# Blockchain based Application for Fake Product Detection

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*Abstract* – **This paper aims to study and introduce an innovative solution that combines cryptography and an immutable blockchain system to address the pressing issue of counterfeit products. The application's primary objective is to identify fake products within supply chains by ensuring data integrity, traceability, and transparency throughout the product's journey. By employing advanced cryptographic techniques, the application secures sensitive information and verifies product authenticity while preserving confidential details. Integrating an immutable blockchain ensures an unchangeable and decentralized record, making it exceedingly difficult for malicious entities to manipulate product records. Blockchain technology can verify the validity of a product and provide confidence to consumers regarding its legitimacy, effectively detecting counterfeits. The QR (Quick Response) code or an encrypted unique code, which is a very effective method for determining the uniqueness of the product, will be used by the model in the suggested system. The blockchain that is accessible after scanning the QR code provides data on the product, the maker, and the owner to assist customers in makinginformed decisions. This study provides a technique foridentifying fake products that uses blockchain technology.**

**Keywords — Blockchain, Ethereum, Counterfeit Product, QR code, Solidity, Dapp.**

## I. INTRODUCTION

Counterfeit products have a significant negative impact on both buyers and sellers in the marketplace. When a seller fails to meet customer expectations, it damages the company's reputation and brand marketing. Counterfeit items can be widespread, affecting customers in various regions, making it essential to locate and prevent them from circulating in the market. This issue becomes critical, particularly in industries like pharmaceuticals and food supplies, where fake products can pose severe risks. To address these challenges, a solution is needed to provide consumers with accessible data to verify product details and build trust in the product's authenticity. Counterfeiting is an ongoing problem throughout the supply chain, putting companies' reputations, earnings, and customer safety at risk.For example, counterfeit pharmaceuticals can directly impactthe health of consumers. To tackle this issue, various systems have been proposed to establish product authenticity. This solution utilizes blockchain technology to determine the legitimacy of products and ensure they are not counterfeit. The system helps solve the problem of

product duplication. In the blockchain database, all of the data will bekept in blocks. Customers may scan a QR code created for a product using this suggested system to obtain more information about it. We can tell whether the products are originals or replicas by scanning that code [1]. Blockchain technology is a decentralised ledger that keeps track of all transactions. Its dispersed structure, which spans a peer-to- peer network, is what makes it special. The suggested system uses Ethereum architecture to record product information and ownership status, and smart contracts are employed to updatethe product's ownership whenever it is sold. A barcode reader may detect fake products when a product's barcode is connected to a Block Chain Based Management (BCBM) system. The system gets the client's special code and checks it against records in the blockchain database. When a customer's code matches, the system tells them; if it doesn't, it queries them about where they bought the item to identify the manufacturer of any counterfeit items [2]. The issue of product counterfeiting has been addressed in the past througha number of strategies. The most popular methods are those that leverage AI, RFID tags, QR code-based systems, and other technologies. Each of these, nevertheless, has certain disadvantages, such as the QR code's potential for theft from real products and use on fake ones, artificial intelligence's usage of CNN and machine learning and its high computing requirements, and more. Through supply chain history tracking, the goal of this initiative is to increase the identification of counterfeit goods. The supply chain can be tracked, and authentic items may be identified throughout thanks to blockchain technology [10].

## II. LITERATURE REVIEW

Products that are counterfeit are a serious problem in the manufacturing sector, harming brands and causing market

declines. A method employing a barcode and QR code connected to a Blockchain is suggested as a defense against this. The system produces unique codes, records product information, and then checks them against previously saved data. If a match is discovered, the product is labelled as fake,

guaranteeing its dependability and enticing people to purchase authentic goods [1]. In order to prevent product fraud and guarantee the authenticity of goods along the supplychain, a practical block chain technology is utilized. Customers that use block chain technology may reliably determine the source of the acquired product without depending on reliable third parties. A block chain is a decentralized and distributed that stores public transactional records, known as blocks, in a number of databases, known aschains, over several networks. As a result, altering any involved block in advance requires altering every following block [2]. The supply chain has been using RFID (Radio Frequency Identification) technology for anti-counterfeiting measures for more than a decade. The authenticity of RFID tags, however, cannot be ensured throughout the post-supply chain because they are very simple to copy in public. In this paper, they propose a novel POMS for post-supply chain anti-counterfeiting products with RFID attachments. For this, we employ the blockchain-based Bit coin idea, which allows anybody to check the ownership proof balance. According to the proposed POMS, even if the RFID tag information is accurate, if the vendor does not have ownership of the counterfeit products, the customer may refuse to purchase the [3]. They have put up the concept of integrating a permissioned blockchain-based smart contract with a biometric identification system that would be implemented as software as a service. Permissioned blockchain utilizing the hyper ledger Fabric technology gives the necessary security and latency, according to recent research. A trustworthy environment will undoubtedly be introduced by such a concept in blockchain- based apps [4]. They have presented the notion of combining a permissioned blockchain-based smart contract with a biometric identity system that would be provided as software as a service. Among the techniques for biometric authentication that have been researched, liveliness detection- fulfilling modalities are chosen. Using hyper ledger Fabric technology and permissioned blockchain, a recent research found that the necessary security and latency may be achieved. If the parties are verified to be trustworthy using the biometric identification approach, self-executing smart contracts can becreated between them without the need for a centralized authority. Such a notion in blockchain-based apps will surely provide a trustworthy environment [5]. The first Blockchain system to present an anti-product forgery technology that is fully operational. Manufacturers are able to utilize the system to save relevant sales information for their products on a blockchain that is available to everyone. The seller's maximum sales potential and the number of products she still has available for purchase are both disclosed. The user may immediately do vendor-side verification using the functionalities provided by our system. The procedure offers identification verification by using digital signatures. Unless thekey owner unintentionally discloses his private key, there are noother ways to decrypt it [6]. To identify the drugs

invisibly and individually, our system depends on blockchain security. As a result, a fake drug or fraudulent distributor may be readily and quickly discovered. The prototype completely overhauls the established pharmaceutical supply chain service architecture,making it possible to provide drug security and manufacturer authenticity. The chain is made reliable and acceptable by optimizing the storage of blockchain data by deleting information about expired medications [7]. We create a supply chain that consists of a manufacturer, users, a third-party company, and an online platform in this article to examine the interaction between remanufacturing and blockchain. One ofthem uses blockchain to collect data on used items and subsequently remanufactures products in response to cap-and- trade regulations. The platform has the ability to increase the size of the possible market and may function as a marketplace or resale platform. The outside company gathers used goods for the producer [8]. Vulnerabilities of centralised product anti- counterfeiting systems might lead to system failure or vulnerability to malicious changes made to product records or other potential attacks on the system components by dishonest participant nodes transiting through the supply chain. Since its inception as an immutable record for bit coin transactions, blockchain technology has evolved into a programmable interactive environment that allows developers to create trustworthy, decentralized apps that cover a variety of use cases internationally [9]. The most widely used techniques involve the use of RFID tags, AI, QR code-based systems, etc. However, each of them has certain drawbacks, such as the QR code's abilityto be copied from a real product and used on a fraudulent one, the fact that artificial intelligence relies on CNN and machine learning, both of which need a lot of computer power, andothers. The goal of this initiative is to increase phoney goods identification using supply chain history tracking. Everything is made decentralized and accessible by several parties at once via a blockchain-based system [10]. This study examines current works that combine supply chain management with blockchain technology and categorizes them based on how complicated they are to be mapped into the blockchain. As a result, the fundamental goal of current blockchain efforts in supply chain management is described as increasing supply chain transparency. As a result, the majority of recent papers discuss straightforward goods and supply systems. Only a small portion of supply chains are mapped by the few methods dealing with complicated pieces. There is currently no example that aims to increase the transparency of complicated industrial supply chains, allows for efficient auditability of all assets, and implements dynamic modifications [11]. This study focuses on the cross-border e-commerce environment in order to achieve traceable items and transactions in supply chain management. After that, it builds a collection of related methods and strategies and suggests a blockchain-based framework. The presentation of

a general blockchain-based architecture for product traceability. The information encryption algorithm, the key distribution method, the information anchoring and the anti-counterfeiting approach are a few examples [12]. Due to the block chain's explosive growth and the growing need for a partial decentralisation of the Internet, the usage of underlying technology based on this platform has received a lot of attention. Along with decentralized items, Ethereum programmable finance system has drawn increasing attention. Smart contracts compromise security, nevertheless, in order to enhance decentralization. Therefore, Ethereum fatal user problem exists, and the Ethereum network as a whole is in danger due to users' carelessness in contract development. Therefore, the purpose of this article is to investigate and broaden the applications of using smart contracts on the Ethereum network [13]. An emerging technology called blockchain was created to make it simpler to verify that things are genuine without the use of a centralized system. Bit coin and Ethereum are two examples of well-known technologies that use blockchain technology. Data included inside each block will be protected by blockchain technology so that it cannot be altered by anybody other than the owner. This study develops a mechanism that enables buyers to confirm the legality of a product without a corresponding merchant. Manufacturers and businesses will be able to utilize this approach to ensure that their products will be more difficult to counterfeit, increasing customer confidence [14]. Productsthat are counterfeited are just inferior reproductions of well- known brands. To stop product counterfeiting, a variety of strategies have been used from time to time, including RFID tags, AI, machine learning, QR code-based systems, andmany more. However, these techniques have drawbacks, including the ability of QR codes to be copied from a real product to a false one, the requirement of considerable computer power for AI and machine learning processes, and the lack of a fully functional technique. In this project, we'vemade an effort to improve the detection of fake items by utilizing blockchain technology [15].

## III.     METHODOLOGY

### 1.     Blockchain:

Blockchain is a distributed, peer-to-peer ledger that uses encryption and is unchangeable. It saves transaction data in the form of blocks and distributes them over various networks. In his 2009 article, Satoshi Nakamoto introduced the idea of a blockchain. He introduced the concept of cryptography or digital cash system. Because there is no thirdparty concept involved in blockchain, it is referred to as a decentralized network. It is a chain of block, use to store the data. A block generally has 5 field in it that is block number, Nonce, data, previous hash value and current hash value. All of these values are cryptographically protected using strong hashing methods like SHA-256.

### 1.1.     Blockchain Features:

Blockchain is an innovative technology that functions on a decentralized network of computers. It securely records transactions using cryptographic methods to maintain data integrity. Once data is logged on the blockchain, it remains unchangeable, ensuring a high level of safety. Smart contracts, which are self-executing code, streamline operations and diminish the necessity for intermediaries. This technology has wide-ranging applications across industries like finance, supply chain, healthcare, and others, offering improved efficiency and trust in digital transactions.

The characteristics of blockchain are essential in establishing a sturdy and dependable system for identifying counterfeitproducts. Below are some fundamental features and their significance:
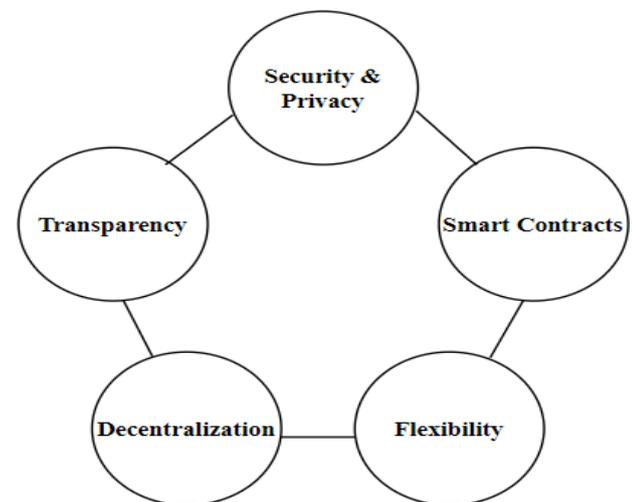


Fig 1. Features of Blockchain

Security & Privacy: Blockchain employs cryptography for data security. A private key is utilized for data authentication, while a public key enables the verification of data integrity and authenticity. It is imperative for a user to safeguard their private key with the same level of diligence as they would with bank OTPs and passwords, ensuring it does not become compromised to maintain the security of their blockchain data.

Smart Contract: Smart contracts are pre-programmed agreements with established rules. They initiate actions automatically once specific conditions are satisfied. In the realm of identifying fake products, smart contracts can be employed to generate alerts or execute actions when counterfeit items are detected.

Flexibility: One of the significant benefits of blockchain technology is its open-source nature. Users have access to a range of both public and private blockchain, allowing them to choose based on the specific requirements of the

application they intend to develop.

Decentralization: In a decentralized blockchain network, there's no need for individuals to be acquainted with or place trust in one another. Every point in the network possesses an identical duplicate of the data, which is maintained as a distributed ledger. If a member attempts to modify or compromise their ledger, it will be dismissed by the majority of network participants.

Transparency: All participants in a blockchain network have visibility into its transactions. This allows for comprehensive monitoring and verification of the entire supply chain by relevant parties, including manufacturers and consumers.

### 2. Working of Blockchain:

The proposed system has used these capabilities to introduce blockchain for product authentication. The proposed solution will be a decentralized application that will use a Ganache based local blockchain as the primary blockchain for recording and managing transactions related to the products and metamask as its local wallet. The system was built on Solidity because it provides the concept of smart contracts, which allow users and suppliers to efficiently manage changes and keep data records updates. Smart contracts can set rules and have them enforced automatically through programming. The smart contract cannot be removed after it has been deployed, and the changes with it are immutable, so blockchain is also called as immutable ledger. That's why the record of transactions conducted with the smart contract is immutable and can accessible to only those users who are register on the blockchain network.

### 2.1 Enrollment on the system:

The user or manufacturer must register on the blockchain by choosing their role in the system. Based on that role, the user interface will appear and the user can perform that task. The login credential will be stored in the database and the password will be encrypted in the database, so that only the user can login to their account and no one else can use others login credential. Also, there is no forget password option, so once he/she forgets it, there is no way to restore it as it is the principle of blockchain

Fig 2. User's Database



### 2.2 Add Product:

Manufacturers who have registered can add their products to the network. When listing a product on the network, manufacturers must provide all relevant information. A unique product id will be generated using hash 256 algorithms once the product is listed on the blockchain network. The id can be used to generate a unique QR code that can be used to identify the product in the future. Manufacturers can add these QR code to their product for product verification at the customer side.
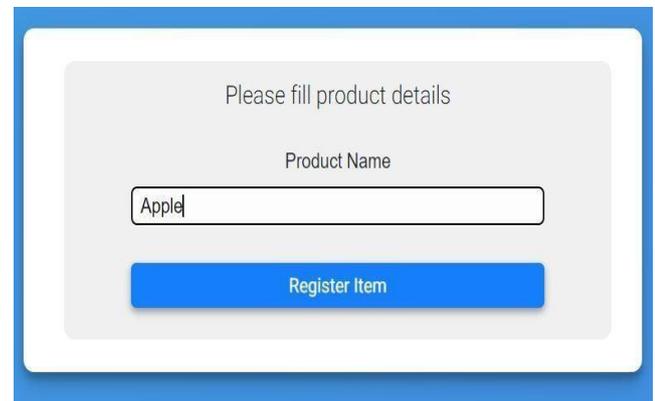


Fig 3. Register Product

### 2.3 Update the Product Location:

The application also provides the feature of updating the product location. One might wonder how can the details of the product be updated while, using blockchain which is immutable. Until now each product corresponds to a particular block in the blockchain. The solution to the update operation on a product is creating a latest block with the information of the previous block, along with the updated location added to it. Thus, the product ID of the product will now be associated with the latest created block.
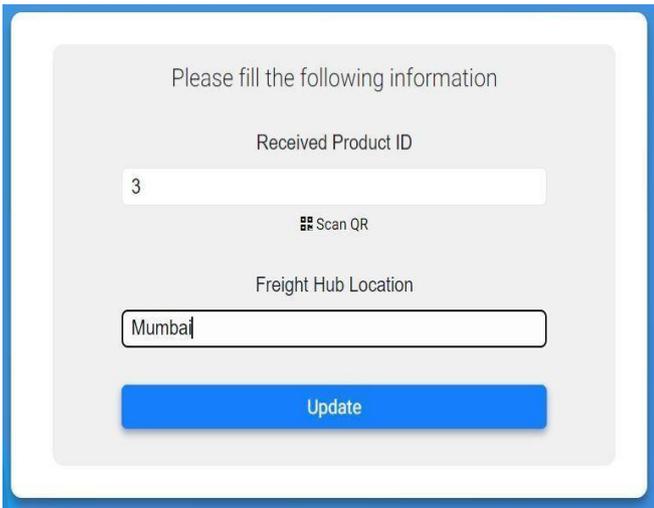
Fig 4. Update
Confirmation

### 2.4 Verification:

To check whether the product has been added to the blockchain or not. One can use the Check Products feature which will accept the product ID or QR as input and return the block containing its details corresponding to it.
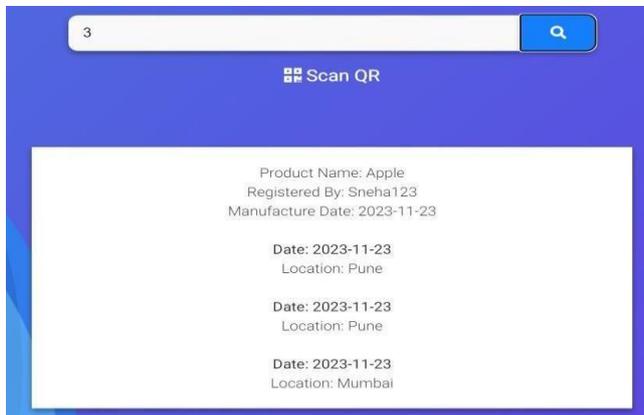


Fig 5. Update
Confirmation

The Manufacturer, Distributor, and Consumer roles make up this Blockchain-based product anti-counterfeiting system, as explained and illustrated in Fig 6.
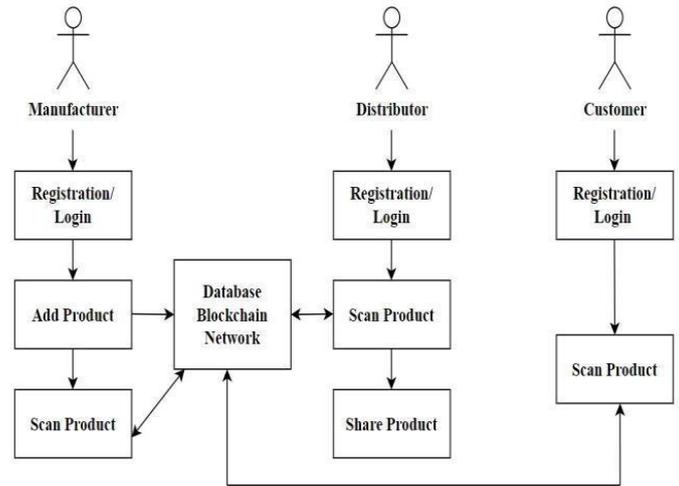


Fig 6. Block Diagram

Consumer: The Blockchain-based Application for Fake Product Detection uses consumers as the final checkpoint in the supply chain, ensuring product authenticity and safety. Consumers scan QR codes on products, triggering requests for detailed product information. This process helps verify origin, specifications, and historical data, separating genuine items from counterfeits. This contributes to a robust ecosystem for identifying and eliminating fake products.

Retailer: Retailers are the final link in the chain, scanning and verifying products using QR codes. They request authentic information from the blockchain network, confirming product legitimacy. If a product is suspected of being counterfeit, they flag it, triggering an investigation. This feedback loop helps identify and isolate fake products, creating a secure marketplace for consumers and manufacturers. Retailers' involvement ensures genuine products are distributed, boosting consumer confidence and protecting brand reputations.

Distributor: In a blockchain-based application for fake product detection, a distributor plays a crucial role in ensuring the integrity of the supply chain. By recording product transactions on the blockchain, distributors contribute to a transparent and immutable ledger. This enables traceability, making it challenging for counterfeit products to enter the supply chain unnoticed. Distributors validate and update the blockchain with accurate information, fostering trust among stakeholders and enhancing the overall authenticity of the product supply chain.

Manufacturer: Manufacturer can leverage blockchain technology to record and verify the entire supply chain, from production to distribution. By immutably recording product information on the blockchain, manufacturers enhance transparency and traceability, making it difficult for counterfeit products to enter the market. This helps in

building trust among consumers and stakeholders, as they can quickly access the tamper-resistant blockchain records to confirm the legitimacy of things.

## IV. RESULTS AND DISCUSSION

The proposed system can distinguish between face product and genuine product which ever are register on the blockchainnetwork.

A traceable and transparent supply chain was guaranteed contract and returns them.

### 1. Roles of Model:

The product's ownership status, including the manufacturer of product, current owner, ownership history, and QR code, is being maintained by the system.

The manufacturer connects to his Ethereum account using theMetamask Wallet as shown in Fig. 7. Consumers and everyday users will only be able to access using blockchain technology. The blockchain was used to product information by scanning a QR code. As soon as a user track every product's path from production to distribution, scans a product, a request is sent to the blockchain, which then giving stakeholders instant access to data.

retrieves the product's information from the manufacturer's smart

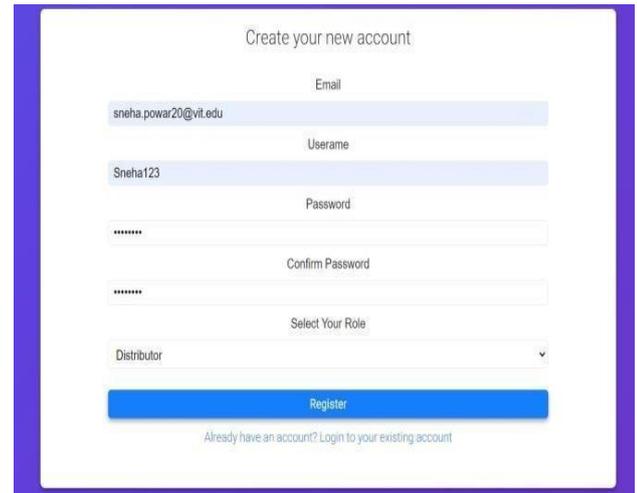Fig. 7. Connecting to Ethereum usingMetamask wallet





Fig 8. Shows the Login page where a manufacturer or customer can sign up to the blockchain application.
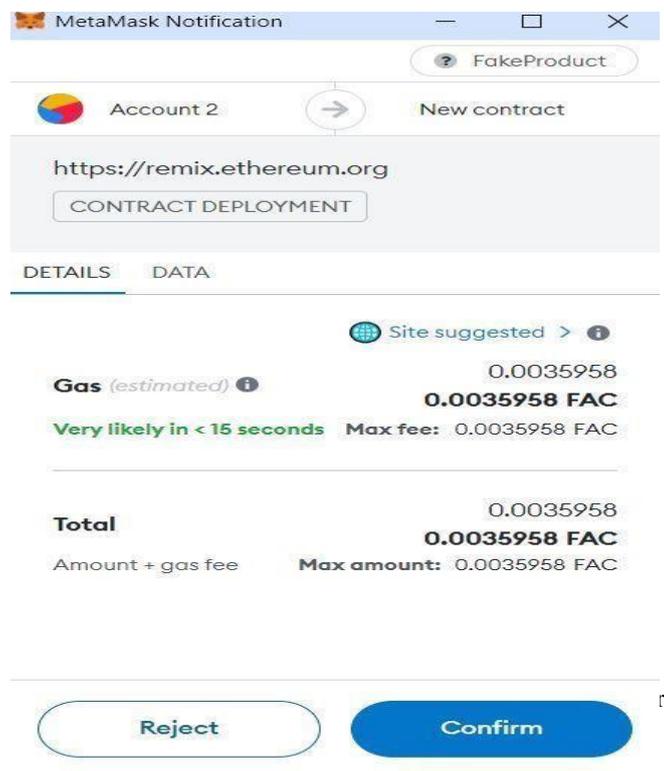


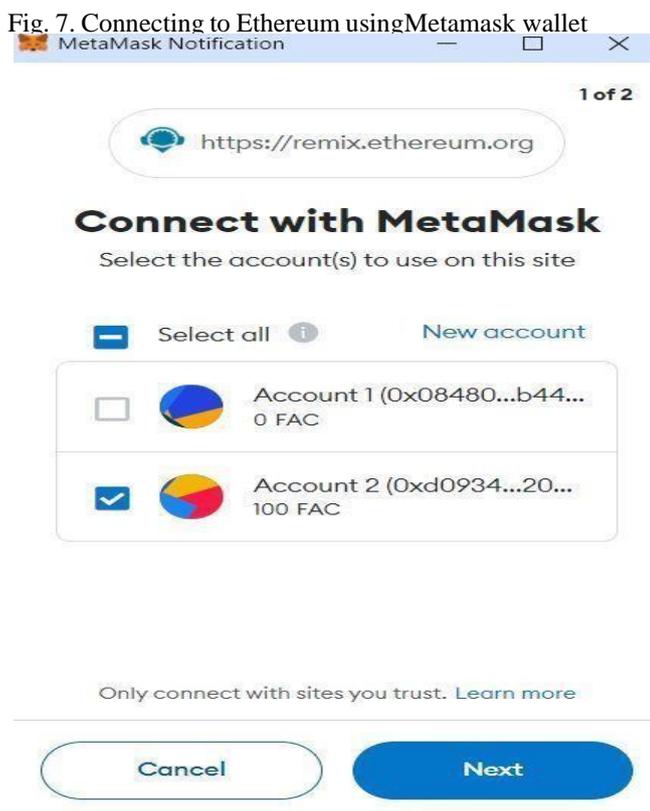Fig 9. Completing the transaction with metamask wallet

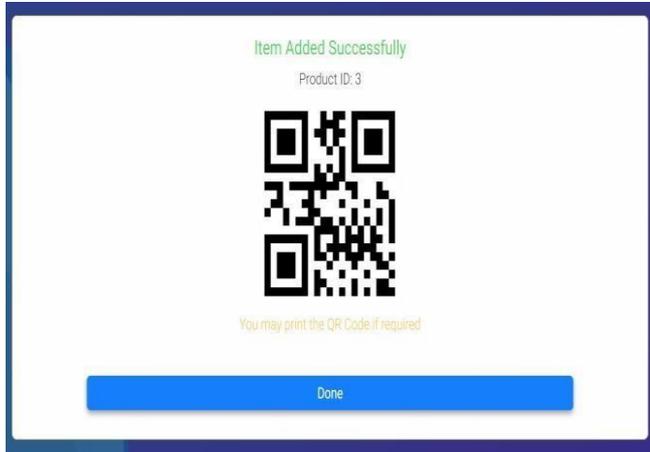Fig 10. Shows the unique QR Code generated after adding the product in blockchain by the manufacturer.



Fig 10. QR code generated

## V. FUTURE SCOPE

The proposed system actually protects retailers, manufacturers, and consumers from products that are counterfeited, but it fails when a QR code is taken from a genuine product and given to a fake product, making the product that is sold first genuine regardless of whether it is genuine or fake. Additionally, since every product's supply chain must be stored, the system will cost a lot of money. The next step is to put this idea into practice and try to overcome the limitations. One way to do this is to incorporate some material inside the product so that when someone tries to scan a QR code, a chip or other device will transmit a signal.

## VI. CONCLUSION

Decentralized blockchain technology is renowned for its security and anonymity. Users would find it easy to search and find out information about the product they want to test thanks to the suggested system. Users will be in a better position to make informed judgments about the market and will have more confidence in the product's creator and seller. It will be rapid and risk-free because they won't need to rely on a third party to verify the validity of the goods. Additionally, it would let manufacturers worry less about items being sold as knockoffs and concentrate more on customer feedback to enhance their services. By enabling businesses to easily track the products they have put on the market, it would also help them prevent financial losses. In general, blockchain technology has the ability to save enterprises and create a new, more secure, and user-friendly trading system.

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