IJIRCCE

e-ISSN: 2320-9801 | p-ISSN: 2320-9798

INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN COMPUTER & COMMUNICATION ENGINEERING

Volume 10, Issue 4, April 2022

INTERNATIONAL STANDARD SERIAL NUMBER INDIA

Impact Factor: 8.165

International Journal of Innovative Research in Computer and Communication Engineering

| e-ISSN: 2320-9801, p-ISSN: 2320-9798| www.ijircce.com | |Impact Factor: 8.165 |

|| Volume 10, Issue 4, April 2022 ||

| DOI: 10.15680/IJIRCCE.2022.1004052|

Product Authentication Using Blockchain

Prof. Smita Chaudhari, Payal Thakur, Chandrakant Shinde, Kalyani Sonawane, Ritesh Borse

Assistant Professor, Dept. of I.T, K. K. Wagh Institute of Engineering Education & Research, Nashik, India

B.E. Student, Dept. of I.T, K. K. Wagh Institute of Engineering Education & Research, Nashik, India

B.E. Student, Dept. of I.T, K. K. Wagh Institute of Engineering Education & Research, Nashik, India

B.E. Student, Dept. of I.T, K. K. Wagh Institute of Engineering Education & Research, Nashik, India

B.E. Student, Dept. of I.T, K. K. Wagh Institute of Engineering Education & Research, Nashik, India

ABSTRACT: In today's world, the problem of counterfeit products trading is ever-increasing, which not only infringe on trademarks and copyrights, but also generate profits for organized crimes at the expense of the affected companies by negatively impacting on their sales and profit. Current anti-counterfeiting supply chains depend on a centralized authority to combat counterfeit products. In order to ensure the identification and traceability of genuine products throughout the supply chain, we plan to implement a fully functional blockchain application system to prevent product counterfeiting. Consumers do not need to fully rely on the merchants to determine if products are authentic as the decentralized blockchain technology approach is used to terminate the trade of counterfeit products and to track the ownership of the product. Fake products are detected using a QR code scanner, where a QR code of the product is linked to a blockchain. This system stores product details and generates unique code of that product as blocks in the database. It collects the unique code from the user and compares the code against entries in the blockchain database. If the code matches, it will notify the customer of the entire product specifications, otherwise it will display a counterfeit warning. We describe a blockchain web application system with products anti-counterfeiting with an additional smart contract feature that enhances trust between the customer and manufacturer.

KEYWORDS: Blockchain, Anti-counterfeiting, Smart Contract, QR code.

I. INTRODUCTION

Nowadays, it is nearly impossible to prove that the product you are purchasing is a genuine product. To ensure the identification and traceability of authentic products throughout the supply chain, we plan to implement a fully functional blockchain system to prevent product counterfeiting which is the need of the hour. We leverage the idea of blockchain that anyone can check the proof of possession of product. In addition to this, we plan to generate and use unique QR codes for every manufactured product. We aim to implement a proof-of-concept system employing a blockchain-based decentralized web application which gives a customer the entire history of a product (e.g. - brand information, manufacturer, vendor, owner, etc). Blockchain architecture will be able to record product ownership. Consumers don't need to fully rely on trusted third parties to safely know the source of the purchased product.

A. MOTIVATION

The trade in counterfeit goods is growing and is affecting the sales and profits of companies affected by this phenomenon. To ensure the identification and traceability of real products throughout the supply chain, we propose a fully functional blockchain system to prevent product counterfeiting. Enterprises only need to remunerate very low transaction fees, and they no longer need to worry about the possibility of obtaining counterfeit products.

B. OBJECTIVES

The aim of this project is to implement a blockchain based web application powered by Ethereum to record product ownership on the blockchain. By using blockchain's untrace-ability and transparency properties, and the assurance that each record cannot be forged on the blockchain, consumers don't need to fully rely on trusted third parties to safely know the source of the purchased product. Hence, the most important objectives within the project are:

| e-ISSN: 2320-9801, p-ISSN: 2320-9798| www.ijircce.com | |Impact Factor: 8.165 |

|| Volume 10, Issue 4, April 2022 ||

| DOI: 10.15680/IJIRCCE.2022.1004052|

- To provide end-to-end supply chain visibility for all partners involved, including the retailers and the consumers
- To verify that authentic products are handed over to an authorized party at each transfer point
- To ensure that a public verified ledger of all transactions is available at all times
- To develop a reliable and secure web application
- To secure product details using a QR code

II. LITERATURE SURVEY

- Jinhu Ma, Shih-ya Lin, Xin Chen, Hung Min Sun, Yeh-Chen Chen, Huxion Wang proposed a Blockchain-Based Application System for Product Anti-Counterfeiting Blockchain based system to assure the customer about the authenticity of product by using ethereum and all information about product get by scanning QR code. [1]
- Neo C. K. Yiu developed Decentralizing Supply Chain Anti-Counterfeiting and Traceability Systems Using Blockchain Technology which is decentralizing a legacy anti-counterfeiting system of supply chain industry using Blockchain technology, to facilitate trustworthy data retrieval, verification and management. [2]
- Naif Alzahrani, Nirupama Bulusu presented a Block-Supply Chain: A New Anti-Counterfeiting Supply Chain Using NFC and Blockchain, contains a new decentralized supply chain (block-supply) utilizing blockchain and NFC technologies for anticounterfeiting of any product. The block-supply chain was able to track-and-trace products and detect modification, cloning, and tag replication attacks. [4]
- A Survey of Counterfeit Product Detection by Prabhu Shankar, R. Jayavadivel. Counterfeit products are growing exponentially with the enormous amount of online and black-market. So, there is an urgent need to address the challenges of detecting counterfeit products and designing appropriate technology to improve detection accuracy. This is one of the active research areas to be explored in the current world. [7]
- Feng Tian utilizes and develops RFID (Radio-Frequency IDentification) and blockchain technology first, and then analyzes the advantages and disadvantages of using RFID and blockchain technology in building the agri-food supply chain traceability system. The emergence of blockchain technology effectively solves the pain-point problem existing in the traceability system of agricultural food supply chains. A framework based on the consortium and smart contracts to track and trace the workflow of agricultural food supply chains. [8]
- In another study of Tripti Rathee, Manoj Malik, Authentication of Product and Counterfeits Elimination Using Blockchain, in this proposed system the products journey from manufacturing to being sold to customer (supply chain) can be recorded, and the customer is assured that the scans were not faked by using NFC tokens and Ethereum network. It handles the product data and can: (i) Create product transactions in Database and Blockchain (ii) Initiate new block creation (iii) Retrieve product data (iv) Authenticate scans.[9]

III. PROBLEM DEFINITION

To ensure the identification, provenance and traceability of authentic products sold on e-commerce platform as well as by retail stores throughout the supply chain with the help of QR Codes by implementing a blockchain-based decentralized web application which gives a customer the entire history of a product inclusive of product information, manufacturer, distributor and delivery person.

IV. REQUIREMENT SPECIFICATION

1. For the front end React, HTML, CSS3 are the technologies which can provide a variety of features for creating highly interactive and responsive web pages.
2. Ethereum, MySQL, Level DB are the backend technologies. Ethereum is an opensource, blockchain based decentralized platform.
3. Solidity Language is an object-oriented, high-level language for implementing smart contract and it is generated to run on Ethereum virtual machine
4. Web3.js and ethereum.js are the API and it is the collection of libraries that allows user to interact with local or remote Ethereum node using http.
5. Node.js is used to form fast and scalable application.

| e-ISSN: 2320-9801, p-ISSN: 2320-9798| www.ijircce.com | |Impact Factor: 8.165 |

|| Volume 10, Issue 4, April 2022 ||

| DOI: 10.15680/IJIRCCE.2022.1004052|

6. Testing purpose is fulfilled by using Geth. It is the implementation of Ethereum node in GO programming language. It is the program that serves as node for Ethereum blockchain and it can make software which can run on EVM.
7. The Ethereum Mist Wallet is one of the few wallets with support from the developers behind the Ethereum Network.
8. Git is a free and open-source distributed version control system designed to handle everything from small to very large project with speed and efficiency.

V. PROPOSED ARCHITECTURE

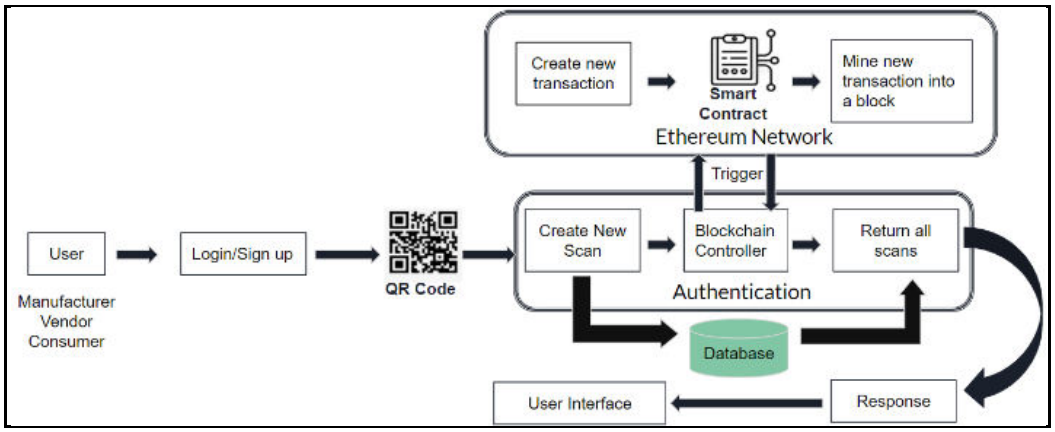

Fig.1. Block Diagram of System Architecture

In perspective of a user, a user is able to perform the following tasks in the specified order to check the authenticity of the product.

1. Login/Sign Up as one of the three types of users from the following:
   (a) Manufacturer
   (b) Vendor
   (c) Consumer
2. Scan QR Code of the Product using any scanner present on a mobile phone or upload the image of QR using web application.
3. The scan will open a page in the browser, The product information is requested from the Authentication Module. Authentication module verifies if it is a genuine request, if yes, it creates a new entry of scan in the database and blockchain and sends response with the Product data and its scan history.
4. Browser shows if the product is authentic and shows its scan history. User is able to view the scan history to check for any anomalous scan history.

The basic working implementation of this requires a blockchain and a node server working on the network. A simple blockchain with in-memory storage, a simple proof of work algorithm and a consensus algorithm to resolve conflicts is required. It is the Service that resides between the Blockchain module and the user. It handles the product data and can:

1. Create product transactions in Database and Blockchain.
2. Initiate new block creation.
3. Initiate new Transaction creation using Smart Contract.
4. Retrieve product data.
5. Authenticate scans and notify if genuine.

VI. METHODOLOGY

The Blockchain transactions and blocks can be visualized in a UI by using the Customer Interface. The database stores metadata of products storage using MySQL and Level DB. Customers scan QR Code using any application QR Code have encoded data within them, which point to the product. Every time the code is scanned, a new immutable entry is created in the chain. The authentication module allows addition of new products and items as well as creating

| e-ISSN: 2320-9801, p-ISSN: 2320-9798| www.ijircce.com | |Impact Factor: 8.165 |

|| Volume 10, Issue 4, April 2022 ||

| DOI: 10.15680/IJIRCCE.2022.1004052|

unique QR Code for each item inclusive of private key and public key generation. Every time the code is scanned it triggers New Scan and save details in Database. It triggers a creation of new transaction using Smart Contract in Blockchain. After a while it triggers a mining action to Blockchain that mines recent transactions into a new block. Nodejs, ethereumjs, Web3js Authentication Server serves product scan page with product and scan history data to client; records new scan data in database and initiates a block creation in the blockchain.

VII. IMPLEMENTATION MODULES

- Add New Vendor

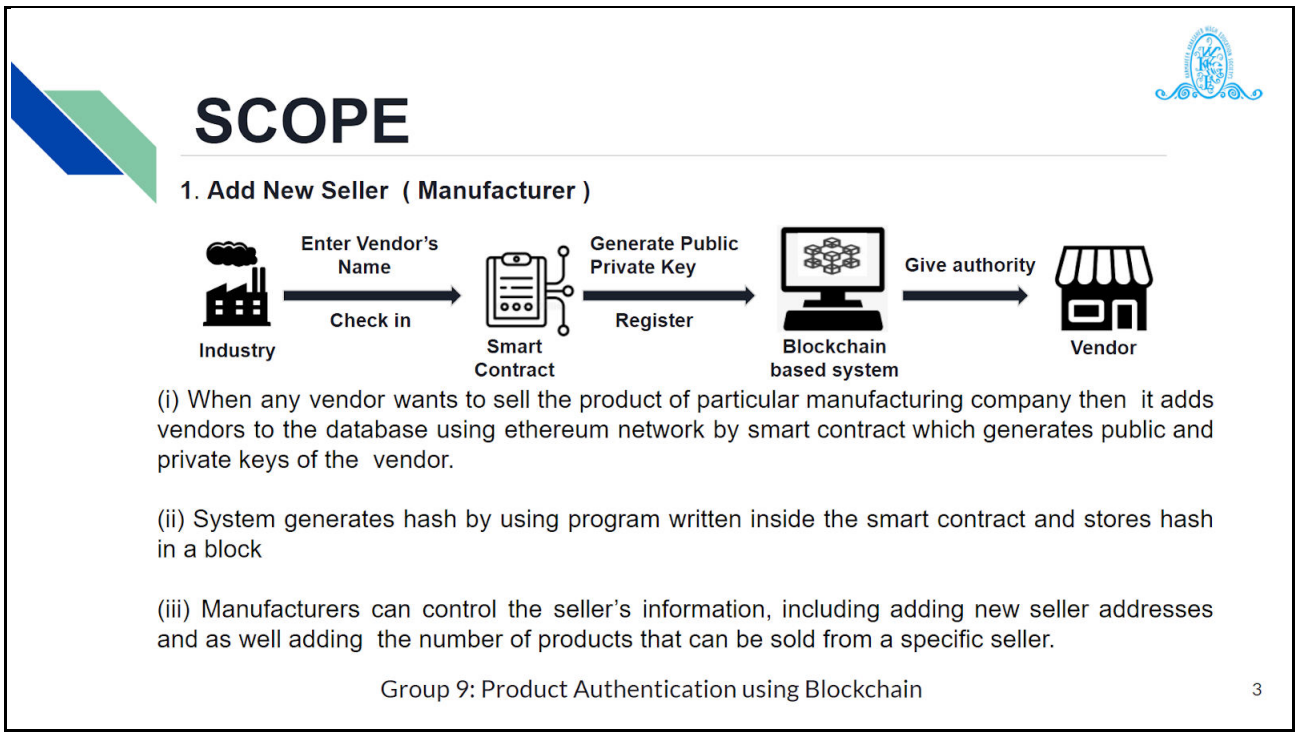

Fig. 2. Add Vendor Functionality

When any vendor wants to sell the product of particular manufacturing company then Manufacturer must create vendor entity to the database using Ethereum network by smart contract which generates public and private keys of the vendor. System generates hash by using program written inside the smart contract and stores hash in a block. Manufacturers can control the seller's information, including adding new seller addresses and as well adding the number of products that can be sold from a specific seller.

| e-ISSN: 2320-9801, p-ISSN: 2320-9798| www.ijircce.com | |Impact Factor: 8.165 |

|| Volume 10, Issue 4, April 2022 ||

| DOI: 10.15680/IJIRCCE.2022.1004052|

- Add Product

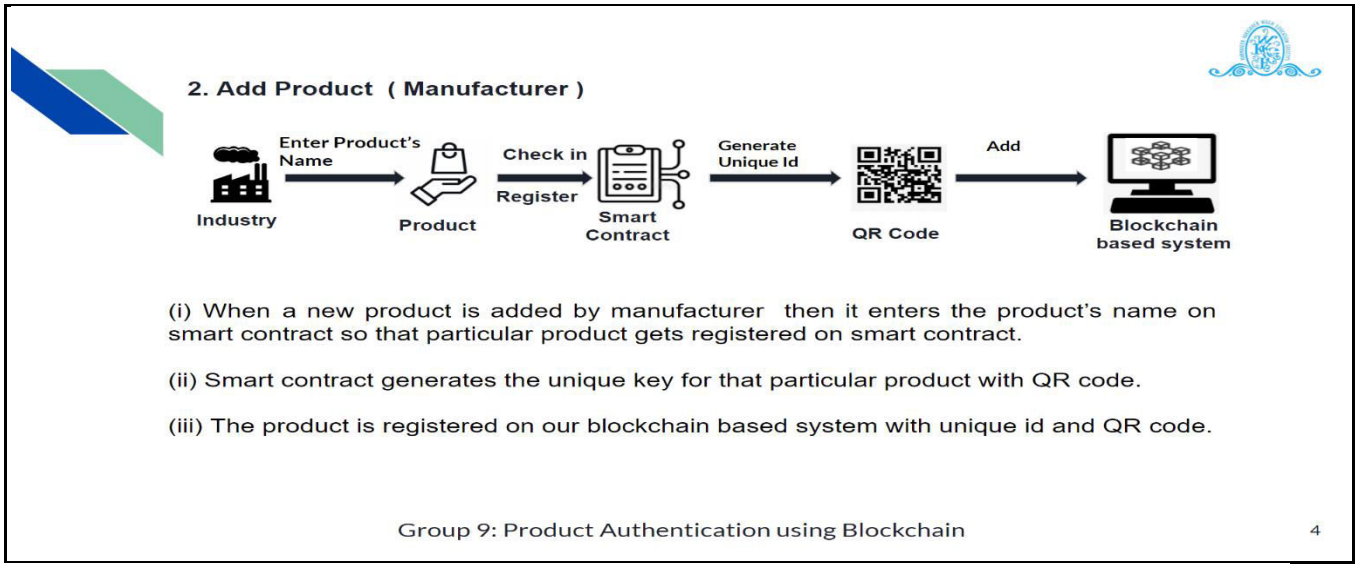

Fig. 3. Add Product Functionality

When a new finished product is produced by manufacturer then it must create a new product entity by entering the product's name on smart contract so that the particular product gets registered and stored on smart contract. Smart contract generates the unique key for that particular product with QR code. The product is registered on the blockchain based system with unique id and QR code.

- Product Verification

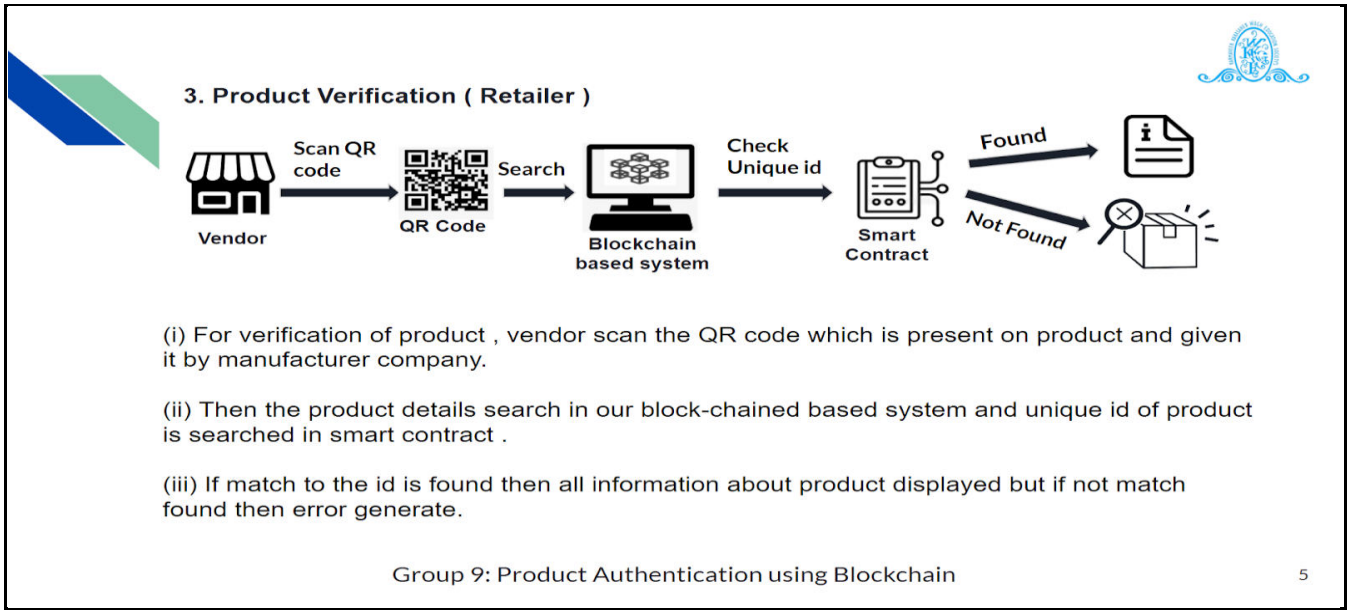

Fig. 4. Product Verification Functionality

| e-ISSN: 2320-9801, p-ISSN: 2320-9798| www.ijircce.com | |Impact Factor: 8.165 |

|| Volume 10, Issue 4, April 2022 ||

| DOI: 10.15680/IJIRCCE.2022.1004052|

In order to verify a product, vendor scans the QR code which is present on product received from the manufacturer company. Then the product details are searched in the blockchain based system by finding the unique ID of product in smart contract. If match to the ID is found then all information about product is displayed and ownership of the product is transferred to the vendor but if match is not found then error is generated and vendor gets notified about the counterfeit.

- Transfer of Ownership

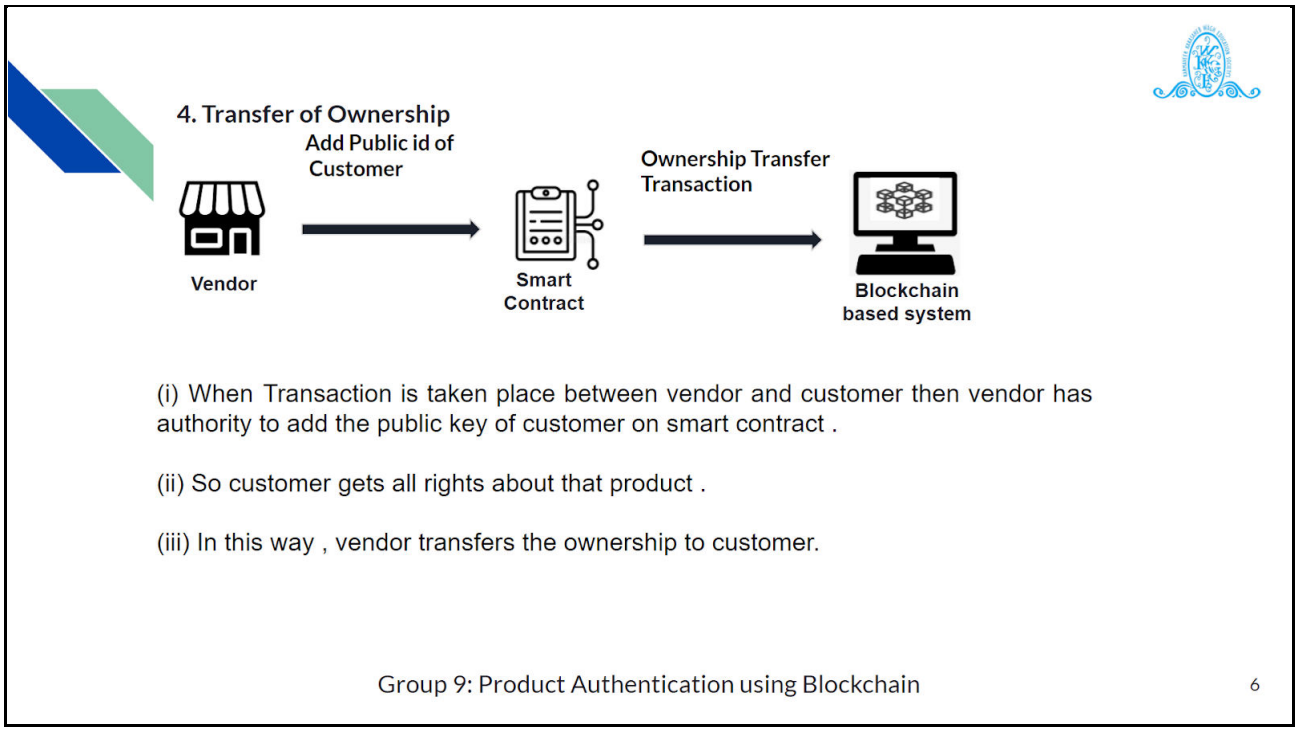

Fig. 5. Product Ownership Transfer

When Transaction finishes execution between vendor and customer then vendor has authority to add the public key of customer on smart contract. Hence, the manufacturer transfers ownership of the product to vendor. On selling the product, the vendor transfers ownership to customer ensuring provenance of the product throughout the supply chain. In this way, vendor transfers the ownership to customer.

| e-ISSN: 2320-9801, p-ISSN: 2320-9798| www.ijircce.com | |Impact Factor: 8.165 |

|| Volume 10, Issue 4, April 2022 ||

| DOI: 10.15680/IJIRCCE.2022.1004052|

- Product Authentication

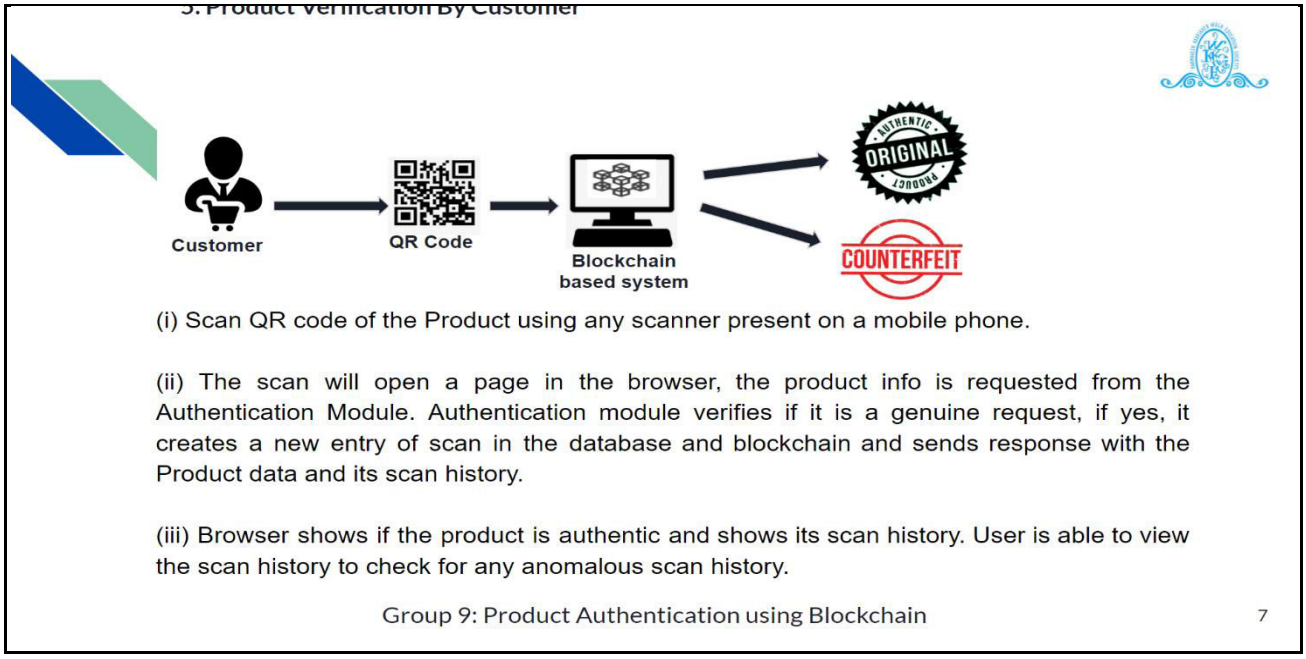

Fig. 6. Product Authentication Module

On successfully scanning the QR code of the Product using any scanner present on a mobile phone. The scan will redirect to a webpage in the browser, meanwhile the product information is requested from the Authentication Module. The response appears as either genuine product verified or counterfeit product reported.

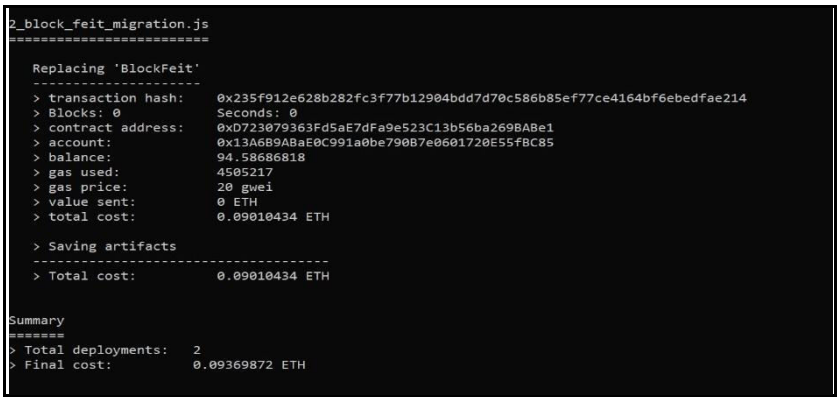

Fig.7. Transaction details: Smart Contract

International Journal of Innovative Research in Computer and Communication Engineering

| e-ISSN: 2320-9801, p-ISSN: 2320-9798| www.ijircce.com | |Impact Factor: 8.165 |

|| Volume 10, Issue 4, April 2022 ||

| DOI: 10.15680/IJIRCCE.2022.1004052|

VIII. USER INTERFACE

Fig. 8. Home Page

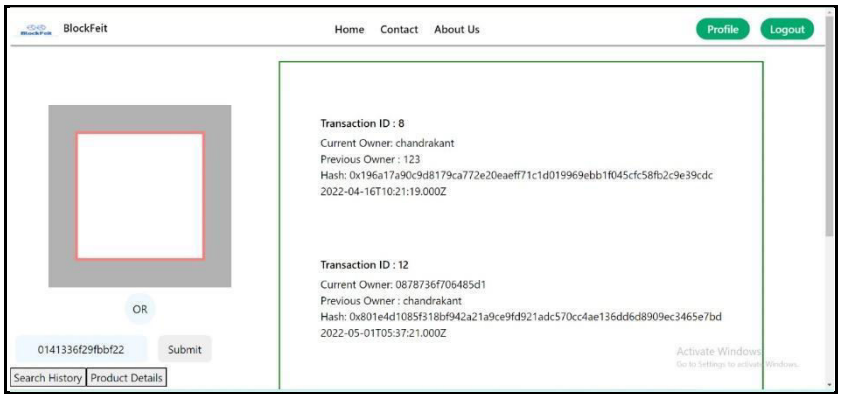

Fig.9. Product Transaction History

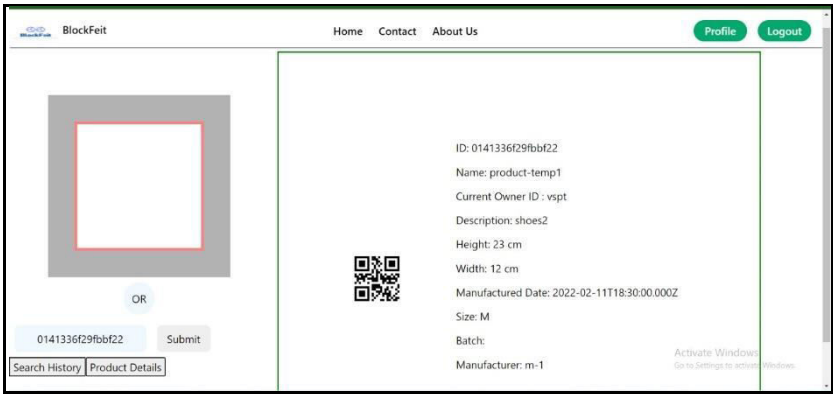

Fig.10. Product Details

International Journal of Innovative Research in Computer and Communication Engineering

| e-ISSN: 2320-9801, p-ISSN: 2320-9798| www.ijircce.com | |Impact Factor: 8.165 |

|| Volume 10, Issue 4, April 2022 ||

| DOI: 10.15680/IJIRCCE.2022.1004052|

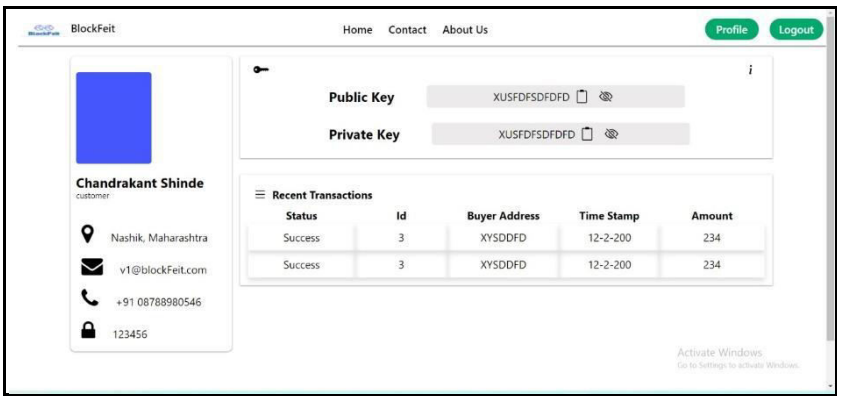

Fig.11. Customer Profile

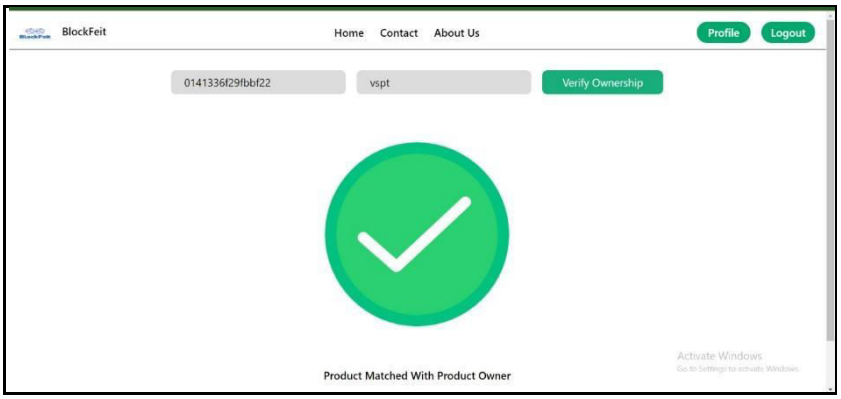

Fig.12. Product Authenticated (after scanning QR code)

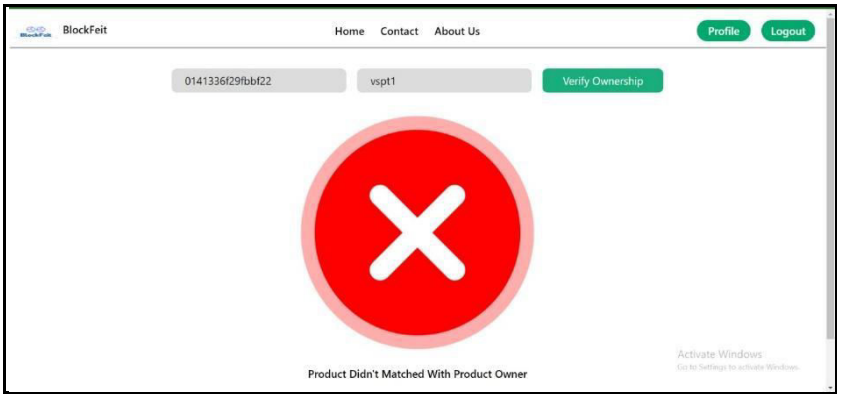

Fig.13. Counterfeit Product detected (after scanning QR code)

IX. CONCLUSION

The proposed a fully functional anti-product forgery system by implementing a blockchain based web application. Manufacturers can use the system to store relevant information on product sales in blockchain which is accessible to everyone. The user can use the functions provided by our system to immediately perform vendor-side verification. The system will provide identity verification by using Smart Contracts on Ethereum network.

| e-ISSN: 2320-9801, p-ISSN: 2320-9798| www.ijircce.com | |Impact Factor: 8.165 |

|| Volume 10, Issue 4, April 2022 ||

| DOI: 10.15680/IJIRCCE.2022.1004052|

REFERENCES

1. JINHUA MA 1, SHIH-YA LIN 2, XIN CHEN 1, HUNG-MIN SUN 2, YEH-CHENG CHEN, "Blockchain-Based Application System for Product Anti-Counterfeiting" IEEE Access date of publication February 6, 2020.
2. Neo C. K. Yiu "Decentralizing Supply Chain Anti-Counterfeiting Systems Using Blockchain Technology" IEEE Access 02/02/2021.
3. Q. Lu and X. Xu, ''Adaptable blockchain-based systems: A case study for product traceability,'' IEEE Softw., vol. 34, no. 6, pp. 21–27, Nov./Dec. 2017.
4. N. Alzahrani and N. Bulusu, ''Block-supply chain: A new anticounterfeiting supply chain using NFC and blockchain,'' in Proc. 1st Workshop Cryptocurrencies Blockchains Distrib. Syst. (CryBlock), 2018, pp. 30–35.
5. K. Toyoda, P. T. Mathiopoulos, I. Sasase, and T. Ohtsuki, ''A novel blockchain-based product ownership management system (POMS) for anti-counterfeits in the post supply chain,'' IEEE Access, vol. 5, pp. 17465–17477, 2017.
6. Ijazul Haq, Olivier Muselemu Esuka," Blockchain Technology in Pharmaceutical Industry to Prevent Counterfeit Drugs" International Journal of Computer Applications (0975 – 8887) Volume 180 – No.25, March 2018.
7. Thomas K., Fran Casino, Costas Patsakis, and Christos Douligeris," A Framework for Supply Chain Traceability Based on Blockchain Tokens " August 2019, Conference: 17th Int. Conference on Business Process Management (BPM 2019).
8. F. Tian, ''An agri-food supply chain traceability system for China based on RFID and blockchain technology'' in Proc. 13th Int. Conf. Service Syst. Service Manage. (ICSSSM), June 2016.
9. Tripti Rathee, Manoj Malik, "Authentication of Product and Counterfeits Elimination Using Blockchain ", International Journal of Innovations in Engineering and Technology (IJIET) Volume 10 Issue 1 April 2018.

INNO SPACE
SJIF Scientific Journal Impact Factor

Impact Factor: 8.165

doi cross ref

ISSN INTERNATIONAL STANDARD SERIAL NUMBER INDIA

निस्केयर NISCAIR

INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN COMPUTER & COMMUNICATION ENGINEERING

9940 572 462 6381 907 438 ijircce@gmail.com

www.ijircce.com

Scan to save the contact details