Chapter 5
Blockchain-Enabled Supply Chain Management for Revolutionizing Transparency, Security, and Efficiency

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ABSTRACT

Blockchain technology holds immense potential for revolutionizing supply chain management by enhancing transparency, security, and efficiency. The key areas of focus encompass goods provenance tracking, traceability enhancement, fraud reduction, and efficiency augmentation. This chapter explores the core attributes of blockchain—decentralization, immutability, and transparency—and their application in supply chains. However, challenges include interoperability issues, data privacy concerns, and security risks like 51% attacks. Costs of implementation are also significant. Additionally, the project addresses pivotal concerns such as interoperability, data privacy, security, and the costs associated with adopting blockchain solutions. Ultimately, the project concludes that integrating blockchain technology into supply chain management has the potential to streamline operations, foster trust between stakeholders, and elevate overall efficiency and resilience within the supply chain ecosystem.

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INTRODUCTION

Supply chain management (SCM) plays a vital role in today's global industry and holds significant implications for the world economy. It encompasses the movement of goods from producers to consumers, involving multiple stages that span from the sourcing of raw materials to the final delivery to customers, with manufacturers, distributors, and retailers all playing integral roles (Meidute-Kavaliauskiene et al., 2021). However, despite its broad scope, traditional supply chain management often falls short of achieving comprehensive compliance (Chen et al., 2018).

Within the supply chain, there are various challenges associated with allowing the final client to cancel transactions and ensuring the quality of delivered goods (Lu, 2018). These challenges arise due to factors such as complex logistics, multiple stakeholders involved, and potential information gaps throughout the supply chain process (Wang et al., 2019). While forward flows primarily focus on the movement of goods from sender to recipient, it is equally crucial to facilitate reverse flows for product returns and customer transactions. However, the current structure of supply chain management can be revolutionized through the implementation of blockchain technology and smart contracts (Huddiniah & Er, 2019). Leveraging the transparency and immutability of blockchain, the supply chain can be modernized, offering a secure platform for data collection and the creation and execution of smart contracts, which are computer programs or applications. By utilizing smart contracts, supply chain managers gain the ability to track the origin and security of their products (Xu et al., 2021). Through thorough analysis and discussion, we have identified the challenges at hand and formulated a solution.

This work aims to develop a conceptual framework for an advanced supply chain management system, leveraging the power of blockchain technology and smart contracts. The primary objective is to ensure secure transactions and deliver high-quality goods to customers (Hastig & Sodhi, 2019). By integrating blockchain into the system, it will establish a trustworthy global market where customers can confidently return products and receive refunds for their purchases (Bai & Sarkis, 2020). Emphasizing the transformative potential, this paradigm shift will bring about a significant transition throughout the entire supply chain management system.

Related Works

In their study, Srivastava (2021) explored the application of blockchain technology in the agri-food supply chain. They emphasized the critical areas of food safety, traceability, transparency, elimination of intermediaries, and integration with the Internet of Things (IoT) as key applications in the agri-food sector. By focusing