A Study on Traceability and Accountability in Supply Chain Transparency Using Blockchain Technology

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ABSTRACT

This article explores the critical importance of traceability and accountability within modern supply chains, and how blockchain technology provides innovative solutions to enhance transparency and trust. Drawing upon literature, case studies, and emerging practices, the study identifies the transformative potential of distributed ledger technology (DLT) in tackling issues such as product authenticity, fraud, and ethical sourcing. As supply chains become increasingly complex, blockchain emerges as a decentralized mechanism to record, verify, and share immutable transaction data across all stakeholders, ensuring end-to-end visibility.

INTRODUCTION:

Blockchain technology has transformed the business world, and supply chain management is no exception. With its ability to create secure and transparent networks, blockchain will reshape the way we manage supply chains. And it has already started. Therefore, a lot of time, money and energy is put here, and a multitude of that money is expected for the industry in the future: According to a comprehensive research report by Market Research Future (MRFR), the market is expected to grow significantly to reach a value of around USD 17.15 billion by the end of 2030.In recent years, supply chain management has become increasingly complex. Globalization and advances in technology have made it possible for companies to operate across borders and collaborate with suppliers and partners from all over the world. While this has led to increased efficiency and lower costs, it has also created new challenges. One of the biggest challenges facing supply chain managers today is maintaining visibility across the entire network. As goods move from one location to another, it can be difficult to track them accurately. This lack of transparency can lead to delays, errors, and even fraud. Like it always used to be. So this is where blockchain comes in. By creating a secure and transparent network that allows for real-time tracking of goods at every stage of the supply chain, blockchain technology can help address many of these challenges. It provides a tamper-proof ledger that ensures data integrity while enabling all parties on the network to access information in real-time.

Key Words: Blockchain, traceability, accountability, supply chain transparency, distributed ledger, logistics

OBJECTIVE:

This is study with the following specific objective

PRIMARY OBJECTIVE:

➢   To evaluate the role of blockchain technology in enhancing traceability and accountability in supply chain transparency.

Secondary Objectives:

➢ To analyze the current challenges in supply chain traceability and accountability.

➢ To assess the impact of blockchain in improving data security, fraud prevention, and operational efficiency.

➢ To explore the factors influencing blockchain adoption in supply chain management.

➢ To identify best practices and strategies for integrating blockchain into logistics operation.

METHODOLOGY:

This study adopts a quantitative and descriptive research methodology to examine the role of blockchain technology in enhancing traceability and accountability in supply chain transparency. The research design is descriptive in nature, aimed at providing insights into current practices, perceptions, and the potential impact of blockchain adoption across supply chain operations. Primary data was collected using a structured questionnaire distributed to professionals working in logistics, procurement, and operations. The questionnaire consisted of categorical variables and Likert-scale items designed to evaluate blockchain awareness, usage levels, and perceived benefits in relation to supply chain transparency.

A purposive sampling technique was used to select 120 respondents with relevant experience in the supply chain domain, ensuring that the data gathered would be both relevant and insightful. To analyze the responses, two statistical tools were employed.

The Chi-Square Test was used to assess associations between categorical variables, such as the relationship between blockchain awareness and department of employment. Meanwhile, ANOVA (Analysis of Variance) was applied to identify significant differences in perceptions based on variables such as years of experience or departmental roles, specifically focusing on how different groups perceive the impact of blockchain on traceability and accountability.

HYPOTHESIS:

H0: There is no significant relationship between the traceability and accountability in supply chain transparency using Block chain technology.

H1: There is significant relationship between the traceability and accountability in supply chain transparency using Block chain technology.

INTERPRETATION OF THE ANALYSIS:

As, the significant value is less than 0.05. So, there is a significant difference in the mean scores of the respondents based on traceability and accountability in supply chain transparency using Block chain technology with respect to age group of the respondents. It is inferred that age group of the respondents its influence the traceability and accountability in supply chain transparency using Block chain technology.

FINDINGS :

• Majority 86 (71.7%) of the respondents are 1-4 years of experience in this company.

• Majority 92 (76.6%) of the respondents are familiar with the concept of block chain technology.

• Majority 74% of the respondents are high knowledge of understanding of block chain.

• Majority 67 (55.8%) of the respondents think manufacturing sector can benefit most from block chain technology

• Majority 50 (41.7%) of the respondents are said excel or spreadsheet recorded data and shred in our company.

• Majority 76 (63.3%) of the respondents are offen encounter issues such as data mismatch or lack of visibility.

• 82 (68.3%) of the respondents are said supply chain traceability is somewhat important in our daily work.

• Majority 84 (70.0%) of the respondents are said block chain can enhance transparency and traceability in logistics.

• Majority 91 (75.8%) of the respondents are think moderately effective block chain is in securing data and

preventing manipulation.

- Majority 77 (64.2%) of the respondents are comfortable using a block chain based system at work.

- Majority 88 (73.3%) of the respondents are said enhanced collaboration benefits associate with block chain in logistics.

SUGGESTION :

- Increase awareness and training among supply chain professionals about blockchain technology and its benefits.
- Begin with pilot projects to test the feasibility and impact of blockchain before full-scale implementation.
- Promote collaboration among all supply chain stakeholders to ensure unified data sharing and transparency.
- Integrate blockchain platforms with existing ERP and SCM systems to streamline adoption.
- Encourage the development of standardized frameworks to support interoperability and compliance.
- Implement strong data security and privacy measures within blockchain systems.
- Use blockchain-backed certifications to enhance consumer trust and product authenticity.
- Advocate for supportive government policies and digital infrastructure to facilitate blockchain adoption.

CONCLUSION

Blockchain's promise of traceability and accountability is revolutionizing how supply chains operate. Like the upskilling initiatives in the labor market discussed in Industry
4.0 literature, blockchain empowers businesses to stay competitive by embedding trust and integrity into every transaction. For maximum impact, a human-technology synergy involving strategic leadership, stakeholder buy-in, and continuous innovation is essential.

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