CECS 574 Topics in Distributed Computing

Blockchain and Supply Chain Transformation

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Abstract:

This review investigates how blockchain technology can revolutionize supply chain management. It analyzes three scholarly articles to demonstrate how blockchain can enhance traceability, trust, and security in multiple sectors such as agriculture, healthcare, and manufacturing. Additionally, the review discusses the combination of blockchain with technologies like IoT and its implementation in practical contexts, such as the frozen food supply chain, highlighting its wide-ranging use and the obstacles related to scalability and interoperability.

Introduction:

Supply chain management encounters several problems, such as inefficiencies in tracking, insufficient transparency, and reduced trust among participants. Blockchain technology, with its features of decentralization, immutability, and transparency, offers solutions to these challenges. This summary brings together insights from three key studies exploring how blockchain can transform supply chains in various industries.

Enhancing Traceability and Security:

Blockchain technology greatly improves the traceability and security of supply chains by distributing data across a decentralized network, making records unchangeable and visible to all stakeholders. This feature is especially important in industries such as food and pharmaceuticals, where the origin and safety of products are critical. For example, one study presents a case study in a frozen food factory where blockchain enhanced product traceability, ensuring that quality standards are maintained throughout the production and delivery process.

Building Trust Among Stakeholders:

One of the primary advantages of blockchain is its capacity to foster and strengthen trust among different participants in the supply chain. Blockchain offers a transparent record of transactions and product paths, minimizing the need for intermediaries and reducing potential fraud and errors. The studies reviewed emphasize that blockchain can create a trustworthy environment, particularly valuable in sectors where numerous parties are engaged in supply chain activities.

Integration with IoT and Other Technologies:

Combining blockchain with IoT and other technologies significantly improves the ability to track and manage supply chains in real time. This combination facilitates process automation and enhanced data gathering, crucial for industries such as agriculture and manufacturing. The research examined explores several applications where blockchain and IoT come together, offering solutions that greatly enhance efficiency and transparency in operations.

Challenges and Barriers to Adoption:

While blockchain offers considerable advantages, its implementation encounters substantial obstacles. The research highlighted points out difficulties like scalability - where the technology needs to efficiently manage vast amounts of transaction - and interoperability - referring to the capacity of blockchain systems to function across diverse platforms and sectors. Addressing these issues is essential for blockchain to be broadly adopted in supply chain management.

Conclusion:

The papers reviewed collectively illustrate the significant advantages of blockchain technology in reshaping supply chain management. Blockchain enhances traceability, boosts security, and fosters trust, which can mitigate many existing challenges within supply chains. However, effective deployment relies on surmounting considerable technical obstacles and tailoring the technology to meet the specific requirements of different industries. Future studies should concentrate on tackling these issues and investigating the economic effects of integrating blockchain across various sectors.