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LOGISTICS PROCESS MANAGEMENT USING ARTIFICIAL INTELLIGENCE OPTIMIZATION

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ABSTRACT

Artificial Intelligence (AI) has been developing particularly fast recently and is becoming part of many areas of our daily lives. The development of artificial intelligence based on the Big Language Model has changed the job descriptions of many people. According to a Goldman Sachs study, generative AI will impact 300 million jobs, and according to a January 2023 study by platform Fishbowl, 43% of employees use AI in their professional lives. At the same time, such a rapid spread of AI is associated with some degree of danger for many. In March 2023, more than 1,000 people working in AI, including Ilon Musk, signed a petition calling for a 6-month moratorium on the development of large AI systems until their capabilities and associated threats are properly understood.

Logistics is one industry where AI can have a transformative impact. It can be used in both the storage/transportation phases of product storage and consumption. AI can help address the challenges the sector faces today - managing logistics processes/optimizing production, managing demand, ensuring the sustainability of logistics systems, and simplifying the logistics transition, including reducing production and transportation costs.

KEYWORDS

Logistics, AI, AI in Logistics, AI in Logistics Forecasting

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Introduction

1. Improving the efficiency of logistics

One of the most important scientific advances of our time is AI. By increasing productivity and maximizing the use of resources, it is helping businesses around the world

AI in logistics can offer many benefits to companies willing to adopt new technologies. The logistics sector is a fast-growing area of application of artificial intelligence, which can fundamentally change the way businesses operate.

Industry titans are developing advanced solutions for unmanned vehicles and other advanced technologies. This development will bring many benefits, including increased productivity in management tasks such as order fulfillment, improved inventory accuracy, shorter delivery times, and more accurate forecasting models [1-5].

Artificial intelligence solutions can be used to manage transportation contracts, negotiate shipping and procurement rates, and identify steps in the supply chain that can be improved to increase profits. At the same time, it is possible to achieve a reduction in processing costs by about 15-20 % (all production costs, excluding raw material costs); Up to 70 % of the cost reduction is achieved due to high labor productivity. According to McKinsey, the first 16 companies to successfully implement AI-based solutions in the supply chain saved logistics costs by 15% (Fig. 1):

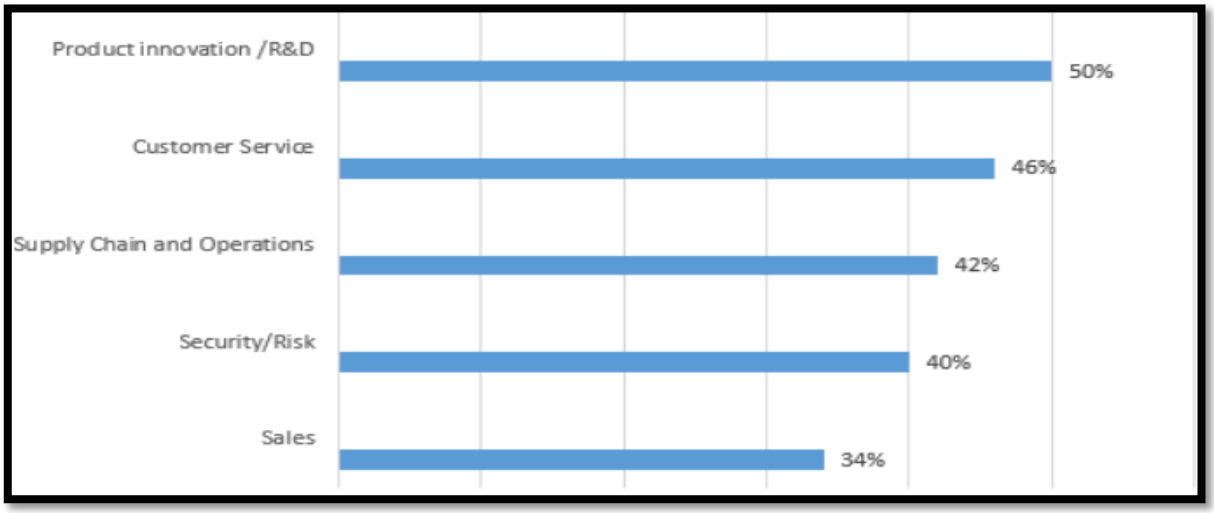

Fig. 1. Top areas where businesses are driving revenue from AI investments

Methodology

The transformation is made possible by supply chains that routinely generate vast components of data and the data processing capabilities of artificial intelligence. Artificial intelligence technology can provide real-time visibility and analysis to train machine learning (ML) models using supply chain data. Artificial intelligence-based logistics optimization helps companies deal with complex cost and supply constraints by providing in-depth analysis and finding the most optimal solutions [6-9].

Artificial intelligence technology is revolutionizing the logistics industry by speeding up the delivery of goods. Logistics using artificial intelligence has a number of advantages. Artificial intelligence can be used to improve every stage of the logistics process (Fig.2):

Fig. 2. The benefits of AI in logistics

2. The future of AI in logistics

Businesses will be able to collect more data about their customers, supply chain, delivery, fleet, drivers, and other topics as logistics and trucking organizations become increasingly digital. Leading logistics companies have already begun using AI in the transportation industry. While many businesses are currently collecting this data and will continue to do so in the future, it remains underutilized [9-14].

The real possibilities of enterprise data are finally being unlocked with artificial intelligence solutions. This will allow users to gain experience; It also improves fleet management, speeds up delivery, reduces breakdowns and improves overall business profitability. All participants in the logistics and transportation ecosystem can benefit from AI, but sustaining development takes time and money **(**Fig. 3):

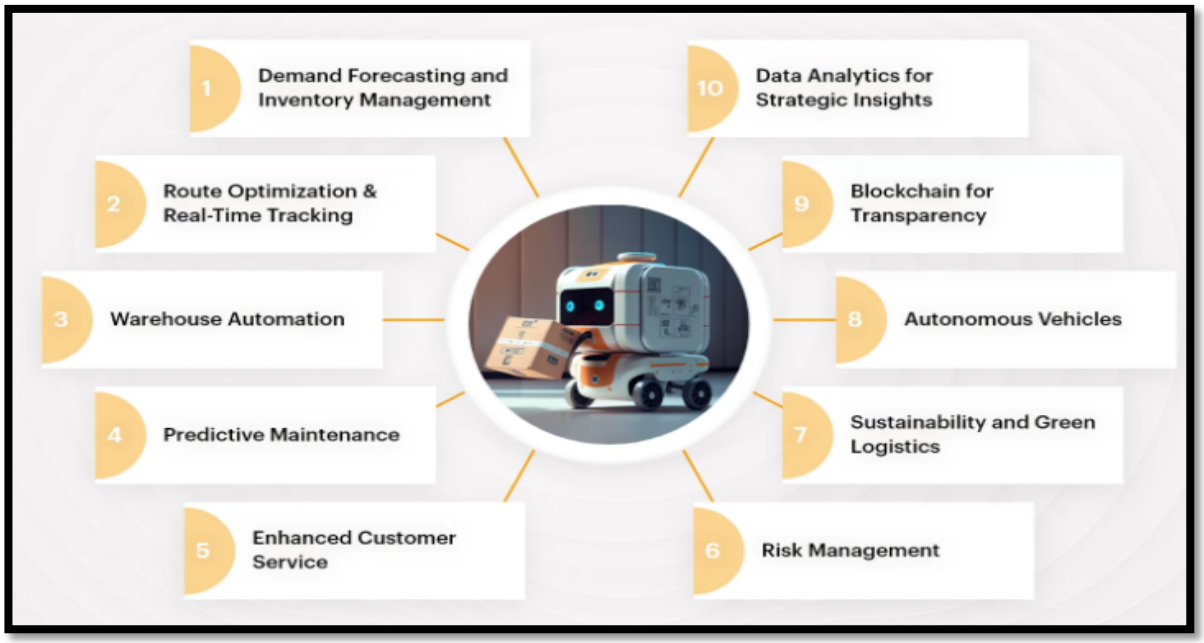

Fig. 3. Role of AI in logistics

3. Supply chain integration through AI

Supply chain integration, enhanced by the power of artificial intelligence (AI), is a key element for improving efficiency, transparency and sustainability in modern logistics. AI enables the automation and optimization of multiple aspects of supply chains, ensuring the smooth flow of goods from suppliers to end consumers. AI enables the integration and analysis of data from all stages of the supply chain, including manufacturing, storage, transportation and retail, which improves forecasting and planning accuracy.

Discussion - Data integration improves transparency in the supply chain, allowing companies and end users to track the origin and condition of goods. AI can automatically identify procurement needs and place orders with suppliers, optimizing inventory levels and minimizing surpluses. AI optimizes logistics processes, including carrier selection, route planning and warehouse management, which speeds delivery and reduces costs.

AI helps reduce the carbon footprint of supply chains through more efficient route planning and optimization. Using AI to manage energy consumption in warehouses and transportation processes helps reduce environmental impact. AI facilitates data sharing and coordination between different supply chain actors, improving overall efficiency and partner satisfaction.

The integration of different systems and technologies requires considerable effort in terms of change management, staff training and data compatibility. Data must be protected and misuse prevented when integrating different information systems. AI-enabled supply chain integration opens up new opportunities to improve efficiency, sustainability, and transparency in logistics. It allows companies to be more flexible and adaptive to changes in market conditions and consumer needs (Fig. 4):

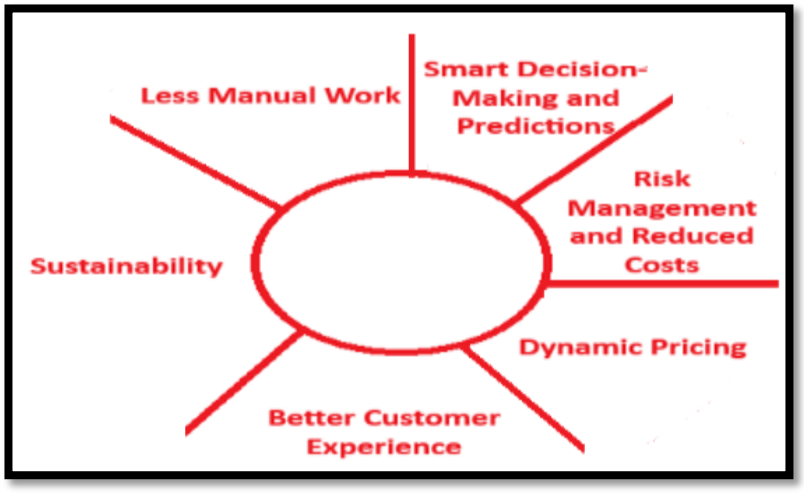

Fig. 4. Benefits af AI in Transportation & logistics

5. Examples of artificial intelligence applications in logistics

- **Amazon** uses **Kiva robots** in its warehouses to automate the picking process. These robots move around the warehouse, automatically picking shelves of goods and delivering them to employees' workstations, which significantly reduces order picking time and increases overall warehouse efficiency.
- **Maersk** has partnered with **IBM** to develop a blockchain and AI-based platform called TradeLens. This platform allows all participants in the transportation and logistics industry to track real-time information on cargo shipments, thus reducing bureaucracy and shortening time for customs clearance and delivery.
- **UPS** uses **the ORION (On-Road Integrated Optimization and Navigation)** system to optimize delivery routes for its trucks. The system analyzes large amounts of data, including traffic, weather and delivery urgency, to determine the most efficient routes. This reduces annual fuel costs by millions of dollars and significantly reduces carbon dioxide emissions.
- **DHL** uses artificial intelligence tools to analyze demand data and optimize inventory management. AI systems analyze historical order data, social media, weather conditions and other external factors to accurately predict future demand for goods. This helps the company optimize inventory and reduce storage costs.
- **Walmart** is implementing automated systems for in-store inventory using robots and AI. Robots scan the shelves, automatically detecting missing, incorrectly placed or expired products. This allows for rapid stock renewal and improved customer service [14-19].

Conclusions

Using AI to improve supply chain and logistics operations is an innovative step for companies operating in this sector. Artificial intelligence can speed up and simplify many important processes, including: automating routine processes that would take a long time to complete manually; Improving operational efficiency, accuracy and minimizing human error. As a result, the use of artificial intelligence in logistics reduces costs and increases the number of satisfied customers.

The application of AI in logistics and supply chain management is opening up new opportunities to create more efficient, cost-effective and environmentally sustainable systems. From warehouse automation to delivery optimization, AI not only improves efficiency but also contributes to more sustainable development.

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