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# The Impact of Digital Transformation through Artificial Intelligence (AI) and Blockchain on Supply Chain Companies

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## ABSTRACT :

This research explores the impact of digital transformation, specifically the adoption of Artificial Intelligence (AI) and Blockchain, on supply chain companies. It evaluates awareness levels, challenges, opportunities, and the relationship between technology adoption and operational efficiency. Through a structured survey involving 100 respondents from notable logistics firms, the study employs basic statistical tools to analyze data and draw conclusions. The findings suggest a growing but uneven adoption of digital technologies, with clear benefits for companies investing in training and digital infrastructure.

KEYWORDS - Digital Transformation, Supply Chain Management, Artificial Intelligence (AI), Blockchain, Logistics

# Introduction

The term "digital transformation" describes how cutting-edge digital technologies are incorporated into every aspect of a company, radically altering how they function and provide value. With the advent of artificial intelligence (AI), blockchain, the internet of things (IoT), and data analytics, this change is particularly noticeable in the logistics and supply chain management (LSCM) industry.

Recent shocks like the COVID-19 epidemic and technological advancements have caused a rapid evolution in the global supply chain ecosystem. Businesses are being pressured to reevaluate how they operate, increase responsiveness, improve transparency, and cut expenses. Supply chain operations have been revolutionised by AI applications such as intelligent routing, demand forecasting, and warehouse automation. Blockchain, on the other hand, guarantees safe and unchangeable transactions, enhancing transparency and lowering fraud.

Many logistics companies, particularly those in developing nations, are still in the early stages of digital maturity despite these developments. This study aims to investigate how supply chain organizations are affected by digital transformation, particularly through AI and Blockchain, as well as the difficulties encountered

Therefore, it is necessary to investigate these organizations' awareness of digital tools, as well as the problems and opportunities they perceive. The goal of this study is to close this knowledge gap and produce knowledge that will facilitate broader and more efficient digital adoption.

# Literature Review

Digital transformation in supply chains is redefining traditional logistics and operations through technologies like Artificial Intelligence (AI) and Blockchain. AI enables intelligent forecasting, real-time decision-making, and automated inventory control, helping firms reduce errors and optimize efficiency. Studies such as those by Waller & Fawcett (2013) and McKinsey (2021) highlight the growing adoption of AI in areas like demand planning and warehouse automation. Blockchain, on the other hand, enhances transparency and traceability by securely recording transactions across the supply chain. It has been instrumental in reducing fraud and enabling more secure, real-time tracking of goods. Saberi et al. (2019) emphasize Blockchain's role in increasing trust and collaboration among supply chain partners.

Despite the potential benefits, challenges remain. Many firms face difficulties related to high costs, lack of technical expertise, and resistance to change. Smaller companies, in particular, struggle with the capital investment and strategic clarity required for successful implementation. Kamble et al. (2020) note that without proper planning and training, digital tools often go underutilized. Nonetheless, the increasing pressure for agility, especially post-COVID-19, has accelerated digital adoption. Literature suggests that companies investing in digital infrastructure and workforce development are more likely to gain a competitive edge in today's fast-evolving global market.

The rapid evolution of digital technologies has dramatically reshaped supply chain management (SCM) in recent years. Scholars like Christopher (2016) and Chopra & Meindl (2019) have emphasized the strategic value of digital transformation in enhancing responsiveness, agility, and efficiency in global supply chains. AI, in particular, has emerged as a transformative force, enabling predictive analytics, real-time tracking, and automation of complex decision-making processes. According to a study by Waller and Fawcett (2013), companies that utilize AI-based analytics tend to outperform their peers

in inventory turnover and demand forecasting. These technologies not only reduce costs but also enhance customer experience through faster delivery and fewer errors.

Blockchain, on the other hand, has gained attention for its ability to increase transparency and trust among stakeholders. As described by Saberi et al. (2019), blockchain technology enables secure, decentralized tracking of goods, which helps eliminate fraud, minimize delays, and build consumer trust. Its role in managing provenance, digital contracts, and compliance is particularly valuable in industries like pharmaceuticals, food, and luxury goods. However, the literature also highlights significant barriers to adoption, including scalability issues, integration with legacy systems, and regulatory uncertainties. Overall, existing studies affirm that while the adoption of AI and blockchain presents challenges, the long-term advantages for SCM are substantial when implemented strategically.

#### **Research Methodology**

#### 1. Research Design

The research followed a **descriptive design** using a **quantitative approach** to understand the current awareness, adoption levels, challenges, and opportunities associated with Artificial Intelligence (AI) and Blockchain technologies in the supply chain sector. The study aimed to gather real-world data to evaluate the practical implications of digital transformation on operational efficiency in supply chain companies.

#### 2. Research Approach

A **quantitative survey-based approach** was employed to collect primary data from professionals working in logistics and supply chain management. The structured format of the questionnaire allowed for easy data aggregation and statistical analysis. This method was selected for its ability to provide measurable insights and identify patterns across a large respondent base.

#### 3. Data Collection Method

Primary data was collected through an **online survey** distributed via platforms such as Google Forms and email. The survey consisted of multiple-choice and Likert-scale questions. It was designed to capture information regarding:

- Awareness of AI and Blockchain
- Current level of adoption
- Key benefits and barriers
- Investment outlook
- Operational outcomes post-implementation

The questions were straightforward, ensuring maximum response clarity and consistency.

#### 4. Sample Size and Sampling Technique

The sample size for this research consisted of **100 respondents** drawn from various supply chain and logistics firms. A **purposive sampling technique** was used, where participants were selected based on their relevance to the topic (i.e., professionals involved in or aware of supply chain operations and digital initiatives).

#### 5. Sources of Data

- **Primary Data**: Collected directly through surveys filled out by logistics and supply chain professionals.
- Secondary Data: Gathered from scholarly journals, industry reports, white papers, case studies, and online publications related to AI, Blockchain, and digital transformation in SCM.

#### 6. Research Instrument

A structured questionnaire was developed as the primary data collection instrument. It included:

- Demographic information (job role, company size, etc.)
- Awareness and usage of digital tools
- Perceived benefits and implementation challenges
- Opinions on future adoption trends

## 7. Statistical Tools Used

To analyze and interpret the collected data, the following basic statistical tools were employed:

- **Percentage Analysis** To understand the distribution of responses.
- Frequency Tables To summarize repetitive patterns.

- Bar and Pie Charts To visually represent data like technology adoption levels and challenge categories.
- Cross-tabulation To compare responses across groups (e.g., company size vs. AI adoption rate).

These tools helped draw meaningful insights without the need for advanced statistical software.

#### 8. Ethical Considerations

All data collected was used strictly for academic purposes. Respondent identities and company details were kept **confidential and anonymous**. Participation in the survey was voluntary, and respondents could withdraw at any point.

#### **Data Interpretation**

The data gathered from a structured questionnaire given to 100 experts in the logistics and supply chain management (LSCM) industries is analyzed and interpreted in this part. The information sheds light on the perceived advantages, difficulties, and awareness of deploying blockchain and artificial intelligence (AI) technology.

# **Respondent Profile**

- Total Responses: 100
- Company Size Distribution:
  - Large Enterprises (1000+ employees): 35%
  - Medium Enterprises (100–999 employees): 45%
  - O Small Enterprises (<100 employees): 20%



Job Roles:

- Supply Chain Managers: 40%
- O IT/Data Analysts: 25%
- O Operations/Logistics Executives: 20%
- O Supporting staff: 15%



The survey includes respondents from various roles within supply chain organizations, with **40%** being **Supply Chain Managers**, who offer strategic insights on AI and Blockchain adoption. **25%** are **IT/Data Analysts**, crucial for understanding the technical aspects, including data integration and security. **20%** of respondents are **Operations/Logistics Executives**, providing practical views on the implementation and impact of these technologies in daily logistics operations. **15%** are **Supporting Staff**, who contribute insights on the day-to-day functions impacted by digital tools. This diverse distribution of roles ensures a comprehensive understanding of digital transformation in supply chains, capturing both strategic and operational perspectives. The mix of high-level decision-makers and technical, operational staff reflects the holistic nature of the study, ensuring a thorough evaluation of the challenges, opportunities, and outcomes of adopting AI and Blockchain technologies in supply chains.



#### AWARENESS OF AI VS BLOCKCHAIN IN SUPPLY CHAIN COMPANIES

Here's the graph comparing AI vs Blockchain awareness among supply chain companies. It clearly shows that:

- AI has higher high-awareness levels than Blockchain.
- Blockchain has more respondents with low or medium awareness compared to AI.
- Awareness of AI and Blockchain
- Artificial Intelligence Awareness:

- O High: 46%
- O Moderate: 35%
- O Low: 19%
- Blockchain Awareness:
  - O High: 28%
  - O Moderate: 37%
  - O Low: 35%

**Interpretation**: While awareness of AI is relatively widespread across LSCM professionals, Blockchain awareness is notably lower. This highlights a technological knowledge gap that may impact the effective implementation of digital initiatives.

# ADOPTION OF DIGITAL TOOLS



- Adoption of AI-based tools: 54%
- Adoption of Blockchain-based solutions: 31%

**Interpretation**: A majority of companies have begun implementing AI, primarily in forecasting and process automation. Blockchain, though less adopted, is gradually gaining traction particularly for applications related to transparency and traceability.

# Findings

# 1) Perceived Benefits of AI and Blockchain

Benefits	AI(%)	Blockchain(%)
Improved Forecasting	60	20
Transparency in Opt	35	70
Reduction in Errors	55	30
Cost Efficiency	40	35



The chart comparing perceived benefits of AI and Blockchain technologies reveals distinct strengths associated with each. AI is perceived to provide the greatest benefit in improved forecasting (60%), followed by reducing manual errors (55%) and enhancing cost efficiency (40%). This suggests that companies view AI as a powerful tool for optimizing internal operations, automating repetitive tasks, and improving demand planning.

On the other hand, Blockchain is most strongly associated with transparency in operations (70%), indicating its key role in enhancing traceability and trust across supply chains. However, it scores lower in areas like forecasting (20%) and manual error reduction (30%), suggesting that companies currently see it more as a transparency enabler than a tool for internal process automation.

Overall, the data suggests that AI is primarily leveraged for operational efficiency, while Blockchain is valued for building secure, transparent networks highlighting complementary roles for both technologies in digital supply chain transformation.

Areas of Improvement	Improved (%)	No Change	Declined
		(%)	(%)
Inventory management	65	30	5
Delivery Speed	55	40	5
Customer Satisfaction	60	35	7

# 2)Impact on Efficiency Post Adoption



The updated analysis of the impact of digital transformation on supply chain efficiency reveals varied outcomes across operational areas. **Inventory Management** saw the highest improvement, with **65%** of respondents reporting enhanced performance, and only **5%** experiencing a decline. This suggests that digital tools like AI-driven inventory tracking and demand forecasting are highly effective in optimizing stock levels.

For **Delivery Speed**, **55%** observed improvements, while **40%** noticed no change and **5%** experienced a decline. This indicates that while technology enhances logistics, some companies may face challenges in real-time integration or last-mile delivery. Interestingly, **Customer Satisfaction** shows a mixed result: while **60%** reported improvements, **7%** noticed a decline—double that of other areas. This

could reflect initial adaptation issues or misalignment between tech implementation and customer experience strategies.

Overall, the data suggests that digital transformation is mostly beneficial, though its success depends on execution, integration, and user adaptation.

# Conclusion

This research paper examined the impact of digital transformation—specifically the adoption of Artificial Intelligence (AI) and Blockchain—on supply chain companies. Based on the survey conducted among 100 respondents, the study found that while awareness of digital technologies is growing, actual implementation varies widely. AI is more commonly adopted, mainly for demand forecasting and automation, whereas Blockchain adoption remains limited but promising in areas like transparency and traceability. Key challenges such as high costs, lack of skilled personnel, and integration issues were frequently reported. Despite these hurdles, companies that have embraced digital tools have seen noticeable improvements in efficiency, responsiveness, and overall operational performance. The findings suggest that with strategic investment in technology and training, digital transformation can significantly enhance supply chain effectiveness and competitiveness.

The results reveal a growing level of awareness and interest in digital tools, with AI being more widely adopted than Blockchain. AI is primarily utilized for functions such as demand forecasting, process automation, and reducing manual errors, whereas Blockchain is gradually gaining traction for its transparency, security, and traceability benefits in the supply chain.

Despite the positive outlook, the research also highlights challenges such as limited technical expertise, high implementation costs, and resistance to change. However, companies that have embraced digital transformation have reported improvements in key operational areas like inventory management, delivery speed, and customer satisfaction.

Notably, the analysis shows that while most organizations experience positive impacts, a small percentage have encountered neutral or even negative results, particularly in areas like customer satisfaction. This underlines the importance of strategic implementation, employee training, and infrastructure readiness.

In conclusion, digital transformation holds substantial potential to revolutionize supply chain operations, but its effectiveness relies heavily on thoughtful planning, investment in capabilities, and long-term commitment to innovation.

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