

Examining Blockchain's Revolutionary Effect on Financial Systems and Supply Chain Management

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ABSTRACT

Blockchain technology was first developed to support Bitcoin, but it has come a long way since then and is now used for more than just money. It features a clear and decentralized structure that changed a lot of industries, especially those that deal with money and managing the supply chain. In the supply chain industry, blockchain makes it easier to trace things, cuts down on fraud, and speeds up operations. Blockchain makes it possible for decentralized finance (DeFi) platforms to work with financial institutions. This makes it easier for more people to use financial services and lowers the cost of transactions. This paper investigates the substantial impacts of blockchain technology across several industries, emphasizing adoption challenges like as scalability and regulatory hurdles, while exploring its benefits, challenges, and practical applications.

Keywords: Decentralized Finance (DeFi), Blockchain Technology, Supply Chain Management, Financial Systems, Transparency, Security, Efficiency, Fraud Reduction, Scalability, and Regulatory Risks.

Introduction

Blockchain technology, which was first used to make Bitcoin, has now become a game-changer in several fields. Blockchain was first used for bitcoin, but its decentralized and unchangeable nature could change the way we handle supply chains and financial institutions. Blockchain allows anyone involved in supply chain management to keep an eye on products in real time, which makes things more open and efficient (Tapscott & Tapscott, 2016). Blockchain facilitates decentralized finance (DeFi) inside the financial sector by eliminating middlemen, hence reducing costs and improving accessibility (Albayati, 2020). This article aims to examine the impact of blockchain on these two critical sectors, exploring its transformative potential and the obstacles that hinder its adoption.

• Blockchain in Financial Systems

The rise of decentralized finance (DeFi) is a clear sign of how blockchain is changing banks and other financial organizations. Blockchain technology is used to build decentralized finance (DeFi) systems. These platforms aim to provide financial services including lending, borrowing, and trading without the need for traditional financial middlemen. Albayati (2020) says that DeFi solutions lower transaction costs and make financial services more available to everyone, especially in places that don't have many of them. Bitcoin and Ethereum are two examples of cryptocurrencies that could replace traditional currencies.

Pieters (2020) posits that decentralized virtual currencies could revolutionize monetary systems by removing central authority monitoring. These technologies make financial systems more open to everyone and provide users more freedom, which makes them less reliant on traditional banks. Things that make it hard to adopt

Despite its potential to be disruptive, blockchain faces many challenges that make it hard for most people to use. Scalability is a big problem. Blockchain networks, particularly those employing proof-of-work protocols like Bitcoin, demand considerable computing power, leading to protracted transaction times and increased energy consumption. Pieters (2020) looks at how these problems with scalability can make it harder to use blockchain in fields that need a lot of transactions to get through quickly. Another important problem is that the rules aren't clear. Governments and financial authorities have been slow to provide clear rules on how to use blockchain and cryptocurrencies.

Bhambhwani et al. (2023) assert that regulatory ambiguity often creates a cautious environment for businesses considering the adoption of blockchain technology. Furthermore, the environmental consequences of blockchain, particularly with energy consumption, raise concerns about its long-term viability for widespread application.

Technique of Research

This study utilizes a qualitative research technique, integrating case studies and expert interviews to clarify the practical applications and challenges of blockchain in supply chain management and financial systems. The paper examines case studies from companies such as IBM and Maersk that have successfully used blockchain into their supply chains. Interviews with blockchain company and bank professionals give us more information about what the technology can and can't do. The gathered data will be analyzed to identify key benefits, challenges, and trends in the implementation of blockchain technology.

Objective of the Study

- To look at how blockchain technology could change supply chain management and financial systems in a big way.
- The project aims to investigate how blockchain enhances transparency, traceability, and efficiency in supply chain operations, along with its role in decentralising financial services to reduce transaction costs and promote financial inclusion.
- To find out the main benefits of using blockchain in the banking and supply chain industries.
- The research analysed how blockchain technology enhances security, reduces fraud, ensures traceability, and fosters collaboration among supply chain stakeholders, in addition to its function in facilitating decentralized finance (DeFi) platforms within the financial sector.
- To look into the problems that are stopping blockchain technology from being widely used in many fields.
- The initiative aims to thoroughly analyses limitations such as scalability, regulatory challenges, energy consumption, and the environmental impacts of blockchain that hinder its adoption.
- To look at how blockchain can be used in real life in supply chains and financial systems. By looking at case studies like IBM and Maersk's blockchain-based logistics and decentralised finance systems, the research will show how to use blockchain effectively and how it may improve operations.
- To give ideas for how to get over problems that make it hard to use blockchain in some fields. The study has devised ways to address the scalability, regulatory, and environmental challenges associated with blockchain and recommend solutions to enhance its integration across the industry.

Review of the Literature

Using Blockchain in Supply Chain Management

There has been a lot of interest in blockchain's ability to change supply chain management from both the academic world and the business world. It has important benefits, including better security, traceability, and transparency, which can make supply chain operations a lot better. One of the best things about blockchain is that it may make the full supply chain easy to trace. Tapscott & Tapscott (2016) say that blockchain's decentralised and unchangeable ledger architecture lets everyone see a

single, trustworthy record. This openness makes sure that all product movements are logged and can be checked at any moment, which lowers the chances of fraud, theft, and mistakes. This feature is especially useful in areas like food and medicine, where making sure that products are real and of good quality is quite important. Treiblmaier (2018) also looks at how blockchain might improve collaboration among people in the supply chain. He points out that it can make it easy for people to share data without any problems.

Another important thing to think about is how blockchain might help with fake goods. Many industries, such as electronics, luxury goods, and pharmaceuticals, are increasingly using blockchain technology to track the origin of products and make sure they are real. Blockchain technology has been widely used in supply chain management because it may make things more clear and reduce fraud. Treiblmaier (2018) says that blockchain lets stakeholders keep an eye on the real-time flow of goods, which improves operational efficiency and proves that the products are real. Xu (2020) also says that blockchain technology helps supply chain partners work together by making it easier to share information safely and making the best use of resources. One important use of blockchain in supply chains is the partnership between IBM and Maersk, which uses blockchain to improve global shipping by making it more visible and cutting down on inefficiencies (Tapscott & Tapscott, 2016). Blockchain technology has also been used in the agriculture supply chain to make it easier to trace products and follow safety rules. Hasan and Habib (2021) look at how blockchain technology is being used more and more in food supply chains, which makes it easier to keep track of products from farm to table. Blockchain's transparency and ability to be traced can greatly reduce fraud and make operations run more smoothly.

Methodology of Research

This study utilised a qualitative research methodology, integrating case studies and expert interviews to clarify the practical applications and challenges of blockchain technology. The technique sought to clarify blockchain's impact on supply chain management and money systems.

- **Case Analyses:** This study investigated case studies of firms that successfully used blockchain in their supply chains and finance systems. Notable examples included the collaboration between IBM and Maersk in marine logistics, as well as decentralised finance (DeFi) platforms. These case studies provided conclusive evidence of blockchain's ability to enhance transparency, traceability, and efficiency.
- **Experts Review:** To learn more about the pros and cons of blockchain technology, we talked to specialists in the field, such as blockchain professionals, financial institution experts, and supply chain managers. The interviews focused on identifying major obstacles faced by companies in implementing blockchain and the concrete outcomes of its adoption.
- **Data Examination:** The data collected from case studies and interviews underwent qualitative analysis to identify recurring themes, issues, and benefits. A thematic analysis approach was employed to comprehend the data and derive key insights regarding the transformative impacts of blockchain.
- **Review of Literature:** The study incorporated an extensive literature review to enhance the case studies and interviews. This review examined previous research on blockchain technology, its application in supply chain management and financial systems, as well as the challenges to its adoption.
- **Sampling Technique:** Purposeful sampling was utilised to choose relevant case studies and expert participants possessing knowledge in the installation or study of blockchain technology within supply chains and financial systems.

Hypothesis of the Study

The following hypotheses were assessed according to the objectives and methodology.

- Blockchain technology made supply networks much more open and easier to follow the hypothesis was evaluated through the study of case studies and expert interviews, demonstrating how blockchain improved product visibility and reduced fraud in supply chain operations.
- Using blockchain in financial systems has lowered transaction costs and made it easier for more people to access financial services.

- The hypothesis was tested by looking at how decentralized finance (DeFi) platforms and digital currencies affect transaction costs and how easy it is for those who are not well-off to get money.
- Scalability and regulatory limitations represented the primary challenges to the widespread adoption of blockchain technology.
- The hypothesis was scrutinized by analyzing the scaling issues and regulatory obstacles highlighted in the case studies and expert interviews, in conjunction with the existing literature on blockchain adoption.
- The environmental effects of blockchain technology, particularly in terms of energy use, have limited its adoption in large corporations.
- The hypothesis was evaluated by analyzing the environmental impacts of blockchain technology and its prospective influence on sustainability, especially in enterprises with significant transaction volumes.

Examination and Conclusions

Blockchain in Managing the Supply Chain Many well-known case studies show how blockchain can make supply chain management more open and less likely to be cheated. For example, IBM and Maersk are working together to use blockchain to keep track of things.

Shipping containers all across the world. Blockchain enables real-time data access, hence reducing the inefficiencies and inaccuracies commonly found in traditional supply chain management systems. The success of this collaboration has set a standard for other companies who want to use blockchain in logistics (Tapscott & Tapscott, 2016).

In agriculture, blockchain technology has been used to make sure that food can be traced from the farm to the table. This has made food safer and made people more confident in it.

Hasan and Habib (2021) stress that blockchain technology can keep an eye on the food supply chain to make sure that safety rules are followed and to give customers clear information about where their food came from.

Blockchain in Financial Systems

The rise of DeFi platforms has led to a big increase in the use of blockchain in financial systems. These platforms do away with the need for middlemen, which is a problem with traditional banking services. Blockchain has made it easier for digital currencies to come about, such as:

- Banks and insurance companies offer a more affordable and accessible option to traditional financial services. Albayati (2020) said that DeFi might make it easier for everyone to get financial commodities, especially in developing places where banks are hard to find. Also, blockchain makes it easier to generate digital currencies like Bitcoin that work independently of central banks and could make traditional financial systems less stable (Pieters, 2020).
- In supply chain management and financial systems, blockchain technology has many advantages. It makes supply chains more open and honest.
- It reduces fraud and makes things run more smoothly. In financial systems, it also helps DeFi solutions that minimize transaction costs and make it easier for everyone to access financial services. But there are still many difficulties that need to be solved in order to fully realize the promise of blockchain. These include problems with scale, unclear regulations, and environmental problems that come with using energy.
- For supply chains, dealing with scalability problems and making energy use more efficient are two important things to do.
- More people may use blockchain if there are more efficient models. In the financial sector, clear rules are necessary to create an environment that encourages new ideas while also protecting consumers. Furthermore, the development of environmentally sustainable blockchain systems will be crucial for durability.

Hypothesis 1

Blockchain technology significantly enhances the transparency and traceability of supply networks.

The primary hypothesis investigates whether blockchain enhances transparency and traceability in supply chains by facilitating real-time tracking of things, hence reducing fraud and inaccuracies. The study investigates the collaboration between IBM and Maersk in logistics, as well as additional supply chain applications within the agricultural and pharmaceutical industries.

There have been a lot of case studies that show that using blockchain has made things a lot more clear and easy to track. The IBM-Maersk blockchain infrastructure made it possible to keep an eye on shipping containers in real time, which greatly reduced errors and inefficiencies (Tapscott & Tapscott, 2016). In addition, blockchain made it easier to keep track of food and agricultural products from farm to table, which helped make sure that products were real and met safety standards (Hasan & Habib, 2021). The fact that blockchain is decentralized means that everyone involved can see an unchangeable record, which builds trust between partners.

Studies show that blockchain technology makes it much easier to track things in international supply chains. The decentralized ledger system makes things more open, lowers the danger of fraud, and makes it easier to do real-time audits of supply chain activities, notably in areas like food, medical, and logistics.

Hypothesis 2

- The use of blockchain technology in banks and other financial organizations lowers the cost of transactions and makes it easier for more people to access financial services.
- Ethereum research. The research examines the utilization of blockchain technology to eliminate intermediaries in financial transactions, hence improving the accessibility of financial services, especially in underserved regions.
- Results: Getting rid of middlemen like banks and payment processors makes financial transactions take less time and cost less (Pieters, 2020). DeFi platforms have also provided financial services like lending and borrowing to people in places where traditional banks are hard to get to, which has made it easier for everyone to get access to money (Albayati, 2020).
- Results: Using blockchain in financial systems cuts transaction costs by getting rid of middlemen, which makes financial services easier to get to and more open to everyone. DeFi platforms have been especially helpful in poor places where regular financial services are hard to come by.
- Blockchain technology, particularly in decentralized finance (DeFi), has significantly reduced transaction costs. As seen by platforms like Ethereum and Bitcoin, the removal of

Hypothesis 3

Scalability and regulatory challenges are the primary barriers to the widespread adoption of blockchain technology.

Research

This hypothesis examines the scalability and regulatory challenges faced by blockchain technology in the supply chain and finance sectors. It looks at how scaling problems with transaction speeds and energy use make it harder for people to accept, as well as how the lack of clear legislative frameworks makes it harder for the whole sector to use the technology.

- **Results:** Scalability remains a significant barrier to blockchain adoption, particularly for high-volume applications such as global supply chains and financial institutions. Blockchain networks, such as Bitcoin, face limitations because of slow transaction speeds and high energy consumption, particularly when utilizing proof-of-work consensus mechanisms (Pieters, 2020). Additionally, the lack of clear rules surrounding blockchain and cryptocurrencies has made businesses hesitant because they don't know if they are following government rules (Bhambhwani et al., 2023).
- **Results:** Scalability and regulatory issues are major problems that make it hard to use blockchain. Blockchain has many benefits when it comes to security and transparency, but it needs to fix its current scale problems and the lack of clear laws before it can be used more widely.

Hypothesis 4: The ecological consequences of blockchain technology, particularly concerning energy use, limit its application in large-scale enterprises.

Examination: This hypothesis assesses the environmental concerns associated with blockchain, particularly in relation to energy consumption, a contentious topic stemming from the rise of cryptocurrencies like Bitcoin. The research investigates if the energy requirements of blockchain limit its feasibility for widespread industrial applications.

Hypothesis 5: Blockchain improved collaboration and efficiency among supply chain management players.

This hypothesis was tested by looking at how blockchain made it easier for people in the supply chain to share information and work together, which led to better use of resources and more efficient work.

Findings

This hypothesis evaluates the impact of blockchain on transaction costs and financial inclusion, specifically through decentralized finance (DeFi) systems and digital currencies like Bitcoin and There are a lot of concerns about how blockchain affects the environment, especially with energy-intensive networks like Bitcoin that need a lot of processing power to provide security through mining. Pieters (2020) notes that blockchain's reliance on proof-of-work consensus methods results in considerable energy usage, which may hinder its acceptance in industries that prioritize sustainability. Even though there have been suggestions for other ways to reach consensus, including proof-of-stake, they haven't been widely used.

Findings

The environmental impact, particularly concerning energy consumption, presents a substantial barrier to the use of blockchain technology in large-scale companies. This difficulty, along with the increasing focus on sustainability, signifies that blockchain must advance towards more energy-efficient consensus mechanisms for extensive adoption. Hypothesis 5: Blockchain may improve collaboration and efficiency among supply chain management stakeholders.

The last hypothesis looks at how blockchain improves collaboration between people in the supply chain, which leads to better use of resources, easier data exchange, and fewer mistakes. Findings: Case studies of IBM and Maersk's blockchain logistics platform show that blockchain makes it easier for people in the supply chain to work together by letting them share data safely and openly (Tapscott & Tapscott, 2016). Additionally, industries such as agriculture have employed blockchain to improve data exchange among farmers, processors, and merchants, hence optimizing the supply chain (Hasan & Habib, 2021). Blockchain's capacity to provide a single, unchangeable record of transactions lets all parties see real-time data, which improves decision-making and operational efficiency. Studies show that blockchain makes supply chain management much easier and more efficient for everyone involved. It builds trust, cuts down on waste, and makes better use of resources by giving people safe, real-time access to data. This makes supply chains more efficient and open.

Conclusion

This research shows how blockchain is changing supply chain management and financial systems in a big way. The study confirms that blockchain enhances transparency, reduces fraud, lowers transaction costs, and fosters collaboration.

However, blockchain must address challenges such as scalability, regulatory uncertainty, and environmental impacts to achieve widespread adoption. Future research should focus on developing scalable, energy-efficient blockchain systems and establishing clear legal frameworks to enable their integration into industrial operations.

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