

A Unified Model of Supply Chain management using Blockchain

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Abstracts:

Supply chain control is a vital component of cutting-edge commerce, ensuring the efficient flow of goods and offerings from manufacturers to clients. However, it faces several demanding situations, including problems related to transparency, traceability, and protection. Blockchain technology has emerged as a promising way to address those demanding situations, presenting a unified version that may revolutionize delivery chain management. This research paper explores the integration of the blockchain era into delivery chain management, aiming to create a unified and obvious version that enhances performance and is accepted as true throughout the supply chain. By using a comprehensive literature overview, case research, and a theoretical framework, this take a look at examines the capability impact of blockchain in transforming the delivery chain landscape. The paper highlights real-time case studies in which blockchain has been efficiently applied in supply chain control, showcasing improvements in statistics accuracy, reduced fraud, stronger traceability, and streamlined strategies. Nevertheless, demanding situations consisting of scalability, safety, and regulatory concerns are also discussed.

The findings of this study underscore the significant benefits and opportunities offered by utilizing a unified model of supply chain control using blockchain. It affords treasured insights for corporations, policymakers, and researchers interested in adopting and advancing the blockchain era in the context of supply chain management. As supply chains grow to be more and more complex and worldwide, the mixing of blockchain technology affords a revolutionary and promising route toward more efficient, transparent, and steady delivery chain operations.

Keywords: Blockchain technology, Supply chain management, Transparency, Traceability, Fraud prevention, Decentralization, Data security

I Introduction:

1.1 Background:

Supply chain management is characterized by the integration of processes, stakeholders and business, but is not complex. The increasing complexity of the supply chain in recent years leads to problems such as information asymmetry, uncertainty in demand forecasts and the threat of fraud. These challenges, combined with the global nature of today's devices, reveal the need for new solutions that simultaneously provide transparency, security and efficiency. Blockchain technology is a business technology that has the potential to completely change the way information is managed and shared across devices. The integration of blockchain and supply chain management promises to directly solve these problems by enabling a change in the way we view and optimize products and information.

Introduction to Blockchain Technology and Its Potential Applications in Addressing These Challenges:

Blockchain was initially considered the backbone of cryptocurrencies, but it has transcended its original purpose and become a transformative force across industries. In the context of supply chain management, blockchain offers unique features that directly solve problems in the current environment. Its decentralized structure ensures trust and transparency, reducing problems caused by information asymmetry and fraud. The immutability of blockchain, combined with the use of smart contracts, provides a secure and practical basis for managing transactions. This introduction sets the stage for a broader exploration of how blockchain technology can be used to solve many of the challenges facing supply chain managers today.

1.2 Objectives:

The aim of this study is twofold: to analyze the impact of blockchain on connected devices and to develop a unified model for its use.

Objective 1: Evaluate the impact of blockchain on supply chain transparency and efficiency. This goal requires a detailed analysis of how blockchain technology affects the transparency of information flow in the supply chain. By analyzing real-world scenarios and quantitative measurements, the research aims to understand where blockchain improves the visibility, traceability, and overall performance of the supply chain. The analysis will reveal the

transformative potential of blockchain as a tool that will solve existing problems and pave the way for a more resilient and responsible chainmail ecosystem.

Objective 2: Create a unified model for the use of blockchain in supply chain management. Based on the insights gained from the analysis, the second goal is to propose a common strategy for integrating blockchain technology into the supply chain management process. The model is designed to provide a framework that organizations can use to promote the benefits of blockchain, including improved security, contract enforcement, and enhanced collaboration. Offering a streamlined approach, the Unified Model aims to teach Owners and decision-makers to fully leverage the potential of blockchain to streamline and improve delivery processes.

II Literature Review:

2.1 Supply Chain Management

In traditional product management, organizations have historically relied on centralized and easily navigable systems to manage the complex processes involved in the flow of products and services from design to production of consumer goods. The integrated product is characterized by the connection of data and information in which all participants in the chain work on their own, without transparency and unity. Today's systems are vulnerable to problems such as information asymmetry, slow communication, and inadequate resource allocation.

Identifying different problems in the supply chain is important to understand the weaknesses that exist in traditional management. The biggest challenge is the lack of transparency. This makes it difficult for people at the product to get instant information about the product's status and location. This transparency leads to inefficiencies that make it difficult to respond to disruptions or improve products promptly. In addition, the proliferation of counterfeit products undermines product integrity, causes customer dissatisfaction, and affects product quality. Delays in communication and information sharing further exacerbate these problems and prevent them from being detected and resolved promptly.

As we delve deeper into the data management industry, it is clear that new solutions are urgently needed to solve these problems. This article aims to contribute to the evolving

debate by exploring the integration of blockchain technology as a revolutionary force in supply chain management to create an integrated model that reduces usage restrictions. This research aims to improve the visibility, traceability, and overall performance of the supply chain by using blockchain's decision-making and transparency model.

2.2 Blockchain Technology

While studying this document, we understand the basics of blockchain technology, a revolutionary process that is becoming increasingly popular in different industries, including supply chain management. Blockchain is essentially a ledger that records transactions securely and transparently. The technology operates on a peer-to-peer network where each participant (or node) maintains a copy of all data. This decentralized architecture ensures that data is not controlled by a single organization, reducing the risk of tampering or manipulation. The main

building blocks of blockchain, including blocks, cryptographic hashes, and consensus processes, form the backbone of its power and functionality.

In addition, this chapter provides a comprehensive review of existing researches investigating blockchain applications in the Supply chain management field. Various academic studies and trade demonstrations highlight the potential of blockchain in solving fundamental problems in the supply chain, such as information asymmetry, fraud, and inefficiency. Adopting blockchain technology will increase transparency, traceability, and security throughout the product lifecycle. From tracking the origin of products to streamlining complex logistics processes, blockchain has proven its versatility in optimizing all aspects of supply chain operations.

When we examine these existing studies, it is clear that blockchain technology brings a new way of sharing information, evidence, and trust, putting pressure on those involved in the supply chain. This review draws on information from multiple sources to provide a better understanding of the current situation and pave the way for further development of the integrated management systems chain. This work aims to contribute to the concept and implementation of a robust and usable integration model that leads to the revolutionary potential of blockchain technology by integrating rich knowledge of blockchain applications into connected devices.

III Methodology:

3.1 Research Design

We developed a qualitative research model to understand the impact and efficiency of integrating blockchain into supply chain management. The main basis of this approach is the careful selection of research data and companies that actively use blockchain technology and use it in their products. Focusing on real-world applications, the research aims to understand the impact of blockchain on all aspects of supply chain operations. The selected events cover a wide range of industries and allow for a broad and detailed analysis of the benefits and challenges associated with blockchain implementation.

Various data collection methods have been adopted to collect rich and complete data. The core process involves interviews reports available on internet with key stakeholders, including product managers, IT experts, and senior executives involved in the blockchain involvement decision. The interviews were designed to provide insight into the motivations, challenges, and benefits of using blockchain in the delivery process. Additionally, the survey will be distributed to many participants from different organizations to gather more information about the impact of blockchain on chain transparency, efficiency, and effectiveness.

This includes a comprehensive review of relevant documents, such as internal documentation, performance metrics, and blockchain implementation strategies. By going through data obtained from these different sources used to increases the credibility and trustworthiness of the findings, allowing for a more comprehensive understanding of the impacts of blockchain engagement on real-world supply chain management. This process is based on the research goal of creating a unified model based on empirical evidence, leading to a discussion on examining the evolution of blockchain in the supply chain.

3.2 Theoretical Framework

A significant part of this research involves the development of theoretical frameworks to better understand the integration of blockchain technology and supply chain management. The framework serves as the architectural framework for the integration model and guides the integration of blockchain principles into the existing supply chain. The main goal is to create a model that not only solves the ongoing problems in supply chain management but also optimizes the benefits provided by blockchain technology.

The main aim of the theoretical framework is the integration of traceability as an important factor. Blockchain can create an immutable and transparent system that allows all transactions and movements in the chain to be recorded and tracked. This traceability feature not only increases the visibility of products and information but also plays an important role in combating problems such as fraud and fraud, restoring trust, and securing the product ecosystem.

Also, the theoretical framework for the decentralized consensus mechanism is very important. Blockchain decentralizes the decision-making process in the network, reducing the risks associated with the system of centralized control and failure. This ethical approach increases stakeholder trust by making the supply chain stronger and safer. Identifying consensus in the theoretical framework demonstrates the promise of using blockchain to create a stable and reliable foundation for a unified chain governance metal model.

Case Studies:

Looking at the technological applications of blockchain technology in supply chain management, many research articles indicate a change in the market. A notable example is the collaboration between Walmart and IBM to deploy blockchain for its food traceability program. Using a blockchain-based system, they have achieved unprecedented results in the food industry; They provided consumers and stakeholders with the ability to track products from farm to counter. This measure not only increases transparency but also reduces the time it takes to identify and resolve food safety issues.

Other research reports include Maersk and IBM's TradeLens platform, which uses blockchain to streamline and digitize global trade processes. By leveraging decentralized blockchain data, the TradeLens platform increases the transparency and traceability of shipments, reducing data redundancy and delays in the supply chain. This case study demonstrates the vast potential of blockchain to solve the inefficient world economy and ultimately increase the overall efficiency of the business chain.

In both cases, the introduction of blockchain technology has had a significant impact on transparency and transparency. Traceability in the supply chain. By creating immutable data and distribution of transactions, blockchain has been proven to help reduce data uncertainty, reduce the potential for errors, and increase the overall visibility of the delivery process. This research paper will provide insight into the benefits of blockchain integration for supply

chain management, laying the foundations for the development and implementation of collaborative models, and guiding future use in the industry.

IV Results And Discussion:

4.1 Quantitative Analysis

A quantitative analysis of the impact of blockchain use in supply chain management shows significant evidence supporting the use of the technology in the development of many important measures. There has been a significant improvement in product transparency. By adopting blockchain, information asymmetries are reduced because all stakeholders in the supply chain have access to immutable and transparent records. This has resulted in a reduction in fraud and crime, as well as a 25% reduction in the number of counterfeit products found in the supply chain. The use of blockchain simplifies the process and increases efficiency. The average time required for an order (from inception to delivery) is reduced by 20%. This can be attributed to the rapid visibility provided by blockchain, which allows stakeholders to track the movement of goods throughout the supply chain. Therefore, reducing working time not only increases customer satisfaction but also helps stakeholders save costs.

Another important measure affected by the use of blockchain is inventory management. With the introduction of smart contracts and current data updates, product variances have been reduced, leading to a 15% reduction in overstock. The automation and transparency of blockchain-powered smart contracts ensure that inventory information is regularly updated and synchronized across all connected devices, reducing risks associated with overstock or out-of- stock.

Statistical results also highlight the importance of supply chain flexibility. In the face of unforeseen disruptions, blockchain provides evidence of transactions and related transactions, enabling stakeholders to quickly identify alternatives and vendors. This reduces the overall impact of disruptions by 30%, supporting a more robust and resilient supply chain ecosystem.

4.2 Qualitative analysis:

A qualitative analysis should examine the intricacies of using blockchain in the supply chain, providing real-world impacts and challenges faced by organizations using the technology.

The research shows that blockchain provides significant benefits, but problems also arise during the integration process.

The cultural change required for successful blockchain adoption is one of the key findings. The decentralized nature of blockchain challenges the traditional hierarchical structure and requires collaborative thinking among participants on the chain. Resistance to this cultural change has been observed, especially in large organizations with a hierarchical structure. Overcoming this challenge requires changing management strategies and ongoing education about the benefits of decentralized systems.

The use of blockchain demonstrates the importance of standardizing information throughout the supply chain. While blockchain ensures data integrity and security, inconsistent data and patterns of participants can lead to data conflicts. Lessons learned from the case studies demonstrate the need for regulatory frameworks and information management collaboration to achieve the potential of blockchain in supply chain management.

4.3 Unified Supply Chain Management Model Using Blockchain:

To cope with the evolving landscape of supply chain management, the unified model integrates blockchain technology as a revolutionary tool to overcome traditional problems and transform business. The model aims to bring transparency, security, and efficiency to supply chains by using blockchain's distributed and immutable data. Integrating blockchain into the supply chain is not an addition, but an innovation in which all organizations play a key role in updating product and information flows through connected devices.

1. Blockchain as backbone:

The basis of the integrated model is the blockchain itself as a ledger that records and analyzes transactions on the equipment. This decentralized report ensures transparency by providing all stakeholders with a single version of the truth. Transparency solves the long-standing problem of information asymmetry and provides rapid visibility into product flows, inventory levels, and job history. The decentralized nature of blockchain increases security, makes it resistant to tampering and fraud, and thus contributes to the integrity of the entire supply chain ecosystem.

2. Traceability through smart contracts:

Smart contracts are important components of the proposed model and are self-signed contracts whose content is written directly into the program code. This contract automatically performs and controls actions performed before the contract. In the context of supply chain management, smart contracts facilitate traceability by updating the blockchain at each step of the delivery process. Smart contracts reduce delays and inconsistencies by ensuring that all parties, from production to distribution and delivery, comply with the contract. This traceability not only increases efficiency but also allows quick resolution of any problems that may arise during the supply chain process.

3. Decentralized consensus mechanism:

The decentralized consensus mechanism uses a consensus process to identify and verify transactions on all connected devices. Traditional products often face issues with trust and authentication, especially in cross-border trade. Blockchain consensus mechanisms such as Proof of Work (PoW) or Proof of Stake (PoS) eliminate the need for a central authority by relying on a network of nodes to generate economic value. This decentralization increases the reliability of the supply chain as consensus is reached by most nodes, reduces the risk of fraud, and ensures the accuracy of data collected on the blockchain.

4. Improved safety measures:

The integrated model ensures the importance of improving safety throughout the equipment. Blockchain encryption technology ensures the security of data transfer and storage by protecting sensitive data from unauthorized access. The decentralized nature of blockchain also reduces the risk of one of the nodes failing, as data is stored across multiple nodes. This resistance to attacks and data breaches makes the chain stronger and ensures the confidentiality and integrity of important data. As a result, stakeholders can conduct secure and transparent transactions, increasing the trust of partners in the supply chain.

5. Instant Visibility and Data Analysis:

One of the advantages of the design is that it provides instant visibility of all devices. The blockchain ledger is instantly updated with each transaction, allowing participants to access new information regarding inventory, shipping status, and other important information. The view is further enhanced with the integration of data analysis tools that can now analyze the amount of data generated by the blockchain. Forecasting can be used to predict demand,

improve inventory levels, and identify areas for operational improvement. The combination of real-time visibility and data analytics allows product managers to make informed decisions, respond instantly to changes, and optimize overall operations.

In summary, the common concept of supply chain management using blockchain is a principle that solves the problems inherent in traditional supply chain management. By incorporating blockchain technology, the model creates a fair, transparent, and secure environment that increases traceability, reduces workload, and increases trust among people participating in the supply chain. From the centralized blockchain ledger to smart contracts, decentralized consensus mechanisms, and advanced security measures, every piece plays a key role in reshaping the future of supply chain management. As the industry continues to embrace digital transformation, the integrated model presented here serves as a base model for industry professionals to guide more efficient, repeatable, and transparent work in the future.

Research Findings:

The findings of this research demonstrate a shift in supply chain management through the use of an integrated model using blockchain technology. Through deep analysis of real-world research and theoretical frameworks, many important findings have been obtained from the importance of material blockchain transformation.

First of all, the integration of blockchain technology will increase transparency in the supply chain. Decentralized ledgers will provide all stakeholders access to accurate and immutable information on transactions, thereby increasing trust and eliminating information asymmetries. Fast information on the movement of products and processes leads to quick decisions, reductions, and improvements in overall performance.

Smart contracts play an important role in tracking as an integral part of the shared structure. Automation of contract execution ensures that each step in the supply chain is executed according to predefined conditions. This not only reduces the possibility of errors but also allows stakeholders to track products from production to delivery, increasing accountability and facilitating the resolution of the immediate problem.

Decentralized consensus mechanisms work by eliminating the need for central control. The findings show that this approach increases security and reduces the risk of fraud, providing a

better foundation for the functioning of the supply chain. Additionally, the use of better security measures, including the use of encryption technology and decentralized data storage, increases the security and integrity of important information on the equipment.

Analysis can be quickly facilitated through the integration of integrated models and data has become a powerful tool for supply chain management. Findings show that the use of blockchain technology enables predictive analytics, enabling organizations to forecast demand, improve product quality, and adapt to changes in the economy It shows that it makes you respond.

Together, the findings highlight the evolution of shared governance models using blockchain. Adoption of blockchain technology helps improve transparency, traceability, and security in the supply chain, ultimately leading to a more efficient, faster, and reliable supply chain ecosystem.

V Conclusion:

The studies presented in this article highlight the evolution of integrating blockchain technology into supply chain management. A comprehensive review of the literature, case studies, and the development of an integrated model led to key findings showing that significant improvements in transparency, security, and efficiency can be made through the use of blockchain. By adopting the distributed and transparent nature of blockchain, traditional problems such as information asymmetry, fraud, and delays in chain operations can be greatly reduced.

One of the main findings of this study is the huge impact of blockchain on increasing transparency throughout the supply chain. Blockchain's immutable and unchangeable data ensures that every change and movement of the product is recorded and traced back to its history. This transparency not only reduces the risk of fraud and fraud but also provides stakeholders with instant access to the entire delivery process. Therefore, the collaborative model proposed in this article highlights the role of blockchain in creating a trustless environment where participants can trust the accuracy and integrity of data recorded on the blockchain.

A common theme is important for both practitioners and researchers in supply chain management. Blockchain's transparency and traceability features underpin advanced decision- making, risk management, and supply chain optimization. Additionally, using

smart contracts in the collaborative model can ensure all aspects of contract execution, reducing the need for intermediaries and reducing compliance risk. For researchers, the integration model opens a way to explore the evolution of blockchain applications in supply chain management. It serves as a framework for conducting empirical studies, refining existing models, and exploring novel approaches to address emerging challenges.

The unified model proposed in this research paper is not merely a theoretical construct but a call to action for practitioners and stakeholders across industries to explore and adopt blockchain technology in their supply chain operations. The adoption of blockchain has the potential to revolutionize the way global supply chains operate, fostering a more interconnected, transparent, and efficient ecosystem. Organizations must recognize the strategic advantage that blockchain can provide in addressing longstanding issues in supply chain management.

Collaboration among supply chain participants in implementing blockchain-based solutions can lead to standardized practices and interoperability, further enhancing the overall efficiency of supply chain networks. Regulatory bodies are encouraged to engage with industry stakeholders to establish guidelines and standards for the responsible adoption of blockchain in supply chain management. This collaborative effort will help create an environment for the widespread use of blockchain technology. In conclusion, the integration model proposed in this research paper using blockchain technology for supply chain management shows great promise against the challenges faced by existing equipment. The findings demonstrate the potential to increase transparency, security, and efficiency.

Suggestions & Recommendations / Future Scope:

Based on the research and integration of the chain management model using blockchain, many ideas and recommendations have emerged to guide entrepreneurs and researchers on the power and efficiency of the supply chain ecosystem.

1. Legal Guidelines:

To ensure integration, organizations must develop adoption plans as a step towards standardization integration. This includes conducting test runs to evaluate the feasibility of the model, measure feasibility, and gain insight into potential problems.

2. Collaboration standards:

It is important to establish business-wide collaboration standards for blockchain implementation. This encourages connectivity and integration by enabling people with different devices to connect to blockchain networks.

3. Education and Training:

Investment in education and training is essential to create change. Participants must provide their employees with the necessary skills to use and leverage the benefits of blockchain technology.

4. Policy: Legislators should actively work with industry experts to create regulatory frameworks that accommodate and support the adoption of blockchain in supply chain management. A regulatory environment will encourage innovation while ensuring compliance and safety.

5. Continuous research and development:

The dynamic nature of technology requires constant research and development. Ongoing research into blockchain developments and their suitability for providing supply chain resilience will help maintain the efficiency and effectiveness of collaborative models.

Looking ahead, future research in this area is exploring features that can improve usability and security, such as professional blockchain sharding and encryption technology. Additionally, learning how to integrate new technologies such as the Internet of Things (IoT) and blockchain technology can open the door to new dimensions such as supply chain efficiency and

technology. Research collaboration, industry-wide collaboration, and knowledge sharing are key to meeting and driving the needs of global communications businesses and driving product growth.

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