
ROLE OF ARTIFICIAL INTELLIGENCE IN SUPPLY CHAIN MANAGEMENT

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Abstract :

Supply Chain Management (SCM) plays an important role in connecting suppliers, manufacturers, warehouses, and customers. In today's competitive business environment, companies face challenges such as demand uncertainty, inventory problems, delays, and high operational costs. Artificial Intelligence (AI) has emerged as a powerful technology to improve supply chain efficiency and decision-making. AI uses techniques like machine learning, predictive analytics, and automation to analyse large amounts of data and provide accurate forecasts. This paper studies the role of AI in various supply chain activities such as demand forecasting, inventory management, logistics, supplier selection, and risk management. The study highlights how AI helps businesses reduce costs, improve accuracy, and enhance customer satisfaction. It also discusses challenges in adopting AI and the future scope of AI in supply chain management.

Keywords : Artificial Intelligence, Supply Chain Management, Demand Forecasting, Inventory Management, Automation, Machine Learning, Predictive Analytics, Logistics Management, Warehouse Automation, Supplier Management, Risk Management, Big Data Analytics, Internet of Things (IoT), Smart Supply Chain

Introduction :

Supply Chain Management refers to the management of the flow of goods, services, information, and finances from raw material suppliers to final consumers. An efficient supply chain helps organizations reduce costs, improve delivery time, and increase customer satisfaction. However, traditional supply chain systems often face problems such as inaccurate demand forecasting, excess inventory, delays in transportation, and lack of real-time information.

Artificial Intelligence is transforming supply chain management by using data-driven decision-making and automation. AI systems can analyse historical data, predict future demand, optimize inventory levels, and improve logistics planning. As a result, businesses are increasingly adopting AI to make their supply chains more flexible, accurate, and efficient.



Objectives of the Study :

1. **To examine the impact of Artificial Intelligence on supply chain efficiency** : Study how AI improves forecasting, inventory control, transportation, and warehouse management.
2. **To analyse the role of AI in demand forecasting and planning** : Evaluate how AI-based predictive analytics enhances accuracy in demand prediction.
3. **To assess the contribution of AI in cost reduction and risk management** : Identify how AI minimizes operational costs and supply chain disruptions.
4. **To evaluate AI applications in logistics and transportation management** : Study route optimization, fleet management, and real-time tracking systems.
5. **To understand the challenges in implementing AI in supply chain management** : Examine barriers such as high investment cost, lack of skilled workforce, and data security concerns.
6. **To study the impact of AI on decision-making processes** : Analyse how AI supports real-time and data-driven managerial decisions.

Methods of Data Collection :

Secondary Data Collection :

- **Books and Academic Journals** : Reference materials related to AI and supply chain management.
- **Research Papers and Case Studies** : Published studies on AI applications in supply chain industries.
- **Websites and Online Databases** : Industry reports from organizations like **McKinsey & Company, Gartner, and Deloitte**.
- **Government and Industry Reports** : Reports from logistics and commerce ministries, trade associations, and supply chain bodies.

Concept of Artificial Intelligence :

Artificial Intelligence is a branch of computer science that enables machines to perform tasks that normally require human intelligence. These tasks include learning from data, problem-solving, decision-making, and pattern recognition.

Common AI techniques used in supply chain management include:

- **Machine Learning (ML)** : Helps systems learn from past data and improve predictions.
- **Predictive Analytics** : Used for forecasting demand and identifying future trends.
- **Robotics and Automation** : Used in warehouses and production units.
- **Natural Language Processing (NLP)** : Used in chatbots and supplier communication.



Supply Chain Management: An Overview :

Supply Chain Management includes the following major activities :

- Procurement of raw materials
- Production and manufacturing
- Inventory management
- Transportation and logistics
- Distribution to customers

The main objectives of SCM are cost reduction, timely delivery, quality improvement, and customer satisfaction. AI helps in achieving these objectives more effectively.

Role of AI in Supply Chain Management :

1. Demand Forecasting :

AI helps organizations predict future demand accurately by analysing historical sales data, market trends, seasonality, and customer behaviour. Accurate forecasting reduces the risk of overstocking and stock-outs.

2. Inventory Management :

AI systems suggest optimal inventory levels by balancing demand and supply. This helps in reducing storage costs and avoiding excess inventory. Automated inventory tracking also improves accuracy.

3. Logistics and Transportation :

AI improves route planning, delivery scheduling, and fuel efficiency. It helps companies choose the best transportation routes, reducing delivery time and transportation costs.

4. Supplier Selection and Management :

AI evaluates supplier performance based on quality, cost, reliability, and delivery time. This helps businesses select the best suppliers and maintain strong supplier relationships.

5. Risk Management :

AI identifies supply chain risks such as supplier failure, demand fluctuations, and transportation delays. Early detection of risks helps organizations take preventive measures.

6. Warehouse Automation :



AI-powered robots and automated systems are used in warehouses for sorting, packing, and storage. This improves speed, accuracy, and labour productivity.

Benefits of AI in Supply Chain Management :

- Improved forecasting accuracy
- Reduced operational and inventory costs
- Faster and efficient decision-making
- Better customer service
- Increased transparency and visibility
- Enhanced flexibility and responsiveness

Challenges in Implementing AI :

Despite its benefits, AI adoption in supply chain management faces some challenges:

- High initial investment cost
- Requirement of high-quality data
- Lack of skilled professionals
- Data security and privacy concerns
- Resistance to technological change

Future Scope of AI in Supply Chain Management :

The future of AI in supply chain management is very promising. With advancements in big data, Internet of Things (IoT), and real-time analytics, AI systems will become more accurate and intelligent. In the future, fully autonomous supply chains with minimal human intervention are expected. AI will also support sustainable and green supply chain practices.

Conclusion :

Artificial Intelligence is playing a significant role in transforming supply chain management. It improves efficiency, accuracy, and responsiveness across all supply chain activities. Although challenges exist, the benefits of AI far outweigh the limitations. Organizations that adopt AI-based supply chain systems can gain a competitive advantage and achieve long-term growth. Therefore, AI can be considered a key driver of modern and efficient supply chain management.

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