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Detection of Fake Product Using Blockchain

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Abstract: Recently, there has been a significant increase in fascination with advancements in blockchain technology. Although often associated with digital currency and currency exchange, blockchain has a much wider range of applications that go beyond these areas, influencing multiple business sectors. The technology's built-in features, like clearness and ability to handle significant transactions, make it a flexible answer that can tackle various obstacles.

An obstacle that blockchain technology can effectively address is the issue of fake products. Consumers are always worried about the genuineness of products in the current market. The increase in duplicate and dangerous products not only endangers people but also has major effects on economic growth. In order to address this problem, blockchain presents a revolutionary method of making transparency a primary focus for consumers. Assigning a distinct digital code to every product is part of the process carried out during the manufacturing and packaging phases. This code acts as the unique representation of the product on the blockchain.

Customers have the option to use a specific app to scan the code of the item, starting a software installation procedure. During this procedure, the app compares the scanned code with the data saved on the blockchain to confirm the product's genuineness. This not only ensures consumers have a trustworthy way to authenticate purchased products but also helps in collectively reducing the prevalence of counterfeit goods. Essentially, blockchain technology is a major step towards eliminating duplicate and unsafe products. Its diverse strategy, including both technological advancements and heightened awareness, highlights the opportunity for a more secure and trustworthy worldwide market.

Keywords: Blockchain technology, Counterfeit detection, Product authenticity, Digital code, Supply chain management

INTRODUCTION

Counterfeiting is a rising problem in India that causes significant harm. The practice involves illegally selling fake products disguised as genuine ones, defrauding consumers and costing the Indian economy an estimated 1 trillion rupees annually. Reports show incidents of counterfeiting are increasing by 20 percent each year. This deceptive business not only negatively impacts the economy but also directly harms citizens through financial losses and potential safety risks from fraudulent goods. The best strategies for mitigating misleading counterfeit risk in international supply chains are supplier relationship management, cost control, and pre-supply evaluation techniques, as well as network transparency. As a result, we are using blockchain technology, which is decentralized, unchangeable, and potentially very helpful in identifying counterfeit goods. This technology makes it simple to identify any third parties that may be interfering with the data. In order to determine whether a product is authentic or fake, we also included a QR code that customers may scan.

Counterfeiting is a widespread issue in multiple sectors, ranging from pharmaceuticals and electronics to luxury goods and automotive components. This problem not only causes substantial economic damage but also jeopardizes consumer safety and brand credibility. Conventional approaches, like holograms and serial numbers, have proven inadequate in tackling this escalating menace. However, blockchain technology offers a promising solution to effectively combat counterfeiting. The detection and eradication of fraudulent goods in the market continue to pose a significant hurdle for both companies and governing bodies. Current remedies frequently lack transparency, traceability, and authentication measures, which hampers the ability to trace the source of products and validate their genuineness. This report endeavors to delve into the possibility of utilizing blockchain technology to create a strong and trustworthy mechanism for identifying counterfeit products.

This paper proposes a fake product detection system using blockchain technology. By leveraging blockchain's transparency and immutability with machine learning, the system can accurately identify fake products. The proposed system employs QR codes assigned to products, enabling end consumers to verify product authenticity through scanning. This application not only enhances security but also provides consumers with a tangible means to confirm product legitimacy,

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fostering trust in the marketplace. Blockchain stands as a robust solution to the global challenge of counterfeit products, ensuring transparency and consumer confidence in the authenticity of goods.

LITERATURE SURVEY

The e-commerce boom has fueled a rise in online counterfeit products, posing threats to business revenue and consumer safety. A potential remedy is blockchain technology, offering secure and decentralized product tracking to combat counterfeiting. This survey examines existing research on blockchain's role in systems that can detect fake products, aiming to distill insights on current knowledge, trends, and advancements in securing product authenticity in the e-commerce realm.

- "A Blockchain-based approach for detecting counterfeit products in supply chains" by H.M. Tharaka Thilina *et al.* (2021): This paper suggests a blockchain-driven strategy for identifying fake products within supply chains. The approach integrates blockchain and Internet of Things (IoT) technology to monitor products across the entire supply chain, spanning from the manufacturer to the ultimate consumer. The authors substantiate the viability of their methodology through a case study centered on a pharmaceutical supply chain.
- "Blockchain-based anti-counterfeiting system for luxury products" by Y. Kim *et al.* (2021): This paper presents a new system designed to combat counterfeit luxury products by combining blockchain technology with Near Field Communication (NFC). Through meticulous product tracing, the system aims to prevent counterfeiting. The authors demonstrate the effectiveness of their method with a case study involving a luxury handbag manufacturer.
- "A blockchain-based product authentication and anti-counterfeit system using QR codes" by H. Jin *et al.* (2020): This paper presents a blockchain-driven system for product authentication and anti-counterfeiting, incorporating QR codes. The system utilizes a blend of blockchain and QR codes to monitor products and deter fake. The authors substantiate the efficacy of their approach through practical experiments conducted on a dataset comprising real-world products.
- "Blockchain-enabled secure and efficient supply chain management: An empirical study" by W. Zhang *et al.* (2019): This paper introduces a supply chain management system empowered by blockchain, designed to identify and mitigate counterfeit products. The authors validate the practicality of their approach through empirical research conducted on a supply chain associated with a consumer electronics product.
- "A secure blockchain-based approach for detecting counterfeit products in online marketplaces" by X. Zhang *et al.* (2020): This paper introduces a secure blockchain-driven strategy for identifying counterfeit products within online marketplaces. The system employs a fusion of blockchain and machine learning to scrutinize product descriptions, images, and additional data, aiming to discern potential counterfeit products. The authors validate the efficacy of their methodology through experimentation on a dataset containing real world products.

PROPOSED APPROACH

Proposed System

A blockchain-based supply chain enables efficient recording of crucial information like price, date, location, quality, and certification, enhancing overall supply chain management. Within the blockchain, this information availability improves traceability in material supply chains, reduces losses from counterfeit and gray market activities, enhances visibility, and ensures compliance in outsourced contract manufacturing. This can elevate an organization's standing as a leader in responsible manufacturing practices. The proposed system consists of three components: a product registration module, a verification module, and a user interface module.

Product registration module: The product registration module is tasked with enrolling products onto the blockchain. Each product is allocated a distinctive identifier, with its key details, including manufacturer, product name, and other pertinent information, systematically logged on the blockchain. Furthermore, the module generates a smart contract, outlining the terms governing the product's authentication.

Verification module: The verification module is tasked with confirming the legitimacy of products. Upon a consumer's purchase, they input the unique identifier of the product into the system. The system then validates the product's authenticity by cross-referencing the blockchain-stored information. If the product is authentic, the smart contract is activated, and the consumer receives a notification. In the event of a counterfeit product, the smart contract remains inactive, and the consumer is promptly informed of the product's fraudulent status.

User interface module: The user interface module provides a user-friendly interface for consumers to interact with the system. The module allows consumers to register their products, check the authenticity of products, and report counterfeit products.

Proposed Methodology

The blockchain network and the product authentication module make up the two primary parts of our suggested fake product detection system. By comparing the product's unique identifier with the one recorded in the blockchain, the product authentication module is in charge of confirming the product's legitimacy. This article is based on an extensive analysis

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of the body of research on blockchain technology, anti-counterfeiting measures, and counterfeit goods. To obtain the required data, scholarly journals, conference proceedings, industry reports, and pertinent websites were examined. Case studies and actual observations were incorporated as well to offer a suitable scenario pertaining to the same.

A smart contract is a self-executing contract that automatically enforces the rules and regulations of a contract when certain conditions are met. Typically, smart contracts are implemented on a blockchain network like Ethereum and written in programming languages like Solidity. A smart contract's main advantage is that it does away with the need for middlemen, such attorneys or notaries, to carry out the provisions of a contract. This improves the efficiency, transparency, and security of the contract execution process.

System Architecture

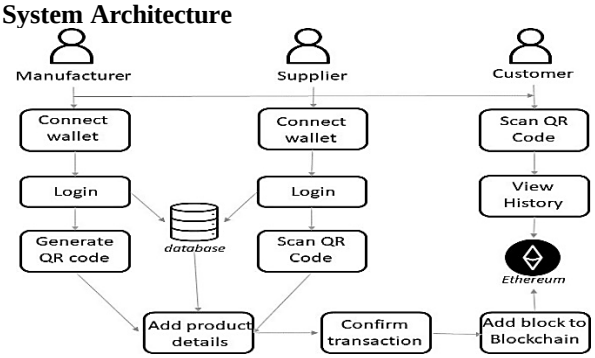

Figure 1: System Architecture

RESULTS & DISCUSSIONS

Initially, manufacturers register their products on the system, providing essential details such as product name, origin, and production date. Each product is then assigned a unique identifier, securely recorded on the blockchain alongside its associated information. As the product traverses the supply chain, stakeholders update its status and location on the blockchain, appending transportation records, quality checks, and other pertinent data at each stage.

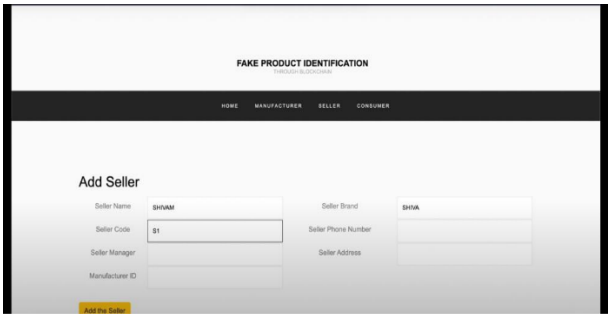

Figure 2: Adding the Dealer

Consumers engage with the system through a user-friendly interface, scanning product QR codes or RFID tags to access the blockchain record. The system retrieves and displays relevant information, leveraging smart contracts to automate verification processes, guaranteeing accuracy and reliability. Based on the information retrieved, consumers can ascertain the authenticity of the product, aiding in informed purchasing decisions. Additionally, the system facilitates feedback mechanisms for users, enabling continuous improvement, and provides channels for reporting suspected counterfeit incidents, triggering further investigation and actions. Continuous monitoring ensures the system's efficacy, with updates and enhancements implemented to maintain its integrity and effectiveness in combating counterfeit products.

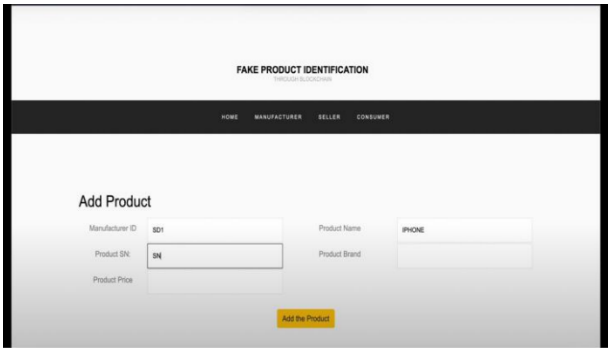

Figure 3: Adding the Product

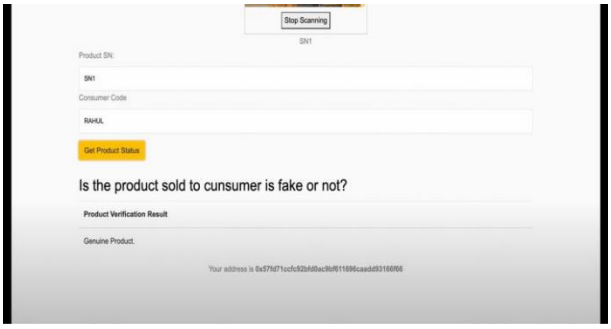

Figure 4: Final Output

Application And Future Enhancement

While the application of blockchain technology for counterfeit product detection holds promising advantages, it's crucial to acknowledge potential drawbacks, including:

- Transaction Speed Limitations: The reliance on a broader network for transaction approval imposes a constraint on the speed at which blockchain operates. Growing transaction volumes may lead to network speed issues, making scalability a current challenge that needs improvement.
- Elevated Energy Costs: The process of verifying transactions through numerous nodes consumes significantly more electricity compared to a single database or spreadsheet. This not only increases the expenses associated with blockchain-based transactions but also raises environmental concerns due to the carbon footprint generated.
- Potential for Illicit Activity: The decentralized nature of blockchain introduces a higher level of

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privacy and confidentiality, making it an attractive option for criminals. Illicit transactions on the blockchain are more challenging to trace compared to traditional bank transactions, which are typically linked to identifiable names.

- Risk of Asset Loss: Certain digital assets, such as cryptocurrencies stored in a blockchain wallet, rely on cryptographic keys for security. The necessity to safeguard these keys introduces a potential vulnerability, limiting the effectiveness of blockchain in detecting fake products throughout the entire supply chain.

While the adoption of blockchain holds great promise in tackling the widespread issue of counterfeit goods, it is essential to recognize and address the potential challenges associated with privacy. The solution's success in enhancing supply chain integrity, building consumer trust, and fostering a more secure marketplace hinges on careful consideration and mitigation of these concerns.

CONCLUSION

In conclusion, the incorporation of blockchain technology offers a robust solution for ensuring the integrity of supply chains. By establishing a tamper-proof and decentralized ledger, each product is assigned a unique identifier that undergoes recording at every stage of the supply chain. This meticulous tracking system guarantees transparency and traceability, empowering both consumers and businesses to authenticate the legitimacy and source of a product in real-time. The swift identification and removal of counterfeit items from the market become more feasible, safeguarding consumers from fraudulent and potentially hazardous products.

Capitalizing on the transparency, immutability, and decentralization features of blockchain, this solution stands to significantly elevate supply chain integrity, bolster consumer trust, and foster a more secure marketplace. Furthermore, the potential of blockchain-based solutions is underscored, providing a shared platform for stakeholders such as manufacturers, distributors, retailers, and consumers to engage in seamless information exchange. This collaborative environment creates a trusted ecosystem where data integrity is guaranteed, fostering a collective endeavor to combat counterfeit products that proves beneficial for businesses and consumers.

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