

ARTIFICIAL INTELLIGENCE IN OPTIMIZING SUPPLY CHAINS AND LOGISTICS

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Annotation: This article analyzes the role of artificial intelligence (AI) in managing and optimizing global supply chains and logistics. It substantiates the effectiveness of AI in demand forecasting, inventory management, route optimization, and warehouse automation, and examines how AI increases supply chain resilience and risk detection. The novelty of the article lies in demonstrating that AI is becoming a strategic tool for supply chain efficiency and resilience, with recommendations developed for implementing these technologies in Uzbekistan's developing economy.

Keywords: Artificial Intelligence, supply chain, logistics, demand forecasting, inventory management, route optimization, warehouse automation, machine learning, predictive analytics, resilience.

Introduction

Supply chains form the backbone of the modern global economy, spanning suppliers, manufacturers, warehouses, and retailers across many countries. Managing such complex systems is extremely difficult, and the COVID-19 pandemic exposed how vulnerable global supply chains can be. Artificial intelligence (AI) has emerged as a powerful tool for managing this complexity. AI improves demand forecasting by analyzing historical data and external factors, optimizes inventory to avoid both shortages and excess, finds the most efficient transport routes, and detects potential disruptions in advance. Given that Uzbekistan occupies an important position on transit routes between Europe and Asia, AI-driven logistics optimization carries significant economic relevance for the country.

Discussion

The application of AI in supply chain management raises three central debates. First, the accuracy of demand forecasting: AI learns complex relationships among seasonality, economic conditions, and trends, but unexpected events such as pandemics or natural disasters can reduce forecast accuracy. Second, the balance between efficiency and resilience: supply chains long optimized purely for minimal cost became vulnerable to disruption, and AI is now used to strengthen resilience as well as

efficiency. Third, data quality and integration: effective AI requires accurate, complete data from all links of the chain, yet data from different companies and systems is often incompatible and fragmented, making integration a central challenge.

Main Part

1. Demand forecasting. AI analyzes historical sales, seasonal trends, economic indicators, weather, and even social media data to predict future demand more accurately than traditional methods, preventing both lost sales and excess inventory costs.

2. Inventory management. AI continuously analyzes demand forecasts, delivery times, and costs to determine the optimal inventory level for each product, freeing up capital and reducing storage costs while preventing shortages.

3. Route and transport optimization. AI identifies the most efficient transport routes by accounting for distance, traffic, weather, and fuel costs, saving time, reducing costs, and lowering harmful emissions.

4. Warehouse automation. AI and robotics optimize product placement, direct robots in order picking, and predict workload, accelerating warehouse operations and reducing errors, particularly in large e-commerce facilities.

5. Risk management and prospects for Uzbekistan. AI detects potential disruptions in advance, increasing supply chain resilience. For Uzbekistan, positioned on key Europe–Asia transit routes, training specialists, deploying AI-based logistics systems, and developing digital infrastructure are essential next steps.

Conclusion

AI-based supply chain and logistics optimization is becoming a strategic tool for the efficiency and resilience of the modern economy. Through demand forecasting, inventory management, route optimization, and warehouse automation, AI significantly reduces costs while increasing efficiency. Challenges remain in forecasting accuracy during unexpected events and in data quality and integration. For Uzbekistan, leveraging AI in logistics is key to economic competitiveness, supported by specialist training and digital infrastructure development.