# Tamper-Proof Supply Chain System for Counterfeit Detection Using Blockchain

**Dr. U. Nilabar Nisha[1], Nisha V[2], Abinaya L[3], Monisha G[4], Govarthini M[5]**
[1]HOD, Dept of Computer Science and Engineering
[2, 3, 4, 5] Students, Dept of Computer Science and Engineering
[1, 2, 3, 4, 5] Mahendra Institute of Engineering and Technology, Namakkal, Tamil Nadu, India

***Abstract-*** *This system presents a blockchain based secure product tracking and authenticity verification solution for modern supply chains. It enables tracking of products at every stage, from manufacturer to end user, ensuring complete transparency. Blockchain technology is used to store all product data in a decentralized and tamper-proof manner. Each product is assigned a unique QR code or barcode that links directly to its blockchain record. This allows consumers to verify product authenticity in real time. The system uses the SHA-256 hashing algorithm to securely store and validate product information. This ensures data integrity and prevents unauthorized modifications throughout the product lifecycle. Every transaction in the supply chain is recorded and cannot be altered once stored. The system reduces dependency on centralized databases and increases reliability. It significantly minimizes the risk of counterfeit products entering the market. It also improves trust and traceability among all stakeholders. Overall, the system enhances security, transparency, and efficiency for manufacturers, distributors, and consumers.*

## I. INTRODUCTION

In today's global market, supply chain systems have become increasingly complex and involve multiple stakeholders. Traditional product tracking methods are centralized and vulnerable to data manipulation and fraud. This often leads to the circulation of counterfeit products, affecting both businesses and consumers. To address these challenges, blockchain technology offers adecentralized and securesolution. It ensures that all transactions are recorded in an immutable and transparent manner. This project focuses on developing a blockchain-based system for secure product tracking and authenticity verification. Each product is monitored at every stage of the supply chain, from manufacturing to delivery. A unique QR code is assigned to each product for easy verification by consumers. The system enhances trust by providing real-time access to product information. It also reduces the risk of unauthorized changes and counterfeit entries. Overall, this approach improves transparency, security, and efficiency in supply chain management.

## II. LITERATURE REVIEW

Blockchain technology has gained significant attention in recent years for its application in supply chain management. Many studies highlight its ability to provide transparency, security, and traceability in product tracking systems. Researchers have proposed blockchain-based solutions to record transactions in a decentralized and tamper-proof manner. Some existing systems focus on improving logistics and inventory management using distributed ledgers. Others emphasize the use of QR codes and RFID technologies for product identification and tracking. However, many of these solutions lack integration between product tracking and real-time consumer verification. Traditional centralized databases are still widely used, but they are vulnerable to data breaches and manipulation. Previous research also shows that counterfeit products remain a major issue in industries like pharmaceuticals and electronics. Blockchain combined with cryptographic hashing algorithms such as SHA-256 improves data integrity and security. Some studies suggest the use of smart contracts to automate verification processes. Despite these advancements, scalability and implementation costs remain challenges. This project aims to overcome these gaps by providing a secure, transparent, and user-friendly product tracking and authentication system.

## III. METHODOLOGY

The proposed system follows a structured approach to ensure secure product tracking and verification. Initially, the manufacturer registers product details into the system. A unique product ID and QR code are generated for each item. The product data is then stored on the blockchain using secure hashing techniques. At every stage of the supply chain, updates are recorded as new transactions. Consumers can scan the QR code to access product details and verify authenticity. This method ensures transparency, data integrity, and protection against counterfeit products.

## IV. TARGET

The target of this system is to provide a secure and transparent solution for product tracking and authentication. It is mainly designed for manufacturers to protect their products from counterfeiting. Distributors and retailers can use the system to track product movement efficiently. Consumers are able to verify product authenticity easily using QR codes. The system is suitable for industries such as pharmaceuticals, electronics, and luxury goods. It aims to improve trust and reliability among all stakeholders. Overall, the target is to enhance security, traceability, and efficiency in the supply chain.

## V. RELATED WORK

### A. METHODOLOGY

The methodology of existing systems focuses on tracking products using centralized databases and basic identification techniques such as QR codes or barcodes. These systems record product details at different stages ofthesupply chain. However, they lack strong security and are vulnerable to data manipulation. Recent approaches use blockchain technology to improve transparency and ensure tamper-proof data storage. This project adopts blockchain to provide a secure and decentralized tracking mechanism.

### B. DATA COLLECTION

Data in traditional systems is collected from manufacturers, distributors, and retailers at each stage of the supply chain. Product details such as ID, origin, and transaction history are stored in databases. In advanced systems, QR codes are generated to link product data. However, data collection methods are not always secure. In the proposed system, data is securely collected and stored on the blockchain to ensure authenticity and reliability.

### C. DATA PREPROCESSING

Before storing the data, preprocessing steps are applied to ensure accuracy and consistency. This includes validation of product details, removal of duplicate entries, and formatting of data. In some systems, cryptographic techniques are applied to secure the data. The proposed system uses hashing algorithms like SHA-256 to preprocess and encrypt product information before storing it on the blockchain.

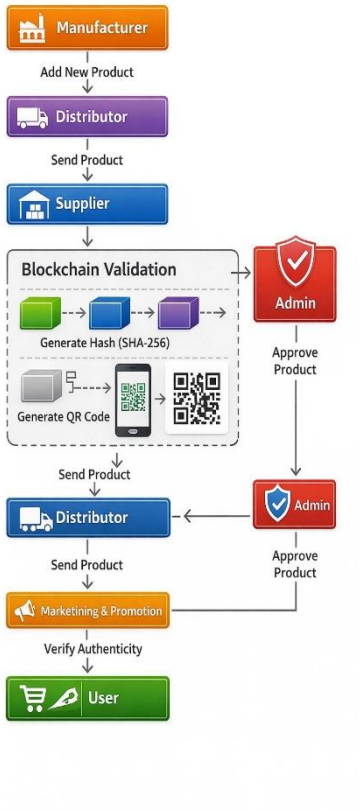
### D. MODEL SELECTION

Existing systems mainly rely on database models for storing and retrieving product information. Some advanced systems use blockchain platforms such as Ethereum for secure data storage. The proposed system selects a blockchain-based model combined with cryptographic hashing to ensure immutability, security, and transparency in product tracking.

### E. EVALUATION

The performance of product tracking systems is evaluated based on security, accuracy, and efficiency. Traditional systems show limitations in data integrity and protection against fraud. Blockchain-based systems provide better results in terms oftransparency and tamper resistance. The proposed system is evaluated by its ability to prevent counterfeit products, ensure secure data storage, and provide real-time authentication for users.

## VI. WORKFLOW DIAGRAM




## VII. PROPOSED ALGORITHM

### 1. Product Registration Algorithm

The process begins when the manufacturer enters the product details into the system. The system generates a unique product ID for each item and creates a corresponding QR code. The product information is then prepared and structured for secure storage in the blockchain.

### 2. Blockchain Storage Algorithm

The product data is converted into a secure hash value using the SHA-256 algorithm. A new block is created containing the product information and its hash. This block is then added to the blockchain network, ensuring that the data becomes immutable and protected from unauthorized modifications.

### 3. Supply Chain Update Algorithm

As the product moves through the supply chain, distributors and retailers update its status in the system. Each update is recorded as a new transaction and added as a block to the blockchain. This process maintains a complete and transparent history of the product's movement.

### 4. QR Code Scanning Algorithm

When the consumer scans the QR code, the system extracts the product ID embedded in it. A request is sent to the blockchain network to retrieve the corresponding product details. The data is then fetched securely and prepared for verification.

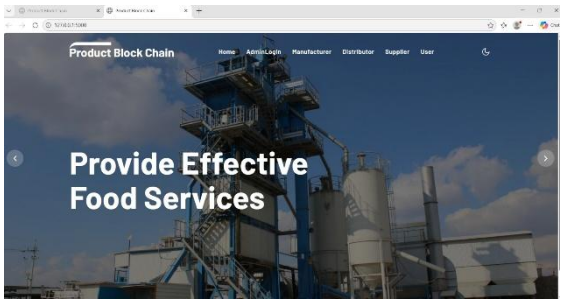
### 5. Authenticatio Algorithm

The retrieved product data is compared with the records stored in the blockchain. The system checks data integrity by verifying the hash values. If the data matches, the product is confirmed as authentic; otherwise, it is identified as counterfeit.

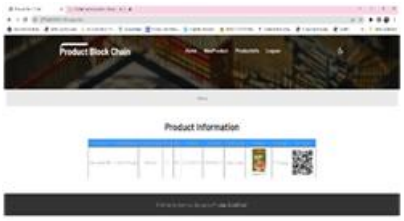
### 6. Result Display Algorithm

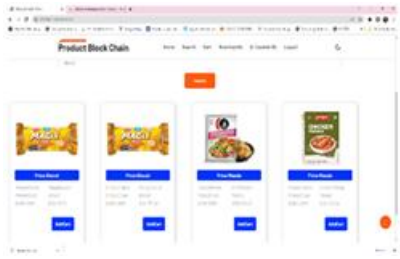
Finally, the system displays the product details to the user, including its origin and transaction history. The authenticity status of the product is clearly shown as valid or invalid. This completes the verification process and ensures transparency for the end user.

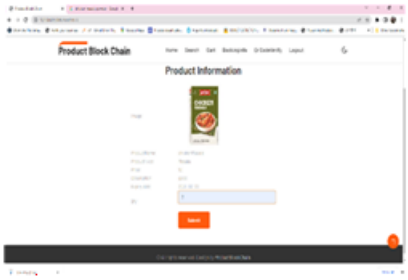
## VIII. RESULT








The proposed system successfully implemented a secure product tracking and authentication solution using blockchain technology. It was able to store product data in a tamper-proof and decentralized manner. The system accurately tracked product movement across all stages of the supply chain. QR code scanning enabled quick and real-time verification of product authenticity. The use of SHA-256 hashing ensured strongdata integrity and security. Thesystem effectively reduced the risk of counterfeit products entering the market.

## IX. CONCLUSION

The proposed system successfully developed a secure and transparent product tracking and authenticity verification solution using blockchain technology. It eliminates the limitations of traditional centralized systems by ensuring tamper-proof data storage and decentralized access. By

integrating QR code-based verification and SHA-256 hashing, the system provides a reliable method for confirming product authenticity. This enhances trust among manufacturers, distributors, and consumers while reducing the risk of counterfeit products.

In the future, the system can be enhanced by integrating mobile applications and advanced technologies such as IoT and AI for automated tracking and intelligent analysis. Additional features like real-time alerts and global supply chain integration can further improve its performance and scalability.

## REFERENCES

[1] Jensen, Steffen Foldager, et al. "Digital product passports for a circular economy: Data needs for product life cycle decision-making." Sustainable Production and Consumption 37 (2023): 242-255.
[2] Sudirjo, Frans. "Marketing strategy in improving product competitiveness in the global market." Journal of Contemporary Administration and Management (ADMAN) 1.2 (2023): 63-69.
[3] Ismail, Shereen, et al. "Toward an intelligent blockchain ioT-enabled fish supply chain: A review and conceptual framework." Sensors 23.11 (2023): 5136