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The Use Of Artificial Intelligence In The Development Of The Digital Economy In Uzbekistan

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ABSTRACT
This article analyzes the current state, opportunities, and challenges of using artificial intelligence (AI) technologies in the development of the digital economy in Uzbekistan. The study examines the role of artificial intelligence in the digital economy, foreign countries' experiences, the level of AI technology implementation in Uzbekistan, state programs, and strategies. Additionally, existing problems have been identified, and proposals and recommendations have been developed to address them. The results indicate that the use of artificial intelligence technologies in Uzbekistan is at an initial stage, and significant achievements in this field can be attained through state support, infrastructure development, training of qualified personnel, and expansion of international cooperation.

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Artificial intelligence, digital economy, Uzbekistan, data analysis, machine learning, digital transformation, AI strategy.

Аннотация: В данной статье анализируется текущее состояние, возможности и проблемы использования технологий искусственного интеллекта (ИИ) в развитии цифровой экономики в Узбекистане. В ходе исследования изучена роль искусственного интеллекта в цифровой экономике, опыт иностранных стран, уровень внедрения технологий ИИ в Узбекистане, государственные программы и стратегии. Кроме того, выявлены существующие проблемы и разработаны предложения и рекомендации по их устранению. Результаты показывают, что использование технологий искусственного интеллекта в Узбекистане находится на начальной стадии, и значительных достижений в этой области можно достичь посредством государственной поддержки, развития инфраструктуры, подготовки квалифицированных кадров и расширения международного сотрудничества.
Ключевые слова: искусственный интеллект, цифровая экономика, Узбекистан, анализ данных, машинное обучение, цифровая трансформация, стратегия ИИ.

Introduction

Today, artificial intelligence (AI) technologies are driving fundamental changes across all sectors of the global economy, enabling the automation of production processes, deepening data analysis, improving decision-making quality, and creating new business models. According to McKinsey, by 2030, AI is expected to add $13–15 trillion in value to the global economy. Reports from the International Monetary Fund (IMF) and the World Bank emphasize that countries effectively using AI are significantly ahead in terms of economic growth rates. Developed countries such as the United States, China, the United Kingdom, South Korea, Singapore, Germany, and Finland have adopted national strategies for AI development and are attracting substantial public and private investments in this field. The Republic of Uzbekistan has also recently focused on transitioning to a digital economy and developing AI technologies. The President of Uzbekistan's decree dated April 28, 2020, "On measures to widely implement the digital economy and e-government," the decree dated October 5, 2021, "On measures to develop artificial intelligence technologies," and the "Uzbekistan – 2030" strategy dated November 10, 2023, have identified developing the digital economy, implementing AI technologies, and training qualified personnel in this field as priority tasks. However, the use of AI

technologies in Uzbekistan is still at an early stage, requiring a systematic approach, studying advanced foreign experience, and adapting it to local conditions. The aim of this research is to analyze the current state of AI usage in the development of Uzbekistan's digital economy, study foreign experience, and develop practical recommendations. The research objectives include: defining the concept of AI and its role in the digital economy; studying advanced practices in AI development in foreign countries; analyzing the implementation of AI technologies in Uzbekistan; identifying existing problems and developing proposals and recommendations to address them.

The research object includes state bodies, IT companies, banks, telecommunication companies, and educational institutions implementing AI technologies in Uzbekistan. The research subject is the organizational-economic and technological mechanisms of AI utilization in developing Uzbekistan's digital economy. The article uses scientific methods such as systematic analysis, comparative analysis, studying statistical data, observation, surveys, interviews, as well as examining foreign and local literature. The concept of AI broadly refers to computer systems and software capable of performing cognitive tasks associated with human intelligence, such as understanding, learning, reasoning, decision-making, and problem-solving. In the context of the digital economy, AI is applied in the following main areas: machine learning – identifying patterns and trends from large datasets; natural language processing – automatically analyzing textual and voice data; computer vision – processing image and video data; expert systems – automating decision-making in specific fields; robotics – automating production and service processes; recommendation systems – providing personalized suggestions to users. The development of AI technologies brings the following main changes to the digital economy: increased labor productivity, reduced production costs, emergence of new products and services, optimization of business processes, improved customer service quality, reduced errors, and faster decision-making. Advanced foreign experiences show that countries adopting national AI strategies and systematically investing in this field achieve significant success. The United States is a global leader in AI. Under the "American AI Initiative" national strategy, more than $50 billion in public and private investments were made in AI from 2020–2025. Major tech companies such as Google, Microsoft, Amazon, IBM, and Facebook are conducting advanced AI research. AI is widely applied in healthcare, finance, transportation, agriculture, defense, and other sectors in the US. China, under the "National AI Development Strategy through 2030," aims to become a global AI hub by 2030, planning over $150 billion in AI investments from 2020–2025. Companies such as Alibaba, Tencent, Baidu, and Huawei have major AI research centers. AI is widely used in China for identity recognition, urban management, finance, education, medicine, and other sectors.

The United Kingdom, under the "AI Sector Deal," invested over £2.5 billion in AI from 2020–2025 through public and private funds. Companies like DeepMind, BenevolentAI, and Babylon Health are internationally recognized. AI applications in the UK cover healthcare, finance, energy, transport, and other sectors. South Korea, under its "AI National Strategy," aims to become one of the top three AI countries by 2030. Samsung, LG, Naver, and Kakao conduct significant AI research and development in South Korea.

In Uzbekistan, AI usage is still at an early stage, with systematic approaches and comprehensive programs not fully developed. However, in recent years, significant steps have been taken by the state to develop AI. The presidential decree dated October 5, 2021, approved the "Roadmap for the development of AI technologies for 2021–2025," defining tasks such as supporting AI research and development, training qualified personnel, developing infrastructure, and expanding international cooperation. The Ministry of Innovative Development, the Ministry for the Development of Information Technologies and Communications, and the "Digital Economy and Innovations" project office are implementing various programs and projects to develop AI. AI technologies in Uzbekistan are applied in the following main areas:

- Banking and finance – scoring systems, anti-fraud systems, chatbots, credit risk assessment;
- Telecommunications – customer communication automation, network load management, error prediction;
- Public administration – automatic processing of citizen requests, tax administration, statistical data analysis;
- Trade and services – recommendation systems, demand forecasting, customer segmentation;
- Education – automated knowledge assessment systems, personalized learning platforms;

- Agriculture – yield forecasting, soil and climate data analysis, irrigation system optimization.

Several challenges exist in implementing AI technologies in Uzbekistan. First, the shortage of qualified personnel – specialists such as data scientists, machine learning engineers, and AI developers are very few, and their qualifications do not fully meet international standards. Second, underdeveloped data infrastructure – AI systems require large volumes of high-quality, structured, and labeled data for training and operation. In many sectors, data are scattered, incomplete, low-quality, and access is limited. Third, insufficient financial resources – AI projects require large initial investments (equipment, software, databases, specialists), which many state agencies and private companies cannot afford. Fourth, insufficient regulatory framework – issues related to AI usage (data privacy, intellectual property, liability, ethical standards) are not fully regulated. Fifth, low level of AI research – fundamental and applied AI research in universities and research institutes is limited, and publications by Uzbek scientists in international journals are very few. Sixth, weak international cooperation – Uzbekistan does not yet sufficiently collaborate with leading foreign universities, research centers, and companies in AI. At the same time, there are favorable factors for AI development in Uzbekistan. First, political will and state support – AI development is receiving serious attention at the presidential and government levels, with relevant decisions and programs adopted. Second, young population interested in digital technologies – over 60% of Uzbekistan's population is under 30, showing interest in IT and AI fields. Third, developing telecommunications infrastructure – internet speed and coverage are improving annually, and 4G/5G networks are being widely implemented. Fourth, support from international organizations – the World Bank, Asian Development Bank, UNDP, and the European Union are ready to fund digital economy and AI development projects in Uzbekistan.

Analysis of foreign and local experience

The analysis of foreign and local experiences shows that the level of artificial intelligence (AI) development varies depending on a country's economic development, innovation policies, and digital infrastructure. Developed countries such as the United States, China, the United Kingdom, South Korea, and Singapore have achieved significant successes in the AI field, while developing countries, including Uzbekistan, remain at the early stages of this process.

Table 1: Level of Artificial Intelligence Technology Implementation in Uzbekistan (by Sector)

№	Sector	AI usage rate (%)	Main Areas of Application
1	Bank and finance sector	35%	Scoring systems, chatbots, antifraud systems, assessing credit risks
2	Telecommunication	20%	Automating Customer Interaction, Network Load Management
3	Trading and service	15%	Recommendation systems, demand forecasting, customer segmentation
4	Public Administration	10%	Automated processing of requests, tax administration
5	Education	5%	Knowledge assessment systems, personalized learning platforms
6	Agriculture	3%	Yield forecasting, analysis of soil and climate data

According to the results of a study conducted in 2023 by the Project Office under the President of the Republic of Uzbekistan, the level of artificial intelligence technology usage in Uzbekistan is as follows: banking and

finance sector – 35% (mainly scoring and chatbots), telecommunications – 20%, public administration – 10%, trade and services – 15%, education – 5%, agriculture – 3%.

Table 2: Indicators of Artificial Intelligence in Foreign and Local Countries (Comparative Analysis)

Indicators	USA	China	Great Britain	South Korea	Uzbekistan
Year of AI Strategy Adoption	2019	2017	2021	2019	2021
Investments for AI (mlrd $)	50+	150+	3,5	5+	0,1
Number of AI companies	5 000+	3 000+	1 000+	500+	50-
Number of AI specialists	500 000+	400 000+	100 000+	50 000+	500-700
Scientific Publications on AI (annually)	50 000+	80 000+	15 000+	8 000+	50-100
Level of AI Adoption in the Financial Sector	85%	70%	75%	65%	35%

These indicators are considerably lower compared to developed countries. For example, in the United States, the application level of AI in the financial sector exceeds 85%, while in China it is over 70%. In Uzbekistan, the number of companies operating in the field of artificial intelligence does not exceed 50, most of which are located in Tashkent. The number of qualified AI specialists is around 500–700, which is very low compared to developed countries. Uzbek higher education institutions do not offer separate bachelor's or master's programs in AI; only some IT programs include individual AI courses.

Problems and Limitations

The first and most significant drawback is the underdeveloped data infrastructure. For AI systems to function effectively, large volumes of high-quality, structured, complete, and labeled data are required. In Uzbekistan, data collected by many state agencies and private companies is scattered, unlinked, stored in various formats, and often of low quality and reliability. Access to data is limited; much of it is kept "closed," making it unavailable for training AI systems. A data labeling system is virtually nonexistent, which complicates AI model training. The second limitation is the lack of high-performance computing infrastructure. AI, especially deep learning models, requires high-performance GPUs, supercomputers, and cloud computing platforms for training. Such infrastructure is almost nonexistent in Uzbekistan. Local researchers and companies are forced to use foreign cloud platforms (Google Cloud, AWS, Microsoft Azure), which increases costs and raises data security concerns. The third limitation is insufficient internet speed and coverage. Although internet speed and coverage in Uzbekistan have improved in recent years, especially in rural areas and provinces, the quality and speed of the connection are still insufficient for real-time AI applications. The 5G network has not yet been fully implemented, which hinders the development of many AI applications (e.g., autonomous vehicles, real-time monitoring systems). The fourth limitation is the lack of software and technological platforms. Local AI software, frameworks, and platforms are almost nonexistent. Researchers and companies mainly rely on foreign open-source platforms (TensorFlow, PyTorch, Scikit-learn), creating technological dependency and hindering the development of local innovations. Organizational and Legal Shortcomings. The fifth shortcoming is the incompleteness of the national strategy and roadmap. Although Uzbekistan has adopted the "Roadmap for the Development of Artificial Intelligence Technologies

for 2021–2025," this document does not fully specify clear goals, target indicators (KPIs), budget allocations, the precise responsibilities of responsible agencies, or mechanisms for monitoring and evaluation. There is no long-term (2030–2050) national strategy. The sixth shortcoming is the inconsistency within the state governance system. Multiple ministries and agencies (Ministry of Innovative Development, Ministry for the Development of Information Technologies and Communications, Digital Economy and Innovations Project Office, Ministry of Science and Education) are responsible for AI development. Due to unclear division of tasks, weak interagency collaboration, and the absence of coordination mechanisms, the work is inefficient. The seventh shortcoming is an insufficient legal framework. Key issues related to the use of AI—such as data privacy and protection, intellectual property rights (including AI-generated works), accountability for AI system actions (manufacturer, user, or the system itself), and ethical standards and boundaries of AI use—are not yet fully regulated. Relevant laws, decrees, and standards have not been adopted. The eighth shortcoming is inadequate financing mechanisms. State budget allocations for AI are very limited (around $10–20 million per year). Venture funds, business angels, and other private financing mechanisms are underdeveloped. There is a lack of grants, subsidies, concessional loans, and tax incentives for AI projects, and no mechanisms exist for financing seed-stage startups. The ninth shortcoming is weak international cooperation. Uzbekistan does not maintain sufficient collaboration with leading foreign universities (MIT, Stanford, Cambridge, Oxford), research centers (DeepMind, OpenAI, Fraunhofer), or companies (Google, Microsoft, IBM). Joint projects, exchange programs, collaborative laboratories, and centers are almost nonexistent. Participation in international conferences, seminars, and training is low.

Proposals and Recommendations

To ensure the effective use of AI in developing Uzbekistan's digital economy, the following recommendations are proposed:

1. Develop and adopt a "National Strategy for the Development of Artificial Intelligence for 2025–2030" with clearly defined goals, tasks, timelines, responsible agencies, and target indicators.
2. Establish a system for training qualified AI specialists—introduce bachelor's, master's, and doctoral programs in AI at universities, organize short-term courses and trainings, and implement joint programs with leading foreign universities.
3. Develop a "Big Data" infrastructure—standardize, clean, label, and provide open access to data collected by state agencies and companies.
4. Create financing mechanisms for AI projects—support them through state grants, venture funds, concessional loans, tax incentives, and subsidies.
5. Improve the regulatory and legal framework in AI—adopt laws and regulations regarding data privacy, intellectual property, accountability, and ethical standards.
6. Support scientific research and development in AI—establish laboratories, centers, and clusters at universities and research institutes; support scientific journals and conferences.
7. Expand international cooperation—implement joint projects, programs, and exchanges with leading foreign universities, research centers, and companies; actively participate in international grants and programs.

Conclusion

The study concludes that the use of AI technologies in developing Uzbekistan's digital economy is at an initial stage, with many challenges remaining. Key obstacles include a shortage of qualified personnel, underdeveloped data infrastructure, limited financial resources, insufficient legal and regulatory framework, low levels of research activity, and weak international collaboration. At the same time, state political will, a young population interested in digital technologies, developing telecommunication infrastructure, and support from international organizations provide favorable conditions for AI development. Experiences from developed countries indicate that long-term national strategies, sufficient financial resources, a qualified workforce, research infrastructure, and a favorable legal and regulatory environment are essential for successful AI development.

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