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USING ARTIFICIAL INTELLIGENCE IN LOGISTICS PROCESSES AND ITS ECONOMIC RESULTS

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Abstract

This article analyzes the economic efficiency of using artificial intelligence (AI) technologies in logistics processes. It examines the potential for cost reduction, service quality improvement, and environmental sustainability through AI-based route optimization, warehouse management, and predictive analytics. The economic outcomes of AI implementation in logistics are highlighted based on global company experiences and statistical data.

Keywords

Artificial intelligence, logistics, economic efficiency, automation, route optimization, predictive analytics, warehouse management.

Аннотация

В данной статье анализируется экономическая эффективность использования технологий искусственного интеллекта (ИИ) в логистических процессах. Рассматриваются возможности снижения затрат, повышения качества обслуживания и достижения экологической устойчивости через оптимизацию маршрутов, управление складами и прогнозный анализ. Экономические результаты применения ИИ в логистике освещаются на основе опыта глобальных компаний и статистических данных.

Ключевые слова

Искусственный интеллект, логистика, экономическая эффективность, автоматизация, оптимизация маршрутов, прогнозный анализ, управление складами.

In recent years, the rapid development of digital technologies, in particular artificial intelligence (AI) systems, has led to fundamental changes in various fields, including the logistics system. Logistics is a system for managing the movement of products, services, information and resources from source to consumer, and is an

important link in the production and distribution chain. The increasing complexity of logistics processes, increased competition in the market and increasing customer demand require the introduction of innovative approaches to this area.

Artificial intelligence technologies are creating opportunities in the logistics system such as automated decision-making, real-time data analysis, optimization of transport and warehouse operations, planning of cargo routes, as well as risk forecasting. All this serves to reduce logistics costs, improve the quality of service and improve overall economic efficiency. Research shows that companies using AI-powered systems are managing their supply chains more effectively, resulting in shorter lead times and better customer satisfaction. In particular, technologies such as machine learning, natural language processing, computer vision, and smart sensors are enabling greater accuracy and speed across all stages of logistics operations.

In the modern economic environment, the logistics industry has become one of the main factors of global competitiveness. The development of information technologies, especially advanced achievements in the field of artificial intelligence (AI), is causing fundamental changes in the logistics sector. Previously manual operations are now being performed using automated systems, which increases efficiency and reduces costs. Applications of artificial intelligence in logistics processes:

1. Route planning and transportation optimization: Artificial intelligence algorithms help analyze and plan transportation routes, which allows you to save time and reduce travel costs. For example, traffic analysis, predicting traffic jams within the city and choosing the fastest routes.

2. Warehouse management: Artificial intelligence helps optimize inventory in warehouses, place goods in stock and increase warehouse efficiency. This is especially useful for analyzing supply and demand in real time.

3. Robotics and automation: Robots based on artificial intelligence are used to automatically place and return goods in warehouses. This speeds up operations and reduces errors.

4. Forecasting and demand analysis: Artificial intelligence systems, based on previously collected data, help in forecasting and planning future demand, which helps to avoid overstocking or understocking.

The use of artificial intelligence (AI) in logistics processes has been widely studied in recent years from a scientific and practical perspective. Various experts and organizations have conducted research in this area.

Consulting companies such as McKinsey & Company have analyzed the role of AI technologies in increasing the efficiency of logistics. According to their

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research, AI can reduce delivery times and reduce costs. Scientists at MIT (Massachusetts Institute of Technology) have developed methods for predicting problems in logistics chains using artificial intelligence. DHL Logistics uses automated systems based on artificial intelligence to manage warehouses and optimize routes. Their reports show that efficiency has increased by 20-30% due to these technologies. The Fraunhofer Institute in Germany has conducted research on the adaptation of artificial intelligence and digital technologies for industrial logistics. Preliminary research is also being conducted in Uzbekistan in this area. In particular, the Tashkent University of Information Technologies and some private logistics companies are testing pilot projects in this regard. As a result of these studies, it was found that the use of artificial intelligence in logistics leads to the following positive economic results: cost reduction; time savings; efficient use of resources; improved quality of customer service; real-time monitoring and analysis capabilities.

Table 1

Economic benefits of artificial intelligence in logistics processes.

Y	Reduce costs (%)	Increase work productivity (%)	Customer service level (%)
2	12%	18%	15%
2	14%	20%	17%
2	10%	25%	20%
2	13%	30%	22%

Source: Prepared by the author based on statistical data.

From 2020 to 2023, costs in the logistics system decreased by an average of 2-3% per year through the use of artificial intelligence technologies. This indicator was at its lowest in 2022 - 10%, but in 2023 it increased again and amounted to 13%. As a result of the integration of artificial intelligence into business processes, the efficiency of production or service provision has steadily increased. In 2020, this indicator was 18%, and in 2023 it reached 30%. This indicator grew due to automation, rapid decision-making and efficient use of resources using AI. The quality of customer service has also improved year by year. The 15% figure in 2020 has reached 22% in 2023, which is the result of the introduction of artificial intelligence to identify customer needs, personalized services, and fast delivery systems. As can be seen from this table, the application of artificial intelligence to

the logistics sector is an important factor in increasing financial savings, efficiency, and customer satisfaction.

The wider application of artificial intelligence in logistics networks creates the opportunity to provide automation in various parts of the network. Optimization of logistics networks can be carried out in the following areas. Transportation systems can be optimized, in which artificial intelligence helps cargo transportation and transport systems work more efficiently. The location and status of vehicles are monitored in real time, and the most efficient and cost-effective methods of transporting goods are determined. and Warehouses and supply chains are also likely to be optimized, in which case automated warehouse and supply chain management systems will mainly allow for real-time monitoring of the movement of resources and products. These processes increase the efficiency of the supply chain. At the same time, AI cannot fail to have an impact on global logistics networks. There are several examples of artificial intelligence causing changes in logistics networks on a global scale.

For example: Companies like Amazon and Alibaba are using automated warehouse systems and real-time route optimization technologies to manage their businesses more efficiently. Large logistics companies like Maersk are using artificial intelligence to optimize maritime transport and container management, improving transportation systems around the world.

Table 2

Expanded use of artificial intelligence in logistics systems

Network	**Scope of application**	**The effect**
Transportation systems	Road optimization, transportation	Increase speed, reduce costs
Warehouses and inventory	Product tracking and storage	Making resource management effective
Supply chain	Delivery optimization	Accelerate and manage the chain efficiently

Source: Prepared by the author based on statistical data.

It clearly shows how artificial intelligence can improve efficiency at each stage of logistics processes. In transport systems, artificial intelligence is used in route optimization and cargo transportation processes. As a result, traffic is accurately planned, which leads to increased speed and reduced operating costs. When artificial intelligence is introduced into product tracking and storage processes,

resource use becomes much more efficient. This system allows for real-time control of product stocks, which prevents the accumulation of excess inventory. By optimizing deliveries, artificial intelligence helps maintain balance at all stages of the supply chain. This allows for faster and more efficient chain management. In general, it highlights the specific areas in which artificial intelligence technologies are used in logistics and their practical impact. These technologies automate processes, increase efficiency, and bring economic benefits.

Artificial intelligence is taking an important place in the logistics sector. It enhances competitiveness by automating, increasing efficiency and reducing costs. In the near future, AI technologies will become an important tool not only for large companies, but also for small and medium-sized businesses. In Uzbekistan, digital technologies have also been introduced in the logistics sector in recent years. In particular, the UzAuto Motors company has automated the spare parts delivery system using artificial intelligence. This has reduced logistics time by 18%. Automation and optimization of logistics processes not only increase operational efficiency, but also bring economic benefits to companies. The development and widespread use of these technologies create new opportunities in the logistics sector and make the market more competitive.

The introduction of artificial intelligence technologies into logistics processes is now not only a modern need for enterprises, but also a strategic solution aimed at increasing economic efficiency. The results of the study show that artificial intelligence-based systems have the potential to optimize transportation and delivery processes, automate warehouse operations, and make accurate forecasts based on data, which will save businesses time, money, and resources. With the help of artificial intelligence technologies, accuracy, speed and flexibility are increasing at various stages of logistics activities. This creates a basis for enterprises to maintain competitiveness in the market, provide high-quality service to customers and develop sustainably. In particular, advanced tools such as machine learning, intelligent algorithms and real-time monitoring systems play an important role in managing the logistics chain.

Therefore, expanding the use of artificial intelligence in the logistics sector, studying national and international experiences in this regard and increasing technological readiness in enterprises are urgent tasks. In the future, research and innovative approaches to be carried out in this direction will undoubtedly have a positive impact on the digital development of the economy.

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