A BLOCKCHAIN-ENABLED FRAMEWORK FOR DETECTING AND PREVENTING COUNTERFEIT PRODUCTS

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Abstract: Consumers and businesses alike are becoming increasingly concerned about the prevalence of counterfeit goods. The presence of counterfeit products on the market jeopardizes consumer safety as well as business finances and reputations. Because blockchain technology is secure and decentralized, users will be able to recognize and avoid counterfeit products more easily. This study looks into whether blockchain technology can be used to detect counterfeit items. This research looks at the core concepts underpinning blockchain technology and how they can be used to create a reliable and accessible system for product identification. We present a novel approach for certifying the validity of an object using blockchain technology and smart contracts. Businesses can utilize this notion to assign unique digital identities to physical objects and record them in a distributed ledger. Consumers can check the validity of a product by scanning a QR code. Furthermore, we assess the potential benefits of employing blockchain technology for product identification, such as enhanced transparency, lower fraud rates, and higher customer confidence. Finally, we look into the drawbacks of employing blockchain-based systems for product identification, such as interoperability and scalability issues. Our findings suggest that employing blockchain technology to identify and eliminate counterfeit products from the market could be a viable strategy. Consumers and businesses are protected from the negative consequences of counterfeit products due to the system's decentralized structure and high level of security. It also gives a simple and dependable framework for establishing the validity of an item or notion.

Keywords: Blockchain, Decentralized, Ethereum, Smart Contract, Counterfeited Product, QR Code.

1. Introduction

The process of identifying counterfeit products using blockchain technology is known as fake product identification in the blockchain. The blockchain is an immutable, decentralized digital record that assures transaction security and transparency. Businesses can utilize blockchain technology to authenticate their products, increasing consumer trust in their transactions. The system tracks the movement of commodities from their point of origin to their final destination across the supply chain. Because the blockchain records every transaction related with a product, its full transactional history is saved and made public. This paper serves as an authentication technique in addition to avoiding thievery.

In this work, the researchers describe a unique way for detecting counterfeit products using blockchain technology. This novel approach keeps an open and readable record of all product-related interactions while verifying product authenticity. Manufacturers may authenticate the legitimacy of their products by attaching a digital fingerprint to each item and storing this information on the blockchain. Customers can have a high level of trust in the products' authenticity because they can verify their legitimacy before to purchasing.

The technique's key goals are to protect the brand and customers, increase income, comply with laws and regulations, and change behavior.

Blockchain technology can be used to ensure product authenticity, speed up the verification process, and lessen the likelihood of counterfeit items entering supply chains. This article also examines the potential benefits of this method, such as increased clarity, visibility of the supply chain, and customer safety. The website will keep a complete digital history of cosmetics, including manufacture, sources, and distribution. Each commodity's origin and destination are tracked on the blockchain. The information is

updated whenever a specific individual is identified during the distribution method. A QR code scanning device is located on the product's label or packaging, which consumers can use to retrieve this information. The blockchain has the ability to provide an immutable and transparent record of cosmetic product history. This strategy speeds up the process of discovering supply chain concerns that could signal the presence of counterfeit goods. A fake or counterfeit product's production history differs from the declared location of origin on the label.

The primary goal of this essay is to provide a thorough examination of the proposed strategy, focusing on both its pros and shortcomings. The evaluation will suggest potential routes for future research and development by comparing the proposed methodology to the state-of-the-art in anti-counterfeiting technology. Finally, a thorough evaluation of the implications for businesses and consumers will be carried out, along with recommendations for future research projects. Taking all relevant criteria into account, the use of blockchain technology to identify counterfeit products has the potential to significantly transform how organizations evaluate product authenticity and battle fraud.

2. Working Model

Proposed System:

Consumers, businesses, and manufacturers are all affected by counterfeiting on a global scale. Each manufactured object would be given a unique identification, which would be recorded and kept in the distributed ledger. The alphanumeric sequence provided is the 16-digit Aadhaar card, which serves as a unique identifying number.

Distributors, retailers, and other supply chain intermediaries add a fresh digital entry to the blockchain. This document will contain the sale's recorded facts, such as the transaction's location, the identities of the customers, the selling price, the product's brand, and the vendor.

Consumers can validate the legitimacy of a product using their smartphones by authenticating the item's distinct identification. All digital paperwork linked with the product's supply chain, including information from manufacturers and other relevant parties, would be available to users. If a counterfeit version of a product enters the supply chain, the blockchain record for that product's integrity is jeopardized. When a customer scans a product's QR code and finds that it does not match any previously gathered information, it signals the presence of counterfeit products.

The use of blockchain technology to prevent counterfeit items from entering the market is one component of this concept, which improves the supply chain's transparency, traceability, and overall responsibility.

As a result, eliminating the problems and financial obligations connected with the selling of counterfeit goods promotes consumer happiness.

System Model:

The planned system's principal blockchain will be Ethereum. The recommended solution is to create a decentralized application (Dapp) that will document and manage all transactions relating to the items sold by enterprises that use Dapp technology. The accompanying visual depiction depicts the system's architecture.
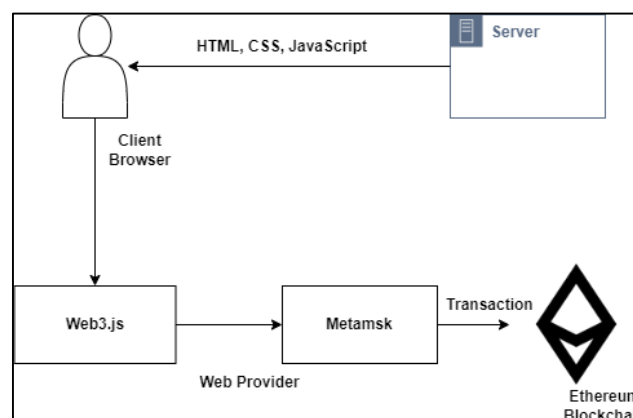

Fig1.1 The branch of knowledge concerned with the principles and processes employed in system design.

➢ Principal application of smart contracts on the Ethereum blockchain is the identification of counterfeit products, in which a decentralized system is built to authenticate commodities throughout the supply chain. Using Ethereum's smart contract capabilities will speed up the development of this system by making it easier to create contracts with predetermined circumstances and terms.

➢ There is no consumer input that has to be rewritten. The following illustration shows how this strategy is used:

➢ The maker grants a unique identifier to the product, which is subsequently stored in the Ethereum blockchain. The blockchain is used to document a product's complete journey, from the distributor to the store and beyond. The user's text has no information that needs to be changed. This

technique creates a clear and unmistakable record of the shipment's travel, providing reliable proof of the product's validity. The use of smart contracts speeds up the verification process. A smart contract in blockchain technology can be used to link a blockchain record to a product's unique identifier, assuring the record's authenticity. Following a thorough study of the commodities, the smart contract can be designed to automatically pay the distributor or producer.

➢ According to contract terms, if a counterfeit goods is identified, the verification status will be changed to fake product. Because the blockchain record is essentially immutable, it cannot be changed or revised. Smart contracts can reduce the need for middlemen while also improving the efficiency of the verification process.

Flow of Proposed System:

This system is primarily concerned with the origins of the supply chain and the authenticity of products. This technique makes use of blockchain technology to offer customers with a complete history of a product, including its original producer and any subsequent

owners. The three main participants in this Blockchain-based system are the Maker, the Dealer, and the Buyer. The diagram below depicts the aforementioned capabilities.
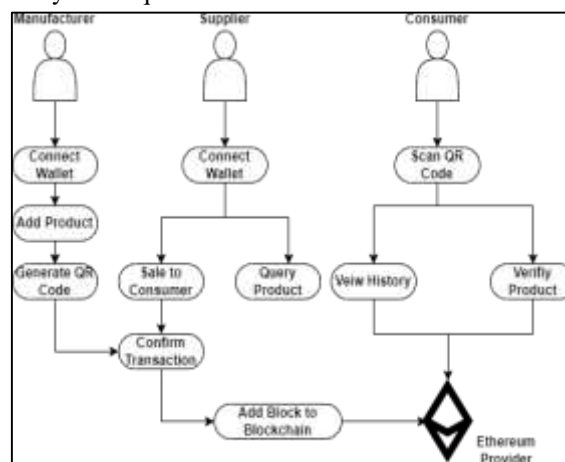

Fig1.2. The reason for this

Manufacturer: The creator of the product creates a Quick Response (QR) code and inserts the relevant information into their designated account. He creates a new block on the Ethereum network using his MetaMask wallet.

Seller: In this case, using a QR code for the goods appears to be advantageous. The manufacturer provides the store with product information. The buyer

receives physical possession of the object after ownership is transferred.

Consumer: The QR code not only verifies the legitimacy of the product, but it also provides information about the customer's prior purchases. When a consumer confirms the legitimacy of a product, its state is altered. If he determines that the goods is a forgery and that the QR code has been stolen, he will notify the buyer that the item is not genuine.

3. Literature Survey
Literature Survey

Table -3.1: An Exhaustive Review of Scholarly Works on Blockchain Technology

Sr No.	Paper Title	Publication Details	Author Name	Limitations	Challenges
1	Fake ProductDetection usingBlockchain	IEEE-Access 2020	Tejaswi Tambe,Sonali Chikkala	Limited Coverage	Data Accuracy
2	Detection ofCounterfeit Productsusing Blockchain	IRJMETS 2022	Kunal Wen-Shik,Isha Sondawale	Cost	Privacy and confidentiality
3	Identifying Counterfeit Productsusing Blockchain Technology in Supply Chain System	IJARIIE 2022	Prannit Dutta	Technical Complexity	Scalability
5	Fake Product Detection UsingBlockchain Technology	IJARCE 2022	Sri Krishna Shastri C, Vishal K	Lack of Standardization	Efficiency
6	Blockchain based product identification system	ITM Web of Conference 2022	M.Suhana S. Sujatha	Less Secure	Privacy and confidentiality
7	Anti-Counterfeiting Blockchain Using a Truly Decentralized, Dynamic Consensus Protocol	PDX Scholar	Naif Alzahrani, Nirupama Bulusu	Technical Complexity	Complexity of algorithm
8	Fake Product Identification System Using Blockchain	IEEE 2022	Anita Kanavalli, Kushagra Gupta	Technical Complexity	Data Accuracy
9	A Blockchain-Based Fake Product Identification System	IEEE 2022	YasmeenDabbagh, Reem Khoja	Cost	Efficiency

Algorithmic Survey
Table -3.2: Quantitative data is used to analyze research endeavors.

Sr No.	Algorithm Used	Time Complexity	Space Complexity	Advantages	Disadvantages
1	Secure Hash Algorithm(SHA)	$O(n)$	$O(1)$	Strong Security, Large key space.	Deterministic.
2	Proof of Work (PoW)	Slower thanProof of Stake	Slower thanProof of Stake	Decentralized,Simple Design.	Consumes large amount of energy.
3	Proof of Stake (PoS)	Faster than Proof of Work	Depends upon network sizeand traffic	Consume less amountof energy.	Security risk.

Live Survey
Table -3.3: This research looks on the real-time uses of blockchain technology in a variety of industries.

Sr No.	OrganizationName	Year Established	Stated Word	Algorithm used	Time & Space Complexity
1	Real ItemsFoundation	2017	REAL Items are verifiable products with a blockchain smart labels each with a digital identity stored on blockchain with Non-Fungible Tokens.	NFT Standard Algorithms	Directly dependent on number of input n and network size.
2	IBM Research	2018	Developed supply chain system for tracking specific goods and medicine tracking system help developingcountries.	Proof of Work, SHA algorithms for Security	Lesser as compared to standard system due to limitednetwork size.

4. Result and Discussion

Manufacturers and suppliers can engage with the system by adding blocks to the blockchain using transactional data while not interfering with other users' blocks. Ganache has been assessed in a limited context due to its network independence. Truffle is used in the process of carrying out and satisfying contractual obligations. This project's layout was made using HTML, CSS, and JavaScript. The Web3.js JavaScript framework is used on the Ethereum blockchain to offer access to and modification of data within smart contracts, among other things. MetaMask, a web browser extension, acts as a digital wallet to support Ethereum blockchain transactions. The IDs from Ganache have been successfully imported into the MetaMask platform. In order for supplier and manufacturer blocks to be included and transactions to

be validated, users must have a MetaMask wallet connected to Web3.js. The consumer can then scan the QR code to gain access to the supply chain and validate the products' validity.

Fig 4.1: Corporate accounts are divided into three types: end-user accounts, vendor accounts, and manufacturer accounts.
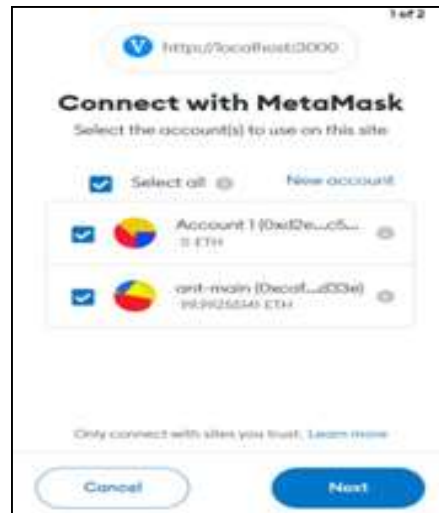

Fig 4.2: Combining a metacognitive pseudonymous wallet with the Ethereum network.

Fig 4.3: The product information will be entered into the MetaMask Wallet by the manufacturer.
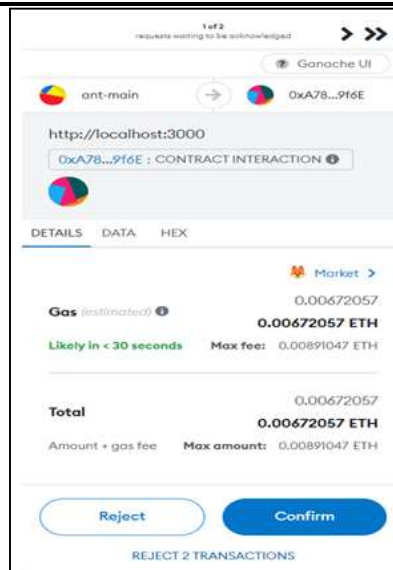
Fig 4.4: Meta Mask, an application, presents a permissions dialog box.

The advancement of real-time technology has made it possible to validate received products.

Fig 4.5: Consumer Market Verification of a product.

5. Conclusion

Factorys might establish permanent digital identities for all final items by utilizing blockchain technology. This enables quality control across the supply chain and allows for item-level data monitoring. This minimizes the chance of people purchasing counterfeit goods and simplifies the process of validating real goods.

Manufacturers and suppliers can store product data on the suggested solution's Blockchain, a decentralized, anonymous, and secure ledger. The client researches the product's pedigree along the whole supply chain to ensure its legitimacy. You can buy the things for sale with complete trust that they are genuine. As a result of this technique, the economy increases but output rates fall. To lessen the possibility of fraudulent behavior, more steps can be made to improve security protocols in financial institutions, internet retailers, healthcare providers, voting systems, and other areas. Using real-time technologies generates independent markets that promote honesty and transparency, lowering the likelihood of online fraud and deception.

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