

# FAKE PRODUCT DETECTION & TRACKING USING BLOCKCHAIN

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## **Abstract**

One of the biggest challenges of online retail industry is the availability of fake products in the market. The products seem genuine, but they are actually counterfeit versions of the branded originals. There are many fake product's available in existing supply chain. This has lack of transparency in Supply Chain Management (SCM) systems has also resulted in numerous frauds. This is negatively affecting companies' brand value, market value, and profits. Here we propose a Blockchain based product authentication and traceability system to overcome these inconsistencies in the current systems. Aim of this project is to improve detection of fake products and to maintain the transparency and confidence within the SCM system and the consumer by means of product tracking using Blockchain Technology. Blockchain based system, makes the whole thing decentralized that may be retrieved by numerous participants at the same time.

Keywords: Counterfeit Products, Blockchain Technology, Supply Chain Management.

## 1. INTRODUCTION

Product authentication is crucial in order to prevent the counterfeiting. Big brands are being significantly impacted by the increasing trend of consumers returning counterfeit products, particularly in the fashion industry, specifically apparel, shoes, and accessories. The authenticity and quality of a product are the key factors involved to coin it as a genuine product. Our goal is to keep the Authenticity of the product and act as single point of product authentication among the consumers. [4]

### 1.1 BLOCKCHAIN

Blockchain is a network of database storage that is decentralized and more reliable than other options available currently. Blockchain stores information by linking a collection of blocks together. Each block has its own hash as well as its previous block hash. It also stores the timestamp and transaction data. The Blockchain guarantees that newly incorporated blocks into its network are unanimously agreed upon by all its nodes.

Blockchain can add data records to its database which does not depend on any centralized authority as an arbitrator, instead it works on its own consensus algorithms. Blockchain is an openly available database and is highly reliable.

**Security and privacy:** Blockchain uses cryptography to secure the data. Private key is used to sign the data, using public key we can verify whether the data has been tampered or not and check its genuineness.

**Decentralized:** Each member in the network has the copy of the exact same data in the form of distributed ledger.

**Untraceability:** Once the block is created and entered into a blockchain, it can't be tamper. Due to this if the block in the Blockchain is altered and is immediately rejected or deleted.

**Transparency:** The data in Blockchain is completely public and can be viewed by the participants.

**Flexibility:** Being open source is one of biggest advantages of blockchain. Various public and private blockchains are available to the users, which can be used based on type of application which has to be created. [7]

### 1.2 FAKE PRODUCT DETECTION

Global product development or branding always entails risks, such as the counterfeiting or duplication of products, which can have adverse effects on a company's reputation, revenue, and customer satisfaction. The trading and marketing of counterfeit products is growing at high rates. It affects inopportune on the sales, reputation, and profit of the companies and also do poses a fatal

threat for the unsuspecting buyers. To ensure identification and traceability of counterfeit goods throughout the supply chain and mitigate this issue, a complete blockchain system is proposed. This system requires companies to pay minimal transaction fees while guaranteeing that end-users receive only authentic products. Because of fake products builder, original manufacturers face the biggest problems and suffer huge losses in sense the of brand damage as well as revenue loss. Utilizing a functional blockchain technology can facilitate the verification of a product's authenticity.

Companies are caught between a tough circumstance, attempting to avoid wasting time and effort dealing with poor imitations of their goods while yet trying to keep their customers pleased. Counterfeiters' negative impact extends beyond customer relationships, causing harm in other areas as well. Due to the actions of counterfeiters, legitimate enterprises often lose the trust of their distributors, retailers, and other business partners.

Fake products create a huge negative impact in the market for both the buyers and sellers. The sellers fail to deliver the product as per the consumer's expectations and the consumer start's to doubt the quality and standards of the company which ultimately results in the false marketing of the brand whose fake products are being circulated or sold in the market. The most critical part about counterfeited products is that these products can be harmful for the consumers. Since, the fake or counterfeit products are not restricted to any sector in the market therefore it has become important for us to detect these products and find a way to keep them out of the market. As we all know that there is no product is safe from counterfeiting due to the continuous growth in counterfeit products in the supply chain. It's degrading company's name and their profit, it also affects the costumer.

According to the report, fake product incidents have risen drastically in the last few years. In 2005, the OECD approximated that the global trade volume of counterfeit goods amounted to \$200 billion, while the World Health Organization (WHO) reported the confiscation of over 34 million counterfeit pills within a two-month period in 2009. [1][2][4]

### **1.3 PRODUCT TRACKING**

The trust of a customer in a product is the key element to drive a business towards growth and this trust can be maintained by providing a transparent system to the consumer. Along with the trust between the SCM system and the customer, there has to be a sense of trust between all the entities participating in the system as well. Blockchain will enable the consumer to get all the details of an individual product by scanning a unique tag present on the product. These tags will allow the customer to scan them and scrutinize all the blocks that were associated with that particular product and trace all the activities that were undertaken from the raw state at the producer end to the final finished product at the retailer end.

Currently, there are several limitations to the existing SCM (supply chain management) systems. These systems lack adequate data security measures, making it easy for the product information to be tampered with. Additionally, there is a lack of monitoring and quality checks, which can result in poor quality management of these systems. The transparency of these processes

is limited, making it difficult for end consumers to verify the authenticity of the products. This can be particularly problematic for products in the food or health industry, where the trade-off between quality and quantity can lead to serious health concerns for consumers. Fortunately, blockchain technology offers a solution to these complications. By providing enhanced security and encryption measures, blockchain can prevent data modification, making the system much more secure and less susceptible to tampering or data corruption. [6]

## 2. SURVEY

Duplicate products not only cause significant losses to companies but also leave the user feeling cheated and frustrated.

### 2.1 LITERATURE SURVEY

#### 2.1.1 *Abhinav Sanghi Et.al [4]:*

This paper proposes a solution for tracking the movement of drugs from the manufacturer to the patient using the Hyperledger Fabric. In this model, the manufacturer must upload drug details to a website that is then sent to the government for approval. Once the government approve the drug, a pharmacies can request the approved drug using blockchain technology. When a patient requires medicine or drugs, a request is made to the blockchain network, and a medical officer or doctor approves or rejects the request. This entire model is implemented in a blockchain network, making it useful for preventing drug counterfeiting and tracking drug movement from the manufacturer to the patient. This paper provides details about Hyperledger, which can be implemented in our proposed system, as well as information on different genres to approve the product in this area. [4]

#### 2.1.2 *Shivam Singh Et.al presented [3]:*

The paper proposes a combined approach of using decentralized blockchain technology and the supply chain to ensure that end-users in the supply chain can verify the authenticity of a product, without relying solely on the trader. This can be achieved by authenticating the product at every stage in the supply chain using One Time Passwords (OTPs) sent to the receiver's mobile phone, in addition to deploying personnel responsible for assuring product quality. The combined approach can significantly lower the cost of product quality assurance, and the proposed system will track the product's authenticity from its origin at the manufacturer to the end-user. [3]

#### 2.1.3 *Srikrishna Shastri C Et.al [2]:*

The paper addresses the issue of counterfeit products, which have had a massive impact on manufacturing industries in recent years, affecting companies' reputation, sales, and profits. The authors propose using blockchain technology to identify real products from fake ones. Blockchain technology, which is distributed, decentralized, and secure, stores transaction-related information in the form of blocks that are connected in chains and cannot be easily hacked or modified. By using blockchain technology, customers or users do not need to rely on third-party services for the safety of the product. The authors argue that blockchain technology has the potential to bring high

transparency and ease in the way transactions are dealt with in different business sectors, not just limited to digital currency. [2]

### **3.1 REQUIREMENTS**

#### **3.1.1 *HARDWARE REQUIREMENTS***

1. INTEL i3 4170 3.70 GHz
2. RAM (minimum 8 GB)
3. ROM (minimum 256 GB)
4. GPU (minimum 2 GB)
5. Printer
6. QR code scanner / Camera

#### **3.1.2 *SOFTWARE REQUIREMENTS***

1. VS code
2. Solidity
3. Ganache
4. Metamask
5. Google Chrome
6. Truffle
7. NodeJS

#### **3.1.3 *LIBRARIES REQUIREMENTS***

1. React.js (Frontend Library)
2. Ethers.js (NodeJS)

#### **3.1.4 *LANGAUAGE REQUIREMENTS***

1. Solidity
2. Typescript/JavaScript
3. Git

## **4. EXISTING SYSTEMS**

There are other approaches based on improved communication between companies and organizations with the interest to combat counterfeiting. One such example is Vechain, a blockchain-based platform for supplychain management that utilizes unique IDs and QR codes to track products and their movements throughout the supply chain. Another example is IBM's Food Trust, which uses blockchain to provide transparency and traceability in the food supplychain, ensuring that consumers have access to accurate information about the products they are buying. Despite the limitations and challenges, blockchain technology has shown great potential in providing a secure and transparent solution to counterfeiting in various industries. Even variety of applications exist in the anti-counterfeit domain as follows.

**BLOCKVERIFY:** It offers an anti-counterfeit solution based on Blockchain. It has faith in the capability of blockchain technology to enhance anti-counterfeiting measures across diverse industries and make a substantial positive impact on society. A blockchain-based anti-counterfeiting solution has been developed to enhance supply chains. It offers unambiguity to be able to review and validate transactions, tracking items through supply chains and logging transfer of possession and verifying locations as well as creating the ability to distinguish items. It uses blockchain technology to improve anti-counterfeit measures in different sectors and have a optimistic social influence. The system operates on a sophisticated enterprise blockchain protocol that guarantees the secure storage of data. It enables tracing and supervising products from production lines to distribution centers to the consumers. Blockverify offers global solutions to identify fake products using blockchain to avoid replicas and enables companies to produce products and review supply chains. They target lavish products and the pharma market. Each product tracked by Blockverify has a tag and is tracked along the supply chain. Vendors can examine that obtained articles are legitimate. Once a product is sold, the customer can also verify if it is genuine. Bitcoin and a private blockchain is used to store the data. [8]

**CHRONICLED:** It is a San Francisco based organization founded in 2014. They received funding of \$1.4m and \$3.4m in 2015 respectively 2016. They are working on solutions to link physical goods to the blockchain. They started with the goal to eliminate counterfeit sneakers, but broadened their target market significantly. Their initial use case of sneakers was simple: Using smart tags and the Chronicled App, users can claim their sneakers, check if there are authentic and keep track of their collection using the App. They generalized this approach by autumn 2016 and offer services for all sorts of products. Example use cases include furniture showrooms, art, wine and sneakers. It offers identity patterns and tamper-obvious cryptographic seals, which enable linking of physical things with the blockchain. It offers Bluetooth Low Energy and Near Field Communication chips, which sign all transactions before they are stored in a public blockchain. The microchips can be incorporated by manufacturers during production or added later on, and they can then use the Chronicled App to register the product on the Blockchain. Consumers can then use the Chronicled App to check the authenticity of a product. [9]

#### **4.1 LIMITATIONS OF EXISTING SYSTEM**

- Forgers are becoming more and more professional and sophisticated.
- These counterfeiters are constantly improving methods to wrap up fake products and bring them to the market unnoticed.
- It is difficult for the average end-consumer can distinguish between a convincing imitation and the real product.
- In addition, the use of covert technologies requires specialized devices to identify counterfeit products, making it impossible for customers to detect or verify the authenticity of their purchases.

- The track and trace technologies with its encoding and security feature can be used in combination to improve this situation, but it leads to another major issue: overhead cost.
- As a consequence, the price of the product has risen further, which in turn leads the end-user to look for counterfeit products.
- Integrity is not offered by the existing systems and hence consumers might be in a doubtful state of mind.
- Product tracking still remains an issue with outdated systems questioning.

## **5. PROPOSED SYSTEM**

The main thing of developing the system is to overcome negative marketing and ameliorate business frugality.

- To cover brand value and duplication pitfalls by developing fake product discovery system using blockchain technology.
- To secure and authenticate the product details which helps in identification and traceability of the specific product throughout the chain.
- All product details are secured and stored in QR code or product ID which helps in identification which is stored in inflexible blocks of blockchain for further security.
- Manufacturer can add product details and the system generates QR which can be used by retailers and distributors for tracing and indeed by consumers to insure purchasing of original products.

## **6. PROPOSED MODEL**

The QR (Quick Response) code-based system is designed to detect counterfeit products by linking each code to a specific item and integrating it with smart contracts. This allows the codes to be scanned using smartphones or other compatible scanners, thereby enabling real-time monitoring and identification of fake products. This will notify us whether the products are original or fake.

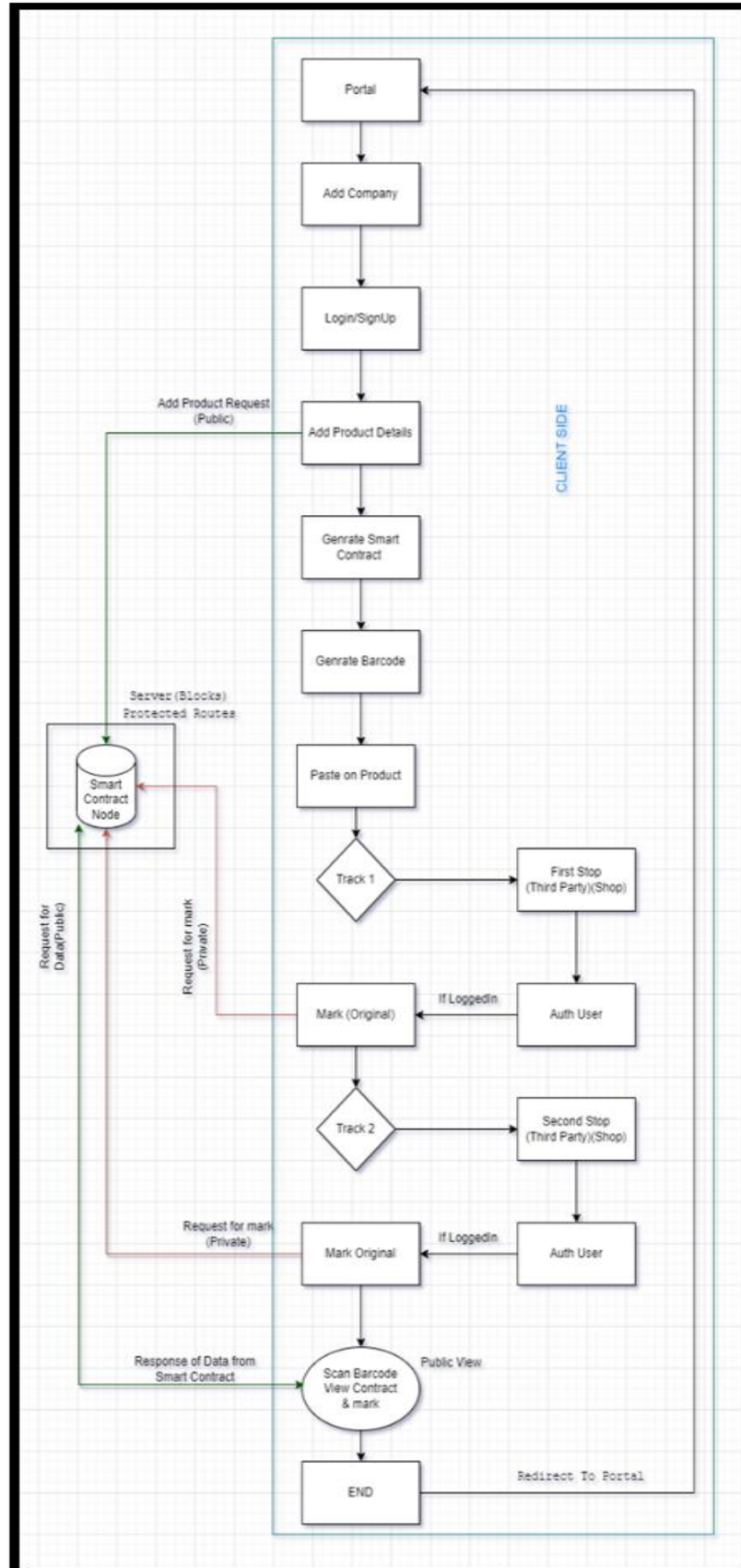
- A company after verification of correspondence ID and enrollment process will be given access to upload the product details with system generated QR code.
- The product details include the brand and product name, as well as the manufacturing time, price, total volume, product quality, and manufacturer information. This will be saved in a database (Firebase), and a QR code will be generated.
- Each sale of block will contain a unique QR code which cannot be reused by the manufacturer for different products.
- Manufacturer can make the tracking and identification process more secure and sure by making use of reissued QR code with can show product information, engage clients and increase trades.
- Client must register login to the system before checking the QR or barcode of the product.

- With the completion of user verification, the exclusively scanned code from the client will be compared with the code generated by the producer that is stored in blocks of smart contracts.
- If code matches, also user will be notified that product is original with all its details and authentic document from database.
- If code doesn't match, the user will be notified that product is fake which can help purchase falsified product and that may affect in significant health or financial losses.
- Indeed, manufacturer can be advantaged if product is fake also the position of the user will be entered with authorization and alert will be transferred to manufacturer who can take farther legal conduct on distributor, retailer and black-request manufacturer.
- This ensures clients trust on merchandisers and increases the user's satisfaction and can save manufacturer time and money in fighting the Vilification and trades because of forged manufacturers.

## **7.CONCLUSION**

The proposal system has the potential to significantly reduce the incidence of counterfeit branded goods and simplify the process for companies to assure consumers that they are not buying fake products. The product can be easily traced by the customer by simply scanning a tag present on the product providing them detailed information about the processes undertaken with the product. The customer don't have to rely on the third party to verify the authenticity of the product. Non repudiation and verification of data in the blocks will guarantee that the data entered in the system is legit. This system will help to build trust and good bonding between manufacturer and customer.





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