CHAPTER XV. ECONOMIC ASPECTS OF IMPLEMENTATION AND USE OF ARTIFICIAL INTELLIGENCE TECHNOLOGIES

DOI 10.33407/lib.NAES.id/50372

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Abstract. The publication explores the economic imperatives of introducing artificial intelligence (AI), focusing on its impact on macro- and microeconomic parameters. The correlation between the integration of AI and the increase in productivity, optimization of business processes, and growth of competitiveness is analyzed. The key benefits, including automation, predictive analytics and personalization, and challenges related to regulatory, ethical and socio-economic aspects are identified. The author substantiates the need to develop comprehensive strategies to maximize the economic benefits of digital transformation, while minimizing the risks associated with technological singularity and changes in the labor market.

Keywords: technological innovation, digital transformation, economic efficiency

Introduction. The rapid development and widespread penetration of artificial intelligence technologies is one of the defining features of the modern global economy. AI is no longer just a theoretical concept, transforming into a powerful tool that fundamentally changes business models, production processes, labor markets, and consumer behavior. The introduction of AI opens up unprecedented opportunities to increase efficiency, optimize resources, create innovative products and services, and build new competitive advantages at the national and international levels. At the same time, however, new challenges arise from the need to adapt existing economic systems, regulatory mechanisms, and social institutions to the realities of artificial intelligence.

The relevance of studying the economic aspects of the introduction and use of AI is due to the need for a deep understanding of its multiplier effect on various sectors of the economy. The scientific analysis will help identify key drivers and barriers to AI integration, assess its impact on productivity, employment, income distribution, and

overall economic development. The findings will be important for formulating sound public policy, developing business development strategies, and minimizing potential negative consequences associated with the spread of artificial intelligence technologies in the economic space. Thus, a comprehensive study of the economic aspects of AI is key to ensuring sustainable and inclusive economic growth in the context of technological transformation.

Literature analysis and problem statement. The study of the economic aspects of the introduction and use of artificial intelligence technologies is becoming increasingly relevant in scientific discourse. Scientists analyze the impact of AI on productivity, transformation of business models, changes in market competition, and structural adaptation of the economy. Considerable attention is paid to optimizing business processes, automating management, decision-making, and improving the efficiency of operating activities of enterprises in various sectors of the economy, including finance, marketing, banking, education, and medicine. The scientific works of M. Li, H. Schippers, A. Louis and E. Ngai, Y. Duan, V. Kuziomko, and other researchers consider the impact of AI on the efficiency of financial management and strategic planning of companies. O. Pizhuk, O. Panukhnyk, and M. Sadika in their co-authorship focus on the problems of labor adaptation to intensive automation and digital transformation of the market. Research by D. Pchelyansky and S. Voinova, V. Reim, J. Astrom, and O. Eriksson covers the risks and challenges associated with regulatory barriers and changes in the economic environment.

Despite a significant number of studies, a number of problems remain insufficiently studied, which requires further analysis of the economic benefits and risks of AI implementation in the context of dynamic changes in the global market, development of effective legal regulation mechanisms, and determination of optimal models for integrating AI into business processes with indicators of macroeconomic factors. In this context, the relevance of this study is due to the provision of a comprehensive analysis of the economic aspects of the introduction and use of AI technologies, which will contribute to the formation of effective strategies and ensure the sustainable development of the digital economy.

Research Results. The introduction of artificial intelligence technologies has a significant impact on increasing the productivity and efficiency of economic processes at various levels. Automation of routine tasks, optimization of production chains, and big data analytics lead to cost savings, faster operations, and improved quality of products and services.

– automation and production optimization: AI-controlled robots and automation systems are capable of performing complex production tasks with greater accuracy and continuity, resulting in higher production volumes and lower production costs. According to *McKinsey*, AI-assisted automation has the potential to automate up to 45% of work tasks, equivalent to $2 trillion in wages globally [1];

– supply chain optimization: AI algorithms can predict demand, optimize inventory, transport routing, and logistics management, minimizing delays and costs. *Gartner* research shows that companies that use AI in supply chain management can achieve up to 15% reduction in logistics costs and 85% increase in demand forecasting accuracy [2];

– data mining and decision-making: AI systems are able to process and analyze huge amounts of data, identifying patterns and insights that help make more informed management decisions. According to IBM's report, companies that actively use AI-based data analytics demonstrate 23% higher operating profitability compared to those that do not [3];

– improving the quality of customer service: AI-powered chatbots and virtual assistants provide round-the-clock customer support, quick resolution of issues, and personalized recommendations, which increases customer satisfaction. *Salesforce* surveys show that companies that use AI to improve customer service experience an increase in customer satisfaction by 25% [4].

AI has a wide range of functionalities that can be used to optimize business processes and increase efficiency. Table 1 provides an overview of the key features of AI in the economy.

Table 1

Peculiarities of AI application in the economy

Features	Inventory	Key economic impacts
Process automation	AI automates routine and complex processes	increase productivity, reduce labor costs, and free up resources for strategic tasks
Big data analysis	AI processes and analyzes large amounts of data	improving decision-making, identifying market trends, optimizing marketing
Personalization	AI creates personalized offers and products	Increase customer loyalty, increase sales, improve customer experience
Forecasting	AI predicts market trends and economic indicators	reducing risks, optimizing production, improving financial planning
Optimization of resources	AI optimizes the use of resources (logistics, energy)	cost reduction, efficiency improvement, environmental sustainability
Digital assistants	AI in the form of chatbots serves customers	reduced maintenance costs, increased speed and quality of service
Financial analysis	AI performs financial calculations and automates trading	improving the efficiency of financial operations, reducing risks
Risk management	AI identifies and assesses risks (lending, investments)	reducing the risks of insolvency and fraud
Reducing fraud	AI detects fraud in financial transactions	reducing fraud losses, improving security
Innovations	AI promotes the development of new technologies and products	creation of new products, increased competitiveness, economic growth

As shown in Table 1, artificial intelligence in the economy is a multifaceted tool that affects various aspects of business processes. It not only automates routine tasks, increasing efficiency, but also plays a key role in more complex data analysis, forecasting market trends, and personalizing customer interactions, including:

– optimizes operational processes: process automation reduces costs and increases productivity, optimization of resources, for example, in logistics, allows for more efficient use of existing assets;

– improves decision-making: big data analysis helps to identify patterns and trends, which contributes to informed decision-making, forecasting market trends and economic indicators allows to reduce risks and plan activities;

– improves the quality of service: personalization of products and services improves customer experience, digital assistants and chatbots provide fast and high-quality service;

– maintains financial stability: financial analysis and trade automation increase the efficiency of financial operations, risk management and fraud reduction help minimize financial losses;

– stimulates innovation: AI promotes the development of new technologies and accelerates the introduction of innovations.

The integration of artificial intelligence into the modern economic paradigm is an irreversible process that leads to an increase in the efficiency of production and management processes, strengthening the competitive position of business entities and stimulating innovation. The variety of AI functionalities covering a wide range of economic sectors is presented in detail in Table 2.

Table 2

Analysis of modern models of artificial intelligence implementation in the economy

Industry	Application of AI	Economic effect
Finance	algorithmic trading	increasing the speed and efficiency of trading, reducing risks
Retail trade	recommendation systems	increase sales, increase customer loyalty
Logistics	optimization of routes	reduction of fuel costs, shorter delivery time
Production	predictive maintenance	reduced repair costs, increased productivity
Marketing	chat bot	reduced maintenance costs, increased customer satisfaction
Healthcare	diagnosis of diseases	improving the accuracy and speed of diagnostics
Agriculture	husbandry	reducing resource costs, increasing yields
Energy	smart grids	reducing energy losses, improving network efficiency

Modern economic systems demonstrate the growing integration of artificial intelligence technologies, which is reflected in various industries. AI applications range from optimizing operational processes to complex data analysis and forecasting market trends.

In the financial sector, AI-driven algorithmic trading automates trading operations based on market data analysis, which helps to increase efficiency and reduce risks. In

retail, AI-powered recommendation systems analyze consumer behavior to provide personalized recommendations, which increases sales and customer loyalty.

In logistics, AI optimizes delivery routes by taking into account various factors, which reduces costs and shortens delivery times. In manufacturing, predictive maintenance based on the analysis of sensor data allows to predict equipment breakdowns, which reduces repair costs and increases productivity.

In marketing, AI-driven chatbots automate customer service, reducing costs and increasing customer satisfaction. In healthcare, AI helps diagnose diseases by analyzing medical images. In agriculture, AI is used for precision farming, optimizing watering and fertilization. In the energy sector, AI manages smart grids, optimizing the distribution of electricity.

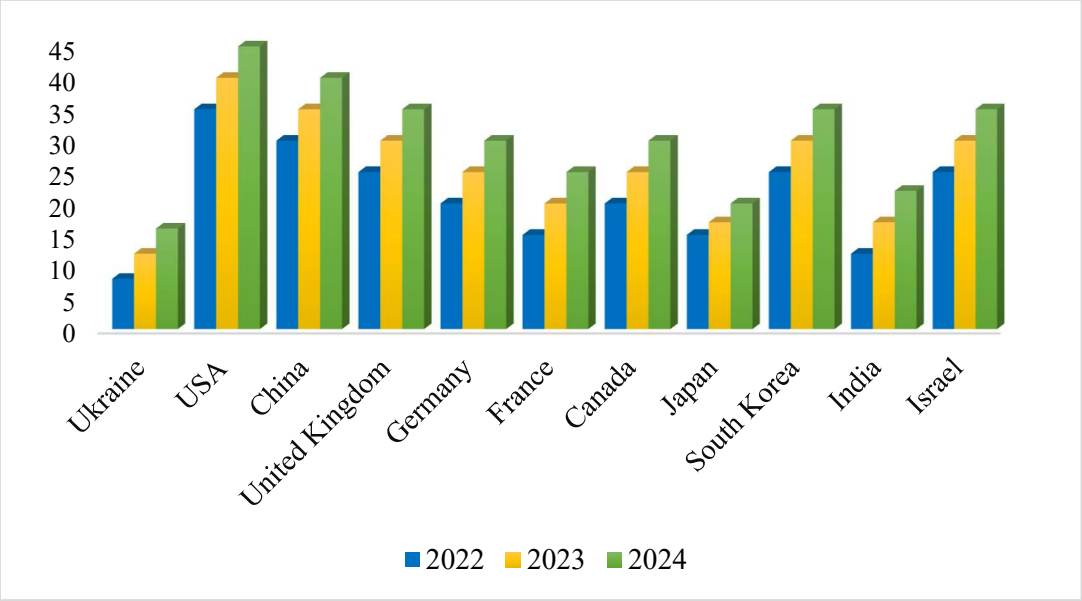


Fig. 1. Dynamics of artificial intelligence technologies adoption among enterprises in selected countries in 2022-2024

The preliminary analysis of the estimated data shows that countries such as the United States and China will lead the way in the adoption of artificial intelligence among enterprises in 2022-2024, which may be due to significant investments in AI research and development, developed technological infrastructure, and active government support. At the same time, other developed economies, such as the UK, Germany, Canada, and South Korea, are also demonstrating significant rates of AI adoption, albeit from slightly lower initial rates. Ukraine, according to rough estimates,

is still lagging behind in terms of implementation, which may be due to economic and geopolitical factors, but also shows positive dynamics in the growth of interest and application of AI technologies.

The integration of artificial intelligence technologies into economic processes is a crucial factor in increasing total factor productivity and operational efficiency at the micro and macro levels. Empirical data, including statistical reports from leading analytical agencies, show a correlation between the introduction of AI and tangible improvements in the automation of production cycles, optimization of logistics systems, in-depth analysis of big data for strategic decision-making, and qualitative improvement of customer interaction.

The introduction and use of artificial intelligence technologies have a significant impact on economic processes, creating new business opportunities and optimizing existing management and production models. AI can significantly reduce operating costs, increase process efficiency, and improve decision-making accuracy by analyzing large amounts of data. Given these advantages, companies and governments around the world are actively investing in the development and integration of such technologies. In countries with a high level of technological development, such as the United States, China, and the United Kingdom, investments in AI contribute to the creation of innovative products and services, which significantly increases the competitiveness of their economies in the global market.

One of the main factors driving the adoption of AI is the significant reduction in production and maintenance costs, in particular through automation and forecasting. For example, in the agricultural sector, AI technologies make it possible to accurately determine the optimal conditions for crop growth, which reduces resource costs and increases yields. In the manufacturing industry, predictive maintenance helps to significantly reduce equipment downtime and repair costs.

However, we cannot ignore the challenges faced by countries seeking to integrate AI into their economies. Among the main barriers are the lack of qualified personnel, high research and development costs, and difficulties in regulating such technologies at the legislative level. Therefore, an important component for the successful

implementation of AI is the creation of a favorable legal and institutional environment that would ensure the security, transparency and ethical use of such technologies. It should be emphasized that the future of economic development is directly linked to the introduction and use of artificial intelligence technologies. Given the rapid pace of development and globalization of technology, countries that can effectively integrate AI into their economic systems will have a significant advantage in the global marketplace. In Ukraine, in particular, it is necessary to create conditions for the development of this area, in particular through investments in education, infrastructure and the development of the innovation economy.

Conclusions. Thus, the introduction and use of artificial intelligence technologies is undoubtedly a powerful driver of economic transformation, leading to a significant increase in productivity, optimization of business processes at all levels, and creation of new economic values that were previously unattainable. Automation of routine tasks, intelligent analysis of large amounts of data, and personalization of services based on machine learning algorithms not only increase the operational efficiency and competitiveness of individual enterprises, but also contribute to the formation of new business models and market niches.

At the same time, the integration of AI is accompanied by a number of important challenges, including changes in the labor market related to job automation, complex ethical issues arising from the autonomy of AI systems and the use of personal data, the need to develop adequate legal regulation to ensure accountability and transparency, and the critical importance of ensuring cybersecurity in the context of growing dependence on digital technologies. Successful utilization of the multifaceted potential of AI requires a balanced and strategic approach that includes active stimulation of innovation, continuous improvement of the regulatory framework with due regard to ethical and social implications, as well as large-scale investments in education and development of digital infrastructure.

Artificial intelligence is emerging not only as a disruptive force for outdated economic models, which inevitably leads to their transformation, but also as a key element in shaping a new paradigm of socio-economic development focused on

efficiency, innovation, and sustainability. Its widespread implementation in various sectors of the economy contributes not only to increasing labor productivity and optimizing the use of resources, but also to a significant reduction in operating costs, which together creates new, often unexpected, competitive advantages at the local and global levels.

At the same time, the adaptation of existing economic systems to the new realities determined by the ubiquity of AI requires a comprehensive and systematic approach, including effective government regulation to minimize negative consequences, the development of modern and secure digital infrastructure, and the creation of effective mechanisms for continuous training and retraining of the workforce to adapt to changing labor market requirements. Further research in this area should be aimed at developing effective and practically oriented strategies for using AI to ensure inclusive and sustainable economic growth in the context of continuous global technological change, while taking into account the social, ethical and legal aspects of its implementation.

Looking ahead, it is clear that AI integration will have a profound impact on the structure of economic sectors. Further automation of routine and monotonous tasks is expected, which will lead to the redistribution of labor resources and the emergence of new professions related to the development, implementation, and maintenance of AI systems. This will require education and training systems to be flexible and able to quickly adapt to new labor market needs, providing employees with the necessary skills and competencies to succeed in the digitalized economy. In addition, the development of AI opens up new opportunities for innovation in products and services, creating the basis for the growth of high-tech industries and improving the quality of life of citizens.

International cooperation in the field of AI regulation is also an important aspect. Since AI technologies are global in nature, harmonization of ethical norms, security standards, and legal frameworks at the international level is critical to ensure the sustainable and responsible development of this field. The exchange of experience and best practices between countries, as well as joint research, can contribute to a more efficient use of AI's potential to address global economic and social challenges.

For Ukraine, the successful integration of AI into the economy is a strategic priority that can ensure accelerated economic growth, increase the competitiveness of national enterprises, and strengthen its position in the international arena. To achieve this, it is necessary to intensify efforts to develop digital infrastructure, stimulate investment in AI startups and R&D projects, create a favorable regulatory environment, and ensure a high level of education and digital literacy among the population. Particular attention should be paid to supporting small and medium-sized businesses in the process of implementing AI technologies, as this sector has significant potential for innovation and job creation.

In conclusion, we can say that artificial intelligence is a key technology of the 21st century that will have a decisive impact on the further development of the global economy. Its effective and responsible use opens up unprecedented opportunities for economic growth, welfare and solving complex socio-economic problems. However, in order to fully realize this potential, coordinated efforts by the state, business, the scientific community and civil society are needed to create favorable conditions for innovation, human capital development and the formation of ethical and legal norms in the field of artificial intelligence. Further interdisciplinary research will play an important role in understanding the complex implications of AI and developing effective strategies to ensure its positive impact on society and the economy in the long run.

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