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Tackling Counterfeit using Blockchain

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Abstract: *The importance of counterfeit goods to industrial sectors cannot be overstated. The product duplication harms the company's brand while also dramatically reducing market demand. Finding the original product is currently the hardest challenge. In order to tackle the problem of fake goods, the best strategy for confirming product authenticity is to be provided. A product's reliability can be assessed using a barcode or QR code. This QR code is linked to a blockchain. This suggested solution creates the unique code and stores the product information as database blocks. Previous entries in the Blockchain Database are contrasted with that code. If the match is not made, this will let the client know the goods is a fake.*

Keywords: Blockchain, Counterfeit, QR code, Web3.

I. INTRODUCTION

The e-commerce industry has seen tremendous growth in recent years. However, the growth has also led to an increase in the number of duplicate products in the market. Duplicate products not only create confusion for customers but also harm the brand's reputation. To address this issue, many e-commerce platforms have implemented product identification systems, but these systems are not very efficient and can be easily manipulated. Blockchain technology can help solve this problem by providing a transparent and immutable record of all product transactions.

1.1 Existing system to detect fake product in market

There are numerous methods in place that can assist in identifying counterfeit goods on the market, it includes:
Barcode: Numerous products have barcodes that can be scanned to confirm their legitimacy. Many businesses offer barcode scanning services that can compare the product to a list of authorised products and highlight any anomalies.
Hologram labels: To help stop counterfeiting, several manufacturers include hologram labels on their products. These labels can be authenticated using a specialised tool because they are frequently challenging to copy.
Digital watermarking:It is a technique used by some producers to incorporate distinctive identifiers into their goods. To confirm the validity of the product, these identifiers can be examined using a smartphone app or a specialised gadget.
Microscopic analysis: Some products, such as high-end electronics or luxury goods, may contain microscopic characteristics that are challenging to recreate. The legitimacy of the goods can be confirmed by looking through these specifics with specialised equipment.

1.2 Problem with existing system

Barcode scanning: Barcode scanning is predicated on the notion that the product's barcode is authentic and has not been copied. False barcodes may be able to pass scanning, nevertheless, thanks to counterfeiters' inventiveness.
Hologram labels: Although replicating hologram labels is challenging, skilled counterfeiters may still be able to make phoney holograms that pass for the real thing.
Digital watermarking: To check the watermark, specialised equipment is needed, yet it can be effective. For some products, this might not be reasonable or cost-effective.
Microscopic inspection: Microscopic inspection calls for specialised tools and skilled workers, which can be costly and time-consuming.

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II. PROPOSED SYSTEM

2.1 Methodology for proposed system

To find counterfeit goods in the market, blockchain technology and QR codes can be combined. With the help of a smartphone camera, QR codes may be scanned and utilised to retain data about a product, including its place of manufacturing, manufacturer, and unique identification number.

The following describes how blockchain and QR codes can be used to identify counterfeit goods:

For each of its items, a manufacturer creates a distinct QR code, which is connected to a distinctive identity in a blockchain ledger.

Customers are directed to a webpage that contains details about the goods, such as its origin and provenance, when they scan the QR code with their smartphone.

Every time the product exchanges hands, such as when it is sold to a distributor or store, the transaction and the product's unique identification are both recorded in the blockchain ledger.

If a duplicate product is produced, it will have a distinct identification that is different from the one listed in the blockchain ledger for the original product and will not match.

The blockchain will not recognise the distinctive identification when a consumer scans the QR code of the duplicate product, and the customer will be informed that the product might be a fake.

It is feasible to construct a tamper-proof record of each product's history using blockchain technology in conjunction with QR codes, it becomes more challenging for counterfeiters to produce duplicate products. In addition, the immutability and transparency of blockchain can make it easier to follow products across the supply chain and build trust between consumers and businesses.

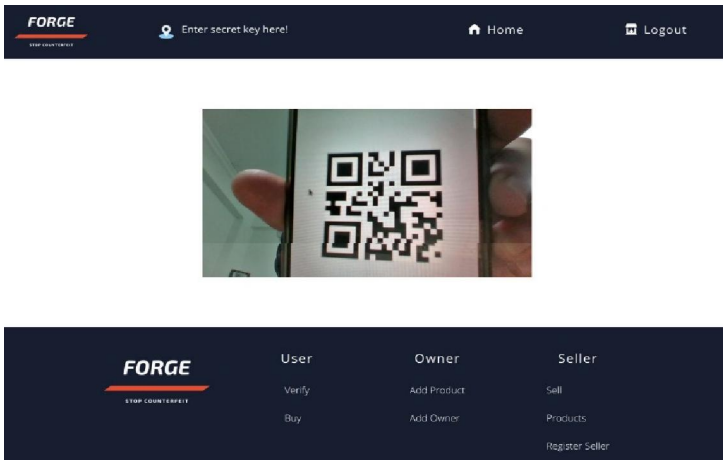

Figure: 1.1 QR code scanner storing product detail

III. SOFTWARE REQUIEREMENT

3.1 Following software are used in this project:

1. Solidity

Solidity is a high-level, object-oriented language that can be used to construct smart contracts. Programmes known as smart contracts control how accounts behave in the Ethereum state. The Ethereum Virtual Machine (EVM) is the intended target of the curly-bracket language known as Solidity. It is influenced by JavaScript, Python, and C++.

2. React

The JavaScript community's preferred framework for contemporary web development is React.js, a front-end library. It is used to create online applications and interactive user interfaces rapidly and effectively with a lot less code than standard JavaScript.

3. Web3.js

You can communicate locally or remotely with an Ethereum node using Web3, a group of JS libraries.

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To establish a connection to a local or remote Ethereum node using either an HTTP or IPC connection, Web3 functions as a wrapper for JSON RPC.

4. Truffle

With the goal of simplifying the work of developers, Truffle is a top-notch programming environment, testing framework, and asset pipeline for blockchains running on the Ethereum Virtual Machine (EVM).

5.Portis

A non-custodial blockchain wallet called Portis is accessible through any web browser. Technically speaking, it functions as a JavaScript SDK for Dapp Developers. It provides a quick and secure gateway to the Ethereum network when you include it in your code.

6.Polygon

A blockchain technology platform that enables blockchain networks to connect and expand is called Polygon and has the symbol MATIC. In 2017, Polygon—"Ethereum's internet of blockchains"—was introduced as Matic Network.

7.Infura

The project Infura is in charge of upkeep for the Ethereum network nodes.The advantage of adopting Infura is that the mainnet and testnets (Ropsten, Kovan, and Rinkeby) are maintained by the Infura service, so you don't need to run your local blockchain for those.A type of node storage (cluster) is Infura. a collection of tools for connecting your application to the Ethereum network.

IV. WORKING OF PROPOSED SYSTEM

Blockchain technology is renowned for being decentralised and unchangeable. It records every transaction that occurs on the specified blockchain. The blockchain is a network of computers that acts as a decentralised and secure database of transactions. A network of computers maintains the distributed ledger known as the blockchain. A record of transactions is kept in each block of the blockchain and is cryptographically protected, meaning that once it is added to the blockchain, it cannot be changed. Because the blockchain is decentralised, no single entity has control over it. As a result, the blockchain is safe and immune to hacking.

For supply chain management or product authentication, we can use blockchain. A Dapp, or decentralised application, is the suggested solution, and it will use the Polygon network as its main blockchain to store all the data and control all the transactions. Because Polygon enables smart contracts, which make it easy for users and suppliers to manage changes and keep the data record updated, it was chosen as the platform for the system.

Working of proposed system involves frontend and backend together to identify fake products using blockchain.

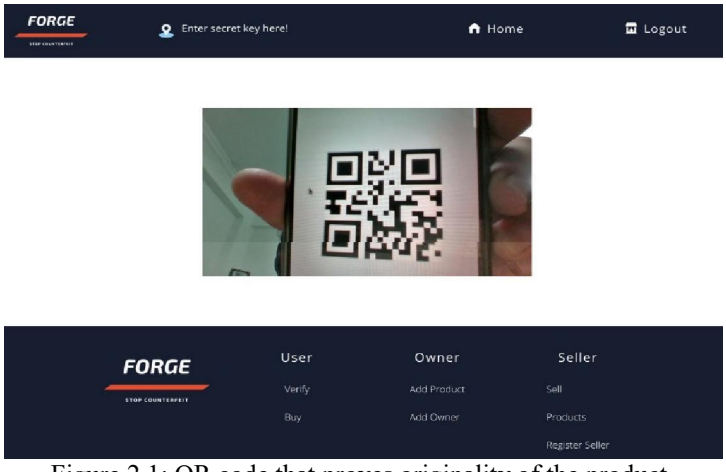

Figure 2.1: QR code that proves originality of the product

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4.1 Frontend

The manufacturer creates a QR code that is unique to each product they produce.A smartphone or QR code reader app can scan a QR code, a sort of two-dimensional barcode. The product name, batch number, production date, and other pertinent details are all included in this QR code. The product label, packaging, or a supporting document may all contain QR code.

When a buyer buys the item, they can use their smartphone or a QR code reader app to scan the QR code. They will be directed to a website or app that is linked to a blockchain network. A QR code reader app, which is nowadays easily available on most smartphones, or the camera on the customer's phone can be used to scan the QR code.

4.2 Backend

The data encoded in the QR code is transmitted to the system's backend when the customer scans it. It is up to the backend to communicate with the blockchain network. The backend uses the data it has obtained from the QR code to query the blockchain network and check the product's authenticity.

4.2.1 Verifying the authenticity of the product

To confirm the product's legitimacy, the backend examines the blockchain.This is performed by comparing the information included in the QR code to the information stored on the blockchain.. Details like the product name, batch number, production date, and other relevant information are contained in the QR code. The blockchain keeps track of all transactions and stores details about each transaction, including the product's origin, manufacturing date, and distribution network. The backend can confirm the product's validity by comparing the data in the QR code with the data kept on the blockchain.

4.2.2 When product is found to be genuine

The backend generates a message confirming the product's authenticity if it is determined that it is authentic. The customer's smartphone or other device displays this message after it is transmitted back to the front end. The message might contain relevant information like the product name, batch number, manufacture date, and other specifics. The buyer will then be sure they are making a legitimate purchase.

4.2.3 When product is found to be fake

The backend generates a message stating that the product is not real if it turns out to be a fake. Additionally, the frontend receives this notification and displays it to the user. The consumer can then decide whether to buy the product or denounce it as a fake to the appropriate authorities. The notification may include information on the product being duplicate, by displaying unmatched corresponding blockchain transaction or an inaccuracy in the product name or batch number.

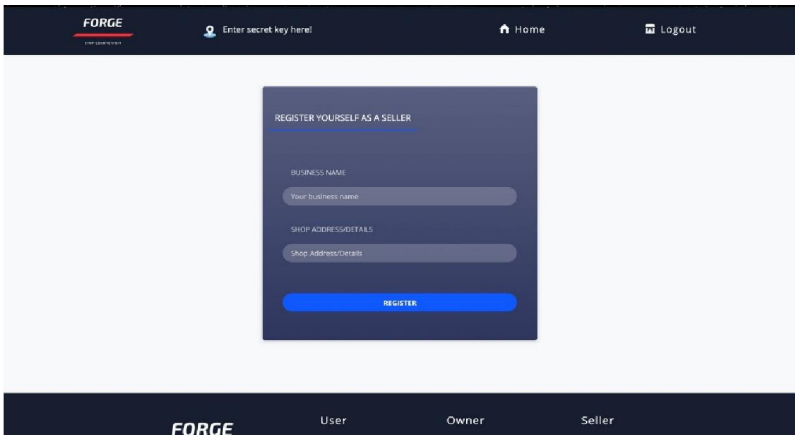

Figure 2.2: User registering itself as seller

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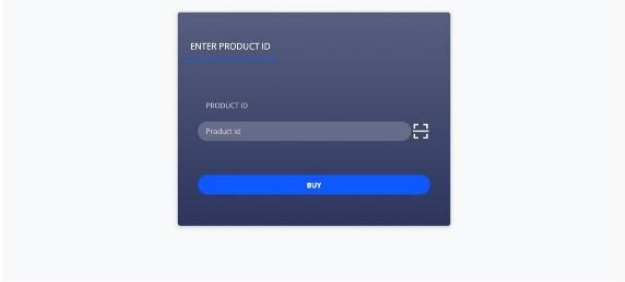

Figure 2.3: Product form in which consumer is entering product Id

V. FUTURE SCOPE

The future scope of detecting fake products using blockchain is quite promising. As the adoption of blockchain technology continues to grow across industries, its potential for combating fake products is rapidly increasingly. Some potential future applications and developments of detecting fake products using blockchain include:

Integration with other technologies: To improve its capacities for spotting counterfeit goods, blockchain can be combined with other technologies like artificial intelligence and the Internet of Things (IoT).

The blockchain can be used to generate a special digital identifier for each medicine, which can subsequently be stored on the blockchain, allowing for the authentication of medications. At each stage in the supply chain, this identifier may be scanned and verified, guaranteeing that the medicine is authentic.

Collaboration amongst stakeholders: Blockchain can enable communication between supply chain participants, including producers, distributors, and regulatory agencies, making it simpler to spot and solve counterfeit medication problems.

Decentralised marketplace development: Blockchain technology can be used to build decentralised marketplaces that let buyers and sellers transact with more transparency and trust, lowering the possibility of fake goods being sold.

VI. CONCLUSION

The e-commerce industry has seen tremendous growth in recent years, but it has also led to an increase in the number of duplicate products in the market.Traditional approaches for detecting duplicate products are inefficient and readily manipulated. Blockchain technology solves this problem by generating a transparent and unchangeable record of all product transactions. The use of blockchain technology for detecting duplicate products has several benefits, but it also poses some challenges. However, with the right resources and expertise, the adoption of blockchain technology can help improve customer trust and satisfaction to the society.

VII. LITERATURE REVIEW

P. Lavanya, N. Ananthi, K. Kumaran, M. Abinaya

In this paper, we use decentralised Block chain technology to ensure that consumers do not have to rely on distributors to determine whether their products are real or not. They present a decentralised Block chain network with anti-counterfeiting products that allow producers to deliver items without needing to manage clear outlets, significantly cutting product quality assurance expenses.

M.C. Jayaprasanna, V. Soundharya, M. Suhana, S. Sujatha

In this study, counterfeit products are discovered using a barcode reader, with the product's barcode linked to a Block Chain Based Management (BCBM) system. As a result, their proposed approach may be used to record product details and unique code as blocks in a database. It obtains the customer's unique code and compares it to entries in the block

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chain database. If the code matches, it will notify the customer; otherwise, it will obtain information from the consumer about where they purchased the product in order to detect counterfeit product manufacturer.

Melanie Herschel, Felix Naumann, U. Jehle, Jens Lufter

In this study, they describe how they successfully extended and used a research prototype, DogmatiX, designed to detect duplication in hierarchical XML data, on a large scale industrial relational database in collaboration with Schufa Holding AG. Schufa's core business is storing and retrieving credit records for over 60 million people. In this case, appropriately recognising duplication is crucial for both individuals and businesses: On the one hand, a mistakenly recognised duplicate may result in a fake negative credit history for an individual, who will therefore be denied credit. However, it is critical for businesses that Schufa recognises duplicates of a person who tries to construct a new identity in the database in order to have a clean credit history.

Aman Thakkar, Nilay Rane, Amey Meher, Swapnil Pawar

They demonstrated the legitimacy of an asset in this study by offering supply chain transparency. It aided in the prevention of counterfeit products entering the supply chain by bringing together manufacturers, suppliers, and distributors in a close knit and transparent manner. By making all transactions and other pertinent information available to all parties involved. They reduced the danger of record tampering by establishing a secure, decentralised, and verifiable supply chain.

Nazmul Alam, Md Rabiul Hasan Tanvir, Sadah Anjum Shanto

To detect fake drugs, they devised a drug tracing system based on blockchain technology. Our technology can detect inferior and anomalous pharmaceuticals from the maker firm to the patient's hand. Smartphones can also be used to verify defective and expired pharmaceuticals on the market by scanning a QR (Quick Response) code. The system might become more trustworthy and transparent thanks to blockchain security. The goal of this article is to use blockchain technology to ensure drug quality, transaction security, and data safety.

Kunal Wasnik, IshaSondawle, Rushikesh Wani, Namita Pulgam

The goal of this research is to improve counterfeit product identification by tracking its supply chain history. This is accomplished through the use of Blockchain technology, which allows for the identification and traceability of genuine products across the supply chain. Everything is made decentralised and accessible by several parties at once via a blockchain-based system.. One of its primary advantages is that the recorded data is difficult to change without the approval of all persons involved, making the data incredibly safe and resistant to all weaknesses. This study describes a system for detecting counterfeit products that uses blockchain technology.

R. Anand, KhadheejaNiyas, Sorjeeta Gupta, S. Revathy

A medical product is counterfeit when its identity or source is misrepresented. In the case of medications, the consequences are far-reaching. This technique prevents the introduction of counterfeit medications into the supply chain, primarily between the manufacturer and the consumer. The technique employs digital signatures, with each block receiving a unique crypto id. This digital signature is issued for each block and provides great control over ownership.

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