Fake Product Identification Using Blockchain

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***Abstract*—The Counterfeit products have a strong effect on product manufacturing industries. They pose serious threats to the health and safety of consumers and also has huge impact on profit, sales as well as name of the company. Blockchain is the technology which can be used to reduce counterfeit goods and allow for faster product recalls. Blockchain is basically a digital ledger of transactions wherein the data is stored in the form of blocks and these blocks are linked to each other. Each block hasa unique identifier which is known as hash value for its ownblock and also contains the hash value for its previous block. Thus Blockchain technology is tamper proof and this makes it secure. Consumers do not have to rely on any third party to ensure product safety.**

Consumers will be able to ensure the authenticity of products using Quick Response code instead of blindly relying on retailers and the manufacturers can also deliver the desired product to the consumers. All the details about the product and its transactions will be stored safely without any tampering with the help of smart contracts. The user will just have to scan the unique code on the product and the code is compared to that in the database. In the event that the code matches, the customer will be notified that the product is real, otherwise it will notify them that the product is fake.

***Index Terms*—Counterfeit, Smart Contract, Quick Response Code, Blockchain**

I.INTRODUCTION

The advent of improved technology, internet and globaldevelopment of products is always associated with a risk factor such as tampering and counterfeiting. The market ofthe counterfeit products has been lifted to billions of dollars and is growing at an unpredicted rate. Indian economy is deeply impacted by the advent of counterfeit goods. The Indian economy loses over Rs 1 lakh crore a year due to counterfeiting, according to industry estimates. In addition to pharmaceuticals, FMCG, automotive, liquor, cement, and electronics, every successful brand suffers from this problem.

[12] Actions of these counterfeiters directly affects company's name, company revenue and also has a huge impact on customer health. Thus it is very important to ensure that the product is fake or real. Blockchain technology can be used to find the genuineness of the product. Blockchain is an arrangement of all the information that is recorded in the form blocks

which makes it difficult to change, hack or cheat. One of the major reasons of blockchain being secure is Decentralization. Blockchain is not stored in one single computer. Alternatively, it is collectively handled by network of computers. Once the information related to a particular product is stored in theblock a unique hash code for the product is generated andit is possible to maintain all the transaction records of that product. The innovation of blockchains allows transparencyin transactions. Anti-counterfeiting systems or fake product identification allow items purchased online to have their own digital identity for the purpose of authentication checks.

In the proposed system with the help of blockchain we will be generating QR code for a particular product and the end customer can scan the QR code through a mobile application toget all the information about the product. To make the system more secure we will be generating script using smart contract and Ethereum so that the system ensures more security and privacy. Thus by simply scanning the customer will get to know whether the product is real or fake.

II.BLOCKCHAIN CONCEPT

Blockchain is a technique to store information in a decentralized manner. Decentralised means that there will be no central authority to control entire data and information. Think an example of RBI. Our Indian rupees is printed by RBI andit guarantees that its value is the same as it is written on the note. So RBI is the central authority for governing all the

Indian rupee around the world. RBI can increase or decreaseor even change the value. But on the other hand bitcoin is a type of currency which is decentralised. There is no central agency or authority controlling bitcoin. It is possible because bitcoin is based on blockchain. And blockchain is a technology which actually makes it decentralised.

Blocks are used to store information in blockchains. There are three main components to each block. In the first place, every piece of information or data is stored in the form of blocks. Second, each block has its special code known as hash which helps to uniquely identify a block among other blocks.Every blockchain has its own QR code. And third, each ofthese blocks store the hash value of the block before it.

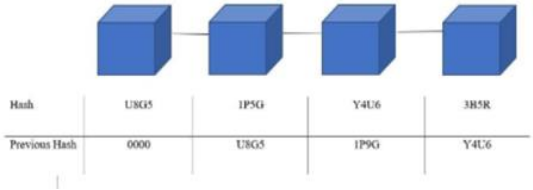

Fig. 1. Blockchain

III.LITERATURE REVIEW

This paper by Tejaswini Tambe, Sonali Chitalkar, Manali Khurud, Madhavi Varpe, S.Y. Raut narrates how QR codes can be used to identify counterfeit products. It has two main applications. One if for manufacturer to enter all the product details, generate QR code and check all the orders. The 2nd application is for customers to go through all the products, order products and verify whether the product is fake or realby scanning QR code. The system uses Android Studio to develop the application, Firebase cloud database where all the product details, hash values and block names are stored and SHA-256 algorithm to get constant hash value of 256 bits. [7]

The paper titled ”Blockchain application in food supply information security” by Daniel Tse, Bowen Zhang, Yuchen Yang, Chenli Cheng, Haoran Mu. This paper introduces the concept of blockchain technology in food supply chain infor- mation security and comparison is made with the traditional supply chain management system. This system mainly focuseson how tracking and monitoring can be done in food supply chain with the help of blockchain. It also helps manufacturers in recording all the transactions. The proposed idea is not put into practice, only the theoretical idea is put into practice. [9]

A Blockchain-Based Supply Chain Quality Management Framework by Si Chen, Rui Shi, Zhuangyu Ren, Jiaqi Yan, Yani Shi, Jinyu Zhang. This paper explains how the traditionalcloud storage model runs centrally so one point of failure can cause the system to crash. To tackle this problem, blockchain- based system was proposed by the authors. This blockchain based framework provides a theoretical basis for smart qualitymanagement within the supply chain supported blockchain technology. Additionally, it provides a basis for developing theories for managing information resources in distributed,virtual organizations. Supported Ethereum blockchain, the decentralized system contains a cipher text keyword search search function that solves the problem of traditional storage systems, where the cloud server returns incorrect results. [10]

A Survey of Counterfeit Product Detection by Prabhu Shankar,

R. Jayavadivel gives us detailed information about counter- feiting. Counterfeit products are fake or duplicate of the real product. As technology is advancing everything is getting digitized due to which the growth of the counterfeit products is exponential with huge amount of online platforms and black market with an intent to take superior advantage of the limited products. Thus there is strong need to design an efficientsystem which helps in detecting the counterfeit products ac- curately. In this paper various techniques are discussed which would help us in detecting counterfeit products. [8]

The paper entitled ‘IMPROVING FAKE PRODUCT DE- TECTION USING AI- BASED TECHNOLOGY’ by Eduard

Daoud, Dang Vu Nguyen Hai, Hung Nguyen and Martin Gaedke describes how a system based on artificial intelligencecan identify fake products and reduce them. In this system,to verify the product authentication, we do not need any special device/gadget. On the basis of the dataset provided, various machine learning algorithms were used to performdata analysis and train the model to generate the output and determine whether the product is fake or not. Based on images,logos, text, or information captured by end users via their devices, the analysis was conducted. The system then verifies it with the

data that is available and returns the final output to the end user to make further decision. [4]

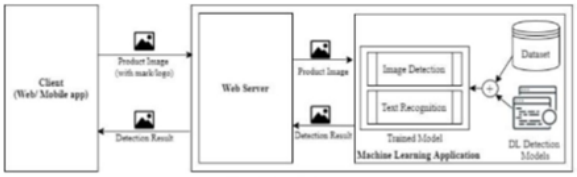

Fig. 2. System Architecture for AI Based System [4]

The paper by Thinh Duy Tran, Sung Je Hong proposes an anti-counterfeiting system based on RFID (Radio Frequency Identification) technology which consists of two main proto- cols. The tag authentication protocol allows the customers in authenticating the RFID tags without having to authenticate the reader and the server. The second protocol which is the database connection protocol allows the server and seller in updating tag status in database periodically. [2]

Limitations:

In order to read and transmit data to the computer systems RFID tags need a special scanner.

These tags are based on the radio wave technology, so if they are not managed properly or are not in required range fromthe scanner, or if they lose their battery power, they will not work properly or might even stop working.

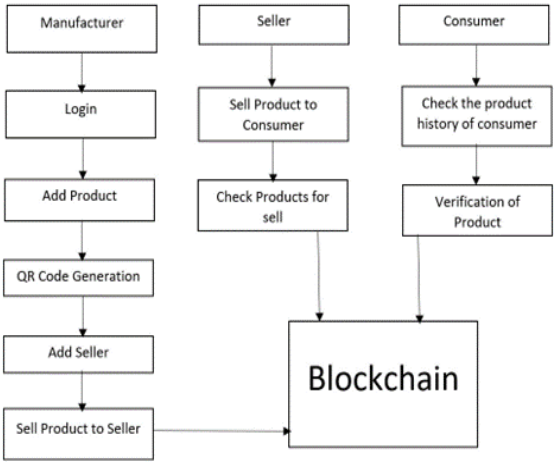

Fig. 3. System Architecture of Project

Year	Authors	Title	Performance/ Results
2021	Tejaswini Tambe, Sonali Chitalkar, Manali Khurud, Madhavi Varpe, S.Y. Raut [7].	Fake Product Detection using Blockchain.	Two main applications:- 1. For manufacturer to add products and generate QR code 2. For user to go through to products and scan QR code based on Firebase Cloud database and SHA-256 Algorithm
2017	Daniel Tse, Bowen Zhang, Yuchen Yang, Chenli Cheng, Haoran Mu [9].	Blockchain application in food supply information security.	Comparision of traditional supply chain with blockchain. Focuses on the downsides, promotes blockchain tracking. monitoring and auditing in the food supply chain, and helps manufacturers authentically record transactions.
2019	Si Chen, Rui Shi, Zhuangyu Ren, Jiaqi Yan, Yani Shi, Jinyu Zhang [10].	Blockchain Based Supply Chain Quality Management Framework	Provides theoretical basis for intelligent quality management within the supply chain supported by the blockchain technology.
2019	Prabhu Shankar, R. Jayavadivel [8].	Survey of Counterfeit Product Detection.	Detailed information about counterfeiting and Counterfeit products. An analysis of counterfeit products is presented in the paper.
2020	Eduard Daoud, Dang Vu Nguyen Hai, Hung Nguyen and Martin Gaedke [4].	Fake Product Detection using Artificial Intelligence	Artificial intelligence (AI) is used to detect fake products by analyzing the logos, photos, text recog nition or other informa- tion captured by users via their devices and compar- ing that information with the available data.
2021	Thinh Duy Tran, Sung Je Hong [2].	Fake Product Detection using RFID Anti-Counterfeiting .	Two protocol system: Tag Authentication protocol, Database connection

TABLE I- SUMMARY OF VARIOUS BLOCKCHAIN BASED APPROACHES.

III.PROPOSED METHODOLOGY

Currently technology and market are on the rise due to which the problem of distinguishing between originals and duplicates has also caused a great deal of damage to manufacturers, distributors as well as sellers. This problem can be addressed through development of a blockchain based application that can be used to detect fake products. In this section, we

provide a brief overview of the system's design, including a description of its function and user Interface. This system is basically a blockchain based decentralized application used to identify whether the product is fake or genuine.

The Proposed system consists of three phases namely, the manufacturer, the seller and the consumer:

A. Manufacturer:

The manufacturer will have to first login into the system using the email-id and password in order to do the further procedure. After successful login, the manufacturer will first add the product details such as the Manufacturer ID, Product Name, Product Brand, Product SN and Product Price. After entering proper details and clicking on the Add Product button, QR code of the product will be generated which the manufacturer can download. Having succeeded at this step themanufacturer can further move on to add seller. Wherein the Seller Name, Seller Brand, Seller Code, Seller Phone Number, Seller Manager, Seller Address and the Manufacturer ID will be required. Once the seller is added, the manufacturer can then sell the product to the seller. At this step the manufacturerwill have to first scan the QR Code of the product that is downloaded and enter the seller code to whom the product isto be sold along with the Product SN. The manufacturer can also check the number of sellers along with their details.

B. Seller:

Once the product is successfully sold to the seller, the sellercan now send the product to the consumer who wishes tobuy the product. At this stage the seller will have to scan the QR Code of the Product and enter the code of the consumer who wants to buy the product. After clicking on Sell Product to Consumer, the product will be successfully sold to theconsumer. The seller can also check the products for sale by entering the seller code.

C. Consumer:

After selling the product to the consumer, the consumer will have to scan the QR Code of the product and enter the consumer code in order to check whether the product is fakeor Genuine. This is the last stage of the entire process.

In this system, in order to detect counterfeit products, QR codes are used, where QR codes are linked to specific products through smart contracts which can be scanned by either providing camera access or uploading the downloaded image file of QR code. By doing so, the user will be able to determine whether the products are original or fake.

At each and every step the transaction will be initiated which needs to be confirmed through the metamask account which is linked to our ganache. After confirmation of transaction the block of each and every transaction will get added into the ganache which will contain all the details that are entered. Even if any one of the transaction confirmationis missed, the system will identify the product as fake. Thus, it is essential to confirm the transaction whenever requiredin order for the system to work accordingly and identify the product as genuine. Also, if any random QR code is scanned the product will be identified as fake, as the system will check the uploaded QR code along with the one which is stored in database. This increases the user's satisfaction and also ensures that the customers trust the merchants.

IV.RESULTS AND DISCUSSION

According to the results of the project, the system works as expected. QR code is used for authenticating originality of theproduct. After scanning the QR code if the output is shown as genuine product, then we can say that the product is authentic.But if after scanning the QR code if output is shown as Fake Product then we can conclude that the product is fake.

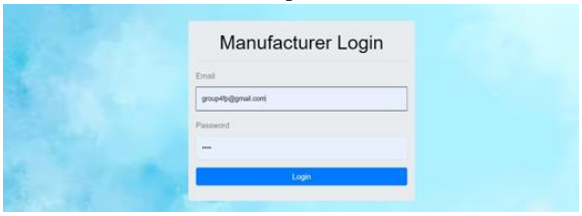

Fig. 4. Manufacturer Login

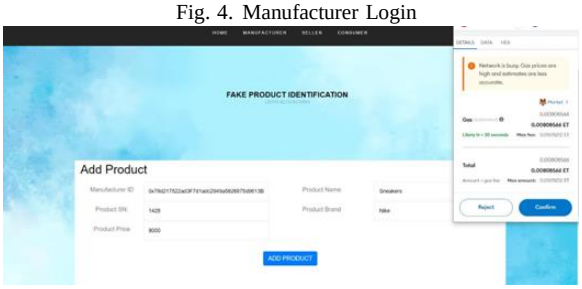

Fig. 5. Manufacturer adding product

The manufacturer will need to add the details such as the Manufacturer ID, Product name, Product Price etc in orderto generate QR Code of product.

Fig. 6. Generation of QR Code

Once the manufacturer adds the product and clicks on the Add Product button, QR Code of the product is generated.

Fig. 7. Seller selling product to Consumer

The seller selling product to the consumer by scanning the QR Code and entering the Consumer code to whom the product is to be sold.

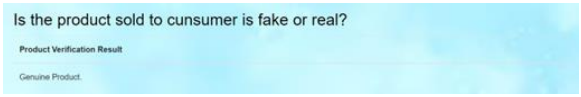

Fig. 8. Consumer Verifying Product (Output showing product as fake) After scanning QR Code, click on Get Product status button,if Output is Fake Product then it means product is not authenticate.

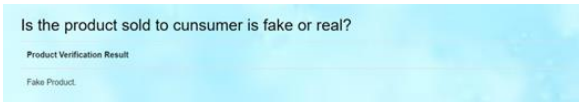

Fig. 9. Consumer Verifying Product (Output showing product as Genuine) After scanning QR Code, click on Get Product status button,if Output is Genuine Product then it means product is authenticated.

CONCLUSION

In the past couple of years, there is an exponential increase in counterfeit products in market. The amount of fake productsbeing manufactured and sold are more then the actual ones. Thus there is a strong need to identify such products and stop them. A QR code is generated of the product added by the manufacturer using Blockchain. The customers can scan the QR code and verify if the product is genuine or not. This system will also be advantageous to the manufacturers as itcan increase their sales. We are using Blockchain technology in our project because all the information stored in blockchain is tamper proof and it is nearly impossible for the hacker to hack the information. Blockchain has proved a powerful tool in terms of security and thus it also helps manufacturer to deliver honest product to customer. The implementation benefits as it is also cost efficient.

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