

Identification of Counterfeit Product Using Blockchain

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Abstract

In today's growing market, the supply of products is on high demands. Thus, productions are increasing with various sources. Counterfeiting is a more common these days, which plays a huge role when it comes to company losses and bad reputation in the consumer market. Counterfeiting can also affect the economy. It can badly affect product sales and their profits as well. Where the real product manufacturers are in major disadvantage because they can never compete with the counterfeiting product manufacturers since they do not care about quality control and uses replica or cheap materials for creating the counterfeit products. It closely resembles the genuine product, complete with identical packaging and branding. Thus, counterfeiting of original product needs to be halted in production. Blockchain technology is the best suited for storing the original manufactured product details, thus it can be used for identification. The decentralized feature of blockchain helps to store the data in the form of blocks which is connected to the database through the chain. It is secure and unbreachable. As for the convenience of customer, QR technology is used where the real product ID is stored and can be scanned through any device with camera attached.

Keywords: Counterfeit product, QR code, blockchain, identification, customer health

INTRODUCTION

The introduction of a novel product or technology invariably brings along potential risks like forgery, counterfeiting, and replication. This can negatively influence a company's name, overall margins and customer health. There are a lot of products that exist in the supply chain with misleading claims. These have incurred great losses to original product manufacturers.

Considering the global market for product consumer and product manufacturer, fake products can damage legitimate product manufacturing companies. These damages can be in terms of money or the brand value of the company. It can permanently harm the trust of that product. The market is full of counterfeit products which are cheaper to manufacture or build. It contains products like food,

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merchandise or medicines, etc. The companies can solve this problem effectively if the consumer can identify the product whether it is legitimate or fake. The fake product detection system uses blockchain technology which proposed the solution of storing the real product identification, which later on can be verified using the QR (Quick Response) code. This code contains the identification of the product which can be scanned by any device with internet and camera facility.

OBJECTIVES

The objectives of this project are:

1. To create a counterfeit prevention system utilizing Blockchain technology.

2. For securing product details using a QR code and image.
3. Enhance client security by providing data to the clients.

SCOPE AND LIMITATION OF PROJECT

The incremental growth of counterfeiting products is getting higher and higher day by day. Due to lack of knowledge, the consumer purchases the products. In recent years, there have been instances of counterfeiting, as indicated by research. The products are circulating in the market regularly, which makes it even harder to distinguish between original and fake. When it comes to finding a solution, the main challenge is, it has to be easy to operate and can be provided to each and every one with a smart device. The user can determine the authenticity of the product by scanning the QR code.

The limitations of fake product detection system are as follows:

1. *Maintaining data accuracy:* The integrity of the blockchain relies on accurate data entry; incorrect information can compromise its effectiveness and lead to false verification results.
2. *Costly:* Implementing blockchain can be expensive, especially for small businesses, and potentially limiting its widespread use and effectiveness.

SYSTEM DESIGN

System architecture refers to placement, and organize structure of the system software and hardware.

Figure 1 shows the working of fake product detection from both consumers and manufacturer viewpoint. The process starts with the manufacturer registration; after successfully registering, the manufacturer can add the product details; with that the blockchain takes the data and generates a QR specific to that product which contains the information about the product as well as the proof that the product is legitimate. The added product can be seen in the database for keeping track.

On other hand, after the registration, the consumer can scan the product through smart device with working camera and can scan the QR; thus blockchain can search and identify whether the product is real or fake and gives end result to the consumer.

IMPLEMENTATION

There are several resources required for the current implementation. These resources are hardware and the actual software which can be able to perform the tasks on any system.

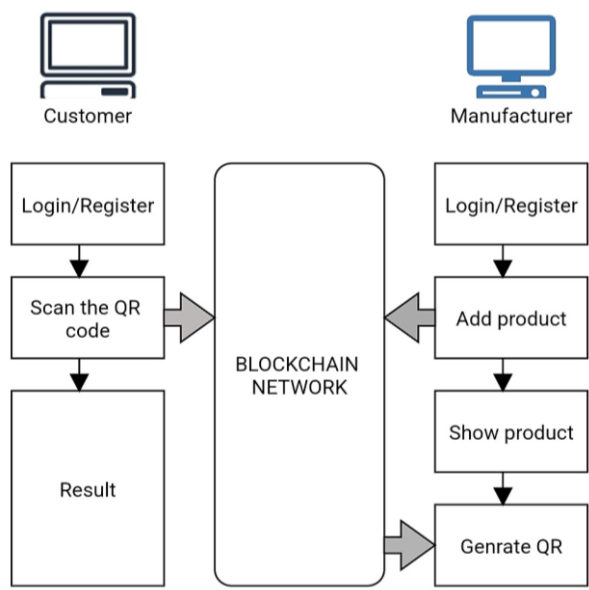


Figure 1. System architecture.

Table 1. Comparison between the existing system.

Attributes	Previous Technologies	Blockchain Technology
Storage of data	Centralized	Decentralized
Risk of data alteration or corruption	More	Less
Security	Less	More
Transparency	It is limited due to centralized system.	It provides full transparency to the user.
Cost	Expensive	Cheaper
Risk of Duplication	More	Less

First, the designing of overall software and recognizing the problem statement as per user needs. Then the actual coding, after the full settlement between the user/customer requirements. Then the execution part, where the software is run and tested. This test is done considering the real case scenario and the overviews. After the testing of software, the handover takes place where the user can start using the new software as shown in Table 1.

The technologies which are needed in order to achieve the end result are:

- Blockchain,
- Solidity,
- HTML,
- CSS, and
- JavaScript.

RESULT

The actual fake product detection system has its own advantages that can benefit the economy and leaves no vulnerability. This means, no fraud is going to take place, and as time passes, the production of fake products will decrease in near future. Here are some detailed advantages:

Decrease in Counterfeit Products

The fake product detection system mainly brings an end to this cycle where the production and distribution of counterfeit products takes place; thus, giving more opportunities for legitimate merchandise to improve.

Authentication of Products is Much Easier

The digital signature, which is embedded in QR codes, can help identify the authenticity of the product. This can reduce the production of fake merchandises in the market.

More Closure on the Products Supply Chain

By providing full details from the start to the end, and consumer shipment details, the transparency between the product and consumer increases drastically. Thus, giving no room for suspicion. It also ensures the product is not changed throughout the way.

Approved Purchasing

Through smart devices or any device with internet and camera facility, the consumer can freely check whether the products are fake or not and thus making right choices while purchasing.

Companies' Product as Security

The product which can be circulated in the market without any external disturbance can obtain more trust from customers. That also helps to improve the company's reputation and can acquire more customers.

Enhanced Security

Due to blockchain technology, the data related to product is secured and cannot be accessed through an outsider. Thus, it improves confidentiality and cannot be used for malpractice.

Warranty Management

By the individual product storing capability, it can help to achieve more after services to the genuine products only. Thus, by providing warranty or guarantee to the real products.

Keeping track of the genuine product

The blockchain technology can show the accurate data to the product manufacturing company.

LITERATURE REVIEW

The main motivation behind creating such a system is to absolutely eliminate the manufacturing of counterfeit products that mislead consumers, which has been taking place in recent years. This causes distrust in the consumer market which badly affects a company's brand value and creates a chaos on both the consumer and manufacturers side.

Reddy *et al.* [1]

A survey paper published by Reddy *et al.* shows that the QR based technology is used to identify and learn product detail with SHA-256 algorithm. SHA 256 is a patented cryptographic hash function that outputs a value that is 256 bits long.

Mitbavkar *et al.* [2]

This study shows the system design with data flow diagram.

Tiwari *et al.* [3]

This study shows different algorithms which are needed, like SHA which provides security, as well as Proof of Work (PoW) for its simple design and decentralized characteristics, and at the last, Proof of Stake (PoS); it is faster than PoW.

Kapoor *et al.* [4]

This literature survey shows advantages of blockchain system in product selling market with its features and compare it with previous technologies.

Ganapathy *et al.* [5]

This research shows the architecture of system and end results.

Khan *et al.* [6]

Results are provided with this study with architecture and data flow diagram and other user cases.

Srikrishna *et al.* [7]

It provides with step-by-step methodology and tools which are needed in process to create a working system.

Wasnik *et al.* [8]

The research shows and discusses importance of blockchain and its advantages which affect counterfeit products in industry.

Renukadevi *et al.* [9]

The paper shows the methodology and end result with an actual system.

Dutta and Anjum [10]

This study paper shows the identification of counterfeit product in supply chain. In this the algorithms are given for creating the registration page, adding product, selling and for manufacturing end as well.

Bali et al. [11]

The paper systematically differentiates between all other techniques which are currently used. For example, RFID, Magnetic strip, barcode and hologram, etc. It shows their advantages and disadvantages.

Shreekumar et al. [12]

It provides suggestions which can be added in end product with different features with information about Ethereum.

Tambe et al. [13]

It suggests software like android studio and firebase cloud for developing the application with system architecture and algorithms with result.

Alzahrani et al. [14]

A New Product Anti-Counterfeiting Blockchain Using Truly Decentralized Dynamic Consensus Protocol: It shows the disadvantages of existing centralized system and how to overcome them.

Casinoa et al. [15]

The literature review gives an overall overview, characteristics of blockchain technology with its limitations and future scope.

CONCLUSION

By introducing blockchain technology, the supply chain and brand integrity will improve, minimizing total losses and obtaining consumer trust, and achieving exponential growth in business with a more secure and trusted path.

Blockchain is a highly secure technology, ensuring the integrity of each block and resistance to tampering or hacking. By leveraging this technology, customers or users do not need to depend on third-party users to check the authenticity of their products.

It can help to achieve more transparency between user for more sustainability. Thus, providing a dependable system, the whole process of distribution, purchasing gets much more efficient.

Future Enhancement

It has great potential when it comes to implementing more technologies for better end product assessment. There are many possible improvements which can be added to enhance the overall system:

Featuring Blockchain Technology in IoT Devices

Conducting more research on the framework of wireless devices which can be used to combine the IoT with blockchain technology. Adding new sensors for shipment or tracking in general provides more value.

Artificial Intelligence (AI)

The improvements when it comes to Artificial intelligence is breaking boundaries in every field. The self-learning system can analyse itself by observing as per requirement; this can help in adding more accurate data to the user in less time.

Scalability Solutions

If the fake product issue is solved, then it can lead to more diverse areas, whether the supply chain can be added more deeply for providing platforms for more products.

User-Friendly Interfaces

Due to hectic schedules, a one tap solution is required to reduce the amount of time while identifying. For easy-to-use system, a simple UI is needed which is understandable and quick to adapt.

There are many possible technologies which can be added with blockchain technology and can improve and optimize the whole system.

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