

Blockchain in SCLM

Hariharan M¹

Student, B.Com BPS, Sri Krishna Arts and Science College, Coimbatore,
hariharanmurugesan0@gmail.com, 9894329255

Dr.C.Thiyaneswaran²

Associate Professor in Commerce, Sri Krishna Arts and Science College, Coimbatore,
thiyanes81@gmail.com, 9842246685

Abstract:

The purpose of this research is to examine the implications of blockchain technology integration on traceability, trustworthiness, and transparency in Supply Chain and Logistics Management (SCLM). This article explains how incorporating blockchain into the supply chain offers a genuine, dependable, and secure system. The purpose of this article is to shed light on consensus systems and smart contracts, which can aid in keeping the supply chain free of fraud, corruption, and manipulation. Blockchain technology is a useful tool for overcoming key difficulties in conventional supply chains and improving chain performance.

Keywords: Supply chain, traceability, blockchain, consensus systems, smart contracts

Introduction

Conventional supply chains face numerous challenges with the increase in complexity of the chain and requires a lot of effort to manage. It can be resolved with the help of integrating blockchain technology in Supply chain and it have the capability to achieve massive business value by increasing the transparency of the supply chain and eliminating the risk.

Objectives of the Study

- To study the impact of blockchain technology in Supply Chain and Logistics Management.
- To Know the effectiveness brought by smart contract to the supply chain.
- To comprehend the blockchain payment automation mechanism.

Review of Literature

Rita Azzi Rima, Kilany Chamoun and Maria Sokhn³

³The power of a blockchain-based supply chain, <https://doi.org/10.1016/j.cie.2019.06.042>

This paper describes how the blockchain can be integrated into the supply chain architecture to create a reliable, transparent, authentic and secure system. To reach this goal, we studied the benefits of introducing the blockchain to the supply chain and the challenges encountered in a blockchain-based supply chain management ecosystem.

Michael Wang, Yong Wu and Melissa Evans⁴

In their study, they took a closer look at the use of blockchain in supply chains beyond cryptocurrency, payment, and finance via the use of smart contract and consensus algorithm (i.e., imposing constraints). The key attributes of blockchain are discussed and potential questions were identified in New Zealand.

Yingli Wang, Catherine Huirong Chen and Ahmed Zghari⁵

This paper reports a two-year design science research (DSR) study of a smart contract initiative piloted by a consortium in the UK's construction sector. We seek answers to the research question, 'How should a blockchain enabled supply chain be designed?' Guided by the theory of business model, we explore how a group of supply chain actors collectively designs and pilots a blockchain solution that addresses the supply chain transparency and provenance problem.

Shuchih E. Chang and Yichian Chen⁶

In their research article, a selected corpus comprising 106 review articles was analyzed to provide an overview of the use of blockchain and smart contracts in supply chain management. The diverse industrial applications of these technologies in various sectors have increasingly received attention by researchers, engineers, and practitioners. Four major issues: traceability and transparency, stakeholder involvement and collaboration, supply chain integration and digitalization, and common frameworks on blockchain-based platforms, are critical for future orientation.

Arim Park and Huan Li⁷

In their paper, they focused on such novel blockchain-based supply chain management and its sustainability performances in the areas of environmental protection, social equity, and governance efficiency. Using a systematic literature review and two case studies, we evaluate whether the three sustainability indicators can be improved indirectly along supply chains based on blockchain technology. Our study shows that blockchain technology has the potential to improve supply chain sustainability performance, and we expect blockchain technology to rise in popularity in supply chain management.

Luh Putu Mahyuni, Richard Adrian and Gusi Putu Lestara Permana⁸

⁴ *Blockchain and Supply Chain Management: A New Paradigm for Supply Chain Integration and Collaboration, Operations and Supply Chain Management (2021)*

⁵ *Designing a blockchain enabled supply chain, International Journal of Production Research (2021)*

⁶ *When blockchain meets supply chain: A systematic literature review on current development and potential applications, IEEE Access (2020)*

⁷ *The effect of blockchain technology on supply chain sustainability performances, Sustainability (Switzerland) (2021)*

⁸ *Mapping the potentials of blockchain in improving supply chain performance, Cogent Business and Management (2020)*

In their research article, they suggested that applying blockchain in the supply chain could improve its performance in terms of transparency, traceability, sustainability, trust, and cost-efficiency. This paper contributes to the literature by offering a comprehensive map of research on blockchain potentials in improving supply chain performance. The findings of this study will also be beneficial for managers who seek for a comprehensive understanding of how blockchain technology affects their companies particularly in supply chain management.

Blockchain

Blockchain technology provides solutions to a variety of complex issues that plague the traditional supply chain. A blockchain-enabled supply chain provides accurate product tracking, which allows us to predict and respond to risks in the chain at the earliest. Users of the supply chain can make use of the distributed ledger system to store new transactions in a decentralised network. It will be validated by peers.

Blockchain technology contributes to the chain's resistance to cyberattacks. It aids in analysing previous data and forecasting the future. It can increase supply chain transparency, which can aid in the reduction of fraud. It helps organisations to digitise physical assets and generate a decentralised, immutable record of all transactions, which allows businesses to trace the assets from manufacture through distribution or usage by end users. This improved openness in the supply chain benefits both businesses and consumers.

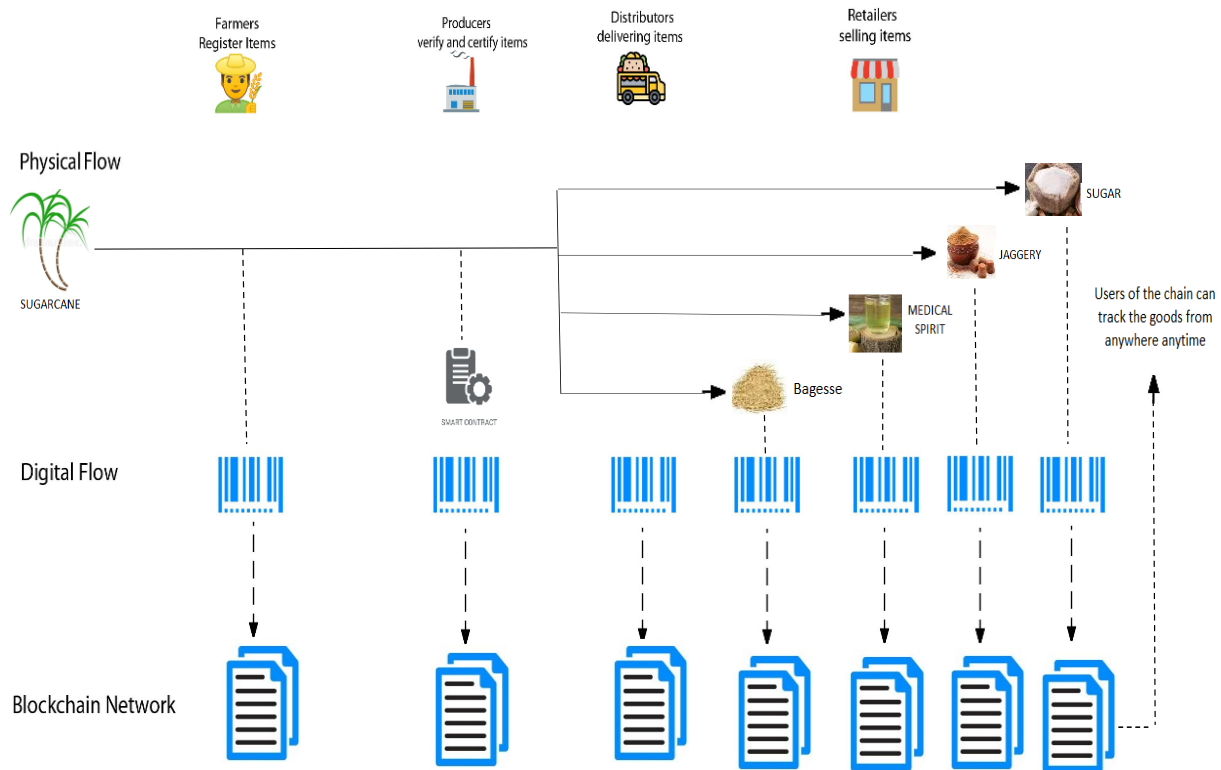
Blockchain technology helps businesses understand the flow of raw materials and finished goods through each subcontractor, reducing losses from counterfeit and grey market trading and increasing end-user confidence.

Smart Contracts:

Smart contracts are digital agreements between parties that are written in computer code and deployed to the blockchain where they self-execute when certain conditions are met. They reduce supply chain complexity by automating the verification and execution of the various business transactions involved. It is impossible to commit fraud or engage in other types of interference because a smart contract will always operate exactly as programmed. A smart contract itself accepts input from a ledger and triggers an event when necessary.

The cryptography and encrypted nature of smart contracts keeps all the documents safe and secure. It also reduces the burden of maintaining massive paper documents. Smart contracts, act as a central element of blockchain enabled Supply Chain and Logistics Management.

Illustration



From the above illustration, we can understand the aspects of implementing blockchain technology in Supply chain. The physical flow of goods and services at every process creates a digital data which is stored in the blockchain network. The data stored in blockchain helps the users of the chain to audit goods and services without any human interaction, it saves money and time. The data stored in one node is verified by the other nodes of the network hence, forming consensus mechanism. The producers can track the physical flow of goods through every process, it eliminates the risk of fraud.

Smart Contract Process

The terms of the contract are initially determined by the contractual parties, the contractual terms mutually agreed by the parties are turned into a programming code and stored in the blockchain network. The code gets copied into all nodes of the network. If the determined terms of the contract get executed and verified by all nodes of the network, the code triggers the execution of the contract. In other terms, smart contracts are simple programs stored on blockchain network that gets executed when digitally pre-determined conditions are met.

In the above illustration, once the goods are delivered by the distributor, smart contracts trigger payment from the retailers. Smart contracts operate autonomously without the need for lawyers and judicial system to enforce the law of contract. If entire supply chain were designed with the help of smart contracts, there is no requirement for the day-to-day management and auditing.

Findings

- Blockchain increases the transparency in the supply chain. It improves honesty and trust among the members of the chain.
- With the help of blockchain, accuracy can be achieved in supply chain as real time data is transferred between every user in the network.
- End-to- end encryption of blockchain network prevents any unauthorized activity or other cyber threats.
- Consensus mechanism keeps check on the risk of error and data being tampered.
- Smart contracts help to make the processing of order and payments faster.
- Smart contracts alert the parties of the contract when manual intervention is needed.
- Maintenance of massive paper trail is avoided as everything is digital.

Suggestions

- Awareness about the Blockchain mechanism is required.
- Technically skilled manpower is needed to execute the integration of blockchain in Supply Chain and Logistics Management.
- Integration of other modern technology such as IOT and AI can make the Supply Chain more automated and effective.
- Cautious planning is very crucial before transforming conventional supply chain into blockchain integrated supply chain.

Conclusion

In this paper, we analysed the implications of blockchain technology in the supply chain and Logistics Management hence, we conclude and strongly recommend that blockchain technology improves the efficiency, transparency and security of these areas.

References

1. Business Logistics/ Supply chain Management – Ronald H Ballau, Samir K
2. The power of a blockchain-based supply chain,
<https://doi.org/10.1016/j.cie.2019.06.042>
3. Blockchain and Supply Chain Management: A New Paradigm for Supply Chain Integration and Collaboration, Operations and Supply Chain Management (2021)
4. Designing a blockchain enabled supply chain, International Journal of Production Research (2021)
5. When blockchain meets supply chain: A systematic literature review on current development and potential applications, IEEE Access (2020)
6. The effect of blockchain technology on supply chain sustainability performances, Sustainability (Switzerland) (2021)
7. Mapping the potentials of blockchain in improving supply chain performance, Cogent Business and Management (2020)

8. <https://www.euromoney.com/learning/blockchain-explained/how-blockchain-data-is-stored-and-secured>
9. <https://www2.deloitte.com/us/en/pages/operations/articles/blockchain-supply-chain-innovation.html>
10. Operations and Supply Chain Management- Richard B Chase, Ravi Shankar, Robert Jacobs