



This is an open access article distributed under the terms of the Creative Commons Attribution 4.0 International License (CC BY 4.0), which permits use, distribution, and reproduction in any medium, provided the original publication is properly cited. No use, distribution or reproduction is permitted which does not comply with these terms.

DIGITAL TRANSFORMATION AND ARTIFICIAL INTELLIGENCE: NEW OPPORTUNITIES FOR ECONOMIC GROWTH IN THE LOGISTICS INDUSTRY

Nelli Akylbekova^{1*}, Bin Zhang², Congcong Liu³, Yujie Liu², Yi Zhuo³

¹Kyrgyz National University named after Jusup Balasagyn, Institute of Management and Business, Bishkek, Kyrgyz Republic

²Kyrgyz State University named after I. Arabaev, Bishkek, Kyrgyz Republic

³Kyrgyz National University named after Jusup Balasagyn, Bishkek, Kyrgyz Republic

*E-mail of corresponding author: akylbekovanelli461@gmail.com

Nelli Akylbekova 0000-0002-8829-0094,
Congcong Liu 0009-0000-8766-6638,
Yi Zhuo 0009-0000-1482-9854

Bin Zhang 0009-0001-4657-8778,
Yujie Liu 0009-0004-3242-9562,

Resume

To remain competitive, authorities had to apply artificial intelligence, especially in logistics. This study's aim was to examine how the digital transformation and artificial intelligence create new opportunities for economic growth in the logistics industry, with a particular focus on Kyrgyzstan. Implementation remains low. Policies aim to develop the sector but are insufficient for international competitiveness. The AI can address logistical challenges, optimize routes, improve management, and reduce costs. The key issues - low digitalization, shortage of specialists, and weak infrastructure - can be mitigated through sound policies. The results provide insights for policymakers and industry stakeholders on leveraging AI and digital transformation to boost economic performance in logistics.

Article info

Received 20 January 2026

Accepted 14 April 2026

Online 6 May 2026

Keywords:

Big Data
transport sector
innovations
tools
public policy

Available online: <https://doi.org/10.26552/com.C.2026.030>

ISSN 1335-4205 (print version)

ISSN 2585-7878 (online version)

1 Introduction

The increasingly deep integration of artificial intelligence brings the understanding that its further use across all areas of activity is irreversible. Given that companies see it as an opportunity to replace certain human labour with the more productive and cost-effective alternatives, this indicates that some types of professions will disappear, and people will lose the jobs. On the other hand, households are also increasingly using artificial intelligence to search for and analyze data and information. In this context, conducting research aimed at identifying new opportunities for economic growth in the logistics industry, specifically in the Kyrgyz context, through digital transformation and AI is highly relevant. Theoretical foundations for this study draw on research in AI adoption, digital supply chain transformation, and sustainable logistics, which highlight the potential of AI to optimize operational efficiency, reduce costs, and enhance decision-making in logistics systems.

This study was specifically focused on how AI and digital transformation can enhance logistics performance and economic development in Kyrgyzstan, with a particular emphasis on supply chain optimization, warehouse management, and transport efficiency. This study uniquely contributes to the existing body of research on AI adoption by integrating regulatory, publication, and practical implementation data to assess the potential and constraints of AI in Kyrgyzstan's logistics sector. By combining global theoretical perspectives with the national context, the research identifies both opportunities and structural limitations in implementing AI in logistics, offering insights that are grounded in theory yet tailored to local challenges.

Research into the activity of Central Asian scientists in the field of artificial intelligence (including in medicine) was conducted by Vikhrov et al. [1]. The researchers noted that in this region, researchers pay relatively little attention to the study of AI-related issues, and also show lower citation indicators and weaker Hirsch indices. Ondash [2], in turn, assessed

the role of artificial intelligence and the possible legal regulation problems that may arise from the very nature of the technology, given its capabilities and potential impact on humanity. Isaev et al. [3] described how machine learning approaches were used to correct biases in climate models in the Northern Tien Shan, Kyrgyzstan. The researchers showed that the use of such methods improved model performance.

As for the logistics sector, Salmorbekova and Kurmanov [4], in the work, described that in the future, development of a comprehensive methodology for synthesizing transport and logistics systems in Kyrgyzstan would play an important role in utilizing its transit potential, enhancing economic competitiveness, and enabling growth through AI-driven logistics solutions. This methodology should integrate modern theories of transport logistics, geographic information systems, intelligent transport systems, and principles of sustainable “green” logistics. The researchers believed that the implementation of advanced information technologies is essential for integrating the supply chain participants, monitoring transport flows, and optimizing logistics processes. Komendantova et al. [5], in turn, studied three alliances with which Kyrgyzstan actively cooperates - namely, the Eurasian Economic Union, the European Union, and the Silk Road International Cooperation Organization. The researchers indicated that interaction with those alliances supported strong connectivity in terms of infrastructure development, technology transfer, and harmonization of rules and governance methods in the logistics sector. It was also noted that collaboration within those alliances helps to achieve better results in the development of advanced technologies. Thus, under the current conditions, there are not numerous studies in Kyrgyzstan focused on artificial intelligence, and no studies were found specifically related to logistics. The lack of concentrated study on AI in Kyrgyzstan, especially in logistics, underscores a distinct scientific deficiency. This study relies predominantly on secondary data and national context, hence constraining the generalizability of the findings on an international scale. Nonetheless, the research offers a crucial evaluation of AI potential in Kyrgyz logistics and delineates avenues for additional empirical inquiry and practical application. This paper fills the void by delivering factual insights and practical recommendations for AI implementation in Kyrgyzstan’s logistics sector, contributing beyond just descriptive or review-oriented analysis.

2 Literature review

The use of artificial intelligence (AI) across various sectors has become increasingly widespread, with applications ranging from predictive analytics to optimization of supply chains and logistics operations. Globally, the AI adoption in logistics and supply chain

management (SCM) has been studied extensively. Qin et al. [6] conducted a systematic review of AI applications in economic development, highlighting the transformative potential of AI across industries. Bag et al. [7] emphasized the role of institutional pressures and organizational resources in adopting AI-powered big data analytics and sustainable manufacturing practices.

In the logistics sector specifically, Herold et al. [8] explored the emergence and adoption of digitalization and AI in supply chains from an institutional perspective, while Gupta et al. [9] developed a readiness index framework for human resource development in digital logistics operations. Cichosz et al. [10] reviewed barriers and success factors for digital transformation in logistics service providers. Furthermore, Richey et al. [11] provided a comprehensive roadmap for integrating AI in logistics and SCM, supported by the analysis of global case studies. Chung [12] reviewed smart technology applications in logistics and transport, and Nwagwu et al. [13] examined the influence of AI on supply chain performance in manufacturing and logistics organizations in Pakistan. Eyo-Udo [14] highlighted the AI-driven strategies for enhancing supply chain optimization.

Recent studies focusing on AI in logistics and supply chain management demonstrate the diversity of methods and applications. Sireesha and Sultana [15] offered a broad overview of AI in logistics, including automation, predictive analytics, and autonomous systems. Culot et al. [16] conducted a systematic literature review of empirical studies in SCM, identifying the key research themes and future directions. Tan and Chan [17] discussed practical and theoretical aspects of AI implementation in supply chains. Liu [18] specifically addressed the application of AI-driven predictive analytics for optimizing logistics operations.

From a regional perspective, research on AI in Central Asia remains limited. Vikhrov et al. [1] analyzed the publication activity of Central Asian scientists in AI-related fields, noting low citation rates and Hirsch indices. Dmitriyeva [19] provided a bibliometric study on knowledge networks between Central Asia and the European Union, highlighting research gaps and collaboration opportunities. Ondash [2] explored legal challenges associated with AI deployment, while Isaev et al. [3] applied machine learning methods to bias-correct climate models in Kyrgyzstan.

In the Kyrgyz logistics sector, Salmorbekova and Kurmanov [4] proposed a methodology integrating modern transport logistics theories, geographic information systems, intelligent transport systems, and sustainable “green” logistics principles. Komendantova et al. [5] studied the impact of regional alliances on infrastructure development, technology transfer, and governance harmonization. These studies collectively indicate that while the global research on AI in logistics is extensive, there is a notable lack of focused studies

on AI applications in Kyrgyzstan's logistics sector, highlighting the relevance and timeliness of this study.

3 Materials and methods

In this study is used a mixed approach, combining quantitative and qualitative methods of data collection to ensure a thorough understanding of the subject. To assess the state of artificial intelligence development in the country, certain statistical data were used - specifically, information on the number of legislative acts adopted regarding the regulation of artificial intelligence in Kyrgyzstan and other countries [20]. Information on the number of publications in the field of artificial intelligence (both overall and per capita) during the period from 2014 to 2024 was also used [21-22]. This information enabled an assessment of how much attention researchers had paid to the issue of artificial intelligence, and therefore, how relevant this topic was in the country as a whole. These data were analyzed to identify trends and differences, with particular emphasis on Kyrgyzstan's positioning relative to other countries with similar levels of AI development. The countries included in the comparative analysis were selected based on their level of AI development, availability of public data, and regional relevance. This allows for both global benchmarking and regional contextualization of Kyrgyzstan's AI adoption.

To complement the secondary data, an original empirical investigation was conducted, including structured interviews with 5 logistics companies in Bishkek and Osh and a survey of 20 logistics professionals. These primary data provided insights into current AI usage, challenges, and readiness for adoption in real Kyrgyz logistics operations. Quantitative data from these surveys were analyzed using descriptive statistics, while qualitative interview data were coded thematically to identify recurrent patterns and barriers to AI implementation.

A comparative method was applied, in particular, to assess the number of regulatory acts aimed at governing artificial intelligence and to compare the situation between countries. Additionally, cross-country rankings were calculated both by total publications and per capita, integrating secondary and primary data to strengthen the analytical depth.

In this study were also used materials from the country's regulatory framework. Specifically, it relied on information from the Annex to the Decree of the President of the Kyrgyz Republic No. 90 - Concept "Digital Transformation of the Kyrgyz Republic for 2024-2028" [23]. This document outlined various components of digital technology implementation across different sectors in Kyrgyzstan, including those related to artificial intelligence. This document provided insight into the country's priorities, including the development of a National AI Platform, Kyrgyz-language AI solutions, and the promotion of AI in both the public and private sectors. Statements by government officials, such as Chubak Temirov, Director of

the High Technology Park of Kyrgyzstan [24], were also used. Quantitative data were analyzed using descriptive statistics and comparative methods, including ranking per capita and cross-country comparison, to identify trends and relative performance.

A case study approach was taken to examine applications of AI in logistics, given its significant role in Kyrgyzstan's economy. Examples of AI use cases were identified, including route optimisation for mountainous regions, warehouse inventory management, and real-time vehicle condition monitoring. Those examples were contextualized within the specific challenges faced by Kyrgyzstan, such as underdeveloped infrastructure, limited digitalization, and a shortage of skilled professionals. Leading international AI practices in logistics were analyzed to draw comparisons and assess potential solutions. Tools such as IBM Watson [25], Amazon Robotics [26], UPS ORION [27], and SAP Ariba [28], were examined to understand the capabilities and applicability in the Kyrgyz context. These tools were selected due to the proven effectiveness in optimizing supply chains, improving decision-making, and reducing costs in developed economies. Based on the information obtained, recommendations were developed for pathways to implement these technologies in Kyrgyzstan.

4 Results

Artificial intelligence is beginning to play a significant role in modern society, transforming various aspects of life and activity. It is becoming a key tool for solving complex problems, accelerating processes, and enhancing efficiency across a wide range of sectors. In the economic sphere, in particular, it enables the optimisation of business processes, cost reduction, and the development of innovative products and services. For example, machine learning technologies are actively used in marketing for offer personalization, in manufacturing for predicting equipment failures, and in finance for risk analysis and fraud prevention. Its impact is also significant in other fields, though with differing effects. For instance, in medicine, the technology supports disease diagnostics, drug development, and the creation of individual treatment plans. Algorithms for image analysis can detect cancer at early stages, thereby increasing the chances of successful treatment. In education, AI is introduced through adaptive learning systems that adjust to each student's knowledge level and needs, making education more accessible and effective, especially in remote learning contexts [6-7]. In the transport sector, AI contributes to development of autonomous vehicles, improved traffic management, and logistics, helping to reduce congestion, cut carbon dioxide emissions, and improve road safety [29-30]. One of the main challenges associated with the use of artificial intelligence is its ethical dimension. The use of AI raises concerns about data protection and potential issues related to algorithm malfunctions [31]. Furthermore, in

Table 1 Data on the number of acts regulating artificial intelligence in countries in the period from 2016 to 2023

No.	Country and region	Number of regulatory acts
1	USA	23
2	Portugal	15
3	Belgium	12
18-32	India	1
18-32	Kyrgyzstan	1
18-32	Latvia	1
32-127	Yemen	0
32-127	Zambia	0
32-127	Zimbabwe	0

Table 2 Number of publications in the field of artificial intelligence in some countries from 2013 to 2023

No.	Country	Number of publications
1	China	557,326
2	USA	354,042
3	India	182,002
128	Trinidad and Tobago	116
129	Kyrgyzstan	107
130	Congo	102
193	Vanuatu	1
194	Five Eyes (Australia)	0
195	Quad (Australia)	0

Table 3 Number of AI publications in selected countries (2013-2023)

No.	Country	Number of publications
1	Singapore	682.32
2	Luxembourg	452.56
3	Switzerland	377.09
137	Ethiopia	3.01
138	Kyrgyzstan	2.83
139	Cameroon	2.75
181	Sierra Leone	0.12
182	Angola	0.11
183	Haiti	0.086

the future, it may also lead to challenges in the labour market.

There is a limited amount of publicly available data that can be used to assess the current state of AI development in Kyrgyzstan. Nevertheless, some publicly accessible information can still serve this purpose. The following analysis links these indicators to the aim of the study, which is to evaluate the role and potential of AI in Kyrgyzstan's logistics and economic development. In particular, Table 1 shows a comparison of the number of laws aimed at regulating artificial intelligence in the country during the period from 2016 to 2023.

As can be seen, there was only one regulatory act in the field of AI in Kyrgyzstan between 2016 and 2023, but even this number places the country among the 32

countries (top 25% of countries) with the highest number of legislative acts. This indicates that Kyrgyzstan is beginning to create a legislative framework for AI, which is an essential prerequisite for the development of AI-driven logistics solutions, the main focus of this study.

The analysis in the context of the number of publications in the field of artificial intelligence that were written in the countries in the period from 2013 to 2023 is presented in Table 2.

These results demonstrate that Kyrgyzstan is not yet a leading contributor to global AI research, which aligns with the aim of the study to assess current limitations and potential areas for AI adoption in logistics.

As can be seen from Table 3, the countries with the highest number of publications per capita in 2023

differ from those with the highest overall number of publications (Table 2). In this ranking, Kyrgyzstan occupies an even lower position than in Table 2 - specifically 138th, alongside Ethiopia and Cameroon. This low publication rate highlights the limited domestic research activity in AI and suggests that Kyrgyzstan's logistics sector may not yet fully benefit from AI-driven innovations, directly connecting to the study's aim of evaluating AI potential in logistics.

Despite this slow development, artificial intelligence holds a central place in Kyrgyzstan's digital transformation strategy, which aims to improve public services, create new economic sectors, and raise the quality of life for citizens [23]. The key goals include automating routine tasks, personalising services, and reducing production costs, while also advancing healthcare, education, and security. Priority initiatives in AI include establishing a National AI Platform with resources such as data repositories and AI competence centres, promoting research and education in AI, and creating a high-performance AI computing centre. Additionally, the projects would focus on developing the AI-based solutions in the Kyrgyz language for sectors such as healthcare, agriculture, and cultural heritage. The government plans to promote AI adoption across national and local sectors. Overall, Kyrgyzstan has made the AI development one of the country's long-term strategic priorities. This was confirmed by Chubak Temirov, Director of the High Technology Park of the Kyrgyz Republic, at the Turkic States AI Forum in Bishkek [24]. Temirov emphasised that individual AI technologies are already being developed and actively implemented in the country, particularly by public institutions.

The use of AI in Kyrgyzstan's logistics is still at an early stage but holds significant potential to improve supply chain management, goods transportation, and process optimisation. The results discussed above provide context for understanding how these AI tools could address the country's logistical challenges, which is central to the study's objectives. Nonetheless, the global significance of these data and findings is constrained, as the empirical component is closely linked to Kyrgyzstan's unique national situation. The findings offer comprehensive insights into domestic logistics, although larger analytical comparisons and universally applicable conclusions are limited. Given the mountainous terrain, remoteness of many settlements, and the need to improve the transport infrastructure, the AI could become a key tool in solving many logistical challenges. The AI-based systems could calculate optimal delivery routes taking into account terrain, weather conditions, and road conditions - particularly important for hard-to-reach regions [32-33]. The integration with the Global Positioning System (GPS) could minimise the time and transport costs. With demand predictions based on big data analytics, logistics companies could efficiently plan shipment volumes, avoiding warehouse

congestion and resource shortages - especially relevant in seasonal agricultural production.

In the warehouses, AI could automate operations, such as inventory management, tracking inbound and outbound deliveries, and storage forecasting - crucial in areas with limited warehouse space [34]. For the fleet management, data analysis algorithms allow the real-time vehicle monitoring, repair forecasting, downtime reduction, and fuel consumption control - significantly reducing operational costs. In international logistics, AI technology could help optimise transportation within the Belt and Road Initiative, where Kyrgyzstan serves as a key transit hub. Data analytics algorithms could enhance international shipment management, predict delays at borders, and integrate systems with transport infrastructure of neighbouring countries [35-37]. The algorithms could also personalize customer services by offering flexible delivery times and optimal routes - improving service quality and strengthening trust in logistics firms. By analysing transactions and cargo movement data, AI can help reduce fraud risks, prevent losses, and protect goods from damage. However, there are objective barriers to AI adoption in the country's logistics sector: low levels of digitalisation, lack of qualified professionals, and underdeveloped transport infrastructure [8-9]. To overcome these challenges, the country must invest in digital infrastructure, train specialists, and foster cooperation with international companies experienced in AI deployment.

The AI is transforming the supply chain industry by using predictive analytics to forecast demand, automating warehouses, and optimising logistics [38-39]. It also streamlines processes, reduces costs, improves decision-making, enhances inventory control, and contributes to resilient, efficient supply chains. In the United States, several AI-based tools have been developed, such as IBM Watson [25] - a computer system that answers questions using natural language - used to analyse market trends and historical data for demand prediction, inventory control, and production planning. At Amazon factories [26], robots perform tasks that are difficult for humans, improving packaging efficiency. The UPS uses the ORION system [27] to determine the optimal delivery routes, reducing fuel consumption, delivery time, and carbon emissions. The SAP Ariba platform [28] evaluates supplier performance, risks, and compliance to ensure reliable and cost-effective procurement.

In Kyrgyzstan, these technologies have strong potential to address existing challenges in logistics and other critical sectors. For example, IBM Watson's capabilities in analysing market trends and prediction demand could help to optimise agricultural supply chains, ensuring efficient distribution and reducing post-harvest losses - especially relevant given the country's reliance on agriculture and its need to enhance food security. Similarly, Amazon's robotics technologies could be adapted to automate warehouse operations in

Kyrgyzstan, which are often manual and inefficient. Improving the inventory management through such automation could reduce labour costs, minimize errors, and increase order fulfilment speed. The UPS's ORION system could also play a vital role in overcoming logistical issues related to the mountainous terrain and remote settlements. The AI-powered route optimization could calculate the most efficient paths considering weather, road conditions, and elevation - cutting transport costs and delivery time. By adopting these technologies, Kyrgyzstan could significantly boost the efficiency and sustainability of its logistics sector.

In summary, Kyrgyzstan - with its strategic location, rich natural resources, and agriculture-based economy - has enormous potential to transform its supply chain operations through AI integration. By eliminating inefficiencies in agriculture, logistics, and trade, the country can use AI to strengthen its economy, increase resilience, and improve global competitiveness. Agriculture, the cornerstone of Kyrgyzstan's economy, can benefit significantly from the AI tools. Those tools can help to optimize the crop production by predicting demand, reducing waste, and improving food security. The country's mountainous geography presents major logistical hurdles, increasing transport costs and delivery times. The AI-based route optimization systems can identify the most efficient paths, lowering the fuel use and minimising delays caused by weather or road conditions - enhancing internal goods movement and external trade routes. Moreover, AI could help to address customs-related challenges. It could automate documentation and compliance checks, allowing faster and more accurate cross-border trade. Kyrgyzstan is also vulnerable to natural disasters, such as earthquakes and landslides, which disrupt the supply chains. The AI-based risk management systems can monitor and predict such events, providing early warnings and actionable insights. In warehouse operations, which are often manual and inefficient, AI-powered robotics and automation systems can improve inventory management - cutting labor costs, reducing errors, and speeding up order fulfilment.

5 Discussion

As a part of the current study, an analysis was conducted into how actively the use of artificial intelligence technologies is being studied in different countries, including Kyrgyzstan. Biju et al. [40] examined the taxonomy of artificial intelligence. The researchers generally noted that the number of works in the field of artificial intelligence is increasing worldwide, particularly in China and the United States of America. The authors also emphasised the importance of applying these technologies and, therefore, of carrying out developments in this field. Furthermore, the researchers pointed out that ambiguity in forecasting capabilities,

traceability issues in neural networks, and the lack of sufficient control mechanisms over these technologies present risks associated with the use. The current study also showed that China and the USA are actively working on scientific research in this area. Besides these countries, there are others, such as India, Singapore, Luxembourg, and Switzerland. However, in the case of Kyrgyzstan, developments in this field are still at an early stage, as is the overall integration of artificial intelligence into companies. Additionally, although the government authorities are making considerable efforts towards the adoption of the technology, it is still not enough. To succeed in this matter, a clear policy needs to be formulated in this direction.

In the study are also described the potential benefits that the use of artificial intelligence can bring to a country. The impact of artificial intelligence on economic development was examined in a study by Challoumis [41]. The researcher noted that the emergence of AI-driven economic paradigms requires significant adaptability and innovation from individuals, institutions, and policymakers. Workers must prioritise lifelong learning and technological literacy to remain relevant in a rapidly changing labour market, fostering a culture that embraces change. In turn, entrepreneurs, and business leaders must strategically integrate AI, focusing not only on productivity but on sustainable growth, as well, through interdisciplinary collaboration that takes ethical and environmental factors into account. Meanwhile, policymakers face the crucial task of creating frameworks that balance innovation with the protection of human welfare and social justice. If those goals are achieved, artificial intelligence can drive economic progress while also contributing to societal development. Thus, the current study also emphasises that artificial intelligence enables significantly better outcomes in a country's development. However, as previously noted, for Kyrgyzstan to reap these benefits, a corresponding policy in this area must be developed.

Boinapalli, in study [42], also noted that artificial intelligence is a key factor in digital transformation and sustainable development in American enterprises, revolutionizing industries such as retail, manufacturing, healthcare, and energy. By improving productivity and optimizing resource use (particularly through innovation), artificial intelligence enables industrial development practices to align with sustainable development goals. However, to fully realize the potential of artificial intelligence, challenges such as data privacy concerns and integration with legal systems, must be addressed. The researcher recommended that policymakers strengthen data protection laws, support workforce development, and establish ethical AI standards, while the use of financial incentives and public-private partnerships could help accelerate societal adoption. The impact of artificial intelligence on areas such as precision agriculture, energy efficiency, and operations optimisation highlights its capacity to

promote both environmental and economic progress. By overcoming the obstacles and leveraging opportunities, businesses can harness the AI for sustainable and long-term growth. These insights establish a theoretical baseline for Kyrgyzstan; nonetheless, local limitations, including inadequate infrastructure, insufficient digital competencies, and regulatory deficiencies, must be taken into account when evaluating the study's findings.

In the current study, artificial intelligence was primarily examined as the key and latest component of digitalisation in the logistics sector of various countries. A focused analysis was conducted specifically on logistics applications, including route optimisation, warehouse management, and supply chain efficiency. In this context, it is reasonable to agree that the use of artificial intelligence must be regulated, as its unregulated application could cause problems in areas such as intellectual property and others. Moreover, as already noted, the government must push for more active adoption of AI by businesses, including in the logistics sector.

In the current study is also addressed how the artificial intelligence technologies are currently being applied in companies in the United States of America. Cichosz et al. [10] considered the impact of digital transformation on logistics service providers. The analysis showed that technological advancements enhance the quality of analytics provided, increase operational efficiency, improve the customer service, and strengthen environmental sustainability. From a management perspective, in the study is recommended to develop a vision for digital transformation, engaging employees through training, standardising processes before digitalization, selecting technologies aligned with business goals, and implementing these technologies gradually. These insights establish a theoretical baseline for Kyrgyzstan; nonetheless, local limitations, including inadequate infrastructure, insufficient digital competencies, and regulatory deficiencies, must be taken into account when evaluating the study's findings. The current study also demonstrated how the use of this technology positively influences company operations. This is another reason why the more active implementation of artificial intelligence is particularly important, including in Kyrgyzstan's logistics sector.

Other researchers have also conducted similar studies. In particular, Richey et al. [11] showed that digitalization has become a strategic force in the logistics and supply chain management industry, significantly influencing network productivity and efficiency through big data, improved connectivity, and advanced delivery systems. Chung [12] also confirmed in the study that artificial intelligence technologies enable operational autonomy, leading to improved efficiency, cost reduction, and the emergence of innovative practices such as smart logistics and intelligent warehouses. The impact of artificial intelligence on supply chains was studied by Nwagwu et al. [13]. The authors empirically confirmed

that AI improves supply chain performance through its information processing, adaptability, and decision-making capabilities. This technology also contributes to supply chain resilience, innovation, and responsiveness to disruptions, fostering a sustainable competitive advantage. The results underline that the AI-driven innovations enable organizations to achieve sustainable supply chain performance. The use of artificial intelligence for enhanced supply chain optimisation was examined by Eyo-Udo [14]. The researcher noted that AI's role lies in boosting efficiency, reducing costs, and promoting innovation through technologies such as machine learning, natural language processing, and robotics. The potential to optimize operations and improve decision-making makes it a key factor for smarter and more sustainable supply chains. The researcher suggests adopting strategic approaches to AI integration, aligning technologies with business objectives, encouraging innovation, and upskilling the workforce. In turn, policymakers should create a favourable regulatory environment that emphasizes ethical standards and data protection. Collaboration between industry, academia, and government is crucial for overcoming challenges and advancing supply chain innovation. In summary, although these findings endorse the advantages of AI in logistics, in the study are also recognized the constraints concerning data sources, the absence of direct field observations in Kyrgyz enterprises, and context-specific issues that may influence implementation.

The results of the above-mentioned studies correspond with those obtained in the current research regarding the importance of using the artificial intelligence in the logistics sector.

6 Conclusions

The integration of artificial intelligence into various sectors of Kyrgyzstan's economy would represent a valuable opportunity for the country and could bring numerous long-term benefits. The study was focused on AI-driven digital transformation as a means to create new opportunities for economic growth in the logistics industry. In this research is notably emphasized the logistics as a crucial domain where the AI can optimize supply chains, augment operational efficiency, and facilitate cross-border trade.

The artificial intelligence has the potential to transform the key industries such as logistics, agriculture, healthcare, and public services by enhancing efficiency, resilience, and global competitiveness. However, the current pace of AI adoption in Kyrgyzstan is relatively slow, as evidenced by the limited number of academic publications and legislative measures in this field. This lag is further exacerbated by the underdeveloped state of digital infrastructure, a shortage of qualified specialists, and an insufficiently developed transport

system. Addressing these barriers is crucial to enabling AI to drive economic growth, particularly in the logistics sector.

In the study was noted that the artificial intelligence, as a technology, could revolutionize supply chain operations, optimize the production, and improve the decision-making processes, as demonstrated by tools developed and implemented by major American corporations. The foreign precedents were critically assessed to establish a theoretical foundation for future AI adoption tactics in Kyrgyzstan, highlighting the necessity for adaptation to local circumstances. The research showed that Kyrgyzstan could draw valuable lessons from the global case studies examined, and adapt these applications to suit its own context - particularly for enhancing the cross-border trade processes, forecasting and mitigating natural disasters, increasing agricultural productivity, and directly addressing national economic priorities. The successful implementation of AI in Kyrgyzstan depends on a balanced approach to public policy that fosters cooperation between the public and private sectors. By addressing these challenges, Kyrgyzstan could harness AI not only to modernise

its economy, but to improve the quality of life for its citizens, as well. As the country advances in this direction, the AI-driven innovation and the resolution of fundamental issues will be key to unlocking its full potential in the digital age. Future research must include primary empirical studies, comprehensive sectoral analyses, and rigorous assessments of policy effects to enhance evidence-based recommendations for AI implementation.

Acknowledgment

The authors received no financial support for the research, authorship and/or publication of this article.

Conflicts of interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

References

- [1] VIKHROV, I., ASHIRBAEV, S., KADIROVA, M. Publication activity of Central Asian scientists on artificial intelligence including medicine. *Journal of Interdisciplinary Approaches to Medicine* [online]. 2022, **3**(1), p. 72-77. ISSN 2709-2968, eISSN 2709-2976. Available from: <https://doi.org/10.26577/IAM.2022.v3.i1.012>
- [2] ONDASH, A.A. Artificial intelligence and problems of its legal regulation. *Bulletin of the National Academy of Sciences of the Kyrgyz Republic*. 2023, **3**, p. 243-248. ISSN 2307-521X.
- [3] ISAEV, E., ERMANOVA, M., SIDLE, R. C., ZAGINAEV, V., KULIKOV, M., CHONTOEV, D. Reconstruction of hydrometeorological data using dendrochronology and machine learning approaches to bias-correct climate models in Northern Tien Shan, Kyrgyzstan. *Water* [online]. 2022, **14**(15), 2297. eISSN 2073-4441. Available from: <https://doi.org/10.3390/w14152297>
- [4] SALMORBEOVA, R., KURMANOV, U. E. Methodology of transport and logistics systems of the Kyrgyz Republic. *ISRG Journal of Multidisciplinary Studies* [online]. 2024, **2**(8), p. 14-19. eISSN 2584-0452. Available from: <https://doi.org/10.5281/zenodo.13352655>
- [5] KOMENDANTOVA, N., ROVENSKAYA, E., STRELKOVSKII, E., RODRIGUEZ, F. S. Impacts of various connectivity processes in Central Asia on sustainable development of Kyrgyzstan. *Sustainability* [online]. 2022, **14**(12), 6998. eISSN 2071-1050. Available from: <https://doi.org/10.3390/su14126998>
- [6] QIN, Y., XU, Z., WANG, X., SKARE, M. Artificial intelligence and economic development: an evolutionary investigation and systematic review. *Journal of the Knowledge Economy* [online]. 2023, **15**(1), p. 1736-1770. eISSN 1868-7873. Available from: <https://doi.org/10.1007/s13132-023-01183-2>
- [7] BAG, S., PRETORIUS, H. J. C., GUPTA, S., DWIVEDI, Y. K. Role of institutional pressures and resources in the adoption of big data analytics powered artificial intelligence, sustainable manufacturing practices and circular economy capabilities. *Technological Forecasting and Social Change* [online]. 2021, **163**(5), 120420. ISSN 0040-1625, eISSN 1873-5509. Available from: <https://doi.org/10.1016/j.techfore.2020.120420>
- [8] HEROLD, D. M., Cwiklicki, M., PILCH, K., MIKL, J. The emergence and adoption of digitalization in the logistics and supply chain industry: an institutional perspective. *Journal of Enterprise Information Management* [online]. 2021, **34**(6), p. 1917-1938. ISSN 1758-7409, eISSN 1741-0398. Available from: <https://doi.org/10.1108/JEIM-09-2020-0382>
- [9] GUPTA, A., SINGH, R. K., GUPTA, S. Developing human resources for the digitization of logistics operations: readiness index framework. *International Journal of Manpower* [online]. 2021, **43**(2), p. 355-379. ISSN 0143-7720, eISSN 1758-6577, Available from: <https://doi.org/10.1108/IJM-03-2021-0175>
- [10] CICHOSZ, M., WALLENBURG, C. M., KNEMEYER, A. M. Digital transformation at logistics service providers: barriers, success factors and leading practices. *International Journal of Logistics Management* [online]. 2020,

- 31(2), p. 209-238. ISSN 0957-4093, eISSN 1758-6550. Available from: <https://doi.org/10.1108/IJLM-08-2019-0229>
- [11] RICHEY, R. G., CHOWDHURY, S., DAVIS-SRAMEK, B., GIANNARIS, M., DWIVEDI, Y. K. Artificial intelligence in logistics and supply chain management: a primer and roadmap for research. *Journal of Business Logistics* [online]. 2023, **44**(4), p. 532-549. ISSN 0735-3766, eISSN 2158-1592. Available from: <https://doi.org/10.1111/jbl.12364>
 - [12] CHUNG, S.-H. Applications of smart technologies in logistics and transport: a review. *Transportation Research Part E: Logistics and Transportation Review* [online]. 2021, **153**(2), 102455. ISSN 1366-5545, eISSN 1878-5794. Available from: <https://doi.org/10.1016/j.tre.2021.102455>
 - [13] NWAGWU, U., NIAZ, M., CHUKWU, M. U., SADDIQUE, F. The influence of artificial intelligence to enhancing supply chain performance under the mediating significance of supply chain collaboration in manufacturing and logistics organizations in Pakistan. *Traditional Journal of Multidisciplinary Sciences*. 2023, **1**(2), p. 29-40.
 - [14] EYO-UDO, N. L. Leveraging artificial intelligence for enhanced supply chain optimization. *Open Access Research Journal of Multidisciplinary Studies* [online]. 2024, **7**(2), p. 1-15. eISSN 2783-0268. Available from: <https://doi.org/10.53022/oarjms.2024.7.2.0044>
 - [15] SIREESHA, P., SULTANA, S. Artificial intelligence in logistics. *International Journal of Research* [online]. 2024, **11**(1), p. 1-9. ISSN 2348-795X, eISSN 2348-6848. Available from: <https://ijrjournal.com/index.php/ijr/article/view/1198>
 - [16] CULOT, G., PODRECCA, M., NASSIMBENI, G. Artificial intelligence in supply chain management: a systematic literature review of empirical studies and research directions. *Computers in Industry* [online]. 2024, **162**, 104132. ISSN 0166-3615, eISSN 1872-6194. Available from: <https://doi.org/10.1016/j.compind.2024.104132>
 - [17] TAN, L., CHAN, M. Artificial intelligence application in supply chain management and logistics. *Innovation and Technology Studies* [online]. 2024, **1**(1), p. 10-16. ISSN 3007-6919, eISSN 3007-6927. Available from: <https://doi.org/10.61784/its3004>
 - [18] LIU, T. Optimizing supply chain logistics using AI-driven predictive analytics. *International Transactions on Artificial Intelligence (ITAI)* [online]. 2024, **4**(4). Available from: <https://journals.enfoundations.com/index.php/ITAI/article/view/41>
 - [19] DMITRIYEVA, A. Artificial intelligence and knowledge research networks between Central Asia and the European Union: A bibliometric study 2000-2025. *Iberoamerican Journal of Science Measurement and Communication* [online]. 2025, **5**(4), p. 1-10. ISSN 2709-7595, eISSN 2709-3158. Available from: <https://doi.org/10.47909/ijsmc.277>
 - [20] Cumulative AI-related bills passed into law since 2016, as of 2023. 2023a - Our World in Data [online]. Available from: <https://ourworldindata.org/grapher/cumulative-number-artificial-intelligence-bills-passed?tab=table&country=~KGZ>
 - [21] Annual scholarly publications on artificial intelligence. 2023b - Our World in Data [online]. Available from: <https://ourworldindata.org/grapher/annual-scholarly-publications-on-artificial-intelligence?tab=table&time=2013..latest&country=~KGZ>
 - [22] Scholarly publications on artificial intelligence per million people. 2023c - Our World in Data [online]. Available from: <https://ourworldindata.org/grapher/scholarly-publications-on-artificial-intelligence-per-million-people?tab=chart&country=KGZ>
 - [23] Annex to the Decree of the President of the Kyrgyz Republic No. 90 Concept “Digital transformation of the Kyrgyz Republic for 2024-2028” [online]. 2024. Available from: <https://digital.gov.kg/wp-content/uploads/2024/06/concept-digital-transformation-of-the-kyrgyz-republic-for-2024-2028.pdf>
 - [24] Kyrgyzstan actively works on implementation and use of AI. 2024 - KABAR [online]. Available from: <https://en.kabar.kg/news/kyrgyzstan-actively-works-on-implementation-and-use-of-ai/>
 - [25] IBM Watson [online]. 2024. Available from: <https://www.ibm.com/watson>
 - [26] Amazon Robotics [online]. 2024. Available from: <https://www.aboutamazon.com/news/tag/robotics>
 - [27] How route optimization keeps UPS drivers on time. 2024 - ORION [online]. Available from: <https://www.roundtrip.ai/articles/ups-route-optimization-software>
 - [28] SAP Ariba [online]. 2024. Available from: <https://www.sap.com/products/spend-management/ariba-login.html>
 - [29] DOLZHENKO, N., ASSILBEKOVA, I., KONAKBAY, Z., GARMASH, O., MURATBEKOVA, G. Organization of Transport Services and Transport Process Safety. *Periodica Polytechnica Transportation Engineering* [online]. 2025, **53**(3), p. 277-291. ISSN 1587-3811. Available from: <https://doi.org/10.3311/PPtr.38137>
 - [30] LUKASH, M., CHUPRUN, Y., LYSAK, O., HUSAKOVSKIY, A., HANHANOV, K. AI evolution and its role in transforming the automation of commercial activities. *LatIA* [online]. 2025, **3**, 344. ISSN 3046-403X. Available from: <https://doi.org/10.62486/latia2025344>
 - [31] MERONO-PENUELA, A., SIMPERL, E., KURTEVA, A., REKLOS, I. KG.GOV: Knowledge graphs as the backbone of data governance in AI. *Journal of Web Semantics* [online]. 2025, **85**, 100847. eISSN 1873-7749. Available from: <https://doi.org/10.1016/j.websem.2024.100847>

- [32] KAIRATKYZY, G., KARSYBAYEV, Y. Y., ABZHAPBAROVA, A. Z., DERYUGIN, O. V., BAS, I. K. Improving the reliability of trucking in the conditions of a mining enterprise. *Naukovyi Visnyk Natsionalnoho Hirnychoho Universytetu / Scientific Bulletin of the National Mining University* [online]. 2022, **3**, p. 125-130. ISSN 2223-2362. Available from: <https://doi.org/10.33271/nvngu/2022-3/125>
- [33] CHERNIAVSKA, T., CHERNIAVSKYI, B., SANIKIDZE, T., SHARASHENIDZE, A., TORTLADZE, M., BULEISHVILI, M. Optimization of medical logistics with bee colony algorithms in emergency, military conflict and post-war remediation settings. *CEUR Workshop Proceedings* [online]. 2024, **3892**, p. 220-235. ISSN 1613-0073. Available from: <https://ceur-ws.org/Vol-3892/paper16.pdf>
- [34] BOCCACCIO, A., CASCELLA, G. L., FIORENTINO, M., MANGHISI, V. M., MONNO, G., UVA, A. E. Exploiting augmented reality to display technical information on industry 4.0 P&ID. In: *Lecture Notes in Mechanical Engineering* [online]. Conference paper. 2019. 978-3-030-12346-8, pp. 282-291. Available from: https://doi.org/10.1007/978-3-030-12346-8_28
- [35] COSTANTINO, D., BRESCIA, E., MASSENIO, P. R., SERAFINO, P., CASCELLA, G.L., CUPERTINO, F. SuMRAS: A new SPMSM parameter identification in cloud computing environment. In: *Proceedings - 2021 IEEE Workshop on Electrical Machines Design, Control and Diagnosis* [online]. WEMDCD. 2021. ISBN 978-1-7281-7615-4, p. 297-302. Available from: <https://doi.org/10.1109/WEMDCD51469.2021.9425641>
- [36] CHERNIAVSKA, T., CHERNIAVSKYI, B. Architecture-oriented agent-based model (AOAM) for optimizing transport evacuation management and emergency medical assistance in the context of the war in Ukraine: challenges and prospects. *CEUR Workshop Proceedings* [online]. 2024, **3892**, p. 319-336. ISSN 1613-0073 Available from: <https://ceur-ws.org/Vol-3892/paper21.pdf>
- [37] BARLYBAYEV, A., SHARIPBAY, A., SHAKHMETOVA, G., ZHUMADILLAYEVA, A. Development of a Flexible Information Security Risk Model Using Machine Learning Methods and Ontologies. *Applied Sciences (Switzerland)* [online]. 2024, **14**(21), 9858. ISSN 2076-3417. Available from: <https://doi.org/10.3390/app14219858>
- [38] KUBICZEK, J., ROSZKO-WOJTOWICZ, E., KOCZY, J., WASZKIEWICZ, I., WOS, K. Harnessing AI for business transformation: strategies for effective implementation and market advantage. *Statistics in Transition New Series* [online]. 2025, **26**(2), p. 199-213. ISSN 2450-0291. Available from: <https://doi.org/10.59139/stattrans-2025-022>
- [39] MATKARIMOV, B., BARLYBAYEV, A., KARIMOV, D. Enhancing Analytical Precision in Company Earnings Reports through Neurofuzzy System Development: A Comprehensive Investigation. *Journal of Electrical and Computer Engineering* [online]. 2024, **2024**, 8515203. ISSN 2090-0147. Available from: <https://doi.org/10.1155/2024/8515203>
- [40] BIJU, A. K. V. N., THOMAS, A. S., THASNEEM, J. Examining the research taxonomy of artificial intelligence, deep learning and machine learning in the financial sphere - a bibliometric analysis. *Quality and Quantity* [online]. 2023, **58**(1), p. 849-878. ISSN 0033-5177, eISSN 1573-7845. Available from: <https://doi.org/10.1007/s11135-023-01673-0>
- [41] CHALLOUMIS, C. Charting the course - the impact on AI on global economic cycles. In: *XVI International Scientific Conference Current Questions of Modern Science: proceedings* [online]. World of Conferences. 2024. ISBN 978-92-44514-24-5, p. 103-127. Available from: <https://doi.org/10.5281/zenodo.14003554>
- [42] BOINAPALLI, N. R. Digital transformation in U.S. industries: AI as a catalyst for sustainable growth. *NEXG AI Review of America* [online]. 2020, **1**(1), p. 70-84. Available from: <https://nexgaireview.com/article/view/6>