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THE INFLUENCE OF ARTIFICIAL INTELLIGENCE ON SUPPLY CHAIN MANAGEMENT

Abstract. Artificial Intelligence (AI) plays a crucial role in supply chain management by optimizing processes and improving operational efficiency. The use of AI enables accurate demand forecasting and production planning, reducing costs and minimizing risks, which significantly contributes to organizations' increased competitiveness and sustainability. AI can also analyze large volumes of data in real time, identifying patterns and trends that might go unnoticed by humans. This enables companies to make informed decisions quickly and respond promptly to market changes. In addition, AI helps automate repetitive tasks, freeing up human resources for strategic and innovative activities.

Key words: Artificial Intelligence, supply chain management.

Introduction. Artificial intelligence (AI) is becoming an important tool in optimizing and transforming the supply chain. It can accurately forecast demand and plan production, optimize inventory levels, and automate orders. In the supply chain, artificial intelligence helps in selecting the best delivery routes and tracking the movement of goods in real time. Risk management is improved through big data analysis and scenario modeling. AI also contributes to enhancing customer experience by personalizing services and improving the speed and quality of services. Overall, artificial intelligence leads to more efficient, agile, and sustainable supply chain management, which enhances productivity and customer satisfaction.

Research Methodology. In the process of determining the influence of artificial intelligence on supply chain management, methods such as the collection and processing of large datasets through machine learning techniques and predictive algorithms were utilized. Additionally, modeling and simulations are employed to assess and enhance process performance. Case studies are analyzed, and data visualization techniques are used to illustrate examples and results of AI implementation in the supply chain.

Research Results. Planning and Forecasting: Artificial intelligence (AI) plays a crucial role in improving demand forecasting and production planning, enabling companies to make more informed and accurate decisions. AI-based solutions utilize advanced algorithms and extensive data sets to predict future demand, allowing businesses to optimize their production processes and inventory management.

For instance, the consumer packaged goods industry has seen significant improvements due to AI in demand forecasting. Visualfabriq, a company specializing

in AI-based demand forecasting, uses sophisticated algorithms to analyze customer purchase history, online behavior, and market trends. This allows consumer goods manufacturers to maintain optimal inventory levels and align production with actual market demand, reducing both shortages and excess stock [1].

Stoneridge Software also highlights the integration of artificial intelligence in Microsoft Dynamics 365 for precise demand forecasting and manufacturing production. This system uses AI to analyze sales data and historical purchasing patterns, generating accurate forecasts for production needs. This helps manufacturers prioritize production schedules and manage inventory levels efficiently, reducing reliance on manual management based on spreadsheets and assumptions [2].

Another practical application can be observed in retail, where AI helps companies like Walmart predict demand for various products in different regions and seasons. By analyzing large amounts of data, AI can forecast which products will be in high demand, allowing retailers to adjust their inventory levels accordingly. This ensures that stores are well-prepared to meet customer demand, especially during peak seasons [3].

In the automotive industry, companies like BMW use artificial intelligence to forecast demand and plan production. AI algorithms analyze market trends and consumer behavior to predict the demand for different car models, helping the company optimize production processes and reduce excess inventory.

Inventory Optimization. The role of artificial intelligence in inventory management and the optimization of warehousing operations is highly important. AI plays a key role in managing inventory and optimizing warehousing operations by applying machine learning algorithms and big data analysis to improve the accuracy of inventory management and the efficiency of warehousing processes.

For example, Walmart actively uses AI to manage its inventory and optimize warehousing operations. By leveraging artificial intelligence, Walmart analyzes data on sales, weather, holiday seasons, and other factors affecting demand. This allows the company to accurately forecast product needs and restock inventory in a timely manner, avoiding both surplus and shortage of goods. Additionally, AI helps optimize the placement of goods within the warehouse, speeding up the stocking and shipping process [3].

Similarly, the logistics company DHL uses artificial intelligence to improve warehousing operations. Utilizing machine learning algorithms, DHL analyzes data on the flow of goods, transaction times, and warehouse usage. This enables the company to optimize warehouse routes, improve shelf arrangement, and increase the overall productivity of warehouse staff. AI also helps forecast the resource needs for warehouses, such as labor and equipment [4].

Another example is Amazon, which uses AI and robots to manage its warehouses. AI-based robotic systems move goods within the warehouse, automating the sorting and shipping process. This greatly accelerates order processing and reduces operational costs. AI also analyzes sales and inventory data to predict future needs and optimize real-time inventory management.

Amazon uses artificial intelligence to optimize inventory management through its Supply Chain Optimization Technology (SCOT). SCOT utilizes deep learning and large datasets to forecast demand for over 400 million products daily, determining which items should be stocked in specific quantities across different fulfillment centers. This system helps Amazon ensure that the right products are in the right places, improving inventory turnover and reducing the need for interregional shipping [5].

Additionally, Amazon employs an adaptive transportation optimization service (ATROPS) to assign optimal delivery routes as soon as a customer places an order. This technology has played a crucial role in Amazon's regionalization efforts, which have enhanced delivery speed and efficiency by fulfilling a higher percentage of orders from regional fulfillment centers. This regional focus minimizes the distance goods travel, thereby optimizing logistics and reducing operational costs [6].

Artificial intelligence is significantly changing the approach to route optimization and transportation management in logistics. Successful applications of AI in this field can be found in companies like DHL and UPS [7].

For instance, DHL uses artificial intelligence to monitor the movement of goods and identify issues in real-time. Their AI systems analyze vast amounts of data to quickly locate delayed shipments and suggest alternative routes. This allows them to take timely corrective actions and ensure on-time deliveries. DHL has also implemented OptiCarton, which optimizes container loading and reduces external packaging, leading to lower CO_2 emissions and transportation costs [8].

La rândul său, compania UPS utilizează sistemul ORION (On-Road Integrated Optimisation and Navigation), care utilizează inteligența artificială pentru a determina rutele optime pentru șoferi. ORION analizează milioane de rute alternative și le selectează pe cele mai eficiente, luând în considerare condițiile actuale de trafic și modelele de livrare. Acest lucru reduce semnificativ kilometrajul și consumul de combustibil și îmbunătățește eficiența logistică generală [7].

Totodată compnaia Amazon a implementat inteligența artificială pentru a-și gestiona flota de drone Prime Air, care asigură livrarea rapidă a coletelor mici. Aceste drone utilizează algoritmi IA pentru a planifica rute optime și a evita obstacolele pentru a asigura livrarea rapidă și sigură a comenzilor către clienți [7].

Gestionarea riscurilor. Inteligența artificială (IA) joacă un rol important în identificarea și minimizarea riscurilor lanțului de aprovizionare, asigurând acuratețe și

agilitate în procesul decizional. De exemplu, compania Coca-Cola utilizează inteligența artificială pentru a crește transparența în lanțul său de aprovizionare. Tehnologiile IA ajută la analizarea unor cantități mari de date, permițându-le să prezică perturbările viitoare și să răspundă în timp util. Aceasta include analiza istoricului aprovizionării și identificarea riscurilor potențiale, permițând companiei să evite pierderi semnificative [9].

Similarly, Everstream Analytics uses artificial intelligence to manage weather and geopolitical risks. Their platforms enable businesses to predict and mitigate the impact of events such as storms on logistics operations. This is achieved by monitoring and analyzing weather and geopolitical data to help develop effective risk mitigation strategies and ensure uninterrupted deliveries.

The Walmart network also uses artificial intelligence to manage supply chain risks. The system analyzes consumer demand data, supply information, and external factors such as weather and economic conditions to predict potential disruptions. This allows the company to take proactive measures to minimize risks, improve inventory management, and optimize logistics [10].

Conclusions. In conclusion, artificial intelligence not only enhances the accuracy of demand forecasts but also improves the overall efficiency of production planning and inventory management, leading to significant cost savings and increased customer satisfaction. AI helps international companies improve inventory management and optimize warehouse operations, making them more efficient and competitive in the market. Moreover, it has been practically demonstrated how artificial intelligence can significantly enhance transportation management and route optimization, reducing costs and improving the efficiency of logistics operations. Additionally, AI can significantly improve supply chain risk management, helping companies respond effectively to unexpected events and maintain stable operations.

Bibliography

1. AI-Driven Demand Forecasting in CPG – A comprehensive guide. URL: https://visualfabriq.com/knowledge-hub/ai-driven-cpg-demand-forecasting-guide/ (дата звернення: 13.05.2024).

2. Marcus Haug. Using AI for Accurate Demand Forecasting and Manufacturing Production. URL: https://stoneridgesoftware.com/using-ai-for-accurate-demand-forecasting-and-manufacturing-production/ (дата звернення: 03.05.2024).

3. Sam Silverstein. Walmart uses AI to predict demand. URL: https://www.supplychaindive.com/news/walmart-grocery-AI-demand-operations/585424/ (дата звернення: 10.05.2024).

4. DHL Supply Chain Continues to Innovate With Orchestration, Robotics, and AI in 2024. URL: https://www.dhl.com/us-en/home/press/press-archive/2024/dhl-supply-chain-continues-to-innovate-with-orchestration-robotics-and-ai-in-2024.html (дата звернення: 13.05.2024).

5. 5 ways Amazon is using AI to improve your holiday shopping and deliver your package faster. URL: https://www.aboutamazon.com/news/operations/amazon-uses-ai-to-improve-shopping (дата звернення: 13.05.2024).

6. Sean O'Neill. Sizing down to scale up: How Amazon reworked its fulfillment network to meet customer demand. URL: https://www.amazon.science/news-and-features/how-amazon-reworked-its-fulfillment-network-to-meet-customer-demand. (дата звернення: 11.05.2024).

7. Smarter. Faster. Cheaper: How AI Transforms Logistic in Action. URL: https://comparethecarrier.com/blog/ai-in-logistics/ (дата звернення: 04.05.2024).

8. ChatGPT and the Like: Artificial Intelligence in Logistics. URL: https://dhl-freight-connections.com/en/trends/chatgpt-and-the-like-artificial-intelligence-in-logistics/ (дата звернення: 04.05.2024).

9. How AI helps Coca-Cola boost supply chain procurement. URL: https://venturebeat.com/ai/how-ai-helps-coca-cola-boost-supply-chain-procurement/ (дата звернення: 09.05.2024).

10. Minimizing new risks in international logistics. URL: https://www.everstream.ai/articles/minimizing-new-risks-international-logistics/ (дата звернення: 10.05.2024).