

Implementing Blockchain Technology for Enhanced Supply Chain Management: Leveraging Recent Innovations in Science and Technology

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Abstract

The increasing complexity of global supply chains has created a growing need for secure, transparent, efficient, and traceable systems for managing the movement of goods and information. Blockchain technology has emerged as a promising innovation for addressing several limitations of conventional supply chain management, including data fragmentation, limited visibility, fraud, counterfeiting, and inefficient documentation. This paper examines the implementation of blockchain technology for enhanced supply chain management by leveraging recent innovations in science and technology. Blockchain enables decentralized and tamper-resistant data storage, allowing supply chain participants to securely record and share transactions across a distributed network. The integration of smart contracts can further automate activities such as procurement, payment processing, inventory management, and compliance verification, thereby reducing administrative costs and human intervention. Recent technological developments, including Internet of Things (IoT) sensors, artificial intelligence (AI), cloud computing, and edge computing, can complement blockchain by providing real-time data collection, predictive analytics, and automated decision-making. The study also explores challenges associated with blockchain adoption, including scalability, interoperability, data privacy, regulatory uncertainty, energy consumption, and implementation costs. By integrating blockchain with emerging technologies, organizations can improve end-to-end visibility, product traceability, operational efficiency, and stakeholder trust. The paper concludes that a technology-integrated approach can contribute significantly to the development of more resilient, intelligent, and sustainable supply chains.

Keywords: Blockchain Technology, Supply Chain Management, Smart Contracts, Internet of Things, Artificial Intelligence, Transparency, Traceability, Data Security, Digital Transformation, Supply Chain Innovation