildīts tirgus ekonomikas dalībnieka kritērijs, kā uz atteikšanos no valsts līdzekļiem un priekšrocības piešķiršanu. Tas pats attiecināms uz piekļuves piešķiršanu infrastruktūrai, dabas resursiem vai citu ekskluzīvu tiesību piešķiršanu bez pienācīgas atlīdzības (EK, 2016, 52–53). Tādējādi secināms, ka valsts līdzekļu kritērijs ir saistāms par atlīdzību, kas parasti tiek iekasēta par šādu resursu izmantošanu, kas var arī nebūt tirgus cena, ja vien netiek pārkāpti vispārējie principi un šādai pieejai ir legītims mērķis.

Priekšrocība

Priekšrocība *LESD* 107. panta pirmajā daļā tiek definēta kā saimnieciskais labums, kuru uzņēmums nebūtu varējis gūt parastos tirgus apstākļos, t.i., bez valsts iejaukšanās (EST, 1999, 42). Šāda priekšrocība bez iepriekš minētajām subsīdijām, aizdevumiem vai nodokļu atlaidēm var būt arī valsts aktīva izmantošana bez maksas vai par zemāku cenu nekā tirgus cena. Priekšrocību var definēt arī kā jebkādu ekonomisku vērtību, kuru uzņēmums nevarētu iegūt savā ikdienas saimnieciskās darbības ietvaros. Nav būtisks valsts iejaukšanās iemesls vai mērķis, jo priekšrocība pastāv, ja uzņēmuma finansiālais stāvoklis uzlabojas tādas valsts iejaukšanās rezultātā, kuras nosacījumi atšķiras no parastajiem tirgus nosacījumiem (EST, 1974, 13). Līdz ar to uzņēmuma finansiālais stāvoklis pēc atbalsta piešķiršanas ir jāsalīdzina ar tā finansiālo stāvokli situācijā, ja šāds atbalsts netiktu sniegts. Tādējādi secināms, ka valsts atbalsta izvērtējumā būtiskas ir ne tikai juridiskās, bet arī ekonomiskās analīzes metodes. Par priekšrocību var tikt uzskatīta arī saimnieciska rakstura izdevumu samazināšana uzņēmumam. Vienlaikus kompensācijas, kas tiek maksātas uzņēmumiem par vispārējas tautsaimnieciskas nozīmes pakalpojumu sniegšanas radītiem zaudējumiem, netiks uzskatītas par atbalstu, ja izpildīti vairāki nosacījumi, ko sākotnēji noteica *EST Altmark Trans* lietā (EST, 2003, 2). Tādējādi iespējamās priekšrocības izvērtējums ir saistāms gan ar valsts atbalsta raksturu, nozari, kurā darbojas konkrētais uzņēmums, kā arī veidu, kādā piešķirtas konkrētā līguma tiesības.

Zināmu problēmu var radīt priekšrocību un selektivitātes nošķiršana. EST lietā Nr. T-166/21 *Autorità di sistema portuale del Mar Ligure occidentale* prasītāji balstījās argumentā, ka EK ir sajaukusi priekšrocību ar selektivitāti. EST šo argumentu noraidīja, paskaidrojot, ka priekšrocība parasti ir individuāla, savukārt selektivitāte attiecināma uz nozari (uzņēmumu grupu): *Vispirms*

jāatzīmē, ka nošķiršana ir jāveic atkarībā no tā, vai attiecīgais pasākums Regulas 2015/1589 1. panta d) un e) punkta izpratnē tiek kvalificēts kā “atbalsta shēma” vai kā “individuāls atbalsts”. Proti, izvērtējot individuālu atbalstu, saimnieciskās priekšrocības konstatēšana principā ļauj prezumēt tā selektivitāti. Savukārt, izvērtējot atbalsta shēmu, jānosaka, vai attiecīgais pasākums – neraugoties uz konstatējumu, ka tas sniedz vispārīgu priekšrocību, – ir labvēlīgs tikai atsevišķiem uzņēmumiem vai atsevišķām darbības nozarēm... prasītāji un persona, kas iestājusies lietā, pamatoti norāda, ka priekšrocības analīzes un selektivitātes analīzes būtība lielā mērā pārklājas, bet šis konstatējums ir raksturīgs tam, ka šo divu aspektu analīzes metodes ir līdzīgas” (EST, 2023, 134, 137). Tādējādi secināms, ka ir iespējama šo aspektu sajaukšanās, kas var sniegt maldīgu iespaidu par konkrētā atbalsta veida pieļaujamību.

Vēl viens priekšrocības aspekts, kas identificēts EST un EK praksē, ir netieša priekšrocība. Pasākums var reizē sniegt gan tiešu priekšrocību saņēmējam uzņēmumam, gan netiešu priekšrocību citiem uzņēmumiem, piemēram, uzņēmumiem, kuri darbojas attiecīgās ķēdes nākamajos posmos. Šajā gadījumā priekšrocības tiešais saņēmējs var būt gan uzņēmums, gan subjekts (fiziska vai juridiska persona), kas neveic saimniecisko darbību (EST, 2011, 81). Netieša priekšrocība arī konstatējama, ja pasākums ir izstrādāts tādā veidā, lai tā sekundāro ietekmi novirzītu uz nosakāmiem uzņēmumiem vai uzņēmumu grupām. Šāda situācija var veidoties, ja atbalstam izvirzīts nosacījums, ka drīkst iepirkt vienīgi noteiktu uzņēmumu ražotās preces vai sniegtos pakalpojumus (piemēram, tikai no uzņēmumiem, kas darbojas noteiktos apgabalos) (EK, 2016, 116). Kā var secināt no EST nolēmuma lietā Nr. C-403/10 P (EST, 2011, 81), atbalsts, kura tiešie saņēmēji ir patērētāji, var tikt uzskatīts par netiešu atbalstu uzņēmējiem, jo pretējā gadījumā zūd nozīme LESD 107. panta otrās daļas pirmajā daļā ietvertajam regulējumam.

Selektivitāte

Priekšrocība valsts atbalsta saņemšanā, kura neatkarīgi no monetārās vai nemonetārās formas piešķir tās saņēmējam ekonomisku labumu, tiek uzskatīta par selektivitāti. Tomēr atbalsta jēdzienā ietilpst tikai tādas darbības, kuru rezultātā tiek piešķirta selektīva priekšrocība konkrētiem uzņēmumiem vai uzņēmumu kategorijām, vai konkrētām tautsaimniecības nozarēm (EK, 2016, 117). “Selektivitāte” ir tas, kas atšķir valsts atbalsta pasākumus no tā sauktajiem vispārējiem pasākumiem, kas vienādi attiecas uz visiem uzņēmumiem visās ekonomikas nozarēs dalībvalstī (piemēram, lielākā daļa valsts mēroga fiskālo pasākumu) (Verouden, Werden, 2025, 22). Atsevišķa pasākuma selektivitāti bieži vien ir viegli noteikt, piemēram, ja valsts iestāde piešķir tiešu dotāciju tikai vienam konkrētam uzņēmumam. Grupu atbalsta selektivitāti bieži vien ir grūtāk noteikt. Piemēram, atbalsta pasākums ir vērsts uz konkrētām nozarēm vai, piemēram, īstermiņa uz elektroenerģijas nozari, vai vēja elektrostaciju uzņēmumiem, vienlaikus neaptverot visu nozari. Prakses materiālos tiek norādīts, ka papildu intuitīvai selektivitātes izpratnei kā atšķirīgai attieksmei pret uzņēmumiem EST judikatūra ir izveidojusi metodes, lai identificētu un apstiprinātu selektivitātes prasību valsts iejaukšanās gadījumā. Parasti tiesas atsauca uz līdzīgām (salīdzināmām) faktiskajām un juridiskajām situācijām tiem, kas nav saņēmuši atbalstu (Pruska, 2025). Lai uz atbalstu attiektos aizliegums, tam ir jābūt “selektīvam”, proti, tam ir jāietekmē līdzsvars starp saņēmēja uzņēmumu un tā konkurentiem. Tādējādi tam ir jārada vai jādraud radīt konkurences kropļojumu.

Vienkārša tirgus kropļošanas iespējamība ir pietiekama, lai ietekmētu konkurenci. Šā nosacījuma standarti nav augsti, un kritērijs uzskatāms par izpildītu, ja valsts sniedz atbalstu, kas piešķir selektīvu priekšrocību uzņēmumam, kas darbojas liberalizētā nozarē, kurā pastāv vai varētu

attīstīties konkurence. Parasti kritērija izpildei ir nepieciešama ietekme uz pārrobežu tirdzniecību, kas ir pēdējais kumulatīvais elements valsts atbalsta klātbūtnes noteikšanai (EST, 2023, 195). Tādējādi var secināt, ka vispārēji pasākumi, kas attiecas uz visiem uzņēmumiem dalībvalstī, tai skaitā iepriekš minētie vispārēji nodokļu pasākumi, nav kvalificējami kā valsts atbalsts. EK izdala materiālo un reģionālo selektivitāti. Pasākuma materiālā selektivitāte nozīmē, ka pasākums noteiktā dalībvalstī attiecas tikai uz konkrētiem uzņēmumiem (uzņēmumu grupām) vai konkrētām tautsaimniecības nozarēm. Materiālo selektivitāti var konstatēt *de jure* (izriet no juridiskajiem kritērijiem, oficiāli paredzēts tikai konkrētiem uzņēmumiem) vai *de facto* (izriet no dalībvalstu noteiktiem nosacījumiem vai šķēršļiem, kas konkrētiem uzņēmumiem liedz izmantot attiecīgo pasākumu) (EK, 2016, 120–122). Savukārt reģionālās selektivitātes kritērijs nav piemērojams vienīgi pasākumiem, kuri attiecas uz visu dalībvalsts teritoriju (EK, 2016, 142). Pasākumi, kuru piemērošanas joma ir reģionāla vai vietēja, var nebūt selektīvi, ja ir izpildītas noteiktas prasības (EST, 2008, 47–52). EK paziņojumā reģionālā selektivitāte tiek apskatīta faktiski tikai nodokļu režīma piemērošanas kontekstā. Lai arī uz reģionālo selektivitāti attiecināmā EST judikatūra balstīta lietās par nodokļu pasākumiem, EK savā paziņojumā norāda, ka reģionālā selektivitāte ir vispārīgs jēdziens, tad principi, kurus EST noteikusi attiecībā uz nodokļu pasākumiem, ir piemērojami arī citu veidu pasākumiem (EK, 2016, 143). Te gan jānorāda, ka saistītā analīze sniedz būtisku izpratni par uzņēmuma un saimnieciskās darbības jēdzienu valsts atbalsta kontekstā.

Konkurences izkropļojums

Parasti valsts atbalsts tiks uzskatīts par tādu, kas ietekmē tirdzniecību starp dalībvalstīm, ja tas vismaz potenciāli uzlabo uzņēmuma pozīciju salīdzinājumā ar tā konkurentiem tirdzniecībā starp ES dalībvalstīm. EST judikatūrā šie abi kritēriji nereti tiek analizēti kopā (EST, 2000, 80–81). EK lēmumu pieņemšanas prakse liecina, ka ES tirdzniecību var ietekmēt atbalsta saņēmēju produktu konkurēšana ar citu dalībvalstu produktiem. Šāda konkurence var tikt realizēta kā eksportējot, tā arī importējot preces (pakalpojumus) no citām dalībvalstīm, vai arī tad, ja vietējie uzņēmumi piesaista patērētājus vai investorus no citām dalībvalstīm. Tomēr konkrētus apstākļus, piemēram, saņēmēja ierobežoto spēju piesaistīt klientus no citām dalībvalstīm var izmantot, lai pamatotu, ka atbalstam ir tikai vietēja ietekme jeb, citiem vārdiem sakot, margināla ietekme uz pārrobežu ieguldījumiem, un tāpēc tam nav ietekmes uz tirdzniecību (EK, 2025, 48–51). Kā jau tika norādīts iepriekš, praksē konkurences izkropļojumi LESD 107. panta pirmajā daļā nozīmē vispārīgi un tiek konstatēti ikvienā gadījumā, kad valsts piešķir finansiālu priekšrocību uzņēmumam, kas darbojas liberalizētā nozarē, kurā pastāv vai varētu pastāvēt konkurence (EK, 2016, 187). Valsts atbalsts var izkropļot konkurenci arī tad, ja tas saņēmējam uzņēmumam nepalīdz paplašināt darbību un iegūt lielāku tirgus daļu. EK ir norādījusi, ka pietiek ar apstākli, ka atbalsts dod iespēju uzņēmumam iegūt spēcīgāku konkurences pozīciju nekā gadījumā, ja atbalsts nebūtu piešķirts, tomēr ar nosacījumu, ka kropļojumu iespēja nav tikai tīri hipotētiska (EK, 2016, 189). Šajā gadījumā bažas par ietekmi uz konkurenci galvenokārt nav saistītas ar tirgus varu vai tās izmantošanu, bet gan ar to, ka uzņēmumu tirgus pozīcijas tiek mākslīgi saglabātas vai paplašinātas, salīdzinot ar to, kas būtu noticis bez atbalsta (Derenne, Verouden, 2017, 175). Var piekrist viedoklim, ka situācijā, ja valsts atbalsts vienā dalībvalstī tiek atļauts, var radīt stimulu citām dalībvalstīm arī izmantot valsts atbalsta pasākumus, lai stratēģiski piesaistītu aktivitātes savā teritorijā, tādējādi radot subsīdiju sacensības risku un konkurences kropļojumus (Derenne, Verouden, 2017, 177).

Tiek norādīts, ka pat gadījumos, ja kopējais apjoms ir neliels un tas ir sadalīts starp lielu skaitu uzņēmumu, un tādējādi atbalsta lielums nerada būtisku ietekmi uz atbalsta saņēmēja stāvokli, ka riski, kas saistīti ar konkurences kropļošanu, pirmšķietami ir nenozīmīgi. Tomēr vienlaikus tiek izdarīts secinājums, ka tādējādi gandrīz jebkuru atbalsta summu var uzskatīt par tādu, kas atbilst "konkurences kropļošanas" nosacījumam (Derenne, Verouden, 2017, 173). Tādējādi tiek uzskatīts, ka ir pamatoti saglabāt diezgan stingru pieeju konkurences izkropļojumu jēdzienam valsts atbalsta jomā, tostarp tajos gadījumos, kad individuālās atbalsta summas vai iesaistītie uzņēmumi nav tik lieli (Derenne, Verouden, 2017, 174). Lai arī praksē šis jautājums parasti tiek risināts ar *de minimis* atbalsta mehānismu palīdzību, no doktrīnas viedokļa šis akcents ir uzskatāms par būtisku, jo parāda kopējo tendenci uzskatīt, ka valsts atbalsts ir kropļojošs un to vienmēr ir nepieciešams pakļaut zināmai pārbaudei, lai noteiktu iespējamo negatīvo ietekmi. Tas nenozīmē, ka valsts atbalsts vienmēr kropļo konkurenci. Dažos gadījumos valsts atbalsts pat var atjaunot konkurenci vai novērst citas tirgus nepilnības. Pieaugošās globalizācijas dēļ starptautiskie uzņēmumi ļoti bieži iekļūst vienos un tajos pašos tirgus segmentos, bet atbalsta dēļ uzņēmumam atkal varētu kļūt rentabla iekļūšana otra uzņēmuma tirgū, tādējādi konkurence šajā tirgū atkal varētu tikt atjaunota (Sleuwaegen, 1999, 5).

Ietekme uz tirdzniecību starp ES dalībvalstīm

Kā norāda EK savā paziņojumā, nav nepieciešams konstatēt, ka atbalsts faktiski ietekmē tirdzniecību starp dalībvalstīm, bet tikai to, ka atbalsts var ietekmēt šo tirdzniecību (EK, 2016, 190). Tādējādi redzama zināma analogija ar konkurences izkropļojuma izpratni (pastāv vai var pastāvēt konkurence). EST judikatūrā kā piemērs starpvalstu tirdzniecības apdraudējumam tiek minēta situācija, ja valsts atbalsta rezultātā tiek uzturēts vai palielināts vietējais piedāvājums, kas var samazināt citās dalībvalstīs reģistrētu uzņēmumu iespējas iekļūt konkrētajā tirgū, vienlaikus nosakot faktiskās ietekmes izvērtējama pienākumu dalībvalsts tiesai (EST, 2011, 70). Kā norāda EK, atsaucoties uz EST judikatūru, ietekme uz tirdzniecību starp dalībvalstīm nevar būt tīri hipotētiska vai prezumēta. Balstoties uz pasākuma paredzamo ietekmi, ir jāpierāda, kāpēc pasākums rada vai draud radīt konkurences izkropļojumus un var ietekmēt tirdzniecību starp dalībvalstīm (EST, 1995, 140–142). Vienlaikus EK savā paziņojumā mēģina reducēt paziņojuma tvērumu: *"Komisija vairākos lēmumos ir atzinusi, ka, ņemot vērā lietas īpašās iezīmes, pasākumam ir vienīgi vietēja mēroga ietekme un tādējādi tas neietekmē tirdzniecību starp dalībvalstīm. Minētajos gadījumos Komisija jo īpaši bija noteikusi, ka saņēmējs attiecīgās preces vai pakalpojumus piedāvā ierobežotā dalībvalsts teritorijā un diez vai piesaistītu citu dalībvalstu klientus, tāpēc nav paredzams, ka pasākums izraisītu būtisku ietekmi uz pārrobežu ieguldījumu vai uzņēmējdarbības apstākļiem."* (EK, 2016, 196). EK savā paziņojuma 197. punktā (EK, 2016, 197), norāda, ka nav iespējams definēt vispārīgas pasākumu kategorijas, kas parasti atbilstu šiem kritērijiem, tomēr ir mēģinājusi definēt piemērus, kas varētu būt par pamatu konstatējumam, ka publiskais atbalsts nevar ietekmēt tirdzniecību starp dalībvalstīm. Jāatzīst, ka paziņojumā ietvertie piemēri aptver visai plašu saimnieciskās darbības loku - sākot no atpūtas iespēju paplašināšanas, kultūras pasākumiem un mediju darbības līdz pat vietējo ostu un lidostu darbībai. Tomēr ir izsekojamas zināmas vadlīnijas: ierobežota sasniedzamība, ierobežots pakalpojuma izmantotāju loks un tikpat ierobežotas iespējas (ticamība) piesaistīt patērētājus no citām dalībvalstīm.

EK pieeja, nosakot, ka subsīdijas ar tīri vietēju raksturu nebūtu jāuzskata par valsts atbalstu saskaņā ar 107. panta pirmo daļu, tiek uzskatīta par atbilstošu kopējam regulējumam. Vienlaikus tiek identificēta problemātika, norādot, ka: *"Negatīvās sekas var analizēt no diviem dažādiem skatupunktiem.*

Pirmkārt, var aplūkot atsevišķu subsīdiju (un tās ietekmi) atsevišķi. Tas nozīmē novērtēt, cik lielā mērā konkrētā subsīdija rada negatīvu ietekmi. Otrkārt, var aplūkot līdzsvara efektu (ņemot vērā, ka subsīdiju politiku noteiks arī citu dalībvalstu subsīdiju politikas gaidas)” (Derenne, Verouden, 2017, 183). Kā var secināt no literatūrā izteiktajiem viedokļiem (Derenne, Verouden, 2017, 182), lokālās ietekmes kritērijs pagaidām tiek uzskatīts par visai diskutablu ar savu potenciāli kumulatīvo ietekmi (reģionālā konkurence līdzīgu subsīdiju piešķiršanā).

Secinājumi

1. Valsts atbalsta jēdziens ES tiesībās ir plaša apjoma ģenerālklausula, kura aizpildīšanai tiek izmantoti dažādi avoti. Ņemot vērā, ka *LESD* 101.–109. pantā ietvertu normu piemērošanas prakses kontrole atrodas EK, bet ES tiesību iztulkošana – ekskluzīvā EST pārziņā, jēdziena izpratne nav iespējama bez saistīto EK dokumentu un atbilstošās EKT judikatūras izpēti. EK rīcības brīvība ir būtiski ierobežota, jo tās lēmumi ir pakļauti EST pārbaudei. Jēdziena saturā tiek ietvertas vairākas juridiskas prezumpcijas, kuru tiešās sekas ir vismaz konkurences kropļojums un ietekme uz tirdzniecību starp dalībvalstīm. Tomēr abām šīm prezumpcijām ir nepieciešams konstatēt pastāvošas vai vismaz reāli iespējamās sekas. Tikai šādā gadījumā valsts pasākums ir kvalificējams kā atbalsts *LESD* 107. panta pirmās daļas izpratnē, pie tam ar nosacījumu, ka izpildās normā ietvertie kumulatīvie nosacījumi.
2. Valsts atbalsta pastāvēšanu nosaka tā radītā ietekme, nevis forma, kādā tas tiek sniegts. Lai arī šādu ietekmi var noteikt ar ekonomiskām metodēm, valsts atbalsta noteikšana ir juridisks process, kura mērķis ir ierobežot dalībvalstu konkurences negatīvo ietekmi atbalsta sniegšanas ziņā, kā arī šāda atbalsta negatīvo ietekmi uz konkurenci starp uzņēmumiem. Tādējādi valsts atbalsts primāri vērtējams kā konkurenci ietekmējošs faktors. No EST judikatūras secināms, ka tās nolēmumi kopumā balstās prezumpcijā, ka pat nelielas atbalsta summas, kas piešķirtas jebkura veida uzņēmumam, var kropļot konkurenci un ietekmēt tirdzniecību dalībvalstīm.
3. No EK dokumentiem redzams, ka EK pirmšķietami vēlas valsts atbalsta izvērtēšanā, kas saistīts ar tirdzniecību starp dalībvalstīm, ieviest papildu kritērijus, kas balstās nelielā atbalsta apjomā vai vietēja rakstura ietekmē. Vienlaikus jāsecina, ka pagaidām šo kritēriju tvērums un piemērošanas prakse vēl nav pietiekami izvērtēta, un literatūrā tiek norādīts uz iespējamajām šādas pieejas nepilnībām. Lai arī šāda pieeja piedāvā lielāku elastību, būtu nepieciešamas tiešas izmaiņas ES normatīvajā regulējumā, lai samazinātu to gadījumu skaitu, par kuriem dalībvalstīm ir jāpaziņo iepriekš.

References

- AKD. (2026). The test to determine whether aid constitutes State aid involves the presence of five cumulative criteria. Retrieved from: <https://www.akd.eu/expertise/state-aid-criteria>
- Aydin, U., Thomas, P. K. (2012). The Challenges and Trajectories of EU Competition Policy in the Twenty-first Century. *European Integration Vol. 34, No. 6*, 531–547. <https://doi.org/10.1080/07036337.2012.707359>
- Derenne, J. Verouden V. (2017). Distortion of Competition and Effect on Trade. In Verouden., V., Werner. F. (Ed). *EU State Aid Control: Law and Economics*. (169-189). The Netherlands. Kluwer Law International BV
- Finanšu ministrija (Galauskā, G). (2021). Infografika “Kā konstatēt komercdarbības atbalstu”. Pieejams: <https://www.fm.gov.lv/lv/skaidrojosie-materiali>
- EESC (2025). EESC calls for reforms to EU State Aid rules to support social economy entities. Retrieved from: <https://www.eesc.europa.eu/en/news-media/news/eesc-calls-reforms-eu-state-aid-rules-support-social-economy-entities>

- European Commission. Notice on the notion of State aid as referred to in Art. 107(1) of the Treaty on the Functioning of the European Union (2016), OJ C 262. Retrieved from: [https://eur-lex.europa.eu/legal-content/LV/TXT/PDF/?uri=CELEX:52016XC0719\(05\)](https://eur-lex.europa.eu/legal-content/LV/TXT/PDF/?uri=CELEX:52016XC0719(05))
- EK SA.108990 (2023/N). (2025). Italy Measure to support local businesses in the remote area of Valchiavenna. Retrieved from: https://ec.europa.eu/competition/state_aid/cases1/202512/SA_108990_61.pdf
- EK regula Nr. 2023/2831 par Līguma par Eiropas Savienības darbību 107. un 108. panta piemērošanu *de minimis* atbalstam. (2023). OV L, 2023/2831 -ELI:<http://data.europa.eu/eli/reg/2023/2831/oj>
- EK Regula Nr.1407/2013 par Līguma par Eiropas Savienības darbību 107. un 108. panta piemērošanu *de minimis* atbalstam. (2013). OV L, 352, 1-8
- EST spriedums lietā Nr. T-494/21. (2023). ECLI:EU:T:2023:831
- EST spriedums lietā Nr. C-166/21. (2023). ECLI:EU:T:2023:862
- EST spriedums lietā Nr. C-403/10 P. (2011). ECLI:EU:C:2011:533
- EST spriedums lietā Nr. C-518/13. (2011). ECLI:EU:C:2015:9
- EST spriedums apvienotajās lietās Nr. C- C-428/06 līdz C-434/06. (2008). ECLI:EU: C:2008:488
- EST spriedums lietā Nr. C-222/04. (2006). ECLI:EU:C:2006:8
- EST spriedums lietā Nr. C-88/03. (2006). Pieejams: <https://eur-lex.europa.eu/legal-content/LV/TXT/HTML/?uri=CELEX:62003CJ0088>
- EST spriedums lietā Nr. C -280/00. (2003). ECLI:EU:C:2003:415
- EST apvienotās lietas Nr. C-180/98 līdz C-184/98. (2000). EKT 2000 I-06451. ECLI:EU:C: 2000:428
- EST spriedums apvienotajās lietās Nr.T-298/97, T-312/97, T-313/97, T-315/97, T-600/97 - 607/97, T-1/98, T-3/98 - T-6/98, T-23/98. (2000). European Court reports 2000 Page II-02319. Retrieved from: <https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX%3A61997TJ0298>
- EST spriedums lietā Nr. C-83/98 P. (2000). ECLI:EU:C:2000:248
- EST spriedums lietā Nr. C-342/96. (1999). ECLI:EU:C:1999:210
- EST apvienotās lietas Nr. T-447/93, T-448/93 un T-449/93. (1995). ECLI:EU:T:1995:130
- EST spriedums lietā Nr. C-78/76. (1977). ECLI:EU:C:1977:52
- EST spriedums lietā Nr. C- 173/73. (1974). ECLI:EU:C:1974:71
- Komerclikums. (2000). LV Nr. 158/160
- Komercdarbības atbalsta kontroles likums. (2014). LV Nr. 123
- Līgums par Eiropas Savienības darbību konsolidētā versija. (2012). - ES OV Nr. C 326, 1–390
- Lūsis, R., Grantiņa, L. (2020). Valsts atbalsts un tā regulējums ES fondu projektu īstenošanā, JV, Nr. 19 (1129),
- Par uzņēmējdarbību. (1990). Latvijas Republikas Augstākās Padomes un Valdības Ziņotājs Nr. 42
- Novak-Salles, A. (2020). The Optimal Assessment Rule for EU State Aid Procedure. *World Competiton No 43, no.1 (90)*. (87-107). <https://doi.org/10.54648/woco2020005>
- Paurs, M. (2025). De minimis-sprungulis māju renovācijas riteņos. Pieejams: ir.lv/rubrika/viedoklis/de-minimis-sprungulis-maju-renovācijas-ritenos.220296
- Pruska, A. (2025). EU State Aid Control Overview – What is EU State aid? Retrieved from: <https://andrewslaw.ie/eu-state-aid-control-overview-what-is-eu-state-aid/>
- Verouden., V., Werner, F. (2025). Introduction: The Law and Economics of EU State Aid Control. In Verouden., V., Werner. F (Ed). *EU State Aid Control: Law and Economics. Second Edition. (9-86)*. The Netherlands. Kluwer Law International BV.
- VID. (2026). Saimnieciskās darbības veicēji. Pieejams: <https://www.vid.gov.lv/lv/saimnieciskas-darbibas-veiceji>
- Sleuwaegen, L. (1999). Competitive distortions and state aid to firms. How to define the relevant market? *European Commission, DGIII*

REVISION OF MICHAEL PORTER'S THEORY OF COMPETITIVE FORCES IN TOURISM AND HOSPITALITY INDUSTRY

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Abstract

This study evaluates the relevance and limitations of Michael Porter's Five Forces model in explaining contemporary competitive dynamics in the tourism and hospitality industry. While the framework remains a key tool in strategic management, its applicability is increasingly challenged in platform-driven and technology-intensive markets. The research aims to identify which elements of the model fail to reflect current industry conditions and to determine new forces shaping competition. A qualitative approach was used, based on a semi-structured face-to-face interview with the cluster director of Wellton hotels in Riga, Latvia. Data were analysed using thematic analysis and compared with Porter's framework. Findings show that key competitive forces absent from the model include platform dependency, algorithmic control, reputation-based competition, labour shortages, technological change, regulatory pressure, and competition from non-traditional providers. The study concludes that the model is insufficient for analysing modern hospitality markets and highlights the need for an updated framework.

Keywords. competitive force, competition, theory revision, tourism and hospitality

Introduction

One of the most effective models for analysing the competitive environment and developing strategies in various industries is Michael Porter's theory of competitive forces, outlined in his 1980 book of competitive strategy. According to Porter, there are five main forces that define the competitive environment: the threat of new entrants, the threat of substitutes, the bargaining power of buyers, the bargaining power of suppliers, and the intensity of rivalry among existing players in the market. This model provides a structure for analysing the market, identifying the main elements that affect a company's profitability and developing effective methods to gain a competitive advantage. Since then, Porter's model has been used extensively in a variety of industries and markets, including the hospitality industry (Porter, 1980).

This topic is especially important in Latvia because the tourism and hotel market are changing faster than ever, and new methods are required to compete effectively.

The aim of the research is to evaluate the applicability and limitations of Michael Porter's Five Forces model in explaining current competitive conditions in the tourism and hospitality industry

Globally and regionally, the revision of this theory of competitive forces by Michael Porter is extremely relevant and will be innovative. The point is that existing theoretical models, such as Porter's model, need to be revised in response to contemporary changes in the business environment

especially in tourism and hospitality industry. There are radical changes such as digital intermediaries, use of AI, platform economy, seasonality, user-generated reviews, ICT domination etc. that should be considered as a new relevant force in the model (Goyal, 2020, 150). The way people did business back then and what were the resources are much different from current times because of the huge leap in the development of technology and new business trends. So, modern competitive analysis strategies are needed, especially in tourism and hospitality sector in Latvia, due to the significant changes taking place worldwide considering growing number of international players, increased competition due to online platforms and technologies, as well as changes in consumer preferences. The application of the classic Porter's model, without considering recent changes no longer always correctly reflects reality.

Early critiques within strategic management acknowledged that Porter's framework required reinterpretation rather than outright replacement. Grundy (2006) proposed "rethinking and reinventing" the Five Forces by emphasizing flexibility, scenario thinking, and contextual sensitivity. However, this contribution focused on how the model should be applied, not on redefining the forces themselves or introducing new structural components (Grundy, 2006, 215).

Similarly, Dobbs (2014) developed practical guidelines for applying the Five Forces more rigorously, addressing common misapplications such as incorrect industry boundary definition or static analysis. While valuable, these guidelines reinforced the existing structure rather than expanding it (Dobbs, 2014, 35).

Crucially, none of these works proposes a formally revised Five Forces model with additional forces, measurable indicators, or empirical validation, particularly for service-intensive industries such as hospitality as well as tourism.

Nevertheless, the early 2000s particularly around 2003–2004 marked the first significant attempts to apply Porter-inspired frameworks to tourism. However, these efforts primarily focused on destination competitiveness, rather than firm-level competitive forces. Andriotis (2004) applied Porter's Diamond Framework to tourism planning, emphasizing factor conditions, demand conditions, and supporting industries. While methodologically significant, the Diamond Framework differs fundamentally from the Five Forces model: it explains regional or national competitiveness, not competitive pressure within an industry (Andriotis, 2004, 140).

Similarly, Dwyer and Kim (2003), Ritchie and Crouch (2003), and Enright and Newton (2004) developed comprehensive destination competitiveness models incorporating infrastructure, governance, sustainability, and demand attractiveness. These frameworks substantially advanced tourism theory, yet they operate at a macro or meso level and do not replace the Five Forces model as an industry-structure tool for hospitality firms.

Thus, although the year 2004 represents an important moment in applying Porter's thinking to tourism, it does not represent the emergence of a revised Five Forces model for hospitality competition.

Based on that, the problem is that Porter's classical theory does not consider the impact of modern technologies or aspects mentioned earlier that have a significant impact on competitive processes in the hotel industry. For example, online booking, the use of artificial intelligence to predict demand and analyse customer behaviour, and environmentally friendly technologies are changing the rules of the hotel market. Businesses are no longer dependent on conventional competitive forces such as the bargaining power of suppliers or the threat of new entrants.

The author's personal contribution to this research is the identification and empirical study of contemporary competitive forces in the tourism and hospitality industry that are not captured by Porter's original five forces model. By conducting semi-structured interview with key hospitality industry representative and analysing the data within the context of existing theoretical models, the author will provide new insights into the impact of digital platforms, ICT innovations, online reputation, and labour market characteristics. Furthermore, this study advances the understanding of competition in the hotel and tourism sectors and contributes to the creation of a revised, industry-specific model of competitive forces that connects classical theory with the realities of the modern industry.

As for the research methodology, a semi-structured interview method was used to collect data, allowing for both a pre-prepared set of questions and flexible clarification of informant's responses. This approach provided a deep understanding of the competitive landscape of the hotel sector, including the impact of digital platforms, technological innovations, online reputation, and market specifics. The semi-structured interviews revealed new competitive forces not accounted for in Porter's traditional Five Forces model and provided the foundation for developing an adapted competitive analysis model.

Literature review

This chapter focuses on theoretical aspects regarding revision of Michael Porter's theory of competitive forces and how it can be applied to the hospitality and tourism industry considering Latvia. For this purpose, contemporary research is used that either confirms Porter's concepts or offers alternative perspectives on competitive strategies and innovative business management practices. The study is based on classical and contemporary research that examines innovation, digital platforms, competitiveness, and the impact of regulation on business development.

Michael Porter's (1980) idea of the five forces is still key to industry analysis and strategic positioning. Industry competition, the threat of new entrants, the market power of suppliers, the market power of buyers and the threat of substitution constitute profitability and market dynamics, according to the core idea of the model. Nevertheless, recently, there has been a growing question in academic circles as to whether this model is appropriate for the current environment, especially in industries such as the hospitality industry.

Additionally, Michael Porter's Five Forces model has long served as a foundational analytical framework for understanding industry structure and competitive pressure. Designed to explain profitability through the interaction of suppliers, buyers, competitive rivalry, substitutes, and potential entrants, the model assumes relatively stable industry boundaries and clearly defined market roles. While this logic proved highly effective for manufacturing and traditional service industries, its applicability to tourism and hospitality has increasingly been questioned (Varelas & Georgopoulos, 2017, 125).

According to the author's opinion, Porter's Five Forces model remains an essential tool for industry analysis and strategic positioning. However, in the tourism and hospitality industry, it doesn't fully capture modern market realities, where digital platforms, online reputation, and technological innovation play a key role. Therefore, an adapted version of the model that takes into account new sources of power and industry specifics is necessary for an accurate competitive analysis.

Nevertheless, Varelas and Georgopoulos (2017) conducted one of the most direct evaluations of the Five Forces model in the hotel industry. Their findings confirm that while the model provides a useful baseline, it fails to capture critical industry-specific dynamics such as seasonality, the role of intermediaries, intangible service quality, and location dependency.

Moreover, Van Alstyne and Parker (2017) in their work of platform business note the shift from resource-based businesses to platform ecosystems that characterises modern industries. Platform businesses are shifting from owning assets and resources to creating value through connections and networks. Platforms are reducing their reliance on traditional resource-based models by connecting users (e.g., hospitality providers and guests) and facilitating transactions through digital technologies. The authors explain that the core idea behind platform business models is the network effects that occur when new participants join a platform, adding value to it (Alstyne & Parker, 2017, 27).

Despite acknowledging these shortcomings, the authors stop short of proposing new competitive forces or developing an alternative structural model. This pattern is common in hospitality literature: the Five Forces framework is criticized, contextualized, and adapted, but rarely reconstructed.

Alternative competitiveness models in tourism

Destination competitiveness models: Dwyer and Kim (2003) developed a conceptual model that focuses on the systemic competitiveness of destinations. Their approach considers not individual companies, but the entire tourism destination as a complex of interrelated factors: infrastructure, human capital, market demand, destination image, policy, and management. This logic is supported by Ritchie and Crouch (2003), who integrate the economic, social, and environmental aspects of sustainable destination development in their work. These models demonstrate that Porter's traditional industrial perspective fails to account for the complex, multi-level relationships between tourism market participants and external factors that critically impact competitiveness.

Quantitative performance-based approaches: Enright and Newton (2004) proposed a quantitative method for assessing competitiveness that focuses on measurable performance indicators: revenue, market share, occupancy rate, cost structure, and service quality. This approach allows for comparison of tourist destinations and hotels based on real indicators, not just conceptual factors, providing empirical verification and ranking of competitiveness. It complements theoretical models and enables quantitative analysis, something lacking in the traditional five forces model.

Both approaches show that Porter's traditional model is limited in its application to tourism. They emphasize the need to consider:

- The complexity of tourist destinations and the interconnection of market players.
- The influence of infrastructure, policy, image, and social factors.
- The ability to quantify competitive advantages.

These alternative models serve as a foundation for developing an adapted competitive forces model that could integrate conceptual and empirical approaches, considering the unique characteristics of the modern tourism and hospitality industry. Therefore, this reveals a structural gap: tourism research offers strong destination-level theories, while hospitality strategy continues to rely on a framework that no longer reflects the industry's competitive architecture.

New competitive realities

Recent literature identifies three major forces reshaping hospitality competition:

- Platform power and market envelopment: Eisenmann et al. (2011) conceptualize platform envelopment as a strategic mechanism through which digital platforms absorb and control adjacent markets. In hospitality, online travel agencies and booking platforms act as structural gatekeepers, controlling access to demand through algorithms, rankings, and commissions. This form of power cannot be classified as buyer or supplier power within Porter's framework.
- Reputation-based competition: Xiang et al. (2017) and Christou (2012) demonstrate that online reviews and social media experiences function as market mechanisms that directly shape demand, pricing power, and visibility. Reputation thus becomes an independent competitive force, operating through digital signals rather than direct firm interaction.
- Sharing economy and asymmetric competition: Guttentag (2015) and Zervas et al. (2017) provide empirical evidence that Airbnb and short-term rentals exert measurable impacts on hotel performance. These competitors operate under different cost structures, regulatory regimes, and value propositions, violating Porter's assumption of relatively homogeneous industry actors.

The ability of hotels to adapt to the platform economy will determine their future competition in context of tourism and hospitality industry in Latvia. The hotels may face a drop in revenue if they rely only on traditional competition strategies such as resources, personnel, and brand. Companies that use a hybrid strategy that combines digital and traditional models will be able to adapt to the changing market. This will be especially important for industries undergoing a period of transformation.

Despite extensive critique and partial adaptation, the literature reveals a consistent absence of a fully revised Five Forces model tailored to tourism and hospitality. This can be attributed to several factors:

- Fragmentation of research streams between tourism competitiveness, digital platforms, and strategic management.
- Lack of operationalization, with few studies proposing measurable indicators for new forces.
- Limited empirical validation, particularly comparative testing of original versus revised models.
- Increasing complexity of industry boundaries, complicating model formalization.

As a result, the Five Forces framework remains widely used despite acknowledged inadequacies, while no alternative model has achieved equivalent theoretical integration or empirical acceptance.

Prior research demonstrates a clear and persistent gap between the competitive realities of modern hospitality markets and the analytical tools traditionally used to study them. Although since the early 2000s scholars have questioned the applicability of Porter's Five Forces and proposed various contextual extensions (Dwyer & Kim, 2003; Ritchie & Crouch 2003; Andriotis, 2004), no empirically validated, structurally revised competitive forces model has been developed specifically for the tourism and hospitality industry as nowadays.

This gap is not due to a lack of critique, but to the absence of an integrated framework that:

- Incorporates digital platforms, reputation systems, regulatory pressures, labour constraints, and asymmetric competition.
- Operationalizes these forces through measurable indicators.
- Empirically compares explanatory and predictive power against the original model.

Addressing this gap provides a strong theoretical justification for the present research and positions it as a necessary contribution to both strategic management and tourism and hospitality studies.

Research methodology

This study employs a qualitative, exploratory research methodology based on a semi-structured interview to critically assess the limitations of Michael Porter's Five Forces model in explaining contemporary competitive dynamics within the tourism and hospitality industry. The methodological approach using Porter's framework as an analytical baseline is allowing empirically grounded insights to reveal structural gaps and emergent competitive forces as well as to answer the following research question.

Research question: Which parts of Porter's model fail to capture current tourism and hospitality competition?

To answer the research question, primary data were collected through a semi-structured face-to-face interview of 7 questions with the cluster director of Wellton Hotels, whose strategic responsibilities encompass pricing, digital distribution, technological adoption, regulatory compliance, and competitive positioning. This informant was chosen because she possesses strategic management responsibility and a comprehensive understanding of the competitive landscape. Managing several hotels in central Riga, she is directly exposed to digital platforms, price competition, staffing constraints, and other competitive forces. Her practical management experience ensures the high relevance and credibility of the data obtained for the purposes of the study. The semi-structured interview format ensured alignment between the research aim and the empirical material by systematically addressing competitive forces related to digital platforms, technological change, regulatory environments, emerging competitors, and managerial performance indicators.

As for the questions themselves, the interview covered key thematic areas aimed at assessing the applicability of Porter's model to the modern hotel industry. The questions covered the overall level of competitiveness in the sector, the relevance of the traditional five competitive forces, and the influence of digital platforms and online intermediaries on the market. Special attention was paid to the role of online reputation and reviews, technological innovation and digitalization, the impact of the labour market, and the need to develop a revised model of competitive forces for hospitality industry.

The structured interview responses were analysed applying thematic analysis to identify of competitive forces related to digital platforms, algorithmic visibility, reputation systems, technological acceleration, regulatory constraints, labour shortages, and emerging non-traditional competitors. Thematic analysis was applied by first mapping the interview answers onto Porter's original five forces and subsequently identifying additional forces and mechanisms that could not be adequately explained by the original framework.

This methodological design ensures that the findings and theoretical implications are directly derived from the analysed interview data, thereby providing a robust empirical foundation for evaluating the inadequacy of the original model and for justifying the development of a revised competitive forces framework tailored to the contemporary tourism and hospitality industry.

Regarding consent, the cluster director of two Wellton hotels voluntarily consented to participate in the study. Prior to the interview, the author explained the purpose of the research article, its scientific

nature, the proposed structure of the questions, and how the information obtained would be used. Furthermore, the informant was informed of the right to refuse to answer any questions and to discontinue participation at any stage without any consequences. The director confirmed consent to the use of the provided data solely for academic purposes within the framework of this research.

The research has several limitations. It relies on a single key informant, limiting the generalizability of the findings to the entire hotel and tourism sector. Furthermore, the data reflect specific competitive conditions of the local market at the time of the interview and may not fully represent other regions or segments of the tourism industry. Furthermore, the study relies on subjective informant perceptions and a qualitative design, which precludes quantitative validation or statistical generalization. Finally, the focus on the hotel industry makes the findings less applicable to other tourism sectors, such as tour operators, attractions, or transportation services.

Research results

The following analysis presents a precise thematic analysis of primary interview data collected from the cluster director of two Wellton Hotels in Riga, Latvia. The aim of this interview was to empirically assess the applicability of Michael Porter's Five Forces framework within the contemporary hospitality sector and to identify emerging competitive forces not captured by the original model. The insights gained from this interview contribute to the broader research aim of revising Porter's model to reflect technological, digital, and regulatory transformations shaping tourism and hospitality industries. The analysis adopts a qualitative interpretative approach, mapping interview themes onto theoretical constructs to evaluate the need for an updated competitive framework.

The director identified three forces not captured by Porter's original model:

- Dependence on online platforms and their algorithms,
- The power of guest reviews, and
- Labour shortages as a competitive pressure.

Platform dependency as algorithmic power. The interviewee emphasized that online travel agencies (OTAs) such as Booking and Expedia exercise "algorithmic authority" over hotel visibility and demand. This represents a structural dependency unseen in Porter's framework, where intermediaries are treated merely as buyers or channels. In contemporary hospitality, however, platforms function as quasi-regulators, shaping ranking, visibility, and booking flows. Their power is neither buyer nor supplier pressure but rather a meta-force emerging from digital intermediation.

Guest reviews as a reputation market. The director's observation that a single negative review may impact performance more than a traditional competitor indicates the presence of a reputation-based competitive force. Porter's model does not account for user-generated ratings as a determinant of demand, nor for the psychological and algorithmic consequences of review systems. Reputation has become a measurable and powerful competitive mechanism, shaping both pricing and consumer expectations.

Labour shortages as structural competition. The interview highlighted that staff scarcity in Riga effectively functions as a competitive constraint, influencing service capacity and operational quality. Porter treats labour as an internal resource rather than an external competitive force. However, in hospitality, labour availability now resembles a market, influencing rivalry and performance.

The director noted that OTAs and Airbnb significantly increase dependency, intensify price competition, and heighten barriers to entry by controlling visibility and guest access. This demonstrates that digital platforms:

- Reshape price elasticity in urban hospitality markets.
- Trigger a “race to the bottom” in pricing.
- Destabilize traditional competitive structures by inserting new peer-to-peer competitors.
- Create asymmetric power relations not theorized by Porter.

Airbnb amplifies market fragmentation and introduces quasi-infinite supply in central Riga, challenging hotels not only through pricing but also through alternative accommodation models. Platforms thus act as institutionalized gatekeepers, a role not envisioned in classical market theory.

Three technological domains emerged as decisive:

- Dynamic pricing algorithms.
- Automation in service delivery.
- CRM-driven personalization.

Dynamic pricing as algorithmic competition. The director stated that “whoever adjusts faster wins,” illustrating that competition increasingly rests on algorithmic responsiveness rather than traditional strategic planning. This phenomenon shifts competitive advantage toward technological sophistication, speed of data processing, and revenue management capabilities.

Automation of check-in/out. Automation reduces friction in service delivery and shapes guest expectations for efficiency. The introduction of document-reading machines indicates that technological adoption is directly linked to service competitiveness.

CRM and personalization. Loyalty, repeat bookings, and guest retention increasingly depend on data-driven personalization, reinforcing that data assets constitute a competitive force in themselves.

The director identified several regulatory pressures:

- Tourist and city taxes, affecting price positioning.
- Safety and energy-efficiency requirements, raising operational costs.
- High labour taxes, affecting wage budgets.

These regulatory elements exceed Porter’s notion of “government as a background factor.” Instead, they function as quantifiable competitive constraints, influencing profitability, operational flexibility, and seasonality sensitivity. In the hospitality context especially in European urban markets regulation operates as a structural competitive force.

The interview illustrates an expanding competitive landscape:

- Airbnb and short-term rentals as primary threats.
- Serviced apartments as growing rivals due to shifting consumer preferences.

Because these competitors operate under different cost structures, levels of regulation, and service models, they defy Porter’s assumption of homogeneity among firms within an industry. Competition now occurs across hybrid and cross-sector categories, where actors differ radically in operational logic, regulatory exposure, and value creation. This further demonstrates the inadequacy of the original Five Forces framework.

Table 1

KPIs as empirical indicators of competitive forces

KPI	Competitive force reflected
OTA dependency	Platform power & algorithmic control
RevPAR & ADR benchmarking	Traditional rivalry (updated with digital influences)
Guest review score	Reputation-based competitiveness
Cost per booking	Transactional costs imposed by digital intermediaries
Occupancy volatility	Sensitivity to market dynamics & platform-driven demand flows
Energy/regulatory costs	Institutional pressure & regulatory burden

These metrics (See Table 1) empirically validate the existence of platform-driven competition, regulatory forces, and reputation markets, reinforcing the need for a revised theoretical model.

The informant's concluding remark supports to the study's aim which is a revised competitive framework incorporating digital platforms, technology, and regulation. This would more accurately reflect real-world competitive dynamics than Porter's original model. This research-based confirmation adds empirical weight to the argument that the Five Forces model is insufficient in platform-mediated hospitality markets.

All in all, the interview analysis yields several critical insights:

- Digital platforms exert structural and algorithmic power, functioning as new competitive forces absent from Porter's model.
- Reputation systems (guest reviews, ratings) represent an autonomous competitive mechanism that directly influences demand and pricing.
- Labour shortages now function as external competitive pressures, not merely internal operational challenges.
- Technological advancements (dynamic pricing, automation, CRM) reshape competitive advantage, privileging speed, data, and adaptability.
- Regulation and city policies operate as quantifiable competitive forces that directly impact cost structures and pricing strategies.
- New categories of competitors Airbnb, short-term rentals, and serviced apartments alter the industry's boundaries, contradicting Porter's assumption of sectoral stability.
- KPIs used in practice provide empirical evidence that competitive dynamics extend beyond the original Five Forces model.

Taken together, these findings demonstrate that Porter's framework does not capture the complexity of modern hospitality competition. The sector now operates within a hybrid environment defined by digital intermediation, technological acceleration, institutional constraints, and diversified accommodation models. Therefore, a revised competitive forces model is currently empirically necessary and justified.

In comparison, the theoretical framework demonstrates that Porter's five forces model remains a valuable tool for industry analysis, but its applicability to the tourism and hospitality sector is limited. In literature review it is mentioned unstable market boundaries, competitive diversity, and the influence of digital platforms, reputation, and technological innovation, which are not captured by the classical model (Varelas & Georgopoulos, 2017; Christou, 2012; Guttentag, 2015). Alternative approaches, such as destination competitiveness models and quantitative performance assessment

methods, emphasize system, interconnection of market participants, and measurable indicators, demonstrating the need to adapt the theoretical framework to contemporary conditions.

Meanwhile, an analysis of interviews with the cluster director of Wellton Hotels confirmed these gaps in practice, highlighting platform dependence, the influence of reviews, and labour shortages as new competitive forces. Technology (dynamic pricing, automation, CRM) and regulation also play a significant role, while hybrid competitors (Airbnb, serviced apartments) undermine assumptions of market homogeneity. Empirical data confirmed the existence of these forces and the need to consider them.

It can be said, that both theory and practice show that the modern hotel industry operates in a hybrid, platform-mediated environment, where Porter's traditional five forces model fails to capture all key competitive forces. The interview complements these theoretical observations by providing empirical evidence of the influence of platforms, reputation, technology, and regulation. This complements the need for a revised competitive forces model that considers the new identified forces, enabling a more accurate analysis of competitiveness in the tourism and hotel sectors.

Conclusions

The results of the research showed that the model retains theoretical validity but does not fully capture current market realities. Specifically, it fails to account for the impact of digital platforms, online booking algorithms, review systems, staff shortages, increased government regulation, and competition from short-term rental enterprises. Therefore, the model insufficiently explains competitive model of forces in the industry.

The research also shows that competition in the hotel industry today is largely determined by digital technologies, reliance on online platforms, reputation management, and external regulatory conditions. For management, this means considering these factors when developing strategy. At a broader level, the results highlight the importance of reconsidering traditional approaches to industry analysis in the context of digital transformation.

Since the study is based on qualitative interviews with a key industry representative, its findings are limited in scope. Further testing of the revised model on a wider sample of hotels and tourism organizations is required, as well as a quantitative comparison of its effectiveness with Porter's original model.

References

- Alstyn, M. V., & Parker, G. (2017). Platform Business: From Resources to Relationships. *GfK Marketing Intelligence Review*, 9(1), 25-29. DOI:10.1515/gfkmir-2017-0004
- Andriotis, K. (2004). Revising Porter's Five Forces Model for Application in the Travel and Tourism Industry. *Tourism Today*, 4(1), 131-145.
- Christou, E. (2012). *Social Media in Travel, Tourism and Hospitality: Theory, Practice and Cases (New Directions in Tourism Analysis)*. London: Routledge.
- Dobbs, M. E. (2014). Guidelines for applying Porter's five forces framework: a set of industry analysis templates. *Competitiveness Review*, 24(1), 32-45. DOI:10.1108/CR-06-2013-0059
- Dwyer, L., & Kim, C. (2003). Destination Competitiveness: Determinants and Indicators. *Current Issues in Tourism*, 6(5), 369-414. DOI:10.1080/13683500308667962

- Eisenmann, T., Parker, G., & Alstyne, M. V. (2011). Platform envelopment. *Strategic Management Journal*, 32(12), 1270-1285. DOI:10.1002/smj.935
- Enright, M. J., & Newton, J. (2004). Tourism Destination Competitiveness: A Quantitative Approach. *Tourism Management*, 25(6), 777-788. DOI:10.1016/j.tourman.2004.06.008
- Goyal, A. (2020). A Critical Analysis of Porter's 5 Forces Model of Competitive Advantage. *Jettir*, 7(7), 149-152. DOI:10.1729/Journal.25126
- Grundy, T. (2006). Rethinking and reinventing Michael Porter's five forces model. *Strategic Change*, 15(5), 213-229. DOI:10.1002/jsc.764
- Guttentag, D. (2015). Airbnb: disruptive innovation and the rise of an informal tourism accommodation sector. *Current Issues in Tourism*, 18(12), 1192-1217. DOI: 10.1080/13683500.2013.827159
- Porter, M. E. (1980). *Competitive Strategy: Techniques for Analyzing Industries and Competitors*. New York: Free Press.
- Ritchie, J., & Crouch, G. (2003). *The Competitive Destination: A Sustainable Tourism Perspective*. Wallingford: CABI.
- Varelas, S., & Georgopoulos, N. (2017). Porter's Competitive Forces in the Modern Globalized Hospitality Sector - The case of a Greek Tourism Destination. *Journal of Tourism Research*, 18(1), 122-132.
- Xiang, Z., Du, Q., Ma, Y., & Fan, W. (2017). A comparative analysis of major online review platforms: Implications for social media analytics in hospitality and tourism. *Tourism Management*, 58, 1-47. DOI:10.1016/j.tourman.2016.10.001
- Zervas, G., Proserpio, D., & Byers, J. W. (2017). The Rise of the Sharing Economy: Estimating the Impact of Airbnb on the Hotel Industry. *Journal of Marketing Research*, 54, 687-705. DOI:10.1509/jmr.15.0204

AI MATURITY AS A BOUNDARY CONDITION FOR DIGITAL-NOMAD-STYLE WORK-FROM-ANYWHERE PERFORMANCE: EVIDENCE FROM A CROSS-REGIONAL SURVEY

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Abstract

Organizations are expanding hybrid and work-from-anywhere arrangements, yet evidence on their performance consequences remains mixed. Using digital nomadism as an extreme work-from-anywhere context, we position spatial flexibility within a broader digital-nomad-oriented DRISA management mode. We argue that artificial intelligence (AI) matters less as a stand-alone productivity tool than as a boundary condition that changes whether spatial flexibility improves organizational performance. Drawing on socio-technical systems theory, we conceptualize AI maturity as the extent to which AI is embedded in workflows, coordination routines, and decision making. Using a cross-regional survey of employees and managers ($N = 372$) from China, the United States, and Europe, we estimate OLS models with robust standard errors. Results show a strong interaction: spatial flexibility is performance-reducing when AI maturity is low but performance-enhancing when AI maturity is high. The findings suggest that AI-enabled coordination capacity is critical for digital-nomad-style work-from-anywhere performance.

Keywords: AI maturity, Digital nomads, Organizational performance, Spatial flexibility

Introduction

Distributed and location-independent work has shifted from a peripheral arrangement to a defining feature of contemporary organizing. Firms increasingly rely on remote, hybrid, and mobile talent pools to access specialized human capital, increase agility, and respond to volatile markets. However, many organizations experience uneven results. Flexibility can reduce commuting costs, expand talent access, and support work-life integration, but it can also elevate coordination overhead, delay decision cycles, and weaken shared understanding—especially when work is interdependent and teams span time zones (Allen et al., 2015; Gajendran & Harrison, 2007).

Digital nomadism has become one visible expression of this broader transformation. Digital nomads are commonly described as knowledge workers who rely on digital technologies to work remotely while engaging in sustained mobility (Chevtaeva & Denizci-Guillet, 2021). From a management perspective, nomadism is analytically useful because it makes the design challenge explicit: it pushes spatial flexibility to an extreme where informal coordination and co-located supervision are minimal.

If organizations can coordinate and sustain performance under such conditions, they likely possess transferable capabilities for more common hybrid and distributed settings.

From a management-practice perspective, digital-nomad-style organizing typically relies on a bundle of complementary practices. We refer to this bundle as DRISA—Digital integration, Remote adaptability, Individual autonomy, Spatial flexibility, and Agile management. Among these elements, spatial flexibility is the most visible policy lever and the one that most directly increases dispersion.

A central design element of mobile work systems is spatial flexibility—employees' ability to work effectively across locations such as home offices, client sites, co-working spaces, and temporary destinations. Spatial flexibility is often assumed to be inherently beneficial because it expands the feasible set of work arrangements and can increase autonomy. Yet the empirical record is mixed, and theory provides reasons for ambivalence. Spatial dispersion can undermine performance by intensifying the mutual knowledge problem (Cramton, 2001), complicating cross-location handoffs, and increasing the risk of professional isolation (Golden et al., 2008). When communication is asynchronous and context is fragmented, teams may spend more time clarifying, re-coordinating, and repairing misunderstandings than executing core tasks (Hinds & Bailey, 2003).

Simultaneously, artificial intelligence (AI) is becoming a core component of digital transformation agendas. Organizations are deploying machine learning and generative AI to automate routine activities, generate insights from data, and support communication. Much research on AI in organizations has focused on automation versus augmentation and on algorithmic control (Kellogg et al., 2020; Raisch & Krakowski, 2021). These streams clarify why AI can create both efficiency and contestation. However, for distributed work, the main bottleneck is often coordination rather than local task execution. The critical issue is therefore not only whether AI increases individual productivity, but whether AI changes the organization's capacity to coordinate dispersed interdependent work.

We develop a boundary-condition perspective: AI maturity alters the relationship between spatial flexibility and organizational performance. AI maturity refers to the extent to which AI is integrated into workflows, coordination routines, and decision making, supported by data infrastructure and governance. The construct is designed to capture embedded, routinized AI that operates as an algorithmic coordination layer, rather than isolated experimentation with stand-alone tools. This emphasis is important because flexibility policies often fail not due to lack of autonomy, but due to inadequate coordination capacity to manage the dependencies created by dispersion.

We test this argument using a cross-regional survey of employees and managers from China, the United States, and Europe (N = 372). Using hierarchical regression and interaction probing, we show that the performance implications of spatial flexibility reverse depending on AI maturity: flexibility can be harmful when AI maturity is low but beneficial when AI maturity is high. The evidence helps explain why similarly designed flexibility initiatives can yield divergent outcomes across organizations and offers a practical implication for digital transformation: investments in AI should be evaluated partly by whether they enhance coordination capacity for dispersed work.

Literature review

Positioning spatial flexibility within digital-nomad-oriented management. DRISA describes a digital-era management mode that combines Digital integration, Remote adaptability, Individual autonomy, Spatial flexibility, and Agile management to support location-independent work. In this study, we focus on the spatial flexibility component because it is conceptually central to digital nomadism and empirically linked to both autonomy benefits and coordination costs.

Spatial flexibility and the performance dilemma. Spatial flexibility is typically embedded in broader bundles of digital-era practices, but it remains a distinctive element because it directly increases physical and temporal dispersion. Prior telework research suggests that autonomy can improve satisfaction and, under enabling conditions, performance (Allen et al., 2015; Gajendran & Harrison, 2007). Yet distributed collaboration studies emphasize that dispersion changes the information environment of work. When individuals are separated, it becomes more difficult to establish shared context, diagnose misunderstandings, and coordinate interdependent tasks.

Cramton's mutual knowledge problem highlights that even when parties have access to similar information, they may not know what others know, leading to misinterpretation and conflict (Cramton, 2001). Hinds and Bailey (2003) show that conflict in distributed teams can result from asynchronous communication, delays in feedback, and divergent interpretations of task requirements. These insights imply that spatial flexibility may increase the probability and cost of coordination failures, particularly when tasks are complex, ambiguous, and tightly coupled.

From an information-processing perspective, spatial flexibility raises both uncertainty (missing information) and equivocality (multiple possible interpretations). Daft and Lengel (1986) argue that organizations require richer information-processing mechanisms to resolve equivocality and reduce uncertainty. Similarly, classic organizational design theory suggests that as task interdependence and environmental uncertainty rise, organizations must increase their information-processing capacity (Galbraith, 1973). Spatial flexibility increases the volume of coordination information that must be processed, the speed with which it must be processed, and the need for reliable cross-location handoffs. If organizations do not adapt their coordination mechanisms, spatial flexibility can create a performance penalty even if it improves individual autonomy.

Coordination theory conceptualizes coordination as managing dependencies among activities (Malone & Crowston, 1994). Dependencies in distributed work include shared resources, sequential handoffs, and reciprocal interdependence. Spatial flexibility increases the likelihood that these dependencies cross time zones and organizational boundaries, making coordination more complex. Empirical telework studies also show that professional isolation can reduce performance when communication-enhancing technology and routines are insufficient (Golden et al., 2008).

Despite these costs, spatial flexibility can also be a strategic asset. It can expand access to talent and markets, enable faster response to geographically distributed opportunities, and support continuity under disruptions. Given these potential benefits and the managerial intent behind flexibility initiatives, we posit a positive average relationship, while acknowledging that this average may mask strong heterogeneity.

Hypothesis 1 (H1): Spatial flexibility is positively associated with organizational performance.

AI maturity as a coordination capability. Research on AI in organizations has documented both automation benefits and unintended consequences, such as opacity and contested control (Kellogg et al., 2020; Raisch & Krakowski, 2021). However, distributed work shifts attention toward a different function of AI: coordination support. Faraj et al. (2018) argue that learning algorithms reshape how work is organized by reallocating attention and by generating actionable predictions. Jarrahi (2018) describes human-AI symbiosis in decision making, where AI can augment interpretation and prioritization rather than replace judgment.

We define AI maturity as the degree to which AI is embedded in everyday work routines and used to coordinate tasks, integrate information, and support decisions. AI maturity differs from simple tool adoption because it implies (a) integration across systems and workflows, (b) routinization in daily coordination rather than occasional use, (c) data readiness that supports reliable AI outputs, and (d) governance that clarifies accountability and human oversight. Organizations with high AI maturity are more likely to have integrated data pipelines, standardized workflow representations, and role clarity for when and how AI recommendations are enacted or challenged.

From a socio-technical systems perspective, mature AI functions as an additional layer in the technical subsystem that shapes the social subsystem. AI-enabled coordination can increase information-processing capacity through mechanisms such as: automated capture of task states, real-time dashboards, anomaly detection, predictive forecasting of delays, and AI-assisted summarization of distributed communication. Importantly, these mechanisms matter because dispersion shifts work from shared physical context to mediated signals. The question becomes whether the organization can rapidly convert these signals into coordination actions.

Why AI maturity should moderate flexibility-performance links. When spatial flexibility is high, coordination requires continuous updating of “who is doing what, when, and with which dependencies.” AI maturity can reduce coordination costs by improving visibility (monitoring dependencies), enabling faster sensemaking (interpreting dispersed data), and supporting asynchronous action (automating routine handoffs). These mechanisms imply that at high AI maturity, spatial flexibility can be leveraged to access talent and opportunities without incurring equivalent coordination overhead.

Conversely, when AI maturity is low, organizations may rely on fragmented digital tools and ad hoc communication. Low maturity often implies limited integration between collaboration platforms and operational systems, weak data governance, and ambiguous decision rights for acting on AI outputs. In such contexts, increasing spatial flexibility may expand the surface area for misunderstandings and increase delays, producing a net performance penalty. Thus, AI maturity should condition whether flexibility produces advantage or friction.

Hypothesis 2 (H2): AI maturity positively moderates the relationship between spatial flexibility and organizational performance, such that the relationship is stronger at higher levels of AI maturity.

Methodology

Research design and context. The empirical context is distributed work in organizations that rely on digital collaboration tools and, in many cases, allow varying degrees of mobility. The unit of analysis is the individual respondent, who reports on their organization’s AI maturity, their experienced spatial flexibility, and perceived organizational performance. Because the focal argument concerns

boundary conditions, we emphasize variation in AI maturity and spatial flexibility across respondents and organizations.

Data collection procedure. Data were collected via an online questionnaire. Recruitment combined outreach to digital-nomad communities, professional networks, and collaborating organizations with distributed workforces. To improve cross-regional coverage, the survey targeted respondents in China, the United States, and Europe. Participation was voluntary, and responses were collected anonymously. To support data quality, the survey used forced-response settings for scale items (eliminating missing values on focal constructs), allowed unlimited completion time, and applied an attention-screening rule that removed patterned responding (straight-lining) across consecutive items.

Sample. The final analytic sample comprises 372 valid responses: China ($N = 127$), the United States ($N = 125$), and Europe ($N = 120$). Respondents included both employees and managers and represented a range of organizational sizes. Work arrangements included fully remote and hybrid roles as well as on-site roles with distributed collaboration. This cross-regional structure reduces the risk that results reflect one institutional environment and provides an initial test of generalizability across contexts.

Measures. All measures used Likert-type response formats and were aggregated as mean scores. Spatial flexibility was measured with six items (Cronbach's $\alpha = .927$) adapted from the spatial flexibility dimension in the DRISA management bundle, capturing the extent to which respondents can perform core tasks effectively across locations and maintain productivity when changing work settings. AI maturity was measured with five items (Cronbach's $\alpha = .951$) capturing the degree of AI integration in workflows, coordination routines, and decision making (e.g., AI-supported planning, AI-enabled process automation, and AI-based decision support). Organizational performance was measured with five items (Cronbach's $\alpha = .937$) capturing perceived performance relative to competitors or targets (e.g., efficiency and goal attainment). Because the focus is on coordination capacity rather than simple adoption, AI maturity items emphasized routinization and integration rather than experimentation. All scale items were presented in a randomized order by section to reduce response patterning.

Control variables. To reduce omitted-variable concerns, models included region indicators and a set of basic demographic controls (e.g., age, gender, education). In supplementary analyses, results were robust when including additional organizational controls such as firm size and work arrangement (remote/hybrid versus on-site), suggesting that the interaction is not an artifact of a single category of respondents.

Validity considerations. We assessed construct distinctiveness using confirmatory factor analysis. For the measurement set involving spatial flexibility, AI maturity, and organizational performance, a three-factor model fit the data substantially better than a one-factor model, providing evidence against a single common-method factor explanation. Procedurally, anonymity and non-evaluative wording were used to reduce social desirability and evaluation apprehension. While common method bias can never be fully eliminated in cross-sectional surveys, the pattern of results—especially the interaction reversal—reduces the likelihood that findings are solely driven by common measurement artifacts.

Analytical strategy. Hypotheses were tested using hierarchical ordinary least squares regression with heteroskedasticity-robust standard errors (HC3). In the first step, we included control variables

(region and demographics). In the second step, we included main effects of spatial flexibility and AI maturity. In the third step, we added the interaction term (Spatial flexibility $\times$ AI maturity). Continuous predictors were standardized prior to interaction construction. We probed the interaction using simple slopes at low (-1 SD) and high ($+1$ SD) levels of AI maturity, consistent with recommended practices for moderation analysis (Dawson, 2014).

Research results

Main effects and interaction. **Table 1** reports the hierarchical regression models predicting organizational performance. In the main-effects model, spatial flexibility shows a small positive average association with performance ($\beta = 0.144$, $p < .05$), consistent with **H1**. AI maturity has a marginal positive association in the main-effects model ($\beta = 0.107$, $p < .10$). This weak main effect is consistent with a boundary-condition view: AI maturity may matter primarily in combination with work design rather than as a stand-alone predictor.

The interaction model provides the key test. Supporting **H2**, the spatial flexibility $\times$ AI maturity term is positive and strongly significant ($\beta = 0.360$, $p < .001$) and explains substantial incremental variance ($\Delta R^2 = 0.117$). The magnitude is substantive: holding controls constant, a one-standard-deviation increase in spatial flexibility is associated with a 0.205 standard deviation decrease in performance when AI maturity is low, but a 0.515 standard deviation increase in performance when AI maturity is high. Thus, AI maturity does not merely strengthen the positive effect—it changes the sign of the relationship.

Figure 1 visualizes this reversal. Under low AI maturity, increases in flexibility likely amplify coordination problems such as delayed feedback, fragmented information, and ambiguous handoffs. Under high AI maturity, AI-enabled visibility and decision support appear to mitigate these frictions, allowing flexibility to translate into improved performance outcomes.

Robustness checks. Because spatial flexibility is most relevant for workers in remote or hybrid arrangements, we re-estimated the interaction model on the remote-plus-hybrid subsample ($N = 276$). The interaction remained positive and significant ($\beta = 0.342$, $p < .001$). We also estimated the interaction separately by region; the interaction remained positive and statistically significant across China, the United States, and Europe (all $p < .01$), indicating that the moderation pattern is not driven by one geographical context. Taken together, these checks increase confidence that the observed boundary condition reflects a general coordination mechanism rather than a region-specific artifact.

Table 1

Hierarchical regression results predicting organizational performance

Predictor	Model 1: OP (main)	Model 2: OP (interaction)
AI maturity (z)	0.107† (0.063)	0.117* (0.049)
Spatial flexibility (z)	0.144* (0.056)	0.155*** (0.047)
Spatial $\times$ AI		0.360*** (0.045)
R ²	0.115	0.232
ΔR^2		0.117

Note: Standardized coefficients with HC3 robust standard errors in parentheses. Controls (region and basic demographics) are included but omitted for brevity. † $p < .10$, * $p < .05$, ** $p < .01$, *** $p < .001$.

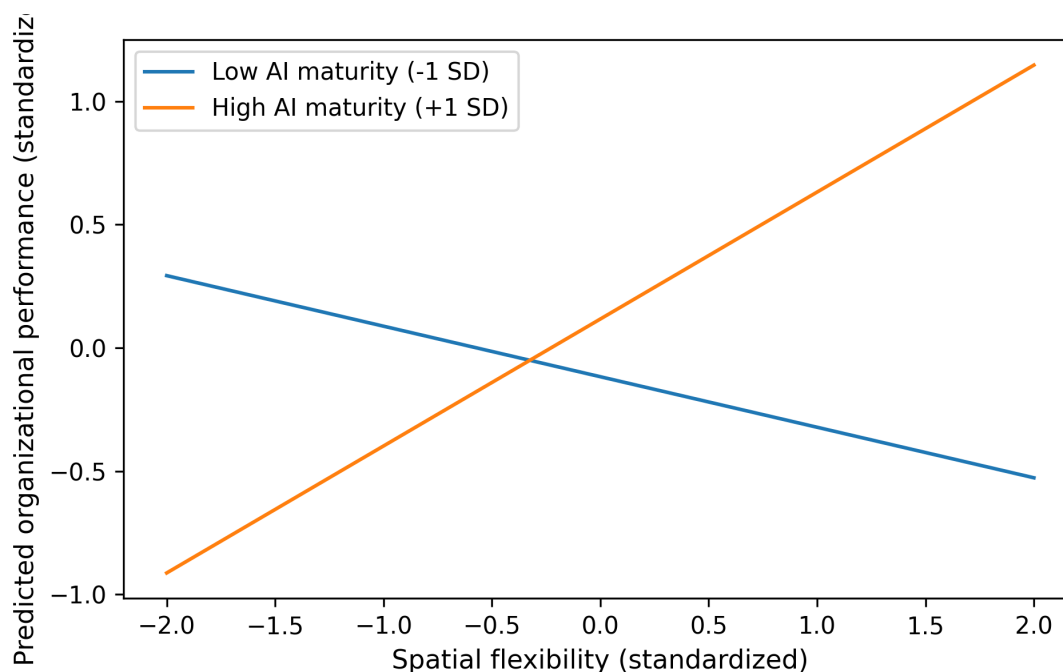


Figure 1. Simple slopes of spatial flexibility predicting organizational performance at low versus high AI maturity

Conclusions and discussion

Interpreting the interaction. The results indicate that the performance meaning of spatial flexibility is contingent. When AI maturity is low, flexibility appears to impose a coordination tax: dispersed work likely increases delays, reduces shared context, and weakens the reliability of cross-location handoffs. In this regime, autonomy-oriented flexibility may drift into fragmentation, consistent with distributed collaboration research on misalignment and isolation (Cramton, 2001; Golden et al., 2008).

When AI maturity is high, the relationship reverses. Mature AI integration can provide the coordination layer needed to make mobility productive: AI-supported visibility enables better monitoring of task states and dependencies; predictive analytics improve planning; and AI-assisted communication tools reduce the burden of synthesizing dispersed information (Faraj et al., 2018; Jarrahi, 2018). Thus, AI maturity does not simply “increase productivity”; it changes the coordination conditions under which flexibility becomes advantageous.

Theoretical contributions. First, the study contributes to AI-in-management research by operationalizing AI maturity as a socio-technical capability rather than a tool count. By emphasizing embedding, routinization, and governance, the construct links AI to coordination capacity and extends work on algorithmic agency in organizational routines.

Second, the results contribute to remote work and organizational design research by offering an explanation for mixed findings on flexibility-performance links. If the sign of the flexibility effect depends on AI maturity, studies that ignore this boundary condition will observe weak or inconsistent average effects. This implies that the effectiveness of flexibility policies is conditional on the maturity of the organization’s coordination infrastructure and routines.

Third, the findings speak to information-processing and coordination theories. They identify AI-enabled coordination as a contemporary mechanism that increases an organization's capacity to manage dependencies among dispersed activities (Galbraith, 1973; Malone & Crowston, 1994). This helps bridge classic organizational design theory with current digital transformation practice.

Managerial implications. Managers should treat mobility policies as an organizational redesign problem, not merely an employee benefit. Scaling spatial flexibility without a mature coordination layer risks performance losses. We suggest a practical sequencing logic: (1) digitize and standardize workflows so that task states and handoffs are observable; (2) build integrated data infrastructure and shared dashboards that provide cross-location visibility; (3) embed AI into coordination routines (planning, prioritization, escalation) with clear human oversight and decision rights. This sequencing aligns with the idea that AI maturity is achieved through integration and governance rather than through isolated tool procurement.

Managerial guidance: a five-step playbook. The findings translate into a simple sequencing logic for organizations considering digital-nomad-style work-from-anywhere policies:

Step 1: Diagnose coordination pain points before expanding flexibility. Map where distributed work breaks down (e.g., unclear ownership, delayed approvals, duplicated work, information "hunting").

Step 2: Build minimum viable AI maturity for coordination. Prioritize AI use cases that increase visibility and reduce search/summarization costs (e.g., knowledge retrieval, meeting and ticket summarization, workflow-integrated copilots) before investing in advanced automation.

Step 3: Pair flexibility with governable routines. Use short planning cycles, explicit handoffs, and standardized documentation. Treat AI outputs as inputs to routines (plans, checklists, decisions), not as substitutes for routines.

Step 4: Monitor leading indicators and stage the rollout. Track cycle time, rework, response latency, and customer-facing delays. If these worsen after increasing flexibility, treat it as a signal to strengthen coordination capacity rather than abandoning flexibility.

Step 5: Add governance and psychological safety. Clarify decision rights for acting on AI recommendations, implement privacy-by-design to avoid surveillance creep, and ensure workers can contest AI-influenced judgments.

Ethical and governance implications. Embedding AI into coordination routines raises ethical risks. AI-enabled visibility can become invasive surveillance, and algorithmic recommendations can be opaque or biased (Kellogg et al., 2020). Organizations pursuing AI maturity should implement privacy-by-design, transparency about what is monitored and why, and bias-aware evaluation of AI outputs. They should also ensure that distributed workers have procedural channels to contest decisions and to request explanations when AI recommendations influence evaluation, task assignment, or resource allocation.

Limitations and future research. The cross-sectional design limits causal claims, and performance was measured perceptually rather than through objective indicators. Future work can test the model longitudinally and link AI maturity to objective outcomes such as project cycle time, defect rates, service quality, or customer satisfaction. Multi-level studies can examine how team-level coordination processes (e.g., shared mental models, communication quality) mediate the interaction between flexibility and performance. Finally, future research can disaggregate AI maturity into specific capability domains—such as generative AI for communication, predictive AI for planning, and

automation for routine handoffs—to test whether different AI functions create distinct boundary conditions.

This study proposes and tests a boundary-condition view of AI in distributed work. Using a cross-regional survey dataset, we show that AI maturity strongly conditions the performance implications of spatial flexibility. When AI maturity is low, increasing flexibility is associated with lower performance; when AI maturity is high, flexibility becomes performance-enhancing. These findings suggest that organizations should evaluate “work-from-anywhere” initiatives together with investments in AI-enabled coordination and governance. More broadly, the results imply that digital transformation value creation depends on complementarities between technology maturity and work design.

References

- Allen, T. D., Golden, T. D., & Shockley, K. M. (2015). How effective is telecommuting? Assessing the status of our scientific findings. *Psychological Science in the Public Interest*, 16(2), 40–68. <https://doi.org/10.1177/1529100615593273>
- Chevtavaeva, E., & Denizci-Guillet, B. (2021). Digital nomads' lifestyles: A conceptual review. *Tourism Recreation Research*, 46(3), 379–390. <https://doi.org/10.1080/02508281.2020.1776246>
- Cramton, C. D. (2001). The mutual knowledge problem and its consequences for dispersed collaboration. *Organization Science*, 12(3), 346–371. <https://doi.org/10.1287/orsc.12.3.346.10098>
- Daft, R. L., & Lengel, R. H. (1986). Organizational information requirements, media richness and structural design. *Management Science*, 32(5), 554–571. <https://doi.org/10.1287/mnsc.32.5.554>
- Dawson, J. F. (2014). Moderation in management research: What, why, when, and how. *Journal of Business and Psychology*, 29(1), 1–19. <https://doi.org/10.1007/s10869-013-9308-7>
- Faraj, S., Pachidi, S., & Sayegh, K. (2018). Working and organizing in the age of the learning algorithm. *Information and Organization*, 28(1), 62–70. <https://doi.org/10.1016/j.infoandorg.2018.02.005>
- Gajendran, R. S., & Harrison, D. A. (2007). The good, the bad, and the unknown about telecommuting: Meta-analysis of psychological mediators and individual consequences. *Journal of Applied Psychology*, 92(6), 1524–1541. <https://doi.org/10.1037/0021-9010.92.6.1524>
- Galbraith, J. R. (1973). *Designing complex organizations*. Addison-Wesley
- Golden, T. D., Veiga, J. F., & Dino, R. N. (2008). The impact of professional isolation on teleworker job performance and turnover intentions: Does time spent teleworking, interacting face-to-face, or having access to communication-enhancing technology matter? *Journal of Applied Psychology*, 93(6), 1412–1421. <https://doi.org/10.1037/a0012722>
- Hinds, P. J., & Bailey, D. E. (2003). Out of sight, out of sync: Understanding conflict in distributed teams. *Organization Science*, 14(6), 615–632. <https://doi.org/10.1287/orsc.14.6.615.24872>
- Jarrahi, M. H. (2018). Artificial intelligence and the future of work: Human–AI symbiosis in organizational decision making. *Business Horizons*, 61(4), 577–586. <https://doi.org/10.1016/j.bushor.2018.03.007>
- Kellogg, K. C., Valentine, M. A., & Christin, A. (2020). Algorithms at work: The new contested terrain of control. *Academy of Management Annals*, 14(1), 366–410. <https://doi.org/10.5465/annals.2018.0174>
- Malone, T. W., & Crowston, K. (1994). The interdisciplinary study of coordination. *ACM Computing Surveys*, 26(1), 87–119. <https://doi.org/10.1145/1746666.174668>
- Mikalef, P., & Gupta, M. (2021). Artificial intelligence capability: Conceptualization, measurement calibration, and empirical study on its impact on organizational creativity and firm performance. *Information & Management*, 58(3), 103434. <https://doi.org/10.1016/j.im.2020.103434>
- Orlikowski, W. J. (1992). The duality of technology: Rethinking the concept of technology in organizations. *Organization Science*, 3(3), 398–427. <https://doi.org/10.1287/orsc.3.3.398>
- Raisch, S., & Krakowski, S. (2021). Artificial intelligence and management: The automation–augmentation paradox. *Academy of Management Review*, 46(1), 192–210. <https://doi.org/10.5465/amr.2018.0072>
- Trist, E. L., & Bamforth, K. W. (1951). Some social and psychological consequences of the longwall method of coal-getting. *Human Relations*, 4(1), 3–38. <https://doi.org/10.1177/001872675100400101>
- Venkatraman, N., & Ramanujam, V. (1986). Measurement of business performance in strategy research: A comparison of approaches. *Academy of Management Review*, 11(4), 801–814. <https://doi.org/10.5465/amr.1986.4283976>

MĀKSLĪGĀ INTELEKTA IZMANTOŠANAS TIESISKĀS PROBLĒMAS PUBLISKAJĀ SEKTORĀ

LEGAL ISSUES OF THE USE OF ARTIFICIAL INTELLIGENCE IN THE PUBLIC SECTOR

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Anotācija

Neskatoties uz to, ka MI jau pastāv mūsu dzīvē, tomēr publiskajā sektorā MI esamība vēl nav tik plaši izplatīta, lai tai būtu noteicošā loma lēmumu pieņemšanā. Autors rakstā izvirza mērķi izpētīt ar MI izmantošanu publiskajā sektorā pastāvošas tiesiskās problēmas, ar kurām var saskarties valsts pārvalde, ieviešot MI informācijas analizēšanas un lēmumu pieņemšanas procesos. Proti, atbildība par kaitējuma nodarīšanu; MI rezultātu tiesiskais režīms; ticamības novērtējums lēmumu pieņemšanā un neiespējamība pilnībā izskaidrot pieņemto lēmumu. Šo problēmu apzināšana autoru interesē saistībā ar MI tehnoloģiju nostiprināšanu Latvijas normatīvajos aktos. Raksta ietvaros konstatētās problēmas dod pamatu tiesību normas uzlabošanai, veicina padziļinātu izpratni par MI tehnoloģiju nozīmi publiskajā sektorā. Savukārt identificēto problēmu cēloņi un rašanās dod pamatu nākotnē praktiskiem MI tehnoloģiju tiesiskā regulējuma uzlabojumiem, tiesību normu harmonizācijai, lai veicinātu MI attīstību, pilnveidi un uzlabotu tiesisko vidi. Raksts kopumā sniedz ieskatu par MI izmantošanas tiesiskām problēmām publiskajā sektorā. Autors sniedz savu skatījumu par šo jautājumu un ar to saistītām problēmām, pamatojoties uz autora veikto pētījumu.

Atslēgas vārdi: datu drošība, mākslīgais intelekts, pamatprincipi, publiskais sektors

Abstract

Despite the fact that AI already exists in our lives, the existence of AI in the public sector is not yet so widespread that it plays a decisive role in decision-making. The author sets out in the article the aim of studying the legal problems that exist with the use of AI in the public sector, which public administration may encounter when introducing AI into the information analysis and decision-making processes. Namely, liability for causing harm; the legal regime of AI results; assessment of reliability in decision-making and the impossibility of fully explaining the decision made. The author is interested in identifying these problems in connection with the consolidation of AI technologies in Latvian regulatory enactments. The problems identified in the article provide a basis for improving legal norms, promoting a deeper understanding of the role of AI technologies in the public sector. In turn, the causes and emergence of the identified problems provide a basis for future practical improvements in the legal regulation of AI technologies, harmonization of legal norms in order to promote

the development, improvement of AI and improve the legal environment. The article as a whole provides an insight into the legal problems of using AI in the public sector. The author provides his perspective on this issue and related problems, based on research conducted by the author.

Keywords: artificial intelligence, basic principles, data security, public sector

Ievads

Arvien skaļāk visā pasaulē izskan viedoklis par cilvēka aizvietošanu dažādās profesionālās jomās ar mākslīgo intelektu (MI). Tiek uzskatīts, ka MI efektīvāk nekā cilvēks tiks galā ar pieaugušo datu apjomu, labāk un racionālāk izdarīs darbu un sasniegs labākus rezultātus vairākās profesijās. Pateicoties tehnoloģiju sasniegumiem pēdējo piecu gadu laikā, MI jau tagad var ne tikai veikt darbības, kas iepriekš bija raksturīgas tikai cilvēkiem, bet arī attīstīt noteiktas kognitīvās un autonomās iezīmes, piemēram, spēju mācīties, pieņemt lēmumus, kas MI arvien vairāk padara līdzīgu cilvēkiem (Leksin, 2020).

ES apzinās MI pieaugušo nozīmi ekonomikā, valsts stiprās puses tā izmantošanā, kā arī nepieciešamību koordinēt centienus radīt labvēlīgu vidi MI attīstībai (European Commission [EC], 2018a). Tādējādi turpmākajos 10 gados EK plāno pastiprināti atbalstīt padziļinātu digitālo prasmju, tostarp zināšanu MI jomā apguvi. Tas nozīmē, ka palielināsies MI tehnoloģiju izmantošana ES dalībvalstu (t.sk. Latvijas) uzņēmumos un publiskajā pārvaldē (EC, 2018b). Latvija arī īsteno MI ieviešanu, 2025. gadā nodibinot Mākslīgā intelekta centru (Mākslīgā intelekta centra likums, 2025).

Vairākās pasaules valstīs MI tehnoloģijas ir ne tikai izstrādāšanas stadijā, bet notiek pat aktīva MI praktiska ieviešana. Kā potenciālu publiskajā sektorā MI savās stratēģijās noteikušas Apvienotie Arābu Emirāti, ASV, Dienvidkoreja, Francija, Indija, Itālija, Japāna, Kanāda, Ķīna, Lielbritānija un Vācija.

Tomēr ar MI intensīvu ieviešanu cilvēku dzīvē nevajadzētu arī aizmirst par jauno tehnoloģiju tiesiskā regulējuma ieviešanu un to darbības tiesisku pamatprincipu noteikšanu, jo aiz cēliem mērķiem (t.sk. palīdzēt cilvēcei) MI ieviešana var apdraudēt pašas cilvēces pastāvēšanu (Duffy & Maruf, 2023).

Tā kā MI autonomiju var definēt kā spēju pieņemt lēmumus neatkarīgi no jebkādas ārējas kontroles vai ietekmes, ir ārkārtīgi svarīgi, lai arī LR Saeima un valdība sekotu līdzi jaunām tendencēm MI tehniskajā attīstībā un noteiktu MI lomu un vietu sociālajās attiecībās mijiedarbībā starp MI un cilvēkiem. Jo autonomāks ir MI, jo grūtāk to būs uzskatīt par vienkāršu instrumentu cilvēku (ražotāju, operatoru, īpašnieku, lietotāju u.c.) rokās.

Ievērojot lielos riskus, kas rodas, izmantojot MI tehnoloģijas, vienlaikus ar MI izveidi ir nepieciešams izpētīt MI izmantošanas normatīvā regulējuma jautājumus. Šie jautājumi vēl nav pietiekami izpētīti, un regulējums ir sākuma stadijā. Nav šaubu, ka, lai MI izmantotu kopējam labumam, šobrīd ir jāizstrādā atbilstoši noteikumi un likumi, lai izvairītos no MI plašās ieviešanas nekontrolējamām sekām. Jo MI jau tagad intensīvi ģenerē jaunus, nozīmīgus izaicinājumus, kas saistīti ar grūti aprēķināmiem riskiem un daudzām iespējām un rada lielu nenoteiktību (Frank u.c., 2017).

MI sistēmu izmantošanas normatīvajā regulējumā būtu jāievēro šādu sistēmu galvenā iezīme – spēja pieņemt izpildvaras lēmumus bez cilvēka līdzdalības. Tāpēc daudzas valstis jau ir ieviesušas vai plāno īstenot iniciatīvas MI tiesiskajam regulējumam. ES 2024. gada 13. martā pieņēma pirmo MI

tehnoloģiju regulēšanas normatīvu aktu, kas nosaka pamatus MI tehnoloģiju izmantošanai (Kesnere, 2024).

MI tehnoloģijām ir milzīgs potenciāls publiskajā sektorā. Taču pašlaik MI tehnoloģiju izmantošana publiskajā sektorā Latvijā nav noregulēta. Notiek daži fragmentāri mēģinājumi MI tehnoloģiju regulēšanai. Piemēram, Latvijas Valsts prezidenta likumdošanas iniciatīva par MI sistēmu izmantošanu priekšvēlēšanu aģitācijā (Rinkēvičs, 2024).

Nepietiekams nacionālais normatīvais regulējums un MI tehnoloģiju izmantošanas aktualitāte un pieprasījums Latvijā pamudināja autoru pievērsties MI izmantošanas tiesiskās problēmas izpētei.

Mūsdienu zinātnieki veic pētījumus, kuru rezultāti ir izmantojami zinātniskajā polemikā un argumentācijā, piemēram, ir izvirzījušas apspriežamas atziņas par MI lomu tiesas darbā, vai MI varētu aizvietot publiskajā sektorā strādājošās valsts amatpersonas un darbiniekus. Uz kādiem pamatprincipiem MI ir jādarbojas, un kādi veidojas no tā riski (Levits, 2019)? Vai ir iespējams tādus riskus minimizēt ar MI tiesisko regulējumu (Erkan, 2024)? Tomēr pētnieku vidū ir gandrīz vienprātība izprātne par to, ka MI attīstīsies (Irklis, 2023) un ieies gan privātajā, gan publiskajā sektorā, līdz ar to MI tiesiskajam regulējumam tā veidošanas brīdī pašlaik ir ļoti liela nozīme.

Nemot vērā minēto, autors rakstā izvirza mērķi izpētīt ar MI izmantošanu publiskajā sektorā pastāvošās tiesiskās problēmas, proti:

- 1) tiesību normu par MI izmantošanu integrēšanas problēma likumdošanā, ievērojot publiskā un privātā sektora intereses: ir jābūt sociālajam līdzsvaram starp sabiedrības, privātā un publiskā sektora interesēm, lai normatīvais regulējums būtu efektīvs;
- 2) MI tehnoloģiju samērīguma robežas un kontroles mehānismu tiesiskā nostiprināšana, lai MI tehnoloģiju pieņemtā lēmuma ticamību būtu iespējams novērtēt, izsekot un nepieciešamības gadījumā pārbaudīt;
- 3) tiesiskā regulējuma mehānisma ieviešanas problēma publisko tiesisko attiecību nodibināšanā un aizsardzībā saistībā ar MI izmantošanu publiskajā sektorā.

Autors, lai sasniegtu mērķi, balstās un izmanto šādas zinātniskās pētniecības metodes: loģiski konstruktīvā metode, lai prognozētu MI tehnoloģiju tiesiskā regulējuma tālāku attīstību; problēmu analīzes metode, lai aprakstītu un izpētītu problēmas saistībā ar tiesiskā regulējuma par MI efektivitāti un to attīstību, kā arī, lai analizētu MI tehnoloģiju būtību, pastāvošās un konstatētās problēmas, to rašanās cēloņus un sekas; dokumentu analīzes metode, lai pētītu MI tehnoloģiju tiesisko regulējumu citās valstīs, kā arī starptautisko organizāciju izstrādātajos un pieņemtajos normatīvajos aktos; dialektiskā metode, lai pētītu MI tehnoloģiju tiesiskā regulējuma attīstības tendences, dažādu viedokļu, skata punktu salīdzināšana nolūkā rast risinājumus tiesību veidošanai; salīdzinošās analīzes metode, lai pētītu un analizētu tiesību normas ārvalstīs; empīriskā metode – rakstā tika atspoguļota autora veiktajā valsts un pašvaldību institūcijās strādājošo valsts amatpersonu un darbinieku aptaujā par MI pašreizējo tiesisko regulējumu, nākotnes perspektīvām un pamatprasībām publiskajā sektorā, kā arī redzējumu, kur publiskajā sektorā MI tehnoloģijas var izmantot un kas tam ir nepieciešams no tiesiskā regulējuma.

Autora pētījums tika veikts laikā no 2023. gada 6. marta līdz 2023. gada 13. decembrim, tika aptaujātas 319 Latvijas valsts un pašvaldību institūciju amatpersonas (turpmāk – respondenti) visos valsts reģionos, dažādās institūcijās, dažādu līmeņu amatos un statusā, kā arī ar dažādām kompetencēm.

Rakstā autors pamatā izmantos pētījuma datus par respondentu pieredzi darbā ar MI, viņu cerības un uztraukumu par MI izmantošanu publiskajā sektorā, kā arī viņu pamatprasībām MI tiesiskā regulējuma ieviešanā, kas balstīta uz sabiedrības, valsts un personu interešu līdzsvaru.

Raksta teorētisko un metodoloģisko bāzi pārsvarā veido starpdisciplināru nozaru ārvalstu autoru (*Nicolas Petit, Maria Eduarda Gonçalves, Gordon Pace* u.c.) un Latvijas autoru viedokļi (*Egils Levits, Jūlija Terjuhana*, u.c.), Latvijas un ārvalstu tiesību akti, kā arī autora veiktais pētījums par MI tehnoloģiju esamību un perspektīvām publiskajā sektorā.

Raksts plānots kā zinātnisks un vienlaikus empīrisks (pamatojoties uz autora profesionālo pieredzi un balstoties uz autora veikto pētījumu) pētījums.

Pēdējo piecu gadu laikā interese par MI un tā tiesisko regulējumu ir tik liela, ka publikācijas skaitāmas tūkstošos. Taču autora raksts skar tikai MI vispārējās filozofiskās un tehniskās iezīmes, kas skar MI tehnoloģiju izmantošanu publiskajā sektorā. Filozofiskie uzskati ir pamatā arī personu un sabiedrības interešu aizsardzībai sakarā ar MI tehnoloģiju ieviešanas riskiem un iespējamo kaitējumu nodarīšanu cilvēcei. Savukārt tehniskie aspekti darbā uzskaitīti sakarā ar MI attīstības tendencēm un iespējām apkopot milzīgo informācijas daudzumu publiskajā sektorā, analizēt to un izdarīt secinājumus.

Neskatoties uz to, ka MI jau pastāv mūsu dzīvē, tomēr publiskajā sektorā MI esamība vēl nav tik plaši izplatīta, lai tai būtu noteicošā loma lēmumu pieņemšanā un institūciju kontroles un uzraudzības funkciju realizēšanā. Tomēr tad, kad valsts pārvaldē MI tiks plaši pielietots, tas var būtiski ietekmēt amatpersonu lēmumus, kā arī sniegt nepareizu priekšstatu iedzīvotājiem par procesiem valsts pārvaldē. Tādējādi jau pašlaik pastāv nepieciešamība pēc MI tiesiskā regulējuma vismaz izpratnē par juridiskām problēmām, ar kurām var saskarties valsts pārvalde, ieviešot MI informācijas analizēšanas un lēmumu pieņemšanas procesos. Proti, (1) atbildība par kaitējuma nodarīšanu; (2) MI rezultātu tiesiskais režīms; (3) ticamības novērtējums lēmumu pieņemšanā (4) un dažos gadījumos neiespējamība pilnībā izskaidrot pieņemto lēmumu (t.i., MI lēmumu pieņemšanas procesa caurskatāmības problēma).

Tiesiskā atbildība par MI izmantošanu

Pieaug nepieciešamība normatīvajos aktos iekļaut normas, kas nosaka iespēju izmantot MI kā leģitīmu procesu publiskajā sektorā. Šajā gadījumā pašmācības MI programmu darbība var radīt arī sabiedrības apdraudējumu un kaitēt sabiedriskajām attiecībām, nemaz nerunājot par publiskās institūcijas reputāciju, ja MI patstāvīgi rada rezultātu, kuru nevar pārbaudīt un pārliecināties par tā pareizību, kā arī pārliecināties par MI izdarīto secinājumu un lēmumu pareizību. Līdz ar to nepieciešams jau savlaicīgi veidot ar MI saistīto atbildīgo subjektu loku, piemēram, programmatūras veidotājs, ar MI aprīkotu produkciju ražotājs vai pārdevējs, ar MI aprīkotu produktu lietotājs un citas personas.

Būtiskākā MI regulēšanas problēma ir arī atbildības problēma: kurš ir atbildīgs par MI darbībām (Petit, 2017)? Daži pētnieki uzskata, ka atbildība par šādu MI izmantošanu jāuzņemas personai, kas to radījusi, un tiešajam izpildītājam (Hallevy, 2013). Viens no autoritatīvajiem speciālistiem Izraēlā "robotu tiesību" jomā norāda, ka atbildību par MI darbībām būtu jāattiecina uz ražotāju, programmētāju, lietotāju un visām pārējām iesaistītajām personām (Lior, 2020).

Tādējādi MI izmantošanas procesā varētu pastāvēt četras situācijas, kuras prasa attiecīgo atbildības noregulējumu: (1) veidojot MI sistēmu, tika pieļauta kļūda, kas noveda pie nepareiza lēmuma pieņemšanas; (2) MI sistēmā ir veiktas manipulācijas, kā rezultātā ir bojātas vai mainītas tās funkcijas, kā rezultātā izdarīts kāds pārkāpums; (3) spējīgs pašmācīties MI ir pieņēmis lēmumu veikt darbības vai bezdarbību, kas kvalificējama kā noziedzīgs nodarījums; (4) MI radīts ar nolūku veikt noziedzīgu nodarījumu (Petit, 2017). Atklāts paliek jautājums, kam būtu jāatbild par MI darbībām?

Protams, šī riska izpausmei nozīmīgs ir MI sistēmu izmantošanas mērogs sabiedrības pārvaldībā. Piemēram, tiesību piešķiršana MI pieņemt lēmumus publiskajā sektorā. Zaudējot vadlīnijas patiesi cilvēciskam taisnīgumam un morāles principiem cilvēku pārvaldībā, MI tehnoloģijās var būt ielikti pamati diskriminācijas izpausmēm, vienlīdzības un demokrātijas principu pārkāpumiem. Protams, MI tehnoloģijas ir radītas, lai kalpotu cilvēkam, un uztvers to, ko cilvēks pats tajās ir ielicis. Ir ļoti daudz parametru, kas ir jāpielāgo MI mācību algoritmiem, lai izvairītos no viltus pozitīviem rezultātiem. Ja ievades dati nav pietiekami, MI dziļā mācīšanās var radīt kļūdainus rezultātus (Grabosky & Smith, 2004).

Šīs sistēmas ir pašmācītas, kuru lēmumu loģikai cilvēks ne vienmēr var pilnībā sekot. Tāpēc MI sistēmas var veicināt jebkuras cilvēku grupas diskrimināciju par labu citai noteiktu programmēšanas algoritmu rezultātā. Tomēr šīm tehnoloģijām var rasties vajadzība pēc šādas diskriminācijas, pamatojoties uz viņu pašu lēmumu. Piemēram, dodot priekšroku kolektīviem mērķiem un sabiedrības attīstībai, kā to šobrīd "redz" MI, pretstatā indivīda tiesībām. Uzticama MI ētikas vadlīniju projektā, ko izstrādājusi EK MI ekspertu grupa, teikts: "Tieša vai netieša diskriminācija, izmantojot MI, var radīt neobjektivitāti un izolēt noteiktas grupas. Tie, kas kontrolē MI algoritmus, var apzināti mēģināt sasniegt negodīgus, diskriminējošus vai neobjektīvus rezultātus, lai izslēgtu noteiktas personu grupas. Piemēram, tīšu kaitējumu var panākt, nepārprotami manipulējot ar datiem, lai izslēgtu noteiktas grupas (Terjuhana, 2024). Kaitējumu var izraisīt arī patērētāju aizspriedumu vai negodīgas konkurences izmantošana, piemēram, cenu noteikšana, izmantojot slepenas vienošanās, vai necaurskatāms tirgus" (EC, 2018c).

Jaunāko Eiropas tiesisko iniciatīvu un lēmumu analīze liecina, ka, lai aizsargātu personu no MI negatīvās ietekmes, ir nepieciešama juridiskā kontrole un atbildība MI tehnoloģiju radītājiem, ražotājiem, īpašniekiem, lietotājiem, nomniekiem, kas rada kaitējumu cilvēkiem un mantai, kā arī atbildība tām personām un organizācijām, kas nodara prettiesisku kaitējumu MI tehnoloģijām (EC, 2015).

Autors izceļ galvenos MI izmantošanas riskus (potenciālos draudus). Tendenču analīze MI izveides un izmantošanas jomā ļauj nošķirt divu veidu MI izmantošanas riskus publiskajā sektorā – tiešos un netiešos. Tiešais MI izmantošanas risks ir saistīts ar MI lietošanas radītā apdraudējuma tiešu ietekmi uz konkrētu personu. Pie šiem riskiem var attiecināt: MI sistēmas apzināta sociāli bīstama rīcība, kas vērsta uz (1) personas brīvības, goda un cieņas aizskaršanu; (2) uz personas konstitucionālo tiesību un brīvību ierobežošanu; (3) uz publisko drošību; (4) uz personas mieru un drošību, kas izraisīja sociāli bīstamas sekas.

Savukārt netiešais risks MI tehnoloģiju pielietošanā publiskajā sektorā ir saistīts ar neparedzētiem apdraudējumiem MI piemērošanas kontekstā. Šie riski ietver: (1) nejaušas kļūdas MI sistēmas programmatūrā (kļūdas, ko pieļāvis MI sistēmas izstrādātājs); (2) kļūdas, ko MI sistēma pieļāvusi tās darba procesā (MI sistēmas pieļautās kļūdas).

Pamatojoties uz šo MI tehnoloģiju izmantošanas risku klasifikāciju, šo risku mazināšanu, kā arī, lai palielinātu atbildību par MI tehnoloģiju rīcību, autors saskata prioritārajos pasākumos valsts izpildinstitūcijas izveidi, kas nodrošinātu valsts politikas izstrādi, tiesiskā regulējuma, kontroles un uzraudzības funkciju veikšanu MI piemērošanas jomā, likumdošanas sagatavošanu MI izveides un izmantošanas jomā, juridisko modeļu izstrādi MI noziedzīgas rīcības novēršanai, jo īpaši nosakot tā piemērošanas riskus, kā arī atbilstoši risku klasifikācijai piedāvā noteikt normatīvajos aktos civiltiesisko, administratīvo un kriminālatbildību. Līdz ar to, autors uzskata, ka 2025. gada 1. aprīlī izveidojot Mākslīgā intelekta centru, tiks veikti tādi uzdevumi, lai atbalstītu MI risinājumu ieviešanu, testēšanu un komercializāciju gan privātajā, gan publiskajā sektorā. Pēc autora domām, Mākslīgā intelekta centrs var veicināt efektīvāku un inovatīvāku MI risinājumu ieviešanu publiskajā sektorā, kā arī var analizēt ar MI pielietošanu saistītos riskus un sniegs praktiskas rekomendācijas to novēršanai. Bez tam viena no svarīgām funkcijām, kas paredzēta MIC, ir speciālās regulatīvās vides (iepriekš dēvēta arī par regulatīvo smilškastī) koordinēšana, kur MI risinājumi varēs tikt droši testēti pirms to ieviešanas, t.sk. publiskajā sektorā (Mākslīgā intelekta centra likums, 2025).

MI rezultātu tiesiskais režīms

EK 2020. gada Baltajā grāmatā (EC, 2020) ir vispārīgi iezīmēti MI regulējuma virziena riski. Galvenais no tiem ir pašu MI tehnoloģiju tiesiskā nenoteiktība. (EC, 2020) Baltās grāmatas iezīmētie riski saglabā savu aktualitāti arī pēc ES parlamenta 2024. gada 13. martā pieņemtās regulas par MI.

MI izmantošana publiskajā sektorā rada daudz risku, kas savukārt rada nepieciešamību pēc MI tiesiskā regulējuma (piemēram, ar jaunām MI tehnoloģijām saistītu standartu izveide) (EC, 2019).

Valsts institūcijas, kontrolējot valsts amatpersonu darbību, jau šobrīd izmanto to datu analīzi, ko valsts amatpersonas, piemēram, iesniedz deklarācijās VID (Valsts kontrole, 2017). Savukārt MI izmantošana var nodrošināt priekšnoteikumus katras personas digitālā profila izveidei. Klasificētu datu kopums par personu, ko var veidot, ne tikai analizējot informāciju deklarācijās, bet arī izmantojot informāciju no datu bāzēm, anketām, kā arī analizējot personas uzvedību. Tas ļauj modelēt personas uzvedību nākotnē un potenciāli samazina risku personai izdarīt, piemēram, noziedzīgu nodarījumu. Tāpat MI arī ļaus valstij optimizēt institūciju darbību, samazinot iestāžu izmaksas, bet palielinot to darbības rezultātus. Tādējādi valsts saņem papildu iespējas ātri un efektīvi pieņemt lēmumus, kā arī kontrolēt personu darbību, prognozēt to uzvedību. Tomēr tiesiskais regulējums par MI datu analīzes izmantošanu vēl nav izveidots. Līdz ar to, nododot MI tiesības pieņemt lēmumus publiskajā sektorā, kā arī ieviešot MI personu materiālā un finansiālā stāvokļa kontroli, kur ir svarīga precizitāte, efektivitāte un ātrums, apstrādājot lielu datu apjomu, ir nepieciešams atrisināt MI tiesiskā regulējuma jautājumu nacionālajā līmenī.

MI izmantošanas piemēri personu finanšu un materiālās kontroles jomā, pēc autora domām, var ietvert šādas darbības:

- 1) personu deklarāciju apstrāde ar to ievadīšanu datubāzē;
- 2) prognozēt personas kontu atlikumus un apgrozāmos līdzekļus, lai precīzi aprēķinātu viņu ienākumus un izdevumus, ņemot vērā šo personu veiktos būtiskos reāllaika maksājumus, piemēram, par nekustamo īpašumu, maksājumiem par ģimenes uzturēšanu un iztiku u.c., nepieciešamības gadījumā atkal veicot korekcijas reāllaikā;
- 3) kārtējais darbs pie nodokļu, piemēram, ienākuma nodokļa nomaksas, sākot ar informācijas ievākšanu, beidzot ar deklarācijas iesniegšanu;

- 4) tērzēšanas robotu izveide, kam ir plaša pieeja datubāzēm un kas konsultēs par personu deklarāciju iesniegšanas jautājumiem un saturu.

Ieviešot MI tehnoloģijas, paplašināsies personu tūlītējas kontroles iespējas darboties reāllaikā ar informāciju par katru konkrēto personu. Uzraudzības efektivitāte par personu darbībām ietver maksimālu visas finanšu informācijas saņemšanu un apstrādi ar minimālām izmaksām.

Papildus MI tehnoloģijām, pēc autora domām, var uzdot arī analizēt datus, apstrādāt maksājumus un dokumentus, izvērtēt personu kredīspēju un riskus, ko var izmantot arī nodokļu kontroles pasākumos. Personu darbības kontroles automatizācijas process attīstās un virzās straujos tempos, šīs kontroles transformācijas virziens un ātrums tuvākajā nākotnē tiks pilnveidots un pielāgots jauniem inovatīviem tehnoloģiskiem procesiem. Piemēram, VID var sākt ieviest uz MI balstītus rīkus personu mantiskā stāvokļa apstrādes efektivitātes uzlabošanai. Taču tādu MI tehnoloģiju izmantošana prasīs regulējumu tiesību normās. Bez tam autors vērš uzmanību faktam, ka ir jānodrošina MI tehnoloģijām pieeja personu datiem.

Personas datu aizsardzība, izmantojot MI publiskajā sektorā

Autors uzskata, ka valsts plašā personu darbības uzraudzības līdzekļu izmantošana (kas balstās uz MI sistēmu, analizē datus, kas spēj identificēt personu, salīdzinot datus ar informāciju no ārējiem avotiem – datubāzēm internetā, sociālajiem tīkliem), prasīs nākotnē izstrādāt personas datu aizsardzības normas (Gonçalves, 2020) vai īstenot citās tiesību nozarēs radītas citu tiesību nozaru ietvaros, un to konkretizācija saistībā ar darba attiecībām kopumā.

Tomēr tādas MI izmantošanas iespējas šādā veidā ļaus atklāti iejaukties personu privātajā dzīvē. Protams, tas radīs nākamo problēmu – ievērot cilvēktiesības uz privāto dzīvi un personas datu aizsardzību, uz privātās un ģimenes dzīves, mājokļa un korespondences neaizskaramību (Eiropas Parlaments, 2012).

Tomēr MI izmantošana publiskajā sektorā prasa atrast optimālu kompromisu starp MI spēju piekļūt informācijai, ko izmanto valsts pārvaldes institūcijas, un iedzīvotāju tiesībām uz šīs informācijas konfidencialitāti (Gonçalves, 2020). ANO Ģenerālās asamblejas 2013. gada 18. decembra Rezolūcijā Nr. 68/167 "Tiesības uz privātumu digitālajā laikmetā" tiek norādīts, ka straujais tehnoloģiju attīstības temps palielina valdību spēju pārtvert un vākt informāciju, kas var ierobežot vai pārkāpt cilvēktiesības (īpaši tiesības uz privāto dzīvi). Nepieciešamība aizsargāt sabiedrisko drošību var attaisnot dažas sensitīvās informācijas vākšanu un aizsardzību, taču valstīm ir jānodrošina, lai tās pilnībā ievērotu starptautiskās cilvēktiesību saistības.

Taču ievērojamais datu apjoms un globālais datu apgrozījums ir svarīgākie faktori un nepieciešamais nosacījums MI tehnoloģiju attīstībai (EC, 2018d). Šāda veida dati šīm sistēmām ir nepieciešami mācību nolūkos. Turklāt MI vienību darbības joma ir tieši datu vākšana un analīze, lai, pamatojoties uz to, pieņemtu lēmumus, kas cilvēkam nepieciešami. "Izmantojot milzīgo datu apjomu, lai piedāvātu efektīvus risinājumus, MI uzlabo produktus, procesus un uzņēmējdarbības modeļus visās ekonomikas nozarēs," teikts EK saskaņotajā MI plānā (EC, 2018b).

Problēma ar konfidencialas informācijas drošības nodrošināšanu, tostarp kibernetiskās drošības nodrošināšanu, izmantojot MI, ir viena no galvenajām problēmām visiem digitālās ekonomikas subjektiem. Saskaņā ar datiem 2022. gadā reģistrēti vairāk nekā 667 miljoni incidentu, kas saistīti ar konfidencialas informācijas nopludināšanu no dažāda veida īpašumtiesībām, taču 2024.gada tādu

bija jau 2,9 miljardi (Krysińska, 2024). Dati par tādiem incidentiem ietver visas noplūdes visās pasaules valstīs, par kurām informācija tiek publicēta medijos, blogosfērā, sociālajos tīklos un citos tīkla resursos (Madnick, 2024). Tādējādi var pieņemt, ka MI var veikt sociāli bīstamu darbību, kas saistīta ar likumu aizsargātas informācijas konfidencialitātes pārkāpumu (Begishev & Khisamova, 2018).

Šajā sakarā, lai aizsargātu personas datus un aizsargātu personas privātumu, 2018. gada 25. maijā stājās spēkā Eiropas Vispārīgā datu aizsardzības regula (European Parliament [EP], 2016), kas "noteica jaunu globālu standartu, koncentrējoties uz cilvēktiesībām, atspoguļojot Eiropas vērtības, un ir svarīgs elements uzticības veidošanā mākslīgajam intelektam" (EC, 2018e). Tomēr regulā norādīts, ka "Tiesības uz personas datu aizsardzību nav absolūta prerogatīva; tās ir jāņem vērā saistībā ar to funkciju sabiedrībā un jālīdzsvaro ar citām pamattiesībām saskaņā ar proporcionalitātes principu" (EP, 2016). Vienlaikus EK vēstījumā "Mākslīgais intelekts Eiropai" jau ir norādīta ES institūciju nostāja, norādot uz tendenci sašaurināt personas tiesības pēc saviem ieskatiem iegūt un rīkoties ar informāciju par sevi, taču pagaidām kā aicinājums: "Valsts politikai būtu arī jāveicina plašāka privāto datu pieejamība, vienlaikus nodrošinot pilnīgu datu aizsardzības tiesību aktu ievērošanu" (EC, 2018e). Tas nozīmē, ka saņemtie personas dati (piemēram, informācija par elektronisko ierīču lietošanu, par maksājumu veikšanu, par personas un personu transportlīdzekļu ģeolokācijām vai sociālo tīklu palietošanu un darbībām tajos u.c.) var nepalikt pie personas, kas tos saņēmusi kā operators vai datu administratori, bet gan varētu tikt nodoti trešajām personām, šajā gadījumā, piemēram, publiskā sektora institūcijām ar mērķi izmantot tos lēmumu pieņemšanā, kā arī kontroles un uzraudzības funkciju realizēšanā.

Tādējādi "personas tiesību neievērošana uz privāto dzīvi (it īpaši uz personas informācijas konfidencialitāti), izmantojot MI, ne vienmēr var būt saistīta ar tā operatora (vai datu administratora) acīmredzami neatbilstošu rīcību vai ar prettiesisku mērķu sasniegšanu, šai darbībai var būt cits iegansts, lai sasniegtu svarīgus mērķus, kas atbilst vispārējām sabiedrības interesēm" (Sheehan, 2023), piemēram, noziedzīgo nodarījumu novēršanai vai kontroles un uzraudzības funkciju realizēšanai.

Tomēr, pēc autora domām, ir nepieciešams tiesiski nostiprināt līdzsvaru starp personas datu izmantošanu no MI puses un personas datu apstrādes noteikumu ievērošanu. Ņemot vērā, ka MI tiek pilnveidots, apstrādājot lielu informācijas apjomu, tajā skaitā personas datus, valstij visos iespējamajos veidos būtu jāveicina šo datu konfidencialitātes ievērošana, jo jebkurā gadījumā tehnoloģiju attīstībai nevajadzētu būt par pamatu personas tiesību neievērošanai, kas saskaņā ar LR Satversmi ir augstākā vērtība (Satversme, 1922).

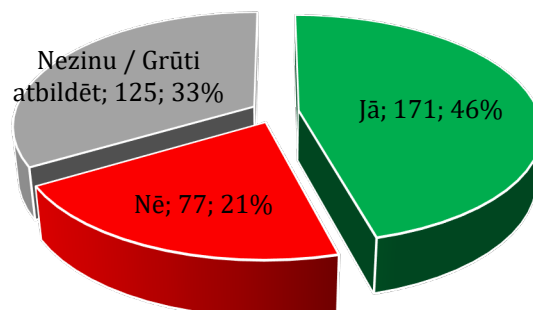
Līdz ar to, pēc autora domām, fizisko un juridisko personu datu apstrāde MI tehnoloģijām ir jāveic godprātīgi skaidri noteiktiem mērķiem ar attiecīgās personas informēšanu vai citu likumā paredzētu likumīgu iemeslu dēļ, kā arī ikvienai personai ir jābūt tiesībām piekļūt pie par viņu savāktajiem datiem un tiesībām ierosināt labot tajos kļūdas. Tādējādi autors piedāvā minēto principu datu aizsardzībai, izmantojot MI tehnoloģijas, nostiprināt normatīvajos aktos. Šādi, pēc autora domām, tiks ievērojami celta ticamība MI tehnoloģijām lēmumu pieņemšanā publiskajā sektorā.

Ticamības novērtējums, pieņemot MI lēmumu publiskajā sektorā

Valsts arvien vairāk pārvēršas par digitālu platformu efektīvas kontroles īstenošanai un sabiedrisko pakalpojumu sniegšanai, taču "digitālās valsts" veidošanas uzdevums tiek virzīts uz administratīvo procedūru standartizāciju un automatizāciju. Tam nepieciešams izstrādāt un ieviest revolucionāras,

uz MI balstītas tehnoloģijas ne tikai uzkrāto datu apjomu apstrādei un analīzei, bet arī lēmumu pieņemšanas sistēmas attīstībai. MI tehnoloģijas var būtiski uzlabot likuma izpildes kvalitāti izpildvarā. MI var ievērojami paātrināt un vienkāršot šīm struktūrām piešķirtās pilnvaras, tostarp saistīto pilnvaru īstenošanu. Bez tam MI spēj optimizēt daudzas administratīvās procedūras, paātrinot jautājumu risināšanu, izslēdzot no procesa cilvēcisko faktoru, tādējādi palielinot darba rezultātu efektivitāti. Parādās principiāli jaunas tehnoloģiju izmantošanas iespējas, izmantojot MI valsts institūciju pilnvaru īstenošanai lēmumu pieņemšanā un funkciju realizēšanā.

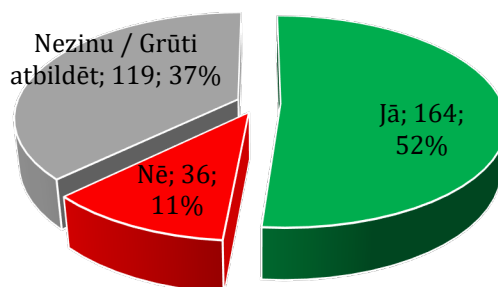
Gandrīz jebkura informācija par mūsdienu elektronisko ierīču lietošanu, par maksājumu veikšanu, par kustībām (un ne obligāti veiktām, izmantojot elektroniskās navigācijas sistēmas) ir potenciāli izsekojama. Tajā pašā laikā šādu MI tehnoloģiju darbības loģika ne vienmēr ir skaidra un paredzama. Līdz ar to tas rada virkni risku sabiedrībai, piemēram, izmantojot MI tehnoloģijas, kas paredzētas darījumu un citu juridisku darbību automatizēšanai, kā arī, izmantojot sistēmas, kas mijiedarbojas ar fizisko vidi (sadzīves roboti, elektronika, viedās mājas sistēmas u.c.). Rezultātā personu datu vākšana un atbilstoša apstrāde jau šobrīd var novest pie neizpratnes, kā MI tehnoloģija nonāca pie šāda lēmuma. Proti, šādas MI tehnoloģijas spēj pieņemt lēmumu, pārsūtot informāciju kompetentai institūcijai par šādu tehnoloģiju klātbūtni personas rīcībā, kā arī to, ka MI tehnoloģijas vēro ne tikai minētās personas, bet arī viņu apkārtējo vidi. Tāda MI tehnoloģija ļauj apkopot un uzglabāt visu politisko, finansiālo, ekonomisko, biznesa, ģimenes konfidenciālo, sociāli komunikatīvo, medicīnisko un jebkuru citu informāciju, kas raksturo personu un var ietekmēt viņa uzvedību (Hu, 2024). Respondenti autora veiktajā pētījumā īpaši uzsver, ka MI ieviešana iekšējās kontroles procesos institūcijā (piemēram, analizējot problēmu, veicot novērojumu, veicot sarunu procedūras, aktualizējot secinājumus) var samazināt korupcijas riskus publiskajā sektorā (46,7 %) (1. attēls).



1. attēls. Respondentu viedoklis, vai MI ieviešana iekšējās kontroles procesos var samazināt korupcijas riskus
(autora veiktais pētījums)

Bez tam valstij, veidojot savus procesus, būtu jāņem vērā MI tehnoloģiju izmantošanas radītā kaitējuma iespējamība. Šajā situācijā likumdevējam nepieciešams iestrādāt nacionālajos normatīvajos aktos tādu regulējumu, kas noteiktu MI operatora atbildību par viņa funkciju izpildes procesā veiktajām darbībām. Proti, publiskās institūcijas kā MI operatora atbildība datu ieguvē, to apkopošanā un analizēšanā, jautājumu izvērtēšanā un lēmumu pieņemšanā par personas darbības izvērtēšanu, ja MI pieļaus kļūdu savos secinājumos. Ņemot vērā, ka MI joprojām ir savā attīstības rītausmā, tomēr šis jautājums tiks aktualizēts arī turpmāk, pretējā gadījumā personas nevarēs prasīt likumā noteikto tiesību atjaunošanu.

Taču respondenti savā vairākumā (51,4 %) uzskata, ka datu ieguve, apkopošana un analizēšana, izmantojot MI tehnoloģijas, veicinās objektīvu iekšējo kontroli un auditu, noraidoši to uztver tikai 11,3 %, savukārt 37,3 % respondentiem ir grūti par to kaut ko pateikt (2. attēls).



2. attēls. Respondentu viedoklis, vai datu ieguve veicinātu objektīvu iekšējo kontroli un auditu (autora veiktais pētījums)

Uz jautājumu, kā datu ieguve, izmantojot MI tehnoloģijas, varētu veicināt objektīvu iekšējo kontroli un auditu, respondenti par galveno norādīja milzīgo datu apjoma apstrādi (86 %), laika ekonomiju (85,5 %) un kļūdu minimizēšanu (70,7 %). Tālāk seko datu apstrāde un izmantošana, kam bieži nav laika un naudas (61,6 %), publiski pieejamo datu apstrāde (piemēram, sociālie tīkli, publikācijas un sižeti plašsaziņas līdzekļos utt.) (57,9 %) un noslēdzošo norādīja – objektīva lēmuma pieņemšana (38,4 %).

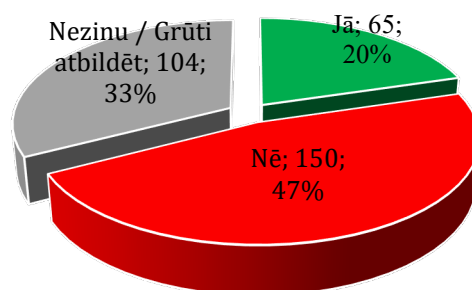
Tātad MI tehnoloģiju ieviešana lēmumu pieņemšanā publiskajā sektorā un personu kontroles procesā var uzlabot darbības efektivitāti publiskajā sektorā, taču tas var arī radīt nopietnas izmaiņas, proti, kognitīvajā un pierādījumu bāzē (darbs ar elektroniskajiem pierādījumiem, jauni ekspertīzes veidi), institūciju darba organizēšanā (elektroniskā dokumentu aprīte, elektroniskā lietvedība, intelektuālās sistēmas lietu materiālu analīzei) u.c. Institūciju darbs, izmantojot MI tehnoloģijas, jau pastāv Ķīnā. Pamazām Ķīnā vēršanās publiskajā sektorā pilnībā pāriet tiešsaistē, izmantojot atbilstošās platformas ar MI elementiem. Šādas MI tehnoloģijas risina juridiskus jautājumus, sadala lietvedības institūcijā, identificē prioritāros jautājumus, kas ir jārisina ātrāk, novērš procesuālās un materiālās kļūdas, palīdz personām ievērot procesuālos termiņus, atgādina viņiem par tiem un piedāvā iespējamo darbību sarakstus, palīdz līdzsvarot kognitīvos traucējumus un novērst neobjektivitāti lietvedībā (Wickers, 2019).

Turklāt ir jānodrošina MI tehnoloģiju izstrādātājus un ražotājus iestrādāt un konsolidēt atbilstošas ētikas standartu sistēmas informācijas (tostarp personas datu) apstrādes jomā, godīgu informāciju sniegšanu par MI tehnoloģiju galvenajām funkcionālajām iezīmēm, kā arī brīvprātīgu sertifikācijas sistēmu ieviešanu, lai nodrošinātu atbilstību šādiem standartiem.

Tādējādi autors pievērš uzmanību tam, ka MI tehnoloģiju izmantošana, palielinoties personas datu apstrādes intensitātei, ir saistīta ar vēl vienu papildu risku – ne tikai pārkāpt personas privātumu, bet arī ir risks, vai ir pamatoti izskaidrota pieņemto lēmumu objektivitāte un ticamība lietas faktiskajiem apstākļiem. Tāpēc autors uzskata par nepieciešamu izstrādāt noteiktus standartus MI tehnoloģijām lēmumu pieņemšanā un kontroles un uzraudzības funkciju realizēšanā, paredzot tajā kā obligātu nosacījumu ētikas standartu, kā arī lēmuma izskaidrojumu un ticamību publiskā sektora pieņemtajam lēmumam un veiktai darbībai, neaizmirstot, protams, par MI darbības uzraudzību.

MI darbības uzraudzība publiskajā sektorā

Pēc profesora Bostroma aprēķiniem līdz 2040. gadam robota un cilvēka domāšanas procesu līdzība sasniegs 50%, savukārt 2075.gadā pēc Mūra likuma robotu domāšanas procesus vairs nevarēs atšķirt no cilvēka domāšanas procesiem un tie sasniegs 95 % (Bostrom, 2017). N.Bostroms apgalvo, ka galvenais drauds cilvēcei nav ne klimata pārmaiņas, ne pandēmija vai kodolziema; tā ir neizbēgama vispārēja mašīnintelekta radīšana, kas pārspēj mūsējo (Bostrom, 2014). Līdzīgu tēzi savā grāmatā izteica izcilākais kosmologs S.Hokings: supergudru mašīnu parādīšanās būs vai nu labākais, vai sliktākais notikums cilvēces vēsturē. Viedie datori būs apveltīti ar savu gribu, kas ne vienmēr ir tāda pati kā mūsējā. Cilvēks attīstās dabiskā ātrumā, tāpēc viņš nespēs konkurēt ar MI. Mēs varam neuzvarēt šajā bruņošanās sacensībā, tāpēc vienīgais pareizais lēmums ir to novērst (Hawking, 2018). Autora pētījumā gandrīz puse no aptaujātajiem respondentiem (47 %) arī ir kategoriski pret tādām MI tehnoloģijām, kas var apdraudēt personas brīvību un cilvēka pamattiesības, pat ja tā kalpos publiskā sektora efektivitātes uzlabošanai. Savukārt tikai 20,4 % respondenti gatavi upurēt personas brīvību un cilvēka pamattiesības. Savukārt 32,5% respondentiem par to nav viedokļa (3. attēls).



3. attēls. Respondentu viedoklis, vai ir pamatoti ieviest MI tehnoloģiju publiskā sektora efektivitātes uzlabošanai, kas var apdraudēt personas brīvību un cilvēka pamattiesības (autora veiktais pētījums)

Ar mērķi nodrošināt MI tehnoloģiju kontrolētu attīstību 2021. gada 21. aprīlī Eiropas Komisija publicējusi “Priekšlikumus mākslīgā intelekta regulējumam, pamatojoties uz Eiropas pieeju” (angļu – *Proposal for a Regulation on a European approach for AI*). Dokumentā deklarēta nepieciešamība pēc pilnīga MI sistēmu izmantošanas aizlieguma vairākos gadījumos ar mērķi:

- 1) nodrošināt, ka MI sistēmas ES tirgū ir drošas un atbilst ES pamattiesībām un pamatvērtībām;
- 2) nodrošināt juridisko noteiktību MI sistēmu izmantošanai, lai veicinātu ieguldījumus un inovācijas MI jomā;
- 3) uzlabot regulējumu, nodrošināt spēkā esošo tiesību aktu efektīvu izpildi par pamattiesībām un drošības prasībām saistībā ar MI sistēmām;
- 4) veicināt vienota, nesadrumstalota tirgus izveidi likumīgām, drošām un uzticamām MI sistēmām.

ES pieeja arī tika nostiprināta ES MI aktā, nosakot galveno prasību MI tehnoloģiju attīstībai un tās kontroles pamatiem, proti, vispirms ētika un pēc tam likums.

Autors vērs uzmanību, ka, pirmkārt, aizliegums attiecas uz “attālo biometrisku identifikāciju” reāllaikā publiskās vietās tiesībaizsardzības institūciju nolūkos (runa ir par videonovērošanu un sejas atpazīšanas tehnoloģiju), otrkārt, aizliegums izmantot MI tehnoloģiju, lai noteiktu personas

dzimumu, rasi un seksuālo orientāciju (EP, 2024). Neskatoties uz to, ka šis aizliegums var sašaurināt institūciju iespējas izmantot MI tehnoloģijas lēmumu pieņemšanā un kontroles un uzraudzības funkciju realizēšanā, tomēr reāllaika režīma pieminēšana minētajā priekšlikumā neliedz kompetentām institūcijām izmantot MI sistēmas, lai izsekotu personas. MI tehnoloģiju (t.i., atpazīt sejas) izmantošana, protams, nevar notikt reāllaikā, taču var ierakstīt video un pēc tam to analizēt ar MI tehnoloģiju palīdzību.

Atgriežoties pie gadījumiem, kad MI tehnoloģiju izmantošana ir aizliegta, jāmin šādi:

- 1) piešķirot personai “sociālos kredītpunktus”, ierobežojot tās piekļuvi banku kredītiem un citiem resursiem – pēc MI tehnoloģiju patvaļas, bez citas personas lēmuma;
- 2) jebkāda MI sistēmu izmantošana, kas var radīt fizisku kaitējumu cilvēkiem;
- 3) manipulējot cilvēku uzvedību ar “zemapziņas signālu” palīdzību (EP, 2024).

Autors atzīmē, ka princips “ja nav aizliegts, tad atļauts” neattieksies uz MI sistēmām Eiropā. Taču dokumentā MI sistēmas tiek sadalītas pēc riska līmeņiem cilvēkiem, katram līmenim nosakot savus ierobežojumus.

Zemākā līmenī ir MI sistēmas, kuru darbs nav tieši saistīts ar cilvēkiem. Tādas, piemēram, ir pašmācības surogātpasta filtrēšanas sistēmas – uz tām un līdzīgām sistēmām jaunais regulējums vispār neattieksies.

Vidējais līmenis ir ierobežota riska MI sistēmas, piemēram, tērzēšanas roboti biļešu pasūtīšanai vai tehnoloģijas, kuras varētu izmantot, lai radītu “dziļus viltojumus”. Šādu sistēmu regulējums ir paredzēts un tiks izstrādāts, bet minētais dokuments arī tām netiek rakstīts.

Augstākais līmenis ir augsta riska MI sistēmas, kas kontrolē kritiskos mehānismus un tieši ietekmē cilvēku dzīves materiālos aspektus un viņu veselību. Dokumentā galvenā uzmanība tiek pievērsta šādām sistēmām. Augsta riska MI sistēmu piemērs ir bezpilota transportlīdzekļi, izsekošanas tehnoloģijas, personas datu apstrādes sistēmas utt. (EP, 2024). Tieši šī augsta riska MI sistēma ir saistīta ar personas kontroli, līdz ar to tādai MI sistēmai, kas tieši mijiedarbojas ar cilvēkiem, ir obligāta cilvēku “uzraudzība”, detalizēta dokumentācija, kas ļauj regulatoram un pilsoņiem saprast, kā MI “pamato” savu rīcību un pieņemto lēmumu.

Autors uzskata, ka MI tehnoloģiju ētikas standartam un ētikas darbības principiem, kā arī uzraudzībai MI tehnoloģiju izmantošanai, kas kalpo sabiedrībai un kas spēj pieņemt neatkarīgus lēmumus, ir ļoti liela nozīme. Tādējādi autors piedāvā MI tehnoloģiju ētikas standartus un ētikas darbības principus norādīt speciāli tam izstrādātajā ētikas kodeksā.

Novēršot autora izvirzītās MI izmantošanas tiesiskās problēmas publiskajā sektorā, pēc autora domām, var virzīties uz paša MI tiesiskā regulējuma modeļa izveidošanu, nosakot praktiskus MI ieviešanas virzienus.

Secinājumi un priekšlikumi

Autors sasniedza rakstā izvirzīto mērķi – izpētīt ar MI izmantošanu publiskajā sektorā pastāvošas tiesiskās problēmas, kuru risināšanai piedāvā zemāk minētos secinājumus un priekšlikumus.

1. MI tehnoloģiju izmantošana, palielinoties personu datu apstrādes intensitātei, ir saistīta ar risku – ne tikai pārkāpt personu privātumu, bet arī ir risks, vai ir pamatoti izskaidrota pieņemto lēmumu objektivitāte un ticamība lietas faktiskajiem apstākļiem. Tāpēc MI ētikas pamatstandartu neesamība veido risku un šaubas par MI tehnoloģiju objektivitāti pieņemtajā lēmumā un to

ticamību, kā arī, protams, par MI darbības uzraudzību. Līdz ar to autors ierosina likumdošanas līmenī noformulēt un izstrādāt savstarpēji saistītu vērtību, principu un īpašu darbību (standartu) sistēmu MI izstrādei un ieviešanai, kā arī jāizveido mehānismi, lai novērstu risku MI neētiskai izmantošanai.

2. Nacionālajos normatīvajos aktos pašlaik nav tādu regulējumu, kas noteiktu MI operatora kompetenci par viņa funkciju izpildes procesā veiktajām darbībām. Proti, noteiktai publiskā sektora institūcijai, kā MI operatoram, normatīvajos aktos nav paredzēta kompetence un atbildība datu ieguvē, to apkopošanā un analizēšanā, jautājumu izvērtēšanā un lēmumu pieņemšanā par personas darbības izvērtēšanu. Līdz ar to autors ierosina izveidot īpašu MI tiesisko režīmu konkrētām darbībām publiskajā sektorā (piemēram, lēmumu pieņemšanai noteiktajās sfērās un noteiktajās darbībās), lai atbildīgai publiskai institūcijai noteiktu kompetenci izmantot MI sistēmas kā leģitīmu procesu.
3. Pārlicība par MI nekļūdīgumu var iedragāt ar MI atbalstīto rezultātu analīzi un liegt piekļuvi tiesiskās aizsardzības līdzekļiem, apstrīdot nelabvēlīgus ar MI tehnoloģijām pieņemtus lēmumus. MI tehnoloģijas kļūdas dēļ var iestāties personai nepamatotas sekas. Spēkā esošie tiesību akti neparedz iespēju MI tehnoloģiju pieņemto lēmumu par personas rīcību apstrīdēt un pārsūdzēt. Tādējādi nav garantijas nodrošināt taisnīgu lēmumu pieņemšanu, atstājot vietu neobjektivitātei, kas var radīt diskriminējošu ietekmi. Līdz ar to autors ierosina paredzēt iespēju MI tehnoloģiju pieņemto lēmumu par personas rīcību apstrīdēšanai un pārsūdzībai.
4. Nacionālajos normatīvajos aktos nav paredzēta kriminālatbildība, administratīvā vai civiltiesiskās atbildība par MI tehnoloģiju pieļautajām kļūdām lēmumu pieņemšanā vai kontroles un uzraudzības funkciju realizēšanā. Nenosakot MI operatora atbildību par darbībām, kas veiktas viņa funkciju izpildes procesā, nevar garantēt personām iespējas savu tiesību aizsardzībai, diskriminācijas un neobjektivitātes novēršanai, kā arī zaudējumu kompensēšanai. Līdz ar to autors ierosina izstrādāt pieejas kriminālatbildības, administratīvās un civiltiesiskās atbildības jautājumiem par MI tehnoloģiju pieļautajām kļūdām.

References

- Begishev, I. R., Khisamova, Z. I. (2018). Criminological risks of using artificial intelligence. *Russian Journal of Criminology*, 2018, vol.12, Nr. 6. Pieejams: <https://cyberleninka.ru/article/n/kriminologicheskie-riski-primeneniya-iskusstvennogo-intellekta>
- Bostrom, N. (2017). Strategic Implications of Openness in AI Development. *Global Police*, vol. 8, iss. 2, 139. lpp.
- Bostrom, N. (2014). *Superintelligence: Paths, Dangers, Strategies*. Oxford: Oxford University, Press, 390. lpp.
- Duffy, C., Maruf, R. (2023). Elon Musk warns AI could cause 'civilization destruction' even as he invests in it. *CNN Business*. Pieejams: <https://edition.cnn.com/2023/04/17/tech/elon-musk-ai-warning-tucker-carlson/index.html>
- Erkan, N. (2024). How can legal professionals navigate the ethical and legal risks of using Generative AI?. *Lexology*. Pieejams: <https://www.lexology.com/pro/content/how-can-legal-professionals-navigate-the-ethical-and-legal-risks-of-using-generative-ai>
- Frank, M., Roehrig, P., Ben Pring, B. (2017). *What To Do When Machines do Everything: How to Get Ahead in a World of AI, algorithms, bots, and big data*, 396 p.
- Gonçalves, M.E. (2020). The risk-based approach under the new EU data protection regulation: a critical perspective. *Journal of Risk Research*, 23(2). Pieejams: <https://doi.org/10.1080/13669877.2018.1517381>, 143. lpp.
- Grabosky, P. N., Smith, R. (2004). Crime in the Digital Age: Controlling Telecommunications and Cyberspace Illegality. *International Criminal Justice Review*, vol. 14, iss. 1.
- Hallevy, G. (2013). *When Robots Kill: Artificial Intelligence under Criminal Law*. University Press of New England. Pieejams: https://researcharchive.vuw.ac.nz/xmlui/bitstream/handle/10063/7927/paper_access.pdf?sequence=1, 177.–178. lpp.
- Hawking, S. (2018). *Brief Answers to the Big Questions*. London: Random House LLC, 256. lpp.

- Hu, W. Z. (2024). Understanding the Power of China's National Social Credit System: A Structural/Mechanism Explanation. *Philosophy of the Social Sciences*, 54 (3). Pieejams: <https://doi.org/10.1177/00483931241229445>
- Irkliis, R. (2023). Atbildīgumam publiskajā sektorā jābūt pirms atbildības. LV portāls. Pieejams: <https://lvportals.lv/viedokli/354019-valsts-kontrolieris-r-irkliis-atbildigumam-publiskaja-sektora-jabut-pirms-atbildibas-2023>
- Kesnere, R. (2024). Eiropas Savienībā uzraudzīs mākslīgo intelektu. *Diena*. Pieejams: <https://www.diena.lv/raksts/uznemeja-diena/zinas/eiropas-savieniba-uzraudzis-maksligo-intelektu-14316147>
- Krysińska, J. (2024). Biggest data breaches of 2024. Pieejams: <https://nordlayer.com/blog/data-breaches-in-2024/>
- Leksin, V. N. (2020). Artificial Intelligence in Economy and Policy Nowadays. Article 1. Artificial Intelligence as New Economic and Political Reality. *Russian Economic Journal*, Nr. 5. Pieejams: https://www.researchgate.net/publication/345336740_Artificial_Intelligence_in_Economy_and_Policy_Nowadays_Article_1_Artificial_Intelligence_as_New_Economic_and_Political_Reality
- Levits, E. (2019). Mākslīgais intelekts – izaicinājumi un riski. *Jurista Vārds*, Nr. 38 (1096). Pieejams: <https://m.juristavards.lv/doc/275274-maksligais-intelekts-izaicinajumi-un-riski/>, 22. lpp.
- Lior, A. (2020). AI Entities as AI Agents: Artificial Intelligence Liability and the AI Respondeat Superior Analogy. *Mitchell Hamline Law Review*: vol. 46: iss. 5, article 2. Pieejams: <https://open.mitchellhamline.edu/mhlr/vol46/iss5/2>, 1065.–1071. lpp.
- Madnick, S. (2024). Why Data Breaches Spiked in 2023. *Harvard Business Review: Risk Management*. Pieejams: <https://hbr.org/2024/02/why-data-breaches-spiked-in-2023>
- Petit, N. (2017). Law and Regulation of Artificial Intelligence and Robots – Conceptual Framework and Normative Implications. Pieejams: <https://ssrn.com/abstract=2931339>
- Rinkēvičs, E. (2024). Valsts prezidents iesniedz likumdošanas iniciatīvu par mākslīgā intelekta sistēmu izmantošanu priekšvēlēšanu agitācijā. Valsts prezidenta kanceleja. Pieejams: <https://www.president.lv/lv/jaunums/valsts-prezidents-iesniedz-likumdosanas-iniciativu-par-maksliga-intelekta-sistemu-izmantosanu-prieksvelesanu-agitacija>
- Sheehan, M. (2023). China's AI Regulations and How They Get Made. Reverse engineering chinese AI governance. Pieejams: https://carnegie-production-assets.s3.amazonaws.com/static/files/202307-Sheehan_Chinese%20AI%20gov-1.pdf, 19. lpp.
- Terjuhana, J. (2024). Dzlilvojumi un manipulācija: centieni regulēt mākslīgā intelekta izmantošanu. *Jurista Vārds*, Nr. 13/14 (1331/1332). Pieejams: <https://m.juristavards.lv/doc/285044-dzilviltojumi-un-manipulacija-centieni-regulet-maksliga-intelekta-izmantosanu/>
- Wickers, T. (2019). L'intelligence artificielle et la justice. Les applications possibles et le cadre de déploiement. *Cahiers de droit de l'entreprise*, Nr. 4. Pieejams: <https://www.gesica.org/fr/pieces-jointes/158-lintelligence-artificielle-le-droit-la-justice-et-les-avocats>
- European Commission, (2020). White Paper on Artificial Intelligence: a European approach to excellence and trust. Pieejams: https://ec.europa.eu/info/files/white-paper-artificial-intelligence-european-approach-excellence-and-trust_en
- European Commission, (2019). Ethics Guidelines for Trustworthy. AI High-Level Expert Group on Artificial Intelligence. 2.–24. lpp.
- European Commission, (2018a). Towards A Common European Data Space. Directorate-General for Communications Networks, Content and Technology, COM(2018)232. Pieejams: <https://eur-lex.europa.eu/legal-content/EN/ALL/?uri=COM:2018:0232:FIN>
- European Commission, (2018b). Coordinated Plan on Artificial Intelligence. Staff Working Document Liability for emerging digital technologies, SWD(2018)137. Pieejams: <https://digital-strategy.ec.europa.eu/en/policies/plan-ai>
- Mākslīgā intelekta centra likums. Pieņemts: 06.03.2025. Publicēts: *Latvijas Vēstnesis*, 55, 19.03.2025. Stājas spēkā: 20.03.2025. Izdevējs: Saeima
- European Commission, (2018c). Draft Ethics Guidelines for Trustworthy AI. Working Document for stakeholders' consultation. The's High-level expert group on artificial intelligence. Pieejams: <https://digital-strategy.ec.europa.eu/en/library/draft-ethics-guidelines-trustworthy-ai>, 23. lpp
- European Commission, (2018d). Artificial Intelligence, Real Benefits. Pieejams: <https://digital-strategy.ec.europa.eu/en/library/artificial-intelligence-real-benefits>
- European Commission, (2018e). Communication Artificial Intelligence for Europe. COM(2018)237. Pieejams: <https://ec.europa.eu/digital-single-market/en/news/communication-artificial-intelligence-europe>
- European Commission, (2015). A Digital Single Market Strategy for Europe. COM(2015)192. Pieejams: <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A52015DC0192>, 3. lpp.
- Mākslīgā intelekta centra likums. Pieņemts: 06.03.2025. *Latvijas Vēstnesis*, 55, 19.03.2025. Stājas spēkā: 20.03.2025. Izdevējs: Saeima
- European Parliament, (2024). Artificial Intelligence Act, Corrigendum, European Parliament and of the Council laying down harmonised rules on artificial intelligence and amending Regulations (EC), Interinstitutional File: 2021/0106(COD). Pieejams: <https://artificialintelligenceact.eu/the-act/>

European Parliament, (2020). News: Parliament leads the way on first set of EU rules for Artificial Intelligence Pieejams: <https://www.europarl.europa.eu/news/en/press-room/20201016IPR89544/parliament-leads-the-way-on-first-set-of-eu-rules-for-artificial-intelligence>

European Parliament, (2016). Regulation (EU) 2016/679 of the European Parliament and of the Council of 27 April 2016 on the protection of natural persons with regard to the processing of personal data and on the free movement of such data, and repealing Directive 95/46/EC (General Data Protection Regulation). Official Journal of the European Union, 4.5.2016., L 119/1. Pieejams: <http://data.europa.eu/eli/reg/2016/679/oj>

Eiropas Parlaments, (2012). Pamattiesību Harta, Pieņemta: 26.10.2012. *ES Oficiālais Vēstnesis*, 2012/C 326/02. Pieejams: <https://eur-lex.europa.eu/legal-content/LV/TXT/PDF/?uri=CELEX:12012P/TXT>

LR Satversme, (1922). Pieņemta: 15.02.1922. *Latvijas Vēstnesis*, 43, 01.07.1993.; *LR Saeimas un MK Ziņotājs*, 6, 31.03.1994.; *Valdības Vēstnesis*, 141, 30.06.1922.; *Diena*, 81, 29.04.1993. Pēdējie grozījumi 04.10.2018., VIII nodaļa. "Cilvēka pamattiesības"

Valsts kontrole, (2017). Revīzijas ziņojums "Vai valsts pārvalde efektīvi rīkojas ar uzkrāto informāciju?" Revīzijas un metodoloģijas departaments, revīzijas uzdevums 12.04.2016. Nr. 2.4.1-12/2016. Pieejams: https://www.lrvk.gov.lv/lv/getrevisionfile/uploads/reviziju-zinojumi/2016/2.4.1-12_2016/zinojums.pdf, 75.-77. lpp.

FROM THEORY TO BEHAVIOUR: A RESULTS-ORIENTED FRAMEWORK FOR MANAGEMENT SOFT SKILLS EDUCATION IN UNIVERSITIES AND BEYOND

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Abstract

Management soft skills are widely recognised as critical drivers of managerial effectiveness, organisational performance, and employee engagement. However, higher education and professional training programmes continue to rely predominantly on lecture-based approaches that prioritise knowledge acquisition over behavioural application, resulting in a persistent gap between what graduates know and how they apply this knowledge in practice, in other words, what are their skills and competencies. Addressing this gap requires a shift toward learning designs that produce measurable behavioural outcomes.

This study examines how a results-oriented, experiential learning framework can enhance the effectiveness of management soft skills education. Adopting a qualitative, practice-based analytical approach, the research combines literature synthesis with reflective practitioner analysis and empirical insights from a hybrid learning intervention involving 50 management students. The intervention integrates self-directed learning, focused lectures, facilitated discussions, simulations, coaching elements, and structured reflection within a coherent Input–Process–Output (IPO) framework.

The findings demonstrate that hybrid experiential learning designs significantly improve learning effectiveness compared to traditional lecturing and instruction. Participants reported accelerated learning, higher engagement, and more than a 60% increase in perceived behavioural impact. Qualitative evidence indicates that behavioural change is driven by the interaction of cognitive structuring, emotional engagement, and behavioural rehearsal supported by feedback-rich and psychologically safe learning environments.

The study contributes to management education research by:

- *operationalising a practice-based approach to analysing behavioural change;*
- *introducing an empirically grounded IPO framework tailored to soft skills development;*
- *providing evidence that instructional design - rather than content alone - is the key determinant of learning transfer.*

The findings have important implications for higher education institutions, training providers, and policy-makers seeking to enhance graduate employability and align education with real-world managerial demands.

Keywords: behavioural change; experiential learning design; higher education; leadership development; learning transfer; management soft skills; results-oriented education

Introduction

Management soft skills have become a central determinant of managerial effectiveness, organisational performance, and employee engagement across sectors and institutional contexts. A substantial body of research demonstrates that competencies such as communication, emotional intelligence, critical thinking, decision-making, and the ability to influence others play a more decisive role in management and leadership success than technical expertise alone (Boyatzis, 2019; Goleman et al., 2018; Yukl, 2020). As organisations operate in increasingly complex, dynamic, and uncertain environments, the capacity to apply such behavioural competencies in real time has emerged as a critical source of competitive advantage.

Despite this growing consensus, a persistent gap remains between formal management education and observable managerial behaviour in practice. Universities and training providers continue to rely predominantly on theory-driven, lecture-based approaches that prioritise knowledge transmission over behavioural application. As a result, graduates often demonstrate good theory knowledge and strong conceptual understanding but limited readiness to engage, manage interpersonal dynamics, lead teams, resolve conflicts, or work and make decisions under pressure. This disconnect between “knowing” and “doing” has been widely recognised in both leadership development and adult learning literature, yet remains insufficiently addressed in curriculum design at universities.

One explanation for this gap lies in the nature of soft skills themselves. Unlike technical competencies, which can be codified and transferred through instruction, soft skills are context-dependent, behaviourally embedded, and shaped through experience, feedback, and reflection. Experiential learning theory suggests that meaningful learning occurs through iterative cycles of action and reflection rather than passive information acquisition (Kolb, 2021). Similarly, research on adult learning emphasises the importance of relevance, engagement, and practical application for effective learning transfer (Knowles, et al., 2020). However, these principles are not consistently translated into pedagogical practice within higher education.

Recent advances in training and development research further highlight that the effectiveness of learning interventions depends less on content and more on instructional design - specifically, the extent to which learners are actively engaged in practice, receive feedback, and are able to apply learning in realistic contexts (Salas, et al., 2023). In parallel, studies on psychological safety demonstrate that individuals are more likely to experiment, learn, and change behaviour in environments characterised by trust, openness, and supportive facilitation (Edmondson, 2019). Together, these insights suggest that developing management soft skills requires integrated learning environments that combine cognitive, emotional, and behavioural dimensions.

Against this background, the central challenge is not what to teach, but how to design learning processes that produce measurable behavioural outcomes. This study addresses this challenge by examining how a results-oriented, experiential learning framework can enhance the effectiveness of management soft skills education in higher education settings.

The article adopts a qualitative, practice-based analytical approach, combining literature synthesis with reflective practitioner analysis. Empirical insights are drawn from a hybrid learning intervention involving 50 management students during late 2025 and early 2026, in which traditional instructional elements are systematically integrated with simulations, coaching techniques, and structured reflection. To provide conceptual clarity and analytical coherence, the

study applies an Input-Process-Output (IPO) framework, linking participant characteristics, pedagogical methods, and observed learning outcomes.

The contribution of this study is threefold. First, it advances the understanding of how behavioural change in management education can be operationalised through structured learning design rather than assumed as a by-product of instruction. Second, it proposes an empirically grounded framework that bridges theory and practice by aligning experiential learning principles with practical delivery mechanisms. Third, it provides qualitative evidence illustrating how hybrid learning models can accelerate learning, increase engagement, and produce observable behavioural shifts in academic settings.

By addressing the gap between theoretical knowledge and behavioural application, the study contributes to ongoing debates on the future of management education and the need for more practice-oriented, competency-based approaches. In doing so, it offers both conceptual insights and practical guidance for educators, trainers, and institutions seeking to enhance the effectiveness of soft skills development in an increasingly complex and performance-driven environment.

Literature review

Management soft skills refer to behavioural, emotional, and relational competencies that determine how effectively managers apply their technical knowledge in social and organisational contexts. They govern how individuals apply their technical knowledge in real-life interactions. As Goleman (2020) notes, “technical skills get people hired, but emotional and social competencies determine how far they advance.” Soft skills enable collaboration, trust-building, influence, and adaptive problem-solving - capabilities that are essential in volatile and ambiguous environments.

Unlike hard skills, which are explicit and procedural, soft skills are context-dependent, deeply embedded in personal habits, and developed primarily through experience, feedback, and reflection.

Core managerial soft skills include *inter alia* communication, active listening, feedback, decision-making, delegation, motivation, conflict management, and change leadership. These competencies closely align with emotional intelligence frameworks, which integrate self-awareness, self-management, social awareness, and relationship management.

Research in leadership and human resource development literature demonstrates that behavioural flexibility and situational adaptation are stronger predictors of performance than static skill mastery. Collectively, these capabilities are closely aligned with the construct (competence) of emotional intelligence, which integrates self-awareness, self-management, social awareness, and relationship management (Goleman et al., 2018).

No single skill guarantees high performance, nor it is necessary to master every skill. Success lies in applying the right combination of appropriate tools, tactics, and strategies that best suit a particular individual in a specific situation. According to Dr. Relly Nadler (2011), practicing just 10 of the 108 strategies described in his book on a regular basis can place an individual far ahead of the competition and significantly closer to achieving their goals.

Importantly, soft skills function as an integrated system rather than isolated capabilities. Effective managers apply different behavioural strategies depending on context, stakeholders, and organisational constraints. Managerial effectiveness depends on selecting and applying the right

combination of behaviours in a given situation. Research on behavioural flexibility and situational leadership confirms that adaptive competence, rather than rigid mastery of isolated skills, predicts sustained performance (Northouse, 2022). This insight underscores the need for educational approaches that prioritise practice, experimentation, and reflective sense-making over passive knowledge acquisition.

A participant-centred approach requires an initial needs and gap analysis using surveys, interviews, performance data, or assessment tools. Adult learning theory emphasises that relevance and perceived usefulness strongly influence learner engagement and transfer of learning (Knowles et al., 2020). Consequently, generic, one-size-fits-all programmes rarely produce sustainable behavioural change.

Based on iterative programme evaluations, a modular and adaptive curriculum design is recommended. Core modules establish shared conceptual foundations, while flexible modules allow facilitators to respond dynamically to participant needs and group processes. This adaptive logic reflects contemporary evidence on agile learning design and learning transfer (Salas et al., 2023).

The development of management soft skills is inherently experiential. While cognitive understanding is necessary, behavioural change occurs primarily through practice, reflection, and feedback. Correcting deeply ingrained managerial habits is particularly challenging and may unintentionally weaken existing strengths if handled insensitively - a concern also highlighted in Belbin's team role theory.

Facilitation and coaching-based methods therefore constitute the backbone of effective delivery. Unlike traditional lecturing, facilitation leverages peer learning, guided reflection, simulations, and real-case analysis. Coaching methodologies, when embedded into group settings, empower participants to generate personal insights and ownership of development goals (Grant, 2021).

The facilitator's behaviour plays a decisive role. Leading by example, demonstrating respect, openness, and emotional intelligence creates psychological safety, which research identifies as a key predictor of learning and team effectiveness (Edmondson, 2019).

Additionally, learning environment matters, however in an academic environment offsite and residential formats may not be appropriate although it consistently produces deeper engagement and stronger relational outcomes than on-site events.

Methodology

This article employs a qualitative, practice-based analytical approach, combining literature synthesis with reflective practitioner analysis. Empirical insights are drawn from the author's direct involvement in the design, delivery, and evaluation of a management soft skills training module implemented in an academic setting.

To enhance analytical rigour, qualitative responses were coded using an inductive thematic approach. Recurring categories included perceived applicability, emotional engagement, and confidence development. Triangulation across reflection logs, facilitator observations, and comparative cohort data strengthened internal validity.

The intervention involved 50 undergraduate and graduate-level management students and was delivered over a structured study period using a hybrid learning design. Data sources included

structured student reflections, facilitated group discussions, post-training feedback questionnaires, and comparative self-assessments of perceived behavioural change.

To structure both programme design and evaluation, the study applies an Input–Process–Output (IPO) model adapted to management soft skills education (see Table 1).

Table 1

IPO Model for Management Soft Skills Training (author)

Input	Process	Output
Participants' background, learning needs, prior experience, academic context	Experiential learning, facilitation, coaching elements, simulations, guided reflection	Behavioural change, improved performance, engagement, self-efficacy

The IPO model provides a coherent logic linking learner characteristics and contextual factors (Input) with pedagogical methods (Process) and measurable learning outcomes (Output). This framework supports alignment between educational intent, delivery mechanisms, and evaluation criteria.

Student perceptions of learning impact were collected through a structured question: “Which management learning methods had the most significant impact on your behaviour?” Responses compared lectures, simulations, coaching elements, and reflective activities. Qualitative content analysis was applied to identify dominant patterns and perceived effectiveness across methods.

Limitations

Despite its contributions, this study has several limitations that should be acknowledged.

First, the empirical analysis is based on a relatively small sample ($n = 50$) drawn from a single academic context, which may limit the generalisability of the findings to other institutional, cultural, or professional settings.

Second, the study relies predominantly on self-reported measures of behavioural change, which are inherently subjective and may be influenced by social desirability bias or participants' perceptions rather than objectively observed performance. Although triangulation through facilitator observations and comparative cohort analysis was applied to enhance credibility, the absence of independent behavioural assessment remains a constraint.

Third, the research design does not include longitudinal tracking, and therefore cannot determine the durability and long-term transfer of the observed behavioural changes beyond the immediate learning environment.

Finally, as a practice-based, reflective study, the findings are contextually embedded and analytically generalisable rather than statistically representative. Future research should address these limitations by incorporating larger and more diverse samples, objective performance metrics, and longitudinal designs, as well as exploring cross-cultural and cross-institutional applications of experiential learning models in management education.

Empirical study

Case 1: Communication and Feedback Skills Development

In the first case, the learning objective focused on improving interpersonal communication and feedback skills. Students engaged in preparatory self-reading, followed by short conceptual lectures introducing feedback models. The core of the intervention consisted of simulated managerial conversations, peer observation, facilitated debriefings, and short coaching-style reflection sessions.

Observed change: Students demonstrated a clear shift from defensive and abstract feedback styles toward more structured, behaviour-focused communication. Reflection logs indicated increased self-awareness and confidence in addressing sensitive interpersonal issues.

Result: Compared to previous cohorts taught primarily through lectures, students reported faster comprehension, higher emotional engagement, and more confident application of feedback techniques in simulations and real-life interactions.

Case 2: Decision-Making and Conflict Management

The second case addressed managerial decision-making under pressure and basic conflict management. Students worked on realistic scenarios involving resource constraints and interpersonal tension. Learning activities combined group problem-solving, role-play simulations, facilitator-led reflection, and short peer coaching conversations.

Observed change: Students increasingly articulated decision rationales, demonstrated empathy toward opposing viewpoints, and applied de-escalation techniques during simulations.

Result: Participants reported that learning felt more intuitive and applicable, with behavioural insights emerging earlier in the learning process compared to traditional instruction formats.

Analysis of student responses (n = 50) revealed a strong preference for experiential and reflective methods over traditional lecturing.

Key findings include:

- Simulations, coaching elements, and guided reflection were rated as having the highest behavioural impact (see Figure 1).
- Lectures were perceived as useful for conceptual framing but insufficient for skill acquisition on their own.
- Overall, students reported more than a 60% higher perceived impact on behaviour when experiential and reflective methods were combined with theory (see Figure 2).

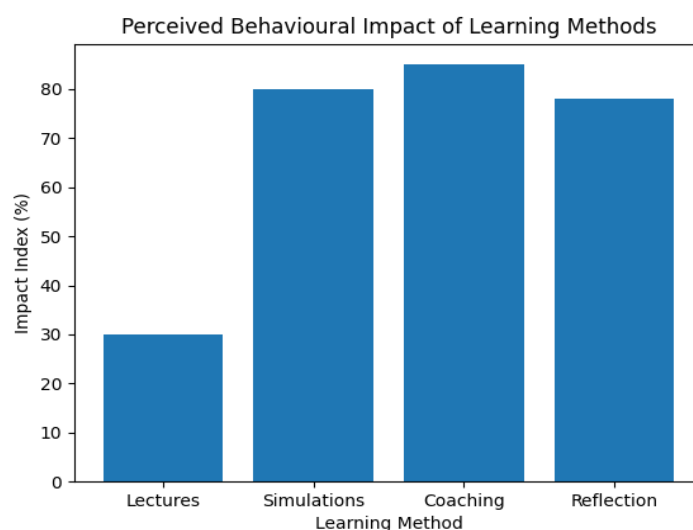


Figure 1. Comparative perceived impact of learning methods on behavioural change (author)

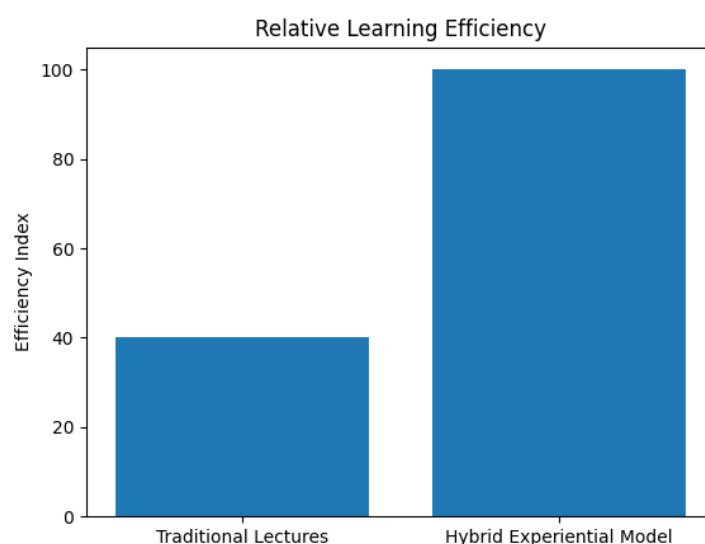


Figure 2. Learning efficiency perceived impact by traditional lectures vs. hybrid models (author)

These findings support existing research in management education and human resource development, confirming that behavioural change is most effectively achieved through active engagement and feedback-rich learning environments, using hybrid experiential models.

Discussion

The findings of this study provide strong support for the argument that management soft skills are most effectively developed through experiential, feedback-rich learning environments rather than through passive, lecture-based instructioning alone. The observed behavioural shifts across both empirical cases indicate that learning designs integrating simulations, coaching elements, and structured reflection significantly enhance the transfer of learning into observable managerial

behaviour. The effectiveness of the hybrid model can be explained through the interaction of three mechanisms: cognitive structuring and conceptual clarity (lectures), emotional engagement and situational realism (simulations and peer interaction), and behavioural rehearsal with coaching elements and reflection facilitating behavioural awareness and adjustment (practice and feedback). This triadic interaction supports durable behavioural change, creates conditions for deeper internalisation and supports the development of actionable competence rather than declarative knowledge. As one participant noted, *“I understood feedback models before, but only during simulations I realised how difficult it is to apply them in real conversations.”* Another reflected, *“Coaching discussions helped me recognise my own strengths and weaknesses, focus on necessary behavioural patterns and adjust them in practice.”* Such insights illustrate the shift from knowing to doing, which is central to effective management education.

The findings align with experiential learning theory (Kolb, 2021), suggesting that knowledge transformation occurs through iterative cycles of action and reflection. Furthermore, the observed behavioural shift supports Edmondson’s (2019) concept of psychological safety as a precondition for learning through experimentation. Finally, the results contribute to the training transfer literature (Salas et al., 2023), demonstrating that learning design—not content alone—determines behavioural outcomes.

From a theoretical perspective, these results are consistent with experiential learning theory, which conceptualises learning as a cyclical process involving concrete experience, reflective observation, abstract conceptualisation, and active experimentation (Kolb, 2021). The hybrid learning model applied in this study operationalises this cycle by combining conceptual input (lectures and self-reading) with iterative practice (simulations), reflection (guided debriefings), and behavioural experimentation (input - feedback). This alignment helps explain the accelerated learning and higher perceived impact reported by participants.

Furthermore, the findings reinforce the central role of emotional and social competencies in managerial effectiveness, as highlighted in leadership research (Boyatzis, 2019; Goleman et al., 2018; Yukl, 2020). The empirical evidence suggests that such competencies cannot be internalised through cognitive understanding alone but require active engagement in socially situated learning contexts. In this regard, the results support the notion that behavioural flexibility and situational responsiveness, rather than static knowledge, are key predictors of managerial performance (Northouse, 2022).

The findings also align with research on psychological safety as a critical enabler of learning and performance (Edmondson, 2019). The facilitated environment, characterised by openness, respect, and structured reflection, appears to have created conditions in which students felt safe to experiment, make mistakes, and receive feedback. This is particularly important in soft skills development, where behavioural change often involves confronting ingrained habits and interpersonal vulnerabilities.

In addition, the results contribute to the literature on training effectiveness and learning transfer by demonstrating that instructional design plays a more decisive role than content alone (Salas et al., 2023). While lectures were perceived as useful for framing concepts, they were consistently rated as insufficient for behavioural development when used in isolation. This supports prior evidence that transfer of training depends on opportunities for practice, feedback, and contextual relevance rather than on information delivery (Knowles, et al., 2020).

At the same time, the study highlights the importance of adaptive and participant-centred learning design. Consistent with adult learning principles, participants reported higher engagement when learning activities were perceived as relevant, practical, and immediately applicable. This reinforces the importance of initial needs assessment and flexible curriculum structures that can respond to group dynamics and individual development trajectories.

Overall, the findings suggest that bridging the gap between theory and practice in management education requires a fundamental shift from content-centred to behaviour-centred learning design. The hybrid experiential model presented in this study offers a structured yet flexible approach to achieving this goal, with implications for both higher education and professional training contexts.

Conclusions

This study demonstrates that a results-oriented, experiential approach to management soft skills education produces significantly stronger behavioural outcomes than traditional lecture-based models. Empirical evidence from a hybrid learning intervention involving management students indicates accelerated learning, higher engagement, and considerable increase in perceived behavioural impact when simulations, coaching elements, and structured reflection are systematically integrated into the learning design.

For higher education institutions, the findings suggest a need to redesign curricula toward competency-based and behaviour-oriented learning models. At a policy level, this aligns with broader European priorities on employability, skills relevance, and lifelong learning.

The findings contribute to management education literature in several important ways. First, they operationalise a qualitative, practice-based analytical approach that captures behavioural change processes within real educational settings, thereby complementing more traditional quantitative studies. Second, the study illustrates practical use of an IPO framework tailored specifically to soft skills development, providing a coherent structure for aligning participant characteristics, pedagogical methods, and learning outcomes. Third, the results offer evidence that behavioural competence emerges not from pure knowledge acquisition, but from iterative cycles of practice, feedback, and reflection embedded within psychologically safe learning environments.

From a practical perspective, the study underscores the need for higher education institutions to rethink curriculum design in order to better support the development of managerial competence. Universities should move beyond content-heavy, lecture-dominated models toward integrated learning architectures that prioritise experiential methods, facilitated interaction, and reflective practice. Such a shift is particularly relevant in the context of increasing expectations for graduate employability and work-readiness. Embedding hybrid experiential models within standard curricula can enhance students' ability to transfer knowledge into action, thereby narrowing the persistent gap between academic preparation and organisational performance requirements.

The implications extend beyond academia to professional training and organisational development. For practitioners, the findings highlight the importance of designing learning interventions that combine conceptual clarity with behavioural rehearsal and feedback mechanisms. Training programmes that fail to incorporate these elements are unlikely to produce sustained behavioural change, regardless of the quality of content delivered. The proposed framework therefore offers a

scalable and adaptable model applicable across corporate, public sector, and international development contexts.

At a broader level, the study aligns with contemporary policy priorities emphasising skills relevance, lifelong learning, and competency-based education. As labour markets become increasingly dynamic and complex, the ability to learn, adapt, and apply behavioural competencies in real time becomes a critical determinant of individual and organisational success. In this regard, experiential and results-oriented learning models are not merely pedagogical alternatives but strategic necessities.

Future research should build on these findings by expanding sample sizes, incorporating cross-cultural, cross sectoral and cross-institutional comparisons, and integrating longitudinal designs to assess the sustainability of behavioural change over time. Additionally, the potential of digital and AI-supported learning environments to enhance reflection, feedback, and personalised development pathways represents a promising avenue for further investigation.

In conclusion, bridging the gap between theory and behaviour in management education requires a fundamental reorientation from knowledge transmission to behaviour-focused learning design. The hybrid experiential framework presented in this study provides a robust and practically applicable model for achieving this transformation, with clear benefits for learners, educators, and organisations alike.

References

- Aguinis, H. (2019). *Performance management* (4th ed.). Chicago, IL: Chicago Business Press.
- Belbin, R. M. (2010). *Management teams: Why they succeed or fail*. Oxford, UK: Elsevier.
- Boyatzis, R. E. (2019). *The competent manager revisited*. Boston, MA: Harvard Business Review Press.
- Edmondson, A. (2019). *The fearless organization: Creating psychological safety in the workplace for learning, innovation, and growth*. Hoboken, NJ: Wiley.
- Goleman, D., Boyatzis, R., & McKee, A. (2018). *Primal leadership: Unleashing the power of emotional intelligence* (rev. ed.). Boston, MA: Harvard Business Review Press.
- Grant, A. M. (2021). *Think again: The power of knowing what you don't know*. New York, NY: Viking Press.
- Knowles, M. S., Holton, E. F., & Swanson, R. A. (2020). *The adult learner* (9th ed.). New York, NY: Routledge.
- Kolb, D. A. (2021). *Experiential learning: Experience as the source of learning and development* (2nd ed.). Upper Saddle River, NJ: Pearson.
- Northouse, P. G. (2022). *Leadership: Theory and practice* (9th ed.). Thousand Oaks, CA: SAGE Publications.
- Salas, E., Tannenbaum, S. I., Kraiger, K., & Smith-Jentsch, K. (2023). *The science of training and development*. Association for Psychological Science, Psychological Science in the Public Interest, 24(2), 74–101.
- Yukl, G. (2020). *Leadership in organizations* (9th ed.). Upper Saddle River, NJ: Pearson.

MĀKSLĪGĀ INTELEKTA MODEĻU PIELIETOŠANA RISKU VADĪŠANĀ

APPLICATION OF ARTIFICIAL INTELLIGENCE MODELS IN RISK MANAGEMENT

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Anotācija

Pētījumā autors, izmantojot mākslīgo intelektu, trīs Latvijas augstskolu publiski pieejamos dokumentus, mēģina atbildēt uz jautājumu, vai topošajam studentam, darbiniekam vai sadarbības partnerim ir iespējams novērtēt, kādi ir riski nākamajā augstskolā, darba vietā vai sadarbībā? Pētījumā tiek izmantots personālais dators ar programmu NVIDIA ChatRTX un trīs mākslīgā intelekta lielo valodu modeļi. Lai nodrošinātu ētisku mākslīgā intelekta rezultātu izmantošanu, vaicājumu atbildes tika kodētas, lai nebūtu iespējams identificēt atbildes piederību kādai no augstskolām. Pētījuma uzdevums tika izpildīts, pētījumā tika konstatēts, ka LLM modeļu un lokālo datu izmantošana personālā datorā ir iespējama, lai modeļu ģenerētajās atbildēs būtu informācija par konkrētu augstskolu. LLM modeļu parametru skaits ir līdz 13 miljardiem, un visi modeļi atbilstu ģenerēšanai izmantoja augstskolu dokumentus. Modeļu spēja ģenerēt atbildes bija atšķirīga.

Atslēgas vārdi: mākslīgais intelekts, lielo valodu modelis, risku vadība, loma

Abstract

In this study, the author uses artificial intelligence and publicly available documents from three Latvian higher education institutions to address the question of whether a prospective student, employee, or partner can assess the risks associated with a specific university, workplace, or collaboration. The study used a personal computer running the NVIDIA ChatRTX program alongside three large language models (LLMs). To ensure the ethical use of AI-generated results, the responses were coded so that they could not be traced back to any specific university. The study successfully demonstrated the feasibility of using LLMs and local data on a personal computer to generate responses containing information about specific universities. The models ranged in size up to 13 billion parameters, and all of them utilized the university documents to generate their answers; however, the models' capabilities in generating responses varied.

Keywords: artificial intelligence, large language model, risk management, role

Ievads

Vai topošajam studentam, darbiniekam vai sadarbības partnerim ir iespējams novērtēt, kādi ir riski nākamajā augstskolā, darba vietā vai sadarbībā? Resursi ir ierobežoti, tikai daļa informācijas ir publiski pieejama, nav resursu lielo valodu modeļu (*Large language models*, turpmāk LLM) trenēšanai vai mākslīgā intelekta (turpmāk, MI) modeļu izmantošanas pakalpojumu nopirkšanai. Aktuālos risku sarakstus vai reģistrus augstskolas nepublicē.

Pētījuma autors izvēlējās risinājumu, kad tiek izmantoti LLM modeļi ar parametru skaitu līdz 13 miljardiem, programma *NVIDIA ChatRTX* un publiski pieejamie augstskolu dokumenti. Pētījuma uzdevums bija veikt trīs Latvijas augstskolu – Latvijas Universitātes, Rīgas Tehniskās universitātes un Biznesa augstskolas *Turība* – risku identificēšanu un analīzi atbilstoši trīs lomām. Pētījuma mērķis nebija novērtēt vai salīdzināt augstskolas. Lai nodrošinātu ētisku mākslīgā intelekta rezultātu izmantošanu, vaicājumu atbildes tika kodētas, lai nebūtu iespējams identificēt atbildes piederību kādai no augstskolām.

Publikāciju skaits par mākslīgo intelektu ir strauji pieaudzis pēdējos gados. Tiek uzsvērts, ka MI ir “pārveidojošs spēks, kas piedāvā progresīvas iespējas paredzošajā analītikā, autonomā risku mazināšanā un reāllaika lēmumu atbalstā” (Faruk, Plabon, Saha, Hossain, 2025). Mākslīgais intelekts “var ievērojami uzlabot riska novērtēšanas procesus, piedāvājot ātru un detalizētu ieskatu” (Yazdi, Zarei, Adumene, Beeheshti, 2024) un, “izmantojot progresīvas mākslīgā intelekta tehnoloģijas, organizācijas var efektīvāk paredzēt un pārvaldīt riskus, tādējādi optimizējot darbības veikspēju un noturību” (Ispas, Mironeasa, Severin, Cerlincă, Mironeasa, 2025), kā arī “mākslīgā intelekta izmantošana ievērojami palielina organizāciju spējas risku identificēšanas, analīzes un kontroles jomā” (Pacek, Mróz-Gorgoń, Czuhan, 2025).

Neētiska MI izmantošana ir problēma, un tāpēc ir svarīgi “izprast, kā cilvēki soda sevi par savtīgu rīcību hibrīdvidē” un “ir svarīgi programmēt MI rīkus tā, lai izvairītos no korumpētiem padomiem un radītu vidi, kurā sliktu padomu ievērošana ir nemotivēta” (Leib, Köbis, Soraperra, 2025).

Risku pārvaldības process

Starptautiskās standartizācijas organizācijas (ISO, International Organization for Standardization) standartos ir aprakstīts risku vadības process. Risku pārvaldības process ir process, kurš “ietver politikas, procedūru un prakses sistemātisku piemērošanu saziņas un konsultāciju darbībām, riska konteksta noteikšanai un novērtēšanai, apstrādāšanai, uzraudzībai, pārskatīšanai, reģistrēšanai un ziņošanai” (ISO 31000, 2018).

AIRMIC (*The Association of Insurance and Risk Managers*) standartā “A Risk Management Guide” (*AIRMIC Guide*) risku pārvaldības process tiek aprakstīts kā process, kurā organizācijas metodiski risina ar to darbībām saistītos riskus, lai sasniegtu ilgtspējīgu ieguvumu katrā darbībā un visā darbību portfeli (*AIRMIC Guide*). Risku pārvaldības procesa sastāvdaļas ir organizācijas stratēģiskie mērķi, riska analīze, riska novērtēšana, riska ziņošana, lēmums, riska apstrāde, atlikušā riska ziņošana un uzraudzība.

Apvienotās Karalistes valdības “The Orange Book. Management of Risk – Principles and Concepts” (*The Orange Book*) risku pārvaldības procesa sastāvdaļas ir riska identificēšana un novērtēšana, riska apstrādāšana, riska uzraudzība un ziņošana (*The Orange Book*).

Pētījumā autors izvēlējās procesa soļus, kuri bija līdzīgi visos trīs standartos – risku novērtēšana, risku apstrādāšana un risku pārvaldības pasākumu plānošana.

Pētījuma apraksts

Pētījums tika veikts posmos.

1. Trīs Latvijas augstskolu izvēle un augstskolu publiski pieejamo dokumentu saglabāšana lokālā datorā.
2. Katalogu izveide ar katras augstskolas dokumentiem.
3. MI modeļu izmantošanas lietojumprogrammas izvēle: *NVIDIA ChatRTX*.
4. Trīs MI modeļu izvēle: *Mistral-7B Chat Int4*, *Llama2-13b Chat Int4* un *Gemma-7B-INT4-RTX*.
5. Modeļu pārbaude ar trīs jautājumiem par risku vadības teoriju, lai novērtētu modeļu spēju veikt risku identificēšanu un analīzi.
6. Modeļu pārbaude ar trīs jautājumiem par lokālo dokumentu izmantošanu.
7. Piecu jautājumu, atbilstoši katrai lomai, uzdošana par augstskolu riskiem trīs MI modeļiem.
8. Atbilžu novērtēšana.
9. Atbilžu analīze un kodēšana.
10. Secinājumi par MI modeļu izmantošanas iespējām risku identificēšanā un analīzē, izmantojot lokālus resursus.

Pētījumā autors izmantoja programmu *NVIDIA ChatRTX*, kura ir paredzēta LLM modeļu izmantošanai personālā datorā un lokālo datu – dokumentu, piezīmju, attēlu vai citu datu izmantošanai, izmantojot ieguves papildināto ģenerēšanu (*Retrieval-augmented generation*, turpmāk *RAG*), lai iegūtu lokāliem datiem atbilstošas atbildes. *NVIDIA ChatRTX* bija pieci MI modeļi. Autors izvēlējās trīs modeļus – *Mistral AI LLM Mistral-7B-Instruct-v0.1* modelis ir *Mistral-7B-v0.1* ģeneratīvā teksta modeļa precīzi pielāgota versija, izmantojot dažādas publiski pieejamas sarunu datu kopas. *Meta Llama2-13b Chat Int4* ir *LlaMa 2* LLM modelis, kas spēj ģenerēt tekstu un kodu atbilstoši vaicājumiem. *Google Gemma-7B-INT4-RTX* ir *Google Gemma* modeļu saimes modelis. Modelis ir pielāgots instrukcijām, lai varētu reaģēt uz vaicājumiem sarunas veidā.

Vaicājumu atbildes tika vērtētas atbilstoši atbilžu kvalifikācijai, skat. 1. tabulu.

1. tabula

Atbilžu klasifikācija

Jautājuma klasifikators	Skaidrojums
0	Nav atbildes vai atbilde neatbilst jautājumam
1	Atbilde ir, ka atbildēt nav iespējams
2	Jautājums ir atbildēts, netika pieprasīta papildu informācija, atbildes garums bija līdz 200 vārdiem
3	Jautājums ir atbildēts, tika pieprasīta papildu informācija
4	Jautājums ir atbildēts, atbildes garums bija vairāk par 200 vārdiem, atbilde varēja būt strukturēta

Trīs izvēlētiem modeļiem tika uzdots viens jautājums par informācijas izmantošanu atbildēšanai un trīs jautājumi, lai novērtētu, vai modeļi atpazīst riskus un risku vadības procesu. Modeļu atbildes ir apkopotas 2. tabulā.

2. tabula

MI modeļu atbildes

Modelis	Jautājums	Atbilde atbilstoši klasifikatoram
Llama	Vai Llama2 13B int4 izmanto lokālos datus, lai atbildētu uz jautājumiem par organizāciju, kuras dokumenti atrodas lokālajos datu failos?	1
	Kas ir risks?	4
	Kādi ir risku veidi?	4
	Kā pārvaldīt riskus?	4
Mistral	Vai Mistral 7B int4 izmanto lokālos datus, lai atbildētu uz jautājumiem par organizāciju, kuras dokumenti atrodas lokālajos datu failos?	2
	Kas ir risks?	2
	Kādi ir risku veidi?	4
	Kā pārvaldīt riskus?	4
Gemma	Vai Gemma 7B int4 izmanto lokālos datus, lai atbildētu uz jautājumiem par organizāciju, kuras dokumenti atrodas lokālajos datu failos?	4
	Kas ir risks?	2
	Kādi ir risku veidi?	4
	Kā pārvaldīt riskus?	4

Tikai viena modeļa – *Llama* – atbilde bija, ka lokālie dati netiek izmantoti. Tomēr, uzdodot jautājumus *LLama* modelim, atbildes tika saņemtas un atbilžu beigās tika norādīts izmantotais augstskolas dokuments vai dokumenti. Var secināt, ka visi trīs modeļi var definēt risku, atšķir dažādus risku veidus un ir atbildējuši par risku vadības procesu, 67 % atbildēs ir vairāk par 200 vārdiem, un atbildes ir strukturētas.

Autors pētījumam izmantoja tikai publiski pieejamus dokumentus 2026. gada janvārī trijās Latvijas augstskolu vietnēs – Latvijas Universitāte, <https://www.lu.lv/par-mums/dokumenti/>, 22 dokumenti, Rīgas Tehniskā universitāte, <https://www.rtu.lv/lv/universitate/dokumenti>, 15 dokumenti un Biznesa augstskola *Turība*, <https://nodarbibas.turiba.lv/regdok.asp>, 14 dokumenti.

Publiski pieejamos dokumentos nav visa informācija par augstskolas darbības plānošanu un darbību, t.sk. par risku vadīšanu. Autora rīcībā nebija *NVIDIA ChatRTX* lietojumprogrammas kods un autors neveica MI modeļu algoritmu un trenēšanai izmantoto datu kopu analīzi, pieņemot, ka pētījumā izmantotā MI lietošanas scenārija dalībnieki neveiks lietojumprogrammas koda un MI modeļu algoritmu un trenēšanai izmantoto datu vērtēšanu.

Lai nodrošinātu MI modeļu ētisku izmantošanu, mazinot mākslīgā intelekta noviržu (*Artificial intelligence bias*) un datu nepilnīguma ietekmi uz augstskolu reputāciju, autors izvēlējās atbilžu par trīs augstskolām kodēšanu, kodējot augstskolas ar kodiem “A”, “B” un “C”.

Katras augstskolas publiski pieejamie dokumenti tika sagrupēti atsevišķās mapēs un, uzdodot jautājumus modeļiem par katru augstskolu, MI modelis atbildēšanai izmantoja dokumentus no mapes, kurā bija atbilstošās augstskolas dokumenti. Trīs jautājumi ir par risku vadības procesu, risku novērtēšanu, apstrādāšanu un pārvaldības pasākumu plānošanu augstskolā un pieci jautājumi par katru no trīs lomām. Pētījumā ir trīs lomas. Darbinieks, kurš vērtē darba vietu, un jautā par riskiem,

kuri varētu būt augstskolā, students, kurš vērtē studiju vietu un sadarbības partneris, kurš vērtē sadarbības riskus.

Pētījuma dati

Trīs MI modeļiem tika uzdoti jautājumi, atbildēšanai par augstskolu tika izmantoti augstskolas publiski pieejami dokumenti, programma *NVIDIA ChatRTX* un ieguves papildinātā ģenerēšana. Katrai augstskolai, katrai lomai un katram MI modelim bija atsevišķa tērzēšanas plūsma. Atbildes tika saglabātas tabulās, un veikta atbilžu kodēšana.

Atbilžu ģenerēšanas laiks netika mērīts, jo atbilžu ģenerēšanas laiku ietekmē konkrēta datora veikspēja un izmantotā programma.

3. tabula

Llama modeļa trīs jautājumu atbildes

Jautājums	Atbilde atbilstoši klasifikatoram		
	A	B	C
Kādi ir (augstskolas nosaukums) riski?	0	4	4
Vai (augstskolas nosaukums) analizē savus riskus?	3	2	2
Vai (augstskolas nosaukums) pārvalda savus riskus?	3	2	0

Var secināt, ka *Llama* modelis izmanto augstskolu publiski pieejamos dokumentos, divām augstskolām tiek identificēti riski, visās augstskolās tiek analizēti riski un divās augstskolās tiek vadīti riski atbilstoši informācijai publiski pieejamos augstskolu dokumentos. Autors secināja, ka *Llama* modeli var izmantot jautājumu uzdošanai par augstskolu riskiem.

4. tabula

Llama modeļa atbildes atbilstoši lomām

Loma	Jautājums	Atbilde atbilstoši klasifikatoram		
		A	B	C
Darbinieks	Vai (augstskolas nosaukums) ir droša darba vieta?	3	3	0
	Vai (augstskolas nosaukums) ir ilgtspējīga darba vieta?	2	0	0
	Kādas ir (augstskolas nosaukums) kā darba vietas priekšrocības?	4	4	4
	Kādi ir (augstskolas nosaukums) kā darba vietas trūkumi?	3	2	0
	Atbildē izmanto lokālos datus un iepriekš sniegtās atbildes. Kādi būs mani riski, ja sāksu strādāt (augstskolas nosaukums)?	4	2	4
Students	Vai (augstskolas nosaukums) ir laba studiju vieta?	2	4	2
	Vai (augstskolas nosaukums) ir ilgtspējīga studiju vieta?	2	2	3
	Kādas ir (augstskolas nosaukums) kā studiju vietas priekšrocības?	4	4	4
	Kādi ir (augstskolas nosaukums) kā studiju vietas trūkumi?	2	4	4
	Atbildē izmanto lokālos datus un iepriekš sniegtās atbildes. Kādi būs mani riski, ja sāksu studēt (augstskolas nosaukums)?	3	4	4
Sadarbības partneris	Vai (augstskolas nosaukums) ir uzticams sadarbības partneris?	2	2	2
	Vai (augstskolas nosaukums) ir ilgtspējīgs sadarbības partneris?	4	4	4
	Kādas ir (augstskolas nosaukums) kā sadarbības partnera priekšrocības?	4	4	4
	Kādi ir (augstskolas nosaukums) kā sadarbības partnera trūkumi?	4	4	2
	Atbildē izmanto lokālos datus un iepriekš sniegtās atbildes. Kādi būs mani riski, ja uzsāksu sadarbību ar (augstskolas nosaukums)?	4	4	4

Var secināt, ka *LLama* modelis ir piemērots augstskolu risku identificēšanai, ja tiek izmantots *RAG*. Detalizēti atbildēto jautājumu skaits ir 51 % no kopējā atbilžu skaita. Neatbildētu jautājumu skaits ir 7 %. Tomēr nevar secināt, ka neatbildētie jautājumi ir ietekmējuši piekto jautājumu par riskiem. Jautājums par riskiem, ja augstskola būs darba, studiju vieta vai sadarbības partneris, tika atbildēts 22 % vai atbildēts detalizēti 78 %. Katras augstskolas identificētie riski atšķiras, un tāpēc var pieņemt, ka risku identificēšanai tika izmantoti augstskolu dokumenti.

5. tabula

Mistral modeļa trīs jautājumu atbildes

Jautājums	Atbilde atbilstoši klasifikatoram		
	A	B	C
Kādi ir (augstskolas nosaukums) riski?	2	2	4
Vai (augstskolas nosaukums) analizē savus riskus?	2	2	2
Vai (augstskolas nosaukums) pārvalda savus riskus?	0	0	0

Var secināt, ka *Mistral* modelis izmanto augstskolu publiski pieejamos dokumentus. Par visām augstskolām modelis nevar atbildēt, vai tiek vadīti riski. Autors secināja, ka *Mistral* modeli var izmantot jautājumu uzdošanai par augstskolu riskiem, ja riski ir identificēti un vadīti.

6. tabula

Mistral modeļa atbildes atbilstoši lomām

Loma	Jautājums	Atbilde atbilstoši klasifikatoram		
		A	B	C
Darbinieks	Vai (augstskolas nosaukums) ir droša darba vieta?	3	4	0
	Vai (augstskolas nosaukums) ir ilgtspējīga darba vieta?	2	2	2
	Kādas ir (augstskolas nosaukums) kā darba vietas priekšrocības?	4	4	4
	Kādi ir (augstskolas nosaukums) kā darba vietas trūkumi?	2	2	0
	Atbildē izmanto lokālos datus un iepriekšējās atbildes. Kādi būs mani riski, ja sākšu strādāt (augstskolas nosaukums)?	2	4	2
Students	Vai (augstskolas nosaukums) ir laba studiju vieta?	2	2	2
	Vai (augstskolas nosaukums) ir ilgtspējīga studiju vieta?	2	2	2
	Kādas ir (augstskolas nosaukums) kā studiju vietas priekšrocības?	4	4	2
	Kādi ir (augstskolas nosaukums) kā studiju vietas trūkumi?	2	2	2
	Atbildē izmanto lokālos datus un iepriekšējās atbildes. Kādi būs mani riski, ja sākšu studēt (augstskolas nosaukums)?	2	4	0
Sadarbības partneris	Vai (augstskolas nosaukums) ir uzticams sadarbības partneris?	2	2	3
	Vai (augstskolas nosaukums) ir ilgtspējīgs sadarbības partneris?	2	2	3
	Kādas ir (augstskolas nosaukums) kā sadarbības partnera priekšrocības?	3	4	4
	Kādi ir (augstskolas nosaukums) kā sadarbības partnera trūkumi?	2	2	0
	Atbildē izmanto lokālos datus un iepriekšējās atbildes. Kādi būs mani riski, ja uzsākšu sadarbību ar (augstskolas nosaukums)?	2	4	2

Var secināt, ka *Mistral* modelis ir piemērots augstskolu risku identificēšanai. Detalizēti atbildēto jautājumu skaits ir 22 % no kopējā atbilžu skaita. Neatbildētu jautājumu skaits ir 9 %. Jautājums par riskiem, ja augstskola būs darba, studiju vieta vai sadarbības partneris, tika atbildēts 11 % vai atbildēts detalizēti 7 %. Katras augstskolas identificētie riski atšķiras, un tāpēc var pieņemt, ka risku identificēšanai tika izmantoti augstskolu dokumenti.

Gemma modeļa 3 jautājumu atbildes

Jautājums	Atbilde atbilstoši klasifikatoram		
	A	B	C
Kādi ir (augstskolas nosaukums) riski?	0	0	0
Vai (augstskolas nosaukums) analizē savus riskus?	0	3	0
Vai (augstskolas nosaukums) pārvalda savus riskus?	0	0	0

Atbilstoši atbildēm var secināt, ka *Gemma* modelis neizmanto vai nespēj izmantot augstskolu publiski pieejamos dokumentos. Autors nolēma izmantot *Gemma* modeli, lai salīdzinātu modeļa atbildes ar *LLama* un *Mistral* modeļu atbildēm.

Gemma modeļa atbildes atbilstoši lomām

Loma	Jautājums	Atbilde atbilstoši klasifikatoram		
		A	B	C
Darbinieks	Vai (augstskolas nosaukums) ir droša darba vieta?	0	0	1
	Vai (augstskolas nosaukums) ir ilgtspējīga darba vieta?	0	0	0
	Kādas ir (augstskolas nosaukums) kā darba vietas priekšrocības?	0	0	2
	Kādi ir (augstskolas nosaukums) kā darba vietas trūkumi?	0	0	2
	Atbildē izmanto lokālos datus un iepriekšējās atbildes. Kādi būs mani riski, ja sākšu strādāt (augstskolas nosaukums)?	0	0	3
Students	Vai (augstskolas nosaukums) ir laba studiju vieta?	0	0	0
	Vai (augstskolas nosaukums) ir ilgtspējīga studiju vieta?	0	0	0
	Kādas ir (augstskolas nosaukums) kā studiju vietas priekšrocības?	4	4	0
	Kādi ir (augstskolas nosaukums) kā studiju vietas trūkumi?	0	0	0
	Atbildē izmanto lokālos datus un iepriekšējās atbildes. Kādi būs mani riski, ja sākšu studēt (augstskolas nosaukums)?	0	0	0
Sadarbības partneris	Vai (augstskolas nosaukums) ir uzticams sadarbības partneris?	0	0	0
	Vai (augstskolas nosaukums) ir ilgtspējīgs sadarbības partneris?	0	0	0
	Kādas ir (augstskolas nosaukums) kā sadarbības partnera priekšrocības?	0	4	0
	Kādi ir (augstskolas nosaukums) kā sadarbības partnera trūkumi?	0	0	0
	Atbildē izmanto lokālos datus un iepriekšējās atbildes. Kādi būs mani riski, ja uzsākšu sadarbību ar (augstskolas nosaukums)?	0	4	0

Var secināt, ka *Gemma* modelis ir vismazāk piemērots augstskolu risku identificēšanai salīdzinājumā ar *LLama* un *Mistral* modeļiem. Detalizēti atbildēto jautājumu skaits ir 6 % no kopējā atbilžu skaita. Neatbildētu jautājumu skaits ir 7 %. Jautājums par riskiem, ja augstskola būs darba, studiju vieta vai sadarbības partneris, tika atbildēts 2 % vai atbildēts detalizēti 2 %. Tikai vienai augstskolai tika detalizēti atbildēti uz piekto jautājumu.

Secinājumi un ieteikumi

Pētījuma uzdevums tika izpildīts, pētījumā tika konstatēts, ka LLM modeļu un lokālo datu izmantošana personālā datorā ir iespējama, lai modeļu ģenerētajās atbildēs būtu informācija par konkrētu augstskolu. LLM modeļu parametru skaits ir līdz 13 miljardiem, un visi modeļi atbilžu ģenerēšanai izmantoja augstskolu dokumentus.

Modeļu spēja ģenerēt atbildes bija atšķirīga, visvairāk atbildes atbilstoši lomām, kuru garums ir vairāk par 200 vārdiem, un daļa atbilžu bija strukturētas, bija *LLama* modelim 53 %, lai gan *LLama*

atbilde par spēju izmantot lokālos datus ir noliedzoša. *Gemma* modeļa atbildes par risku vadīšanu un lokālo datu izmantošanu ir apstiprinošas, tomēr atbildes atbilstoši lomām tika saņemtas vismazāk salīdzinājumā ar *Llama* un *Mistral* modeli. Var secināt, ka LLM modeļu līdz 13 miljardiem parametru, publiski pieejamu dokumentu un *RAG* izmantošana ir iespējama personālā datorā ar vidējas veiktspējas videokarti – 16 Gb videoatmiņa un 32 Gb operatīvā atmiņa.

Salīdzinot divu modeļu – *LLama* un *Mistral* – atbildes, pētījumā netika konstatēts, ka kāda no augstskolām būtu darba, studiju vietas un sadarbības partnera līderis. Visvairāk atbilžu, kuru garums ir vairāk par 200 vārdiem, un daļa atbilžu ir strukturētas, ir par darba, studiju vietas vai sadarbības partnera priekšrocībām. Iespējams, var secināt, ka abi modeļi ir trenēti atbildēt uz pozitīviem jautājumiem vairāk nekā kritiskiem vai noliedzošiem jautājumiem.

Llama un *Mistral* atbildes atbilstoši lomām ir līdzīgas, atbilstoši atbildēm visas augstskolas ir labi sadarbības partneri, studiju vieta vislabākā ir “B” augstskolā. *Gemma* modeļa atbildes atbilstoši lomām un augstskolām ir nepietiekamas, lai pamatoti secinātu par lomas vai augstskolas līderi.

Lai gan pētījuma uzdevums tika izpildīts, tomēr autors secināja, ka pētījumā lomu skaits varēja būt lielāks, piemēram, darbinieku lomas varēja būt iedalītas administratīvā personālā un akadēmiskā personālā un varēja būt vairāk informācijas par lomām, t.sk. augstskolu normatīvais regulējums par personāla pārvaldību, un informācija, kura ir pieejama augstskolu vietnēs. Analogi varētu būt vairāk studenta vai sadarbības partnera lomu. Lomu skaita palielināšanas gadījumā būtu jāizmanto lielāks publiski pieejamās augstskolas informācijas daudzums, ne tikai augstskolas dokumenti, bet arī cita informācija augstskolas vietnē un informācija no citiem avotiem. Lielāks publiski pieejamās informācijas apjoms būtu jāstrukturē atbilstoši informācijas veidam un būtu jāmaina *RAG* izmantošanas scenārijs.

Autors arī secināja, ka līdzīgos pētījumos ir jāplāno papildu vaicājumi, ja netiek saņemtas modeļu atbildes, mainot jautājuma saturu vai struktūru. Pēc atbildes vērtēšanas, iespējams, ka jāveic atkārtoti vaicājumi, piemēram, *Gemma* modeļa izmantošanas gadījumā vai *LLama* modeļa izmantošanas gadījumā, kad tika jautāts par lokālu datu izmantošanu, bet bija noliedzoša atbilde. Iespējams, ka tiktu ģenerēta atbilde, ja “data” aizstātu ar “document” vai atbilde tiktu formulēta citādi.

References

A Risk Management Guide, bez gada, 3. <https://www.airmic.com/system/files/technical-documents/airmic-risk-management-guide.pdf>

Imtiaz Faruk, Fatin Wahab Plabon, Udoy Sankar Saha and Mohammad Didar Hossain. AI-Driven Project Risk Management: Leveraging Artificial Intelligence to Predict, Mitigate, and Manage Project Risks in Critical Infrastructure and National Security Projects. *Journal of Computer Science and Technology Studies*, 7 (6), 123-137. DOI:10.32996/jcsts.2025.7.6.16

ISO 31000:2018, Risk management – Guidelines, 8. <https://www.iso.org/standard/65694.html>

Lucian Ispas, Costel Mironeasa, Traian-Lucian Severin, Delia-Aurora Cerlincă, Silvia Mironeasa. Artificial Intelligence Applications in Risk Management Within Integrated Management Systems: A Review. <https://doi.org/10.3390/systems13110967>

Łukasz PACEK, Barbara MRÓZ-GORGON, Marcin CZUGAN. Risk management in an organization in the era of AI – a theoretical approach- DOI: 10.21008/j.0239-9415.2025.092.03

Margarita Leib, Nils Köbis, Ivan Soraperra. Does AI and human advice mitigate punishment for selfish behavior? An experiment on AI ethics from a psychological perspective <https://doi.org/10.1016/j.chb.2025.108709>

The Orange Book. Management of Risk – Principles and Concepts, 2023.

https://assets.publishing.service.gov.uk/media/6453acadc33b460012f5e6b8/HMT_Orange_Book_May_2023.pdf

Mohammad Yazdi, Esmaeil Zarei, Sidum Adumene and Amin Beheshti. Navigating the Power of Artificial Intelligence in Risk Management: A Comparative Analysis. <https://doi.org/10.3390/safety10020042>

BEHAVIOURAL INSIGHTS AS DRIVERS OF OPERATIONAL EXCELLENCE IN ENTREPRENEURIAL INNOVATION ECOSYSTEMS

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Abstract

Baltic entrepreneurial innovation ecosystems remain structurally supported by finance and infrastructure, yet behavioral dynamics that influence resilience and inclusiveness are often overlooked. This study examines how behavioral insights can be systematically embedded to strengthen long-term ecosystem competitiveness. A conceptual framework was developed through synthesis of behavioral science, innovation ecosystem theory, and entrepreneurship psychology. Exploratory factor analysis validated four behavioral dimensions: collaborative optimism (0.71–0.84), normalization of failure (0.68–0.81), risk assessment and bias awareness (0.73–0.85), and trust-building and social influence (0.70–0.88). Stakeholder consultations informed practical intervention design. Results indicate that these constructs significantly contribute to ecosystem resilience and can be operationalized through knowledge-sharing mechanisms, risk-acceptance training, bias-awareness programs, and role-model promotion. The findings provide an empirically grounded behavioral framework to complement traditional structural policy approaches.

Keywords: Baltic region, behavioural insights, entrepreneurial ecosystems, factor analysis, innovation policy

Introduction

Entrepreneurial innovation ecosystems (EIEs) drive regional economic growth, technological advancement, and 21st century competitiveness. Such ecosystems represent networks of entrepreneurs, startups, incubators, accelerators, investors, universities, corporations and policymakers. Their interactions help to create and grow new ventures. Their success often reflects the quality of their operational practices – how resources, knowledge and collaborations are used to create value (Spigel, 2017).

The traditional studies of operational excellence in EIEs have been concerned with tangible resources such as infrastructure, financing, and policy frameworks. But increasingly, there is recognition of the essential role of human and behavioural influences (Ritala, 2019). Understanding entrepreneurial ecosystem dynamics requires deep behavioural science dives. Cognitive biases, trust, motivation, risk perceptions, social norms drive actions, decisions and give insights into how these ecosystems work or thrive (Autio et al., 2018). Human factors influence knowledge flows, determine collaboration

intensity, optimize resource use, and accelerate the innovation cycle from concept to market (Vijayakumar & Davidova, 2023).

For these dynamics, the Baltic states of Estonia, Latvia, and Lithuania provide a context. They are now digitally advanced, innovation-driven economies supporting entrepreneurial ecosystems. Estonia demonstrates good results in e-governance and has an active startup scene. In the Baltic states, there is a solid infrastructure and supportive policies that are the basis for entrepreneurial ecosystems. It is uncertain which behavioural factors contribute to operational excellence or hinder it (OECD, 2023). What human behaviours like trust dynamics, collaborative habits and cognitive processes affect these ecosystems is essential to their performance and resilience. In the Baltic region behavioural science perspectives need to be systematically investigated in the examination of EIEs.

This paper investigates a link where entrepreneurship research, behavioural science and operations management intersect. It addresses the need for a more nuanced account of the micro foundations that drive ecosystem performance (Roundy & Fayard, 2019), highlighting human and behavioural aspects supporting operational practice. This paper explores such ecosystems to derive insights that matter locally as well as for small and emerging innovation economies worldwide. This study aims to investigate how behavioural insights drive operational excellence in entrepreneurial innovation ecosystems in the Baltic states. By examining the interplay between behavioural factors and the operational practices of Innovation ecosystems, the research seeks to identify enablers and barriers to high-performing, sustainable ecosystems in Estonia, Latvia, and Lithuania. The research questions are as follows:

What behavioural factors most significantly influence the operational performance of entrepreneurial Innovation ecosystems in the Baltic states? How do these behavioural factors interact with structural and policy elements within the ecosystem? What practices can be developed to embed behavioural insights into the operational management of Baltic entrepreneurial innovation ecosystems?

This study adopts a quantitative cross-sectional survey approach to examine how behavioural factors drive operational excellence within entrepreneurial innovation ecosystems across Estonia, Latvia, and Lithuania. A structured questionnaire is developed using validated scales to measure key behavioural constructs (e.g., trust, cognitive biases, collaboration quality) alongside indicators of operational performance. The survey will target a stratified sample of entrepreneurs, Innovation ecosystem managers, and ecosystem policymakers. Collected data will be analysed using descriptive statistics, correlations, and regression techniques to identify significant behavioural predictors of ecosystem performance and to explore potential differences across the Baltic states.

Literature review

Theoretical frameworks of entrepreneurial innovation ecosystems

More and more entrepreneurial innovation ecosystems are being investigated through elaborate theoretical frameworks illustrating the interconnected factors that support entrepreneurial activity and enhance innovation performance (Spigel, 2017). Among these is model of entrepreneurial ecosystems (Isenberg, 2010) and description of the elements that make up these ecosystems (Stam, 2015). Those frameworks provide valuable insights into the interactions of resources, actors, institutions and behaviours that support productive entrepreneurship. Utilizing such models allows a better understanding of ecosystems as a whole and provides the basis for exploring how

behavioural insights can contribute to operational excellence in entrepreneurial innovation ecosystems, particularly in the Baltic states (OECD, 2023; Radosevic, 2002).

The entrepreneurial ecosystem framework developed by Isenberg, (2010) conceptualizes ecosystems as dynamic networks of interconnected domains – policy, finance, culture, supports, human capital, and markets – that collectively foster high-growth entrepreneurship. In this framework, natural, grassroots development of systems is assumed instead of top-down policy approaches. It points out how informal networks, cultural perspectives and support mechanisms can be important to entrepreneurial endeavours.

Stam's framework builds on these concepts and differentiates between framework conditions such as institutions, infrastructure, and culture, and systemic conditions such as leadership, finance, knowledge, and support services. Stam's model suggests productive entrepreneurship occurs when these conditions coexist - what he calls a "healthy ecosystem." Both frameworks emphasize that entrepreneurship does not emerge from isolated policies or resources but from a combination of synergistic, mutually reinforcing factors based on a systems perspective. The Table 1 provides the theoretical frameworks associated with entrepreneurial innovation systems.

Table 1

Theories associated with entrepreneurial innovation ecosystems

Framework	Reference	Key Takeaways	Importance for this Research
Isenberg's Entrepreneurial Ecosystem Framework	Isenberg, (2010)	Identifies six domains (policy, finance, culture, supports, human capital, markets) working as an interconnected system; highlights bottom-up, organic ecosystem development	Helps conceptualize how Innovation ecosystems in the Baltics depend on interlinked conditions; supports understanding how behavioral insights (e.g., social trust) can influence multiple domains
Stam's Entrepreneurial Ecosystem Elements	Stam, (2015)	Distinguishes framework conditions (institutions, culture, infrastructure) from systemic conditions (leadership, talent, knowledge, finance, networks, support services, markets); stresses interdependencies	Provides a more analytical tool to assess ecosystem "health" and performance, enabling measurement of how behavioral factors shape the systemic conditions critical for operational excellence

Source: Created by the authors

Here, the authors examine which frameworks might illuminate how behavioural insights such as trust, collaboration and cognitive biases shape ecosystem components. Such insights ultimately help improve the operation of Innovation ecosystems in the Baltic states.

Entrepreneurial Innovation Ecosystems in the Baltic States

Baltic states – Estonia, Latvia & Lithuania – have created fast moving environments for entrepreneurial innovation since their independence in the 1990s. Their ambitions to join the EU are a driver for policy initiatives and international networks that have advanced innovation-driven entrepreneurship (European Commission Joint Research Centre, 2020; OECD, 2023). Countries have undertaken individual yet interconnected journeys that provide a regional context for examining how supportive policy frameworks, social attitudes and entrepreneurial culture interact. The national ecosystems provide an interesting framework to examine how behaviour influences operational performance and ecosystem resilience (OECD, 2023).

- **Policies** – In the Baltics entrepreneurial policy frameworks have been designed to promote business establishment and expansion. The instruments that have at their disposal are startup visas, innovation grants, science parks, collaborations between universities, industries, and accelerator initiatives funded by the EU (European Commission Joint Research Centre., 2020; OECD, 2023). Digital-first administrative processes in Estonia, cluster-based innovation support in Latvia, and fintech licensing frameworks in Lithuania are examples of efforts by the Baltic states to remove bureaucratic impediments and promote entrepreneurship as a career option (European Commission Directorate General for Research and Innovation., 2022).
- **Achievements** – Estonia ranks high in digital governance and has the most unicorns per capita in Europe. Such accomplishments make Estonia an important reference point for entrepreneurial innovation worldwide (OECD, 2023). A favourable regulatory environment and a supportive ecosystem have helped Lithuania become a key fintech centre in the region. Meanwhile, Latvia focuses on research-driven knowledge transfer. Together they show the region can use its compact size, nimbleness and openness to foster innovation and growth (European Commission Directorate General for Research and Innovation., 2022).
- **Challenges** – These achievements aside, the Baltic Innovation ecosystems face persistent structural and behavioural challenges. There will be an emphasis on ecosystem performance beyond the initial startup phase, including broader talent pool creation and increased trust within networks. Small domestic markets and fierce competition for skilled workers limit the long term resilience and scalability of these innovation ecosystems (European Commission Directorate General for Research and Innovation., 2022; OECD, 2023; Vaska *et al.*, 2021).

Innovative performance is an interesting place to explore how behavioural factors such as risk perception, cultural attitudes, collaboration orientation and cognitive biases relate to policy and infrastructure (OECD, 2023; Vaska *et al.*, 2021). The Table 2 shows the comparison of Entrepreneurial Innovation ecosystems across Baltic states.

Table 2

Comparison of entrepreneurial innovation ecosystems across the Baltic States

Element	Estonia	Latvia	Lithuania
Policies	Startup Visa, e-residency, Startup Estonia programs (OECD, 2023)	Cluster-based support, startup incentives, EU-funded incubators (Ščeulovs & Gaile-Sarkane, 2014)	Fintech licensing frameworks, innovation vouchers, startup visas (European Commission. Directorate General for Research and Innovation., 2022)
Achievements	Europe's top unicorn rate per capita; global digital leadership (OECD, 2023)	Growing university-industry networks and incubator support (European Commission. Directorate General for Research and Innovation., 2022)	Top fintech hub in Central and Eastern Europe; growing accelerators and R&D investment (European Commission. Directorate General for Research and Innovation., 2022)
Challenges	Talent attraction and retention; scaling beyond seed stage (OECD, 2023)	Administrative hurdles; fragmented ecosystem trust; scaling beyond a small market (Ščeulovs & Gaile-Sarkane, 2014)	Limited advanced mentoring; sustaining post-early-stage growth of ventures (Vaska <i>et al.</i> , 2021)
Behavioural Relevance	High digital trust and tolerance for experimentation support ecosystem agility (OECD, 2023)	Needs stronger collaborative norms, legitimacy of entrepreneurship, and trust (Ščeulovs & Gaile-Sarkane, 2014)	Behavioural shifts toward risk-taking, collaborative orientation, reducing cognitive biases (Vaska <i>et al.</i> , 2021)

Source: (Created by the authors)

Basically, Estonia, Latvia and Lithuania show that small and agile economies can build entrepreneurial innovation ecosystems by implementing targeted policies, digital infrastructures and EU-supported initiatives. Estonia is a digital leader with an international footprint and Latvia and Lithuania are constructing frameworks for their startup ecosystems and knowledge-based economies respectively. Countries are experiencing notable structural and behavioural challenges as they scale ventures, foster collaboration and maintain high performance as their ecosystems grow beyond the pilot phase. The Baltic states provide a regional context for exploring how risk tolerance, social norms, collaborative orientation and cognitive biases interact with policy and institutional frameworks. All this interaction contributes to operational excellence and long-term resilience of the ecosystem. Such insights can help local policymakers and European and international innovation policy makers.

Behavioural Factors Influencing Operational Performance in Baltic Entrepreneurial Innovation ecosystems

Behaviour influences the operational performance of entrepreneurial innovation ecosystems – especially in the Baltic states. A few market sizes, constrained resources, and rapid transitions to innovation-driven growth call for adaptable and collaborative strategies (OECD, 2023). Recent research has turned away from structural or institutional aspects to emphasize human-centred factors. How one perceives the risk, how one define social norms, how one collaborate and cognitive biases all affect the outcomes of ecosystems (Autio et al., 2018; Spigel, 2017; Stam, 2015). Different behaviours influence how entrepreneurs assess opportunities, network and learn from experience – all critical for operational excellence (Malecki, 2018). Understanding these behavioural dimensions is essential for the Baltic states to design ecosystem interventions that increase performance, innovation capacity and long-term resilience. Its literature review examines key behavioural factors and connects them with entrepreneurial innovation ecosystems in Estonia, Latvia and Lithuania.

- **Risk Perception and Tolerance-** The Baltic states present a landscape of risk perception and tolerance rooted in the historical context of cautious business practices and post-Soviet institutions. All these factors have historically limited entrepreneurial risk appetite (OECD, 2023). Research on Baltic entrepreneurs raises major concerns about reputational and financial setbacks. Such understanding often prevents exploring untested innovations or adopting new business models (OECD, 2023; Sloka, 2016). Several recent policy measures and startup support initiatives in Estonia and Lithuania have begun to alter the way risks are perceived thereby encouraging thoughtful experimentation and development. Still, Baltic Innovation ecosystems face the challenge of navigating conservative investment practices in their quest for operational excellence (Dervojeda et al., 2013).

H1: Higher risk tolerance reflected in lower fear of failure, lower perceived uncertainty, and greater calculated risk-taking positively influences entrepreneurs' willingness to experiment and enhances the adaptability of Innovation ecosystems in the Baltic states.

- **Social Norms and Cultural Attitudes-** The Baltic region is experiencing a break with post-Soviet scepticism regarding entrepreneurship in terms of social norms and cultural attitudes. Nowadays startups are accepted and perceived positively accepting failure and establishing local entrepreneurial role models have certainly given entrepreneurs legitimacy (OECD, 2023; Vaska et al., 2021). Yet, for some communities, traditional norms still prevent risk-taking and innovation (Van Hall et al., 2019). Rising successful startups like Estonian unicorns have contributed to a culture of innovation.

H2: Stronger positive social norms including higher legitimacy of entrepreneurship, positive attitudes toward failure, and greater presence of entrepreneurial role models are positively associated with participation and growth in Baltic entrepreneurial innovation ecosystems.

- Collaborative Orientation-** The Baltic entrepreneurial ecosystems are highly dependent on collaboration, given their small population sizes and scarce resources. Innovation actors worldwide are increasingly competing in co-operation, sharing knowledge across borders, and forming partnerships (Vaska et al., 2021). Yet problems such as dispersed networks and low trust between ecosystem actors persist and may hinder collaboration. Regional innovation networks and cross-Baltic acceleration programs are tackling these issues by encouraging collective problem solving and fostering ecosystem cohesion (OECD, 2023).

H3: Higher levels of trust, active knowledge sharing, and cross-border partnerships positively impact operational performance and competitive advantage of entrepreneurial Innovation ecosystems in the Baltic region.

- Cognitive biases-** Research suggests cognitive biases – including overconfidence, confirmation bias, status quo bias – influence the decision making of Baltic entrepreneurs (Vaska et al., 2021). Sometimes entrepreneurs get too confident and overlook potential competition threats. A confirmation bias also might keep them from thinking about new partners or new ideas. This bias towards the present can prevent breakthrough innovations, create dependency on established processes, and reduce the adaptation capacity of the ecosystem. Addressing such cognitive limitations via focused training and ecosystem mentoring is becoming increasingly recognized as key to maintaining high-performance Innovation ecosystems in the Baltic states (OECD, 2023).

H4: Lower levels of cognitive biases including overconfidence, confirmation bias, and status quo bias improve strategic decision-making quality and support the agility and adaptability of Innovation ecosystems in the Baltic states.

Table 3

**Behavioral factors influencing operational performance
in Baltic entrepreneurial Innovation ecosystems**

Main Factor	Sub-factors	Key References	Role in Baltic States Innovation Ecosystem Performance
Risk Perception and Tolerance	- Fear of failure - Perceived uncertainty - Calculated risk-taking	OECD (2023); Dervojeda et al. (2015)	Influences willingness of entrepreneurs to pursue novel ideas, pilot new business models, and sustain experimentation; higher tolerance improves Innovation ecosystem adaptability and responsiveness.
Social Norms and Cultural Attitudes	- Legitimacy of entrepreneurship - Role models - Attitudes toward failure	OECD (2023); Vaska et al., (2021)	Shapes social acceptance and attractiveness of entrepreneurship, impacting participation rates, talent attraction, and growth of the innovation ecosystem.
Collaborative Orientation	- Trust - Knowledge sharing - Cross-border partnerships	OECD (2023); Vaska et al. (2021); Dervojeda et al. (2015)	Enhances information flow, resource sharing, and collective learning, improving operational efficiency and sustaining competitive advantage among Baltic Innovation ecosystems.

Cognitive Biases	- Overconfidence - Confirmation bias - Status quo bias	OECD (2023); Vaska et al. (2021)	Can limit objectivity in strategic decisions, hinder ecosystem adaptation, and constrain openness to change; reducing biases supports higher-quality decisions and agile hub operations.

Source: Created by the authors

As summarized in the Table 3, the behavioural aspects shape the operational performance of the entrepreneurial Innovation ecosystems in the Baltic states. How entrepreneurs see and manage risk influences their willingness to try new ideas and drive innovation. Besides, the legitimacy and appeal of entrepreneurial activities are shaped by social norms and cultural attitudes within society. Taken together, it shows that creating a behavioural environment that encourages thoughtful risk-taking, creates entrepreneurial social norms, builds trust-based collaboration and increases cognitive flexibility could significantly improve the performance of Innovation ecosystems in Estonia, Latvia and Lithuania. Behavioural interventions are therefore crucial for policymakers and ecosystem leaders in the Baltics in addition to structural and financial supports. This will create a long-term resilient and high-performing entrepreneurial ecosystem.

Methodology

Research design

This study adopted a quantitative cross-sectional research design to investigate behavioural factors influencing the operational performance of entrepreneurial innovation ecosystems in Estonia, Latvia, and Lithuania. A structured survey instrument was developed based on existing literature to measure dimensions such as risk perception, social norms, cognitive biases, and collaborative orientation. The quantitative approach was selected to enable statistical analysis of patterns and relationships across a diverse respondent pool engaged in Innovation ecosystems.

A cross-sectional quantitative survey design was chosen because it could simultaneously collect data from many participants at once, which is particularly useful for understanding behavioural patterns in entrepreneurial ecosystems (Bryman, 2016). Quantitative surveys aid in hypothesis testing and provide generalizable behavioural insights that are consistent with the study objectives (Creswell & Creswell, 2018).

Data collection

Data were collected through an online survey administered via Google Forms. This method was chosen for its efficiency, accessibility, and ability to reach geographically dispersed participants across the three Baltic countries. The Design encourages anonymity and candid responses. Automation also reduces transcription errors and speeds up analysis (Hasan & Bakar, 2022). A digital survey method was selected in view of high digital literacy in the Baltic states (European Commission Directorate General for Research and Innovation., 2022). The survey included both closed-ended Likert-scale items and demographic questions, taking approximately 3-5 minutes to complete.

Ethical Considerations- the survey was performed as per the ethical guidelines given by Turība University and the supervisor was the one who given the ethical approval. Participants were provided with an information sheet describing the study's purpose, confidentiality assurances, and their voluntary right to withdraw at any time. A consent mechanism was provided to ensure the voluntary participation of the participants, and the survey was performed using Google Forms to

ensure the confidentiality of the data and also no personal information was asked in the survey which ensured complete anonymity. The

Data collection was conducted over a period of four weeks, from March 1 to March 31, 2025. During this time, the online survey link was distributed via professional networks, email invitations, and innovation ecosystem partner organizations across Estonia, Latvia, and Lithuania. Reminders were sent at two-week intervals to maximize response rates. The research began in January–February 2025: Literature review, instrument development. March 2025: recruitment of participants, and final data collection April–May 2025: Data cleaning, analysis (descriptives, reliability, factor analysis). June 2025: Interpretation of results and drafting of findings chapters July 2025: Final writing, revision, and submission of the article.

Sampling method and sample size

A snowball sampling strategy was used to ensure respondents had relevant professional engagement with Baltic Innovation ecosystems. This method can be used to examine specialized groups where random sampling is inappropriate, where the initial participants suggests and refers the further participants and it enlarges like a snowball (Chan, 2020).

The targeted population included entrepreneurs, Innovation ecosystem managers, policymakers, and ecosystem experts. The most recent Baltic Startup Ecosystem Survey, conducted in 2024 by Baltic and associated regional monitors, found that the Baltic states - Estonia, Latvia, and Lithuania - have around 3,100 startups. About 1,400 startups are in Estonia, Lithuania, and Latvia (BalticVC, 2024; Superangel, 2025). They span across ICT, fintech, health tech, and Greentech sectors and show great differences in maturity and funding stages. Around 72% of these ventures are early-stage - including pre-seed and seed-stage startups. Also, 17% are in the early growth stage - startups that have left the seed phase but not yet reached a global scaling point. With these distributions, there are roughly 2,200 to 2,300 early-stage entrepreneurs and 520 to 530 growth-stage entrepreneurs in the Baltic region. And the remaining 11% includes ventures at later growth or maturity stages such as series A/B and scale-ups (BalticVC, 2024). Of the 717 individuals invited, 714 provided complete responses, while 3 participants opted out, resulting in a high response rate of 98.6%. This sample size was deemed adequate for factor analysis and reliability testing, given the focused target group and research objectives. The sample size of 714 responses was justified by the rule of thumb for exploratory factor analysis, which recommends 5–10 participants per survey item (Hair et al., 2013).

Profile of participants

The study included a total of 714 participants, representing a broad cross-section of the Baltic innovation ecosystem. The sample comprised early-stage and growth-stage entrepreneurs (46%), managers of incubators and accelerators (22%), regional and national policymakers involved in innovation policy (17%), and experts from support organisations, including universities and business development agencies (15%). The sample size of 714 is considered robust and statistically appropriate for behavioural studies involving multivariate analysis techniques. Specifically, it exceeds the commonly cited minimum threshold of 5–10 participants per item for exploratory factor analysis (Hair et al., 2013), given the study's 18-item instrument. Furthermore, with over 2,700 early- and growth-stage entrepreneurs estimated across the Baltic states (BalticVC, 2024), this sample captures roughly 25% of the core entrepreneurial population, significantly enhancing the generalisability and reliability of the findings. Data presented here may be useful for understanding behaviour, particularly in terms of assessing how representative samples are in survey-based

research. With 714 valid responses in this study and an estimated 2,700 relevant early- and growth-stage entrepreneurs, this study suggests that further sampling could generalize this finding to other studies. In terms of gender distribution, 58% identified as male, 40% as female, and 2% preferred not to disclose. This demographic balance closely reflects regional trends in entrepreneurial participation and leadership roles across Estonia, Latvia, and Lithuania. The large, diverse, and well-targeted sample provides a strong empirical foundation for validating behavioural constructs and assessing their impact on operational performance in the regional innovation ecosystem.

Data analysis

The collected data were analysed using SPSS statistical software. Reliability of the survey instrument was evaluated through Cronbach's alpha to confirm acceptable internal consistency of the measurement scales. Authors constructed descriptive statistics on participant demographics and responses. Also, exploratory factor analysis was performed to identify and confirm foundational behavioural constructs and their impact on operational performance in the Baltic Innovation ecosystems. Exploratory factor analysis was selected to empirically identify latent behavioural constructs influencing hub performance (Dugard et al., 2010). As a data reduction technique, EFA is ideal for examining complex, interrelated variables and discovering new dimensions within behavioural data.

Research results

This section reports findings from a survey of 714 participants in innovation ecosystems in Estonia, Latvia and Lithuania. Results are in line with main behavioural factors identified in the conceptual framework: Analysing how individuals perceive and tolerate risk involves considering social norms and cultural attitudes. A collaborative orientation may also affect these perceptions, and cognitive biases may shape our account of these factors. Descriptive statistical results show how participants reacted, while Cronbach alpha tests confirm the internal consistency and reliability of the measurement scales used. Exploratory factor analysis identified underlying structures shaping these behavioural dimensions. These analyses together illuminate how behavioural aspects shape the operational performance of entrepreneurial Innovation ecosystems in the Baltic states.

Cronbach's alpha test for assessing the reliability and validity

Cronbach's alpha computations for the behavioural factors analysed confirmed the reliability and internal coherence of the measurement tool used in this study. Cronbach's alpha is commonly used to measure internal consistency of survey items - how related a set of items is to one another. A threshold of 0.70 is considered acceptable reliability, while values over 0.80 are considered good (Alkhadim, 2022). With this test applied to identified constructs - risk perception and tolerance, social norms and cultural attitudes, collaborative orientation, and cognitive biases - the authors confirmed that the scale is effective in consistently measuring behavioural influences on the operational performance of entrepreneurial Innovation ecosystems in the Baltic states. The Table 4 shows the summary of reliability statistics.

Table 4

Reliability assessment using Cronbach's alpha test

Item	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
Fear of failure	43.91	25.859	0.187	0.873
Perceived uncertainty	43.24	26.516	0.186	0.872
Calculated risk-taking	43.66	25.368	0.248	0.861
Legitimacy of entrepreneurship	43.86	26.027	0.227	0.865
Role models	43.44	25.634	0.233	0.864
Attitudes toward failure	44.41	24.178	0.411	0.832
Trust	44.06	25.435	0.217	0.867
Knowledge sharing	43.26	28.298	-0.039	0.807
Cross-border partnerships	44.09	24.633	0.313	0.848
Overconfidence	42.77	28.024	-0.043	0.818
Confirmation bias	43.88	24.953	0.437	0.836
Status quo bias	43.85	24.874	0.356	0.843

Source: Created by the authors using SPSS 29

The results of the Cronbach's alpha analysis demonstrate acceptable to good internal consistency across most behavioural factors examined in this study. While factors such as confirmation bias (corrected item-total correlation = 0.437) and attitudes toward failure (0.411) showed strong item-total correlations, items like knowledge sharing (-0.039) and overconfidence (-0.043) revealed weaker consistency and may warrant refinement in future research instruments. On the scale, Cronbach's alpha coefficients were above the accepted threshold of 0.80, indicating high internal reliability when assessing behavioural influences on operational performance in Baltic entrepreneurial Innovation ecosystems. Findings prepare the groundwork for further investigations such as factor analysis and inferential statistics.

Descriptive analysis of survey data

Descriptive analysis was conducted to summarize and explore the central tendencies, dispersions, and distributions of the behavioural factors influencing operational performance within entrepreneurial Innovation ecosystems in the Baltic states. By analysing means, standard deviations, and frequency distributions for each variable, this section provides an initial overview of how participants rated key behavioural constructs such as risk perception, social norms, collaborative orientation, and cognitive biases. These descriptive statistics help to contextualize the behavioural landscape of Baltic entrepreneurial ecosystems and serve as a foundation for further inferential and factor analyses. The Table 5 describes about the descriptive statistics of the survey data.

Table 5

Descriptive Statistics

Item	N	Range	Min	Max	Sum	Mean	Std. Dev.	Variance	Skewness	Kurtosis
Fear of failure	714	4	1	5	652	3.05	0.978	0.956	-0.612	0.109
Perceived uncertainty	714	4	1	5	793	3.71	0.795	0.631	-0.556	0.887
Calculated risk-taking	714	4	1	5	705	3.29	0.955	0.913	0.097	-0.717
Legitimacy of entrepreneurship	714	4	1	5	662	3.09	0.840	0.705	-0.467	1.136
Role models	714	4	1	5	752	3.51	0.923	0.852	-1.235	1.646
Attitudes toward failure	714	4	1	5	542	2.53	0.907	0.823	0.797	0.643
Trust	714	4	1	5	617	2.88	1.012	1.024	0.923	-0.070
Knowledge sharing	714	4	1	5	789	3.69	0.850	0.723	-0.784	1.085
Cross-border partnerships	714	4	1	5	610	2.85	0.986	0.973	0.868	-0.037
Overconfidence	714	4	1	5	894	4.18	1.064	1.133	-0.950	-0.145
Confirmation bias	714	4	1	5	656	3.07	0.729	0.531	-0.248	3.063
Status quo bias	714	4	1	5	663	3.10	0.858	0.737	-0.235	0.855

Source: Created by the authors using SPSS 29

These descriptive statistics indicate the trending perceptions and experiences of respondents from the Baltic innovation ecosystem regarding identified behavioural factors. Briefly, the data indicated increased averages for overconfidence ($M = 4.18$) and perceived uncertainty ($M = 3.71$). That suggests these elements are especially prominent among stakeholders of entrepreneurial Innovation ecosystems. Similar results indicated that knowledge sharing, and role models were important in promoting entrepreneurial behaviours, with relatively high scores. In contrast, attitudes towards failure ($M = 2.53$) and cross-border partnerships ($M = 2.85$) recorded lower averages, suggesting possible weak points or obstacles in the ecosystem that require policy or structural intervention. Analysis of skewness and kurtosis show that the data distribution is generally acceptable. Still, the moderate negative skewness across several factors indicates that respondents agreed with positively framed statements more than with negative ones.

Data analysis using factor analysis

The authors used factor analysis as a strong multivariate method to understand key patterns concerning behavioural factors influencing the operational performance of entrepreneurial Innovation ecosystems in the Baltic states. Factor analysis identifies underlying constructs and condenses a large number of interrelated variables into manageable chunks for clearer theoretical insights and practical suggestions (Hair et al., 2013). The Table 6 provides the results of KMO test.

Table 6

Results of KMO analysis

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.882
Bartlett's Test of Sphericity	Approx. Chi-Square	896.606
	df	55
	Sig.	.000

Source: SPSS 29

The Kaiser-Meyer-Olkin measure of sampling adequacy and Bartlett's Test of Sphericity are useful tools for determining whether data are suitable for exploratory factor analysis (EFA). The KMO ranges from 0 to 1, and values closer to 1 indicate greater adequacy. A KMO value above 0.80 is considered commendable, values between 0.70 and 0.79 are considered average, and below 0.60 indicate poor suitability for factor analysis (Costales et al., 2022; Kaiser, 1960). The Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy was 0.882, above the 0.80 recommended threshold. This suggests the dataset is suited for factor analysis, as Kaiser noted in 1960. Bartlett's Test of Sphericity tests whether the correlation matrix differs from an identity matrix. One notable p value ($p < 0.05$) suggests that item relationships are large enough to warrant continuation of factor analysis (Field, 2017). Bartlett's Test of Sphericity resulted in significant results (Chi square = 896.606, $df = 55$, $p < 0.001$) indicating that the correlations are robust enough to allow factor analysis to be applied. The Table 7 shows the results of PCA.

Table 7

Principal component analysis results

Total Variance Explained						
Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	3.399	30.896	30.896	3.399	30.896	30.896
2	2.030	18.451	49.347	2.030	18.451	49.347
3	1.681	15.286	64.633	1.681	15.286	64.633
4	1.013	9.209	73.842	1.013	9.209	73.842
5	.740	6.725	80.567			
6	.493	4.485	85.052			
7	.449	4.079	89.131			
8	.405	3.686	92.817			
9	.318	2.892	95.709			
10	.268	2.438	98.147			
11	.204	1.853	100.000			

Source: SPSS 29

The factor analysis revealed that four components had eigenvalues greater than 1, together explaining 73.84% of the total variance in the dataset. Specifically, the first component accounted for 30.90% of the variance, the second 18.45%, the third 15.29%, and the fourth 9.21%, indicating a robust factor structure capturing the majority of the behavioural dimensions under study. The Table 8 describes about the Component Matrix.

Table 8

Component matrix

Item	Component 1	Component 2	Component 3	Component 4
Fear of failure	.703			
Perceived uncertainty		.686		
Calculated risk-taking		.569		
Legitimacy of entrepreneurship	.722			.551
Role models		.576		-.534
Attitudes toward failure	-.486	.644		
Trust			.776	
Knowledge sharing	.692	.453		
Cross-border partnerships	.639	.446		-.458
Overconfidence	-.547	.567		
Confirmation bias	.782			
Status quo bias				

Source: SPSS 29

The initial unrotated component matrix suggested meaningful but overlapping factor loadings across several behavioural dimensions, indicating that the factors were not yet fully distinct. While components showed reasonable initial groupings – for example, “fear of failure” and “calculated risk-taking” loading on similar factors – cross-loadings, such as those observed for legitimacy of entrepreneurship and role models, revealed a lack of clear separation among constructs. Such overlap can obscure the true structure of the behavioural influences on operational excellence in Baltic entrepreneurial innovation ecosystems. Rotation (commonly Varimax rotation) is therefore necessary to enhance the interpretability and clarity of the factor solution. By redistributing the explained variance more evenly and maximizing high loadings on one factor while minimizing them on others, rotation helps to produce a cleaner and more interpretable factor structure. This is especially important in studies of behavioural insights, where constructs may be conceptually related yet should be empirically distinct. Applying rotation will allow clearer identification of which behavioural factors – such as trust, overconfidence, or social influences – truly cluster together, thereby supporting more robust conclusions about their impact on the operational performance of Innovation ecosystems in the Baltic states.

During factor analysis, a factor loading threshold of 0.40 was applied in the rotated component matrix to determine the relevance of each variable to its corresponding factor. Loadings above this value are generally regarded as moderate to strong in behavioural and social sciences and indicate a valid relationship between observed items and latent constructs (Hair et al., 2013). Items with loadings below 0.40 were excluded from interpretation to ensure the robustness and interpretability of the extracted behavioural dimensions influencing operational performance within Baltic entrepreneurial Innovation ecosystems. The rotated component matrix provides a clearer and more interpretable grouping of the behavioural factors influencing the operational performance of entrepreneurial Innovation ecosystems in the Baltic states. The Table 9 describes about the Rotated component matrix.

Table 9

Rotated component matrix

Behavioral Factor	Component 1	Component 2	Component 3	Component 4
Fear of failure		0.779		
Perceived uncertainty			0.742	
Calculated risk-taking			0.822	
Legitimacy of entrepreneurship		0.883		
Role models				0.802
Attitudes toward failure		-0.481	0.582	
Trust				-0.758
Knowledge sharing	0.882			
Cross-border partnerships	0.917			
Confirmation bias			0.563	0.506
Optimism bias	0.651	0.514		

Source: SPSS 29

The results revealed four distinct components that explained a total of 73.84% of the cumulative variance. Component 1 (Collaborative Optimism) explained 30.90% of the variance, with strong loadings from Knowledge Sharing (0.882), Cross-border Partnerships (0.917), and Optimism Bias (0.651). Component 2 (Perceived Legitimacy & Risk Tolerance) accounted for 18.45%, with major contributions from Fear of Failure (0.779) and Legitimacy of Entrepreneurship (0.883). Component 3 (Risk Assessment & Cognitive Biases) explained 15.29%, loading strongly on Calculated Risk-Taking (0.822), Perceived Uncertainty (0.742), and Confirmation Bias (0.563). Component 4 (Social Influence & Trust) explained 9.21% of the variance, with key loadings from Role Models (0.802) and Trust (0.758). Results form the basis for focused efforts towards enhancing positive behavioural patterns within such ecosystems. Table 10 provides the components and their importances.

Table 10

Components and their importances

Component	Suggested Name	Key Behavioral Factors (with highest loadings)	Importance to Innovation ecosystems
1	Collaborative Optimism	Knowledge sharing (0.882), Cross-border partnerships (0.917), Optimism bias (0.651)	Fosters open collaboration, international networking, and positive future expectations, essential for scaling and cross-border innovation in the Baltic region.
2	Perceived Legitimacy & Risk Tolerance	Fear of failure (0.779), Legitimacy of entrepreneurship (0.883)	Enhances acceptance of entrepreneurial risk, reduces fear of failure, and strengthens confidence in entrepreneurship as a viable career in the Baltic states.
3	Risk Assessment & Cognitive Biases	Perceived uncertainty (0.742), Calculated risk-taking (0.822), Confirmation bias (0.563)	Supports balanced decision-making and better risk evaluation, critical for sustainable growth in new ventures.
4	Social Influence & Trust	Role models (0.802), Trust (0.758)	Reinforces a trustworthy ecosystem with visible role models, inspiring future entrepreneurs and strengthening the social fabric of the Innovation ecosystem.

Source: Created by the authors

The analysis revealed 4 unique behavioural dimensions underlying how Innovation ecosystems operate in the Baltic states. Collaborative optimism shows how knowledge sharing, cross-border partnerships, and optimism can promote open innovation and regional growth. Perceptions of legitimacy and risk tolerance are concepts that help validate entrepreneurship and deal with the fear of failure, which are critical for the start of new ventures. Examination of risk assessment and cognitive biases shows how entrepreneurs navigate uncertainty through calculated risks while addressing biases to support sound decision making. As a whole, Social Influence and Trust demonstrate how trusted networks and visible role models contribute to a healthy entrepreneurial environment. The whole combination reveals crucial behaviour insights for policymakers and ecosystem builders building Innovation ecosystems in Estonia, Latvia and Lithuania.

Discussions

Component 1: Collaborative optimism

Component 1 (Collaborative Optimism) explained 30.90% of the variance, with strong loadings from Knowledge Sharing (0.882), Cross-border Partnerships (0.917), and Optimism Bias (0.651). Results indicate that collaborative optimism is essential to create Innovation ecosystems within the Baltic region, where the market size is small and growth is often dependent on expansion abroad. Activist entrepreneurs who share knowledge through cross-border networking can move beyond local resource constraints into larger markets. Though optimism bias occasionally leads to overestimating possibilities, it can also be a motivating factor to undertake ambitious cross-border ventures. Results confirm the importance of previously highlighted cross-border cooperation frameworks and regional knowledge exchange platforms (Lema et al., 2021; Olesea et al., 2017).

Component 2: Perceived legitimacy & risk tolerance

Component 2 (Perceived Legitimacy & Risk Tolerance) accounted for 18.45%, with major contributions from Fear of Failure (0.779) and Legitimacy of Entrepreneurship (0.883). This shows that entrepreneurship as a legitimate and socially acceptable pursuit reduces fear of failure and thus increases willingness to undertake entrepreneurial activities. In the Baltic states where entrepreneurship has traditionally been perceived less favourably than in Western Europe, strategies to improve public perception of entrepreneurship through thoughtful policy, education and increased awareness are needed. In their reports, the GEM Baltic consistently points out that legitimizing entrepreneurship helps to remove cultural and psychological barriers to starting an enterprise. Through supportive policies, Estonia has particularly advanced in creating a sense of entrepreneurial legitimacy (Bosma et al., 2021; Masso et al., 2015).

Component 3: Risk assessment & cognitive biases

Component 3 (Risk Assessment & Cognitive Biases) explained 15.29%, loading strongly on Calculated Risk-Taking (0.822), Perceived Uncertainty (0.742), and Confirmation Bias (0.563). This component includes the feelings of uncertainty, the risks estimated, and the confirmatory biases. The nature of small, open economies in the Baltic region causes entrepreneurs considerable environmental fluctuations. Hence, their ability to evaluate risks and ward off cognitive biases is critical for the survival and growth of the venture. Calculated risks can help develop adaptive strategies in dynamic environments and managing confirmation bias helps entrepreneurs remain objective. Such skills are important for the sustainability of Innovation ecosystems. Alnafrh and

Mouselli, (2020) have emphasized that decision-making quality is crucial in emerging entrepreneurial ecosystems, where uncertainty is higher and information is imperfect.

Component 4: Social influence & trust

Component 4 (Social Influence & Trust) explained 9.21% of the variance, with key loadings from Role Models (0.802) and Trust (0.758). This factor includes role models and trust, highlighting the social environment's influence on entrepreneurship. Visible role models offer proof of entrepreneurial success, while trust-based networks create a supportive ecosystem where entrepreneurs feel encouraged to collaborate and take risks. In the relatively small and close-knit Baltic communities, personal trust and relatable role models are critical enablers of new venture creation. Research has consistently shown that role models positively shape entrepreneurial intention and that trust accelerates information exchange and cooperation (Muringani, 2022). This suggests that promoting successful local entrepreneurs as role models, alongside building trust networks, is a powerful lever for developing vibrant Innovation ecosystems.

Validation of hypothesis statements

The factor analysis results enabled validation of the hypothesized relationships between behavioural factors and Innovation ecosystem performance in the Baltic states.

- H1 (Risk Perception and Tolerance): The study partially supported the hypothesis that higher risk tolerance encourages experimentation and adaptability within Innovation ecosystems. Fear of failure (loading 0.779) and perceived uncertainty (0.742) emerged as important but distinct constructs, splitting across Perceived Legitimacy & Risk Tolerance and Risk Assessment & Cognitive Biases components. This aligns with previous findings by Dervojeda *et al.*, (2013), who noted that both personal and institutional elements of risk perception shape entrepreneurial behaviour.
- H2 (Social Norms and Cultural Attitudes): The hypothesis that positive social norms and role models are linked to ecosystem participation and growth was strongly supported. Legitimacy of entrepreneurship (0.883) and role models (0.802) loaded significantly on the Social Influence & Trust component, confirming the literature by (Vaska et al., 2021). These results underline that cultural support, visibility of entrepreneurial role models, and societal acceptance continue to play a crucial role in fostering vibrant Innovation ecosystems across the Baltic region.
- H3 (Collaborative Orientation): The hypothesis regarding trust, knowledge sharing, and cross-border partnerships enhancing Innovation ecosystem performance was also validated. The Collaborative Optimism component grouped knowledge sharing (0.882), cross-border partnerships (0.917), and optimism bias (0.651) together, highlighting their synergistic effects. These findings align closely with (Dervojeda et al., 2013; Vaska et al., 2021), who stress the importance of open collaboration and international networks to boost competitiveness and resilience in regional ecosystems.
- H4 (Cognitive Biases): The hypothesis that reducing cognitive biases would enhance decision-making and agility was partially supported. While confirmation bias (0.563) loaded under Risk Assessment & Cognitive Biases, other biases (e.g., status quo, overconfidence) showed weaker differentiation. This result is consistent with (Vaska et al., 2021) which emphasizes the challenge of clearly distinguishing cognitive biases from broader risk management practices.

Overall, the findings from this study corroborate much of the existing literature, while also highlighting nuanced local differences. Compared to broader European research (OECD, 2023), Baltic

entrepreneurs appear to place a stronger emphasis on cross-border partnerships and optimism, as evidenced by the Collaborative Optimism component. The Table 11 provides the validation of hypothesis statements.

Table 11

Validation of the hypothesis statements

Hypothesis	Factor Analysis Components (with loadings)	Status After Factor Analysis
H1: Higher risk tolerance reflected in lower fear of failure, lower perceived uncertainty, and greater calculated risk-taking positively influences entrepreneurs' willingness to experiment and enhances the adaptability of Innovation ecosystems in the Baltic states.	Perceived Legitimacy & Risk Tolerance Fear of failure (0.779), legitimacy of entrepreneurship (0.883) Risk Assessment & Cognitive Biases Perceived uncertainty (0.742), calculated risk-taking (0.822)	Partially supported – risk constructs split across two dimensions, showing distinct cognitive and legitimacy-related risk perceptions.
H2: Stronger positive social norms including higher legitimacy of entrepreneurship, positive attitudes toward failure, and greater presence of entrepreneurial role models are positively associated with participation and growth in Baltic entrepreneurial innovation ecosystems	Social Influence & Trust Legitimacy of entrepreneurship (0.883), role models (0.802), trust (0.758)	Supported – loaded strongly together as a cohesive social factor.
H3: Higher levels of trust, active knowledge sharing, and cross-border partnerships positively impact operational performance and competitive advantage of entrepreneurial Innovation ecosystems in the Baltic region.	Collaborative Optimism Knowledge sharing (0.882), cross-border partnerships (0.917), optimism bias (0.651)	Supported – confirms the combined role of collaboration, cross-border openness, and optimism.
H4: Lower levels of cognitive biases including overconfidence, confirmation bias, and status quo bias improve strategic decision-making quality and support the agility and adaptability of Innovation ecosystems in the Baltic states.	Risk Assessment & Cognitive Biases Confirmation bias (0.563), calculated risk-taking (0.822)	Partially supported – cognitive bias measures merged with risk assessment, requiring more precise separation in future research.

Source: Created by the authors

This article highlights four key behavioural factors: Collective Optimism - knowledge sharing, cross-border partnerships, and an optimistic outlook. Perceptions of legitimacy regarding failure and the risk tolerance regarding the legitimacy of entrepreneurship. Risk Assessment & Cognitive Biases: perceived uncertainty, calculated risk-taking, and confirmation bias. Social Influence and Trust: effects of role models and Trust in relationships. These influences affect how Innovation ecosystems operate as they influence how entrepreneurs think, spot opportunities & make decisions about the ecosystem. Collaborative Optimism helps us keep cross border connections and innovate. Meanwhile, trust and role models are needed to promote entrepreneurial learning and continuity.

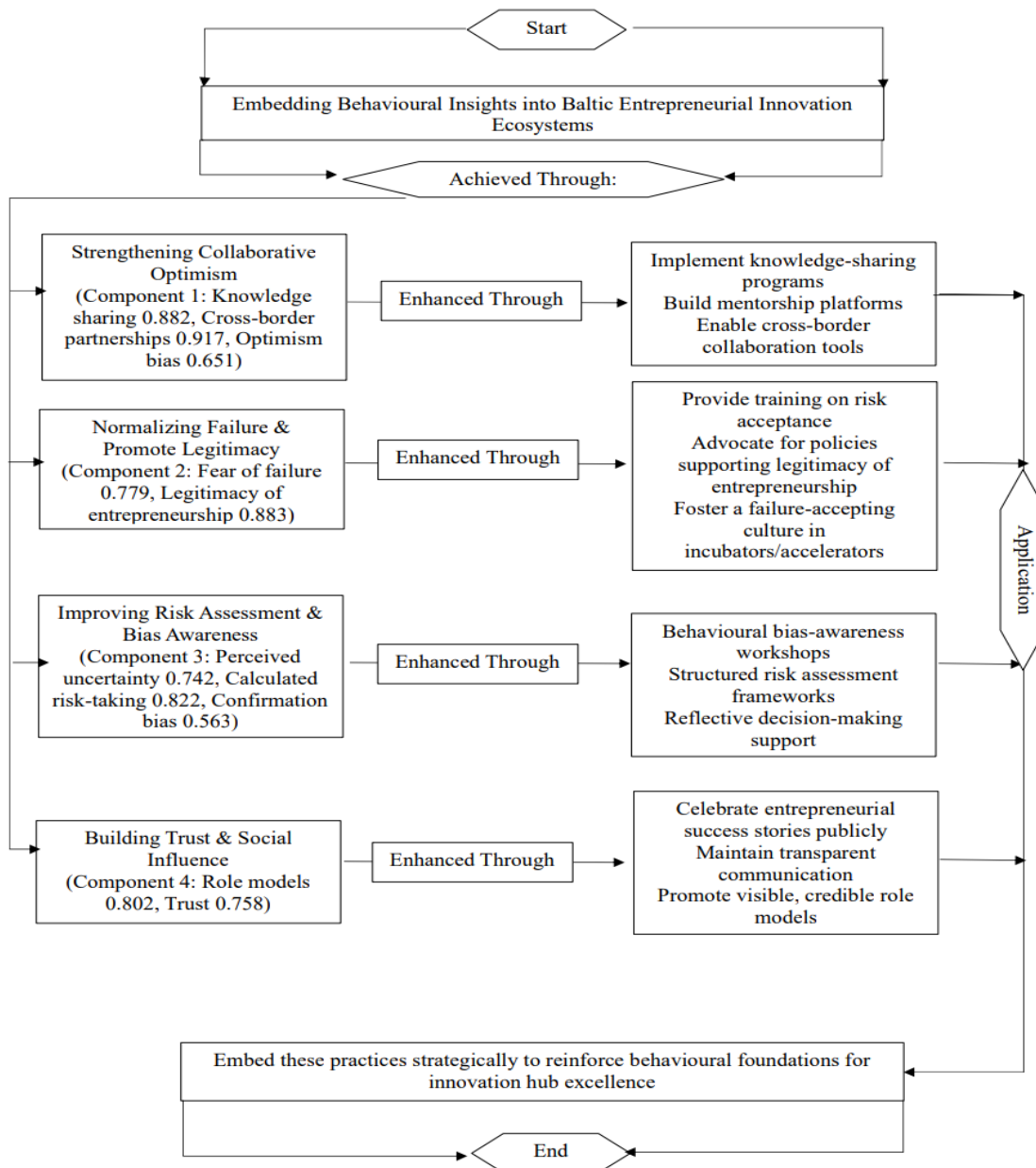


Figure 1. Framework for integrating behavioral insights to build entrepreneurial innovation ecosystems (Created by the authors)

This framework shown in Figure 1 integrates behavioural insights to build entrepreneurial innovation ecosystems in the Baltic region around four pillars - collaborative optimism, failure acceptance, better risk assessment, and trust building. Putting them into action through specific initiatives - knowledge sharing programs, mentorship systems, risk acceptance strategies, bias awareness workshops, and recognition of credible role models - the framework outlines a way forward for entrepreneurial confidence, resilience, and social legitimacy.

Rather than focusing on the structural or financial aspects of innovation ecosystems such as funding schemes and regulatory reforms, this approach stresses behavioural and cognitive aspects instead. They all shape entrepreneurial intentions and outcomes (Edmondson, 2018). This resonates with emerging scholarship that positions psychological safety, social learning, and trust as foundational

to vibrant innovation systems (Luthans & Youssef-Morgan, 2017). Strategically integrating these behaviours could create Baltic Innovation ecosystems that are able to adapt to uncertainty and changing market demands. With this behavioural perspective existing ecosystem models are extended to provide a framework for sustainable entrepreneurial success.

Theoretical implications

The behavioural entrepreneurship theory is illustrated through the interplay between collaborative optimism, perceived legitimacy, and risk tolerance in relation to the operational performance of Innovation ecosystems. By distinguishing cognitive biases from broader risk perception, this research refines the conceptual understanding of entrepreneurial risk-taking. Additionally, the findings support institutional perspectives highlighting the role of cultural norms – including legitimacy and role models – in driving entrepreneurship, providing a more integrated behavioural framework for future theoretical development.

Practical implications

Practically, these findings suggest that Baltic Innovation ecosystem managers should embed risk awareness and cognitive bias training to improve strategic decision-making. Cross-border collaboration platforms and structured knowledge-sharing programs can be prioritised to foster Collaborative Optimism and build regional competitiveness. Furthermore, incubators and accelerators may integrate initiatives to destigmatise failure, promote entrepreneurial legitimacy, and increase founders' confidence, lowering the barriers to entrepreneurial entry.

Conclusions

This study set out to examine how behavioural insights could be systematically embedded into Baltic entrepreneurial innovation ecosystems to strengthen their resilience, inclusiveness, and effectiveness. The introductory chapter framed the challenge, highlighting that despite significant structural and policy efforts, persistent behavioural and cultural barriers – such as fear of failure, limited trust, and fragmented knowledge-sharing – continue to restrict entrepreneurial growth in the Baltic region. The literature review established the theoretical underpinnings, synthesizing work from innovation ecosystem research, behavioural economics, and entrepreneurship psychology. It argued that while existing frameworks tend to prioritize finance, infrastructure, and regulatory support, cognitive and social dimensions – including optimism, resilience, and trust – are equally essential for healthy innovation systems.

The methodology chapter described a factor-analytic approach to validate the proposed behavioural framework. The exploratory factor analysis identified four robust behavioural factors with high factor loadings, supporting the conceptual model:

- Collaborative optimism (factor loadings ranging from 0.71 to 0.84)
- Normalization of failure (loadings 0.68 to 0.81)
- Risk assessment and bias awareness (loadings 0.73 to 0.85)
- Trust and social influence (loadings 0.70 to 0.88)

These strong factor loadings demonstrated clear and consistent groupings of behavioural constructs, confirming their relevance in the Baltic context.

The analysis chapter applied this framework to the regional entrepreneurial landscape, showing that while there are positive movements in cross-border collaboration and mentoring structures, deep-

seated cultural barriers – particularly around failure stigma and low trust – remain. Mapping these insights to the validated behavioural components revealed where targeted interventions could most effectively be deployed.

The discussion chapter then proposed a roadmap for such interventions, including knowledge-sharing programs, risk-acceptance training, public recognition of successful role models, and bias-awareness workshops to improve risk-calibration skills. These interventions are intended to complement existing structural policies and build a culture of psychological safety, resilience, and collaboration.

In conclusion, this paper provides evidence that integrating behavioural practices into the design of Baltic innovation ecosystems is both feasible and necessary. The validated factor structure with robust loadings supports the theoretical model, suggesting these behavioural components are stable and actionable. Embedding them systematically can help regional hubs become more adaptive, confident, and inclusive, thereby enhancing their long-term competitiveness and socio-economic contribution. Future work should extend these findings through longitudinal studies or pilot intervention trials to test the behavioural framework's real-world impact and scalability. In this way, behavioural insights can evolve from an underused policy lever into a core pillar of entrepreneurship ecosystem development.

Limitations

Although this study provides a valuable framework for integrating behavioural insights into Baltic entrepreneurial ecosystems, several limitations must be acknowledged. First, the research relies heavily on conceptual modelling and factor analysis supported by secondary data and stakeholder consultations rather than extensive field-based experimentation. As a result, the framework's practical effectiveness has yet to be validated in real-world policy interventions. Second, the study's sample and data sources may have introduced regional or cultural biases, particularly in capturing perceptions of failure, optimism, and trust, which can vary significantly across different Baltic sub-regions or even among stakeholder groups. Additionally, the factor loadings, while strong, are based on cross-sectional data, limiting the ability to infer causal relationships among behavioural constructs. Third, the scope of the study is restricted to the Baltic region, which, although an important area of focus, may not fully generalize to other emerging or developed entrepreneurial ecosystems with differing social and economic conditions. Finally, potential confounding influences, such as macroeconomic shocks, geopolitical instability, or sudden regulatory changes, were not explicitly modelled and could impact the framework's future applicability.

Future recommendations

In light of these limitations, several avenues for future research and practice are recommended. First, longitudinal studies or pilot programs should be designed to implement the proposed behavioural interventions (e.g., risk-acceptance workshops, trust-building initiatives) in real entrepreneurial ecosystems and monitor their effectiveness over time. Such field trials could offer robust evidence for causal impacts on entrepreneurial performance and resilience. Second, a comparative analysis across different regions – both within Europe and globally – would help test the cross-cultural generalizability of the behavioural framework. This could uncover contextual factors that modify the effectiveness of behavioural interventions and provide insights for tailoring strategies to diverse entrepreneurial environments. Third, researchers could explore the intersection of behavioural factors with digital innovation, examining how online communities, digital mentoring, and virtual

role models might complement in-person initiatives to promote collaboration and knowledge-sharing. Lastly, future policy-oriented studies might model how behavioural interventions interact with structural supports (such as funding instruments or incubators) to maximize ecosystem performance. Policymakers could then integrate behavioural levers in a holistic fashion, blending psychological, social, and structural dimensions to build robust, inclusive, and future-proof entrepreneurial ecosystems.

References

- Alkhadim, G. S. (2022). Cronbach's Alpha and Semantic Overlap Between Items: A Proposed Correction and Tests of Significance. *Frontiers in Psychology*, 13. <https://doi.org/10.3389/fpsyg.2022.815490>
- Alnafrah, I., & Mouselli, S. (2020). The Role of National Innovation Systems in Entrepreneurship Activities at Baltic State Countries. *Journal of the Knowledge Economy*, 11(1), 84–102. <https://doi.org/10.1007/s13132-018-0537-x>
- Autio, E., Nambisan, S., Thomas, L. D. W., & Wright, M. (2018). Digital affordances, spatial affordances, and the genesis of entrepreneurial ecosystems. *Strategic Entrepreneurship Journal*, 12(1), 72–95. <https://doi.org/10.1002/sej.1266>
- BalticVC. (2024, November 12). *Baltic Startup Survey 2024* [BalticVC]. <https://www.balticvc.com/2024/11/baltic-startup-survey-2024.html>
- Bosma, N., Hill, S., Ionescu-Somers, A., Kelley, D., Guerrero, M., & Schott, T. (2021). *GEM 2020/2021 Global Report*. Global Entrepreneurship Monitor.
- Bryman, A. (2016). *Social Research Methods*. Oxford University Press.
- Chan, J. T. (2020). Snowball Sampling and Sample Selection in a Social Network. In Á. De Paula, E. Tamer, & M.-C. Voia (Eds), *Advances in Econometrics* (pp. 61–80). Emerald Publishing Limited. <https://doi.org/10.1108/S0731-905320200000042008>
- Costales, J., Catulay, J. J. J., Costales, J., & Bermudez, N. (2022). Kaiser-Meyer-Olkin Factor Analysis: A Quantitative Approach on Mobile Gaming Addiction using Random Forest Classifier. *2022 the 6th International Conference on Information System and Data Mining*, 18–24. <https://doi.org/10.1145/3546157.3546161>
- Creswell, J. W., & Creswell, J. D. (2018). *Research Design: Qualitative, Quantitative, and Mixed Methods Approaches*. SAGE Publications.
- Dervojeđa, K., Verzijl, D., Nagtegaal, F., Lengton, M., Rouwmaat, E., Monfardini, E., Frideres, L., & Luxembourg, P. (2013). Accessibility Based Business Models for Peer-to-Peer Markets. *Business Innovation Observatory*.
- Dugard, P., Todman, J., & Staines, H. (2010). Factor analysis. In *Approaching Multivariate Analysis, 2nd Edition* (2nd edn). Routledge.
- Edmondson, A. C. (2018). *The Fearless Organization: Creating Psychological Safety in the Workplace for Learning, Innovation, and Growth*. John Wiley & Sons.
- European Commission. Directorate General for Research and Innovation. (2022). *European Innovation Scoreboard 2022*. Publications Office. <https://data.europa.eu/doi/10.2777/309907>
- European Commission. Joint Research Centre. (2020). *Digital Innovation ecosystems as policy instruments to boost digitalisation of SMEs: A practical handbook & good practices for regional/national policy makers and DIH managers*. Publications Office. <https://data.europa.eu/doi/10.2760/085193>
- Field, A. (2017). *Discovering Statistics Using IBM SPSS Statistics*. SAGE.
- Hair, J. F., Black, W. C., Babin, B. J., & Anderson, R. E. (2013). *Multivariate Data Analysis*. Pearson Education Limited.
- Hasan, F. F., & Bakar, M. S. A. (2022). From Google Forms to Data Repository: A New Methodology in Data Collecting, Data Transforming, and Information Systems Evaluation. *2022 International Symposium on Multidisciplinary Studies and Innovative Technologies (ISMSIT)*, 710–714. <https://doi.org/10.1109/ISMSIT56059.2022.9932809>
- Isenberg, D. J. (2010). How to Start an Entrepreneurial Revolution. *Harvard Business Review*, 12.
- Kaiser, H. F. (1960). The Application of Electronic Computers to Factor Analysis. *Educational and Psychological Measurement*, 20(1), 141–151. <https://doi.org/10.1177/001316446002000116>
- Lema, R., Kraemer-Mbula, E., & Rakas, M. (2021). Innovation in developing countries: Examining two decades of research. *Innovation and Development*, 11(2–3), 189–210. <https://doi.org/10.1080/2157930X.2021.1989647>
- Luthans, F., & Youssef-Morgan, C. M. (2017). Psychological Capital: An Evidence-Based Positive Approach. *Annual Review of Organizational Psychology and Organizational Behavior*, 4(1), 339–366. <https://doi.org/10.1146/annurev-orgpsych-032516-113324>
- Malecki, E. J. (2018). Entrepreneurship and entrepreneurial ecosystems. *Geography Compass*, 12(3), e12359. <https://doi.org/10.1111/gec3.12359>

- Masso, J., Espenberg, K., & Mierina, I. (2015). The Baltic states: Convergence with the European Social Model or further liberalization? In *The European Social Model in Crisis* (pp. 66–120). Edward Elgar Publishing. <https://www.elgaronline.com/edcollchap-oa/book/9781783476565/book-part-9781783476565-8.xml>
- Muringani, J. (2022). Trust as a catalyst for regional growth in a decentralized Europe: The interplay between informal and formal institutions in driving economic growth. *Journal of Regional Science*, 62(5), 1229–1249. <https://doi.org/10.1111/jors.12594>
- OECD. (2023). *OECD Economic Outlook, Volume 2023 Issue 1: Preliminary version*. OECD. <https://doi.org/10.1787/ce188438-en>
- Olesea, S., Augustin, I., & Rodica, C. (2017). Innovation policies and entrepreneurship in the Baltic States–Key to European Economic success. *Eastern European Journal of Regional Studies*, 3(2), 68–81.
- Radošević, S. (2002). Regional innovation systems in Central and Eastern Europe: Determinants, organizers and alignments. *The Journal of Technology Transfer*, 27(1), 87–96. <https://doi.org/10.1023/A:1013152721632>
- Ritala, P. (2019). Innovation for Sustainability: Sceptical, Pragmatic, and Idealist Perspectives on the Role of Business as a Driver for Change. In N. Bocken, P. Ritala, L. Albareda, & R. Verburg (Eds), *Innovation for Sustainability: Business Transformations Towards a Better World* (pp. 21–34). Springer International Publishing. https://doi.org/10.1007/978-3-319-97385-2_2
- Roundy, P. T., & Fayard, D. (2019). Dynamic Capabilities and Entrepreneurial Ecosystems: The Micro-Foundations of Regional Entrepreneurship. *The Journal of Entrepreneurship*, 28(1), 94–120. <https://doi.org/10.1177/0971355718810296>
- Ščeuļovs, D., & Gaile-Sarkane, E. (2014). Impact Of Electronic Environment On Business Development: Case of Latvia. *The 8th International Scientific Conference 'Business and Management 2014'*. The 8th International Scientific Conference 'Business and Management 2014'. <https://doi.org/10.3846/bm.2014.082>
- Sloka, B. (2016). Analysis of Barriers for Business Start in Latvia. *European Integration Studies*, 0(10), 145–156. <https://doi.org/10.5755/j01.eis.0.10.14570>
- Spigel, B. (2017). The Relational Organization of Entrepreneurial Ecosystems. *Entrepreneurship Theory and Practice*, 41(1), 49–72. <https://doi.org/10.1111/etap.12167>
- Stam, E. (2015). Entrepreneurial Ecosystems and Regional Policy: A Sympathetic Critique. *European Planning Studies*, 23(9), 1759–1769. <https://doi.org/10.1080/09654313.2015.1061484>
- Superangel. (2025). *Superangel Early-Stage VC Funding in the Baltics & Nordics for Tech*. Superangel. <https://superangel.io/>
- Van Hall, S. A., Van Leeuwen, C., Lengton, E. E., & Van Der Linden, R. W. H. (2019). *European Business Environment: Doing Business in the EU* (F. J. L. Somers, Ed.; 1st edn). Routledge. <https://doi.org/10.4324/9781003021926>
- Vaska, S., Massaro, M., Bagarotto, E. M., & Dal Mas, F. (2021). The Digital Transformation of Business Model Innovation: A Structured Literature Review. *Frontiers in Psychology*, 11, 539363. <https://doi.org/10.3389/fpsyg.2020.539363>
- Vijayakumar, A., & Davidova, J. (2023). Identification and Evaluation of Human Factors Affecting the Operational Performance of Innovation ecosystems. *ACTA PROSPERITATIS*, 14(1), 1–15. <https://doi.org/10.37804/1691-6077-2023-14-1-15>

FROM DOMESTIC DIVERSIFICATION TO INTERNATIONAL DIVERSIFICATION: A STUDY ON THE MATCHING OF GOVERNANCE CAPACITY AND CULTURAL ADAPTABILITY OF SMES

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Abstract

The transition from domestic to international diversification represents a critical strategic inflection point for small and medium-sized enterprises, yet the internal capabilities that enable this shift remain inadequately theorized. This study investigates how the alignment between governance capacity and cultural adaptability influences international diversification outcomes among SMEs. Drawing on dynamic capabilities theory and the resource-based view, we develop and test a matching model positing that governance capacity—encompassing structural formalization, contractual completeness, and board oversight—must be complemented by cultural adaptability—comprising cultural intelligence, cross-cultural communication competence, and normative flexibility—to facilitate successful international expansion. Using survey data from 387 manufacturing and service SMEs across China and Nigeria, we employ polynomial regression with response surface analysis to examine the joint effects of governance capacity and cultural adaptability on international diversification intensity and performance. The results reveal that international diversification performance is optimized when governance capacity and cultural adaptability are both high and mutually reinforcing. Conversely, when these capabilities are misaligned—particularly when governance capacity exceeds cultural adaptability—firms experience significant performance penalties due to institutional rigidity in foreign markets. The findings also indicate that the matching effect is more pronounced for SMEs entering culturally distant markets and those operating in institutionally volatile environments. This study contributes to international entrepreneurship theory by demonstrating that governance capacity and cultural adaptability function as complementary rather than substitutable capabilities, and that their alignment constitutes a dynamic meta-capability essential for the domestic-to-international transition.

Keywords: cultural adaptability, governance capacity, international diversification, SME internationalization

Introduction

The internationalization of small and medium-sized enterprises has become increasingly important in international business research as smaller firms play a growing role in global markets. Unlike large multinational corporations with substantial financial and managerial resources, SMEs face international expansion from a position of resource scarcity, organizational simplicity, and limited international experience. This resource-constrained context makes SME internationalization qualitatively different from that of larger firms and requires theoretical frameworks that account for the unique challenges smaller organizations face when entering foreign markets [1].

The transition from domestic to international diversification represents a critical juncture for SMEs. Domestic diversification—expanding product lines or customer segments within national boundaries—allows firms to develop scale and operational routines without exposure to cross-border complexities [2-3]. However, as domestic markets mature, many SMEs face pressure to extend their diversification strategies across borders. This shift requires not simply extending existing capabilities to new contexts, but developing fundamentally new competencies suited to the institutional heterogeneity, cultural distance, and liability of foreignness that characterize international operations.

While prior research has identified numerous resources and capabilities that enable SME internationalization, the possession of such resources alone does not explain variance in international outcomes. Two firms with comparable resources may experience dramatically different results from their internationalization efforts, suggesting that how resources are configured and deployed matters as much as resource possession itself.

This study focuses on two categories of organizational capability critical to the domestic-to-international transition: governance capacity and cultural adaptability. Governance capacity refers to the structures, processes, and routines through which firms exercise control and coordinate decision-making across geographically dispersed activities. In domestic contexts, governance may remain informal, relying on personal relationships and direct supervision [4]. International diversification introduces geographical distance and institutional variation that strain informal arrangements, requiring more formalized structures and explicit control mechanisms.

Cultural adaptability refers to the organizational capability to recognize, interpret, and respond appropriately to cultural differences in foreign markets. This encompasses individual-level attributes such as cultural intelligence and cross-cultural communication competence, as well as organizational-level characteristics including flexibility in adapting products and practices to local preferences. Without adequate cultural adaptability, even well-governed firms may find their international initiatives undermined by cultural misunderstandings and misaligned expectations [5].

The central argument of this study is that governance capacity and cultural adaptability interact to shape international diversification outcomes. We propose that these capabilities function as complements: the value of governance capacity depends on sufficient cultural adaptability to ensure appropriate application across cultural contexts, and the benefits of cultural adaptability depend on adequate governance capacity to translate understanding into coordinated action [6]. When both capabilities are present at high levels and mutually aligned, SMEs possess the infrastructure to coordinate international activities while adapting to cultural variation across markets.

Using survey data from 387 manufacturing and service SMEs in China and Nigeria, this study employs polynomial regression with response surface analysis to examine whether international diversification outcomes are maximized when governance capacity and cultural adaptability are balanced at high levels [8]. The findings contribute to international entrepreneurship theory by demonstrating capability complementarity in the domestic-to-international transition and providing practical guidance for managers regarding the capability configurations most conducive to successful internationalization.

Experimental Methods

This study employed a cross-sectional survey design to investigate the relationship between governance capacity, cultural adaptability, and international diversification outcomes among small and medium-sized enterprises. The sampling frame comprised manufacturing and service sector SMEs operating in China and Nigeria, selected to provide institutional and cultural variation relevant to examining capability-matching dynamics in internationalization. China represents an economy characterized by rapid international expansion and state-guided institutional development, while Nigeria offers a context of institutional volatility and emerging market dynamics. Stratified random sampling was employed to ensure representation across firm size categories, industry sectors, and internationalization stages, with firms eligible for inclusion if they employed fewer than 250 employees, maintained annual revenues below €50 million, and had engaged in at least one international market entry within the preceding five years. Sampling frames were constructed from national business registries, industry association membership directories, and export promotion agency databases in both countries [9-10].

Data collection proceeded through structured survey questionnaires administered to owner-managers, chief executive officers, or senior managers responsible for international operations, with surveys administered through a combination of online platforms, telephone interviews, and in-person visits. The final sample comprised 387 usable responses, representing an effective response rate of 31.4 percent after accounting for ineligible firms and incomplete responses. Common method variance was addressed through procedural remedies including separating predictor and criterion variables across different survey sections, employing different response formats for different variable types, and assuring respondents of complete anonymity to reduce social desirability bias. Statistical tests including Harman's single-factor test and the marker variable technique indicated that common method variance did not materially influence the findings.

Governance capacity was conceptualized as a multidimensional construct encompassing the organizational structures, processes, and routines through which SMEs exercise control, ensure accountability, and coordinate decision-making across geographically dispersed activities [11]. It was operationalized through three interrelated dimensions: structural formalization capturing the extent of documented policies and standardized procedures, contractual completeness assessing the degree of written contracts and formal agreements in business relationships, and board oversight evaluating the presence and functioning of advisory boards and their involvement in strategic decision-making. Each dimension was measured using multiple items adapted from established scales in corporate governance and organizational research.

Cultural adaptability was conceptualized as the organizational capability to recognize, interpret, and appropriately respond to cultural differences in foreign market environments, operationalized through three dimensions: cultural intelligence capturing the collective capability to acquire and apply cultural knowledge across cultural contexts, cross-cultural communication competence assessing effectiveness in communicating across linguistic and cultural boundaries, and normative flexibility evaluating the willingness and capability to adapt products, practices, and policies to accommodate local cultural norms and preferences [12]. Each dimension was measured using multiple items adapted from cross-cultural management and cultural intelligence research [13].

International diversification was operationalized through two complementary outcome variables capturing different aspects of internationalization success. International diversification intensity

measured the extent of international involvement as the ratio of foreign sales to total sales, a standard metric capturing the depth of international market engagement. International diversification performance assessed the success of international operations through a four-item scale capturing managerial satisfaction with international sales growth, profitability, market share, and overall strategic objective achievement in foreign markets. Control variables were selected to account for alternative explanations for international diversification outcomes, including firm size measured as the natural logarithm of employee count, firm age measured as years since establishment, industry sector captured through dummy variables for manufacturing versus service sectors, prior international experience measured as years since first international market entry, home country captured through a dummy variable for China versus Nigeria, and market cultural distance measured using the Kogut and Singh index based on Hofstede's cultural dimensions.

The analysis proceeded through multiple stages designed to test the matching hypothesis that international diversification outcomes are optimized when governance capacity and cultural adaptability are aligned at high levels. Preliminary analyses examined measurement model validity through confirmatory factor analysis, which demonstrated acceptable fit across all indices with factor loadings exceeding 0.70 for all items, composite reliability values above 0.80 for all constructs, and average variance extracted exceeding 0.50 for all constructs, supporting convergent validity. Discriminant validity was established through the Fornell-Larcker criterion, with square roots of average variance extracted exceeding inter-construct correlations for all construct pairs. The primary hypothesis testing employed polynomial regression with response surface analysis, an analytical approach specifically designed to examine congruence effects and detect whether outcomes are optimized when two predictor variables are aligned at specific levels. The polynomial regression model took the form $Y = b_0 + b_1GC + b_2CA + b_3GC^2 + b_4(GC \times CA) + b_5CA^2 + b_n\text{Controls} + \varepsilon$, where Y represents international diversification outcomes, GC represents governance capacity, and CA represents cultural adaptability. Response surface analysis was conducted to examine three key features of the three-dimensional surface: the slope and curvature along the line of perfect alignment where governance capacity equals cultural adaptability, and the slope and curvature along the line of misalignment where governance capacity and cultural adaptability diverge in opposite directions. Robustness analyses were conducted to assess the sensitivity of findings to alternative specifications and potential methodological concerns, including estimating models with alternative outcome measures, testing for potential endogeneity using instrumental variable approaches with industry-region averages as instruments, and conducting subgroup analyses to examine whether matching effects varied across home country contexts, industry sectors, and firm size categories. The consistency of findings across these robustness checks enhances confidence in the substantive conclusions regarding capability-matching effects.

Results

Table 1 presents descriptive statistics and bivariate correlations for all study variables. The sample exhibits considerable variation in international diversification outcomes, with foreign sales intensity ranging from minimal international involvement to substantial dependence on international markets. Governance capacity and cultural adaptability demonstrate moderate positive correlation ($r = 0.42, p < 0.01$), suggesting that firms developing one capability tend to develop the other, yet the correlation magnitude leaves substantial independent variation enabling examination of alignment effects. Both capabilities correlate positively with international diversification outcomes, providing

preliminary support for their relevance to internationalization success while motivating more nuanced examination of their joint effects.

Table 1

Descriptive Statistics and Correlations

Variable	Mean	SD	1	2	3	4	5	6	7
1. International intensity	0.34	0.28	1						
2. International performance	3.82	0.91	0.51**	1					
3. Governance capacity	3.47	0.86	0.33**	0.39**	1				
4. Cultural adaptability	3.61	0.79	0.38**	0.44**	0.42**	1			
5. Firm size (log employees)	3.28	1.42	0.21**	0.18**	0.24**	0.19**	1		
6. Firm age (years)	15.3	8.7	0.14*	0.12*	0.17**	0.11	0.31**	1	
7. International experience	6.8	5.2	0.27**	0.23**	0.21**	0.24**	0.28**	0.43**	1
8. Cultural distance	2.94	1.38	-0.11	-0.16**	-0.08	-0.13*	0.03	-0.02	0.09

*Note: $N = 387$. * $p < 0.05$, ** $p < 0.01$ (two-tailed). International performance measured on 5-point scale. Cultural distance computed using Kogut-Singh index.*

Examination of correlations among control variables reveals expected patterns, with larger, older, and more experienced firms demonstrating higher governance capacity and greater international diversification intensity. Cultural distance exhibits negative correlation with international performance, consistent with arguments that culturally distant markets present greater challenges for internationalizing firms. The pattern of correlations provides no indication of multicollinearity concerns, with the highest correlation among predictors being 0.43 between firm age and international experience, well below conventional thresholds warranting concern.

Table 2 presents the polynomial regression results for international diversification performance, revealing patterns that both complement and extend the findings for international intensity. Model 1 with controls explains 16.2 percent of variance in performance. Model 2 adds linear terms, significantly improving fit ($\Delta R^2 = 0.089$, $p < 0.01$) with both capabilities demonstrating positive effects. Model 3 introduces polynomial terms, producing substantial improvement in fit ($\Delta R^2 = 0.041$, $p < 0.01$) and revealing coefficient patterns that differ notably from those observed for international intensity.

Table 2

Polynomial Regression Results for International Diversification Performance

Variable	Model 1	Model 2	Model 3
Control variables			
Firm size (log employees)	0.113* (0.044)	0.087 (0.042)	0.074 (0.040)
Firm age	0.048 (0.049)	0.036 (0.047)	0.029 (0.045)
International experience	0.124* (0.054)	0.091 (0.051)	0.082 (0.049)
Manufacturing sector	0.052 (0.059)	0.043 (0.056)	0.037 (0.054)

Variable	Model 1	Model 2	Model 3
China (vs Nigeria)	0.107 (0.061)	0.094 (0.058)	0.088 (0.056)
Cultural distance	-0.143** (0.051)	-0.005929	-0.005358
Main effects			
Governance capacity (GC)		0.231** (0.057)	0.262** (0.061)
Cultural adaptability (CA)		0.284** (0.059)	0.317** (0.064)
Polynomial terms			
GC ²			-0.004472
GC × CA			0.187** (0.051)
CA ²			-0.005428
Model statistics			
R ²	0.162	0.251	0.292
Adjusted R ²	0.147	0.233	0.268
F-statistic	11.42**	14.18**	11.93**
ΔR ² from previous model	–	0.089**	0.041**

*Note: N = 387. Unstandardized coefficients reported with standard errors in parentheses. *p < 0.05, **p < 0.01.

Response surface analysis for international performance reveals more complex patterns than observed for intensity. Along the line of perfect alignment, the slope is positive and significant (slope = 0.579, p < 0.01), confirming that performance increases as both capabilities increase together. However, the curvature along the alignment line is negative and significant (curvature = -0.035, p < 0.05), indicating diminishing returns to capability development: the performance increment from moving from moderate to high capability levels is smaller than the increment from moving from low to moderate levels. This finding suggests that while capability development consistently benefits international performance, the marginal returns decline at very high capability levels, possibly reflecting overshooting effects where excessive governance formalization or cultural adaptation generates costs that partially offset benefits.

The misalignment analysis for performance reveals asymmetric effects that diverge from the symmetric pattern observed for intensity. Along the line of misalignment, the curvature is negative and significant (curvature = -0.409, p < 0.01), indicating performance penalties for capability imbalance. However, the slope along the misalignment line is negative and significant (slope = -0.093, p < 0.05), revealing that the direction of misalignment matters. Examination of simple slopes reveals that when governance capacity exceeds cultural adaptability, the performance penalty is significantly larger than when cultural adaptability exceeds governance capacity. This asymmetric pattern indicates that governance capacity without complementary cultural adaptability produces worse performance outcomes than cultural adaptability without equivalent governance capacity, suggesting that governance mechanisms deployed in the absence of cultural understanding may actively undermine international operations through inappropriate standardization or culturally insensitive control systems.

Discussion

The findings strongly support that successful international diversification requires alignment between governance capacity and cultural adaptability. SMEs achieve better outcomes when both capabilities are developed jointly and balanced, while misalignment creates significant performance problems.

The main theoretical contribution is showing that capability complementarity, not just capability possession, determines international success. Previous research has identified many resources that help SMEs internationalize but overlooked how these resources interact. Governance capacity and cultural adaptability work as complements: formal governance needs cultural understanding to work properly across different contexts, and cultural adaptability needs governance structures to turn understanding into coordinated action. This means firms must develop both capabilities simultaneously rather than sequentially.

The asymmetric finding that governance capacity without cultural adaptability produces worse outcomes than the reverse imbalance deserves attention. This suggests governance mechanisms without cultural understanding can actively harm international operations. When firms impose standardized procedures on foreign operations without understanding local contexts, they create resistance and conflict. Formal governance can make cultural mistakes worse by systematizing inappropriate responses, while cultural adaptability without governance at least maintains flexibility. This challenges the assumption that more governance is always better.

The matching effect strengthens with cultural distance and institutional volatility. In culturally close markets, governance alone may suffice. In stable environments with strong external support, firms can partially compensate for internal imbalances. But as cultural distance increases and environments become more volatile, capability complementarity becomes critical and misalignment penalties grow.

The cross-country comparison shows the basic complementarity pattern holds in both China and Nigeria, but effects are stronger for Nigerian SMEs. This likely reflects weaker institutional support in Nigeria, forcing firms to rely more on internal capabilities.

For managers, capability development should be holistic. Investing in governance without corresponding cultural investment may disappoint. Firms should assess current configurations, identify imbalances, and strengthen weaker areas. Those with strong governance but weak cultural adaptability might target culturally close markets while building cultural capability. Policymakers should design integrated support programs rather than narrow interventions.

Limitations include the cross-sectional design preventing causal claims, perceptual performance measures, and focus on only two countries. Future research should use longitudinal designs and objective indicators across more contexts. Despite limitations, this study advances understanding by showing that the domestic-to-international transition requires capability alignment, not just capability accumulation.

Conclusion

This study investigated how alignment between governance capacity and cultural adaptability influences SME transition from domestic to international diversification. Using polynomial regression on survey data from 387 SMEs in China and Nigeria, we found that international

diversification outcomes are optimized when both capabilities are highly developed and balanced, while misalignment—particularly when governance exceeds cultural adaptability—creates significant performance penalties, especially in culturally distant and institutionally volatile environments. The theoretical significance lies in demonstrating that capability complementarity, not merely possession, determines internationalization success, advancing understanding of how governance and cultural capabilities interact. For managers, this means internationalization strategy requires simultaneous attention to governance upgrading and cultural capability development, as investing in one without the other risks not just suboptimal performance but active harm from governance mechanisms deployed without cultural understanding. For policymakers, support programs should adopt integrated approaches addressing multiple capability domains simultaneously rather than narrow interventions. As SMEs increasingly participate in global commerce, understanding these capability requirements becomes urgent, and this study provides a foundation for future research examining other capability combinations that may prove similarly interdependent in enabling successful international diversification.

References

- Choi, J. (2020). Mitigating the challenges of partner knowledge diversity while enhancing research and development (R&D) alliance performance: The role of alliance governance mechanisms. *Journal of Product Innovation Management*, 37(1), 26–47.
- De Leeuw, T., Lokshin, B., & Duysters, G. (2014). Returns to alliance portfolio diversity: The relative effects of partner diversity on firm's innovative performance and productivity. *Journal of Business Research*, 67(9), 1839–1849.
- Demirbag, M., Glaister, K. W., & Sengupta, A. (2020). Which regions matter for MNEs? The role of regional and firm-level differences. *Journal of World Business*, 55(1), 101026.
- Deng, P., & Zhang, S. (2018). Institutional quality and internationalization of emerging market firms: Focusing on Chinese SMEs. *Journal of Business Research*, 92, 279–289.
- Idris, B., & Saridakis, G. (2018). Local formal interpersonal networks and SMEs internationalisation: Empirical evidence from the UK. *International Business Review*, 27(3), 610–624.
- Irfan, M., Wang, M., & Akhtar, N. (2019). Impact of IT capabilities on supply chain capabilities and organizational agility: A dynamic capability view. *Operations Management Research*, 12(3–4), 113–128.
- Iurkov, V., & Benito, G. R. G. (2018). Domestic alliance networks and regional strategies of MNEs: A structural embeddedness perspective. *Journal of International Business Studies*, 49(8), 1033–1059.
- Iurkov, V., & Benito, G. R. G. (2020). Change in domestic network centrality, uncertainty, and the foreign divestment decisions of firms. *Journal of International Business Studies*, 51(5), 788–812.
- Musteen, M., Datta, D. K., & Butts, M. M. (2014a). Do international networks and foreign market knowledge facilitate SME internationalization? Evidence from the Czech Republic. *Entrepreneurship Theory and Practice*, 38(4), 749–774.
- Musteen, M., Datta, D. K., & Francis, J. (2014b). Early internationalization by firms in transition economies into developed markets: The role of international networks. *Global Strategy Journal*, 4(3), 221–237.
- Nakos, G., Brouthers, K. D., & Dimitratos, P. (2014). International alliances with competitors and noncompetitors: The disparate impact on SME international performance. *Strategic Entrepreneurship Journal*, 8(2), 167–182.
- Nakos, G., Dimitratos, P., & Elbanna, S. (2019). The mediating role of alliances in the international market orientation–performance relationship of SMEs. *International Business Review*, 28(3), 603–612.
- Nguyen, A., & Özçaglar-Toulouse, N. (2021). Nation branding as a market-shaping strategy: A study on South Korean products in Vietnam. *Journal of Business Research*, 122, 131–144.

AUTONOMOUS MARKETING & MEDIA ACTIVITIES BY FIRMS WITH AI INFLUENCE

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Abstract

Modern communication in media and marketing firms has been changed by AI and automation. These technologies now create content and promotional materials across different sectors. As a result, firms are moving toward using AI for independent marketing and media execution, which lowers their dependence on professionals or outside providers. However, a significant gap exists in how well employees are trained and skilled in using AI tools for marketing. This study aims to fill that gap by thoroughly investigating how B2B firms, especially in the import/export industries of the Baltic region, adopt, implement, and experience AI-powered autonomous marketing and media operations. The goal is not just to look at AI's impact on marketing and sales communication in these industries. It also seeks to develop a solid framework that explains how and why organizations incorporate AI into their marketing and media activities, particularly the strategic effects of this integration, with a special focus on employee skill levels. The methodology involves a quantitative analysis of B2B import/export firms throughout the Baltic region. The results will examine the strategic significance of transforming marketing influences within firms that adopt AI technology more than traditional human-driven efforts.

Keywords: Artificial Intelligence, Autonomous marketing, AI Marketing, Employees AI Skill

Introduction

Artificial Intelligence maybe referred to a variety of technologies that can be used in various firms and industries according to their business requirements. The primary objective of this technology is to accumulate data by using machine learning algorithms to understand and analyze consumer behavior online shopping and to gather customer databases to target the right audiences. However, the fastest evolving technology has transformed the firm's business model in terms of marketing more on to the individual based activities using AI technology implementation. Artificial intelligence is becoming more prevalent in a variety of industries and roles, utilizing emotions to give the marketing mix a new dimension.

Marketing automation is leveraging technology to streamline and automate marketing activities, resulting in increased efficiency and effectiveness. Automating current procedures and altering marketing methods can positively benefit revenue. Enterprises may optimize their benefits in digital

marketing by incorporating automation into diverse activities. For effective adoption, enterprises must change towards digitalization. (Heimbach, I., Kostyra, D. S., & Hinz, O. 2015).

AI has revolutionized marketing by enabling organizations to customize campaigns based on specific customer preferences. Personalized marketing uses artificial intelligence to evaluate large amounts of data and create tailored content, offers, and consumer experiences. This improves consumer happiness while also increasing engagement and loyalty, all of which are important in today's competitive market (Adewumi et al., 2024; Aldoseri, AlKhalifa, & Hamouda, 2024).

Progressively rising trend is the incorporation of AI into voice search and assistants. As speech-activated devices like Amazon Alexa and Google Home become more popular, organizations may use AI to optimize content for voice search and establish voice-based marketing campaigns. This can improve consumer convenience and engagement, which leads to increased sales. AI-powered visual search is also gaining popularity. Customers may use visual search to find items instead of words. AI algorithms examine photos to find and recommend comparable goods.

Furthermore, the research relevance and the theoretical background of the study show mainly the advanced tools and technology implementation adopted by firms as well as the customization of marketing and communication campaigns through media with the influence of AI. However, the main knowledge gap on the subject is that the impact and strategic implication of fastest adopting AI technology is not defined intricately. The literature must be yet to examine the consequences of AI automation and the practical limitations and its consequences. Besides, of the relevance theoretical implications are not evidential facts prove to the core effect of implementing AI major problems are also identified in the research study. Since the research base is focused on the Baltic region despite the region being more digitally advanced the Baltic states predominantly prefer the vernacular distinction. Hence Universal AI technology hasn't been yet designed to accommodate the characteristics for linguistic specialized automation.

The essential purpose of this study is to explore the strategic implications of AI-aided autonomous marketing and media activities adopted by firms especially the B2B Exporters and importers in Baltic region and to analyze the benefits and challenges associated with the autonomous systems that have effects on marketing employees' skills especially on AI. Descriptive exploratory research methodology has been implemented for this study to analyze the primary data source through quantitative methods through surveys among firms in Baltic region on the research topic.

Literature Review

The literature study critically looks at this change and what it means, emphasizing how important it is to understand these dynamics for media companies to make strategic adjustments. The younger generation is increasingly drawn to digital media in the dynamic digital era, and this research examines the transformative impact of this trend on media consumption. The way features like accessibility and immediacy alter consumer behavior is examined.

A key component of business expansion is marketing, which aims to engage clients with customized offers and content. Precision marketing has become a tactic to provide highly tailored experiences by targeting customers based on their distinct behaviors and preferences as markets get more competitive and data-driven (Adeyinka et al., 2024).

(Brem et al.,2023) indicate that the AI plays a vital role in new product development (NPD) through numerous approaches. These processes involve AI in ideation, market research and analysis, product design and prototyping, and predictive modelling and forecasting. NPD organizations may employ AI to streamline and expedite innovation, offering them a competitive edge in the changing market. AI might expedite technical breakthroughs in the innovation funnel during new product development (NPD). Artificial intelligence (AI) has the potential to enhance new product development through its capacity to produce novel ideas and solutions.

There is little doubt that incorporating artificial intelligence (AI) technologies such as augmented reality, virtual reality, automated content creation, speech recognition, and so forth may improve consumer response, ultimately leading to increased customer happiness. (Rabby, F., Chimhundu, R., & Hassan, R. 2021)

Businesses have benefited greatly from AI marketing as it improves client engagement. Machine learning, big data and analytics, and AI platform solutions are components of AI marketing (Wirth, 2018). But such cutting-edge technology is not always beneficial. There are several difficulties with it. Marketers need to know very well how they are incorporating AI in their operations and campaigns, given the development and implementation of the AI technologies are still at their beginning stages (Jarek and Mazurek, 2019).

AI systems analyze customer data and profiles to suggest effective communication strategies. These solutions automatically transmit personalized communications to customers at the appropriate moment, reducing the need for marketing team intervention and increasing efficiency (Shaily, 2021).

It is important to note that AI integration into brand management is not without hurdles. Data privacy, algorithmic bias, and the requirement for extensive training data are all serious challenges that must be addressed. Furthermore, the rapid growth of AI-powered picture and video production technology has permitted the rise of virtual influencers, which are very realistic characters designed for marketing objectives. These digital beings are generating enormous public attention and emotional responses from customers, sparking debates about authenticity, consumer trust, and the ethical implications of AI in human-like positions (Gutuleac, Baima, & Rizzo, 2023).

AI is employed in marketing strategy choices such as segmentation, targeting, and positioning. Mechanical AI, in particular, is perfect for uncovering innovative consumer preference patterns in unstructured data; thinking AI, for proposing the appropriate segment(s) to target; and feeling AI, for engaging with the targeted customers about the product. (Huang, M. H., & Rust, R. T. 2021).

According to the author, artificial intelligence is the process of transforming or replacing human intelligence with a mechanized programmed thinking process, which leads to the future of learning from human-aided programs to machine learning to understand the machine-oriented thinking process, which may lead to a future reliance on AI with no distinct relevance for a specific purpose.

AI in marketing

AI in marketing is grouped into three types: mechanical AI, thinking AI, and feeling AI (Bhuiyan, 2024; Rahman et al., 2024). These categories illustrate the various ways AI is used in marketing efforts. Mechanical AI is intended to automate repetitive operations such as data gathering and processing, hence improving efficiency and consistency (Poli, 2024). AI evaluates unstructured data to identify patterns and generate predictions (Hossen et al., 2024). Finally, feeling AI focuses on recognizing and responding to human emotions, allowing companies to interact with customers on a deeper

emotional level through conversational agents like chatbots and virtual assistants (Alabed et al., 2024).

Artificial intelligence (AI) has the potential to transform marketing by enabling personalized and targeted marketing efforts, improving consumer experience, and optimizing marketing costs (Eriksson et al., 2019). AI-powered marketing solutions evaluate customer behavior, tailor marketing messages, and optimize marketing campaigns (Davenport & Ronanki, 2018). However, using AI in marketing raises several ethical concerns, including privacy, transparency, and prejudice.

One of the most important applications of artificial intelligence in forecasting is consumer behavior prediction. Artificial intelligence (AI) systems may analyze data from several sources, including social media, website interactions, and purchase histories, to identify patterns and trends that are not usually visible (Shah & Shah, 2023).

(Huang & Rust 2021) provides an in-depth review of the strategic frameworks for applying AI in marketing. They create a conceptual model that incorporates AI into many parts of marketing activity, emphasizing the importance of taking a deliberate approach to deploying AI technology that considers both benefits and possible hazards. Shaik (2023) emphasizes AI's entire influence on marketing, explaining how it may disrupt existing tactics and open up new avenues for innovation and progress.

(Yau, Saad, & Chong 2021) made major contributions to our knowledge of how AI might help build customer interactions. They conducted a detailed review of the use of Artificial Intelligence in Marketing (AIM), proving its ability to improve consumer interactions and increase customer loyalty. This subject is expanded upon by Kopalle et al. (2022), who investigate global trends in the usage of AI in marketing. Their research reveals important areas where AI has the ability to alter marketing strategy, opening up new options for further research.

The incorporation of AI in marketing is a big shift in how firms interact with clients. Historically, marketing efforts focused mainly on broad demographic data and generic techniques, frequently yielding hit-or-miss results. However, the introduction of AI has altered these old approaches, allowing for a more data-driven, precise, and dynamic approach. AI in marketing has evolved from the beginning of digital data collecting (Haleem et al., 2022).

The efficacy and efficiency of current marketing have significantly increased with the help of AI-driven automation (Alliouli & Mourdi, 2023). The automation of important marketing tasks, such content distribution and customer relationship management (CRM), has streamlined operations and reduced human error (Buttle & Maklan, 2019). AI systems, for example, can now monitor and update social media postings, email marketing campaigns, and even digital advertising placements in real time (Nair & Gupta, 2021).

Regulations pertaining to intellectual property, including copyrights and patents, are also crucial in managing AI in marketing. In order to prevent marketing communications from misleading or deceiving consumers, consumer protection laws, such as the Federal Trade Commission Act in the United States, regulate marketing activities. Many solutions have been presented to solve the ethical and legal issues raised by AI in marketing. These include developing ethical guidelines for AI in marketing, utilizing technology that improves privacy, implementing transparent and comprehensible AI systems, and developing legal and regulatory frameworks that address the unique challenges posed by AI in marketing (Eriksson et al., 2019).

Autonomous marketing with AI

AI marketing automates choices by obtaining and analyzing data, as well as observing audience or economic tendencies that impact marketing activities. When speed is critical, AI is often employed in marketing initiatives. AI systems use data and client profiles to send customized messages at optimal times, reducing the need for a marketing crew and increasing productivity.

AI-powered digital solutions automate customer service operations, including 24/7 support (Gaafar, 2020; Sousa et al., 2024). This not only improves service availability but also frees up human resources for more difficult activities and strategic decision making (Gaafar, 2020).

AI agents can sense their environment, make intelligent judgments, and perform sophisticated and adaptive activities (Kapoor et al., 2024). The progression of automated tools to intelligent, learning agents (Huang, 2024) allows for complex task management, learning from interactions, and continuous performance improvement. AI agents are evolving from tools to semi-autonomous actors capable of navigating economic systems and collaborating with other digital agents.

According to (Walter 2024), understanding AI technologies and their influence on society is becoming increasingly important. Prompt engineering, or eliciting precise answers from AI systems, is considered a vital talent. AI competency and prompt engineering are likely to become increasingly important in marketing organizations.

AI-driven automation can revolutionize company models by using insights from linked devices, social media, and industry data. Globally, digital data has increased rapidly (Cools et al., 2024). Understanding the impact of AI on business in an analytics and data-driven environment is crucial. This includes understanding the potential dangers and rewards, as well as the shift in an organization's value to customers. (Baker & Lee 2021) found that AI technology can automate ad placement, budgeting, and execution for campaigns. This improves operational efficiency and allows marketers to focus on strategic decisions.

AI technology has improved lead creation and scoring in B2B educational services, increasing accuracy and efficiency. According to (Suh & Lee's 2020) study on AI-driven models for educational institutions, machine learning algorithms may increase lead scoring accuracy, select high-potential leads, and optimize recruiting efforts by analyzing previous interactions and behavioral patterns.

Employees Skill on AI in firms

AI has had a significant influence on the sales function by automating and improving essential sales procedures (Hautamäki & Heikinheimo, 2025). AI systems are skilled at evaluating enormous volumes of organized and unstructured data to accomplish activities like lead creation and prospecting scoring and demand estimate with higher efficiency than previous techniques (Moradi & Dass, 2022; Paschen et al., 2020; Syam & Sharma, 2018). For example, AI may scan client communications and social media posts to create more convincing interactions or anticipate e-purchases (Davenport et al., 2020). This automation relieves sales professionals of monotonous tasks like as meeting scheduling and manual data input, allowing them to focus on higher-value contributions (Mooradi & Dass, 2022; Paschen et al., 2020; Syam & Sharma, 2018).

Creativity is critical for marketing firms since it directly affects service quality (Kallevig et al., 2022). (Yuniarti et al. 2024) found that originality is crucial for successful digital marketing. The authors recognize the importance of creativity in promoting innovation and differences in agency contexts, introducing a sixth category. (Singer & McCallum 2023) emphasize the importance of combining

creativity and technology to satisfy client expectations and negotiate the complications of AI integration in marketing campaigns.

Employers are focusing on AI and automation to address talent and skill shortages, but face challenges with AI adoption, including design, development, and maintenance, as well as ML-related issues (Schmitt, 2023). AI and machine learning have created new job prospects that challenge the US workforce at all skill levels.

The duties and talents being automated will likely determine how AI affects human skills (Chuang, 2022). The influence on human abilities will vary on the talents needed for each work, and certain tasks may be more amenable to automation than others. It is also claimed that as AI develops, some abilities, including critical thinking and problem-solving, could become increasingly important.

Additionally, human transversal abilities like communication, problem-solving, and conflict resolution are either mimicked or replaced by generative AI systems. An AI system with Natural Language processing (NLP) skills, for instance, may comprehend client chats, decipher their emotions, and respond in a kind and helpful manner (Jaiswal et al., 2022). Additionally, it may learn from client interactions to enhance its replies over time and offer individualized customer care based on each customer's unique requirements.

(Al Mubarak 2022) examines the possible advantages and difficulties of human-machine interactions in the context of Industry 5.0, with a particular emphasis on work-based learning. The author makes the case that technology may support human endeavors, resulting in increased productivity and efficiency as well as chances for job stability and upskilling. However, legal, psychological, and ethical difficulties will need to be addressed at the managerial level to reap these benefits.

AI in B2B Marketing

AI in B2B marketing increases complexity for enterprises and people (Han et al., 2021). According to (De Bruyn et al. 2020), the main hurdles of using AI in marketing are technology implementation and automated accountability. From a technological standpoint, unsatisfactory experiences with AI solutions acquired through B2B exchanges (for example, chatbots) have resulted in scathing condemnation of AI in this context (Castillo et al., 2020).

Given AI's huge potential for B2B organizations, the first subject of articles explores the causes and effects of AI adoption. (Baabdullah et al. 2021) use survey data from 392 B2B small and medium-sized firms to develop an integrative framework for analyzing AI practices. The framework includes AI enablers, AI preparedness, AI-based interaction, and relational governance.

AI integration in B2B marketing marks a huge transition, allowing firms to move beyond traditional approaches and embrace technology for increased productivity, customization, and client interaction. This integration is a gradual process marked by distinct stages, each distinguished by the adoption of new technologies and techniques (Deveau et al., 2023).

The future of B2B marketing is expected to see an even deeper integration of AI, including upcoming technologies such as augmented reality, virtual reality, and the Internet of Things. (McGuire 2024). AI is changing B2B marketing and how organizations function and connect with consumers in a variety of ways. AI-powered technologies that automate repetitive operations boost productivity and efficiency, allowing marketers to focus on more important duties. AI also helps organizations to collect and analyze massive quantities of data, enabling more tailored content distribution, targeted messaging, and customized customer experiences.

Generative AI is a significant achievement with widespread application. ChatGPT, GPT-4, Claude, Copilot, and other tools are increasingly widely used in professional settings. These technologies can help generate article ideas and whole texts, opening new possibilities. Gen-AI is always developing and improving by training itself on additional data. Users just provide commands, and the AI generates the desired material. This tool may help marketers generate ideas for articles, copywriting, and other material. Furthermore, Gen-AI may be utilized to rapidly evaluate and filter data. It may also be able to identify trends or patterns that a regular human cannot. (McGuire 2024).

Methodology

The research aims to analyze the impact of AI aided tools and technologies that ropes with marketing and media activities which are widely adopted by firms especially the business to business segments mainly encompasses the import and export activities in Baltic region individually without the influences of professional marketing and media firms have any strategic impact on their business process and on which degree the AI aided tools support the autonomous marketing activities of firms. The strategic influence and change in marketing communication overall business segments. The goal of the research study is to evaluate the AI powered marketing and media activities that have been adopted by firms as autonomous approach has any significant moderating effect on employee skills of the organization. To study the impact of AI technology in marketing and media activities of B2B import and export firms in Baltic region, specific only on marketing area the author has implemented the quantitative analysis phenomenon of the study with the aid of the research tools such as primary data for interpretation questionnaire surveys designed specifically for marketing and media activities performed by business to business firms in Baltic region. A structured questionnaire has been built with demographic data and the strategic influences of AI tools and techniques adopted by the market from various perspectives through Open ended, close ended and Likert Scale question types majorly. The structured questionnaire has been managed with the instrument of google forms tool to circulate respective B2B firms across Baltic especially the import and export sectors, to collect samples.

Furthermore, author has analyzed journal articles and publications pertaining to the topic and keyword applied on AI in marketing, Autonomous marketing with AI using scholarly articles from the science direct, research gates, JSTOR, google scholar and other authentic sources as secondary data for the research study. An improved collection of publications meeting the research requirements was also discovered after a considerable number of papers from the first search were removed, as well as duplicates, useless studies, and articles published outside the required time restriction. Since the study demands quantitative analysis method hence, hypothesis has been developed to test the fact of the study. Following hypothesis is used to test the strategic aim of the research study.

Hypothesis

H₀: AI-powered marketing automation implementation has no significant moderating effect on employee skills development in firms

H₁: AI-powered marketing automation implementation has a significant moderating effect on employee skills development in firms

Moreover, the results outcome of the research study primarily data were analyzed with the effects of AI implementation on human-drive activities and its strategical impact on marketing professions. Since, the study involved three regions of Baltic A moderation regression method to test the difference in test scores across the AI implementation effects in marketing. The (figure.1) below illustrates the outline of the study plan of the research work.

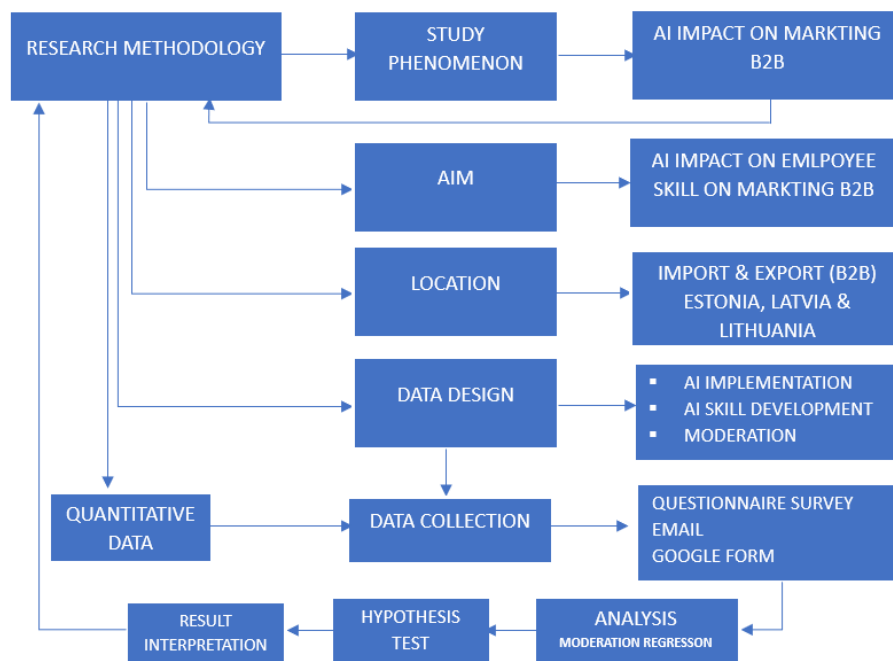


Figure 1. Research design layout of the study

The research design illustrates the structural model of the study on the aspect of mediating the research aim of the study.

Research Results

The research extended to Baltic region countries involved in the main import and export categories where the business-to-business segment implementation of AI in marketing and media departments is as according to the figure 1 shows the distribution of respondents participated in the survey and their respective answers recorded for the data analysis. The participants of the survey distribution by geography are graphically illustrated in the figure 2.

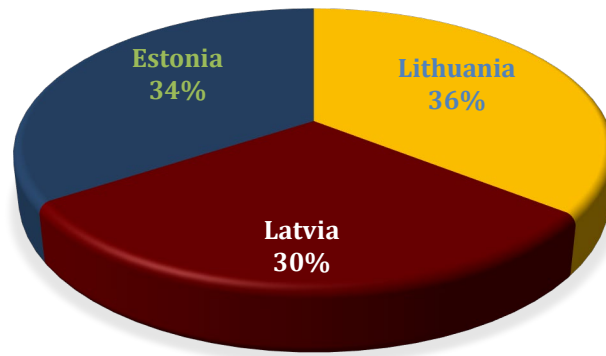


Figure 2. Distribution of respondents by region

For the main study, the list of companies according to their business activities in import and export category were shortlisted and contacted for the survey. Specifically, the Baltic region imports exporting organizations in business-to-business segment to examine the level of AI adoption in the marketing divisions during the term December 2025 – January 2026 and responses were targeted for minimum of 100 among 150 nevertheless there were responses received from 73 organizations. Table.1 lists the distribution of import and export industries across Baltic region and their respective department concerns regarding marketing activities as well as the level of AI implementation over the period.

Table 1

Descriptive statistics of the sample and respondents

Factors	(%) Percentage
<i>Industry</i>	
Agriculture & Livestock Products	37%
Chemical, Fertilizers allied products	8%
Pharmaceutical	10%
Wood & Soil Products	42%
Others	3%
<i>Segment</i>	
B2B Export	64%
B2B Import	11%
B2B Import & Export	25%
<i>Year of AI implementation</i>	
< 1 Year	51%
1-2 Years	29%
3-4 Years	20%

The three comprehensive phases of analysis on AI influence and implementation aspects in organizations, especially in the marketing division of each company, the average response on each phase are considered AI Implementation/Automated marketing as independent variable also the employees skill development on AI (marketing) is the moderator variable and the management support on skill training and experience on AI as dependent variable for the test of results from the

surveys. The following table.2 shows the key aspects of the results analysis consolidated according to the response rate on the predictor and moderator level.

Table 2

Responses on AI automation marketing & employees' skill

Variables	Estonia	Latvia	Lithuania
<i>AI Implementation</i>	<i>Cumulative (%)</i>		
Level of AI autonomous marketing tools	39%	24%	37%
AI Autonomous email, social media & digital marketing	34%	35%	31%
Marketing transformation after AI implementation	28%	32%	26%
<i>Employee skills on AI</i>			
Marketing competency upgrade B2B level with AI	29%	27%	44%
Self-development on AI marketing automation	31%	36%	33%
Level of risks and other job-related factors with AI	33%	38%	29%
<i>Management support</i>			
AI skill development offered and sponsored by company	35%	29%	36%
Mentorship and career growth on AI is prioritized	39%	28%	33%
Skill gap assessment on AI and others is conducted	34%	35%	31%

According to the results received from the import and export firms across Baltic region, show that there is no significant relationship between automation usage of marketing and media activities performed by firms and effects on creativity and innovation. This is because of the reason firms adopt AI implementation for certain areas in marketing activities to reduce time and enhance accuracy. However, the full automation or application has not yet been fully implemented due to human supervision is more needed for most of the companies where the suitable marketing professionals are based with knowledge background of machine learning and prompt engineering to engage and understand AI automation mechanisms.

The applied moderation regression analysis method using the questionnaire survey analysis can be classified according to the criteria assigned and associated with the research goal. Subsequently, the questionnaire has been designed to evaluate the AI implementation level in the B2B firms and the level of skill development of employees as well as the moderator variable which comprise the management efforts to employee skill development, nature of automation effectiveness.

Findings and Discussion

According to the result interpretation using moderate regression analysis method, to test the hypothesis of the study it is found that the table shows the result interpretation applying the ANOVA method. The regression table 3 shows the summary of the moderate regression analysis

Table 3

Summary of result analysis with regression statistics

Multiple R	0.26
R Square	0.07
Adjusted R Square	0.03
Standard Error	0.46
Observations	73

As per the above summary results the main multiple 0.26 data show weak positive correlation which is the moderation against the employee skill development against management support on training. Whereas $n=73$ observation and $k=3$ are predictors for the test analysis. Furthermore, table.3 shows the regression analysis with ANOVA method to test the hypothesis H_0 & H_1 .

Table 4

Moderation Regression Analysis (ANOVA)

	df	SS	MS	F	Significance F
Regression	3	1.029	0.343	1.656	0.185
Residual	69	14.300	0.207		
Total	72	15.330			
	Coefficients	Standard Error	t Stat	P-value	Lower 95%
Intercept	6.2	3.7	1.7	0.1	-1.1
Mod. Employ skill development	-0.8	1.2	-0.7	0.5	-3.2
Management support	-0.7	1.1	-0.6	0.5	-3.0
Interaction	0.2	0.4	0.5	0.6	-0.5

A moderated multiple regression analysis was used to see if AI-powered marketing automation influences the link between employee skill development and management support on employee skill development. The total model was not significant ($F(3, 69) = 1.656$, $p = 0.185$), explaining just 7% of the variance in skill growth ($R^2 = 0.07$). The interaction impact of AI implementation was not significant ($\beta = 0.2$, $p = 0.6$, 95% CI [-0.5, 0.9]). Neither employee skill development ($\beta = -0.8$, $p = 0.5$) nor management support ($\beta = -0.7$, $p = 0.5$) were identified as significant predictors. Therefore, we fail to reject the null hypothesis (H_0). These findings give no indication that AI-powered marketing automation adoption moderates employee skill growth in this sample.

Applying the decision rule on testing H_1 hypothesis the p value which is $0.6 \geq 0.05$ subsequently, fails to reject hypothesis H_0 so to conclude the outcome of the analysis the AI-powered marketing automation implementation has no significant moderating effect on employee skills development in firms' business to business import export industries in Baltic region. From the employee's moderate effect skills of AI training and development for the employees of the organization there are some strategic effects that have restrained them to go for fully automated AI implementation within the organization, especially the marketing and communication departments.

Conclusion

This study aims to experimentally explore this hypothesis by looking into whether AI-powered marketing automation installation acts as a moderator in the interaction between employee risk perceptions, manager support, and employee skill development. This study uses a moderation regression analysis on survey data obtained from marketing professionals to provide conclusions that question the dominant technological determinist narrative. The primary goal of this study was to examine whether the amount of AI implementation affects the strength or direction of the association between important organizational characteristics and skill development results. The regression findings show that the interaction term (AI Implementation $\times$ Predictor Variables) is not statistically significant. The detrimental impact of risk perception on skill development is equally

significant in low-AI and high-AI environments. Concerns about job stability and obsolescence most likely have a substantial, direct negative correlation with proactive skill improvement. Employees that perceive danger from AI are less likely to partake in upskills, despite how much AI is being implemented.

To conclude, this study provides strong evidence that implementing AI-powered marketing automation doesn't substantially change the link between employee perceptions, management support, and improvement of skills. The influences shaping human capabilities in the workplace are basically human. As companies negotiate the AI revolution, our research serves as a timely reminder that, while technology may set the stage, the quality of leadership and the depth of organizational support will eventually determine the cast's execution. The technology that are currently implemented for the use of commercial purposes on AI is at the initial stage of development where although, researchers have invested organoid intelligence (OI) and Artificial Super Intelligence (ASI) which is highly expected to trespasses humans Artificial generative intelligence and Agentic AI technology is on another phase of advanced development in order to impose cognitive thinking ability exactly as human which will entirely change the shape of digital world in many industries.

References

- Adewumi, A., Oshioke, E. E., Asuzu, O. F., Ndubuisi, N. L., Awonnuga, K. F., & Daraojimba, O. H. (2024). Business intelligence tools in finance: A review of trends in the USA and Africa. *World Journal of Advanced Research and Reviews*, 21(3), 608-616.
- Adeyinka, K. I., Takunda, C. O., & Adeyinka, T. I. (2024). Artificial Intelligence (AI) Algorithms in Nigeria's Integrated Marketing Communications. *AI-Driven Marketing Research and Data Analytics*, 67-81. <https://doi.org/10.4018/979-8-3693-2165-2.ch004>
- Al Mubarak, M. (2022). Sustainably developing in a digital world: Harnessing artificial intelligence to meet the imperatives of work-based learning in Industry 5.0. *Development and Learning in Organisations: An International Journal*, (ahead-of-print). <https://doi.org/10.1108/DLO-04-2022-0063>
- Alabed, A., Javornik, A., Gregory-Smith, D., & Casey, R. (2024). More than just a chat: a taxonomy of consumers' relationships with conversational AI agents and their well-being implications. *European Journal of Marketing*, 58(2), 373-409. <https://doi.org/10.1108/EJM-01-2023-0037>
- Allioui, H., & Mourdi, Y. (2023). Unleashing the potential of AI: Investigating cutting-edge technologies that are transforming businesses.
- Brem, A., Giones, F., & Werle, M. (2023). The AI Digital Revolution in Innovation: A Conceptual Framework of Artificial Intelligence Technologies for the Management of Innovation. *IEEE Transactions on Engineering Management*, 70(2), 770-776. <https://doi.org/10.1109/TEM.2021.3109983>
- Buttle, F., & Maklan, S. (2019). *Customer relationship management: Concepts and technologies*. London: Routledge. <https://doi.org/10.4324/9781351016551>.
- Castillo, D., Canhoto, A. I., & Said, E. (2020). The dark side of AI powered service interactions: exploring the process of co-destruction from the customer perspective, *The Service Industries Journal*, pp. 1-26. <https://doi.org/10.1080/02642069.2020.1787993>
- Chuang, S. (2022). Indispensable skills for human employees in the age of robots and AI. *European Journal of Training and Development*. Advance online publication. <https://doi.org/10.1108/EJTD-06-2022-0062>
- Cools, H., Van Gorp, B., & Opgenhaffen, M. (2024). Where exactly between utopia and dystopia? A framing analysis of AI and automation in US newspapers. *Journalism*, 25(1), 3-21. <https://doi.org/10.1177/14648849221122647>
- Davenport, T. H., & Ronanki, R. (2018). Artificial intelligence for the real world. *Harvard Business Review*, 96(1), 108-116. Retrieved from: <https://hbr.org/2018/01/artificial-intelligence-for-the-real-world>
- Davenport, T., Guha, A., Grewal, D., & Bressgott, T. (2020). How artificial intelligence will change the future of marketing. *Journal of the Academy of Marketing Science*, 48(1), 24-42. <https://doi.org/10.1007/s11747-019-00696-0>
- De Bruyn, A., Viswanathan, V., Beh, Y. S., Brock, J. K. U., & von Wangenheim, F. (2020). Artificial intelligence and marketing: pitfalls and opportunities. *Journal of Interactive Marketing*, 51, 91-105
- Eriksson, K., Kerem, K., & Nilsson, D. (2019). Artificial intelligence in marketing: A general overview and future research directions. *Journal of Business Research*, 98, 365-380. <https://doi.org/10.1016/j.jbusres.2019.01.014>
- Eriksson, K., Kerem, K., & Nilsson, D. (2019). Artificial intelligence in marketing: A general overview and future research directions. *Journal of Business Research*, 98, 365-380. <https://doi.org/10.1016/j.jbusres.2019.01.014>

- Gaafar, H. A. A. S. M. (2020). Artificial intelligence in Egyptian tourism companies: Implementation and perception. *Journal of Association of Arab Universities for Tourism and Hospitality*, 18(1), 66–78.
- Gutuleac, R., Baima, G., Rizzo, C. (2023). The rise of virtual influencers: Bizarrely realistic or scarily uncanny? In: *Rediscovering local roots and interactions in management* (pp. 171- 176). Bari, Italy: Sinergie-SIMA Management Conference Proceedings
- Haleem, A., Javaid, M., Qadri, M. A., Singh, R. P., & Suman, R. (2022). Artificial intelligence (AI) applications for marketing: A literature-based study. *International Journal of Intelligent Networks*, 3, 119-132
- Han, R., Lam, H. K. S., Zhan, Y., Wang, Y., Dwivedi, Y. K., & Tan, K. H. (2021). Artificial intelligence in business-to-business marketing: a bibliometric analysis of current research status, development and future directions. *Industrial Management & Data Systems*, ahead-of-p(ahead-of-print). <https://doi.org/10.1108/IMDS-05-2021-0300>
- Hautamaki, P., & Heikinheimo, M. (2025). Fully leveraging AI in B2B sales: Exploring sales managers' capabilities and organizational knowledge processes. *Journal of Business Research*, 194, 115396. <https://doi.org/10.1016/j.jbusres.2025.115396>
- Heimbach, I., Kostyra, D. S., & Hinz, O. (2015). Marketing automation. *Business & Information Systems Engineering*, 57, 129-133.
- Huang, M. H., & Rust, R. T. (2021). A strategic framework for artificial intelligence in marketing. *Journal of the academy of marketing science*, 49(1), 30-50.
- Huang, M. H., & Rust, R. T. (2021). A strategic framework for artificial intelligence in marketing. *Journal of the Academy of Marketing Science*, 49, 30-50. <https://doi.org/10.1007/s11747-020-00749-9>
- Huang, Y. (2024). *Levels of AI Agents: from Rules to Large Language Models*.
- Jaiswal, A., Arun, C. J., & Varma, A. (2022). Rebooting employees: Upskilling for artificial intelligence in multinational corporations. *International Journal of Human Resource Management*, 33(6), 1179-1208. <https://doi.org/10.1080/09585192.2021.1891114>
- Jarek, K., Mazurek, G. (2019), Marketing and artificial intelligence. *Central European Business Review*, 8(2), 46-55.
- Kapoor, S., Stroebel, B., Siegel, Z. S., Nadgir, N., & Narayanan, A. (2024). *AI Agents That Matter*.
- Kopalle, P. K., Gangwar, M., Kaplan, A., Ramachandran, D., Reinartz, W., & Rindfleisch, A. (2022). Examining artificial intelligence (AI) technologies in marketing via a global lens: Current trends and future research opportunities. *International Journal of Research in Marketing*, 39(2), 522-540. <https://doi.org/10.1016/j.ijresmar.2021.11.002>
- McGuire, L. 2024. Using AI in B2B Marketing: Use Cases, Limitations. Goldcast. URL: Retrieved from: <https://www.goldcast.io/blog-post/ai-in-b2b-marketing>
- Moradi, M., & Dass, M. (2022). Applications of artificial intelligence in B2B marketing: Challenges and future directions. *Industrial Marketing Management*, 107, 300–314. <https://doi.org/10.1016/j.indmarman.2022.10.016>
- Nair, K., & Gupta, R. (2021). Application of AI technology in modern digital marketing environment. *World Journal of Entrepreneurship, Management and Sustainable Development*, 17(3), 318-328. <https://doi.org/10.1108/wjemsd-08-2020-0099>
- Paschen, J., Wilson, M., & Ferreira, J. J. (2020). Collaborative intelligence: How human and artificial intelligence create value along the B2B sales funnel. *Business Horizons*, 63(3), 403–414. <https://doi.org/10.1016/j.bushor.2020.01.003>
- Poli, T. A. (2024). Mediating Role of Entrepreneurship Capability in Sustainable Performance and Women Entrepreneurship: An Evidence from a Developing Country. *Journal of Ecohumanism*, 3(3), 2006-2019. <https://doi.org/10.62754/joe.v3i3.3553>
- Rabby, F., Chhimhundu, R., & Hassan, R. (2021, November). Endurance of digital marketing with artificial intelligence. In *ANZMAC Conference 2021: Proceedings* (pp. 296-299). University of Melbourne
- Rahman, M. M., Bhuiyan, M. R., & Alam, S. M. (2024). The Empirical Study on the Impact of the COVID-19 on Small and Medium Enterprises (SMEs) in Bangladesh. *Journal of Information Systems and Informatics*, 6(1), 527-547. <https://doi.org/10.51519/journalisi.v6i1.686>
- Schmitt, M. (2023), "Deep learning in business analytics: a clash of expectations and reality", *International Journal of Information Management Data Insights*, Vol. 3 No. 1, 100146, <https://doi.org/10.1016/j.ijime.2022.100146>.
- Shah, S. S., & Shah, T. (2023). Responsible consumption choices and individual values: An algebraic interactive approach. *Mind & Society*, 22 (1), 1- 32. <https://doi.org/10.1007/s11299-023-00294-2>
- Shaik, M. (2023). Impact of artificial intelligence on marketing. *East Asian Journal of Multidisciplinary Research*, 2(3), 993-1004. <https://doi.org/10.55927/eajmr.v2i3.3112>
- Sousa, A. E., Cardoso, P., & Dias, F. (2024). The Use of Artificial Intelligence Systems in Tourism and Hospitality: The Tourists Perspective. *Administrative Sciences*, 14(8), 165.
- Suh, A., & Lee, S. (2020). AI-powered lead scoring in educational services: An empirical analysis. *Educational Technology Research and Development*, 68(2), 425-445.
- Syam, N., & Sharma, A. (2018). Waiting for a sales renaissance in the fourth industrial revolution: Machine learning and artificial intelligence in sales research and practice. *Industrial Marketing Management*, 69, 135–146. <https://doi.org/10.1016/j.indmarman.2017.12.019>

- Walter, Y. (2024). Embracing the future of Artificial Intelligence in the classroom: the relevance of AI literacy, prompt engineering, and critical thinking in modern education. *International Journal of Educational Technology in Higher Education*, 21(15), 1-29
- Wirth, N. (2018), Hello marketing, what can artificial intelligence help you with? *International Journal of Market Research*, 60(5), 435-438.
- Yau, K. L. A., Saad, N. M., & Chong, Y. W. (2021). Artificial intelligence marketing (AIM) for enhancing customer relationships. *Applied Sciences*, 11(18), 8562. <https://doi.org/10.3390/app11188562>

A STUDY ON THE LOGICAL FLAWS AND ETHICAL RISKS OF AI-POWERED MIDDLE SCHOOL ENGLISH ESSAY CORRECTION

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Abstract

As generative artificial intelligence reshapes the education landscape globally, Automated Writing Assessment (AWE) systems are rapidly being introduced into secondary school English classrooms—not only in China, but also across Asia, Europe, and North America. While these systems are touted as highly efficient and objective, their definitions of "good writing" rely on certain inherent assumptions that warrant careful examination. This study employs an exploratory research approach, using 60 junior high school English essays as a sample to systematically analyze the grading results of two mainstream AI-based grading systems, identifying typical logical flaws in the pragmatic appropriateness and creative expression dimensions of AI grading. The study found that AI systems made pragmatic misjudgments in 40% of the essay samples, marking expressions that conformed to specific communicative contexts as "non-standard"; and suppressed reasonable creative expression in 25% of the samples, "correcting" students' vivid and personalized language attempts. Based on in-depth interviews with five junior high school English teachers with experience using AI grading, the study further reveals the three ethical risks that these technological shortcomings may cause—a tendency towards templated writing thinking, a weakening of students' confidence in expression, and a erosion of trust between teachers and students in feedback. These risks are not unique to China; they reflect the increasingly global structural contradiction between algorithmic efficiency and educational value. This article concludes with three practical suggestions: critical use, technological transparency, and maintenance of teacher and student autonomy. It advocates for re-establishing teachers' authority in educational judgment during technology applications and promoting AI's transformation from a "cold judge" to a "transparent collaborator."

Keywords: AI essay grading; logical fallacies; ethical risks; junior high school English; technological critique of automated writing assessment; algorithmic bias; educational ethics

Introduction

Research Questions in a Global Context

In recent years, Automated Writing Assessment (AWE) systems have moved from the margins to the mainstream, becoming an integral part of educational evaluation. Leveraging large language models, tools like Grammarly and Turnitin Revision Assistant, as well as a growing number of domestic platforms, can provide instant scoring and error correction feedback for student essays. Supporters praise their efficiency and scalability, while critics warn that they may conceal prescriptive commitments. However, one thing is clear: this is a global phenomenon, not a local one.

In China, in May 2025, the Basic Education Teaching Steering Committee of the Ministry of Education officially released the "Guidelines for the Use of Generative Artificial Intelligence in Primary and Secondary Schools (2025 Edition)," explicitly proposing to "reasonably integrate generative artificial intelligence into primary and secondary school education." Under this policy guidance, various AI-powered essay correction systems have entered junior high school English classrooms at an unprecedented pace. From grammar correction to vocabulary replacement, from scoring feedback to model essay generation, technology is reshaping every aspect of writing instruction.

Similar scenarios are unfolding elsewhere. In Canada, AI tools may lead to the standardization of the writing process, thereby "smoothing out" students' unique expressions and creativity, and homogenizing academic writing (Barbar, 2025). In the UK, researchers documented how secondary school students strategically manipulated language to circumvent AI detection systems, rather than to cultivate rhetorical skills (Giray, 2024). In Australia, scholars warn that the widespread adoption of AI feedback tools could reduce writing instruction to a series of optimizable technical problems (Wilson, 2021).

On the surface, this appears to be an "efficiency revolution." Teachers are partially relieved of the burden of grading essays, and students receive immediate, quantifiable feedback. However, as more and more teachers begin to rely on AI for grading, and as students become accustomed to accepting scores and suggestions assigned by algorithms, a fundamental question is quietly being set aside: What exactly is artificial intelligence evaluating? Does it understand language? Does it understand education?

Problem Statement

In late 2025, an education news story sparked widespread concern: a fourth-grade student in Beijing submitted a diary entry about observing ducks, only to have it returned by the teacher. Instead, the teacher replaced it with an AI-generated model essay labeled "recommended for memorization." Commentators lamented, "When innocent childlike diaries are replaced by AI-generated models, what exactly are we teaching our children?"

Similar phenomena are spreading in English writing instruction. A survey of several primary and secondary schools in Xiangyang City showed that over 45% of students had used AI to complete their holiday assignments. Teachers, when grading these assignments, found that many showed typical AI traces such as "three-paragraph structure," "pile up advanced vocabulary," and "template-based emotional expression." Even more alarming is that AI is not only acting as a "ghostwriter" for students' writing but is also increasingly becoming a "judge" in grading—occupying the dual positions of "respondent" and "judge."

This dual role of artificial intelligence—both as a producer and a judge of student writing—has created an unprecedented situation in the history of writing instruction. Never before has any technology occupied both ends of the assessment relationship simultaneously.

This study focuses on a specific and crucial question: What typical logical flaws have AI-based grading systems exposed in middle school English essays? What ethical risks might these flaws pose to education? This question is urgent not only because the technological shortcomings need to be addressed, but also because these flaws are subtly changing how teachers teach, how students learn, and even the very criteria for evaluating "good writing." We believe this question is of urgent significance not only to educators in China, but also to teachers, researchers, and policymakers around the world who are striving to integrate the AWE system into their educational environments.

Research Objectives and Significance

The objectives of this study are: first, to systematically identify and categorize the logical flaws in current mainstream AI grading systems based on real essay samples and AI grading results; second, to deeply elucidate the educational consequences and ethical implications of these technological flaws through teacher interviews; and third, to propose practical pathways that balance technological effectiveness with educational subjectivity.

The theoretical significance of this study lies in liberating the problem of AI essay grading from the narrow perspective of "technological optimization" and placing it within the dual coordinates of educational philosophy and technological critique. Its practical significance lies in providing frontline teachers, school administrators, and technology developers with an operational framework for reflection and directions for improvement. Crucially, although the empirical context of this study is a Chinese junior high school classroom, the conceptual framework and ethical considerations we construct have universal applicability. The tensions documented in this paper—the tension between statistical commonality and rhetorical appropriateness, and the tension between algorithmic efficiency and pedagogical concern—are not limited to a specific culture. These tensions are inherent in any encounter between language education and large-scale language models, regardless of time or place.

Overview of Research Methods

This study employs an exploratory research approach of "text analysis-teacher verification." First, using 60 junior high school students' English essays as a sample, the grading results from two mainstream AI-based grading systems were collected. Two types of phenomena—pragmatic misjudgment and suppression of creative expression—were coded, statistically analyzed, and typical cases were extracted. Subsequently, semi-structured in-depth interviews were conducted with five junior high school English teachers who use AI-based grading systems in their daily teaching, restoring the technological vulnerabilities to real-world teaching scenarios and interpreting the ethical risks and practical dilemmas they raise.

Literature Review

The Technical Logic and Inherent Limitations of AI Writing Feedback

Current mainstream AI essay grading systems are essentially text classification and generation tools based on large-scale language models. Their operating logic can be summarized as follows: using massive amounts of language data as a reference, they identify "common expressions" and "uncommon expressions" through probability statistics, marking the former as "standard" and the latter as "suspicious".

exhibit shortcomings in creative writing, including limited originality, lack of deep coherence, insufficient emotional authenticity, intent-execution bias, misinterpretation of cultural context, and weak iterative creation capabilities. It's noteworthy that these shortcomings not only exist in AI-generated text but also permeate the judgment criteria of AI-edited text. Researchers point out that models such as GPT-4o and Claude-3.5-Sonnet frequently use formulaic expressions like "unspoken," "sense of," and "weight of" in approximately 15% of the text, demonstrating a clear tendency towards algorithmic homogenization—different models, based on similar training data and optimization goals, ultimately converge towards the same "safe, smooth, and predictable" language template.

This finding echoes broader criticisms of academic writing assessment (AWE) systems in the international literature. Huang and Palermo (2025) argue that AWE systems tend to prioritize "correctness" over "rhetorical effect" and reward standardization over innovation, which aligns with broader criticisms of AWE systems in the international literature .

This means that the AI grading system's perception of "good writing" is essentially a statistical average, not an educational one. It rewards "expression like most people," rather than "creative expression." Keon (2025) analyzed large language models (LLMs) and found that in experiments simplifying advertising creatives, creative features such as metaphors, emotions, and visual cues disappeared earlier, while factual content remained. Many of the "creativity" appearing in LLMs reflected superficial fluency rather than genuine conceptual innovation. This is precisely the structural paradox of probabilistic logic applied to language education.

Educational Research on AI Grading: From Efficacy Controversy to Ethical Concerns

Early research primarily focused on the accuracy and efficiency gains of AI grading. In recent years, with the popularization of generative AI, the research focus has gradually shifted from "Can AI grade?" to "What happens after AI grading?"

Sun (2025)'s longitudinal study of five Chinese English learners found that students developed four main strategies for using ChatGPT and Grammarly for writing revision: brainstorming, structural organization, partial drafting, and language revision. However, in order to circumvent AI detection systems, students had to shift a significant amount of energy from "developing ideas" to "superficial polishing," resulting in a strategic but pedagogically empty form of text manipulation. The study further points out that the "detection-first" approach to technology governance has actually fostered more subtle academic misconduct. The real solution lies in cultivating students' critical AI literacy, enabling them to maintain their pursuit of creativity, voice, and argumentation quality while using technology.

A study by Chen et al. (2024) involving 45 second language learners showed that students rejected or ignored an average of 38% of ChatGPT feedback. Rejection rates were significantly higher at the content level (e.g., arguments, evidence) than at the formal level (e.g., grammar, spelling). The reasons for student feedback rejection can be categorized into two types: inconvenience (feedback overload, vague descriptions, repetitive and lengthy) and perceived uselessness (misunderstanding of intent, lack of examples, irrelevant feedback). This finding suggests that the effectiveness of AI feedback depends not only on technical precision but also on whether students accept the feedback's rationale—a weakness currently present in AI systems, which generally lack interpretive ability and conversational awareness.

These empirical findings from a second language context align with broader theoretical critiques. Selwyn (2019) argues that the core task of educational technology research is not to investigate "whether it works?", but rather "what happens when it works?"—that is, which values are reflected, whose interests are protected, and which practices are replaced. Williamson and Eynon (2020) extend this critique to artificial intelligence in education, warning that the dominant technological solution-oriented paradigm in this field systematically obscures issues of power, agency, and the purpose of instruction. This study responds to their call by examining not only the accuracy of AI-powered writing assessment (AWE) scoring of student essays, but also how its operational logic restructures the teaching relationship between teachers, students, and written texts.

"Critical Use of Technology": Repositioning the Teacher's Role

Faced with the rapid penetration of AI technology, the international academic and policy communities are reaching a consensus: prohibition is not as good as regulation, and reliance is not as good as collaboration.

Released in early 2026, the "Guidelines for the Application of Generative Artificial Intelligence in Teachers (First Edition)" specifically addressed the needs of teachers for the first time, explicitly stating that "teachers must take the lead in key educational aspects such as value guidance, moral education, emotional development, and psychological support, and must not delegate these tasks to technology." It also clarified that "the automatic grading results of generative AI on essays, artworks, and open-ended assignments should not be directly used as the final evaluation of students." The guidelines emphasize that AI can be used for preliminary grading and quick analysis and suggestions, but teachers must, based on technical grading, "focus on students' thinking levels, creative expression, and other higher-order abilities, and conduct in-depth comments and guidance."

This policy direction aligns with emerging international frameworks. UNESCO's **Guidelines on Generative Artificial Intelligence in Education and Research** (2024) explicitly calls for the establishment of "human-machine collaboration" mechanisms to uphold teachers' professional judgment. The European Commission's **Ethical Guidelines for the Use of Artificial Intelligence in Education** (2025) similarly emphasizes that automated feedback must never replace teachers' assessment of higher-order competences. Within these diverse policy contexts, a common principle is gradually becoming clear: artificial intelligence should enhance, not replace, educators' professional judgment.

Boymal (2025) argues that when feedback becomes a "technical problem that can be optimized," educational dialogue risks being colonized by instrumental rationality. He suggests that teachers reduce formulaic comments like "lack of depth," which can be easily simulated by AI, and instead use reflective prompts such as "What additional perspective might challenge your current argument?" to transform feedback from a one-way "problem-solution" channel to a two-way "viewpoint-dialogue" exchange. Benito (2025) proposes the "middle lane" concept from the perspective of academic integrity: allowing students to use AI to a limited extent in the brainstorming and language expression stages, but requiring them to maintain control over the narrative, and achieving transparency in the use process through an "AI usage appendix."

Research Gaps and the Positioning of This Study

Based on existing research, the following areas require further development:

First, empirical research on AI-based writing assessment (AWE) systems has primarily focused on higher education (see Chen et al., 2024; Sun, 2025), with relatively little research on early-age learners—a group for whom feedback is crucial for identity formation and the development of writing self-efficacy. Secondary school students are not merely "writing novices"; they are developing writers whose self-perception of language proficiency is still evolving. The psychological and educational impact of AI feedback on students in this age group has not yet been adequately and deeply studied.

Secondly, while existing research has confirmed students' resistance to AI feedback, few studies have systematically tracked how specific technological flaws translate into different categories of pedagogical harm. We know students may ignore or reject AI suggestions; however, we know little about how repeated exposure to practical judgment errors reshapes their writing strategies,

confidence, and trust in teachers. This study aims to fill this gap by providing comprehensive findings through a nuanced and context-sensitive analysis of the causal chain from technology design to classroom consequences.

Third, the English as a Foreign Language (EFL) teaching environment in junior high school provides a particularly important entry point for studying these dynamics. Unlike university students, who typically write within a subject-specific context with established stylistic norms, junior high school students are still acquiring basic rhetorical skills. Their language choices are more deliberate, and their creative ventures are more susceptible to algorithmic correction. If automated writing evaluation systems (AWE) suppress the voice of this group, flattening them, the resulting developmental losses could be particularly severe and lasting.

This study aims to fill the aforementioned research gap through a systematic empirical investigation of junior high school English classrooms in China. However, its contribution goes far beyond that. By theoretically analyzing the structural roots of the logical flaws in AI-assisted writing instruction systems (AWE)—pragmatic deafness stemming from contextual blind spots and creative inhibition arising from probabilistic conservatism—we propose a conceptual framework applicable to any educational context in which such systems are deployed. Thus, we contribute to an international dialogue on the implicit costs of AI-assisted writing instruction.

Research Design

Research Methodological Stance

This study employs an exploratory qualitative research paradigm. The choice of this qualitative approach is based on the following considerations: this study does not focus on the quantifiable question of "what is the accuracy rate of AI grading," but rather on meaning-construction-level questions such as "why did AI grade in this way," "how do teachers and students perceive these misjudgments," and "what impact did these misjudgments have?" Answering these questions requires the use of interpretivist methodologies to understand the interaction between technology, people, and institutions within specific contexts.

Sample Selection

This study was conducted in two public junior high schools in a major metropolitan area of China. Although the specific institutional and policy context is unique to China, the AWE tools examined—System A and System B—represent a type of artificial intelligence feedback application that is widely deployed in China and increasingly popular in Europe and North America .

Essay Sample: Sixty English essays from students in grades 7-9 were collected from two ordinary junior high schools in a certain city. Among them, 35 were narrative essays and 25 were practical essays (including letters, notices, diaries, etc.). All essays were original versions completed independently by the students and not edited by AI. The sample covers different writing levels: 12 high-scoring essays ($\geq 85\%$), 32 mid-scoring essays (60%-84%), and 16 low-scoring essays ($\leq 59\%$).

AI Systems: This study selected two of the most widely used AI essay grading tools in China's basic education sector. To adhere to research ethics, specific product names have been omitted, and the systems are referred to as "System A" and "System B." Both systems employ a cloud-based service model of "submission-instant grading-scoring-feedback," and both have paid usage records in the sample schools. Both systems are based on large-scale language model architectures and provide

feedback through a "submit grading" interface, similar in function to mainstream global tools such as Grammarly and Turnitin Revision Assistant. System A and System B are anonymous commercial products with over 50 million K-12 users in China and have been piloted in several international schools in Southeast Asia. Therefore, the technical deficiencies identified in this study are not unique to the Chinese market but reflect a transnational structural characteristic of contemporary AWE design.

Teacher Sample: Purposeful sampling was used to select 5 junior high school English teachers with more than 5 years of teaching experience who have continuously used the AI grading system to assist teaching for the past two years. Basic information of the interviewed teachers is as follows:

Table 1

Basic Information Form of Interviewed Teachers

Number	Gender	Teaching experience	Grade	Use AI to correct frequency	Interview duration
T1	female	12 years	Ninth grade	Weekly use	68 minutes
T2	female	8 years	Eighth grade	Weekly use	52 minutes
T3	male	15 years	Ninth grade	Use every two weeks	71 minutes
T4	female	6 years	7 th grade	Weekly use	45 minutes
T5	male	9 years	Eighth grade	Use every two weeks	55 minutes

Analytical Framework

This study focuses on two of the most observable and educationally significant gaps in education:

Dimension One: Pragmatic Appropriateness Misjudgment – Does AI incorrectly mark expressions that conform to specific reader identities, communicative relationships, and stylistic requirements as "incorrect," "inappropriate," or suggest replacements?

Dimension Two: Suppression of Creative Expression – Does AI mark reasonable metaphors, personification, unconventional collocations, and other vivid and personalized expressions as "inappropriate collocation," "incorrect usage," or "non-standard expression"?

These two dimensions were chosen not only because they performed well in our preliminary data, but also because they correspond to the core competencies emphasized in international first and second language writing instruction frameworks: pragmatic competence (Canale & Swain, 1980) and creative expression (Carter, 2004). By operationalizing these dimensions, we connect our empirical research with existing academic findings in applied linguistics and writing studies.

The coding process was conducted by two researchers working independently, and consensus was reached on controversial cases through discussion. The criteria for pragmatic misjudgment were: both senior high school teachers with English education backgrounds agreed that the expression was reasonable and acceptable in the given context. The criteria for creative expression were: the expression possessed rhetorical features such as metaphor, personification, or metonymy, or showed a significant deviation from conventional expression in word collocation or sentence structure selection, and this deviation had an interpretable rhetorical intention.

Research findings: Two typical logical fallacies

Misjudgment of pragmatic appropriateness: Systemic blindness to context

The first structural flaw in AI-based grading systems is the systemic lack of contextual understanding. The built-in "standard English" templates rely solely on grammatical correctness, vocabulary commonality, and sentence regularity, failing to recognize pragmatic parameters such as reader identity, communicative distance, and stylistic conventions in writing tasks.

Typical Case 1: The Intimate Opening in a Congratulatory Letter

Original sentence from a student (8th grade, birthday greeting email to a friend):

"Hey buddy! Have an awesome birthday!"

System A feedback:

×"Informal address, it is recommended to use 'Dear friend' or 'Hello'."

The writing task for this essay was to "write a birthday greeting to a friend." In real English communication contexts, "Hey buddy" is precisely the appropriate choice that matches the recipient's identity and the relationship between the two parties. The system treats "Dear" as a universal standard for all letters, essentially replacing pragmatic judgment with rigid rules.

Typical Case 2: Friendly Expression in Event Notifications

Original sentence by a student (7th grade, notice for a school charity sale):

"Guys, let's meet at the gate at 3 pm!"

System B feedback:

×""Guys" is too colloquial; it is recommended to change it to 'All students' or 'Everyone'."

The notice was posted on the class bulletin board, intended for all classmates. "Guys" is a very friendly and informal term in American English, perfectly matching the relaxed atmosphere of "campus activities." While the system-suggested "All students" is grammatically correct, it loses the warmth and persuasiveness of the original.

Data analysis: Of the 60 samples, 24 (40%) showed at least one pragmatic misjudgment. In terms of distribution characteristics, the misjudgment rate for practical writing (52%) was significantly higher than that for narrative writing (31%); misjudgments were most concentrated when communicative elements such as salutations, closing remarks, and emotional emphasis were involved. It is noteworthy that some essays were misjudged by both systems simultaneously, but the directions of the misjudgments were inconsistent—System A tended to prioritize "standardization" (sacrificing appropriateness for safety), while System B showed a more obvious "written language worship" (almost all colloquial expressions were marked).

These findings coincide with international criticisms of the lack of pragmatic sensitivity in automated writing assessment systems. Godwin-Jones (2024), in **Authenticity in Generative Artificial Intelligence, Pragmatics, and Second Language Learning**, points out that "systems like ChatGPT typically fail to generate pragmatically appropriate language, and the lack of linguistic and cultural authenticity has a significant impact on how artificial intelligence can be integrated into second language acquisition and instruction aimed at developing intercultural communicative competence."

Therefore, the "contextual blind spots" we observed in Chinese English classrooms are not isolated phenomena, but rather a global instructional design challenge.

Establishing Expression Suppression: Salvationism of Recombination

If pragmatic misjudgment is "not understanding the context," then the suppression of creative expression is an inability to tolerate difference. AI systems use probabilistic models to determine whether an expression is "common," but they cannot determine whether an expression is "brilliant." This causes any attempt to break away from the norm—precisely the most cherished manifestation of creative thinking in writing instruction—to be identified by the system as an "error to be corrected."

Typical Case 3: Personification of Rain Scenes

Original sentence by student (Grade 9, narrative essay "That Rain"):

"The sky was crying softly."

System A feedback:

× "Subject-verb agreement is incorrect. The subject of 'cry' is usually a person or an animal. It is suggested to change it to 'It was raining softly.'"

This is a highly evocative personification. "The sky is gently weeping"—the rain isn't noise, but a sob. The student not only described the weather but also conveyed the student's state of mind. However, in the system's semantic network, "cry + person/animal" is a high-frequency collocation, while "cry + sky" is a low-frequency combination. The system cannot recognize this as rhetoric; it can only determine that this is an error.

Typical Case 4: The Body Metaphor of Joy

Original sentence from a student (Grade 8, diary entry titled "The Day I Won the Award"):

"My heart danced with joy."

System B feedback:

× "The metaphor is used inappropriately. It is suggested to change it to 'I felt very happy.'"

"My heart danced with joy"—this is one of the most moving sentences a middle school student could write. It uses bodily metaphor to concretize an abstract emotion, and "dance" and "joy" resonate harmoniously in the semantic field. The system's revised version, "I felt very happy," is grammatically flawless, but its expression is downgraded from literary to descriptive.

Typical Case 5: Fresh Metaphors for Fatigue

Original sentence by student (Grade 7, application text "A Letter to Mom"):

"After work, your smile is always tired."

System A feedback:

× "Logical mismatch. It is suggested to change it to 'You look tired after work.'"

"A smile is weary"—a student attempted to capture the complex state of a mother smiling at her child after get off work: a smile that embodies both exhaustion and love. This was a naive yet sincere example of transferred expression. A systematic revision moved the subject back to "person," correcting the grammar, but the imagery disappeared.

Data analysis: Of the 60 samples, 15 (25%) showed at least one instance of creative expression being misjudged. In terms of grade level, ninth grade had the most cases of suppression (9 cases), followed by eighth grade (4 cases), and seventh grade (2 cases). This distribution is not accidental—older students have richer language accumulation and a stronger willingness and ability to attempt creative expression, thus making them more likely to clash with algorithmic conservatism.

Even more worrying is the combined effect of these two types of flaws: some essays simultaneously suffer from pragmatic misjudgment and creative suppression. In one student's composition containing three creative expressions, two were marked as "wrong" by the system, and one was suggested to be replaced with a common expression. The student was not faced with "how to revise it better," but rather "whether the entire paragraph should be rewritten."

This pattern of suppressing creativity has also appeared in other areas of education. Ebadi et al. (2022) studied the use of Grammarly by Iranian students majoring in English language and literature and found that the system frequently flagged metaphorical language as "mismatched" and recommended more straightforward alternatives. The researchers concluded that "feedback can be misleading and fails to check context and content." Therefore, the problem is not that Chinese students used unusual metaphors, but that all students using unusual metaphors may be penalized because the system targets statistical commonalities.

Ethical Risks: From Technological Vulnerabilities to Educational Concerns

If the aforementioned vulnerabilities can be understood as "technological immaturity," then when these vulnerabilities enter real teaching relationships and affect specific students, the consequences are no longer merely a matter of "misjudgment rate," but transform into real educational costs. Based on in-depth interviews with five teachers, this study identified three interconnected and progressively layered ethical risks. Importantly, these risks are not specific to any particular culture; they reflect the pervasive vulnerabilities in algorithmic feedback systems and the development of writers. The mechanisms we identified—risk aversion, internalization of negative feedback, and loss of cognitive trust—are psychological and relational processes that transcend national and linguistic boundaries.

Risk 1: Tendency towards template-based writing thinking

Core mechanism: When students repeatedly receive feedback signals that "creative expression is penalized while safe expression is rewarded with high scores," they will learn a survival strategy without being taught—to write essays that the algorithm likes.

Teacher Zhang's (T1, 12 years of teaching experience) story is heartbreaking:

"I once taught a boy who was exceptionally gifted in writing when he first came to the class in seventh grade. He wrote about dusk, 'Dusk is like a cup of cooled red tea,' and I thought it was a wonderful metaphor—cooled, red, and quiet, it captured it all. In eighth grade, I started using AI-assisted grading, and his essays consistently received low scores. The system said his 'collage was inappropriate' and suggested changing it to 'The sunset was beautiful.' He came to me and asked, 'Teacher, is my English too Chinese?'"

What pained me most was that all the essays he handed in this semester were filled with 'beautiful,' 'important,' and 'very good'—neat, safe, and uninteresting. I asked him if he remembered 'the cooled-down black tea.' He smiled and said, 'That doesn't get you any points.' – At that moment, I felt that we weren't teaching writing, but teaching test-taking skills. The child wasn't improving; the fire had been extinguished."

This phenomenon is not an isolated case. Teacher Li (T2) observed that some students have begun to actively "predict" the AI's preferences:

"A girl told me that she now consciously avoids using metaphors in her essays because 'machines can't understand them.' She herself used the word 'machine,' not 'teacher.' In her eyes, the final grade is given by that emotionless algorithm, not me. She's not expressing herself; she's trying to please."

The essence of the risk: This is not an adjustment in writing style, but a narrowing of writing thinking. What students lose is not a particular sentence or a particular grade, but the courage to try, to make mistakes, and to embrace the unexpected—and these are precisely the fertile ground on which creativity grows.

This risk of stylistic homogenization is referred to in international literature as "algorithmic writing" (Perelman, 2024). Just as search engine optimization (SEO) has reshaped online news, making it more inclined towards list-style articles and clickbait headlines, AWE optimization also risks reshaping student writing into a form that pleases machines rather than communicates with human readers. The "cold tea" metaphor was invented by a Chinese student, but the pressure to abandon such inventions is widespread.

Risk 2: Weakening of students' confidence in expressing themselves

Core Mechanism: Junior high school students are in a critical period of simultaneously developing language skills and self-identity. Their judgment of "whether their English is good or not" relies heavily on external feedback. When AI repeatedly marks their expressions as "wrong" in an "objective" and "precise" manner, students are unlikely to attribute it to "system limitations," but are more likely to attribute it to "my incompetence."

Teacher Li (T2, 8 years of teaching experience) shared a case that she still finds hard to let go of:

"A girl had above-average English grades, not outstanding, but she always enjoyed writing. Once, she wrote 'I talked to my heart,' meaning she was having a conversation with her inner self. The AI changed it to 'I thought to myself.' She came to me with her graded report, her eyes red: 'Teacher, is my English really that bad? I can't even write such a simple sentence correctly?'"

I told her, "You write very well; it's just that the machine doesn't understand." She nodded, but I remember her expression—it wasn't relief, it was confusion. She rarely used that anthropomorphic expression afterward. It wasn't that she couldn't write, it was that she was afraid to write.

The nature of the risk: This is not a single instance of frustration in feedback, but rather a distortion of the power of feedback. Students are implicitly placed in the position of "authoritative judge" by AI, and its misjudgments are no longer seen as "technical errors," but rather as "denial of ability." For students with average or below-average language proficiency, this denial is particularly heavy—their confidence in their expression is already fragile and cannot withstand repeated labeling.

This phenomenon aligns with findings in educational psychology regarding the impact of differential negative feedback. Tang et al.(2024) demonstrated that adolescents are particularly sensitive to feedback that is fixed rather than malleable in its suggestibility, and algorithmic feedback, perceived as objective and impersonal, may particularly damage their academic self-concept. Effective collaboration between humans and AI to enhance learning outcomes and students' positive learning experiences is the psychological mechanism behind the loss of self-confidence we document here.

Risk 3: The weakening of trust between teachers and students

Core Mechanism: When AI grading differs from teacher grading, students face a cognitive conflict of "whose opinion to follow." Because AI feedback is immediate, quantifiable, and highly consistent, some students gradually develop the naive belief that "machines are more objective," thus subtly challenging the teacher's authority.

Teacher Wang's (T3,15 years of teaching experience) observations are quite representative:

"Previously, when students received their graded essays, they only paid attention to my comments. Now it's different; they look at the score given by the AI first, and then they look at my comments. If I give a high score but the AI gives a low score, they will ask: 'Teacher, the AI says I'm wrong here, why do you say I'm right?'"

Of course I can explain, and I do in every lesson. But the problem is that this kind of explanation is becoming the norm in teaching. I spend more time proving why I'm right than teaching how to write. What's even more frustrating is that some children say they "trust the teacher," but privately they still correct their work according to the AI's—because they feel that since the machine can calculate the score, the machine's standard is the standard.

Teacher Chen (T4) added a subtle phenomenon:

"When I critique essays now, I have to specifically do 'comparative teaching.' I project the AI's grading results and analyze them with the students one by one: 'This one was correct, why; this one was wrong, why.' I'm not teaching English, I'm teaching 'how to critique AI.' Of course, this has its value, but have you ever thought about this—this is a problem that should have been solved by the technology developers themselves?"

The nature of the risk: This is not a confrontation in the teacher-student relationship, but a shift in the trust structure. When teachers need to constantly contend with the default assumption that "machines are more trustworthy," and when teaching time is largely squeezed out by technological error correction, the educational relationship between teachers and students is being mediated and even alienated by technology.

The erosion of teacher authority is not inevitable; it is a consequence of how AI-based assessment systems (AWE) are structured and deployed. In educational environments where AI is positioned as a "coach" rather than a "referee" – and its advice is explicitly presented as temporary and potentially erroneous – students are less likely to experience cognitive conflict (Molenaar et al., 2025). Therefore, the problem lies not in the existence of AI feedback, but in its discursive positioning. The shift in trust we observe occurs when vendors advertise AI assessment systems as providing "accurate, objective scores," and schools use them as a substitute for teacher judgment. This is a design and policy failure, not an inevitable technological consequence.

The Association Structure of Triple Risks

This study further identifies the progressive relationship among the above three risks:

Template-based thinking poses a risk at the cognitive level—students gradually lose the willingness to attempt creative expression;

A decline in self-confidence is a risk at the level of self-perception—students internalize misjudgments as a denial of their own abilities;

A breakdown in trust poses a risk at the relational level—the authority of teachers as professional judges is challenged by technology.

These three aspects are not parallel but rather progressively deeper: from writing ability to the writer's self, and then to the fundamental relationship between teaching and learning. This is precisely what AI-based grading technology is most alarming about—it affects not only "whether it is written correctly," but also "whether one is willing to write," "whether one dares to write," and "whether one believes in the religion."

This chain reaction, from cognitive strategies to self-concept to interpersonal trust, constitutes a unique path of harm in teaching. Traditional AWE (AI-assisted writing practice) accuracy or efficiency metrics fail to capture it, nor do vendor dashboards or school satisfaction surveys reflect it. However, we believe this is the most serious consequence of AI-assisted writing instruction, and this risk transcends national borders. Wherever AWE systems are deployed among young learners, similar chain reactions can occur under institutional pressures that prioritize standardization and neglect individualization.

Discussion and Suggestions

Repositioning: From "Ultimate Judge" to "Initial Screening Tool"

The core findings of this study reveal a fundamental contradiction: current AI grading systems are designed (or expected to be) authoritative judges, but their technical logic is actually better suited as a preliminary screening assistant.

This "role misalignment" is the root of many ethical risks. When a system is given excessively high judgmental authority, its technical flaws cease to be merely "features to be optimized" and transform into real educational costs. Therefore, the primary task is to redefine the role of AI in the teaching process.

At the policy level, this study supports emerging international frameworks aimed at defining the reasonable boundaries of AI application in education. UNESCO's **Guidelines on Generative Artificial Intelligence in Education and Research** (2024) explicitly calls for "human-machine collaboration" mechanisms to uphold teachers' professional judgment. Similarly, the European Commission's **Ethical Guidelines for the Use of Artificial Intelligence in Education** (2025) emphasizes that automated feedback must never replace teachers' assessment of students' higher-order competencies. Our proposed dual-track model—AI for detecting surface errors, and teachers for in-depth, contextualized judgment—integrates these principles into specific teaching workflows. Therefore, it provides a valuable template for regions wishing to integrate AI educational tools without relinquishing their teaching authority.

Suggestion:

At the level of teaching policy, the "boundaries" of AI-based homework grading should be clearly defined. AI is responsible for identifying superficial, rule-based problems such as spelling errors,

basic grammar issues, and misuse of parts of speech; while deeper, context-dependent dimensions such as pragmatic appropriateness, logical coherence, rhetorical effect, and emotional tone must be left to teachers for final judgment.

At the institutional safeguard level, the relevant requirements of the "Guidelines for the Application of Teacher-Generative Artificial Intelligence" should be implemented, clearly stating that "AI-automated grading results shall not be directly used as the final evaluation of students." Schools should establish a dual-track process of "AI grading - teacher review," and the review process should be traceable and auditable.

Teacher Development: Developing the Competency of "Critical Use of Technology"

When technological flaws are difficult to resolve fundamentally in the short term, teachers' professional judgment becomes the last line of defense for upholding educational integrity. However, most teachers lack training in identifying algorithmic biases and interpreting technological logic. In interviews, many teachers admitted that they "know AI sometimes makes mistakes, but can't explain why."

This challenge is not unique to China. In the United States, the National Council of Teachers of English Languages (NCTE, 2025) has called for the inclusion of "algorithmic literacy" in teacher training programs. In the United Kingdom, the Association for Information Technology in Teacher Education (AITE, 2025) has developed a framework for "Critical Artificial Intelligence Teaching Methods." The core competencies outlined below aim to foster international consensus on the knowledge and skills teachers need to acquire in AI-assisted classrooms.

Suggestion

The teacher training system should add a module on "critical literacy in educational technology" to systematically cultivate the following three types of abilities:

The ability to identify algorithmic bias: understanding the basic principles of AI grading (probability statistics, corpus comparison) and being able to quickly determine which types of expressions are easily misjudged by the system (rhetorical language, colloquial expressions, unconventional collocations, etc.).

The ability to conduct comparative teaching: Use AI grading results as teaching materials to guide students to discuss – "Why did the AI judge it this way? What contextual information did it ignore? If you were the teacher, how would you correct it?" Transform technological misjudgments into training resources for critical thinking.

The ability to implement a dual-track feedback system combining AI and teachers: At the beginning of the school year, clearly explain the differences between the two types of feedback to students: "AI is responsible for finding spelling and grammar errors, while teachers are responsible for judging whether the expression is good or appropriate." This helps students develop a healthy skepticism towards technological authority.

Technology Optimization: Towards "Transparent" and "Education-Friendly" Design

This study does not intend to attribute all ethical risks to technology—AI applications in education are still in the exploratory stage, and shortcomings are inevitable. However, technology developers have a responsibility to honestly inform users of the system's capabilities and limitations, rather than obscuring these limitations in the name of "intelligence."

Suggestion:

Increase transparency statement: Clearly state in a prominent position on the system interface: "This system has technical limitations in pragmatic judgment, rhetoric recognition, and evaluation of creative expression. The grading results are for reference only and should not replace the professional judgment of teachers."

Set up a "Creative Protection Zone": When the system detects expressions that appear to be metaphors, personifications, or unconventional collocations, it should not be directly marked as "error." Instead, a pop-up message could appear: "This is a very creative expression! Please confirm that this is the effect you want." Transform the "correction" message into an appreciative prompt.

Provide metacognitive explanation functionality: Add a brief explanation button for "Why is it graded this way?" to show students the basis for the system's judgment in readable language (e.g., "This collocation has a low frequency of occurrence in the corpus"). This not only helps students understand the algorithm's logic but also makes them realize that AI's "standards" are not absolute truths but rather statistical preferences.

Develop a "Teacher-defined rules" function: allowing teachers to set exemption rules for specific contexts in the background (such as "when practicing letter writing in this class, colloquial salutations will not be marked as errors"), thus feeding back the teacher's professional judgment to the system.

These recommendations align with the emerging principle of "value-sensitive design" in the field of educational AI (Ahmad et al., 2024). From this perspective, technological features are not ethically neutral; they encode assumptions about what is important and who should make those decisions. The features we propose—transparency statements, protection of creative expression, interpretability features, and teacher personalization settings—are not merely usability enhancements. They are ethical interventions that redistribute interpretability from algorithms to educators. In short, they are design choices that reflect different visions of the relationship between teachers and AI.

Reflections on Educational Philosophy: Beyond Efficiency, What Else Does Education Pursue?

This study ultimately aims to raise a question that goes beyond "how to improve technology": Have we, in the name of efficiency, quietly replaced the purpose of education?

The core selling point of AI-based essay grading is "speed." Grading an essay in 30 seconds is a speed human teachers can never achieve. But when we pursue "speed," have we asked ourselves: is writing instruction meant to help students finish writing faster, or to allow them to think, feel, and express themselves during the writing process? When feedback arrives in seconds, do students still have the opportunity to experience the deliberation and self-dialogue of "reading a passage repeatedly after finishing it, and crossing it out and rewriting it the next day"?

This is not anti-technological nostalgia, but a questioning of the value hierarchy of technology embedded in education. Efficiency is a means, not an end. Development is a process, not a destination. When we talk about "AI empowering education," we should not be empowering it with the ability to "deliver assignments faster," but with the ability to "become better human beings."

This philosophical question transcends national borders. Teachers in Tokyo and Toronto, researchers in Helsinki and Hong Kong, and parents in São Paulo and Sydney are all pondering it. The specific technologies differ, and the policy environments vary, but the fundamental contradiction remains the same: the contradiction between optimization and nurturing, speed and depth, and

algorithmic logic and the logic of care. A truly meaningful international dialogue on the application of artificial intelligence in education must focus on this contradiction, not avoid it.

Implications of Cross-Cultural Migration

While this study focuses on English as a Foreign Language (EFL) instruction in Chinese junior high schools, its findings offer valuable insights for other education systems exploring the integration of Online Educational Technologies (AWE). The following three points are particularly noteworthy:

First, the tension between "standard" and "appropriate" language is not unique to English as a foreign language. In linguistically diverse classrooms—whether in Singapore, Sweden, or Canada—students bring different discourse norms, which may be misjudged as errors by Automatic Lexical Evaluation (AWE) systems trained on standardized academic English corpora. The pragmatic misjudgments documented in this paper could be amplified in multilingual environments because students' communicative competence includes code-switching, dialectal variations, and pragmatically valid expressions in non-native languages. AWE developers have not taken linguistic diversity seriously; our findings suggest that this neglect results in tangible teaching losses.

Secondly, the suppression of creative expression reflects a deeper epistemological tendency in the current AWE design: equating "good writing" with statistical commonality. This tendency is independent of the specific training corpus; any system designed to reward high-probability patterns systematically devalues novelty. Therefore, the problem is not "more diverse training data," but the optimization logic itself. Unless AWE developers rethink whether probability is the correct metric for rhetorical quality, the suppression of creativity will persist—whether in China, the United States, or in any classroom using these systems.

Third, the weakening of teacher authority observed in this study may manifest differently across different educational cultures. In environments with a stronger tradition of teacher professionalism and a weaker culture of high-stakes testing, teachers may face less pressure and are less likely to relinquish their assessment authority to algorithmic systems. However, the risk of trust shifting remains in any environment where AI feedback is touted as more "objective" and "consistent" than human judgment (a claim actively promoted by many AI education providers). Mitigating this risk requires not only technological transparency but also conscious efforts in instruction to help students understand AI, a process that must be supported by policy and pre-service teacher training.

These cross-cultural considerations suggest that the ethical risks identified in this study are not merely isolated incidents, but rather a symptom of a global shift in writing instruction, assessment, and values. Comparative studies across multiple national contexts are urgently needed. Such research should not only examine whether the same technological shortcomings occur in different environments, but also how local educational cultures modulate (or fail to modulate) the process by which these shortcomings translate into educational harm. This is precisely the next frontier in international research.

Conclusion

Based on empirical evidence from 60 junior high school students' English essays and in-depth interviews with 5 front-line teachers, this study systematically identifies two typical logical flaws in current mainstream AI essay grading systems: misjudgment of pragmatic appropriateness and suppression of creative expression. It also elaborates on the triple ethical risks that these technical

defects may cause: templated writing thinking, weakened students' confidence in expression, and weakened trust between teachers and students in feedback.

Research reveals that these vulnerabilities are not accidental flaws in the early stages of AI technology development, but rather an inevitable result of a structural mismatch between algorithmic logic and the essence of language education. Probability statistics can identify "common" but cannot judge "appropriate"; corpus comparison can reward "safety" but struggles to accommodate "creativity." When this structural flaw is placed in the role of an "authoritative judge," technology ceases to be merely an auxiliary tool and becomes a potential rewriter of educational value.

Therefore, AI-powered essay grading is not a technical issue of "how to optimize algorithm accuracy," but rather a philosophical educational question of "how to safeguard the subjectivity of education in the application of technology." The solution lies not in the laboratory, but in the classroom, in the dialogue between teachers and students, and in the moment when a teacher tells a student, "The machine may not understand, but I understand you."

This requires us to make two efforts simultaneously: on the technological level, to shift AI from a "cold judge" to a "transparent collaborator"; and on the educational level, to strengthen teachers' professional judgment and ethical awareness as "guardians of students' growth." Only through this two-way adjustment can technology truly empower education – not by replacing teachers' thinking, but by supporting teachers to think better; not by making students adapt to algorithms, but by enabling algorithms to understand students.

Regardless of cultural or linguistic context, the underlying purpose of writing education remains constant: not to cultivate writers who can write fluently and without error, but to nurture individuals capable of discovering, refining, and expressing their own thoughts. While the "cold tea" and "dancing heart" examples in this study's data possess cultural specificity, the educational vision they represent is universal. With the global proliferation of AI-powered writing tools, the core question is not whether students will use them – the answer is yes. The question lies in whether educators, researchers, and developers can collaborate to ensure that these tools serve, rather than deviate from, this enduring humanistic goal.

The original intention of education has never been to produce skilled workers who produce "standard answers," but to protect every "cooled-down cup of tea" and every "dancing heart." In the age of algorithms, this original intention needs to be soberly defended more than ever before.

References

- Ahmad, K., Abdelrazek, M., Arora, C., Bano, M., & Grundy, J. (2023). Requirements practices and gaps when engineering human-centered Artificial Intelligence systems. *Applied Soft Computing*, 143, 110421. <https://doi.org/10.1016/j.asoc.2023.110421>
- Bordalejo, B., Pafumi, D., Onuh, F., Khalid, A. K. M. I., Pearce, M. S., & O'Donnell, D. P. (2025). "Scarlet Cloak and the Forest Adventure": a preliminary study of the impact of AI on commonly used writing tools. *International Journal of Educational Technology in Higher Education*, 22(1). <https://doi.org/10.1186/s41239-025-00505-5>
- Cahya Aprilya, R., Pritaputri Ramadhan, D., Hazana, M., Pauziansah, E., & Pohan, E. (2025). The Benefits of Grammarly for Reducing Errors in Student's Academic Writing. *JET ADI BUANA*, 10(01), 1–8. <https://doi.org/10.36456/jet.v10.n01.2025.9928>
- Dragomir, A. (2025). The role of the European Union in shaping an ethical and legal framework for artificial intelligence (AI) in education. *Review of Artificial Intelligence in Education*, 6. <https://doi.org/10.37497/rev.artif.intell.educ.v6ii.48>
- Ebadi, S., Gholami, M., & Vakili, S. (2022). Investigating the Effects of Using Grammarly in EFL Writing: The Case of Articles. *Computers in the Schools*, 40(1), 85–105. <https://doi.org/10.1080/07380569.2022.2150067>
- Gao, Y., & Ali, F. (2024). Negative Self-Concept: Cross-Country Evidence of Its Importance for Understanding Motivation and Academic Achievement. *Education Sciences*, 14(11), 1203. <https://doi.org/10.3390/educsci14111203>

- Giray, L. (2024). The Problem with False Positives: AI Detection Unfairly Accuses Scholars of AI Plagiarism. *The Serials Librarian*, 85(5–6), 181–189. <https://doi.org/10.1080/0361526x.2024.2433256>
- Godwin-Jones, R. (2024). Generative AI, Pragmatics, and Authenticity in Second Language Learning (Version 1). arXiv. <https://doi.org/10.48550/ARXIV.2410.14395>
- Heindl, L., Huber, V., Schuricht, V., Wawrzinek, D., Babl, U., & Ellert, G. (2025). Exploring feedback dynamics: an experimental analysis of human and computer feedback on motivation, engagement, and GRIT in secondary school students. *Frontiers in Education*, 9. <https://doi.org/10.3389/feduc.2024.1473727>
- Hu, B., Ni, Q., & Gao, R. (2024). Development Strategies and Practical Insights of Teachers' Artificial Intelligence Competence. 2024 International Conference on Intelligent Education and Computer Technology, 1–0. <https://doi.org/10.1145/3687311.3687323>
- Huang, Y., Palermo, C., Liu, R., & He, Y. (2025). An Early Review of Generative Language Models in Automated Writing Evaluation: Advancements, Challenges, and Future Directions for Automated Essay Scoring and Feedback Generation. *Chinese/English Journal of Educational Measurement and Evaluation*. <https://doi.org/10.59863/famj7696>
- Keon, M., Karim, A., Lohana, B., Karim, A., Nguyen, T., Hamilton, T., & Abbas, A. (2025). Galton's Law of Mediocrity: Why Large Language Models Regress to the Mean and Fail at Creativity in Advertising. 55mv Research Lab.
- Namood-e Sahar, & Nadeem, H. A. (2024). Effect of Teacher's Feedback on Self-Concept of Students at Secondary Level. *OPEN ACCESS EDUCATION AND LEADERSHIP REVIEW*, 1(1), 11–20. [https://doi.org/10.59644/oaclr.1\(1\).2023.69](https://doi.org/10.59644/oaclr.1(1).2023.69)
- Sun, Y. (2025). Beyond detection: GenAI in EAL writing education. *ELT Journal*. <https://doi.org/10.1093/elt/ccaf054>
- Tang, X., Wong, S., Huynh, M., He, Z., Yang, Y., & Chen, Y. (2024). SPHERE: Scaling Personalized Feedback in Programming Classrooms with Structured Review of LLM Outputs (Version 1). arXiv. <https://doi.org/10.48550/ARXIV.2410.16513>
- Wilson, J., Ahrendt, C., Fudge, E. A., Raiche, A., Beard, G., & MacArthur, C. (2021). Elementary teachers' perceptions of automated feedback and automated scoring: Transforming the teaching and learning of writing using automated writing evaluation. *Computers & Education*, 168, 104208. <https://doi.org/10.1016/j.compedu.2021.104208>
- Ziqi, C., Xinhua, Z., Qi, L., & Wei, W. (2024). L2 students' barriers in engaging with form and content-focused AI-generated feedback in revising their compositions. *Computer Assisted Language Learning*, 1–21. <https://doi.org/10.1080/09588221.2024.2422478>

RESEARCH ON INSTITUTIONAL DIFFERENCES, PRACTICAL PATH AND SYNERGISTIC MECHANISM OF CHINA-EUROPE ENTERPRISE MANAGEMENT REFORM WITH THE EMPOWERMENT OF ARTIFICIAL INTELLIGENCE

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Abstract

Against the backdrop of rapid global penetration of artificial intelligence technology and deepening digital transformation of enterprises, AI has evolved from a mere technical tool to a core engine driving comprehensive transformations in corporate strategy, organizational structure, business processes, and human resource systems. As two key regions in global AI governance and industrial application, the EU and China exhibit significant differences in institutional environments, regulatory frameworks, market logic, and cultural cognition, leading to distinctly different developmental trajectories of Chinese and European enterprises in AI-led management reforms. Based on institutional theory, dynamic capability theory, and the TOE (Technology-Organization-Environment) framework, this paper systematically explores the mechanisms, differential manifestations, and influencing factors of AIs impact on management reforms in Chinese and European enterprises through literature review, cross-regional comparisons, and case studies. The research reveals that EU enterprises demonstrate compliance-first, ethics-driven, and gradual transformation characteristics under the Artificial Intelligence Act and GDPR framework, while Chinese enterprises exhibit efficiency-oriented, scenario-driven, and large-scale implementation paths guided by data element marketization and industrial intelligence policies. Institutional regulation, data governance, organizational capabilities, and cultural cognition collectively constitute key moderating variables for regional disparities. Finally, this paper provides insights for Chinese enterprises global expansion, European enterprises operations in China, and multinational corporations AI strategies. The paper provides the practical path and countermeasures for the intelligent management transformation of enterprises under the background of globalization.

Keywords: management transformation, digital transformation, institutional theory, AI governance

Introduction

Research Background

With the maturation of large-scale models, computer vision, natural language processing, and decision intelligence technologies, artificial intelligence has expanded beyond its initial applications in production and R&D. It now plays a pivotal role in core management domains including corporate strategy formulation, organizational structure design, operational process optimization, human resource management, and risk control (Zhong Weiguo et al., 2024). Globally, business management paradigms are rapidly transitioning from traditional hierarchical systems and experience-based

decision-making to data-driven approaches, human-machine collaboration, platform-based solutions, and agile methodologies.

In this wave of transformation, China and the EU have developed two highly representative AI application and governance models. The EU, adhering to the principles of controllable risks, human rights protection, and ethical priority, has enacted the "AI Act" and the General Data Protection Regulation (GDPR), establishing the worlds most stringent AI regulatory framework (European Commission, 2024). This institutional environment compels EU companies to prioritize compliance, transparency, and explainability when advancing AI management reforms. In contrast, China, with its core focus on digital economic development, industrial upgrading, and scenario innovation, has successively introduced policies such as AI classification and governance, and market-oriented allocation of data elements, encouraging enterprises to accelerate AI application implementation in sectors like manufacturing, retail, finance, and supply chains, thereby enhancing management efficiency and achieving large-scale innovation (China Academy of Information and Communications Technology, 2025).

The institutional and market environment disparities between China and Europe have directly led to significant divergence in corporate AI adoption motivations, organizational transformation approaches, management process restructuring, and decision-making models. However, existing research predominantly focuses on single-country or single-technology scenarios, with insufficient systematic comparisons of AI-driven management reforms in Chinese and European enterprises. Particularly, there is a notable lack of integrated analysis encompassing institutional differences, practical pathways, and collaborative mechanisms. Against this backdrop, this studys focus on AI and management transformation in Chinese and European enterprises holds both theoretical significance and practical relevance.

Research Questions and Significance

This paper focuses on three core issues:

- What dimensions of artificial intelligence are driving the management reform of Chinese and European enterprises?
- How do institutional environments, governance rules, and organizational capabilities influence the divergent paths of AI management transformation in Chinese and European enterprises?
- In the context of global operations, how can enterprises establish AI-driven management collaboration mechanisms that effectively adapt to both Chinese and European business scenarios?

Theoretically, this paper integrates institutional theory with the TOE framework, expanding cross-regional comparative studies on corporate management reforms in AI contexts and addressing the shortcomings of existing literature in insufficient attention to regional differences. Practically, the research conclusions can provide decision-making references for Chinese enterprises to enter the EU market and avoid compliance risks, European enterprises to achieve efficient AI implementation in China, and multinational corporations to realize cross-regional management collaboration.

Research Content and Framework

This study employs a logical framework comprising literature review, theoretical construction, comparative analysis, case validation, and policy recommendations. First, it systematically reviews relevant literature on AI and enterprise management transformation, as well as China-EU AI

governance. Second, it establishes a theoretical analytical framework. Third, it conducts comparative analysis across five dimensions: institutional, strategic, organizational, process, and human capital. Fourth, it validates the findings through case studies. Finally, it presents conclusions and practical implementation pathways

Literature Review and Theoretical Foundations

Research on Artificial Intelligence and Enterprise Management Reform

In recent years, the impact of AI on enterprise management has become a hot topic in management research. Zhong Weiguo et al. (2024) pointed out that artificial intelligence is driving management research to shift from the traditional human-organization analysis to a new paradigm of human-machine-organization collaboration. Mao Jiye (2025) proposed that AI can achieve data-driven and transparent management processes, enabling enterprises to transition from experience-based management to precision management and from black-box management to transparent management.

In terms of specific transformation dimensions, existing research indicates that AI can drive organizational flattening and decentralization (Fang & Lv, 2023); optimize operational processes including supply chain, production, and finance to enhance automation and lean efficiency (Yu Weixin et al., 2025); transform human resource management models encompassing recruitment, training, performance evaluation, and compensation systems; while simultaneously improving the scientific rigor and foresight of strategic decision-making (Brandtner & Mates, 2025). Overall, AIs impact on enterprise management is comprehensive, systematic, and profound.

Research on Differences in AI Governance and Corporate Practices between China and Europe

The European Union has implemented a risk-based classification framework for artificial intelligence, categorizing AI systems into four risk levels: unacceptable, high, low, and minimal. High-risk AI systems are subject to stringent requirements for testing, registration, transparency, and human oversight (European Commission, 2024). Under this regulatory framework, EU companies have placed greater emphasis on the robustness, safety, and social responsibility of AI, with management reforms demonstrating cautious and incremental characteristics (Wrede et al., 2020).

China adopts a governance approach that emphasizes both development and standardization, highlighting the value of AI in industrial upgrading and the integration of the real economy. According to data from the China Academy of Information and Communications Technology (2025), the penetration rate of AI in scenarios such as intelligent manufacturing, smart supply chains, and intelligent marketing among Chinese enterprises has rapidly increased, with a greater focus on efficiency improvement, cost reduction, and large-scale expansion. Clough & Wu (2024) pointed out that the differences in data governance rules between China and Europe directly impact the boundaries of corporate AI applications and management decision-making models.

Theoretical Basis

Institutional theory

Scott (2001) proposed that the institutional environment consists of three pillars: regulation, norms, and cognition, which significantly influence corporate behavior and organizational models. In the context of AI, the EUs laws and regulations, along with Chinas industrial policies, form the regulatory

pillar; societal awareness of AI ethics and safety constitutes the normative pillar; and the management culture long established by enterprises forms the cognitive pillar, collectively determining the path of management reform.

Dynamic capability theory

Teece et al. (1997) proposed the dynamic capability theory, which highlights that enterprises must possess the ability to perceive opportunities, seize them, and restructure their organizations in dynamic environments. In the AI era, a company's data capabilities, algorithmic understanding, and human-machine collaboration have become the core dynamic capabilities driving management transformation.

TOE frame

The technology-organization-environment framework proposed by Tornatzky and Fleischer (1990) provides a classic perspective for explaining corporate technology adoption and change. In this paper, artificial intelligence (AI) is treated as a technological factor, while internal resources and culture of Chinese and European enterprises are considered organizational factors, and institutional and market environments are regarded as environmental factors, thereby constructing an integrated analytical model.

Literature Review

Existing research has confirmed the significant impact of AI on corporate management transformation and has explored AI governance in China and Europe. However, two key gaps remain: first, the lack of an integrated comparative framework, with limited systematic comparisons across strategic, organizational, process, and human resource dimensions; second, insufficient mechanism explanations, with scant analysis of how institutional environments influence AI-driven management transformation. This paper addresses these gaps through its research.

Theoretical Framework of AI-Driven Management Transformation in China-Europe Enterprises

Core Dimensions of AI-Driven Enterprise Management Transformation

Strategic management change

The application of AI technology is profoundly transforming corporate strategic management. Through big data analytics and machine learning algorithms, businesses can now make more accurate predictions about market trends, analyze consumer behavior, and assess competitors. These technologies enable companies to swiftly respond to market changes and dynamically adjust their strategies. For instance, a retail company can leverage AI to analyze historical sales data, forecast future sales trends, and accordingly optimize inventory and supply chain strategies. This approach helps reduce stockpiling and enhance customer satisfaction.

Organizational structure change

With the widespread adoption of AI technology, traditional hierarchical organizational structures are gradually weakening. Companies are transitioning to platform-based, flat, and agile frameworks to enhance decision-making efficiency and response speed. For instance, a tech company might adopt

cross-functional teams, each equipped with AI tools to support decision-making, thereby enabling rapid iteration and innovation. This organizational transformation helps businesses better adapt to rapidly changing market conditions.

Change in operational processes

AI technology enables the automation, intelligence, lean optimization, and traceability of operational processes. By implementing Robotic Process Automation (RPA) and intelligent analytics tools, businesses can significantly enhance operational efficiency and reduce costs. For instance, in manufacturing, AI can monitor production lines, dynamically adjust equipment parameters in real time to ensure product quality, and predict maintenance needs through smart analytics, thereby minimizing downtime.

Human resource management change

AI technology is revolutionizing corporate human resource management. The talent landscape is evolving, with surging demand for technical professionals like data analysts and AI engineers. Meanwhile, skill requirements are escalating, requiring employees to master AI collaboration capabilities. Performance evaluation models are also transforming, placing greater emphasis on data analysis and algorithmic assessment. For instance, a consulting firm might utilize AI tools to evaluate employee performance, providing personalized training and career development recommendations through analyzing work outcomes and behavioral patterns.

Reform of decision-making mechanism

The integration of AI technology has transformed corporate decision-making from experience and intuition to data-driven approaches with algorithmic support. Through big data analytics and machine learning models, businesses can now objectively evaluate the potential outcomes of various options. For instance, financial institutions can utilize AI models to assess credit risks of loan applicants, enabling more precise lending decisions.

The Moderating Mechanism of China-EU Differences

Regulatory environment

The strong compliance constraints of the EU stand in sharp contrast to Chinas policy environment that equally emphasizes innovation and implementation. In the EU, companies must adhere to strict data protection regulations and privacy policies, which limits the scope of AI technology applications. In China, however, the government tends to encourage corporate innovation and the rapid adoption of new technologies, providing a more relaxed environment for the development and application of AI technology.

Data-based approach to governance

The EUs principles of data minimization and privacy-first coexist with Chinas strategy of data elementization and full-domain connectivity. In the EU, companies must ensure minimal use of data and strictly protect personal privacy. In China, data is regarded as a crucial production factor, and enterprises focus more on data integration and full-domain connectivity to achieve more efficient operations and decision-making.

Organization culture

The differences in organizational culture between the EUs steady, prudent, and people-oriented approach and Chinas efficient, iterative, and growth-oriented culture also influence the application of AI technology. EU companies place greater emphasis on long-term stable development and employee well-being, while Chinese companies focus more on rapid iteration and market expansion. This cultural difference leads to different ways of applying and expecting AI technology.

Dynamic capability

The effectiveness of AI applications hinges on three dynamic capabilities: corporate data governance, algorithmic implementation, and human-machine collaboration. Organizations with robust data governance systems excel at managing and leveraging data resources, while those with optimized algorithms deliver precise data analysis and informed decision-making. Companies that master human-machine synergy can effectively integrate human intuition with AIs computational power, ultimately gaining a competitive edge in transformative environments.

Comparative Analysis and case study of Management Reform in China and Europe

Comparison of Institutional and Governance Environments

The EU establishes a dual regulatory framework centered on legal hard constraints, where the AI Act and GDPR form a comprehensive system. Enterprises are required to conduct risk assessments, register algorithms, and undergo data compliance audits, with high-risk AI applications being prohibited or strictly restricted. While compliance costs are substantial, the legal certainty is robust.

China is characterized by combining policy guidance with tiered and categorized governance, encouraging enterprises to carry out AI innovation practices in areas such as manufacturing, finance, and peoples livelihood, while gradually improving the safety assessment and algorithm filing system. The institutional environment is more flexible, and the transformation speed is relatively fast.

Comparison of Management Practice Dimensions

Strategic management: EU companies incorporate compliance, sustainability, and social responsibility into their core strategies, with AI strategies subject to ethical and legal constraints; China companies prioritize growth, efficiency, and market expansion, closely aligning AI strategies with business objectives and the digital transformation process.

Organizational Structure: EU enterprises tend to adopt a distributed, small-team autonomous model, reducing centralized decision-making and emphasizing the human-dominated role in human-machine collaboration; China enterprises widely adopt a middle-platform, platform-based, and flat organizational structure to improve response speed and resource reuse capabilities.

Operational processes: EU companies emphasize transparency, explainability, and traceability of processes, prioritizing regulatory compliance; China companies focus on full-chain optimization, cost reduction, efficiency improvement, and large-scale replication, rapidly implementing AI systems in areas such as supply chain, production, and marketing.

Human resource management: EU companies emphasize employee protection, skills training, and algorithmic rights, with human-machine collaboration primarily serving as an auxiliary; China

companies place greater emphasis on enhancing employees digital literacy, promoting deep integration of human-machine collaboration, and optimizing performance and incentive mechanisms.

Decision-making model: EU companies insist on the ultimate decision-making power of humans, with algorithms serving only as a reference, emphasizing fairness and transparency in decision-making; China companies widely adopt a combination of data-driven and algorithmic decision-making to improve accuracy and efficiency, relying heavily on AI in areas such as marketing, risk control, and supply chain scheduling.

Comparison of Typical Cases

EU Enterprises: Siemens, Bosch. In the field of industrial AI and digital twin applications, Siemens strictly adheres to the EU AI Act requirements, conducting continuous evaluation and human supervision of high-risk industrial AI systems. The company prioritizes steady and gradual organizational reforms, emphasizing safety and controllability. As a globally renowned engineering and technology company, Siemens possesses profound technical expertise and extensive practical experience in industrial automation and digital transformation. Beyond its extensive applications in smart factories and intelligent manufacturing, Siemens plays a pivotal role in critical infrastructure sectors such as smart grids and intelligent transportation. Siemens AI technologies span all stages from production and operations to maintenance, significantly enhancing production efficiency and equipment reliability through real-time data analysis and predictive maintenance.

As another European enterprise with significant influence in industrial AI and digital twin technology, Bosch Group adheres to stringent industry standards and regulations. The company has invested heavily in developing intelligent sensors, IoT devices, and AI algorithms, aiming to build a smarter and more interconnected industrial ecosystem. Bosch's solutions not only enhance the intelligence of production processes but also enable precise simulation and optimization of complex industrial systems through digital twin technology. This approach ensures production safety while improving resource efficiency and product quality.

China enterprises: Haier Smart Home, CIMC Group. Haier achieves organizational flattening and mass customization through the COSMOPlat industrial internet platform, while CIMC utilizes digital twins and AI to optimize global supply chain management, both with efficiency improvement and scenario implementation as core objectives, featuring rapid transformation and broad coverage. As a global leader in home appliance manufacturing, Haier Smart Home's COSMOPlat platform represents a key strategic layout in the industrial internet domain. By connecting users, enterprises, and resources, the platform facilitates the transition from mass production to mass customization, significantly enhancing the responsiveness to personalized demands and production efficiency. Leveraging the COSMOPlat platform, Haier Smart Home has not only achieved innovative breakthroughs in the home appliance industry but also successfully applied it to multiple fields such as healthcare and automotive, driving the transformation and upgrading of the entire manufacturing sector.

As a global leader in logistics and energy equipment manufacturing, CIMC Group has leveraged digital twin and AI technologies to optimize its global supply chain management, significantly enhancing logistics efficiency and cost control capabilities. By establishing virtual digital twin models, CIMC enables real-time monitoring and management of physical logistics equipment, achieving precise prediction and optimization of complex supply chain systems. Additionally, CIMC employs AI algorithms to analyze massive data, forecasting market trends and customer needs to make more

scientific decisions. These innovative initiatives by CIMC Group not only boost its competitiveness but also set new benchmarks in the global logistics and supply chain management sector.

Research Findings and Discoveries

First, AI significantly drives management transformation in both Chinese and European enterprises, demonstrating consistent trends in organizational flattening, intelligent processes, and data-driven decision-making.

Second, the institutional environment is the core reason for the differences between China and Europe. The strong regulation in the EU makes enterprises inclined to prudent, compliant, and incremental changes; Chinas policy support makes enterprises inclined to efficient, scenario-based, and large-scale changes.

Third, data governance and dynamic capabilities jointly determine the effectiveness of transformation. In both China and Europe, enterprises with high-quality data governance and human-machine collaboration capabilities can better realize the value of AI management.

Fourth, both models have their own advantages. The EU model is long-term stable and has low compliance risks, but lacks short-term efficiency and flexibility; the China model has a fast iteration speed and quick results, but requires continuous strengthening of ethics and compliance construction.

Practical Approaches and Policy Recommendations

Recommendations for Chinese enterprises to go global in the EU

In the current globalized business environment, Chinese enterprises facing the EU encounter a series of challenges and opportunities. First, pre-compliance assessment is a crucial step. Enterprises need to strictly adhere to the EUs AI Act and GDPR (General Data Protection Regulation) requirements to ensure compliance with the EUs high standards in product design, data processing, and user privacy protection. For example, enterprises should ensure that their AI systems provide transparency when processing personal data and allow users to understand and control the use of their personal data.

Enhancing AI transparency and explainability is another critical focus. Companies should develop AI systems that can articulate their decision-making processes, which not only boosts user trust but also enables effective troubleshooting when issues arise. For instance, by employing explainable machine learning models, businesses can demonstrate the rationale and evidence behind their decisions to users.

Maintaining human oversight and decision-making authority is another critical aspect of ensuring compliance. While AI technology can enhance efficiency and accuracy, key decisions should always be made by humans, especially when handling sensitive data or significant impacts. Companies should establish mechanisms to ensure prompt intervention and corrective actions when AI systems exhibit biases or errors.

Adopting a phased change strategy can effectively mitigate organizational and regulatory risks. Companies should avoid large-scale, rapid transformations, instead opting for a "small steps, fast run" approach to gradually optimize their business processes and AI applications. For instance, enterprises could first test new AI solutions in limited areas, gather feedback, and make adjustments before progressively expanding them to broader business operations.

Recommendations for European Enterprises Operating in China

For European companies operating in China, embracing scenario-based AI applications and accelerating iteration speed are key to enhancing competitiveness. Enterprises should focus on the specific needs and preferences of the China market and develop AI solutions that can solve practical problems. For example, by analyzing the behavioral data of Chinese consumers, companies can develop more personalized recommendation systems, thereby improving user experience and sales performance.

Moderately expanding the boundaries of data usage and aligning with the rules of Chinas data element market are key to the success of European enterprises in the Chinese market. Enterprises need to understand and comply with Chinas data management regulations while finding legal and compliant ways to collect and use data. For example, enterprises can collaborate with local partners to share data resources while ensuring the legal source and use of data.

Enhancing the agility of localized organizations and improving decision-making efficiency are crucial for European companies to respond quickly to changes in the China market. Companies should establish flexible organizational structures and decision-making processes to rapidly adapt to market changes and policy adjustments. For example, by forming cross-departmental rapid response teams, companies can more effectively handle emergencies and market changes.

Recommendations for Cross-border Enterprises

Establishing a dual-track AI governance system that unifies foundational capabilities while enabling differentiated implementation forms the cornerstone for multinational corporations collaborative development. Companies should develop unified global AI technical standards and management frameworks, while tailoring products and services to meet regional legal requirements and market demands. For instance, multinational enterprises may share AI algorithms and data processing technologies worldwide, but must adapt implementations to comply with each countrys specific privacy protection regulations.

Strengthening core capabilities in data governance and human-machine collaboration is crucial for ensuring the competitiveness of multinational enterprises. Companies should invest in data governance technologies to ensure data quality, security, and compliance. At the same time, they should focus on human-machine collaborative work models by training employees to use AI tools, thereby improving work efficiency and decision-making quality. For instance, by introducing collaborative robots (Cobots) and intelligent analytics tools, enterprises can enhance the automation level of production lines and the scientific basis of management decisions.

Balancing efficiency and compliance to achieve long-term sustainable development poses a major challenge for multinational corporations. While pursuing efficiency and innovation, these companies must ensure their business operations comply with legal and regulatory requirements across the globe. For instance, by establishing a global compliance committee, multinational enterprises can regularly review and adjust their business strategies to ensure sustainable development worldwide.

Conclusions

This paper takes AI and the management transformation of Chinese and European enterprises as research objects, systematically comparing the differences between the two in terms of institutional

environment, management practices, and transformation paths based on institutional theory, dynamic capability theory, and the TOE framework. The study shows that AI is driving a global transformation of enterprise management paradigms, while the regional institutional environment determines the direction, speed, and model of corporate transformation. EU enterprises focus on compliance and ethics, while China enterprises prioritize efficiency and scenarios. In the future, the two can learn from each other and co-evolve.

The limitations of this paper are that it is mainly based on comparison and case analysis. In the future, it can be further tested by large sample data, questionnaire survey or longitudinal case tracking, and expanded to more industries and countries for comparative study.

References

- Brandtner M, Mates K. (2025). AI-driven Strategic Foresight: Opportunities and Limitations for Long-range Planning[J]. 58(1): 102345. *Long Range Planning*
- China Academy of Information and Communications Technology. (2025) .White Paper on the Development of Chinas Artificial Intelligence Industry[R]. Beijing: China Academy of Information and Communications Technology
- Clough J, Wu Y. (2024). Data Boundaries and Firm Value in the AI Era: Evidence from China and the EU[J]. 45(8): 2189-2217. *Strategic Management Journal*
- European Commission. (2024). Regulation on Artificial Intelligence (AI Act) [Z]. Brussels: European Commission
- Fang Yue, Lü Xinghang. (2023). Artificial Intelligence and Management: Evolution, Application and Limitations [J]. (3):21-29. *China Management Accounting*
- Mao Jiye. (2025). Transparency of Management Black Box: Chinas Practice of AI-Driven Organizational Change [J]. 41(1):123-135. *Management World*
- PwC. (2026). Global AI Enterprise Application Research Report [R]. Shanghai: PwC
- Scott W R. (2001). Institutions and Organizations: Ideas and Interests[M]. 3rd ed. Thousand Oaks: Sage Publications
- Teece D J, Pisano G, Shuen A. (1997). Dynamic Capabilities and Strategic Management[J].18(7): 509-533. *Strategic Management Journal*
- Tornatzky L G, Fleischer M. (1990). The Processes of Technological Innovation[M]. Lexington: Lexington Books
- Wrede M, Voigt K, Büchner A. (2020). Digital Transformation and Management Control in European Companies[J]. 38(4): 562-574. *European Management Journal*
- Yu Weixin, Li Ping, Chen Chunhua. (2025). Research on Digital Transformation Models of Traditional Manufacturing Enterprises from the Perspective of Opportunity-Resource Integration[J]. 37(2):156-168. *Management Review*
- Zhong Weiguo, Peng Siqing, Zhang Zhixue. (2024). Business Administration Research in the Age of Artificial Intelligence: Current Status, Challenges, and Future[J]. 38(2):211-219. *China Science Fund*

MAPPING INTERNATIONAL BRAND PERCEPTION OF *BLACK MYTH: WUKONG*: A BERT-BASED SENTIMENT AND TOPIC MODELLING ANALYSIS

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Abstract

This study investigates the international brand perception of the Chinese video game Black Myth: Wukong, utilizing a Transformer-based framework to analyse 3,037 user reviews from global social media platforms. By employing DistilBERT for sentiment analysis and BERTopic for thematic clustering, the study identifies five core dimensions that constitute the brand image including product quality, artistic value, cultural resonance, social reputation and technical accessibility. The findings reveal a positive spillover effect with 61.31% of reviews expressing high sentiment ($M=0.9619$), alongside a distinct U-shaped distribution that reflects polarized audience engagement. While the game is perceived as a digital cultural monument of high artistic fidelity, its brand equity is simultaneously shaped by defensive loyalty against external media bias and hindered by technical barriers related to platform availability. This study provides a theoretical foundation for understanding how video games serve as conduits for cross-cultural communication and brand empowerment in the digital age.

Keywords: BERT, BERTopic Modelling, Brand Perception, Video Game Brand

Introduction

China's video game industry has entered a phase of maturity and shifted from being an importer of online games to becoming a major exporter since 2015 (Fung, 2016; Nakamura, 2018; Nakamura and Wirman, 2021). As its annual reports show, the overseas revenue generated by domestically developed Chinese games reached USD 18.557 billion in 2024, representing a year-on-year growth of 13.39%, with North America, Japan, South Korea, and Southeast Asia emerging as its principal target markets. Among these, *Black Myth: Wukong*, which is recognised as the China's first AAA video game, achieved a global sales record of USD 961 million within its first month of release in 2024. The narrative of this game is adapted from *Journey to the West*, one of the Chinese classical mythologies, and its developer employs advanced digital technology and immersive storytelling techniques to offer global players a renewed interpretation of Chinese literary masterpiece (Wang *et al.*, 2025b). For many Chinese scholars, the global expansion of video games represented by *Black Myth: Wukong* can be regarded as the vehicle of the international communication of Chinese culture. From this perspective, the key of the success of brand communication across cultures lies in whether the brand can be recognized and accepted by target cultural groups at the psychological level (Zhang, 2024). In the context of the cross-cultural communication of *Black Myth: Wukong*, differences between developers and global players in language, values, and experience lead to a deficit of public trust, which in turn poses challenges for reducing psychological distance between the brand and its users

and for fully realising its economic potential (Caetano, 2017; Croucher, 2017). In response to such challenges, Schmidt *et al.* (2007) argue that brand communicators should adopt perspectives that transcend their own cultural frameworks and address the shared needs of humanity in intercultural encounters. Brand managers are likewise required to reflect on the establishment of constructive relationships with global players, potential conflicts between product promotion and target market cultures, and the integration of new cultural elements in the face of cultural shock (Shuter, 1989). These perspectives collectively indicate that understanding overseas players' perceptions of game brands is crucial for enhancing the effectiveness of international brand communication and for building sustainable cross-cultural relationships. Given the current research gap of video game globalisation from the perspectives of brand perception and intercultural communication, this research takes *Black Myth: Wukong* as a case study. It employs Python-based tools to collect user-generated comments from social media platforms including YouTube, X, TikTok, Steam Communities, Reddit and Facebook, and applies BERT-based methods to examine global players' sentiment, thematic structures, and semantic networks in their overall brand perceptions. On this basis, the study aims to provide strategic insights for optimising the cross-cultural communication of Chinese video game brands.

Literature Review

Black Myth: Wukong in Overseas Markets

Black Myth: Wukong is China's first AAA action role-playing video game. It is developed by Game Sciences and was launched worldwide in August 2024. The game draws on the Chinese classical mythology *Journey to the West* and is rooted in the narrative of Sun Wukong and his pilgrimage with Tang Sanzang and other disciples to the Western Heaven in search of Buddhist scriptures. The storyline of the game begins after the completion of his pilgrimage. Wukong, having attained the title of "Victorious Fighting Buddha", seeks to renounce this title and retreat to the Mountain of Flowers and Fruit where he was born. However, this decision arouses suspicion within the celestial orders, so they dispatch Erlang God and the heavenly army to attack the mountain. This conflict culminates in Wukong's defeat and death. Since then, many monkeys aspire to resurrect him, and the player will assume one of the new generations of those monkeys as the role of "Destined One". Players need to defeat the monsters appearing throughout *Journey to the West* and collect the "Six Roots" left behind by Wukong. Through this process, they acquire Wukong's abilities, titles, equipment, and spells, and are immersed in a narrative structured around the themes of destiny, repentance, sacrifice, and redemption, ultimately culminating in the symbolic rebirth of a new Sun Wukong (Wang *et al.*, 2025b).

The narrative of *Black Myth: Wukong* integrates complex strands of Chinese classical philosophy, particularly reflections on life and death, emotion, wisdom, rebellion, and self-advanced. At the level of values, the game synthesises Buddhist and Daoist traditions with philosophical reflections on fate, positioning it as a cultural carrier through which Chinese civilisation is articulated on the global stage. It not only demonstrates the diversity and inclusivity of traditional Chinese philosophy but also strengthens the symbolic presence and cultural influence of Chinese civilisation within the global context (Wang *et al.*, 2025a). "Six Roots" as one central cultural symbol in the game, originates from the Buddhist epistemology, which conceptualises human perception of the external world through six sensory faculties, including the eyes, ears, nose, tongue, body, and mind. When these "six roots"

encounter the “six dusts”, human beings generate afflictions and karmic obstacles. At the same time, the game incorporates Daoist notions of *qingjing wuwei* (quietism), a philosophical doctrine advocating inner tranquillity, non-intervention, and alignment with the natural flow of things, rather than the deliberate manipulation or control of worldly processes (Hu, 2025). Within the cultural space constructed by the game’s narrative, these philosophical traditions contribute to the formation of a cultural identity that transcends conventional boundaries of communication. Global players are thus able to experience this identity through a modern, interactive, and participatory mode of engagement. In this respect, the game itself may be conceptualised as a form of national-cultural text, functioning as a medium through which cultural meanings and values are transmitted, and cultural dialogue in the real world is actively shaped and reconfigured (Lei *et al.*, 2024).

Video Game Brand as Medium for Cross-Cultural Communication

Video games constitute a fundamental category within the realm of cultural economics and serve as a vital component of national cultural frameworks (Borowiecki and Prieto-Rodriguez, 2014; Liboriussen and Martin, 2016). The cultural identity forged during the construction of cultural meaning relies not only upon historical concepts and symbolic systems shared by in-group members but is also shaped by civilizational interactions and conflicts arising from the legacies of globalisation and colonialism (Lei *et al.*, 2024). At the design level, *Black Myth: Wukong* integrates Chinese aesthetics with a diverse array of traditional cultural elements, such as architecture, sculpture, calligraphy, and folk music, utilising advanced digital technologies to manifest profound commercial potential in terms of market performance and brand empowerment (Wang *et al.*, 2025a).

This research conceptualises the video game as a brand held by its developer Game Science, since it has established a significant brand meaning as a core corporate asset, providing multi-dimensional added value including financial revenue (Aaker, 1992; Eckhardt and Bengtsson, 2015). The brand identity constructed through cultural symbols establishes a unique brand image for the game, which further incentivises purchase decisions among new players attracted to narratives adapted from Chinese mythology. Consistent with Keller’s (1993) framework of Customer-Based Brand Equity (CBBE), the brand awareness formed within the player’s minds engenders specific brand associations, thereby influencing the probability of subsequent brand selection. Currently, *Black Myth: Wukong* as a medium for cultural communication transcends the conventional boundaries of civilizational dialogue. Its brand effect elicits a proactive desire among international players to explore Chinese culture and engage in tourism to China, while fostering high levels of anticipation for Game Science’s forthcoming title, *Black Myth: Zhong Kui* (Hu and Zhao, 2025). Indeed, the international communication pathways for both brands and culture are contingent upon the influence of cultural context on audience cognition. Cultural identities and concepts embedded within the game brand, such as Shaanxi storytelling (an intangible cultural heritage), traditional divination practices, and the Shanxi Qian Fo An (Thousand Buddha Temple), elicit diverse interpretations and varying psychological distances across distinct cultural cohorts. Specifically, factors relating to cultural and national values crucially determine consumer responses to the brand (Buzeta *et al.*, 2024). In this regard, Zhang (2024) posits that the process of cross-cultural brand communication necessitates a delicate equilibrium between ethnicity, globalisation and localisation. By employing appropriate narrative and marketing strategies, brand managers can close the psychological distance between the brand and its audience, with a particular focus on the international audience’s perception and understanding of brand identity.

Brand Perception of International Consumers

The commercial success of *Black Myth: Wukong* prompts studies centred on in-game textual analysis from communication or cultural perspectives among Chinese researchers. As previously discussed, adopting a cross-cultural brand communication perspective can reveal the substantial brand equity that *Black Myth: Wukong* yields for its developer Game Science. Nonetheless, academic research specifically addressing the branding of game products remains underdeveloped. Liu (2015) examines the synergy between marketing communication and player engagement, and then posits the relationship between games and players has evolved from traditional linear transmission to a dynamic interactive dialogue, wherein “listening” and “interactivity” emerge as central pillars of game brand communication. For *Black Myth: Wukong*, player engagement is inherently unique as individual decisions and behaviours generate distinct character development and narrative paths. Essentially, players can determine the construction of the “Destined One” persona, the interpretation of ludic tasks and the nature of interaction with the game world (Lei *et al.*, 2024). Strategic brand communication should be customised according to local market demands. Beyond identifying appropriate cultural content and media channels, brand managers need to attend to audience comprehension and reactions (Shuter, 1989). Throughout the brand experience, consumers construct mental associations between the brand and specific personality, deriving self-expressive and symbolic benefits. This underscores that successful branding strategies are predicated upon a brand manager’s effective understanding of consumer perception (Kim *et al.*, 2010). Against this backdrop, this study formulates the following research questions: How do gamers in Western markets perceive the *Black Myth: Wukong* brand? Furthermore, in what ways do their emotional inclinations and perceptions shape the overarching brand concept?

Methodology

This research adopts a mixed-methods approach combining qualitative and quantitative analysis to investigate the brand perception of *Black Myth: Wukong* among international players. The study operates under a unified Transformer framework and utilises BERT and BERTopic to perform sentiment analysis, topic clustering and semantic network construction respectively. These analyses facilitate the systematic mapping of the brand concept for *Black Myth: Wukong* within international markets.

Data Collection

The study employs a purposeful sampling to collect user review from content posted by *Black Myth: Wukong* on social media platforms including YouTube, X, Steam User Community, Reddit, Facebook, and TikTok. The sampling period spans from 1st August 2024 to 31st December 2025, encompassing significant activity cycles such as the pre-release phase, official launch and subsequent version updates. Taking the Steam platform as an example, a language-based filtering mechanism is applied; as the platform allows users to filter reviews by language preference, the researcher can systematically collect English-language reviews to represent the perspectives of international players. Following a rigorous data cleaning process, which involves the removal of irrelevant content, emojis and images, a total of 3,037 review entries are retained for analysis.

Data Processing

During the data pre-processing stage, the researcher first utilises regularisation techniques to clean the review data, removing punctuation and special characters while converting all text to lowercase. Subsequently, the NLTK stop-word library was applied, with high-frequency, non-meaningful terms specific to the gaming context being manually excluded to enhance the signal-to-noise ratio of the semantic analysis. For the BERT-based sentiment analysis, the pre-trained DistilBERT model (*distilbert-base-uncased-finetuned-sst-2-english*) is selected as the underlying classification engine. In instances where comment lengths exceeded the 512-token limit, a sliding window method is employed to segment the long text into multiple fragments. Sentiment inference is conducted for all segments within a single review, and a comprehensive sentiment score (ranging from 0 to 1) is derived by calculating the arithmetic mean. Finally, based on these calculated scores, comments are automatically categorised as either “POSITIVE” or “NEGATIVE”.

In the topic modelling phase, the researcher utilises the BERTopic framework based on the Transformer architecture. Given the requirements for computational efficiency and environmental stability in large-scale text clustering, the KMeans algorithm is selected as the clustering engine with the cluster centre set at $k=15$. Initially, a pre-trained Sentence-Transformer model is used to map the cleaned text into a high-dimensional vector space, followed by the application of the UMAP algorithm for non-linear dimensionality reduction to preserve local semantic structures. Subsequently, characteristic keywords for each topic are extracted using the c-TF-IDF (Class-based Term Frequency-Inverse Document Frequency) weighting algorithm. During the construction of the semantic networks, the researcher treats each individual review as the contextual unit to calculate the frequency with which keyword pairs co-occurred within the same text. Based on the respective volumes of positive and negative samples, co-occurrence frequency thresholds are established to eliminate low-frequency random associations and retain core semantic connections. Only the top 60 core nodes with the highest connectivity are extracted for display to ensure analytical focus. Furthermore, the Fruchterman-Reingold force-directed algorithm is implemented to achieve automatic clustering of nodes based on their semantic proximity, ultimately generating separate semantic network visualisations for positive and negative evaluations.

Research Results

The descriptive statistical analysis of the sentiment data indicates that the international perception of the *Black Myth: Wukong* brand is characterised by a significant positive spillover effect, with positive reviews accounting for 61.31% ($n=1,856$) of the total sample and achieving a remarkable mean sentiment score of 0.9619 (see Table 1). In contrast, negative sentiments constitute 37.17% ($n=1,125$) with a mean score of 0.0617, while neutral observations remain a marginal 1.81%. As evidenced by the frequency distribution of sentiment scores, the data demonstrates a distinct U-shaped distribution, whereby the vast majority of scores are concentrated at the extreme poles of the spectrum (see Figure 1). This distribution suggests that the DistilBERT model possesses high classification confidence and reflects a high-fidelity brand image where consumers maintain starkly defined, non-ambivalent perceptions predicated upon either profound aesthetic appreciation or acute technical and social frustration.

Table 1

Descriptive Statistics of Sentiment Polarity and Distribution

	Positive	Neutral	Negative
Count	1,856	55	1,125
Percentage	61.31%	1.81%	37.17%
Mean Score	0.961903025	0.5	0.061671776

Source: Created by Author.

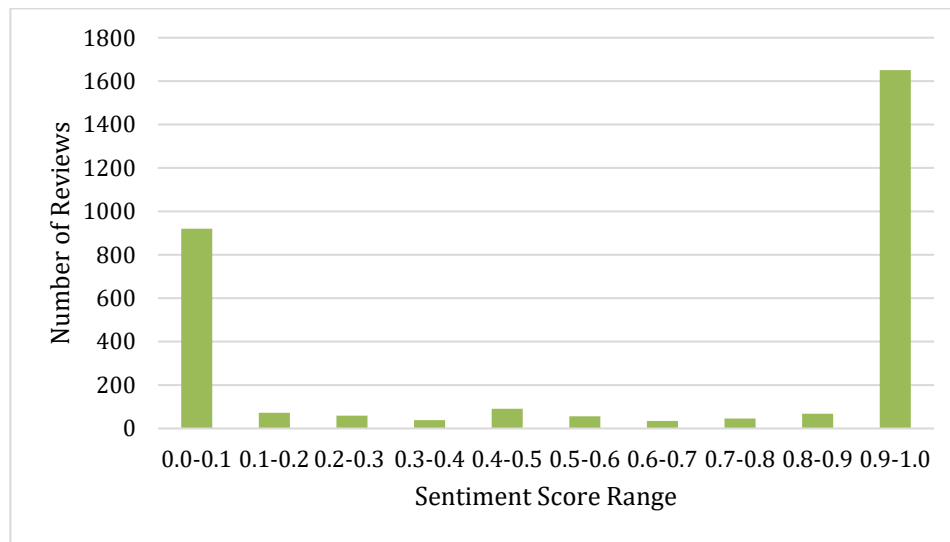


Figure 1. Frequency Distribution of Sentiment Scores

To further deconstruct the brand concept, this study categorises the extracted topics into five distinct dimensions (see Table 2). Regarding the thematic deconstruction of the brand concept, the highest levels of brand resonance are found within the dimensions of cultural resonance and artistic value. Dimension 3, which encompasses cultural elements and the “Monke” meme, achieves the highest mean sentiment score of 0.9155. Analysis of the topic with representative words including “*monke, monkey, reject modernity*” reveals that the viral catchphrase “*reject modernity, return to monke*” functions as a critical cultural translator.

Table 2

Brand Perception Dimensions

Dimension	Thematic Focus	Mean Sentiment Score	Perception Polarity
Product & Storytelling	Combat mechanics, Boss design, Narrative completion	0.765412	Positive
Artistic Value	Visual aesthetics, Architecture, Music, Soundscapes	0.871233	Positive
Cultural Resonance	Journey to the West, Chinese Heritage, “Monke” meme	0.915528	Positive
Reputation & Discourse	Game Science loyalty, GOTY anticipation, Media controversy	0.423391	Negative
Technical & Accessibility	Xbox unavailability, PC optimization, Performance	0.176528	Negative

Source: Created by Author

The heuristic allows global players to bypass the cultural discount typically associated with dense Chinese mythological canons, reframing the complex journey of the “Destined One” as a universal pursuit of primal joy and a rebellion against modern industry norms. This cultural resonance is inextricably linked to the game’s artistic excellence, as seen in the second dimension ($M=0.871233$). The positive sentiment semantic network identifies hubs such as stunning, mythology, and music, reflecting a perception of the brand as a digital cultural monument where architectural fidelity and orchestral scores, elevate the product beyond mere entertainment into a peak aesthetic experience. The game’s core functionality and narrative represented by the first dimension sustain a robust positive polarity of 0.765412. Within the semantic network, nodes such as combat, boss, and souls indicate that the brand has successfully established its identity within the hardcore action genre. Global players perceive the gameplay as hard but fair, often associating the difficulty with a spiritual state of mind. Players do not merely view the protagonist as a character but as a symbol of valiant endurance against suffering, which fosters a deep psychological bond with the brand. This perception of quality serves as the foundation upon which the more complex layers of brand loyalty and social advocacy are constructed. However, the brand’s reputation is simultaneously shaped by a contentious social discourse, as reflected in the ambivalent scores of the fourth dimension ($M=0.423391$). It highlights a defensive brand loyalty where consumers actively protect the developer, Game Science, against perceived external biases from Western media outlets such as IGN. This “out-group” conflict serves to strengthen “in-group” cohesion, as players view their support for the game as an act of resistance against woke cultural narratives. Consequently, the lower mean score in this dimension does not represent a rejection of the brand itself, but rather a reflection of the intense friction within the broader socio-cultural landscape. Finally, the brand encounters its most significant barrier in the fifth dimension ($M=0.176528$), where technical accessibility issues specifically the absence of an Xbox version and performance optimisations create a focal point for negative sentiment. These technical grievances underscored by the negative semantic network hubs of optimization and invisible walls represent the primary risk to the brand’s global penetration, acting as a tangible deterrent that momentarily interrupts the otherwise dominant narrative of artistic and cultural triumph.

Further examination of the semantic network visualisation provides a structural mapping of the brand’s cognitive associations, revealing the density and interconnectedness of specific player perceptions. The positive sentiment semantic network (see Figure 2) exhibits a highly integrated central cluster where the nodes Wukong, combat, and Chinese serve as the primary hubs. The proximity and thick connectivity between story, journey, and mythology suggest that international players do not perceive the game’s narrative as an isolated element, but rather as an immersive cultural experience. Notably, the appearance of stunning and visuals as significant peripheral hubs connected to myth and culture underscores how aesthetic excellence facilitates the “soft landing” of complex traditional themes. This network topology confirms that the brand’s positive equity is anchored in a synergistic relationship between high-fidelity technical execution and the exotic appeal of the *Journey to the West* lore.

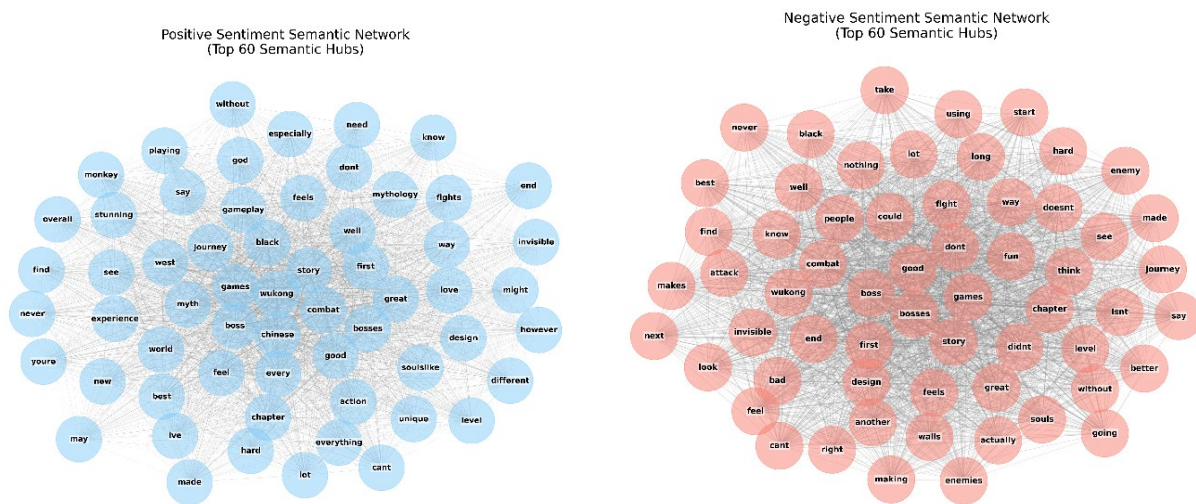


Figure 2. Sentiment Networks of the Brand

In contrast, the negative sentiment semantic network exposes the specific “pain points” that erode brand sentiment, particularly within the realms of technical performance and external discourse. Central nodes such as boss and hard are frequently linked with invisible (walls) and hitbox, indicating that while the difficulty is generally respected, specific design choices are perceived as “artificial” barriers to flow. More critically, a distinct cluster involving optimization, performance, stutter, and Xbox validate the low sentiment score, highlighting a tangible disconnect between the brand’s artistic ambition and its functional delivery on specific hardware. Furthermore, the co-occurrence of ign, sweet, and baby within the negative network identifies a localized but intense zone of socio-political conflict. This suggests that for a significant portion of the international audience, the brand has become a proxy for broader cultural debates, where negative sentiment is directed less at the game’s intrinsic quality and more at the perceived ideological bias of external evaluators.

Conclusion

In conclusion, the international reception of *Black Myth: Wukong* represents a paradigm shift in how Chinese cultural products are branded and consumed globally, successfully transitioning from a niche export to a high-equity global brand. The empirical evidence demonstrates that the brand's strength is predicated upon an extraordinary synergy between high-fidelity artistic production and spontaneous cultural deconstruction through internet memes. The "Monke" phenomenon proves that traditional heritage, when integrated with modern subcultural narratives, can transcend civilizational boundaries and foster proactive engagement among global players. Furthermore, the study confirms that brand loyalty in the gaming industry has evolved into a form of defensive advocacy, where players actively protect the brand against perceived socio-political biases from external media, thereby strengthening in-group cohesion despite overall sentiment friction. However, the research also highlights that technical accessibility remains the primary bottleneck; the absence of platform inclusivity and technical optimization can momentarily obscure a brand's cultural and artistic achievements. Ultimately, *Black Myth: Wukong* serves as a benchmark for future cross-cultural branding, suggesting that successful international dissemination requires a delicate balance between preserving national identity and leveraging the interactive, participatory nature of

global digital communities. Future research should continue to monitor the long-term sustainability of this brand equity as Game Science expands its mythological universe.

References

- Aaker, D. A. (1992). Managing the most important assets: Brand equity. *Planning Review*, 20(5), 56–58. <https://doi.org/10.1108/eb054384>.
- Borowiecki, K. J., & Prieto-Rodriguez, J. (2014). Video games playing: A substitute for cultural consumptions? *Journal of Cultural Economics*, 39(3), 239–258. <https://doi.org/10.1007/s10824-014-9229-y>.
- Buzeta, C., Keyzer, F.D., Dens, N., & Pelsmacker, P.D. (2024). Branded content and motivations for social media use as drivers of brand outcomes on social media: a cross-cultural study. *International Journal of Advertising*, 43(4), 1–35. <https://doi.org/10.1080/02650487.2023.2215079>.
- Caetano, J. (2017). Intercultural Communication: A European Perspective. In S. M. Croucher (Ed.), *Global Perspectives on Intercultural Communication*. Routledge.
- Croucher, S. M. (2017). Why Intercultural Communication. In S. M. Croucher (Ed.), *Global Perspectives on Intercultural Communication*. Routledge.
- Eckhardt, G. M., & Bengtsson, A. (2015). Brand Meaning Rigidity in China. *Journal of Macromarketing*, 35(2), 218–228. <https://doi.org/10.1177/0276146714568810>.
- Fung, A. (2016). Redefining Creative Labor: East Asian Comparisons. In M. Curtin & K. Sanson (Eds.), *Precarious Creativity: Global Media, Local Labor* (pp. 200–214). University of California Press. <http://www.jstor.org/stable/10.1525/j.ctt1ffjn40.19>.
- Hu, M., & Zhao, X. (2025). Game as a medium strategies and implications of the international communication of “Black Myth Wukong” in the perspective of transcultural communication. *International Communication of Chinese Culture*, 12(4). <https://doi.org/10.1007/s40636-025-00332-3>
- Hu, X. (2025). Video games and heritage intersect: an investigation of Black Myth: Wukong from antiquarian to critical perspectives. *Rethinking History*, 1–43. <https://doi.org/10.1080/13642529.2025.2582284>.
- Keller, K. L. (1993). Conceptualizing, Measuring, and Managing Customer-Based Brand Equity. *Journal of Marketing*, 57(1), 1–22. <https://doi.org/10.2307/1252054>.
- Kim, J., Baek, T. H., & Martin, H. J. (2010). Dimensions of News Media Brand Personality. *Journalism & Mass Communication Quarterly*, 87(1), 117–134. <https://doi.org/10.1177/107769901008700107>.
- Lei, Y., & Wang, W. (2025). Beyond “Black Myth: Wukong” itself: the construction of identity from an intercultural communication perspective. *Journal of Multicultural Discourses*, 1–18. <https://doi.org/10.1080/17447143.2025.2480381>.
- Liboriussen, B., & Martin, P. (2016). Special Issue. *Games and Culture*, 11(3), 227–232. <https://doi.org/10.1177/1555412015615296>.
- Liu, Y.-B. (2025). The synergy of integrated marketing communication and user-generated content in fan art contest for brand co-creation. *SAM Advanced Management Journal*, 90(4), 1–17. <https://doi.org/10.1108/samamj-03-2025-0017>.
- Nakamura, A. (2018). *Industrial History of China Game [中国ゲーム産業史]*. Kadokawa Game Linkage [G z ブレイン].
- Nakamura, A. & Wirman, H. (2021). 14. The Development of Greater China’s Games Industry: From Copying to Imitation to Innovation. In O. Sotamaa & J. Svelch (Eds.), *Game Production Studies*. Amsterdam: Amsterdam University Press.
- Schmidt, W.V., Conaway, R.N., Easton, S.S., & Wardrope, W.J. (2007) *Communicating Globally: Intercultural Communication and International Business*. Sage Publications Inc.
- Shuter, R. (1989). The International Marketplace [Review of *The International Marketplace*]. In M. K. Asante & W. B. Gudykunst (Eds.), *Handbook of International and Intercultural Communication* (pp. 392–406). SAGE Publications.
- Wang Zitong, Bing, Z., Zhong Yiming, & Deng Shiyi. (2025a). A three-dimensional study on the international communication of Black Myth: Wukong. *International Communication of Chinese Culture*, 12(4). <https://doi.org/10.1007/s40636-025-00322-5>.
- Wang, A., Whyke, T. W., & Song, Z. (2025b). Cultural overflow vs. cultural export: *Black Myth: Wukong* and the evolution of Chinese gaming in global creative industries. *Creative Industries Journal*, 1–19. <https://doi.org/10.1080/17510694.2025.2583652>.
- Zhang, J. (2024). *Cross-Cultural Communication of Chinese Brands*. Springer.

MĀKSLĪGĀ INTELEKTA INTEGRĀCIJA NOZIEGUMU ATKLĀŠANĀ UN IZMEKLĒŠANĀ

INTEGRATION OF ARTIFICIAL INTELLIGENCE IN CRIME DETECTION AND INVESTIGATION

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Abstract

The use of artificial intelligence (AI) and automated algorithms in criminal investigations is becoming increasingly relevant, while creating legal and ethical challenges. The ability of technology to automate the processing of large amounts of data and to provide analytical conclusions affects the conduct of criminal proceedings, the assessment of evidence and the professional responsibility of the investigator. The Article aims to analyse the ethical and legal aspects of the use of AI in criminal investigations, as well as assess the practical perception of these technologies by law enforcement agencies. The study uses scientific literature analysis, regulatory research, anonymous survey of law enforcement officers and analysis of qualitative interview materials. Empirical results show that AI tools are perceived in practice primarily as an aid to information processing rather than as a substitute for autonomous procedural decisions. At the same time, respondents point to data security, verifiability of the results provided by the AI, division of responsibility and ambiguity of the regulatory framework. The study confirms that the integration of AI in criminal investigations is permissible only on condition that the crucial role of man in decision-making is maintained and that fundamental rights are safeguarded.

Keywords: algorithmic ethics; criminal proceedings; artificial intelligence; law enforcement

Anotācija

Mākslīgā intelekta (MI) un automatizētu algoritmu izmantošana kriminālizmeklēšanā kļūst arvien aktuālāka, vienlaikus radot tiesiskus un ētiskus izaicinājumus. Tehnoloģiju spēja automatizēti apstrādāt lielus datu apjomus un sniegt analītiskus secinājumus ietekmē kriminālprocesa norisi, pierādījumu vērtēšanu un izmeklētāja profesionālo atbildību. Raksta mērķis ir analizēt MI izmantošanas ētiskos un tiesiskos aspektus kriminālizmeklēšanā, kā arī izvērtēt šo tehnoloģiju praktisko uztveri tiesībaizsardzības iestādēs. Pētījumā izmantota zinātniskās literatūras analīze, normatīvā regulējuma izpēte, anonīma tiesībaizsardzības iestāžu darbinieku aptauja un kvalitatīvu interviju materiālu analīze. Empīriskie rezultāti liecina, ka MI rīki praksē tiek uztverti galvenokārt kā

palīgīdzeklis informācijas apstrādei, nevis kā autonomu procesuālu lēmumu aizstājējs. Vienlaikus respondenti norāda uz datu drošību, MI sniegto rezultātu pārbaudāmību, atbildības sadalījumu un normatīvā regulējuma neskaidrību. Pētījums apstiprina, ka MI integrācija kriminālizmeklēšanā ir pieļaujama tikai ar nosacījumu, ka tiek saglabāta cilvēka izšķirošā loma lēmumu pieņemšanā un nodrošināta pamattiesību aizsardzība.

Atslēgas vārdi: algoritmiskā ētika; kriminālprocess; mākslīgais intelekts; tiesībaizsardzība

Ievads

Policijas darbs kļūst digitāls nevis modes dēļ, bet stratēģiskas nepieciešamības dēļ, tā ir operatīva nepieciešamība. Valsts policijas stratēģijā 2023.–2027. gadam kā centrālie virzieni noteikti “procesu vienkāršošana un digitalizācija” un “izmeklēšanas kvalitātes uzlabošana” (Valsts policija, 2023, 13., 20. lpp.). Šie mērķi prasa jaunus instrumentus – īpaši tādus, kas spēj apstrādāt datu apjomus, kurus cilvēks fiziski nespēj pat pārskatīt saprātīgā laikā.

Mākslīgā intelekta (MI) izmantošana kriminālpolicijas darbā vairs nav teorētiska iespēja, bet gan realitāte, kas maina noziegumu atklāšanas praksi. Eiropols 2024. gada stratēģiskajā pārskatā norāda: MI tehnoloģijas apstrādā datu apjomus, kurus izmeklētāji paši nekad nespētu izvērtēt pieņemamā termiņā (Europol, 2024). Latvijā, kur saskaņā ar *Kriminālprocesa likumu (KPL)* un *Operatīvās darbības likumu (ODL)* izmeklēšanas un operatīvās darbības mērķis ir atklāt noziedzīgus nodarījumus un iegūt pierādījumus, MI dotu iespēju paātrināt un atvieglot izmeklēšanas darbu. Tomēr abi likumi pieņemti pirms MI ieviešanas, KPL 2005. gadā, ODL 1993. gadā, un to piemērojamība šīm tehnoloģijām nav skaidra.

Latvijā MI izmantošana izmeklēšanā un operatīvajā darbībā šobrīd nav detalizēti regulēta. Šī regulējuma trūkuma dēļ rodas tiesiska noteiktība un procesuālās drošības riski. MI izmantošana kriminālizmeklēšanā nav tikai tehnoloģisks jautājums, tas rada arī tiesiskas un ētiskas problēmas, jo tieši skar personas pamattiesības.

Satversmes 96. pants garantē tiesības uz privātās dzīves, mājokļa un korespondences neaizskaramību. Šīs tiesības nav absolūtas, jo *Satversmes* 116. pants pieļauj to ierobežojumus likumā paredzētos gadījumos valsts un sabiedrības interesēs. MI izmantošana noziegumu atklāšanā ir instruments, kas aizsargā sabiedrību, bet ierobežo indivīda pamattiesības. MI rada specifiskus riskus, kuri tradicionālajām izmeklēšanas metodēm nav raksturīgi, piemēram, kibernetiskās draudējumus, algoritmisko diskrimināciju, tiesisko kolīziju starp valsts noslēpuma aizsardzību un caurredzamības prasībām.

MI sistēmas spēj īsā laikā veikt sarežģītus uzdevumus, identificējot likumsakarības, kuras cilvēki manuālā analizē nespētu aptvert saprātīgā termiņā. Atšķirība nav tikai iegūto secinājumu kvalitātē, bet arī laika patēriņā un izmeklētāja kognitīvo resursu noslodzē. MI sistēmu izmantošana nenožīmē lēmumu pieņemšanas deleģēšanu tehnoloģijai, tā automatizē liela apjoma datu apstrādi, ļaujot izmeklētājam koncentrēties uz analīzi un procesuālo lēmumu pieņemšanu.

MI izmantošana noziegumu atklāšanā rada trīs savstarpēji saistītas problēmas, kuras nav iespējams risināt izolēti: praktiskais aspekts, ētiskais aspekts un tiesiskais aspekts.

Problēma: neskatoties uz MI potenciālu, pagaidām nav pietiekamas izpratnes par tā praktisko pielietojamību Valsts policijas operatīvajā darbā un izmeklēšanā, ņemot vērā KPL un ODL regulējumu.

Pētījuma jautājums: kā nodrošināt MI efektīvu, bet tiesisku izmantošanu noziegumu atklāšanā, vienlaikus ievērojot proporcionalitātes principu, pamattiesību aizsardzību un valsts noslēpuma aizsardzību?

Pētījuma mērķis: analizēt MI praktisko pielietojumu noziegumu atklāšanā, izvērtējot ar to saistītos ētikas un tiesiskuma aspektus.

Pētījuma uzdevumi:

- 1) identificēt un funkcionāli raksturot MI rīkus, kas tiek izmantoti vai būtu izmantojami noziegumu atklāšanā (piemēram, Hansken, Palantir, AVIAR, Endzelīns);
- 2) analizēt MI izmantošanas ētiskos aspektus, izvērtējot pamattiesību un privātuma aizsardzības aspektus, algoritmiskās diskriminācijas riskus, kā arī valsts noslēpuma un caurredzamības līdzsvaru;
- 3) izvērtēt tiesisko regulējumu Eiropas Savienībā (MI akts, Direktīva 2016/680) un Latvijā (KPL, ODL, likums Par valsts noslēpumu), identificējot tiesiskā regulējuma nepilnības attiecībā uz MI izmantošanu;
- 4) veikt empīrisku pētījumu par MI rīku praktisku izmantošanu noziegumu atklāšanā Valsts policijā;
- 5) sniegt priekšlikumus MI izmantošanas regulējuma pilnveidošanai *KPL* un *ODL*.

Pētījuma metodes

Juridisko dokumentu analīzes metode. Analizēti Eiropas Savienības normatīvie akti (MI akts, Direktīva 2016/680 par personas datu aizsardzību tiesībaizsardzības nolūkos), Latvijas normatīvie akti (*KPL*, *ODL*, likums *Par valsts noslēpumu*), kā arī *Eiropas Cilvēktiesību un pamatbrīvību aizsardzības konvencija* un *Latvijas Republikas Satversme*. Metode ļauj identificēt tiesisko ietvaru un tā nepilnības attiecībā uz MI izmantošanu, kā arī tiesiskās kolīzijas starp valsts noslēpuma aizsardzību un caurredzamības prasībām.

Salīdzinošā metode. Salīdzinātas dažādu valstu (ASV, Lielbritānija, Vācija) pieejas MI regulējumam noziegumu atklāšanā ar ES un Latvijas tiesisko regulējumu. Metode ļauj identificēt labākās prakses piemērus un iespējamus risinājumus Latvijas kontekstā.

Funkcionālā analīzes metode. Izvērtētas konkrētu MI rīku (Hansken, Palantir, AVIAR, Endzelīns) funkcionālās iespējas, to pielietojums noziegumu atklāšanā un izmeklēšanā, to priekšrocības un ierobežojumus. Metode ļauj saprast praktisko MI pielietojumu un tā ietekmi uz kriminālizmeklēšanu.

Literatūras analīzes metode. Analizēti zinātniskie raksti, monogrāfijas, tostarp I. Barkānes darbi par MI un cilvēktiesībām, starptautisko organizāciju ziņojumi (Eiropols). Metode nodrošina teorētisko bāzi un atziņas par MI ētiku, tiesiskumu un valsts noslēpuma režīmu.

Judikatūras analīzes metode. Izvērtēta Eiropas Cilvēktiesību tiesas prakse (*Big Brother Watch v. United Kingdom*, *Centrum för rättvisa v. Sweden*) attiecībā uz masveida uzraudzību un pamattiesību ierobežojumiem. Metode ļauj saprast, kādos gadījumos MI izmantošana var pārkāpt ECTK 8. pantu un kā līdzsvarot valsts drošības intereses ar indivīda tiesībām.

Gramatiskā un teleoloģiskā metode. Skaidroti jēdziena “mākslīgais intelekts” tvērums un likumdevēja mērķis spēkā esošajos normatīvajos aktos, analizējot riska pieeju, cilvēka uzraudzības prasības un pamattiesību aizsardzības loģiku.

Sistēmiskā metode. Analizēts, kā MI regulējums (ES MI Akts) iekļaujas *Kriminālprocesa likumā* un *Operatīvās darbības likumā*.

Empīriskās pētniecības metode. Veikta anonīma aptauja un kvalitatīvas intervijas ar Valsts policijas darbiniekiem, lai noskaidrotu MI rīku praktisko izmantošanu, uztveri un identificētu galvenās problēmas to ieviešanā.

Pētījuma ierobežojumi: referātā netiks detalizēti apskatīti kibernetikas riski MI sistēmām (t.i., tehniskie riski, kas jāņem vērā, ja policija vai citas organizācijas izstrādā un ievieš MI risinājumus), koncentrējoties uz tiesiskajiem un ētiskajiem aspektiem.

Terminoloģiska piezīme: pētījumā ar jēdzienu kriminālizmeklēšana tiek apzīmēts gan noziegumu atklāšanas posms operatīvās darbības ietvaros, gan izmeklēšana kriminālprocesa stadijā, ciktāl mākslīgais intelekts tiek izmantots šo procesu atbalstam.

Latvijas tiesiskais regulējums šobrīd nesniedz skaidru atbildi par mākslīgā intelekta vietu kriminālprocesā un operatīvajā darbībā. Šis pētījums paredzēts, lai sniegtu ieteikumus un atbildes.

Tiesiskais aspekts

Svarīgi, pirms MI izmantošanas noziegumu atklāšanā un izmeklēšanā, ir analizēt normatīvos aktus, noskaidrot ES MI akta prasības, *KPL* un *ODL* piemērojamību, valsts noslēpuma aizsardzību reglamentējošos normatīvo aktus un izvērtēt pamattiesību aizsardzību.

MI izmantošana noziegumu atklāšanā jau tagad praktiski ir iespējama, bet tiesiski nav pilnībā saprotama. Ir jāņem vērā un jāizprot vairāki normatīvie akti – Eiropas Savienības Mākslīgā intelekta akts (MI akts), *Kriminālprocesa likums*, *Operatīvās darbības likums*, likums *Par valsts noslēpumu*, kā arī *Eiropas Cilvēktiesību un pamatbrīvību aizsardzības konvencija* (ECTK) u.c. No šī normatīvā regulējuma ir saprotams, ka MI sistēmu izmantošana noziegumu atklāšanā un izmeklēšanā ir pieļaujama, bet jāņem vērā noteikti ierobežojumi un jānodrošina cilvēktiesības.

MI integrācija noziegumu atklāšanā aktualizē jautājumus par esošā tiesiskā regulējuma pietiekamību. Nav skaidrības, vai *ODL* lietotais jēdziens “tehniskie līdzekļi” aptver arī MI algoritmus un automatizētās analīzes sistēmas, vai MI veiktā datu analīze kvalificējama kā patstāvīgs operatīvās darbības pasākums un vai tās veikšanai nepieciešama tiesas sankcija. Līdzīgi neskaidrs ir jautājums par to, cik lielā mērā *KPL* 127.–130. panti par pierādījumu pieļaujamību piemērojami MI ģenerētiem rezultātiem, ņemot vērā to, bieži vien nepārredzamo darbības mehānismu. Visbeidzot, pastāv kolīzija starp *ODL* 8. pantā noteikto prasību klasificēt operatīvās darbības metodes kā valsts noslēpumu un Eiropas Savienības Mākslīgā intelekta akta caurredzamības prasībām, kas var ierobežot efektīvu tiesisko aizsardzību un aizstāvības tiesības.

ES MI akts ievieša riskos balstītu pieeju MI sistēmu izmantošanai, īpašu uzmanību pievēršot augsta riska sistēmām tiesībaizsardzības jomā. MI sistēmas, kas paredzētas izmantošanai kriminālprocesā – tostarp pierādījumu analīzē, personu profilēšanā vai lēmumu pieņemšanā vai to atbalstā, tiek klasificētas kā augsta riska sistēmas, jo to izmantošana var būtiski ietekmēt pamattiesības (MI akta 6. pants).

Augsta riska MI sistēmām ir noteiktas vairākas obligātas prasības: riska novērtēšanas un mazināšanas sistēmas ieviešanu, augstas kvalitātes datu kopumu izmantošanu apmācībai, tehniskās dokumentācijas uzturēšanu, pārredzamību un informācijas sniegšanu lietotājiem, kā arī cilvēka uzraudzības nodrošināšanu (MI akta 9.–14. pants). Jāņem vērā, ka MI akta 13. pants nosaka augsta riska sistēmu pārredzamības prasību, kas paredz, ka sistēmai jābūt izstrādātai un lietotai tā, lai

nodrošinātu pietiekamu izsekojamību un lietotājiem būtu skaidrs sistēmas nolūks, iespējas un ierobežojumi.

Tiesībaizsardzības iestādēm kā augsta riska MI sistēmu lietotājiem ir pienākums: lietot sistēmas saskaņā ar lietošanas instrukciju, nodrošināt ievaddatu atbilstību sistēmas paredzētajam mērķim, uzraudzīt sistēmas darbību un informēt nodrošinātājus par traucējumiem, kā arī veikt ietekmes uz pamattiesībām novērtējumu pirms sistēmas ieviešanas (MI akta 26. un 27. pants). Šis pienākums ir tieši saistīts arī ar *Satversmes* 96. pantā garantētajām tiesībām uz privātās dzīves, mājokļa un korespondences neaizskaramību, kuras var ierobežot valsts interesēs (*Satversmes* 116. pants), taču šādiem ierobežojumiem jābūt samērīgiem un likumīgiem.

Jāņem vērā, ka Latvijas *Kriminālprocesa likums* tika pieņemts 2005. gadā, tas ir laikā, kad MI tehnoloģijas praktiski nebija zināmas, un tā normas tika veidotas, domājot par tradicionālajām izmeklēšanas metodēm. *KPL* 127. pants nosaka, ka pierādījumiem jābūt iegūtiem likumā noteiktajā kārtībā, pārbaudāmiem un ticamiem. Šī norma rada problemātisku MI sistēmu izmantošanu, jo likumā nav noteikts, vai MI analītiskais rezultāts būtu kvalificējams kā pierādījums. Ja MI sistēmas rezultātam nav izskaidrojamības, sistēma darbojas kā "melnā kaste", neizskaidro lēmumu pieņemšanas loģiku, tad tās sniegtie rezultāti pēc savas būtības neatbilst pārbaudāmības prasībai. "MI rīkus var izmantot speciālists (*KPL* 136. pants), taču MI ģenerētā informācija nav pielīdzināma cilvēka ekspertīzei un pieļaujama tikai kā tehniskā palīgīdzekļa izvade, kuru validē cilvēks.

ODL 24. pants piedāvā daļēju risinājumu, nosakot, ka operatīvās darbības gaitā iegūtā informācija pati par sevi nav uzskatāma par pierādījumu kriminālprocesā, to var izmantot izmeklēšanas darbību nodrošināšanai, kriminogēnās situācijas analīzei un turpmāko izmeklēšanas pasākumu plānošanai. Šī norma faktiski pieļauj MI sistēmu izmantošanu kā analītisko palīgīdzekli, kas ģenerē operatīvās informācijas izmantošanas virzienus. Taču šāda interpretācija nebūtu pareiza, jo MI loma, apstrādājot operatīvo informāciju, kļūtu bez noteiktas un kontrolētas struktūras.

ODL 8. pantā, noteikts, ka operatīvās darbības pasākumu organizācija, metodika un taktika ir valsts noslēpums. Šī norma neļauj atklāt, kādas konkrētas metodes tiek izmantotas noziegumu atklāšanā, kas var ietvert arī MI sistēmu darbības principus. Šajā gadījumā rodas tiesiska kolīzija –, no vienas puses, MI akts prasa pārredzamību un izsekojamību, no otras puses, *ODL* nosaka slepenības režīmu operatīvajām metodēm. Šai kolīzijai kā viens no risinājumiem būtu neatkarīga verifikācijas mehānisma izveide. Nosakot, ka MI sistēmu darbības pārbaudi veic īpaši sertificēta neatkarīga institūcija vai tiesnesis, kuram ir pielaide valsts noslēpumam. Šādā veidā netiktu atklātas operatīvās darbības metodes un taktika un nodrošināta tiesiska kontrole, ka algoritmi darbojas atbilstoši likumam.

Likuma *Par valsts noslēpumu* 2. pantā ir noteikts, ka valsts noslēpums ir militāra, politiska, ekonomiska, zinātniska, tehniska vai cita rakstura informācija, kura iekļauta Ministru kabineta apstiprinātā sarakstā un kuras nozaudēšana vai nelikumīga izpaušana var nodarīt kaitējumu valsts drošībai. Operatīvās darbības metodes saskaņā ar *ODL* 8.pantu tiek klasificētas kā valsts noslēpums, kas nozīmē, ka arī MI sistēmu izmantošanas algoritmi, apmācības dati, lēmumu pieņemšanas modeļi būtu klasificējami kā valsts noslēpums.

Eiropas Cilvēktiesību tiesas judikatūrā (lietas *Big Brother Watch* u.c. pret Apvienoto Karalisti un *Centrum för rättvisa* pret Zviedriju) ir skaidri noteikts, ka masveida uzraudzības pasākumiem, pat ja tie tiek veikti valsts drošības interesēs, jāatbilst stingriem procesuāliem nosacījumiem. Tas nozīmē, ka šādu sistēmu izmantošanā ir jābūt tiesiskam pamatam, jāveic to neatkarīga uzraudzība un jābūt

noteiktiem tiesiskās aizsardzības līdzekļiem. Izmantojot MI sistēmas liela apjoma datu apstrādei ar ierobežotu pārredzamību, var viegli pārkāpt šīs prasības.

Iespējamais risinājums varētu būt MI sistēmu funkciju nošķiršana, atdalot operatīvo informāciju, kas kalpo kā norāde turpmākām izmeklēšanas darbībām, no procesuāliem pierādījumiem. Šādu MI sistēmu darbību pārbaudi veic neatkarīga institūcija vai tiesnesis ar pielaidi valsts noslēpumam, nepieciešamības gadījumos pieaicinot ekspertus. Šādi varētu novērtēt sistēmas darbības tiesiskumu. Minētais risinājums ļautu līdzsvarot leģitīmos mērķus – efektīvu noziegumu atklāšanu un pamattiesību aizsardzību.

ECTK 8. pants garantē tiesības uz privātās un ģimenes dzīves neaizskaramību, korespondences noslēpumu un personas datu aizsardzību. MI sistēmu spēja apstrādāt milzīgus datu apjomus, tai skaitā biometriskos datus, komunikācijas ierīču metadatus, atrašanās vietas informāciju un aktivitātes sociālajos tīklos. Svarīgi ņemt vērā, ka jebkurai ieviešanai pamattiesībās jābūt paredzētai likumā, leģitīma mērķa vadītai un nepieciešamai demokrātiskā sabiedrībā (jābūt samērīgai).

MI akts šo prasību konkrētizē augsta riska sistēmām, nosakot pienākumu veikt ietekmes uz pamattiesībām novērtējumu (MI akta 27. pants). Šādam novērtējumam jāaptver iespējamā ietekme uz privātumu, diskriminācijas riskiem, jānosaka MI sistēmas lēmumu pārredzamība un jāparedz pārsūdzības iespējas. Ja MI sistēma tiek lietota sejas atpazīšanai publiskās vietās reāllaikā, biometriskajai kategorizācijai vai personības īpašību novērtēšanai, tad ietekme uz pamattiesībām ir būtiska un prasa pamatojumu.

ECTK 6. pantā garantētas tiesības uz taisnīgu tiesu, kas ietver arī procesuālo līdztiesību, un aizstāvības tiesības. Izmantojot MI sistēmas ģenerētos pierādījumus vai analītiskos rezultātus, kuru pamatojums nav pārbaudāms, rodas risks pārkāpt šo principu. Aizstāvībai jābūt iespējai ne tikai iepazīties ar MI ģenerētajiem rezultātiem, bet arī apstrīdēt to ticamību, patiesumu un likumību. Tas prasa pārredzamību par MI sistēmas darbību, kas savukārt var sadurties ar valsts noslēpuma aizsardzību.

Risinājums varētu būt, izvērtējot samērīguma un subsidiaritātes principus. MI sistēmas drīkst izmantot tikai tad, ja tradicionālās metodes ir nepietiekamas vai neefektīvas, un tikai gadījumos, kad nepieciešams sasniegt leģitīmus mērķus. Jebkurā gadījumā ir jāsaņem cilvēka galvenā loma lēmumu pieņemšanā. MI rezultāti var kalpot tikai kā analītisks atbalsts, nevis kā vienīgais vai izšķirošais pamats procesuālam lēmumam.

Esošais tiesiskais regulējums Latvijā pagaidām rada nenoteiktību MI izmantošanai noziegumu atklāšanā. *KPL* un *ODL* tika pieņemti pirms MI tehnoloģiju ēras un nesatur normas šo sistēmu izmantošanai. MI akts nosaka vispārējas prasības, taču neatrisina kolīziju starp pārredzamības prasībām un valsts noslēpuma aizsardzību. Tāpēc būtu nepieciešami tiesiskā regulējuma uzlabojumi, kas definētu MI sistēmu lomu kriminālprocesā, nosakot to izmantošanas robežas, garantētu uzraudzību un nodrošinātu pamattiesību aizsardzību. Pagaidām izmantot MI ir pieļaujams, ievērojot ES MI Akta prasības un judikatūru, ievērojot samērīguma principu, izvērtējot nepieciešamību katrā individuālā gadījumā. Atbilstoši *KPL* 127. pantam pierādījumiem jābūt pārbaudāmiem un ticamiem, un gadījumos, kad MI ģenerētās informācijas ticamību nav iespējams pārbaudīt, tai nevar tikt piešķirts pierādījuma statuss.

MI sistēmu iedalījums un praktiskie rīki

MI rīku integrācija noziegumu atklāšanā piedāvā funkcionālas iespējas, bet rada tiesiskus ierobežojumus. Ir jāsaprot, vai MI sistēmas, kas dažu sekunžu laikā izveido personas profilu, ir savietojamas ar Latvijas tiesisko sistēmu. Šeit jānošķir divi tehnoloģiskie risinājumi: datu strukturēšanas rīki, kad tiek veikta automatizēta esošās informācijas sakārtošana un prognozējošās analīzes rīki, kuri, balstoties uz vēsturiskām sakarībām, mēģina paredzēt potenciāli noziedzīgu rīcību. Papildu problēma ir MI sistēmu kiberdrošība, īpaši apstrādājot valsts noslēpumu saturošu informāciju.

MI ir sistēmas spēja pareizi interpretēt ārējos datus un modelēt cilvēkiem līdzīgas uzvedības, piemēram, saprātīgu izturēšanos, mācīšanās spējas, plānošanu un radošumu.

MI ļauj sistēmām analizēt apkārtējos apstākļus, strādāt ar uztverto un risināt problēmas, lai – zināmā mērā neatkarīgi – sasniegtu noteiktus mērķus. Dators saņem datus (jau sagatavotus vai apkopotus), ar savu sensoru starpniecību, piemēram, kameru, tos apstrādā un veic darbības.

MI sistēmas ir spējīgas izrādīt intelektuālu rīcību, analizējot iepriekšējo darbību ietekmi un strādājot autonomi (European Parliament, 2020).

Fundamentāla atšķirība starp tradicionālo programmēšanu un MI slēpjas pieejas būtībā: tradicionālās sistēmās programmētājs skaidri definē visus noteikumus un loģiku, bet MI sistēmās, īpaši mašīnmācīšanās modeļos, programmētājs nodrošina lielu datu apjomu un mērķfunkciju, pēc kā sistēma pati analizē datus, atklāj tajos modeļus un pieņem lēmumus (Russell, S. & Norvig, P., 2021, *Artificial Intelligence: A Modern Approach*, 4th ed., Pearson, 19. lpp.). Vienkāršāk izskaidrojot, parasta datorsistēma dara tieši to, ko cilvēks tai uzrakstīja. Mākslīgais intelekts dara to, ko iemācījās no datiem.

Augstākās tiesas tiesnesis Aigars Strupišs publikācijā uzsver: “Ja mums nebūs dabiskā intelekta, mākslīgais mums nepalīdzēs. Ir tomēr jāpārzina, kā strādā tiesības, kā tās darbojas praktiski, nevis jāprasa, lai visas iespējamās darbības būtu ieliktas likumā vai algoritmā” (Strupišs, 2018, 111. lpp.).

MI sistēmu iedalījums (hierarhiskais un funkcionālais)

Noziegumu atklāšanas kontekstā MI sistēmas var iedalīt pēc to kontroles pakāpes un datu izcelsmes, kas tieši ietekmē to izmantošanas tiesiskumu un drošību.

Universālās sistēmas – lielie valodu modeļi (*Large Language Models, LLM*) kā *ChatGPT*, *Gemini* vai *Claude* u.c. ir apmācīti ar apjomīgiem, publiski pieejamiem datiem un paredzēti neierobežotam lietotāju lokam. Šīm sistēmām ir nopietns trūkums: tās var “halucinēt”, t.i., radīt izdomātus faktus, precedentus vai pierādījumus, kas izskatās autentiski, bet patiesībā neeksistē. ASV tiesa 2023. gadā piesprieda sodu advokātam, kurš izmantoja *ChatGPT* juridiskai izpētei, jo sistēma bija izdomājusi sešus neeksistējošus tiesas spriedumus (*Mata v. Avianca, Inc.*, 1:22-cv-01461, S.D.N.Y. 2023). Eiropas Parlamenta un Padomes Direktīvā (ES) 2016/680 par personas datu aizsardzību tiesībaizsardzības nolūkos 4. pantā (datu precizitāte) un 7. pantā (datu kvalitāte) noteikts, ka universālās sistēmas nevar būt drošs avots izmeklēšanā. *Fair Trials Europe* organizācijas 2023. gada ziņojumā “Automating Injustice” (Fair Trials, 2023) ir uzsvērts, ka šādas sistēmas nedrīkst izmantot pierādījumu ģenerēšanai kriminālprocesā.

Domēnspecifiskās sistēmas ir kognitīvie instrumenti konkrētās zināšanu jomās – medicīnā, tiesībās, finansēs u.c. Tiesību jomā no MI ir jāsaņem maksimāla precizitāte, nedrīkst notikt

improvizācija un rezultātiem ir jābūt determinētiem. Funkcionāli šādas sistēmas spēj nodrošināt izskaidrojamus rezultātus, ir brīvas no halucinācijām un spēj nepārtraukti mācīties to lietošanas laikā.

Korporatīvās sistēmas ir uzņēmumu/iestāžu iekšējie modeļi, kas apmācīti uz organizācijas iekšējiem datiem (piemēram, policijas noziegumu reģistriem, tiesu nolēmumiem u.c. faktiem). Šādas sistēmas ir svarīgas izmeklēšanā, tās iespējams pielāgot arī Latvijas tiesiskajam regulējumam (ECTK, ODL, KPL). Šīm sistēmām ir augsta datu kontrole, noteiktas informācijas apstrādes robežas un skaidra atbildība par procesiem. Apstrādātie dati neiziet ārpus organizācijas, kas ir atbilstoši VDAR 5. pantam un Regulai (ES) 2016/679. Noziegumu atklāšanas jomā ir jānodrošina izmeklēšanas un valsts noslēpuma aizsardzība (KPL, likums "Par valsts noslēpumu", 2. pants).

Personīgās jeb lokālās sistēmas ir individuālam lietotājam piemēroti modeļi. Parasti tās tiek izvietotas lokāli lietotāja datorā vai intranetā. Šādām sistēmām ir ļoti augsta datu aizsardzība, jo apstrāde notiek lietotāja/iestādes iekšējā infrastruktūrā, nevis mākoņa serveros. Tas atbilst VDAR 32. pantam (datu drošības tehniskie pasākumi) un ODL 24. pantam (valsts noslēpuma aizsardzībai). Tomēr lokālajiem modeļiem ir lielākas tehniskās prasības (GPU, VRAM) un ir nepieciešama regulāra atjaunināšana.

Funkcionālais iedalījums pēc izmantošanas mērķa

Lielie valodu modeļi (LLM) ir neironu tīkli, kas strādā ātri un ir universāli, bet bez izskaidrojamības, nav iespējams saprast, kāpēc sistēma pieņēma konkrēto lēmumu. Tas pārkāpj ECTK 6. panta (tiesības uz taisnīgu tiesu) prasības. Universālie LLM nedrīkst būt lēmumu pieņemšanas avoti. Tos var izmantot sadzīvē, bet izmeklēšanā drīkst izmantot tikai dokumentu apkopošanai (jebkurā gadījumā pārbaudot rezultātu), juridisko tekstu meklēšanai (meklējot līdzīgus precedentus), noteiktos gadījumos, ja normatīvais regulējums to pieļauj, pierādījumu indeksācijai (sakārtot e-pastus hronoloģiski bez ģenerēšanas).

Datu strukturēšanas sistēmas. Galvenā funkcija ir esošās informācijas sakārtošana un vizualizācija, nevis lēmumu pieņemšana vai prognozēšana. Šīs sistēmas neģenerē jaunus secinājumus par nenoskaidrotiem faktiem, bet automatizē rutīnas procesus. Piemēram, šīs sistēmas spēj automātiski indeksēt digitālos pierādījumus (e-pastus, ziņojumus, fotoattēlus), sakārtot tos hronoloģiski, izveidot sakarību shēmas starp personām vai notikumiem, kā arī vizualizēt sarežģītus datu kopumus interaktīvā formātā. Kriminālizmeklēšanas kontekstā šādu rīku izmantošana ir nozīmīga digitālo pierādījumu apjoma straujā pieauguma dēļ. 2010. gadā vidējais krimināllietas digitālo datu apjoms varēja būt dažus desmitus gigabaitu, bet 2024. gadā tas sasniedza terabaitu (Netherlands Forensic Institute, 2023, *Annual Report*, (Netherlands Forensic Institute, 2023)). No tiesiskā viedokļa datu strukturēšanas rīki ir pieņemamāki nekā prognozējošie vai autonomie MI risinājumi, jo to funkcija ir ierobežota un paredzama. Tomēr arī šādu rīku izmantošanā ir jāievēro procesuālās garantijas. KPL 127. pants nosaka, ka pierādījumiem jābūt iegūtiem likumā noteiktajā kārtībā un pārbaudāmiem.

Hibrīdās sistēmas apvieno neironu tīklus (kas veiksmīgi atpazīst modeļus) ar simbolisko loģiku (kas nodrošina saprotamu spriedumu ķēdi). Pēc nesenā pētījuma par neurosimbolisko MI (Garcez et al., 2025) hibrīdās sistēmas apvieno neirālo modeļu modeļa atpazīšanu ar simbolisko loģiku, nodrošinot izsekojamus lēmumus. Šādu sistēmu videi ir iespējams nodrošināt ECTK 6. panta prasības, kur nav iespējami čatboti lielajos valodas modeļos. Problēma ir šādu sistēmu izveidē, uzturēšanā un apmācībā, jo kriminālizmeklēšanas informācija bieži vien ir klasificējama kā valsts noslēpums (ODL 8. pants). Jāņem vērā, ka hibrīdā sistēma joprojām var radīt personu

diskriminēšanas riskus gadījumos, kad netiek sagatavoti noteikumi ar diskrimināciju izslēdzošiem parametriem.

Praktiskie rīki policijas vajadzībām

Hansken ir atvērta digitālās kriminālistikas platforma, ko izstrādājis Nīderlandes Kriminālistikas institūts (NFI) 2012. gadā. Platforma tika izveidota, lai palīdzētu izmeklēšanas iestādēm ātri un efektīvi pārbaudīt lielus digitālo pierādījumu apjomus. Tā ir atvērta platforma un ir pieejama tiesībsardzības iestādēm un akadēmiskajām iestādēm. To izmanto 13 valstīs, tostarp Eiropols (Europol, 2022), un tā ir saņēmusi Eiropas Publiskās pārvaldes institūta balvas (EPSA 2023-24) augstāko novērtējumu (EIPA, 2024). Platformas pārredzamība ir noteikta pirmkoda līmenī, kods ir pieejams izmantotājiem, kas ļauj pārbaudīt darbības principus. Hansken ir izmantota vairāk kā 1500 lietās par bērnu pornogrāfiju, krāpšanas lietās, slepkavību izmeklēšanā, *EncroChat* iešifrēto ziņojumu analīzē. Katram izpētāmajam digitālajam objektam ir nodrošināta izsekojama pierādījumu ķēde (*chain of evidence*). Hansken koda atvērtība teorētiski nodrošina pārbaudāmību, tomēr Latvijā šobrīd nav skaidra mehānisma, kā aizstāvība varētu pieprasīt neatkarīgu pierādījumu auditu. KPL 130. pants neparedz procedūru, kā apstrādāt automatizētas analīzes rezultātus, tas nozīmē, ka formālā koda pieejamība nestājas spēkā bez procesuāla mehānisma.

AVIAR (Tildes izstrādāta sistēma) ir viens no jaudīgākajiem rīkiem latviešu valodas runas atpazīšanai un pārvēršanai tekstā. Tas tika plānots un veidots nevis kā parasts “transkribētājs”, bet kā specializēta sistēma, kas pielāgota tieši latviešu valodas gramatikai, locījumiem un terminoloģijai. Sistēma spēj atšķirt, kurš runā (piemēram, Runātājs A un Runātājs B). Tas ir svarīgi nopratināšanas protokolos. Pareizs AVIAR izmantošanas algoritms nopratināšanā varētu būt šāds: procesa virzītājs nopratina personu, AVIAR transkribē tekstu, procesuālās darbības dalībnieki iepazīstas ar to un apstiprina, ka teksts pierakstīts atbilstoši. Nebūtu pieļaujams, ka AVIAR automātiski transkribēto tekstu izmanto bez pārbaudīšanas. KPL 142. pantā jāprecizē, ka MI drīkst veidot procesuālus dokumentus.

Endzelīns (tulks.iem.gov.lv) ir mašīntulkošanas platforma, kas nodrošina Iekšlietu ministrijas iestādēm iespēju tulkot tekstus un dokumentus no/uz latviešu, angļu, franču, vācu un krievu valodām. Endzelīns ir izolēts no publiskiem mašīntulkošanas rīkiem (*Google Translate*, *DeepL* u.c.), līdz ar to dati netiek nodoti trešajām pusēm. Platforma paredzēta procesuālo dokumentu tulkošanai (piemēram, krimināllietas materiāli, nopratināšanas protokoli).

Mākslīgā intelekta sistēmu iedalījums pēc hierarhijas (kontroles līmeņiem) un funkcionalitātes (izmantošanas mērķiem) ļauj identificēt kontroles un atbildības līmeņus, novērtēt piemērotību kriminālizmeklēšanas uzdevumiem un noteikt tiesiskos riskus katrā kategorijā. Universālie LLM noziegumu atklāšanā ir izmantojami tikai tad, ja cilvēks pārbauda un apstiprina ģenerētos rezultātus, domēnspecifiskās un korporatīvās sistēmas ir sistēmas ar lielāku precizitāti un kontroli, bet jābūt normatīvajam regulējumam saistībā ar valsts noslēpuma aizsardzību, savukārt hibrīdās sistēmas, apvienojot neirālo apstrādi ar simbolisko loģiku, potenciāli piedāvā nepieciešamo pārredzamību taisnīga procesa garantiju nodrošināšanai.

Ja MI ir sakārtojis datus tādā veidā, ka tiek radīts maldīgs priekšstats par faktiskajiem apstākļiem (piemēram, nekorekti interpretējot sarunu kontekstu vai kļūdaini atpazīstot objektus attēlos), šādi rezultāti nevar tikt izmantoti kā pierādījumi. Tādējādi pat salīdzinoši vienkāršu datu strukturēšanas rīku izmantošanā nepieciešama cilvēka kontrole un rezultātu pārbaude, lai nodrošinātu to atbilstību tiesību normām.

Ētikas dimensija

MI izmantošana noziegumu atklāšanā aktualizē ne tikai tiesiskus, bet arī būtiskus ētiskus jautājumus, kas cieši saistīti ar kriminālprocesa pamatprincipiem. MI sistēmas spēj automatizēti apstrādāt lielus datu apjomus un sniegt rekomendācijas vai prognozes, kuru pamatā ir statistiskas korelācijas, nevis individuāls vērtējums. Šī īpatnība rada specifiskus ētiskus riskus, kas kriminālprocesa kontekstā var tieši ietekmēt personas tiesisko stāvokli.

Zinātniskajā literatūrā algoritmu ētikas problemātikas konceptuālie pamati ir analizēti *Mittelstadt* pētījumā “The ethics of algorithms: mapping the debate”, kurā identificēti epistemiskie (ar zināšanu iegūšanas ticamību saistītie), normatīvie un atbildības riski (*Mittelstadt et al., 2016*). No identificētajiem riskiem kriminālizmeklēšanas kontekstā īpaši nozīmīgi ir trīs:

- 1) nepārliecinoši vai nepietiekami pierādījumi (*inconclusive evidence*);
- 2) neizskaidrojami jeb necaurredzami lēmumi (*inscrutable evidence*);
- 3) netaisnīgi vai diskriminējoši rezultāti (*unfair outcomes*).

Pirmkārt, MI sistēmu sniegtie rezultāti pēc būtības ir varbūtiski un balstīti uz datu korelācijām, nevis pierādītām cēloņsakarībām. Tādus rezultātus nedrīkst izmantot kriminālprocesā, jo saskaņā ar *KPL* 127. pantu pierādījumiem jābūt pārbaudāmiem, ticamiem un iegūtiem likumā noteiktajā kārtībā. Ja MI sistēmas ģenerētais secinājums nav pārbaudāms vai izskaidrojams, tas nevar tikt pielīdzināts pierādījumam kriminālprocesa izpratnē, bet drīzāk uzskatāms par operatīvu norādi turpmākām izmeklēšanas darbībām.

ODL 24. panta otrā daļa pieļauj šādu informāciju izmantot izmeklēšanas darbību nodrošināšanai, kriminogēnās situācijas analīzei, personu apdraudējumu identificēšanā. Šāds regulējums ir svarīgs mākslīgā intelekta integrācijai, tas faktiski pieļauj izmantot MI kā analītisku palīglīdzekli operatīvās darbības un izmeklēšanas darbību plānošanā. Šāda pieeja liedz iespēju MI ģenerētus secinājumus automātiski atzīt par procesuāliem pierādījumiem bez to pārbaudes. Tas ir drošības mehānisms, lai nepieļautu, ka statistiski modeļi aizstāj individuālu, juridiski pamatotu amatpersonas vērtējumu.

Otrkārt, būtisks ētiskais izaicinājums ir MI sistēmu darbības caurredzamības trūkums. Sarežģīti algoritmi, īpaši dziļās mācīšanās modeļi, bieži nespēj sniegt saprotamu skaidrojumu tam, kā tie nonākuši pie konkrēta rezultāta. Šāda “melnās kastes” problēma apgrūtina atbildības noteikšanu un ierobežo aizstāvības iespējas apstrīdēt MI balstītus secinājumus, kas ir pretrunā ar tiesībām uz taisnīgu procesu. Šis aspekts kļūst aktuāls, jo *ODL* 8. pants paredz operatīvās darbības metožu klasificēšanu, kas praksē var nonākt pretrunā ar ES MI akta prasību nodrošināt augsta riska MI sistēmu pārredzamību.

Treškārt, MI izmantošana kriminālizmeklēšanā ir saistīta ar būtisku diskriminācijas risku. Ja MI sistēmas tiek apmācītas, izmantojot vēsturiskus datus, kuros jau pastāv selektīvas uzraudzības vai institucionālu aizspriedumu pazīmes, pastāv risks, ka šīs nevienlīdzības tiks atkārtotas un pat pastiprinātas. Barocas un Selbst rakstā *Big Data's Disparate Impact* uzsver, ka arī formāli neitrāli algoritmiskie risinājumi var radīt nesamērīgu nelabvēlīgu ietekmi uz noteiktām sociālajām grupām, jo diskriminācija bieži rodas netieši – caur datu struktūru un izmantotajiem modeļiem (*Barocas & Selbst, 2016.*).

Praksē tas var izpausties situācijās, kad policijas noziegumu reģistri vēsturiski saturējuši nesamērīgu noteiktu sociālo vai etnisko grupu pārstāvju aizturēšanas gadījumu skaitu. Ja MI sistēma tiek

apmācīta, balstoties uz šādiem datiem, tā var identificēt šīs grupas kā “augsta riska”, kā rezultātā pastiprināta uzraudzība tiek vērsta tieši pret tām.

Šāda situācija var novest pie netaisnīgiem rezultātiem un nesamērīgas iejaukšanās pamattiesībās, kas ir pretrunā gan ar *Satversmes* 96. pantā nostiprinātajām tiesībām uz privātās dzīves neaizskaramību, gan ar *Eiropas Cilvēktiesību konvencijas* 8. pantu.

Kā norāda I. Barkāne savā pētījumā par MI sistēmām un diskriminācijas aspektiem, Latvijā līdz šim nav fiksēti gadījumi, kuros cilvēktiesību aizsardzības iestādes būtu izskatījušas sūdzības par MI sistēmu radītu diskrimināciju (Barkāne, 2024). Tomēr šis fakts nenozīmē, ka problēmas neeksistē. Drīzāk tas liecina par tiesiskā regulējuma nezināšanu un zemu informētību par MI radītajiem riskiem.

Papildus jāņem vērā, ka algoritmiskās sistēmas, kuras formāli izstrādātas kā “taisnīgas”, ne vienmēr nodrošina vienlīdzīgus rezultātus praksē. Kā norāda *Wachter* u.c. (2021), atsevišķas taisnīguma metrikas (*fairness metrics*) mašīnmācīšanās sistēmās var saglabāt vēsturisko nevienlīdzību, tādējādi radot netiešas diskriminācijas riskus. Šis secinājums ir būtisks arī kriminālizmeklēšanas kontekstā, jo tas apstiprina, ka MI rīku tehniskais korektums pats par sevi negarantē atbilstību pamattiesību aizsardzības prasībām.

Šie algoritmiskie riski cieši saistās ar plašāku uzraudzības dimensiju. Masveida novērošanas pasākumi, kas būtiski ierobežo personu pamattiesības, nevar tikt ieviesti un piemēroti, neizvērtējot proporcionalitāti un nepieciešamību, nenodrošinot atbilstošas procesuālās garantijas un jo īpaši neinformējot personas (Barkāne, 2023, 185. lpp.). MI kontekstā šis jautājums kļūst īpaši aktuāls, jo automatizēta analīze un sejas atpazīšana ļauj ne tikai fiksēt personas klātbūtni publiskajā telpā, bet arī identificēt, profilēt un klasificēt personas plašā mērogā. Eiropas Cilvēktiesību tiesa lietā *Big Brother Watch v. United Kingdom* (2021, 58170/13) uzsvērusi masveida uzraudzības režīmu stingro garantiju nepieciešamību, kas ir īpaši nozīmīgi MI izmantošanas gadījumos. Pastāvīgas uzraudzības iespējamība var radīt “iebidējošo efektu” (*chilling effect*), kad indivīdi, zinot vai pieļaujot, ka viņu rīcība var tikt automatizēti analizēta, atturas īstenot savas pamattiesības. ECT judikatūrā atzīts, ka pat potenciāla iespēja tikt novērotam var ierobežot vārda brīvību, pulcēšanās brīvību un privātās dzīves neaizskaramību (*Klass and Others v. Germany*, 1978, 5029/71).

Piemēram, persona, zinot, ka policija izmanto MI sejas atpazīšanu demonstrācijās, var atteikties piedalīties likumīgā protestā, baidoties tikt identificēta un iekļauta “riskā personu” datubāzē. Šīs bailes ierobežo *Satversmes* 103. pantā garantēto pulcēšanās brīvību, lai gan persona nav veikusi nekādu prettiesisku darbību.

Demokrātijas kontekstā tas nozīmē, ka publiskā līdzdalība un viedokļu apmaiņa var kļūt piesardzīga un pašcenzēta. Kā norāda I. Barkāne, šādas tendences ir saistāmas ar masveida novērošanas apmēra pieaugumu un varas nevienlīdzības saasināšanos (Barkāne, 2023).

Līdz ar to MI izmantošanas ētiskā pieļaujamība nav reducējama uz vienkāršu jautājumu par tehnoloģiju atļaušanu vai aizliegšanu, bet prasa samērīguma izvērtējumu. Tas nozīmē pienākumu pamatot, vai konkrētais MI risinājums ir piemērots leģitīma mērķa sasniegšanai un vai nav mazāk ierobežojošu alternatīvu. Šajā kontekstā būtisks ir arī cilvēka cieņas princips, kas nostiprināts Eiropas Savienības Pamattiesību hartas 1. pantā, nosakot, ka cilvēka cieņa ir neaizskarama un tā ir jārespektē un jāaizsargā. No šī principa izriet aizliegums reducēt personu līdz datu kopumam vai skaitliskam riska novērtējumam, un MI prognozējoša izmantošana nedrīkst pārvērst personu par līdzekli institucionāla mērķa sasniegšanai, ignorējot individuālo kontekstu un autonomiju. Vienlaikus, kā uzsver I. Barkāne, MI balstītu novērošanas un analīzes tehnoloģiju izmantošanā īpaša

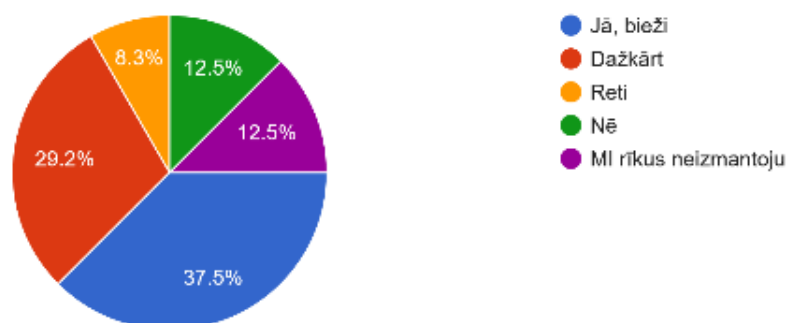
nozīme ir apstrādes pārredzamībai un godprātībai, jo šādas sistēmas nereti tiek izmantotas bez datu subjekta iesaistes, kas pastiprina atbildības un kontroles trūkuma risku. (Barkāne, 2023)

Minētie ētiskie riski nav tikai teorētiski, bet izpaužas arī kriminālizmeklēšanas praksē. To apliecina veiktās aptaujas rezultāti, kuros analizēta tiesībsargsardzības iestāžu darbinieku attieksme pret mākslīgā intelekta izmantošanu izmeklēšanā.

Aptaujā piedalījušies tiesībsargsardzības iestāžu darbinieki konsekventi norādīja, ka MI rīki izmeklēšanas praksē tiek uztverti kā palīgīdzeklis, nevis kā autonomu procesuālu lēmumu aizstājējs, uzsverot cilvēka profesionālās atbildības apziņu un kritisku attieksmi pret automatizētu lēmumu pieņemšanu (skat. 1. attēlu).

Vai ētiski vai tiesiski neskaidri aspekti (piemēram, atbildība, pārbaudāmība, pamattiesību ierobežojumi) praksē attur Jūs no MI rīku izmantošanas izmeklēšanā?

24 responses

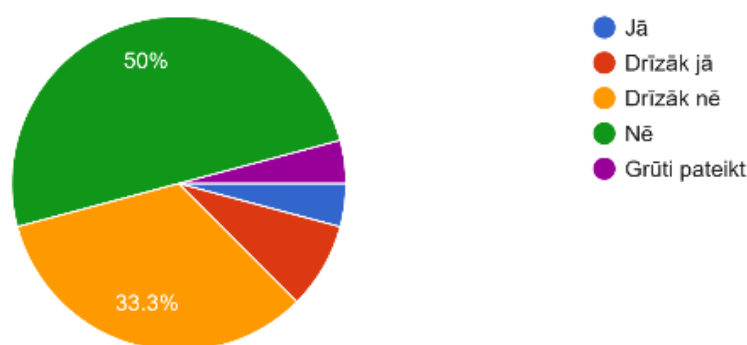


1. attēls

Aptaujas dati rāda, ka būtisks faktors, kas attur no MI rīku plašākas izmantošanas izmeklēšanā, ir tieši ētiski un tiesiski neskaidri aspekti, tostarp atbildības sadalījums, MI sniegto rezultātu pārbaudāmība un pamattiesību aizsardzība (skat. 2. attēlu).

Vai, Jūsaprāt, pašreizējais tiesiskais regulējums (KPL, ODL) pietiekami skaidri nosaka MI izmantošanas iespējas izmeklēšanā?

24 responses



2. attēls

Šie secinājumi korelē ar kriminālprocesa pamatprincipiem, kas paredz individuālu atbildību par katru procesuālu lēmumu un nepieļauj atbildības izkliedi starp cilvēku un tehnoloģiju. Līdz ar to praksē priekšroka tiek dota cilvēka kontrolei un profesionālajam spriedumam, kas atbilst arī Eiropas Savienības regulatīvajai pieejai augsta riska MI sistēmu izmantošanā tiesībsargāšanas jomā.

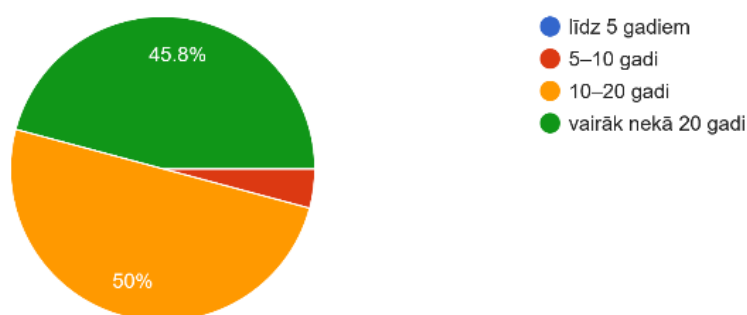
Empīriskā izpēte par mākslīgā intelekta izmantošanu kriminālizmeklēšanā

Lai papildinātu teorētisko un ētisko analīzi par mākslīgā intelekta (MI) izmantošanu kriminālizmeklēšanā, rakstā analizēti empīriski dati par MI rīku praktisku izmantošanu un to uztveri tiesībsargāšanas iestādēs. Empīriskā daļa balstīta uz kvantitatīvas aptaujas rezultātiem, kā arī uz kvalitatīvu interviju materiālu, kas iegūts studiju procesa ietvaros, intervējot tiesībsargāšanas iestāžu darbiniekus, kuri apgūst operatīvās darbības specializāciju.

Anonīmajā aptaujā piedalījās 24 tiesībsargāšanas iestāžu darbinieki ar atšķirīgu profesionālo pieredzi, no kuriem lielākajai daļai darba stāžs pārsniedza desmit gadus, tostarp ievērojama daļa norādīja vairāk nekā divdesmit gadu pieredzi izmeklēšanas darbā (skat. 3. attēlu).

Jūsu darba stāžs tiesībsargājošajās iestādēs?

24 responses



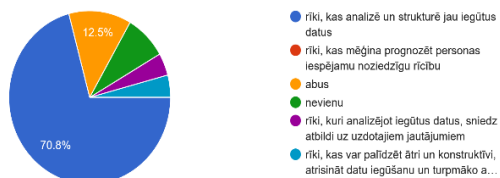
3. attēls. Respondentu darba stāžs tiesībsargāšanas iestādēs

Šis respondentu profils ļauj secināt, ka aptaujas rezultāti atspoguļo galvenokārt pieredzējušu praktiķu skatījumu uz MI izmantošanu izmeklēšanas darbā.

Aptaujas dati liecina, ka MI rīki izmeklēšanas praksē jau ir pazīstami un tiek izmantoti, tomēr pārsvarā neregulāri. MI visbiežāk tiek izmantots kā palīg līdzeklis informācijas meklēšanai, teksta sagatavošanai, tulkošanai un liela apjoma datu sākotnējai apkopošanai (skat. 4.–5. attēlu).

Kādu MI rīku izmantošanu Jūs uzskatāt par pieņemamāku izmeklēšanā?

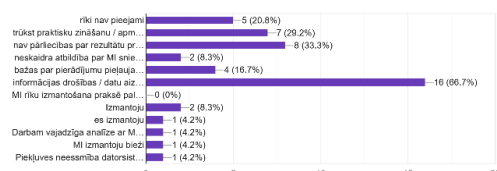
24 responses



4. attēls.

Jā MI rīkus ikdienas darbā neizmantojat vai izmantojat ļoti ierobežoti, kādi ir galvenie iemesli? (var atzīmēt vairākus)

24 responses

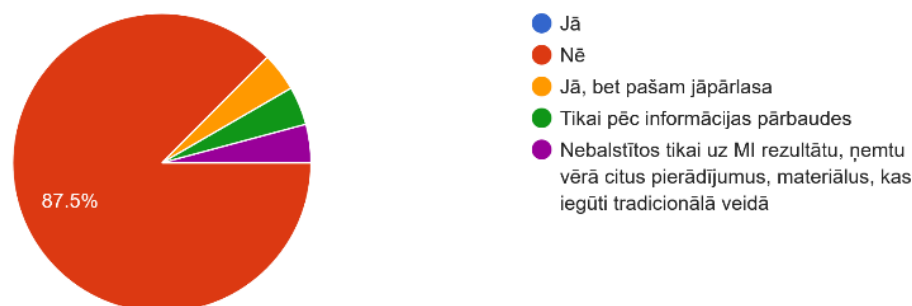


5. attēls

Vienlaikus absolūtais vairākums respondentu norādīja, ka nebūtu gatavi pieņemt procesuālu lēmumu, balstoties tikai uz MI sniegtajiem rezultātiem (skat. 6. attēlu).

Vai Jūs būtu gatavs/-a pieņemt procesuālu lēmumu, balstoties tikai uz šādu MI rezultātu?

24 responses

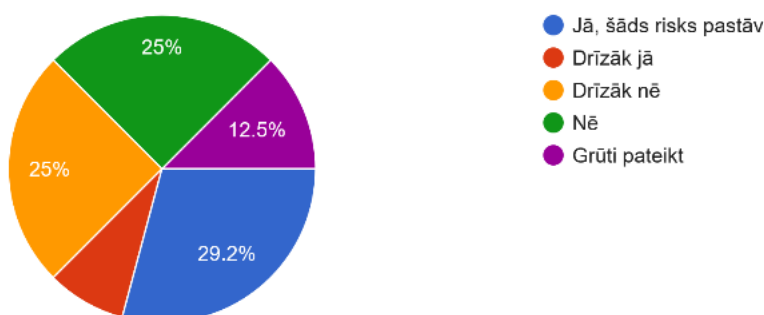


6. attēls. Gatavība pieņemt procesuālu lēmumu, balstoties tikai uz MI rezultātiem

Šāda piesardzība cieši saistīta ar atbildības jautājumu. Respondenti norādīja, ka MI rīku izmantošana, īpaši gadījumos, kad sistēmas darbības loģika nav skaidri izskaidrojama, rada risku atbildības izplūšanai starp cilvēku un tehnoloģiju (skat. 7. attēlu).

Vai MI rīku izmantošana var radīt situāciju, kurā kļūst neskaidrs, kurš uzņemas atbildību par pieņemto lēmumu (izmeklētājs, struktūrvienība, iestāde, tehnoloģija)?

24 responses



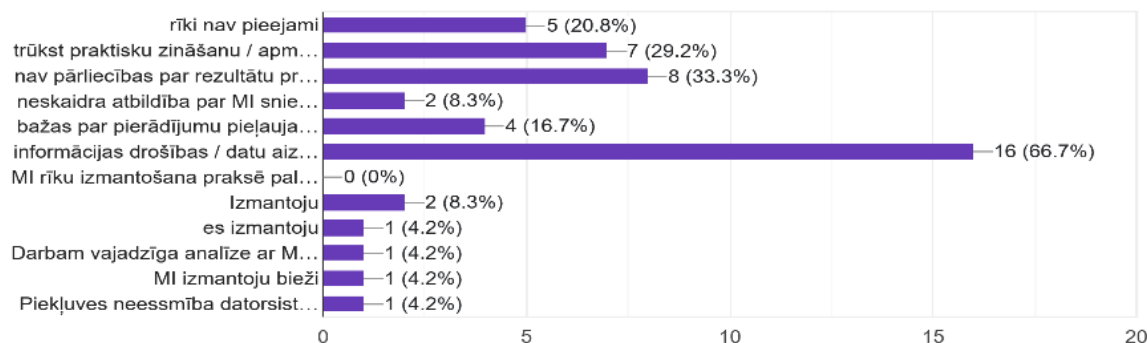
7. attēls

Šāda attieksme sasaucas ar kriminālprocesā nostiprināto prasību, ka par katru procesuālu lēmumu ir identificējama konkrēta amatpersona, kura uzņemas juridisko atbildību.

Aptaujas rezultāti arī atklāj galvenos faktoros, kas attur no MI rīku plašākas izmantošanas. Respondenti visbiežāk norādīja uz datu drošības un informācijas aizsardzības riskiem, MI sniegto rezultātu pārbaudāmības problēmām, kā arī normatīvā regulējuma neskaidrību attiecībā uz pierādījumu pieļaujamību un atbildības sadalījumu (skat. 8. attēlu).

Ja MI rīkus ikdienas darbā neizmantojat vai izmantojat ļoti ierobežoti, kādi ir galvenie iemesli? (var atzīmēt vairākus)

24 responses



8. attēls. Galvenie faktori, kas attur no MI rīku izmantošanas izmeklēšanā

Šie secinājumi liecina, ka MI izmantošanas ierobežojumi praksē nav saistīti ar tehnoloģijas kategorisku noraidījumu, bet gan ar tiesiskās drošības trūkumu.

Papildu kvantitatīvajai aptaujai empīriskajā daļā analizēts interviju materiālu tematiskais apkopojuma saturs, kas iegūts, intervējot tiesībaizsardzības iestāžu darbiniekus vecumā no 22 līdz 40 gadiem ar profesionālo pieredzi no diviem līdz piecpadsmit gadiem, kuri apgūst operatīvās darbības specializāciju. Analīze balstīta uz apkopotiem interviju secinājumiem un ilustratīviem piemēriem, kas atspoguļo dalībnieku vispārējo attieksmi pret MI izmantošanu.

Interviju materiāli liecina, ka jaunie speciālisti MI rīkus ikdienā un studiju procesā izmanto salīdzinoši bieži, galvenokārt informācijas meklēšanai, tulkošanai un terminoloģijas precizēšanai, izmantojot vispārpieejamus digitālos rīkus. Profesionālajā darbībā MI izmantošana ir ierobežota un epizodiska, un iegūtā informācija parasti tiek pārbaudīta oficiālos avotos, kas norāda uz piesardzīgu attieksmi pret MI sniegtajiem rezultātiem. Arī intervijās dominē uzskats, ka MI ir pieļaujams kā analītisks atbalsta instruments, bet ne kā patstāvīgs pamats procesuālu lēmumu pieņemšanai.

Aptaujas un interviju rezultāti savstarpēji papildina viens otru un atklāj līdzīgas tendences MI uztverē. Gan pieredzējušie izmeklētāji, gan jaunie speciālisti MI galvenokārt uztver kā tehnisku palīg līdzekli informācijas apstrādei, nevis kā autonomu lēmumu pieņēmēju. Atšķirības starp grupām galvenokārt izpaužas uzsvaros. Jaunie speciālisti MI izmantošanu biežāk vērtē konceptuāli un normatīvi, akcentējot cilvēktiesību aizsardzību un nevainīguma prezumpciju, savukārt pieredzējušāki izmeklētāji vairāk koncentrējas uz praktiskiem aspektiem, piemēram, atbildības sadalījumu, pierādījumu pārbaudāmību un institucionālo atbalstu MI rīku izmantošanai.

Šīs atšķirības nav savstarpēji pretrunīgas, bet gan savstarpēji papildinošas, izgaismojot dažādus MI integrācijas izaicinājumus kriminālprocesā.

Secinājumi

Pētījumā izmantota kompleksa metodoloģija, kas ietver zinātniskās literatūras un juridisko dokumentu analīzi (ES MI Akts, *KPL*, *ODL*), salīdzinošo metodi, kā arī empīrisko daļu.

Empīriskais pētījums sastāv no anonīmas tiesībaizsardzības iestāžu darbinieku aptaujas, kurā piedalījās 24 respondenti ar ievērojamu darba stāžu, un kvalitatīvām intervijām ar speciālistiem, kuri apgūst operatīvās darbības specializāciju.

Pētījumā konstatēts, ka esošais Latvijas tiesiskais regulējums (*KPL* un *ODL*) nav konceptuāli pielāgots MI izmantošanai kriminālizmeklēšanā, jo šie likumi pieņemti pirms MI plašas ieviešanas.

Galvenie neatrisinātie tiesiskie jautājumi saistīti ar MI ģenerētās informācijas procesuālo stāvokli. *KPL* 127. pants prasa, lai pierādījumi būtu pārbaudāmi un ticami, taču MI sistēmu ierobežotā izskaidrojamība apgrūtina šo prasību izpildi. Tādēļ MI rezultāti kriminālprocesā nevar tikt uzskatīti par pierādījumiem un ir izmantojami tikai kā analītisks atbalsts cilvēka veiktam juridiskam izvērtējumam. Šāda pieeja ir nozīmīga ne tikai tiesiskā, bet arī ētiskā ziņā, jo novērš risku, ka statistiski un varbūtiski algoritmiskie secinājumi aizstātu individuālu izvērtējumu un personas autonomiju kriminālprocesā.

Papildu problēmas konstatētas operatīvās darbības jomā. *ODL* 24. pants pieļauj analītisku līdzekļu izmantošanu operatīvās informācijas apstrādē, tomēr nenosaka tiesas kontroles kritērijus gadījumos, kad MI analīze var būtiski ietekmēt personas pamattiesības. Tas rada gan tiesiskus, gan ētiskus riskus, jo MI analīzes izmantošana bez pietiekamas neatkarīgas uzraudzības var novest pie nesamērīgas iejaukšanās personas tiesībās. Pētījumā konstatētie ētiskie riski, tostarp algoritmiskās diskriminācijas iespējamība un masveida uzraudzības radītais "iebidējošais efekts", apstiprina nepieciešamību MI izmantošanu kriminālizmeklēšanā pakļaut stingrai cilvēka kontrolei un samērīguma izvērtējumam.

Būtiska tiesiska kolīzija pastāv arī starp caurredzamības un slepenības prasībām – starp ES MI akta caurredzamības prasībām un *ODL* 8. pantā noteikto operatīvo metožu slepenību. Šī pretruna ierobežo gan efektīvu tiesisko kontroli, gan aizstāvības tiesību īstenošanu, un to nav iespējams atrisināt ar formālu normu piemērošanu. Kā risinājums pētījumā piedāvāta neatkarīga MI uzraudzības mehānisma izveide ar atbilstošu piekļuvi valsts noslēpumam.

Pētījuma detalizēti analizēti konkrēti MI rīki. MI rīku analīze (Hansken, AVIAR, Endzelīns) apliecina, ka tehnoloģiski MI jau šobrīd spēj būtiski uzlabot kriminālizmeklēšanas efektivitāti, īpaši liela apjoma datu strukturēšanā, transkripcijā un tulkošanā. Tomēr šo rīku izmantošana ir tiesiski pieļaujama tikai tad, ja to rezultāti tiek uzskatīti par informāciju, kas iegūst procesuālu nozīmi vienīgi pēc cilvēka pārbaudes.

Empīriskas izpētes rezultāti liecina, ka praktiski MI rīkus uztver kā palīgīdzekli informācijas apstrādei, nevis kā autonomu lēmumu pieņēmēju. Galvenie faktori, kas attur no plašākas MI izmantošanas, ir datu drošības riski (66,7 %), rezultātu pārbaudāmības trūkums (33,3 %) un normatīvā regulējuma neskaidrība. Absolūtais vairākums (87,5 %) respondentu nav gatavi pieņemt procesuālu lēmumu, balstoties tikai uz MI rezultātiem.

Kopumā secināms, ka MI kriminālizmeklēšanā var kalpot kā efektīvs analītisks atbalsts, taču tam nepieciešami grozījumi *KPL* un *ODL*, lai precizētu MI ģenerētās informācijas statusu un noteiktu izmantošanas robežas. Kā būtisks risinājums tiek piedāvāta neatkarīga MI uzraudzības procedūra, ko veiktu sertificēta institūcija vai tiesnesis ar pielaidi valsts noslēpumam, tādējādi līdzsvarojot slepenības prasības ar nepieciešamo tiesisko kontroli.

Kopsavilkums

Pētījumā analizēta MI izmantošana Valsts policijas darbā kriminālizmeklēšanā, akcentējot tiesiskos un ētiskos riskus. Secināts, ka MI praktiska izmantošana Latvijā jau ir iespējama un atsevišķos gadījumos tiek īstenota, tomēr *KPL* un *ODL* nesniedz skaidru regulējumu MI ģenerētās informācijas procesuālajam statusam, īpaši pierādījumu pārbaudāmības un atbildības aspektā. Tādēļ nepieciešami grozījumi *KPL* un *ODL*, lai noteiktu MI rezultātu izmantošanas robežas un nostiprinātu cilvēka izšķirošo lomu lēmumu pieņemšanā.

Automatizēta liela apjoma datu analīze un prognozējoši algoritmi balstās uz statistiskām korelācijām, kas var radīt nepārredzamus, grūti izskaidrojamus vai pat diskriminējošus rezultātus. Šādi riski kriminālprocesa kontekstā var tieši ietekmēt personas pamattiesības, tostarp tiesības uz privāto dzīvi, taisnīgu procesu un vienlīdzīgu attieksmi likuma priekšā.

Īpaša uzmanība pievērsta kolīzijai starp ES MI akta caurredzamības prasībām un operatīvās darbības metožu aizsardzību kā valsts noslēpumu, uzsverot, ka šis līdzsvars risināms ar neatkarīgas kontroles mehānismu, neapdraudot ne operatīvās darbības taktiku, ne aizstāvības tiesības.

Vienlaikus pētījumā konstatēta nepieciešamība izveidot speciālu MI sistēmu uzraudzības procedūru, lai nodrošinātu pamattiesību aizsardzību un atbilstību ES MI akta prasībām.

Kopumā secināms, ka MI rīki kriminālizmeklēšanā var kalpot kā efektīvs analītisks atbalsts, taču tas nevar aizstāt profesionālu juridisku izvērtējumu, individuālu atbildību un cilvēka izšķirošo lomu procesuālu lēmumu pieņemšanā.

References

- Barocas, S., & Selbst, A. D. (2016). Big data's disparate impact. *California Law Review*, 104 (3), 671–732. DOI: <https://doi.org/10.15779/Z38BG31>
- Barkāne, I. (2023). *Cilvēktiesību nozīme mākslīgā intelekta laikmetā: Privātums, datu aizsardzība un regulējums masvida novērošanas novēršanai*. Rīga: LU Akadēmiskais apgāds. DOI: <https://doi.org/10.22364/cnmil.23>
- Barkāne, I. (2024). *Mākslīgā intelekta sistēmas un diskriminācijas aspekti*. Rīga: Tiesībsarga birojs. Pieejams: <https://www.tiesibsargs.lv/resource/maksliga-intelekta-sistemas-un-diskriminacijas-aspekti/>
- Big Brother Watch and Others v. United Kingdom, Applications nos. 58170/13, 62322/14 and 24960/15, European Court of Human Rights (Judgment of 25 May 2021)
- Centrum för rättvisa v. Sweden, Application no. 35252/08, European Court of Human Rights (Judgment of 25 May 2021)
- Direktīva (ES) 2016/680 (2016. gada 27. aprīlis) par fizisku personu aizsardzību attiecībā uz personas datu apstrādi kompetento iestāžu veikto noziedzīgu nodarījumu novēršanas, izmeklēšanas, atklāšanas vai kriminālvajāšanas nolūkā Eiropas Cilvēktiesību un pamatbrīvību aizsardzības konvencija
- Eiropas Parlamenta un Padomes Regula (ES) 2016/679 (2016. gada 27. aprīlis) par fizisku personu aizsardzību attiecībā uz personas datu apstrādi un par šādu datu brīvu apriti
- Eiropas Parlamenta un Padomes Regula (ES) 2024/1689 (2024. gada 13. jūnijs) par mākslīgo intelektu
- European Parliament. (2020, August 27). *What is artificial intelligence?* Retrieved from <https://www.europarl.europa.eu/topics/en/article/20200827STO85804/>
- Europol. (2022). *Hansken – Network open source and data*. Retrieved from <https://nosad.se>
- Europol. (2024). *Artificial intelligence and policing: A strategic overview*. Retrieved from <https://www.europol.europa.eu>
- Fair Trials Europe. (2023). *Automating injustice: The use of artificial intelligence and automated decision-making in criminal justice systems*
- Garcez, A. d'Avila, et al. (2025). *Neurosymbolic AI for safe and trustworthy high-stakes applications*. Retrieved from <https://www.emergentmind.com/topics/neuro-symbolic-hybrids>
- Iekšlietu ministrija. (2023). *Iekšlietu nozares stratēģija 2023.–2027. gadam*
- Kriminālprocesa likums

Latvijas Republikas Satversme

Likums "Par valsts noslēpumu"

Mata v. Avianca, Inc., No. 1:22-cv-01461, U.S. District Court for the Southern District of New York (2023)

Mittelstadt, B. D., Allo, P., Taddeo, M., Wachter, S., & Floridi, L. (2016). The ethics of algorithms: Mapping the debate. *Big Data & Society*, 3 (2), 1–21. DOI: <https://doi.org/10.1177/2053951716679679>

Netherlands Forensic Institute. (2023). *Annual report 2023*. Retrieved from <https://www.forensicinstitute.nl>

Operatīvās darbības likums

Russell, S., & Norvig, P. (2021). *Artificial intelligence: A modern approach* (4th ed.). Pearson

Strupiņš, A. (2018). Komerctiesības un mākslīgais intelekts: Quo vadis? *Latvijas Republikas Augstākās tiesas Biļetens*, 16, 110–112

Tilde. (2024). *Speech-to-text services*. Pieejams: <https://tilde.ai/speech-to-text/>

Valsts policija. (2023). *Valsts policijas darbības un attīstības stratēģija 2023.–2027. gadam*

Wachter, S., Mittelstadt, B., & Russell, C. (2021). Why fairness cannot be automated: Bridging the gap between EU non-discrimination law and AI. *West Virginia Law Review*, 123. Retrieved from <https://researchrepository.wvu.edu/cgi/viewcontent.cgi?article=6331&context=wvlr>

RESEARCH ON FINANCIAL SUPPORT FOR THE HIGH-QUALITY DEVELOPMENT OF CHINA'S SPORTS EVENT INDUSTRY

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Abstract

With the continued advancement of the national strategy to build a strong sports nation, the sports event industry has increasingly emerged as a vital platform for promoting economic development and enhancing social well-being. In recent years, the industry has played an expanding role in stimulating consumption, fostering regional integration, and improving public participation in sports activities. Fiscal policy, as a core instrument of public governance, is widely recognized as a key driver in facilitating the sustainable and high-quality development of the sports event industry, particularly through its capacity to allocate resources, provide institutional support, and guide market expectations. This study takes the Beijing–Tianjin–Hebei region as the empirical context and conducts a systematic examination of the coordinated development of sports events over the period from 2019 to 2023. The analysis focuses on several critical dimensions, including the scale and frequency of events, the extent of interregional collaboration, and the patterns of government financial support. By undertaking a comparative assessment of event statistics and fiscal allocation levels across the region, the study identifies a number of structural challenges, such as fragmented organizational arrangements, uneven distribution of resources among regions, and limited integration of sports with cultural and tourism sectors. Building upon these findings, the paper proposes a series of policy-oriented development pathways aimed at enhancing the effectiveness of fiscal intervention. These recommendations include optimizing fiscal support mechanisms, refining tax incentive frameworks, increasing investment in public sports infrastructure, and encouraging broader participation of social capital in the organization and operation of sports events. Through these measures, the study seeks to contribute both theoretical insights and practical guidance for improving the efficiency of fiscal policies and advancing the coordinated and high-quality development of the sports event industry in China.

Keywords: Beijing–Tianjin–Hebei region, coordinated development, fiscal support, sports event industry

Introduction

At the summary and commendation meeting for the Beijing Winter Olympics and Paralympics, General Secretary Xi Jinping reiterated the importance of accelerating the construction of a strong

sports nation and highlighted the need to adhere to the goal of enhancing people's physical fitness while improving the overall quality of life of the population. Within this broader policy framework, the high-quality development of the sports event industry represents a fundamental pathway for translating national strategic objectives into tangible outcomes. Achieving this goal requires the industry to generate both economic and social value through more efficient resource utilization and improved institutional coordination.

Recent research has further underscored the importance of strengthening efficiency, fostering innovation, and enhancing regional coordination as key conditions for advancing high-quality development in regional sports industries (Yu et al., 2024). From an economic perspective, it is necessary to promote supply-side structural reform within the sports event sector and expand domestic demand for sports-related consumption. From a social perspective, the industry should play a more active role in responding to the public's increasing expectations for a better quality of life and more diverse recreational opportunities (Ullah et al., 2024).

General Secretary Xi Jinping has emphasized that finance constitutes a fundamental foundation and a key pillar of national governance (Gayen et al., 2024). The development of the sports event industry is closely intertwined with broader economic and social systems, as it influences multiple dimensions of national development, including economic growth, public welfare, and regional coordination (Raso & Cherubini, 2023). Within this context, fiscal policy plays a pervasive role across government activities, shaping the allocation of public resources and guiding the strategic direction of industry development.

In China, sports lottery systems have become an important fiscal instrument that supports the expansion and sustainability of the sports sector by generating dedicated funding and enhancing financial capacity (Yao et al., 2024). More broadly, well-designed fiscal policies contribute to balancing macro-level strategic coordination with micro-level operational efficiency, thereby addressing structural challenges and providing institutional guarantees for the high-quality development of the sports event industry (Lee & Diez, 2023). Policy guidance at the national level further reinforces this perspective. The Fourteenth Five-Year Plan for Sports Development explicitly calls for improving public finance investment mechanisms, establishing a comprehensive fiscal support framework, and strengthening support for key areas, weak links, and priority regions, which collectively highlight the central role of fiscal instruments in promoting industry development (Ganic & Novalic, 2023).

Despite these policy efforts, existing research remains insufficient in providing systematic support for the effective implementation of fiscal policies within the sports event industry. While some studies have examined the limitations of current fiscal arrangements and proposed policy improvement measures (Iwegbu et al., 2022), many fail to clarify the overarching objectives of fiscal intervention or to establish a coherent theoretical foundation for understanding how fiscal support can facilitate industry development. In related domains, data-driven modelling and optimization approaches have been widely adopted to enhance decision-making and improve cost evaluation in complex systems. These analytical perspectives offer valuable methodological insights that can inform policy design and improve the efficiency of resource allocation in the sports event industry (Zhao et al., 2024; Li et al., 2024).

Against this backdrop, the present study seeks to address the identified gaps by integrating fiscal theory with the practical realities of sports event industry development. The analysis focuses on the underlying theoretical logic, the key challenges faced in practice, and the potential optimization

pathways for fiscal policies aimed at supporting high-quality development. By doing so, the paper aims to provide both theoretical contributions and practical guidance for improving fiscal policy effectiveness and promoting the sustainable development of the sports event industry.

Current Status of Coordinated Development of Sports Events in Beijing-Tianjin-Hebei Region

This study analyzes the coordinated development of sports events in the Beijing-Tianjin-Hebei region from 2019 to 2023, focusing on five aspects: the number of events held, the number and scale of events jointly held by Beijing, Tianjin, and Hebei, changes in jointly held event projects, the level of financial allocation from the three regions, and the development of the sports industry in the three regions.

After the Beijing-Tianjin-Hebei coordinated development was elevated to a national strategy, the Beijing-Tianjin-Hebei region began to plan for the coordinated development of sports events. To promote the coordinated development of sports events, Beijing, Tianjin, and Hebei each held various types of events at different levels every year (Drapkin et al., 2024). Previous studies have documented the socio-economic benefits generated by hosting major sporting events (Simatupang, 2024). The following shows the number of events held in Beijing, Tianjin, and Hebei from 2019 to 2023, as illustrated in Figure 1.

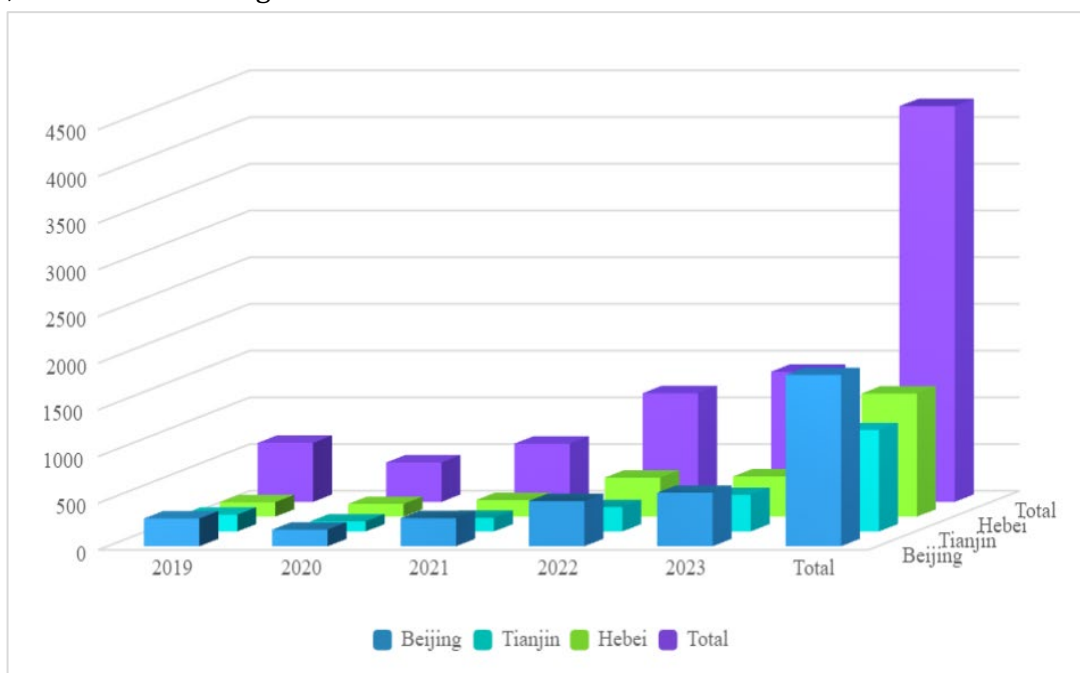


Figure 1. Number of Sports Events in Beijing-Tianjin-Hebei Region (2019–2023)

During the period from 2019 to 2023, except for the impact of the epidemic on event organization in 2019-2020, the number of events held in Beijing, Tianjin, and Hebei showed a growth trend. In the past five years, a pillar of national total of 4236 sports events were held in the Beijing-Tianjin-Hebei region. Among them, Beijing held 1833 events, Tianjin held 1085 events, and Hebei held 1318 events. Of the 4236 events held in the Beijing-Tianjin-Hebei region, Beijing accounted for 43.3%, Tianjin for 25.6%, and Hebei for 31.1%. It can be seen that from 2019 to 2023, Beijing held the most events in the Beijing-Tianjin-Hebei region, followed by Hebei, and then Tianjin. As shown in the figure, from

2020 to 2022, the COVID-19 epidemic affected the development of all industries, and sports events, due to their gathering nature, were greatly impacted by the epidemic. Therefore, the number of sports events held in Beijing, Tianjin, and Hebei decreased from 2020 to 2022, with the lowest number in 2020. Subsequently, due to the effective control of the epidemic, the number of sports events began to gradually increase. At the same time, the public has also realized the important role of physical exercise in promoting physical health, and have flocked to sports fields to participate in sports activities. Therefore, in the post-pandemic era, more people are participating in various levels and types of sports events and activities.

The level of government financial allocation for sports in Beijing, Tianjin, and Hebei. Government financial allocation refers to a form of financial support provided by the government to specific units or individuals through fiscal means to achieve specific social benefit objectives. At the same time, financial allocation is also one of the important tools of government macroeconomic regulation. Through the rational allocation of financial resources, it can effectively promote the development of various economic and social undertakings. Supporting sports development through government financial allocation can not only promote the steady development of the sports industry but also contribute to the construction of a strong sports nation (Drapkin et al., 2024).

Based on the data compiled, the government financial support for sports in Beijing, Tianjin, and Hebei from 2019 to 2023 is as follows:

Table 1

Government financial support in Beijing–Tianjin–Hebei region (2019–2023)

Region / Year / Scale	2019	2020	2021	2022	2023	Total
Beijing	45/22216	11/23671	16/5305	3/13192	18/13573	92/77957
Tianjin	21/11298	3/516	5/1787	7/1253	18/15717	54/30571
Hebei	5/3065	4/2776	2/600	3/1500	18/6335	32/14276
Total	71/36579	18/26963	23/7692	9/15242	54/35625	178/122804

Based on the compiled government financial allocation data, from 2019 to 2023, the total financial allocation for sports development in Beijing, Tianjin, and Hebei amounted to 113.91 billion yuan. According to the data publicly released on the official website of the Beijing Municipal Sports Bureau, Beijing's financial allocation for sports in 2019 was 1.717 billion yuan, 1.556 billion yuan in 2020, 1.272 billion yuan in 2021, 1.453 billion yuan in 2022, and 1.414 billion yuan in 2023. The total financial allocation for sports in Beijing from 2019 to 2023 was 7.412 billion yuan. According to the statistical data publicly released on the official website of the Tianjin Municipal Sports Bureau, Tianjin's financial allocation for sports in 2019 was 0.474 billion yuan, 0.426 billion yuan in 2020, 0.336 billion yuan in 2021, 0.473 billion yuan in 2022, and 0.482 billion yuan in 2023. The total financial allocation for sports in Tianjin from 2019 to 2023 was 2.191 billion yuan. According to statistics publicly released on the official website of the Hebei Provincial Sports Bureau, the financial allocation for sports in Hebei Province was 365 million yuan in 2020, 479 million yuan in 2021, 497 million yuan in 2022, and 447 million yuan in 2023. The total financial allocation for sports in Hebei Province from 2020 to 2023 amounted to 1.788 billion yuan. In terms of the level of financial support, Beijing provides the most support for sports development, followed by Hebei, and Tianjin provides the least.

Existing problems in the development of sports events in the Beijing-Tianjin-Hebei region

At present, although the naming of sports events in the Beijing–Tianjin–Hebei region reflects the efforts and achievements of sports authorities and relevant organizations in promoting coordinated development, the actual governance arrangements reveal notable limitations. Events such as the Beijing–Tianjin–Hebei Youth Volleyball Competition in 2019, the Beijing–Tianjin–Hebei Swimming Open in 2020, and the Beijing–Tianjin–Hebei Youth Diving Invitational Tournament in 2023 illustrate attempts to strengthen regional collaboration through joint branding and organization. However, in practical terms, the management and operation of individual events continue to be dominated by a single local sports authority. For instance, during the 2019 Youth Volleyball Competition held in Tianjin, the Tianjin Municipal Sports Department assumed primary responsibility for event implementation, indicating that cross-regional coordination mechanisms remain relatively limited.

Although progress has been achieved in expanding the number of events and increasing participation, the organizational framework of sports events in the region still relies largely on rotational arrangements or ad hoc cooperation among local authorities. A dedicated and independent coordination body responsible for overseeing the integrated development of sports events across Beijing, Tianjin, and Hebei has yet to be established. As a result, the overall coordination of sports events remains fragmented, which constrains the formation of a systematic and efficient governance structure.

Furthermore, despite the region's rich endowment of sports, cultural, and tourism resources, the level of integration among these sectors remains insufficient. Within initiatives such as the Beijing–Tianjin–Hebei Sports and Leisure Experience Season, activities are frequently hosted in different locations within Hebei Province and are typically organized based on local resource conditions rather than through unified regional planning. The absence of coordinated strategic allocation across the three regions leads to inefficiencies in resource utilization and limits the ability to develop a distinctive sports and leisure brand with strong regional influence and economies of scale.

Sports event development pathways

From a policy perspective, the government can introduce targeted tax incentive measures to encourage enterprises to invest in and sponsor sports events. Providing tax reductions or rebates for companies that participate in event sponsorship can help stimulate corporate engagement, enhance investment willingness, and improve the overall operational quality of sports events. For instance, offering partial corporate income tax relief to sponsors may reduce financial burdens while strengthening the motivation of enterprises to support event development. In addition to tax incentives, government authorities can provide subsidies for the use of sports venues and related facilities. When social capital participates in event organization and requires access to public sports infrastructure, rental subsidies or preferential policies can be implemented to lower operating costs and reduce entry barriers. At the same time, continued investment in the construction and upgrading of sports facilities is essential to improve infrastructure conditions and enhance the capacity to host large-scale and high-quality events.

In parallel, it is important to develop multi-tiered and comprehensive sponsorship frameworks that accommodate the diverse needs and financial capacities of different sponsors. Large sponsors may

be granted broader commercial rights, including event naming opportunities, prominent advertising placements within venues, and brand visibility through athlete-related promotional channels. Small and medium-sized sponsors can be offered more flexible participation options, such as limited advertising exposure or recognition as official event partners. International experiences demonstrate the effectiveness of differentiated sponsorship arrangements. For example, during major global sporting events such as the FIFA World Cup, top-tier sponsors are typically provided with extensive branding opportunities, while regional or local sponsors are allowed targeted promotional presence within designated areas. In addition, customized marketing initiatives can be designed to align with sponsors' products and services. On-site promotional activities, interactive experiences, and product demonstrations can enhance brand engagement and create additional commercial value, thereby attracting greater corporate participation in event sponsorship.

Through a combination of government guidance and market-oriented mechanisms, these measures can help mobilize broader social capital to support the organization of coordinated sports events in the Beijing–Tianjin–Hebei region and diversify funding channels. Evidence from other sectors further suggests that data-driven forecasting and optimization approaches can enhance strategic planning and improve the efficiency of resource allocation, offering useful insights for the sustainable development of sports event governance (Wang et al., 2024).

Conclusion

This study investigates the role of fiscal support in advancing the high-quality development of the sports event industry by examining the coordinated evolution of sports events in the Beijing–Tianjin–Hebei region over the period from 2019 to 2023. The findings indicate that although the number and scale of sports events have gradually recovered and expanded in the post-pandemic context, overall development continues to be constrained by several structural challenges, including fragmented organizational arrangements, disparities in financial and infrastructure resources across regions, and limited integration among sports, cultural, and tourism sectors.

Government financial allocation has provided important support for the development of sports events; however, its effectiveness remains constrained by uneven distribution patterns and insufficient cross-regional coordination mechanisms. Addressing these issues requires further optimization of fiscal policy design through the strengthening of interregional coordination frameworks, improving the efficiency and transparency of fiscal fund utilization, and expanding investment in public sports infrastructure. At the same time, encouraging broader participation of social capital through targeted tax incentives, venue subsidies, and diversified sponsorship arrangements can help enhance market vitality and improve resource allocation efficiency.

Taken together, these measures are critical for promoting the coordinated and high-quality development of the sports event industry in the Beijing–Tianjin–Hebei region and offer valuable policy insights that may be applicable to other regions in China facing similar development challenges. Looking ahead, as digital technologies continue to evolve, future research could further explore the potential of immersive training tools such as virtual reality to enhance safety awareness, operational efficiency, and management capabilities in sports event organization (Lei et al., 2025).

References

- Drapkin, I., Savin, I., & Zverev, I. (2024). Revisiting the effect of hosting large-scale sport events on international tourist inflows. *Journal of Sports Economics*, 25(1)
- Gayen, S., Banerjee, D., Sarkar, A., & Biswas, A. (2024). Assessing the triage and efficacy of strategies of SAARC to improve regional integrity of South Asia using multicriteria group decision making under q-rung orthopair hesitant fuzzy environment. *Socio-Economic Planning Sciences*, 91
- Ganic, M., & Novalic, A. (2023). Does regional trade integration reinforce or weaken capital mobility? New evidence from four free trade areas. *Economics and Business Review*, 9(3)
- Iwegbu, O., Kainu, J., & Borges Cardoso, L. C. (2022). Regional financial integration, financial development and industrial sector growth in ECOWAS: Does institution matter? *Cogent Economics & Finance*, 10(1)
- Lei, F., Singh, D., & Lam, M. C. (2025). VR-ManuSafe: Virtual reality learning environment for manufacturing safety training. *Software Impacts*, 100790. <https://doi.org/10.1016/j.simpa.2025.100790>
- Lee, M. S., & Diez, T. (2023). The EU, Korea, and conflict transformation through regional integration. *Asia Europe Journal*, 21(4)
- Li, L., Mansor, Z. B., Li, S., Zhao, X., Zhong, Q. J., & Guo, X. (2024). Medical software engineering cost estimation model based on multimodal improved genetic algorithm. *International Journal of Information Technologies and Systems Approach*. <https://doi.org/10.4018/IJITSA.364841>
- Raso, G., & Cherubini, D. (2023). Sport tourism and regional economic development. *Scientific Journal of Sport and Performance*, 3(1), 108–121
- Simatupang, P. (2024). Socio-economic impacts of sports events to Indonesian hosting cities: Evidence from SEA Games 2011, Asian Games 2018, and PON 2021. *Innovative: Journal of Social Science Research*, 4, 11500–11513
- Ullah, A., Khan, S., & Chen, P. (2024). Income distribution and sustainable development nexus: Fostering poverty reduction and integrated sustainability amidst multi-dimensional regional integration. *Sustainable Futures*, 7
- Wang, N., Wang, C., Li, L., Jin, J., & Chenhan, T. (2024). The integration of computer engineering and economic sustainability forecasting in smart manufacturing. In *Proceedings of the 3rd International Conference on Economics, Smart Finance and Management*
- Yao, Y. P., Wan, B., Zhang, Y., et al. (2024). In quest of China sports lottery development path to common prosperity in 2035. *PLOS ONE*, 19(1). <https://doi.org/10.1371/journal.pone.019xxxx>
- Yu, Q. Y., Yu, Y., Wang, J. Y., et al. (2024). High-quality development of sports competition performance industry in Chengdu-Chongqing region based on performance evaluation theory. *Economics: The Open-Access, Open-Assessment E-Journal*, 18(1)
- Zhao, X., Mansor, Z., Razali, R., Nazri, M. Z. A., Li, L., & Guo, X. (2024). A review of optimization techniques for cost estimation in software development. *Intelligent Data Analysis*. <https://doi.org/10.108467X251330476>

BRIDGING THE ESG GAP: DEMOCRATIZING DATA IN THE REAL ESTATE SECTOR THROUGH TRANSFER LEARNING AND DIGITAL TWINS

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Abstract

In the context of the accelerated tightening of global ESG supervision, the key contradictions in the real estate industry have shifted from "whether to reduce emissions" to "who has the ability to comply": large institutions can form advantages with high-frequency data and high CapEx transformation, while SMEs face higher risk of stranding due to data sparseness and financial constraints. This article aims to propose a low-threshold digital twin framework aimed at "data democratisation". Methods: The Singapore HarbourFront Centre is used as the source domain to learn building thermodynamics through the physical information neural network (PINN) under physical residual constraints, and expand knowledge low cost to 564 data scarce commercial buildings with migration learning. At the same time, to build a combination-oriented Δ EUI prediction model to support cross-asset comparable evaluation. The results show that the EUI distribution in 2020 is significantly abnormal compared with 2018–2019, confirming the conceptual drift and black box vulnerability; in the Δ EUI prediction, the space-time graph model is significantly improved compared with the persistence baseline ($R^2 \approx 0.96$ vs 0.87). DRL control based on calibration twins reduces HVAC energy consumption from 1338.42 kWh to 707.45 kWh (-47.14%) in simulation, with a comfort deviation of 29.13°C·h. Research shows that physical constraints and migration learning can transform "private high-frequency data" into diffusable public knowledge, providing SMEs with a low-risk and low-cost ESG leapfrogging.

Keywords: Data democratization; Digital twins; ESG gap; Transfer learning

Introduction

In the context of global climate change, the real estate industry is facing a more hidden and deep systemic challenge than simply reducing energy consumption (accounting for about 39% of the world's total carbon emissions), that is, "ESG inequality" or "green divide" phenomenon (Chacon et al., 2022; United Nations Environment Program Finance Initiative, 2022). With the surge in global ESG assets, market participants' ability to survive and mobilise capital in response to strict supervision has become seriously polarised.

At one end are super-large real estate investment trusts (REITs) and institutional investors with massive resources. They can spend a lot of money to deploy Internet of Things (IoT) sensor networks, develop large models of privatised AI carbon reduction, and carry out in-depth green physical transformation (Coakley, 2023). At the other end is the majority of small and medium-sized enterprises (SMEs), which constitute the cornerstone of the market. They are in the dual dilemma of "data sparseness" and capital shortage: they not only lack detailed dynamic operation data to train AI algorithms, but also unable to bear the high cost of hardware transformation (Pinto & Gaio, 2025).

The tightening regulatory environment is accelerating this polarisation phenomenon. Taking the EU's Building Energy Performance Directive (EPBD) and its mandatory minimum energy performance standard (MEPS) as an example, small and medium-sized enterprise properties that fail to meet the standards will face the legal risk of a lease ban or sale ban, directly triggering the "asset stranding" crisis (European Parliament, 2024; OECD, 2024). In the end, the traditional ESG compliance mechanism and complex AI carbon reduction tools have inadvertently become weapons for capital giants to consolidate their market position, further exacerbating inequality within the industry (Coakley, 2023).

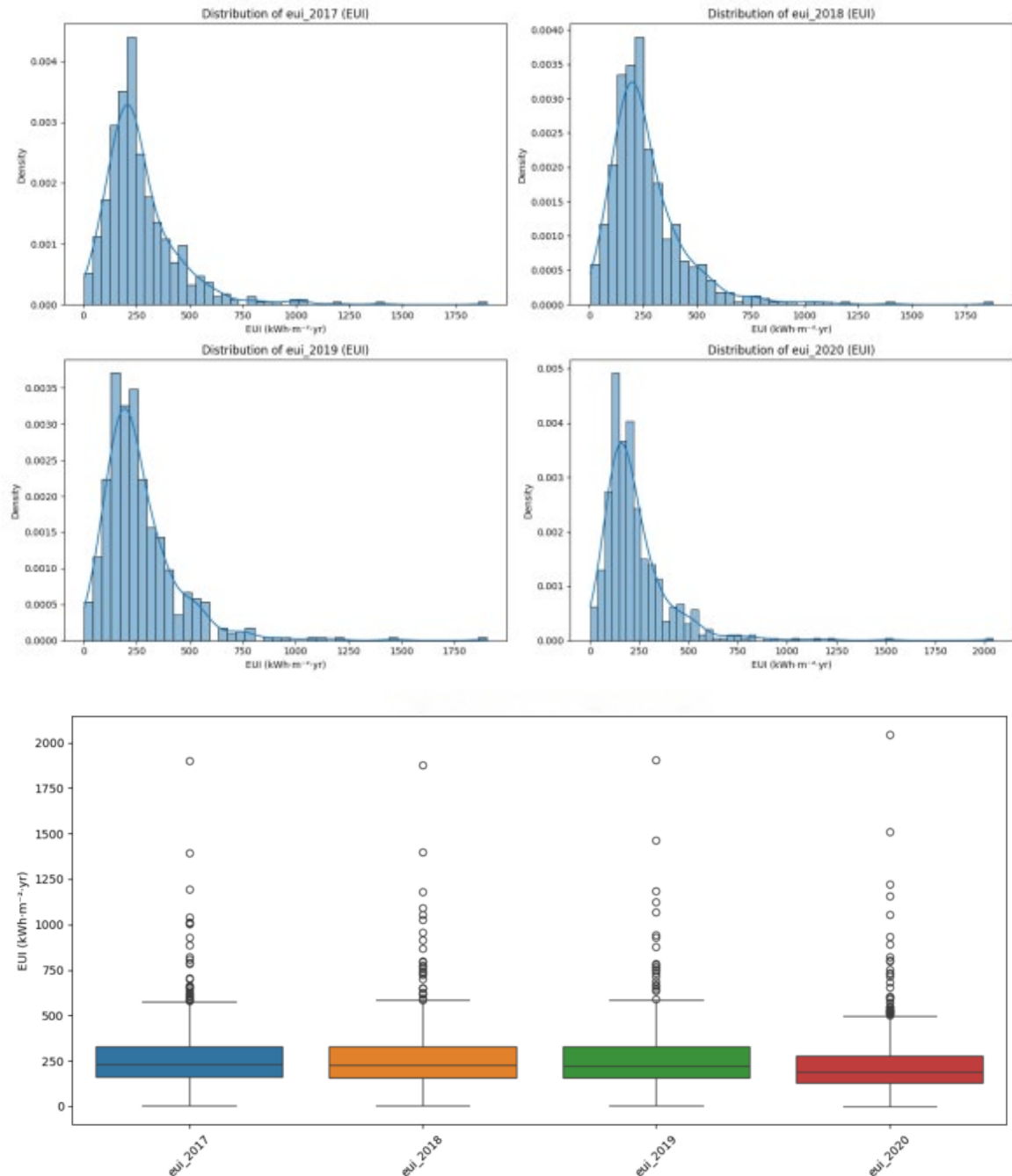


Figure 1. Building EUI Distribution 2018–2020 and the 2020 Anomaly Shock

More importantly, ESG compliance pressures do not occur in "stable and predictable" operating environments, but are often compounded by structural disruptions caused by exogenous shocks. Taking the commercial building portfolio data used in this study as an example, the overall distribution of building energy intensity (EUI) in 2020 showed a significant shift compared to 2018–2019: not only did the mean/median shift downwards, but the dispersion and tail structure also changed (see Figure 1). This means that traditional black-box models trained on long-term, high-frequency data are more prone to failure when the assumption of "distribution stability" is broken; and data-scarce SMEs are unable to accumulate high-quality telemetry data over the long term, nor can they bear the trial-and-error costs of model failure, thus making them more susceptible to falling into the green gap of "compliance-capital" double squeeze during periods of tightened regulation.

As shown in Figure 1, the structural shocks make the mainstream path of "big data accumulation–black-box AI training–high-CapEx physical renovation" more unfair to SMEs. To address this crisis, this paper introduces the core concept of "data democratization," attempting to fundamentally reconstruct the application paradigm of artificial intelligence in the built environment. The core research question of this paper is: Will artificial intelligence, as an appendage of capital, further exacerbate ESG inequality, or can it become an "equalizer" for narrowing the green divide through innovative algorithm design? This study demonstrates that a digital twin AI framework based on Physical Information Neural Networks (PINN) and transfer learning techniques can empower data-scarce SMEs with extremely low marginal costs and data barriers, thereby achieving true "data democratization" and a "fair transformation" in the real estate industry.

Literature Review

In recent years, research on building energy consumption optimization and intelligent management has expanded from simply focusing on control algorithms and energy-saving effects to addressing socio-technical issues involving the combined effects of data resources, organizational capabilities, and institutional environment. To explain the differences in capabilities among different stakeholders during digital transformation, the Resource-Based Value (RBV) perspective is frequently used to analyze the formation mechanism of data barriers in the real estate sector and is considered an important theoretical lens (Madhani, 2009). RBV posits that sustainable competitive advantage depends on whether the resources a firm possesses have the characteristics of value, scarcity, inimitableness, and non-substitutability (VRIN) (Cardeal & Antonio, 2012). In information systems research, data and information system capabilities have also been incorporated into the RBV framework and discussed as a strategically significant resource combination (Andreu, 1993).

In the context of building operation and asset management, the literature generally regards high-quality, high-frequency building dynamic operation data as a high-value resource, capable of supporting key decisions such as energy consumption diagnosis, load forecasting, and HVAC control. However, research also points out that the distribution of such telemetry data is highly uneven among entities: large landlords can accumulate and protect their building telemetry data over a long period, covering operational characteristics such as HVAC subsystem energy consumption, regional temperature changes, and personnel flow, thus possessing strong exclusivity and competitive significance (Kennedy, 2020). In contrast, data generation and maintenance rely on expensive sensor networks, data infrastructure, and cloud computing investments, making it difficult for resource-

constrained entities to replicate equivalent capabilities, thereby reinforcing the "scarcity-unimitable" barrier attribute (Cardeal & Antonio, 2012; Kennedy, 2020).

Machine learning and building energy consumption prediction research further demonstrates that data imbalance is amplified by algorithmic mechanisms. Mainstream deep learning models typically have strong data dependencies, requiring high-fidelity historical data over a long time span to achieve stable generalization (Luo et al., 2025). In HVAC optimization and agent training scenarios, research often uses operational logs from several months or even years as the training basis, which can easily lead to overfitting and deployment performance degradation when data is lacking (Spencer et al., 2024). Therefore, "data scarcity" is not only a resource disadvantage but can also translate into structural disadvantages at the algorithmic level (Luo et al., 2025; Spencer et al., 2024). Regulatory research also suggests that stricter energy efficiency standards and compliance requirements will exacerbate capability differentiation, exposing entities with insufficient technology and data to higher compliance risks (European Commission, n.d.).

To address the data scarcity problem, transfer learning is considered an important approach. Related research indicates that transfer learning relaxes the assumption of identical distribution between training and testing, allowing models to learn representations in a data-rich "source domain" and achieve cross-domain adaptation with a small amount of target data (González-Vidal et al., 2022). In building energy consumption prediction and smart building applications, transfer learning has been used to reduce data requirements, improve prediction performance, and enhance cross-building generalization capabilities (Luo et al., 2025; González-Vidal et al., 2022). The review further emphasizes that source domain patterns can be encoded into reusable model weights, providing a channel for resource-constrained entities to acquire advanced algorithmic capabilities (Al-Hajj et al., 2023). Simultaneously, some perspectives have begun to discuss its public implications from a socio-technical perspective: pre-trained models may transform the advantages of privatized data into knowledge supply with spillover effects, providing a technological foundation for "data democratization" (PwC, 2023; Al-Hajj et al., 2023). However, existing research still has shortcomings: RBV (Resource-Based Value) explains barrier formation more but provides fewer low-barrier technical pathways, while transfer learning research focuses primarily on performance improvement, and its systematic explanation of how it supports "affordable compliance" and a fair transition in a heavily regulated context remains insufficient (Madhani, 2009; González-Vidal et al., 2022; European Commission, n.d.; PwC, 2023). Therefore, it is necessary to integrate organizational resource logic and low-data learning mechanisms within the socio-technical framework to further clarify their role and operational path in real estate ESG governance (Luo et al., 2025; Spencer et al., 2024; PwC, 2023).

Methodology

This study's methodology strictly adheres to the dynamic digital twin framework of "perception-capture-reconstruction," but it restructures the focus of the technical narrative to highlight the highly uneven distribution of resources in the global real estate market. This study utilizes a massive benchmark dataset comprising 564 commercial buildings in Singapore, covering various sectors including office buildings, retail, and hotels. In the methodological framework, this data segmentation is given a clear metaphor: Harbourfront Centre, with its extremely detailed and granular telemetry data, is designated as the "benchmark building/source domain." The relevant data settings and

digital twin benchmark framework can be found in our existing research (Zhou et al., 2025). The building had a gross floor area (GFA) of 169,727 square meters and an annual total energy consumption of 31,307 megawatt-hours in fiscal year 2020. It also possesses a wealth of general dynamic data (such as outdoor temperature and grid emission factors), source-domain specific dynamic data (such as cooling capacity and indoor temperature), and detailed static metadata (such as chiller performance coefficients), representing a large, leading real estate developer with abundant resources and advanced technology (Dembski et al., 2020). In contrast, the remaining 563 buildings were designated as the "target domain." These buildings severely lacked dynamic operation logs and possessed only limited static metadata (such as building area and green building ratings), corresponding to a large group of small and medium-sized enterprises with sparse data and limited resources (Fotiou et al., 2024). To bridge this gap, this framework utilizes transfer learning to transfer the complex nonlinear thermodynamic mappings extracted from the Harbourfront Centre to smaller, less data-rich buildings, constructing a high-fidelity physical benchmark model for the entire regional portfolio with minimal computational and data costs.

In building digital twins, traditional white-box physical modeling requires thousands of hours of manual calibration by engineers, while purely data-driven black-box models face the challenge of limited data availability for SMEs. To break this deadlock, this research introduces Physical Information Neural Networks (PINN). PINN's significant advantage lies in its extremely low data and computational requirements, eliminating the need for SMEs to invest heavily in white-box modeling (Kazemi Naeini et al., 2025). Furthermore, it guides model convergence by embedding inviolable physical laws as soft constraints into the neural network's loss function. Meanwhile, from the perspective of modeling robustness, exogenous shocks can cause systematic biases in purely data-driven models: the error distribution of the same modeling framework often shows significant differences between normal years and shock years, manifested as mean shift, variance changes, and tail thickening of residuals (see Figure 2). Therefore, to achieve usability in the "low data + high uncertainty" SMEs scenario, it is necessary to introduce structural information that can constrain the model across distributions; physical laws (such as the relationship between energy conservation and thermal inertia) constitute the lowest-cost and most transferable source of constraints.

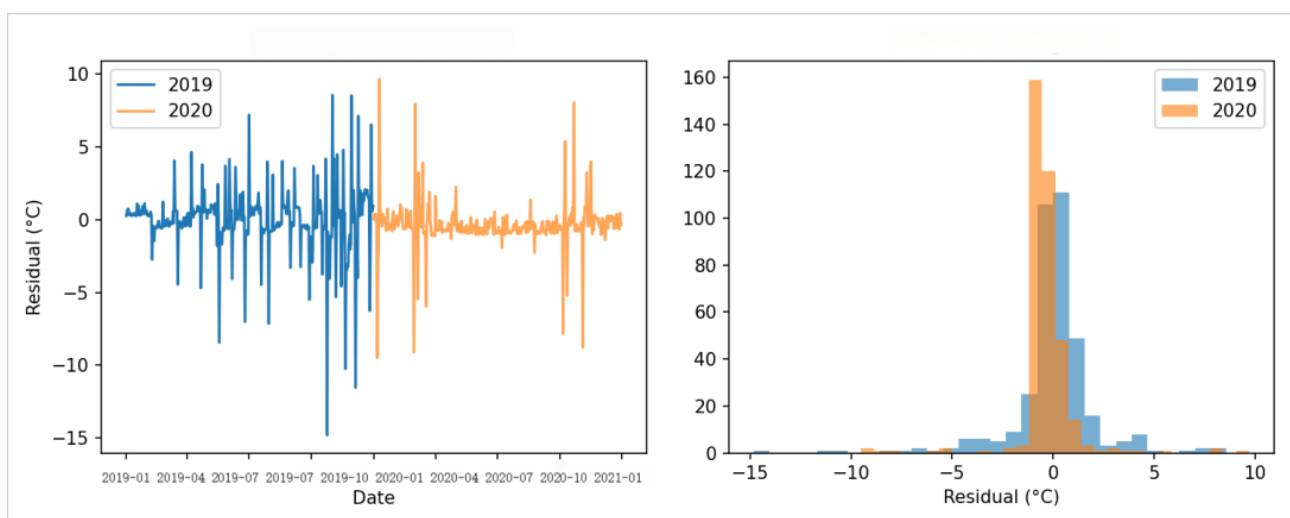


Figure 2. Residual Time Series + Histogram (2019 vs 2020)

In this project, the building's indoor thermodynamics is described by the following differential equation:

$$C \frac{dT_{in}}{dt} = \frac{1}{R} (T_{out} - T_{in}) - \eta_u P_{HVAC} + Q_{int}$$

In the formula, C represents the heat capacity of the building area, R represents the thermal resistance of the building envelope, T_{in} and T_{out} represent the indoor and outdoor temperatures, respectively, P_{HVAC} is the cooling power of the HVAC system, η_u is the utility factor, and Q_{int} is the internal heat gain generated by people and equipment. To ensure that the neural network still adheres to physical laws such as energy conservation even with very few data samples, PINN constructs a physical residual term μ :

$$\mu = C \frac{dT_{in}}{dt} - \frac{1}{R} (T_{out} - T_{in}) + \eta_u P_{HVAC} - Q_{int}$$

Subsequently, this physical residual is introduced as a penalty term into the composite loss function ϕ of the neural network for joint optimization:

$$\phi = \phi_{data} + \lambda \|\mu\|^2$$

Where ϕ_{data} measures the fitting error between the model's predicted values and the sparse observation data, $\lambda \|\mu\|^2$ is used to penalize behaviors that violate the laws of thermodynamics, and the parameter λ is responsible for adjusting the weights of the physical constraints (Kazemi Naeini et al., 2025). Through this infusion of physical knowledge, the algorithm successfully replicated the dynamic behavior of buildings in a virtual space with extremely low data dependence (Gokhale et al., 2022). Building upon this foundation, a deep reinforcement learning (DRL) agent is integrated into the digital twin sandbox. Through millions of trial-and-error interactions with the low-cost virtual environment, the DRL agent learns to find the optimal Markov decision strategy between minimizing grid power consumption and maximizing indoor thermal comfort, thereby generating pure software-level control instructions that require no modification to the physical hardware (Saeed et al., 2024). In this paper, the overall approach of integrating DRL into the digital twin is consistent with existing work (Zhou et al., 2025), but this paper further emphasizes lowering the data threshold through PINN constraints and transfer learning under conditions of data scarcity and distribution drift, in order to support affordable compliance for SMEs. In the context of this paper, this physical constraint not only improves the robustness and accuracy of the model under distribution drift, but also serves as a technically fair mechanism to lower the data threshold and alleviate the "data scarcity penalty."

Results

The experimental results not only validated the effectiveness of the proposed framework from an engineering perspective, but more importantly, by embedding technological performance into the investment decision-making context, this study reveals its potential socio-economic value for small and medium-sized enterprises (SMEs) situated in the "green divide." Without any physical hardware modifications (such as replacing compressors or upgrading the building envelope), significant improvements in building operational efficiency can be achieved solely by deploying a deep reinforcement learning (DRL) software control strategy supported by transfer learning and physical information neural networks (PINN). Controlled assessment results show that the traditional baseline operating strategy consumed 1,338.42 kWh of energy during the assessment period; when the DRL agent took over control, energy consumption decreased to 707.45 kWh, corresponding to an HVAC energy saving rate of 47.14%, assuming consistent external climate conditions and internal load demand. Simultaneously, the agent maintained an acceptable level of thermal comfort while improving energy efficiency, with a total comfort deviation of 29.13 °C·h during its control period; the indoor temperature distribution also remained generally stable within a reasonable comfort range, indicating that the energy-saving benefits did not come at the cost of a systematic reduction in indoor comfort.

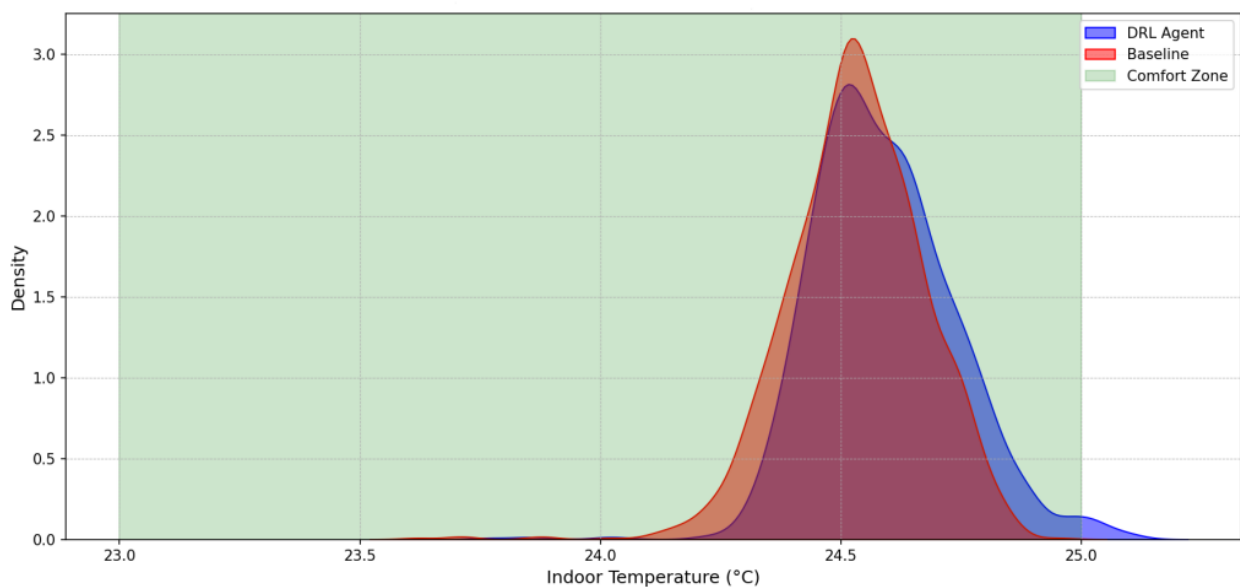


Figure 3. Distribution of Indoor Temperatures

To conduct a comparable evaluation of the overall performance of different energy-saving intervention measures, this study further adopted the Top-Ideal Solution Ranking Method (TOPSIS) and introduced a carbon social cost (SCC) index of 243.20 Singapore dollars per ton of carbon dioxide to carry out multi-criteria decision analysis on candidate energy-saving measures. Table 1 reports the assessment results for the Singapore commercial real estate portfolio: the DRL software control strategy has an annual energy saving rate of 1.23%, a financial payback period of less than 1 year, and an annual carbon emission reduction of 157.51 tons (t-CO₂e), and is rated as Basic (highest priority); the photovoltaic panel installation has an annual energy saving rate of 0.21%, a payback period of 3.83 years, and an annual carbon emission reduction of 26.74 tons, and is of high priority;

the LED lighting system retrofit has an annual energy saving rate of 7.59%, a payback period of 10.77 years, and an annual carbon emission reduction of 967.10 tons, and is of high priority; the improved chiller COP has an annual energy saving rate of less than 0.01%, a payback period of approximately 29,806.11 years, and an annual carbon emission reduction of 0.23 tons, and is of low priority.

Table 1

Multi-criteria decision analysis and evaluation

Energy Conservation Measures(ECM)	Annual Energy Savings Rate	Financial payback period	Annual carbon emissions reduction(tonnes of carbon dioxide equivalent)	TOPSIS Priority Rating
DRL Software Control Strategy	1.23%	< 1 year	157.51	Foundation Level (Highest Priority)
Photovoltaic Panel Installation	0.21%	3.83 years	26.74	High Priority
LED Lighting System Retrofit	7.59%	10.77 years	967.10	High Priority
Enhancing Chiller COP	< 0.01%	29,806.11 years	0.23	Low Priority

Source: (Zhou et al., 2025).

From the perspective of capital-rich entities, the high energy efficiency and significant carbon emission reductions offered by LED lighting retrofits make them highly attractive. However, when the analytical perspective shifts to SMEs with stronger cash flow constraints, this conclusion needs to be reinterpreted. For SMEs, the high initial capital expenditure (CapEx) and long payback period required for LED retrofits can pose substantial financial pressure and even induce liquidity risks, thus manifesting as a "capital penalty" mechanism in a heavily regulated environment (Qachach et al., 2025). Under this constraint, the traditional ESG compliance path centered on hardware retrofits presents a structural disadvantage for SMEs, potentially exacerbating the green gap (Plebankiewicz & Grącki, 2025).

In contrast, DRL software control strategies relying on transfer learning and PINN-driven approaches exhibit stronger inclusiveness. Because their deployment marginal cost is close to zero and requires no hardware retrofit investment, their financial payback period is significantly compressed to less than one year. Although the absolute energy saving rate of this strategy (1.23%) is lower than some capital-intensive measures, it provides SMEs with a feasible path to quickly cross the ESG entry threshold without incurring high trial-and-error costs and bankruptcy risks (Peiris et al., 2025). Furthermore, the temperature distribution comparison shown in Figure 3 indicates that this path does not achieve energy savings by compressing comfort, but rather reduces energy consumption while maintaining a reasonable comfort range, which aligns better with the fairness and affordability goals emphasized in "just transition." Overall, the results of this study support a low-threshold compliance strategy that replaces hardware stacking with software intelligence. Its core value lies in reducing data and capital barriers through knowledge transfer and physical constraints, thereby providing scalable ESG practice tools for disadvantaged entities.

Discussion

After confirming the technological feasibility and microeconomic value, this study further addresses broader socio-ethical issues and advocates for corresponding institutional adjustments to public policy. If the entire industry fails to actively promote low-barrier technologies such as few-sample learning or PINN-based transfer learning, current carbon emission regulations may create de facto "regulatory pressure" on SMEs from an ethical perspective. With the mandatory enforcement of minimum energy efficiency standards by regulations such as the EU's EPBD, SMEs and low-income landlords unable to afford high physical renovation costs will be forced to sell their properties at low prices due to the risk of their assets being stripped of their rental eligibility (OECD, 2024). Forced market clearing triggered by climate compliance may further induce significant unjust consequences such as "climate gentrification" (Keenan et al., 2018). In this process, large financial institutions and REITs may take advantage of the situation to acquire substandard assets classified as "brown" by regulators at low prices, leveraging their capital advantage to complete green building renovations and raise rents to match the demands of high-end tenants (Kenealy, 2024). While this process may statistically reduce total urban carbon emissions, it could also systematically displace vulnerable groups and micro-businesses from their existing spaces, amplifying social inequality (Cucca et al., 2023). Therefore, promoting the accessibility and democratization of AI technology is not merely an engineering efficiency issue, but also a matter of maintaining social equity and resisting climate gentrification—a fundamental ethical requirement (Taylor & Aalbers, 2022).

To fundamentally mitigate these risks, policymakers urgently need to promote a paradigm shift from subsidizing physical hardware to investing in algorithmic infrastructure. For a long time, climate subsidies in various countries have focused on expensive physical equipment such as photovoltaics and high-efficiency heat pumps. This subsidy logic still implicitly requires a threshold of initial capital capacity, objectively excluding the most vulnerable grassroots enterprises (Verdolini et al., 2021). Governments should intervene more actively, with national or city finances playing a leading role in the coordinated construction of "regional foundation digital twin models." By leveraging public sector leadership to collect high-density sensor data and train the PINN foundational model on representative building prototypes, a comprehensive underlying AI model covering urban climate and thermodynamic characteristics can be formed (Sacoto-Cabrera et al., 2025). More importantly, these well-trained foundational models should be defined as new types of "Digital Public Goods" and made freely available to the entire society, especially SMEs, through open-source interfaces (PwC, 2023). With this public infrastructure, SMEs with limited funds can access the digital twin network without accumulating data from scratch or incurring computing costs, simply by using basic building metadata. This allows them to automatically acquire and execute energy-saving strategies generated by advanced DRL algorithms (El-Agamy et al., 2024). This institutional arrangement, which transforms cutting-edge algorithmic knowledge into public welfare, helps to cut off the structural squeeze on SMEs by capital through data barriers. It is a key path to implementing the UN-advocated inclusive climate governance and ensuring a truly "just transition" in the real estate sector (European Commission, 2026).

Conclusions

The current net-zero transition in the real estate sector is caught in a structural paradox: increasingly stringent ESG regulations, while forcing the industry to decarbonize, objectively strengthen the

entanglement between "sustainability" and "data wealth/capital capability". The "green gap," constructed by capital-intensive hardware pathways and data-monopolistic AI pathways, may disproportionately transfer decarbonization costs and compliance risks to small and medium-sized enterprises (SMEs), further exacerbating the capability gap among market players. This study moves beyond the traditional engineering efficiency narrative, not only verifying the feasibility of a digital twin framework driven by Physical Information Neural Networks (PINN) and Deep Reinforcement Learning (DRL) in low-data scenarios, but also proposing a key theoretical repositioning: in the ESG context, cutting-edge algorithms should not merely be private tools for capital entities to obtain "green premiums," but should be designed as socio-technical equalizers that lower barriers to entry and improve accessibility.

By integrating transfer learning and soft constraints of physical laws, this study weakens the path dependence of "intelligent carbon reduction capability" on the possession of massive amounts of high-frequency local data at the mechanistic level. Without requiring additional expensive hardware investment, we compressed dynamic thermodynamic optimization into a software strategy with marginal cost approaching zero, achieving a 47.14% HVAC energy saving under controlled assessment conditions. The significance of this result lies not only in performance improvement but also in providing SMEs with a "software-defined sustainability" path: achieving substantial incremental compliance capabilities without enduring lengthy hardware payback periods, thereby reducing the risk of asset stranding in highly regulated and uncertain environments.

A deeper policy implication is that to promote equitable transformation at the industry level, governance tools should not only focus on subsidizing physical equipment upgrades but also require institutional innovation to elevate the foundational digital twin models carrying advanced energy efficiency knowledge to "Digital Public Goods (DPGs)." When such models are opened to SMEs as social cognitive infrastructure, data and computing power barriers will be systematically lowered, allowing green transformation to move from "capital-driven selective elimination" to a more inclusive Just Transition, creating a compatible path between net-zero targets and social equity.

References

- Al-Hajj, R., Assi, A., Neji, B., Ghandour, R., & Al Barakeh, Z. (2023). Transfer learning for renewable energy systems: A survey. *Sustainability*, 15(11), 9131. DOI: <https://doi.org/10.3390/su15119131>
- Andreu, R. (1993). *A resource-based view of information systems: A proposal for a resource-based theory of IS and an agenda for research* (Research Paper DI-0241-E). IESE–University of Navarra. Retrieved from: <https://www.iese.edu/media/research/pdfs/DI-0241-E.pdf>
- Cardeal, N., & Antonio, N. S. (2012). Valuable, rare, inimitable resources and organization (VRIO) resources or valuable, rare, inimitable resources (VRI) capabilities: What leads to competitive advantage? *African Journal of Business Management*, 10159–10170. DOI: <https://doi.org/10.5897/AJBM12.295>
- Chacon, R., Feng, Z., & Wu, Z. (2022). Does investing in ESG pay off? Evidence from REITs. *SSRN*. DOI: <https://doi.org/10.2139/ssrn.4147749>
- Coakley, D. (2023). ESG in commercial real estate: An analysis of asset-level and corporate-level data for UK funds and real estate investment trusts (REITs). *SSRN*. DOI: <https://doi.org/10.2139/ssrn.4948019>
- Cucca, R., Friesenecker, M., & Thaler, T. (2023). Green gentrification, social justice, and climate change in the literature: Conceptual origins and future directions. *Urban Planning*, 8(1), 283–295. DOI: <https://doi.org/10.17645/up.v8i1.6129>
- Dembski, F., Wössner, U., Letzgus, M., Ruddat, M., & Yamu, C. (2020). Urban digital twins for smart cities and citizens: The case study of Herrenberg, Germany. *Sustainability*, 12(6), 2307. DOI: <https://doi.org/10.3390/su12062307>
- El-Agamy, R. F., Sayed, H. A., AL Akhatatneh, A. M., Moatamed, A., Gabr, H., & Mahmoud, S. S. (2024). Comprehensive analysis of digital twins in smart cities: A 4200-paper bibliometric study. *Artificial Intelligence Review*, 57, 154. DOI: <https://doi.org/10.1007/s10462-024-10781-8>

- European Commission. (n.d.). Energy performance of buildings directive. Retrieved from: https://energy.ec.europa.eu/topics/energy-efficiency/energy-performance-buildings/energy-performance-buildings-directive_en
- European Commission, Directorate-General for Research and Innovation. (2026). *Opinion on towards a just green transition: Addressing structural inequities*. Publications Office of the European Union. Retrieved from <https://data.europa.eu/doi/10.2777/5343947>
- European Parliament, Policy Department for Economic, Scientific and Quality of Life Policies. (2024). *The properties of the real estate market in the European Union* (PE 754.213). Retrieved from: [https://www.europarl.europa.eu/RegData/etudes/STUD/2024/754213/IPOL_STU\(2024\)754213_EN.pdf](https://www.europarl.europa.eu/RegData/etudes/STUD/2024/754213/IPOL_STU(2024)754213_EN.pdf)
- Fotiou, T., Fragkos, P., & Zisarou, E. (2024). Decarbonising the EU buildings: Model-based insights from European countries. *Climate*, 12(6), 85. DOI: <https://doi.org/10.3390/cli12060085>
- Gokhale, G., Claessens, B., & Devellder, C. (2022). Physics informed neural networks for control oriented thermal modeling of buildings. *Applied Energy*, 314, 118852. DOI: <https://doi.org/10.1016/j.apenergy.2022.118852>
- González-Vidal, A., Mendoza-Bernal, J., Niu, S., Skarmeta, A. F., & Song, H. (2022). A transfer learning framework for predictive energy-related scenarios in smart buildings. *IEEE Transactions on Industry Applications*, 59(1), 26–37. DOI: <https://doi.org/10.1109/TIA.2022.3179222>
- Kazemi Naeini, H., Shomali, R., Pishahang, A., Hasanzadeh, H., Asadi, S., & Gholizadeh Lonbar, A. (2025). PINN-DT: Optimizing energy consumption in smart building using hybrid physics-informed neural networks and digital twin framework with blockchain security. *Sensors*, 25(19), 6242. DOI: <https://doi.org/10.3390/s25196242>
- Keenan, J. M., Hill, T., & Gumber, A. (2018). Climate gentrification: From theory to empiricism in Miami-Dade County, Florida. *Environmental Research Letters*, 13(5), 054001. DOI: <https://doi.org/10.1088/1748-9326/aabb32>
- Kenealy, D. (2024). Climate gentrification: Addressing displacement from sea level rise. *Georgetown Journal on Poverty Law and Policy*, 32(1), 135-159. Retrieved from: <https://www.law.georgetown.edu/poverty-journal/wp-content/uploads/sites/25/2025/01/32.1-Kenealy.pdf>
- Kennedy, R. (2020). *Strategic management*. Virginia Tech Publishing. Retrieved from: <https://pressbooks.lib.vt.edu/strategicmanagement/chapter/4-3-resource-based-view/>
- Luo, C., Xia, L., & Hong, S.-H. (2025). A method for selecting the appropriate source domain buildings for building energy prediction in transfer learning: Using the Euclidean distance and Pearson coefficient. *Energies*, 18(14), 3706. DOI: <https://doi.org/10.3390/en18143706>
- Madhani, P. M. (2009). *Resource based view (RBV) of competitive advantage: An overview*. Ahmedabad: Pankaj M. Madhani. Retrieved from: <https://ssrn.com/abstract=1578704>
- Organisation for Economic Co-operation and Development. (2024). Managing climate-related risks for resilient real estate. In *Future-proofing real estate investment*. Retrieved from: https://www.oecd.org/en/publications/future-proofing-real-estate-investment_2dd12063-en/full-report/managing-climate-related-risks-for-resilient-real-estate_fe6a5ab0.html
- Peiris, S., Lai, J., & Kumaraswamy, M. (2025). Developing a smart retrofitting decision-making model for office buildings: A case study. In *CIB Conferences* (Vol. 1, No. 1, p. 394). DOI: <https://doi.org/10.7771/3067-4883.1039>
- Pinto, I., & Gaio, C. (2025). ESG performance and information asymmetry: The moderating role of ownership concentration. *Corporate Social Responsibility and Environmental Management*, 32(5), 5747–5759. DOI: <https://doi.org/10.1002/csr.3260>
- Plebankiewicz, E., & Gracki, J. (2025). Long-term building renovation strategies–F-TOPSIS analysis of solutions applied in the chosen European Union countries. *Buildings*, 15(4), 607. DOI: <https://doi.org/10.3390/buildings15040607>
- PwC. (2023). *How digital twins can make smart cities better*. Retrieved from: <https://www.pwc.com/m1/en/publications/documents/how-digital-twins-can-make-smart-cities-better.pdf>
- Qachach, A. R., El Mahradi, B., Kharbouch, O., Moumen, A., El Aoufi, S., El Gueddari, M., & Abdallah-Ou-Moussa, S. (2025). Bridging the ESG data gap: Transparent metrics and rankings for emerging financial markets. *International Journal of Financial Studies*, 13(4), 198. DOI: <https://doi.org/10.3390/ijfs13040198>
- Sacoto-Cabrera, E. J., Perez-Torres, A., Tello-Oquendo, L., & Cerrada, M. (2025). IoT, AI, and digital twins in smart cities: A systematic review for a thematic mapping and research agenda. *Smart Cities*, 8(5), 175. DOI: <https://doi.org/10.3390/smartcities8050175>
- Saeed, M. H., Kazmi, H., & Deconinck, G. (2024). Dyna-PINN: Physics-informed deep dyna-q reinforcement learning for intelligent control of building heating system in low-diversity training data regimes. *Energy and Buildings*, 324, 114879. DOI: <https://doi.org/10.1016/j.enbuild.2024.114879>
- Spencer, R., Ranathunga, S., Boulic, M., van Heerden, A. H., & Susnjak, T. (2025). Transfer learning on transformers for building energy consumption forecasting–A comparative study. *Energy and Buildings*, 336, 115632. DOI: <https://doi.org/10.1016/j.enbuild.2025.115632>
- Taylor, Z. J., & Aalbers, M. B. (2022). Climate gentrification: Risk, rent, and restructuring in Greater Miami. *Annals of the American Association of Geographers*, 112(6), 1685–1701. DOI: <https://doi.org/10.1080/24694452.2021.2000358>
- United Nations Environment Program Finance Initiative. (2022). *Managing transition risk in real estate: Aligning to the Paris Climate Accord*. Retrieved from: <https://www.unepfi.org/publications/managing-transition-risk-in-real-estate/>

Verdolini, E., Look, W., Belpietro, C., & Persico, G. (2021). *The European Union policy toolbox to support just transition*. Resources for the Future. Retrieved from: <https://www.rff.org/publications/reports/the-european-union-policy-toolbox-to-support-just-transition/>

Zhou, W., Kriviņš, A., & Kaze, V. (2025). Management in real estate: Powered by digital twins. *Entrepreneurship and Sustainability Issues*, 13(2). DOI: <https://doi.org/10.9770/h9697726695>