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Abstract: Counterfeit goods have been a significant factor in the manufacturing of goods in recent years. This has an impact on a company's brand, sales, and bottom line. Blockchain technology is used to identify genuine goods and identify counterfeit goods. The distributed, decentralised, and digital ledger known as blockchain technology stores transactional data as blocks in numerous databases that are linked by chains. Since blockchain technology is secure, no block can be altered or compromised. Customers or consumers can certify the safety of a product without relying on third parties thanks to blockchain technology. In this research, we employ Quick Response (QR) codes, a reliable method for thwarting the practice of product counterfeiting. When a product's original QR code is connected to a Blockchain, a QR code scanner can detect counterfeit goods. The systemrequests the user's unique code, then checks it against records in the Blockchain database. If the code matches, the goods is authentic; if not, the customer will be informed that the product is phoney.

Keywords: Blockchain, Quick Response Codes,decentralized.

1 Introduction

In today's global market, companies that develop new products or technologies face various risks such as counterfeiting and duplication that can tarnish the company's reputation, revenue, and even the health of customers. Counterfeit or fake products pose a significant problem for manufacturers, resulting in enormous losses. Onepromising solution to verify the authenticity of a product is blockchain technology.

Blockchain technology is a system for recording information that is nearly impossible to tamper with, hack, or manipulate. Essentially, it is a digitalledger of transactions that is duplicated and distributed across a network of computers. Each block in the chain contains numerous transactions, and every new transaction is added to every participant's record. This decentralized database, which is managed by a network of participants, is known as Distributed Ledger Technology (DLT). Blockchain is a type of DLT that records transactions with an immutable cryptographic signature known as a hash.

The use of blockchain technology can help solve the problem of counterfeit products. Once a product is registered on the blockchain network, a unique hash code is generated to maintain all transaction records of the product. All transaction records are stored in the form of blocks in the blockchain. In the proposed system, a QR code is assigned to a specific product at the time of ordering, and customers can scan the code to verifywhether the product is genuine or fake. With blockchain technology, companies can enhance their product's security, maintain consumer trust, and safeguard their brand's reputation.

1.1 BlockChain Technology

Blockchain is a secure method of recording and storing information that is difficult to change, hackor manipulate. The technology is based on a distributed ledger, which duplicates and distributestransactions across a network of computers participating in the blockchain.

Fig 1: Block Chain Connection

The blockchain stores transactional records or blocks in several databases, known as the "chain," within a network connected through peer-to-peer nodes. This storage is referred to as a digital ledger,and each transaction in the ledger is authorized by the digital signature of the owner. This authentication safeguards the transaction from tampering, making the information on the digital ledger highly secure.

In simple terms, the digital ledger is like a shared Google spreadsheet among numerous computers ina network where the transactional records are stored based on actual purchases. One of the most fascinating aspects of blockchain technology is thatanyone can view the data, but no one can corrupt it.

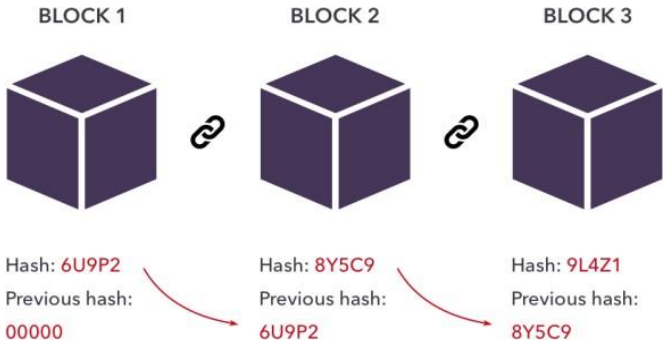

Fig 2: Blocks in Blockchain

2 Literature Survey

Si Chen's paper [1] proposes a supply chain quality management framework that is based on blockchain technology. The framework provides a theoretical basis for intelligent quality management of the supply chain and can serve as the foundation for developing theories about information resource management in distributed virtual organizations. Chen, together with Shi et.al, explains the SCQI framework, which is aimed at improving the quality management of supply chains through blockchain technology. The framework incorporates RFID technology, which is used torecord quality information and transactional data. Additionally, smart contracts are employed to execute quality control measures and enhance the efficiency of the supply chain.

[2] Introducing a novel system that uses QR code technology to detect counterfeit products. End- users can scan the QR code to access product details and transaction history, including product enrollment, shipping to distributors and retailers, and relevant information about the product. In a Blockchain-based system, each node stores the data and exchanges it with other nodes over the network. The node verifies the transactions received and includes them in the new block, based on its own Blockchain data, and attempts to obtain the rights of the new block. The proposed system uses Ethereum as the backend Blockchain operating system, which is an open-source platform for global payments, digital money, and applications. The Blockchain technology stores information about product sales, making it easily accessible to everyone and cost-efficient. The proposed system provides a secure environment for information sharing, where the user has full control over the data, making third-party interference difficult. The Blockchain block contains essential information such as sender, receiver, transaction ID, product ID, and four metadata. With Ethereum, users can connect to the platform, manage their funds, and use applications powered by the technology. The process is straightforward, and users can start building their applications in no time.

The proposed system [3] utilizes Ethereum as theunderlying Blockchain operating system and leverages the high-level programming language Solidity for writing smart contracts. Solidity is an efficient language designed specifically for the Ethereum Virtual Machine (EVM) and supports advanced features such as inheritance and library importing. In contrast to Bitcoin's script, Solidity provides support for loops and is Turing complete, enabling developers to create more complex on sophisticated decentralized applications. The cost of running an application on the Ethereum public chain is directly proportional to the complexity of the code, hence, the proposed system aims to maintain simplicity in the code to reduce costs and enhance efficiency. Future work includes implementing proof of code simplicity, where customers can trust the application because of the simplicity of the code, and no redundant code will consume additional resources.
In this study, we suggest using an Ethereum-provided Blockchain architecture to track product ownership on the Blockchain. Consumers may reliably know the source of the acquired product without having to completely rely on reliable third parties because to the untraceability, transparency, and guarantee provided by the Blockchain. In order to achieve safe and unforgeable anti-counterfeit authentication, SMEs can implement the anti-counterfeit application system suggested in this research and just need to pay a relatively low-cost for the operating fees.[4,5]

Blockchain is a system for storing data that makes it challenging or difficult to alter, hack, or defraud the system. A blockchain is essentially a network of computer systems that copy and distribute a digital record of transactions across the whole network. [6] Every block in the chain includes numerous transactions, and a record of each transaction is added to each participant's record each time a new transaction takes place on the blockchain. Distributed ledger technology (DLT) refers to the decentralized database that is controlled by the number of members.[7]

[8] Quick response (QR) codes offer a promising method for combating the practice of counterfeiting in this project, especially in view of recent developments in wireless and mobile technologies. To detect fake items, this is done by scanning a QR code connected to a Blockchain. This method can therefore be used to store product data and create a special identification for each product in a database. It searches the Blockchain database for matches based on the user's unique code. The client will be informed if a code matches; if not, the consumer will be informed that the goods is a fake.[9]

3 Proposed Model

The proposed system aims to combat the issue of counterfeit products by implementing a novel approach that uses Quick Response (QR) codes andimage logos. The QR code is attached to the product and linked to the Blockchain network, which stores important data such as the product details and a unique code for each product as blocks in the database. This data can be accessedby users who scan the QR code with a scanner. Theunique code is then uploaded and compared to the Blockchain database. If the code matches the one generated during the manufacturing process, the customer is notified that the QR code is authentic. However, if the code does not match, the customer is informed that the product is fake. This method provides a robust technique for detecting fake products and helps ensure that customers are getting genuine products.

3.1 Architecture Diagram of the Proposed Model

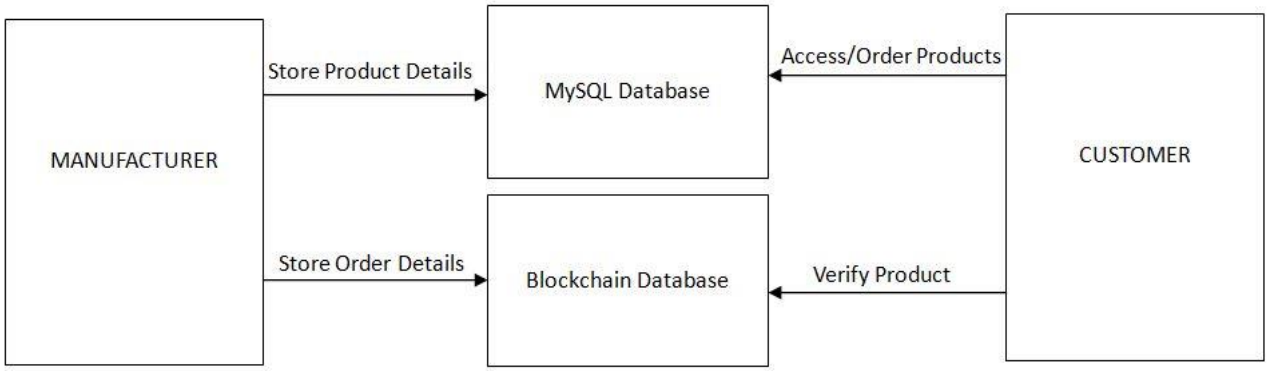

Fig 3: Architecture Diagram

We have a few possibilities for the first application, which is the manufacturer or business-side application. One choice is to include a product where the maker can add information about the product. Another choice is to display the order so that they may view the specifics of the clients' orders and then choose whether or not to accept them. The manufacturer can also observe whether or not the product was delivered.

The Customer application is a second application that has a product-showing option that allows customers to view information about products such name, total number, price, and manufacturer information. By entering the quantity of the commodity, we may book the product there. We may view orders using the show my order feature in this application. Here, we can see the product details, including name, amount, date, and time of production, price, and whether the product has been delivered or not. This program has a QR code scanner that we may use to determine whether a product is legitimate or phony by scanning its QR code. Another choice is a blockchain, which shows the name of the generated block, the quantity of the product, the generated hash value, and if the product is corrupted or not.

3.2 Design of the Proposed Model

Data Flow Diagram

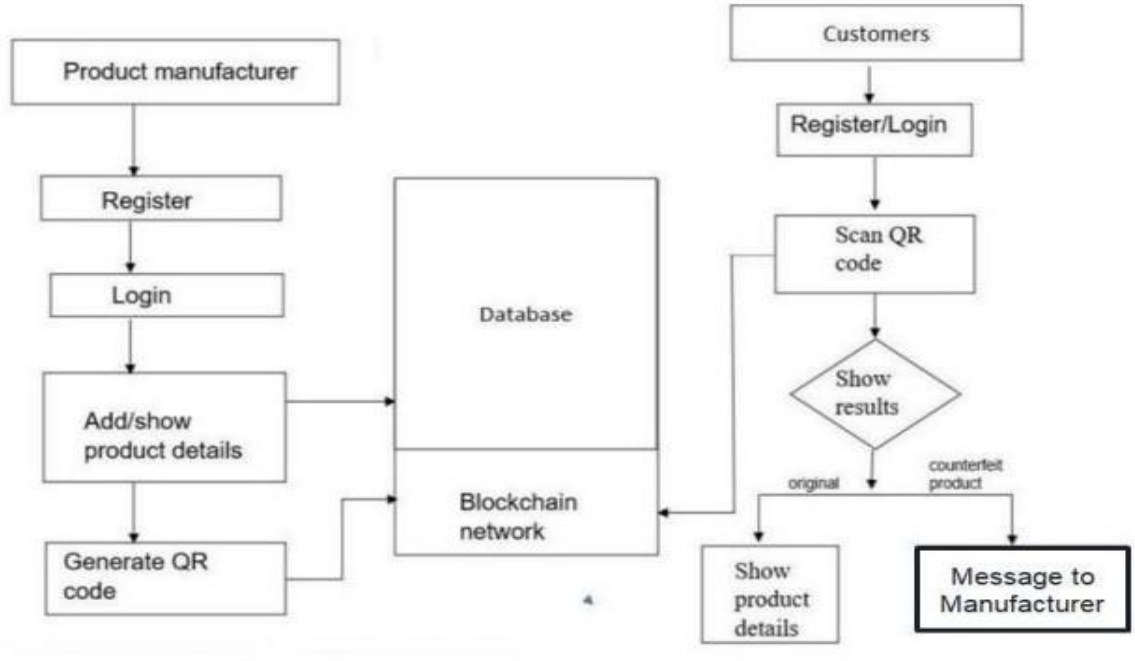

Fig 4: Data Flow Diagram

The design of the proposed system's data flow diagram illustrates the complete process and flow of the paper. In the beginning, the product manufacturer will register/login to the system and will have access to perform actions such as adding products, deleting products, listing products, monitoring users, etc. Similarly, the customer will register and login to the application, and they will order a product based on their choice and product availability. The order will be placed, and the order status will be marked as pending. The manufacturer will receive the product order request and create a unique order ID, generate a QR code based on the order ID and product name, and add it to the blockchain.

The manufacturer will then change the order status to accept. After this, the customer will be able to check the order status, and the unique order ID and QR code will be available to the customer. Upon receiving the product, the customer will scan the QR code on the product to verify the details with the details available on the orders page. If the product matches the QR code on the blockchain, a message stating "This product is original" will be displayed on the screen. If the QR code does not match, a message saying "This product was never manufactured" will be displayed.

4 Proposed Algorithm

Secure Hash Algorithm -256

The National Security Agency developed SHA-2 (Secure Hash Algorithm 2) in 2001 as a replacement for SHA-1. The SHA-256 algorithm is one variant of SHA-2. A 256-bit value is produced by the patented cryptographic hash algorithm SHA-256.

1. A constant hash size of 256 bits is obtained every time using the blockchain's Sha-256 algorithm. The encryption technique also includes this algorithm. Let's examine this algorithm's operation now:
2. The algorithm's prototype can be seen in the figure. There is information in this referred to as IV that is of 256 bits. Now that we are receiving input, it will be enormous. Therefore, make it 512 bits in size.
3. Since the input is never exactly a multiple of 512 bits, some input will always be omitted.
4. We add 10 bits of padding before this left input and concatenate the input with it. The precise multiple of our input allows us to go ahead and do that.
5. 256 bits of IV are now added to the 512 bits of input to create a total of 768 bits. These 768 bits are compressed using function 'c' to produce an output of only 256 bits.
6. This 256-bit output is once more combined with 512-bit input from block B2.
7. In order to get a 256-bit output, the sum is once more run through the compression method. The final block (block n) in this loop is filled in.
8. Once more, a compressing procedure begins and produces a final output of 256 bits, or what is known as a hash of the input data.

5 Implementation

5.1 XAMPP

XAMPP is a popular web server solution stack that enables developers to run and test web applications on their local machines. It is a free and open-sourcesoftware package developed by Apache Friends, consisting of Apache HTTP Server, MySQL database, and interpreters for scripting languages like PHP, Perl, and others. XAMPP is available for multiple operating systems including Windows, Linux, and Mac, and is easy to install and use. It provides a complete development environment for building dynamic web applications and is widely used by developers around the world. XAMPP is also customizable and can be configured to meet the specific needs of different projects. [10]

5.2 META MASK

Metamask is a browser add-on(browser extension)that manages a user's Ethereum wallet by storing their 16 private key on their browser's data store and the seed phrase encrypted with their password.It is a non-custodial wallet, meaning, theuser has full access and responsibility their private key. Once lost, the user can no longer control the savings or restore access to the wallet. [11]

5.3 Module Split-up

i. Manufacturer

To ensure the security of the application, the Adminpanel will be designed with various features. It will include a comprehensive list of features such as Purchase History, User List, Product Management, User Management, Admin Management, and a Dashboard. When a product is ordered, the manufacturer generates a unique ID and QR code, which is then stored in the blockchain for security purposes. This information is shared with the customer through the application, which contains the unique product ID.

All the data about the products, users, and admins are stored in a secure database, such as MongoDB or MySQL, and the QR codes are stored in a private blockchain network. To interface with the blockchain, MetaMask will be used to ensure the proper transfer of blocks into the blockchain. For testing purposes, a separate test network will be created and utilized. Upon acceptance of the order, the customer will receive the product ID and QR code to verify the authenticity of the product.

ii. Customer

In the proposed system, customers can access the web-based application and browse through the available products. They can also register to the application and add or remove products from their cart. Once a customer places an order, they can track the order status, which will be updated to "accepted" once the manufacturer accepts the order and generates a unique QR code containing theproduct ID.

The order status also reflects the current location of the product, either with the manufacturer or the retailer. Customers can view the products organized by department based on their preferences. All customer data, including usernames, passwords, order details, and history, is stored in a secure database management system. After receiving the product, customers must verify the QR code on the product with the one displayed in the application to ensure the product's authenticity.

5.4 Results

Fig. 5 displays the home page of the website's information, including login, orders, etc.

Fig 5: Home Page

The dashboard, shown in Fig. 6, displays information about the user, the order, and the product.

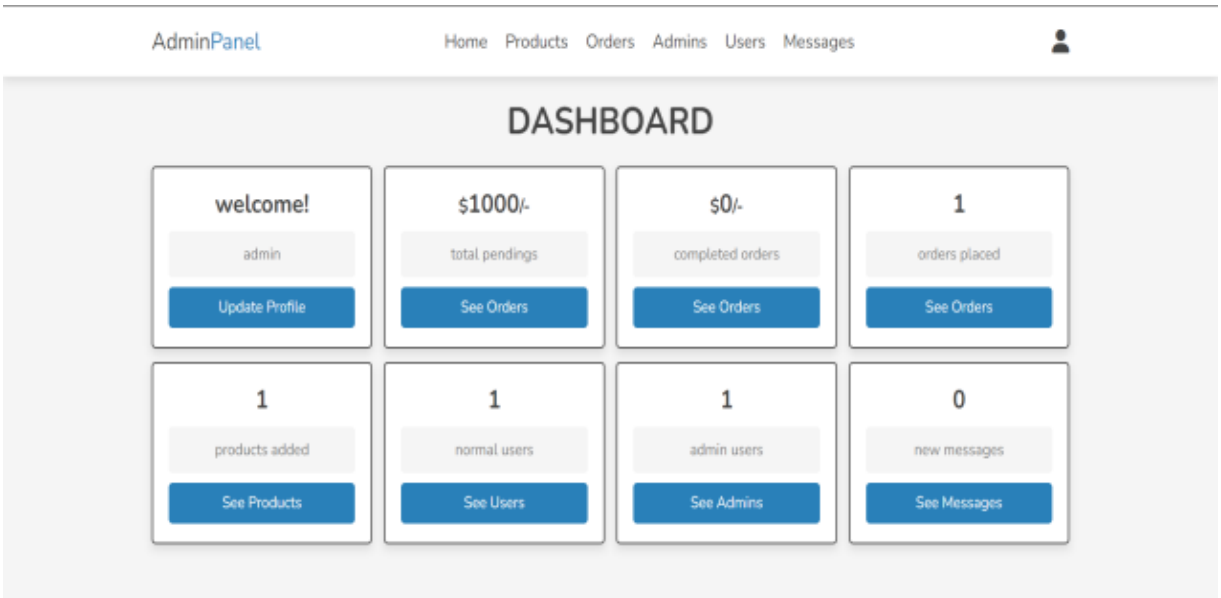

Fig 6: Admin Dashboard

Figure 7 demonstrates how a product is uploaded to a blockchain and how to use a unique product identifier to determine whether a product is original or not.

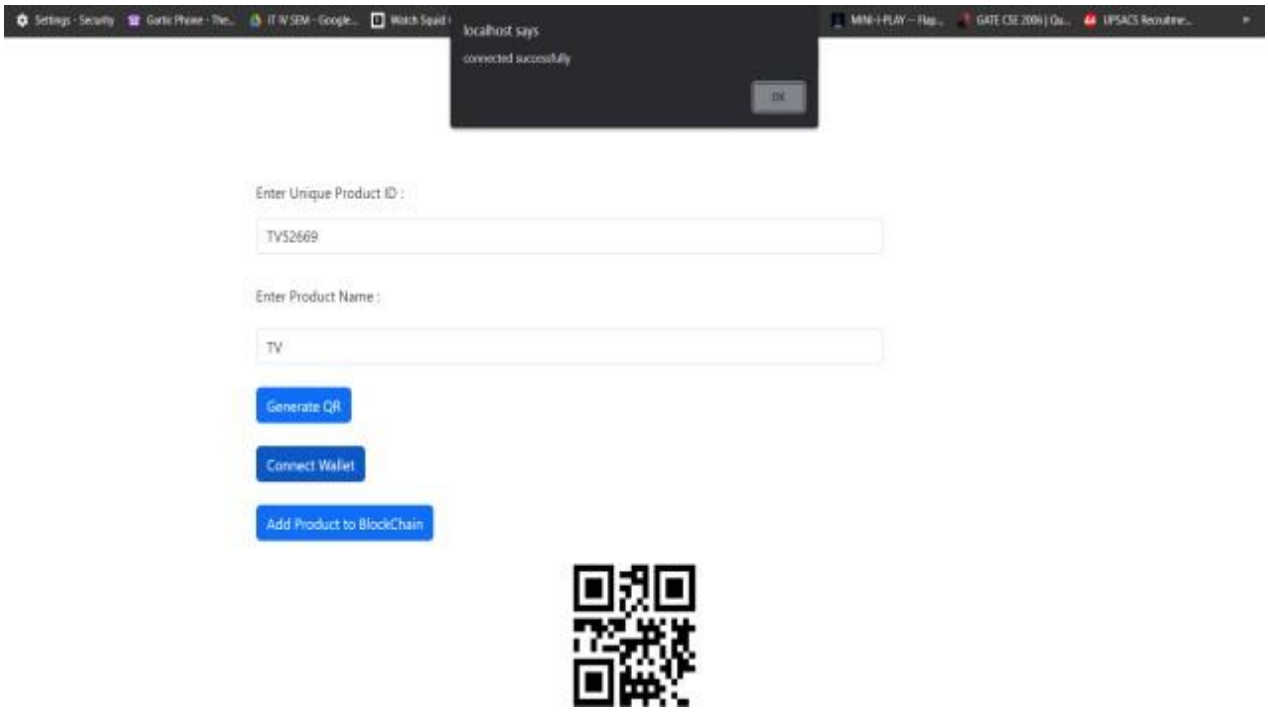

Fig 7: Adding Product into Blockchain

Fig. 8 demonstrates that the added product is authentic by including the product id, name, and manufacturer.

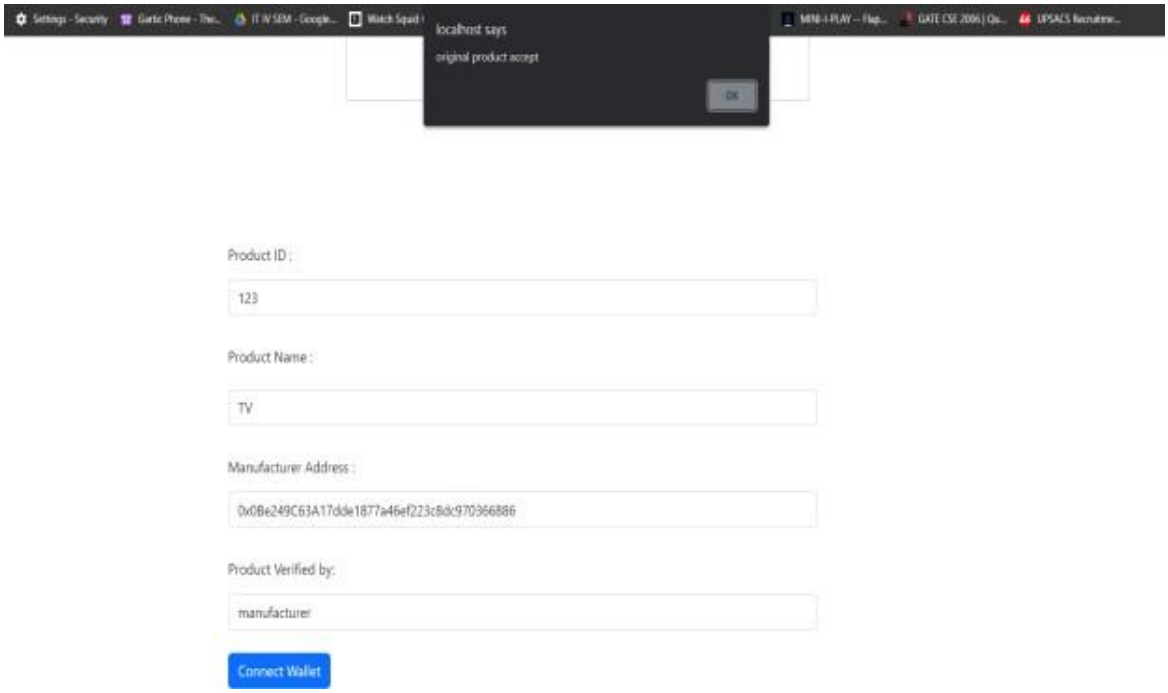

Fig 8: Result – if product is original

With regard to product id, name, and manufacturer, Figure 9 demonstrates that the added item is a fake.

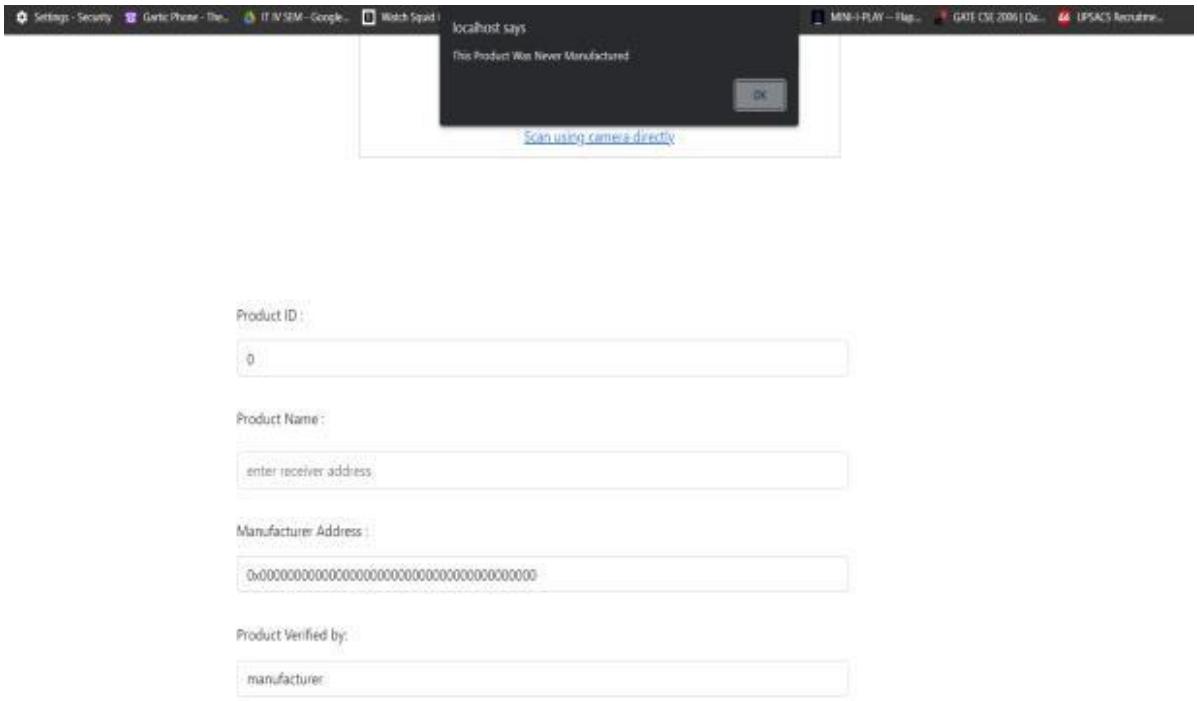

Fig 9: Result – if product is fake

6 Conclusion

The proposed paper is focused on implementing blockchain technology to combat the problem of counterfeit products in the Ecommerce industry. Inaddition to being an online marketplace, the projectalso includes a feature to identify whether a product is genuine or fake. This feature can greatly benefit customers by allowing them to quickly verify the authenticity of a product and avoid falling victim to fake product

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