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Research Paper

SYSTEM FOR IDENTIFYING FAKE PRODUCT USING BLOCK CHAIN TECHNOLOGY

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Abstract:

The proliferation of counterfeit products poses a severe threat to global markets, endangering consumer safety, diminishing brand value, and causing significant economic losses. Traditional methods of product verification are often inefficient, prone to manipulation, and lack transparency. This project proposes a blockchain-based system to combat product counterfeiting by enabling secure, immutable, and transparent product authentication throughout the supply chain. Leveraging the decentralized nature of blockchain technology, each product is assigned a unique digital identity, which is updated at every stage of its journey—from manufacturing to the end consumer. Authorized stakeholders can validate and trace the product's origin, ensuring its authenticity. The system enhances trust among manufacturers, suppliers, retailers, and customers, while reducing the risk of fraud. This solution not only safeguards brand integrity but also promotes consumer confidence and regulatory compliance.

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I.INTRODUCTION

Counterfeit products are a growing global concern, affecting industries ranging from pharmaceuticals and electronics to luxury goods and automotive parts. The World Health Organization estimates that a significant percentage of drugs in developing countries are counterfeit, posing a direct threat to human life. In such an environment, traditional anti-counterfeiting techniques—such as barcodes, QR codes, or holograms—fall short, as they can be easily duplicated or tampered with.

Blockchain technology, with its core attributes of decentralization, immutability, and transparency, presents a promising solution to address this challenge. By creating a tamper-proof digital ledger that records every transaction and movement of a product through the supply chain, blockchain allows consumers and stakeholders to verify the authenticity and

provenance of products in real-time.

This project introduces a blockchain-enabled system designed to detect and prevent the circulation of fake products. The system records every stage of a product's lifecycle on a blockchain network—starting from the manufacturer, passing through the distributor and retailer, and finally reaching the end user. Each transaction is verified by the network and linked to previous records, making it virtually impossible to alter the data without detection.

Through this secure and transparent ecosystem, stakeholders can access accurate, real-time information about product origins and history, thereby ensuring product integrity and boosting consumer trust. This solution not only deters counterfeiters but also provides a scalable framework for smart supply chain management in various industries.

II.LITERATURE SURVEY

The problem of product counterfeiting has attracted considerable attention from researchers, industry experts, and regulatory bodies over the past two decades. Various technological interventions—such as RFID tags, barcodes, QR codes, holograms, and centralized databases—have been proposed and implemented to tackle the issue. However, each of these solutions has limitations regarding data integrity, traceability, and resistance to tampering. Recent research has explored the potential of blockchain technology as a robust alternative due to its decentralized and immutable characteristics. This literature survey presents key contributions from relevant research and solutions in this domain.

1. Kshetri, N. (2018) – "1 Blockchain's roles in meeting key supply chain management objectives"

This study outlines the transformative impact of blockchain technology in achieving supply chain goals, including traceability and transparency. It highlights how blockchain can create an immutable record of product origins and handling, which is essential in detecting counterfeits.

Contribution: Emphasized blockchain's effectiveness in recording supply chain activities to ensure authenticity.

Limitation: Lacked implementation details for specific industries.

2. Toyoda, K., Mathiopoulos, P. T., Sasase, I., & Ohtsuki, T. (2017) – "A novel blockchain-based product ownership management system (BOPS) for anti-counterfeits in the post supply chain"

The authors proposed a blockchain-based system for verifying ownership history of

products. The BOPS system enables users to trace product ownership, effectively identifying fake products by verifying the integrity of their transaction history.

3. Tian, F. (2016) – "An agri-food supply chain traceability system for China based on RFID & blockchain technology"

This research focuses on food supply chains and proposes an RFID and blockchain-based traceability model to address food fraud. The proposed system combines physical tracking with blockchain-based recording.

Contribution: Demonstrated a real-world use case combining physical sensors (RFID) with blockchain for anti-counterfeiting.

Limitation: Limited to the agricultural domain.

4. Francisco, K., & Swanson, D. (2018) – "The supply chain has no clothes: Technology adoption of blockchain for supply chain transparency"

This work explores how blockchain adoption improves supply chain transparency and how transparency, in turn, helps detect counterfeiting and ensures authenticity.

Contribution: Provided insights into industry challenges and opportunities in blockchain adoption.

Limitation: Lacked experimental implementation and performance analysis.

5. Mahajan, P., & Saxena, V. (2019) – "Product Provenance Tracking Using Blockchain"

This paper presents a smart contract-based system to track product provenance. It ensures that every product component is recorded on the blockchain with timestamps and verified actors.

Contribution: Introduced the use of smart contracts for product lifecycle management.

Limitation: Implementation lacked scalability analysis.

6. IBM & Walmart Blockchain Food Safety Initiative (2017)

IBM and Walmart collaborated on using blockchain to track food products through the supply chain. The results showed dramatic improvements in traceability and data accuracy.

III.EXISTING SYSTEM

In the current marketplace, several traditional methods are employed to identify and prevent fake or counterfeit products. One of the most widely used techniques is the application of barcodes and QR codes. These codes are scanned to retrieve product-related information from centralized databases. While this system is cost-effective and easy to implement, it suffers from major security vulnerabilities. QR codes can be easily duplicated or copied,

and centralized databases are prone to hacking and data tampering. Furthermore, these systems lack real-time traceability and do not provide insights into the complete lifecycle of a product.

Another common technique is the use of holograms and tamper-proof security labels. These physical tags provide visual confirmation to consumers regarding a product's authenticity. However, with advancements in printing technology, counterfeiters have found ways to replicate these security features, making them unreliable. Additionally, these solutions are not integrated with any digital verification process and cannot ensure end-to-end supply chain integrity.

Technologies like RFID (Radio Frequency Identification) and NFC (Near Field Communication) tags have also been adopted to track products during distribution. These tags allow for automated identification and location tracking, which can significantly improve inventory and logistics management. However, they are relatively expensive to implement on low-cost consumer goods and still rely on centralized storage of information. Moreover, they are vulnerable to signal interception and tag manipulation.

IV.PROPOSED SYSTEM

The proposed system introduces a blockchain-based solution to effectively identify and prevent the distribution of fake products across the supply chain. Unlike traditional centralized systems, this approach leverages the decentralized, immutable, and transparent nature of blockchain technology to ensure that every transaction or event associated with a product is securely recorded and verifiable. Each product is assigned a unique digital identity in the form of a cryptographically secure token or serial number, which is stored on the blockchain along with details such as manufacturer ID, date of production, and transfer history.

As the product moves from the manufacturer to distributors, retailers, and finally to the end consumer, every transaction or handoff is recorded as a new block in the chain. These blocks are verified by network participants (nodes), making the system resistant to tampering or unauthorized modification. Since the data is distributed across multiple nodes, there is no single point of failure, and the records remain secure and transparent for all authorized users. Smart contracts can be integrated into the system to automate verification processes, enforce rules, and validate the authenticity of products in real-time.

V.SYSTEM ARCHITECTURE

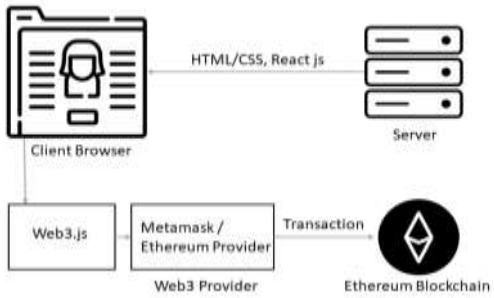


Fig 5.1 System Architecture

The system architecture for identifying fake products using blockchain technology is designed to ensure transparency, security, and real-time verification of product authenticity. At the front-end, users interact with the application through a client browser interface built using HTML, CSS, and React.js. This user-friendly interface allows manufacturers to register products, distributors to update product movements,

VI.IMPLEMENTATION



Fig 6.1 Manufacturer Login page



Fig 6.2 : Manufacturer adding the details

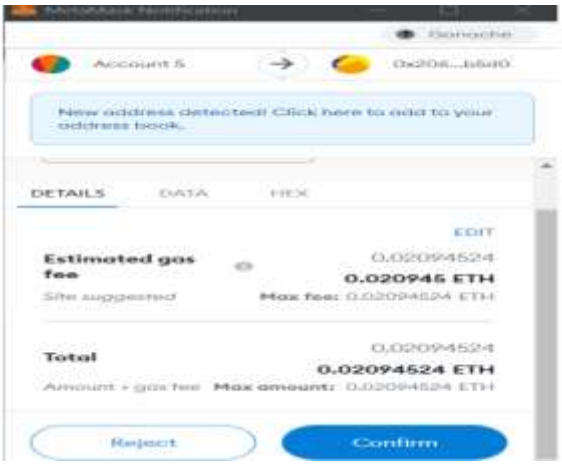


Fig 6.3 Completing the transaction with metamask wallet



Fig 6.4 Supplier adding details for the product.



Fig 6.5 Supplier Login page.

VII.CONCLUSION

The increasing prevalence of counterfeit products across various industries poses a serious threat to consumer safety, brand reputation, and economic stability. Traditional methods of product authentication, such as barcodes, holograms, and centralized databases, have proven to be insufficient due to their vulnerability to duplication, tampering, and lack of transparency. In this project, a blockchain-based solution has been proposed and designed to effectively address these limitations.

By leveraging the core principles of blockchain technology—decentralization, immutability, and transparency—the system ensures that every product's journey from manufacturer to consumer is securely recorded and verifiable. The integration of smart contracts and Web3-based tools like MetaMask allows for secure user interactions, real-time verification, and tamper-proof product data storage on the Ethereum blockchain. Consumers can easily scan a product code and instantly verify its authenticity, while manufacturers and supply chain stakeholders can ensure trust and traceability at every step.

This system not only helps in identifying and preventing the distribution of fake products but also promotes trust, accountability, and regulatory compliance within the supply chain ecosystem. It lays a strong foundation for scalable, transparent, and secure product tracking systems that can be applied across various sectors including pharmaceuticals, electronics, fashion, and more. Thus, blockchain emerges as a powerful tool in the fight against

counterfeiting, providing a robust solution for a global challenge.meaningful, impactful, and scalable manner.

VIII.FUTURE SCOPE

The proposed blockchain-based system for identifying fake products holds vast potential for future enhancements and scalability across various sectors. As blockchain technology continues to evolve, there are numerous opportunities to expand the functionality, performance, and applicability of this system.

One major area of future development is the integration of IoT (Internet of Things) devices and RFID/NFC sensors. These can automate the real-time tracking of product movement through the supply chain and record environmental conditions (like temperature and humidity) directly on the blockchain—especially useful in pharmaceuticals and food industries.

Another significant enhancement could be the adoption of IPFS (InterPlanetary File System) or other decentralized storage solutions to store larger product-related data such as certificates, product images, manufacturing videos, and customer reviews. This would ensure that even rich media content remains immutable and decentralized.

In the future, this system can be extended to support multi-chain interoperability, allowing communication between different blockchain networks (like Ethereum, Polygon, or Hyperledger) for better scalability, reduced transaction costs, and cross-industry adoption.

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