



INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

Supply Chain Management For Dairy Product Using Blockchain Technology

¹Prof.Atiya Kazi, ²Ms.Janvi Mungekar, ³Ms.Reenal Naik, ⁴Ms.Soniya Rane, ⁵Mr.Akash Pawar

¹Assistant Professor, ²Student, ³Student, ⁴Student,

⁵Student ¹ Department Of Information Technology,

¹Finolex Academy of Management and Technology, Ratnagiri, India

Abstract: This study explores the transformative potential of blockchain technology in revolutionizing the dairy supply chain, specifically targeting improvements in traceability and transparency. Employing a comprehensive case study methodology, we meticulously examine the seamless integration of blockchain across diverse supply chain stages. Results underscore the potency of real-time data sharing, the efficacy of smart contract automation, and the reinforcement of trust through blockchain's intrinsic features. Addressing challenges like initial setup costs, we present pragmatic strategies for resolution. Promisingly, initial findings indicate a substantial uptick in operational efficiency and heightened customer satisfaction.

Index Terms - Blockchain technology; internet of things; agriculture; dairy supply chain system; food

I. INTRODUCTION

Using blockchain technology to manage the supply chain of dairy products is like giving it a superpower. It introduces a special kind of record-keeping system that is super secure and can't be changed. This system keeps track of important information about the milk, like where it comes from, how good it is, and if it meets certain standards. Imagine it like a magic book that writes down everything about the milk from the moment it's collected to when it reaches you. It's so smart that it can even do things automatically, like making sure everyone gets paid correctly. This makes everyone involved feel more confident because they know they can trust the information. For you, as a consumer, it means you can find out all about the milk you're buying - where it's been, and how good it is. And for the people in charge of making sure everything is done properly (like the regulators), it's like having a special key to check that everything is being done the right way. Using blockchain in dairy supply chains makes everything more reliable and trustworthy, which is great news for everyone involved.

II. . BLOCKCHAIN CHARACTERISTIC

1. Decentralization

- Instead of having one big boss in charge, blockchain spreads power across many computers. This makes it fairer and safer because no one person can control everything.

2. Transparency and Immutability

- Imagine if everyone could see a big, unchangeable list of all the things that happened. That's what blockchain does. Once something is written down, it can't be erased or changed.

3. Security

- Blockchain uses secret codes to keep information safe. It's like having a super-strong lock on a door. Even if someone tries to break in, it's really, really hard.

4. Smart Contracts

- These are like super clever agreements that are written in computer code. They automatically do things when certain conditions are met, like paying someone when a job is done.

III. OBJECTIVES

1. Transparency and Traceability

- Blockchain provides real-time, unchangeable ledger access for all in the dairy supply chain, ensuring thorough documentation and easy verification. This transparency allows consumers to trace a dairy product's journey, enhancing confidence in its authenticity and quality.

2. Quality Assurance

- Recording crucial details on the blockchain, such as milk quality, production dates, and processing methods, assures stakeholders of dairy product authenticity and safety, curbing the spread of substandard or fake goods.

3. Reducing Fraud and Counterfeits

- Blockchain's immutability prevents tampering or alteration of data once it's recorded. This reduces the risk of fraudulent activities in the supply chain, such as substituting low-quality products for higher-grade ones.

4. Payment and Settlements

- Blockchain can facilitate faster and more secure payment processing between stakeholders in the supply chain, reducing the need for intermediaries and potential delays.

5. Consumer Trust

Implementing blockchain in supply chain management demonstrates a commitment to transparency and quality. This can serve as a competitive advantage and build trust with consumers who value knowing where their food comes from.

IV. LITERATURE REVIEW

In [1] we can observe that the context of blockchains in SCs by considering qualitative SC business research, existing implementations and system architectures to form a set of holistic technical design recommendations for a BT system in an SC context.

In [2] The paper focuses on milk as the product of choice and details its journey from the farm to the processing plant. All processing steps which the milk undergoes are recorded and uploaded onto the blockchain in an automated manner by the use of sensors. The use of QR codes can be widely seen in the work as it acts as a gateway to all information concerning a particular product.

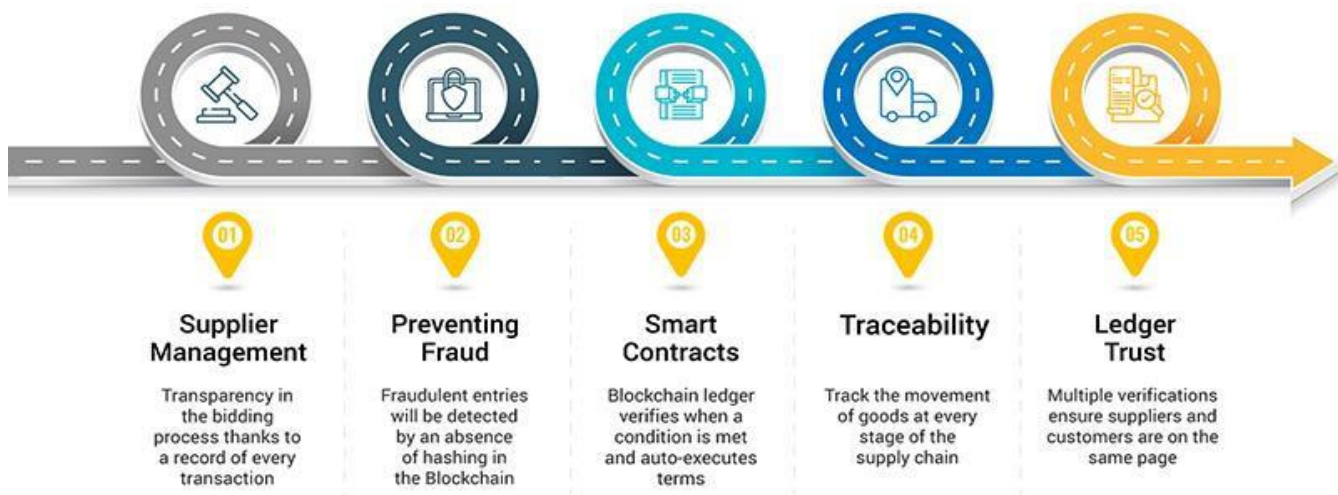
In [3] Multiple approaches have been applied for supply chain traceability ranging from traditional recording on papers to sophisticated and advanced technologies [24]. While there have been several cutting-edge techniques to perform traceability in supply chain suggested in literatures, the paper-based approach is still highly favoured for food supply chain in less developed countries.

In [4] This research attempted to establish the underlying dimensions of supply chain management practices, blockchain technology and supply chain performance in the Indian dairy industry. Additionally, the study proposes a conceptual model that shows the mediating effects of blockchain technology in the relationship between supply chain management practices and supply chain performance.

V. THE EXISTING PROCESS

An existing process of using blockchain in the supply chain involves creating a decentralized ledger that records all transactions and activities related to the movement of products. This ledger is shared across participants, ensuring transparency and security. Smart contracts automate processes based on predefined conditions. This technology enhances traceability, prevents fraud, and builds trust among stakeholders by providing an immutable record of all supply chain activities.

Implementing Blockchain in Supply Chain



VI. PROPOSED METHODOLOGY WITH BLOCKCHAIN:

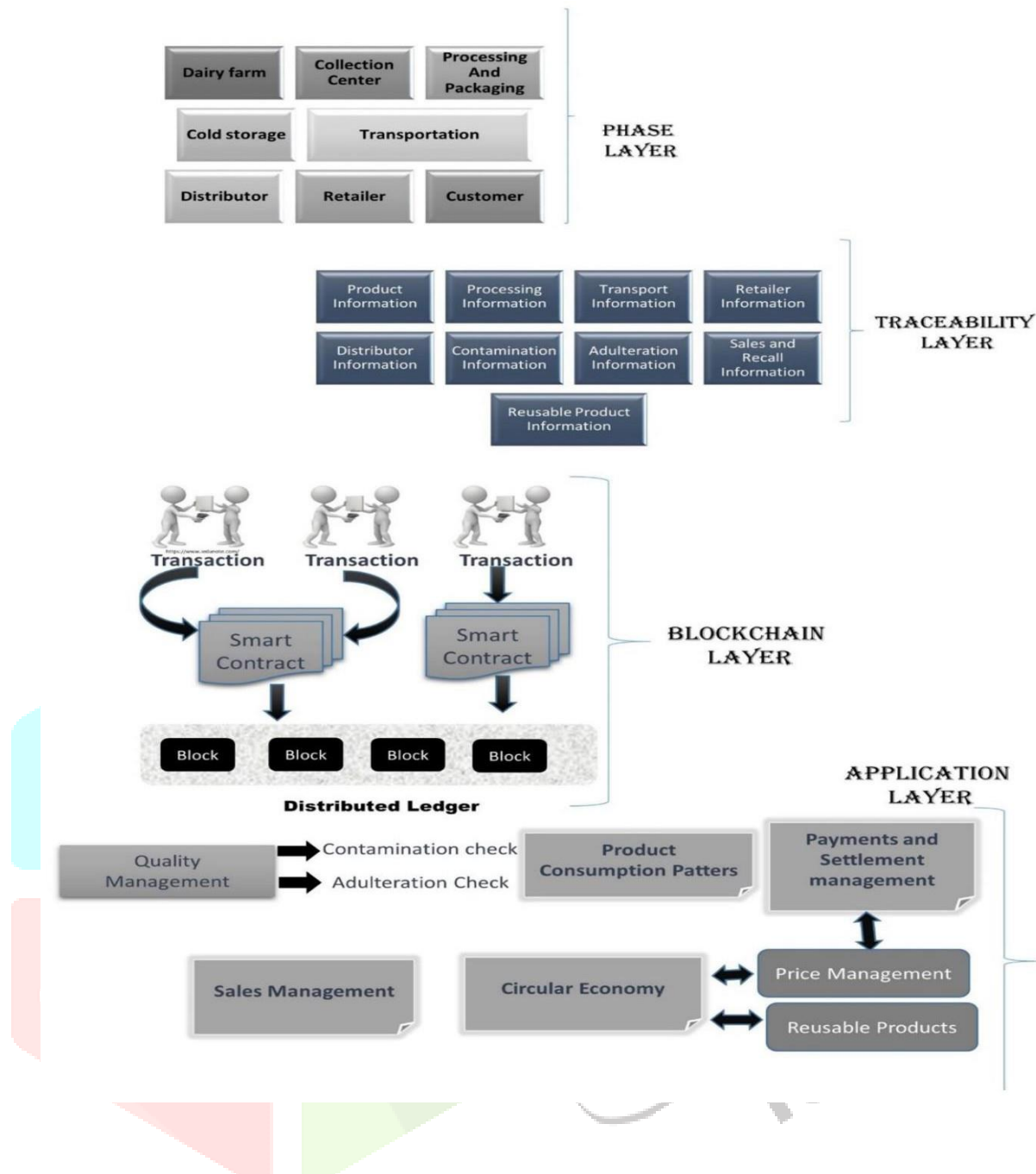
The proposed supply chain management for dairy products using blockchain involves several distinct layers.

In the Phase Layer, initial steps focus on registering farmers and collection centers on the blockchain. This creates secure digital identities for participants. Subsequently, data collection and quality assurance processes utilize IoT sensors for accurate recording, ensuring a reliable record of milk-related information. Additionally, processing and packaging details are logged onto the blockchain, contributing to the transparency and security of these critical stages.

The Traceability Layer introduces unique identifiers or batch numbers, enabling the thorough tracking of dairy products. This feature enhances accountability and trust. Simultaneously, shipment and distribution information, including location, temperature, and humidity, are updated on the blockchain during transit, ensuring visibility throughout the supply chain.

Within the Blockchain Layer, smart contracts play a pivotal role. They automatically execute various processes, such as quality checks and payments, streamlining operations and reducing manual intervention. The immutable ledger maintains an unchangeable record of all transactions and activities, bolstering transparency and security.

At the Application Layer, consumers engage with the system. They can trace a product's journey, offer feedback, and verify product details through user-friendly applications or interfaces. Regulatory compliance and audits are facilitated by restricted access for authorized bodies, ensuring adherence to food safety and quality standards.



VII. TECHNOLOGY USED IN BLOCKCHAIN

Hyperledger Fabric

Hyperledger Fabric is a permissioned blockchain framework developed by the Linux Foundation. It's designed for enterprise applications and provides a modular architecture with support for smart contracts.

Smart Contracts

In Hyperledger Fabric, chaincode is the equivalent of smart contracts in other blockchain platforms. It contains the business logic that defines the rules for transactions on the blockchain.

Truffle

Truffle is a development environment, testing framework, and asset pipeline for Ethereum. It provides tools for writing, testing, and deploying smart contracts. It also helps in managing the development process.

VIII.CONCLUSION

The integration of blockchain in dairy supply chain management offers transformative benefits. It ensures transparency, traceability, and security, building trust and enabling swift recalls if needed. Immutability safeguards data integrity, while smart contracts streamline processes, reducing costs. Decentralization enhances security, and cryptographic techniques provide robust authentication. Blockchain meets consumer demands for transparency and sustainability. Challenges include initial costs and scalability. Overall, blockchain promises a more efficient, transparent, and resilient dairy industry, urging stakeholders to invest and collaborate for a sustainable future.

VIII. REFERENCES

- [1] Shubhani Aggarwal and Neeraj Kumar. 2021. Hyperledger. In *Advances in computers*. Vol. 121. Elsevier, 323– 343.
- [2] Esteban Angulo and Xavier Ferre. 2014. A case study on cross-platform development frameworks for mobile applications and UX. In *Proceedings of the XV International Conference on Human Computer Interaction*. 1–8.
- [3] Myo Min Aung and Yoon Seok Chang. 2014. Traceability in a food supplychain: Safety and quality perspectives. , 172-184 pages. Issue 1.<https://doi.org/10.1016/j.foodcont.2013.11.007>
- [4] Rita Azzi, Rima Kil any Chamoun, and Maria Sokhn. 2019. The power of a blockchain-based supply chain. *Computers and Industrial Engineering* 135 (92019), 582–592. <https://doi.org/10.1016/j.cie.2019.06.042>
- [5] Gavina Baralla, Andrea Pinna, and Giacomo Corrias. 2019. Ensure traceability in european food supply chain by using a blockchain system. *Proceedings -2019 IEEE/ACM 2nd International Workshop on Emerging Trends in Software Engineering for Blockchain, WETSEB 2019*, 40–47. <https://doi.org/10.1109/WETSEB.2019.00012>
- [6] Kay Behnke and M. F.W.H.A. Janssen. 2020. Boundary conditions for traceability in food supply chains using blockchain technology. *International Journal of Information Management* 52 (6 2020). <https://doi.org/10.1016/j.ijinfomgt.2019.05.025>
- [7] Thomas Bocek, Bruno B. Rodrigues, Tim Strasser, and Burkhard Stiller.2017.*Blockchains Everywhere - A Use- case of Blockchains in the Pharma Supply-Chain.*(2017).
- [8] M. Bowman, D. Das, A. Mandal, and H. Montgomery. 2021. On Elapsed Time Consensus Protocols. Vol. 13143 LNCS. 559–583 pages.https://doi.org/10.1007/978-3-030-92518-5_25
- [9] Daniel Bumblauskas, Arti Mann, Brett Dugan, and Jacy Rittmer. 2020. A blockchain use case in food distribution: Do you know where your food has been? *International Journal of Information Management* 52 (6 2020). <https://doi.org/10.1016/j.ijinfomgt.2019.09.004>
- [10] Pankaj Dutta, Tsan Ming Choi, Surabhi Somani, and Richa Butala. 2020. Blockchain technology in supply chain operations: Applications, challenges and research opportunities. *Transportation Research Part E: Logistics and Transportation Review* 142 (10 2020). <https://doi.org/10.1016/j.tre.2020.102067>.