

A  
Project Report  
on

## **Product Authentication System Using Blockchain**

Submitted to  
Sant Gadge Baba Amravati University  
In partial Fulfillment of the Requirement  
For the Degree of  
Bachelor of Engineering in  
Computer Science and Engineering

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2022-23

SHRI SANT GAJANAN MAHARAJ COLLEGE OF ENGINEERING,  
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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING



**CERTIFICATE**

This is to certify that Mr. Adish Raipure, Mr. Atharva Kolhe, Mr. Bhavesh Mittal, Mr. Gagan Wanjari and Mr. Ritesh Manusmare, students of final year B.E. in the year 2022-23 of Computer Science and Engineering Department of this institute has completed the project work entitled “**Product Authentication System Using Blockchain**” based on syllabus and has submitted a satisfactory account of his work in this report which is recommended for the partial fulfillment of degree of Bachelor of Engineering in Computer Science and Engineering.

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**CERTIFICATE**

This is to certify that the project work entitled “**Product Authentication System Using Blockchain**” submitted by **Mr. Adish Raipure, Mr. Atharva Kolhe, Mr. Bhavesh Mittal, Mr. Gagan Wanjari and Mr. Ritesh Manusmare**, students of final year B.E. in the year 2022-23 of Computer Science and Engineering Department of this institute, is a satisfactory account of his work based on syllabus which is recommended for the partial fulfillment of degree of Bachelor of Engineering in Computer Science and Engineering.

**Internal Examiner**

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## Abstract

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Blockchain technology is the distributed, decentralized, and digital ledger that stores transactional information in the form of blocks in many databases which is connected with the chains. Blockchain technology is secure technology therefore any block cannot be changed or hacked. By using Blockchain technology, customers or users do not need to rely on third-party users for confirmation of product safety. In this project, with emerging trends in mobile and wireless technology, Quick Response (QR) codes provide a robust technique to fight the practice of counterfeiting the products. counterfeit products are detected using a QR code scanner, where a QR code of the product is linked to a Blockchain. It collects the unique code from the user and compares the code against entries in the Blockchain database. If the code matches, it will give a notification to the customer, otherwise it will give the notification to the customer that the product is fake.

## Acknowledgement

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*The real spirit of achieving a goal is through the way of excellence and lustrous discipline. I would have never succeeded in completing my task without the cooperation, encouragement and help provided to me by various personalities.*

*I would like to take this opportunity to express my heartfelt thanks to my guide **Dr. N. M. Kandoi**, for his esteemed guidance and encouragement, especially through difficult times. His suggestions broaden my vision and guided me to succeed in this work. I am also very grateful for his guidance and comments while studying part of my seminar and learnt many things under his leadership.*

*I extend my thanks to **Dr. S.B. Patil**, Head of Computer Science & Engineering Department, Shri Sant Gajanan Maharaj College of Engineering, Shegaon for their valuable support that made me consistent performer.*

*I also extend my thanks to **Dr. S. B. Somani**, Principal Shri Sant Gajanan Maharaj College of Engineering, Shegaon for their valuable support.*

*Also, I would like to thanks to all teaching and non-teaching staff of the department for their encouragement, cooperation and help. My greatest thanks are to all who wished me success especially my parents, my friends whose support and care makes me stay on earth.*

**Gagan Wanjari  
Adish Raipure  
Atharva Kolhe  
Bhavesh Mittal  
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Session 2022-23**

# Contents

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<i>Abstract</i>	<i>i</i>
<i>Acknowledgement</i>	<i>ii</i>
<i>Contents</i>	<i>iii</i>
<i>List of Figures &amp; Tables</i>	<i>v</i>
<b>1. Introduction</b>	<b>1</b>
1.1 Preface	2
1.2 Motivation	3
1.3 Problem Statement	3
1.4 Objectives	4
1.5 Scope of Project	4
1.6 Organization of Project	4
<b>2. Literature Survey</b>	<b>5</b>
<b>3. Implementation</b>	<b>7</b>
3.1 Proposed System	7
3.2 System Model	8
3.3 Tool Requirements	11
3.4 Entities in The System	11
<b>4. Deployment</b>	<b>14</b>
4.1 Requirements	15
4.2 Installation	15
4.3 Setup	18
<b>5. Implementation &amp; Result Analysis</b>	<b>19</b>
5.1 Add Seller	20
5.2 Add Product	21
5.3 Sell Product to Seller (Manufacturer)	23
5.4 Sell Product to Consumer (Seller)	24
5.5 Query Sellers Register (Manufacturer)	25
5.6 Query Product Register (Seller)	26
5.7 Verify Products	26

5.8	Consumer Product History	28
5.9	Result Analysis	29
<b>6.</b>	<b>Conclusion</b>	<b>30</b>
	<i>References</i>	

## List of Figures and Tables

---

Figure 3.1	Proposed System Model
Figure 3.2	Manufacturer User Flow
Figure 3.3	Seller User Flow
Figure 3.4	Consumer User Flow
Figure 5.1	Home Page
Figure 5.2	Add Seller Tab
Figure 5.3	Seller Confirmation by Metamask
Figure 5.4	Add Product Tab
Figure 5.5	Product Confirmation
Figure 5.6	Sell Product to Seller
Figure 5.7	Confirm Product Sale to Seller
Figure 5.8	Sell Product to Consumer
Figure 5.9	Confirm Product Sale to Consumer
Figure 5.10	The Seller Register
Figure 5.11	The Product Register



**CHAPTER 1**  
**INTRODUCTION**

# **INTRODUCTION**

## **1.1 PREFACE**

In recent years, counterfeiting and fraudulent activities have become a major concern for many industries. The issue of counterfeit products not only affects the profits of legitimate manufacturers but also poses a threat to consumers' safety and security. In order to combat this problem, there has been an increasing need for an efficient and reliable product authentication system.

The emergence of blockchain technology has paved the way for a new approach to product authentication. With its inherent features of transparency, immutability, and decentralization, blockchain can provide a secure and tamper-proof way to track the entire supply chain of a product.

This project aims to develop a product authentication system using blockchain technology. The system will enable consumers to verify the authenticity of a product by simply scanning a QR code on the product's packaging. The QR code will contain a unique identifier that is linked to the product's blockchain record, which contains information about the product's origin, manufacturing process, and distribution.

The proposed system will not only help manufacturers to prevent counterfeiting and protect their brand reputation but also enhance consumer trust and confidence in the products they purchase. Additionally, the system can also facilitate regulatory compliance and reduce the risk of product recalls.

This project will involve the implementation of a blockchain-based system, along with the development of a user-friendly mobile application that enables consumers to scan and verify the authenticity of products. The project will also involve testing and evaluating the system's performance, as well as conducting a cost-benefit analysis to determine its economic feasibility.

Overall, this project aims to provide a solution to the growing problem of product counterfeiting and enhance the transparency and trustworthiness of supply chains using blockchain technology.

## **1.2 MOTIVATION**

The motivation for this project comes from the growing problem of counterfeit products in various industries, including pharmaceuticals, luxury goods, and electronics. Counterfeit products not only affect the profits of legitimate manufacturers but also pose a serious threat to consumer health and safety.

Currently, many traditional product authentication methods, such as holograms and serial numbers, can be easily duplicated or tampered with. Moreover, these methods do not provide end-to-end traceability of a product's journey from the manufacturer to the end consumer.

Blockchain technology provides a potential solution to these problems by providing a secure and immutable way to track a product's entire supply chain. The use of blockchain for product authentication can help to prevent counterfeiting and protect consumer safety by enabling consumers to verify the authenticity of a product with ease.

This project's specific motivation is to develop a practical and efficient product authentication system using blockchain technology that can be easily implemented by manufacturers and adopted by consumers. The proposed system aims to address the limitations of existing authentication methods by providing a tamper-proof and transparent way to track a product's journey from the manufacturer to the end consumer.

In addition to addressing the problems of counterfeiting and consumer safety, the proposed system also has the potential to provide significant benefits to manufacturers. By ensuring the authenticity of their products, manufacturers can protect their brand reputation, reduce the risk of product recalls, and enhance their relationship with consumers.

## **1.3 PROBLEM STATEMENT**

To create a robust and dependable product authentication system for high-value products, which allows consumers to effortlessly verify product authenticity, guarantees end-to-end traceability from manufacturer to end consumer, and offers a secure and tamper-proof mechanism for storing and verifying product information.

#### **1.4 OBJECTIVE**

- 1) To Design Anti Counterfeit System using Blockchain.
- 2) To secure product details using a QR code.
- 3) Provide security to the clients by offering data to client.

#### **1.5 SCOPE OF PROJECT**

- 1) The project uses blockchain technology and QR codes to prevent counterfeiting, protect consumers, and enhance supply chain transparency.
- 2) The system stores a product's source chain and ownership histories, ensuring the authenticity of the product information.
- 3) Unauthorized data alteration is prevented through the use of blockchain technology.
- 4) A mobile application will be developed to enable easy access to the product's blockchain record.
- 5) The project includes testing, evaluating, and cost-benefit analysis to ensure practicality and efficiency of the product authentication system.

#### **1.5 ORGANIZATION OF PROJECT**

Chapter 1: It gives an Introduction of the project.

Chapter 2: Literature Survey of the research papers referred to get an idea of the previous work done on this project.

Chapter 3: After reviewing, the methodology of how the project can be executed.

Chapter 4: The implementation details that we have followed to complete the project.

Chapter 5: How the project was deployed on frontend using HTML CSS frontend framework.

Chapter 6: The conclusion derived from this project. Chapter 7: Details of the research papers referred.

**CHAPTER 2**  
**LITERATURE**  
**SURVEY**

## LITERATURE SURVEY

Sr. no.	Title	Name of Journal/ conference	Author name	Conclusion
[1]	Do you need a blockchain in construction? Use case categories and decision framework for DLT design options	Advanced Engineering Informatics 45 (2020): 101094	Hunhevicz, Jens J., and Daniel M. Hall	It gives us a straightforward flowchart that helps us determine whether or not we need blockchain for our initiatives. It offers various scenarios, and by ignoring them, you may determine whether or not blockchain technology is necessary.
[2]	A comparative study: Blockchain technology utilization benefits, challenges, and functionalities	IEEE Access 9 (2021): 12730-12749	Ali, Omar, et al	It gives us a thorough explanation of blockchain technology. It provides comprehensive details regarding the blockchain's history, advantages, disadvantages, architecture, and security.
[4]	Sales-forecasting of Retail Stores using Machine Learning Techniques	IEEE, 2018	Akshay Krishna, Akhilesh V, Animikh Aich, ChetanaHegde.	Presented a system for identifying counterfeit goods. The suggested system is to create a QR code for a product that contains all of its information and store that QR in a blockchain database. When a customer or distributor purchases the same product and scans the QR code that is embedded in the product, the system determines whether the product is genuine or fake based on whether it matches the stored QR code.

[5]	Blockchain Technology for Supply Chain Management	Global Joint Conference on Industrial Engineering and Its Application Areas. Springer, Cham, 2020	Dursun, Taner, et al	It gives us details about the blockchain-based supply chain management solution. Blockchain technology has the potential to improve product traceability, authenticity, and legality in a more cost-effective manner by creating a permanent, shareable, auditable record of products across their supply chain
[8]	Two-stage textured-patterns embedded QR codes for printed matter authentication	Research Square (2021)	Xie, Shundao, et al.	It gives us details regarding the texture of QR codes and their authenticity. It is simpler to counterfeit critical printed material, such as important documents, the anti-counterfeit label on merchandise, packaging, etc., due to the widespread use of high-quality printing and scanning QR codes.
[10]	Fake Product Detection Using Blockchain Technology	Journal of algebraic statistics 13.3 (2022): 2815-2821	Shreekumar, T., et al.	Offered a straightforward QR code-based method in which the consumer validates the product's authenticity by comparing its QR codes to those stored on their device.

**CHAPTER 3**  
**IMPLEMENTATION**



### 3.1 PROPOSED SYSTEM

The proposed application system aims to combat the increasing prevalence of counterfeit goods by utilizing blockchain and QR codes. The system will store the product's source chain and maintain ownership histories, allowing buyers to access comprehensive product details and make informed purchasing decisions. QR codes will be used to validate products and add product information, while blockchain technology ensures the integrity of the stored data, preventing unauthorized alterations. By leveraging these technologies, the system will effectively identify counterfeit products, enhancing trust and transparency in the market place.

### 3.2 SYSTEM MODEL

The proposed application system aims to combat the increasing prevalence of counterfeit goods by utilizing blockchain and QR codes. The system will store the product's source chain and maintain ownership histories, allowing buyers to access comprehensive product details and make informed purchasing decisions. QR codes will be used to validate products and add product information, while blockchain technology ensures the integrity of the stored data, preventing unauthorized alterations. By leveraging these technologies, the system will effectively identify counterfeit products, enhancing trust and transparency in the market place.

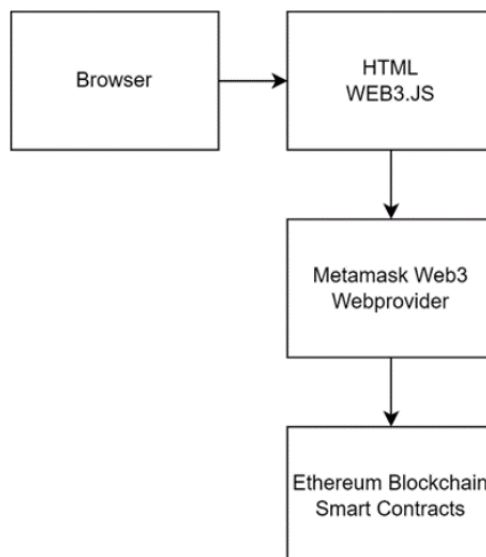


Figure 3.1: Proposed System Model

### **3.3 TOOL REQUIREMENTS**

#### **1. Ganache:**

Ganache is a personal blockchain software that allows users to create their own Ethereum blockchain network for development and testing purposes.

- It provides a local blockchain environment that runs on the user's machine, allowing for faster and more efficient development without the need for interaction with the public Ethereum network.
- With Ganache, users can create multiple accounts with pre-funded Ether for testing purposes, making it easy to simulate real-world scenarios.
- It also offers a graphical user interface (GUI) that provides a comprehensive overview of the blockchain network, including account balances, transaction history, and block information.
- Ganache allows users to deploy and interact with smart contracts on the local blockchain network, enabling developers to test and debug their contracts before deploying them to the main Ethereum network.
- It provides additional features like automated contract testing, allowing developers to write tests to ensure the correctness and functionality of their smart contracts.
- Ganache also supports integration with other development tools and frameworks, such as Truffle, allowing for a seamless and efficient development workflow.

#### **2. Truffle Suite**

Truffle Suite is a development framework for building decentralized applications (DApps) and smart contracts on various blockchain platforms, including Ethereum. It offers a suite of tools that simplify the development, testing, deployment, and management of blockchain-based applications. Here are some of the basic functions and components of Truffle Suite:

- **Truffle Framework:** The core component of Truffle Suite is the Truffle Framework, which provides a development environment for creating and managing smart contracts. It offers a project structure, build pipeline, and testing framework to streamline the development process.

- **Smart Contract Compilation:** Truffle Suite includes a Solidity compiler that automatically compiles your smart contracts into bytecode, which can be deployed on the blockchain. It supports the latest Solidity versions and allows you to configure compilation settings.
- **Contract Migration:** Truffle provides a migration system that helps in deploying smart contracts to the blockchain. Migration scripts are written in JavaScript and allow you to manage the deployment process, including deploying multiple contracts, handling dependencies, and updating contract versions.
- **Ganache Integration:** Truffle Suite seamlessly integrates with Ganache, a personal blockchain for local development. With Ganache, you can create a local blockchain network for testing and debugging your smart contracts, providing a simulated blockchain environment.
- **Contract Interaction:** Truffle provides a JavaScript library called Truffle Contract that simplifies the interaction with smart contracts from your DApp's frontend or backend. It abstracts away the complexities of interacting with the blockchain, providing a higher-level API to send transactions, call contract functions, and retrieve contract state.
- **Network Management:** Truffle allows you to configure and manage connections to different blockchain networks, including local development networks like Ganache, as well as public testnets and mainnets. It simplifies the process of deploying contracts to different networks and switching between them.
- **DApp Development Tools:** Truffle Suite includes additional tools for DApp development, such as Truffle Boxes, which are pre-built project templates that provide boilerplate code for common use cases, and Drizzle, a front-end development framework that integrates with Truffle and simplifies state management and contract data fetching.

### 3. Metamask

Metamask is a web browser extension that serves as a bridge between the browser and the Ethereum blockchain. It provides a user-friendly interface for interacting with blockchain networks and managing Ethereum accounts. Here are its functionalities in reference to Ganache and Truffle:

- **Ethereum Wallet:** Metamask allows users to create and manage Ethereum wallets directly within their web browser. Users can generate and import Ethereum accounts, securely store private keys, and manage their digital assets.
- **Integration with Ganache:** Metamask can be configured to connect to the local blockchain network created with Ganache. This enables developers to interact with their locally deployed smart contracts directly from the browser, without the need for additional setups or deployments.
- **Smart Contract Interaction:** Metamask acts as a provider for web applications, enabling seamless integration with the Ethereum blockchain. It injects the web3.js library into web pages, allowing developers to interact with smart contracts deployed on the connected blockchain network, including those created with Truffle.
- **Transaction Management:** Metamask provides a user interface for users to initiate and manage transactions. When interacting with a decentralized application (DApp), Metamask prompts users to approve and sign transactions, ensuring secure and authenticated interactions with smart contracts.

#### 4. NodeJs

Node.js is an open-source, server-side runtime environment that allows you to run JavaScript code outside of a web browser. It uses the V8 JavaScript engine, which is the same engine used by Google Chrome, to execute JavaScript code on the server. Node.js enables you to build scalable and high-performance web applications, command-line tools, and server-side APIs.

#### 5. Solidity

Solidity is a programming language specifically designed for writing smart contracts on blockchain platforms, with Ethereum being the most prominent one. Smart contracts are self-executing contracts with the terms of the agreement directly written into code. Solidity allows developers to create these contracts, define their rules, and deploy them on the Ethereum Virtual Machine (EVM) or other compatible blockchain platforms.

### **3.4 ENTITIES IN THE SYSTEM**

#### **1. MANUFACTURER**

The manufacturer plays a crucial role in the proposed system model by adding authorized sellers, adding products with detailed information, updating ownership histories when products are sold, and querying the system to retrieve information about registered sellers. These functions contribute to maintaining the integrity of the supply chain, combating counterfeit goods, and providing transparency to buyers in making informed purchasing decisions. The manufacturer's functions in the system include:

- 1) **Adding Seller:** The manufacturer has the role of adding authorized sellers to the system. This involves registering sellers who are authorized to distribute and sell the manufacturer's products. By adding sellers to the system, the manufacturer establishes a trusted network of authorized distribution channels.
- 2) **Adding Product:** The manufacturer is responsible for adding their products to the system. This involves providing comprehensive details about each product, such as its name, description, unique identifiers, manufacturing information, and any other relevant information. By adding products to the system, the manufacturer enables buyers to access accurate and detailed information about the products they are considering purchasing.
- 3) **Sale Product:** When a manufacturer sells a product to an authorized seller, they update the ownership history of the product in the system. This ensures that the product's ownership chain is recorded and can be traced back to the manufacturer. By maintaining ownership histories, the system enables buyers to verify the authenticity and legitimacy of a product by checking its ownership trail.
- 4) **Query Seller:** The manufacturer can make queries to find sellers registered under their brand. This function allows the manufacturer to retrieve information about the authorized sellers associated with their products. It helps the manufacturer monitor the distribution network, track sales, and ensure that the products are being sold through authorized channels.

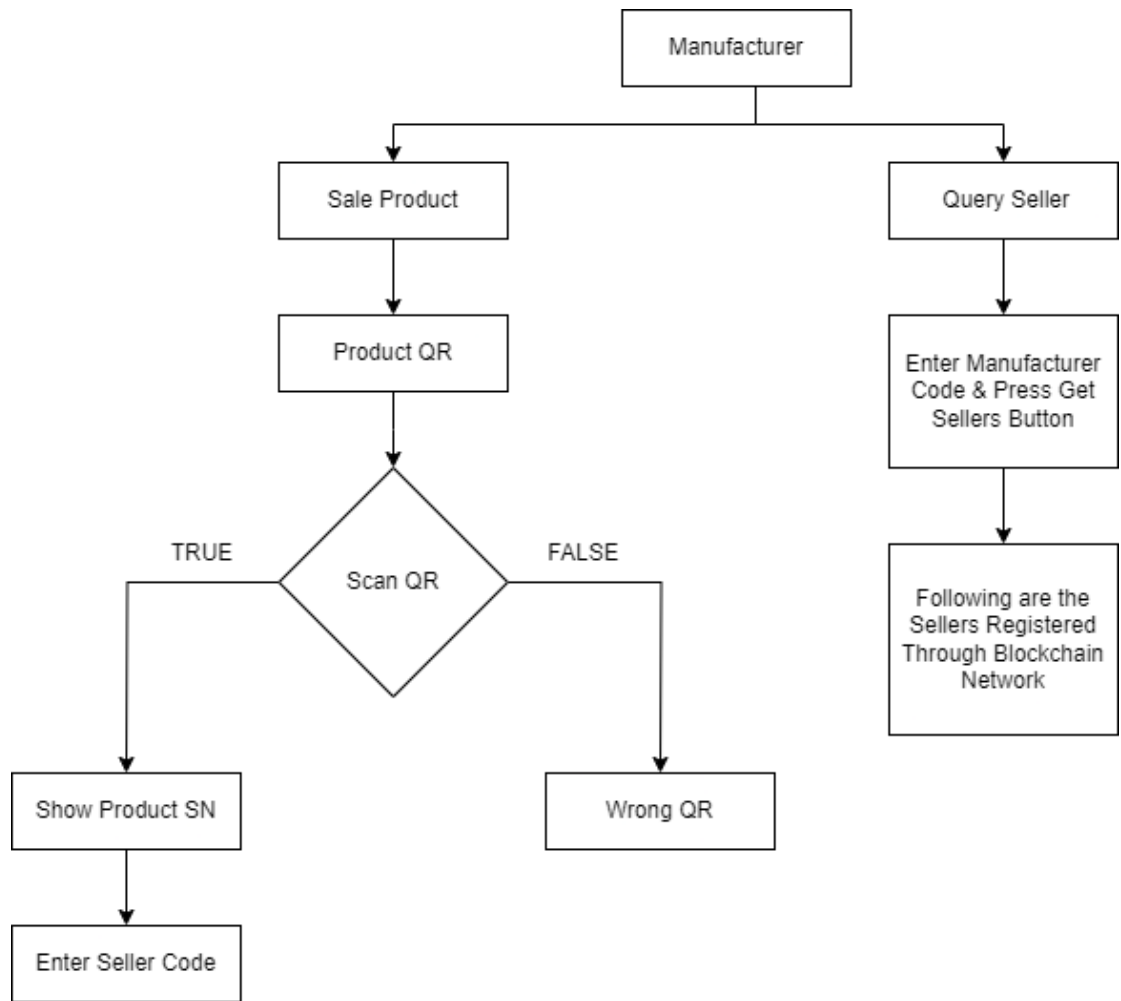


Figure 3.2: Manufacturer User Flow

## 2. SELLER

The seller's roles in the proposed system model involve checking the availability of products for sale and facilitating the sale process to consumers. They rely on the information provided by the manufacturer and utilize the system's features, such as QR code validation and blockchain-backed data integrity, to ensure the authenticity and traceability of the products they sell. The seller's functions are as follows:

- 1) **Checking Available Products:** The seller can access the system to check for available products for sale. This involves querying the system to retrieve a list of products associated with their authorized manufacturer. By checking the available products, the seller can determine which products they can offer to consumers.
- 2) **Selling the Product to Consumers:** Once the seller identifies a product for sale, they can facilitate the transaction with the consumer. This includes providing

product information, assisting with the purchase process, and handling the logistics of delivering the product to the consumer. The seller ensures that the transaction is completed securely and efficiently.

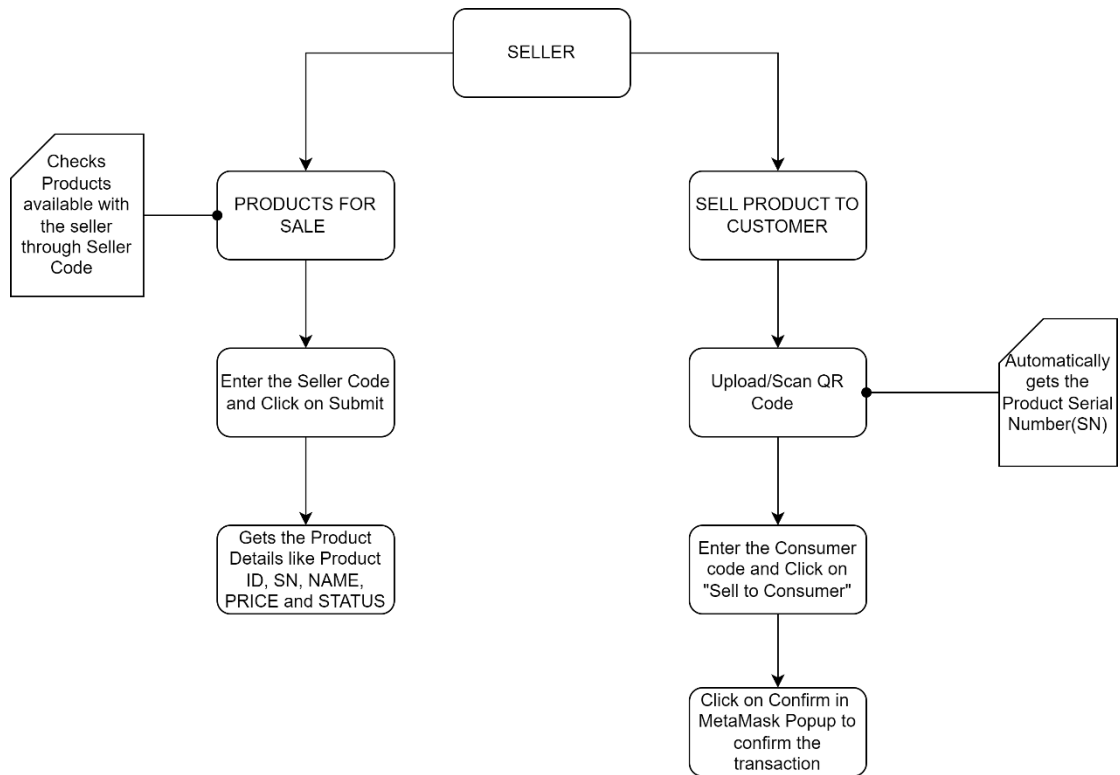


Figure 3.3: Seller User Flow

### 3. CONSUMER

The consumer's roles in the proposed system model involve verifying the authenticity of the product using the system's QR code verification feature and accessing the product's history to gain transparency and make informed decisions. By utilizing these functions, the consumer can protect themselves from counterfeit goods and ensure the integrity of their purchases.

The consumer's functions are as follows:

- 1) **Verifying the Product:** The consumer can use the system to verify the authenticity of the product they are interested in purchasing. This involves scanning or inputting the product's QR code, which triggers a verification process. This allows the consumer to ensure that they are buying genuine products and not falling victim to counterfeits.

- 2) Checking Product History: The consumer can access the product's history stored in the system. This includes information such as the product's origin, manufacturing details, previous owners (including the manufacturer and authorized sellers), and any relevant data associated with the product's journey through the supply chain. By checking the product's history, the consumer can gain insights into the product's authenticity, quality, and compliance with standards.

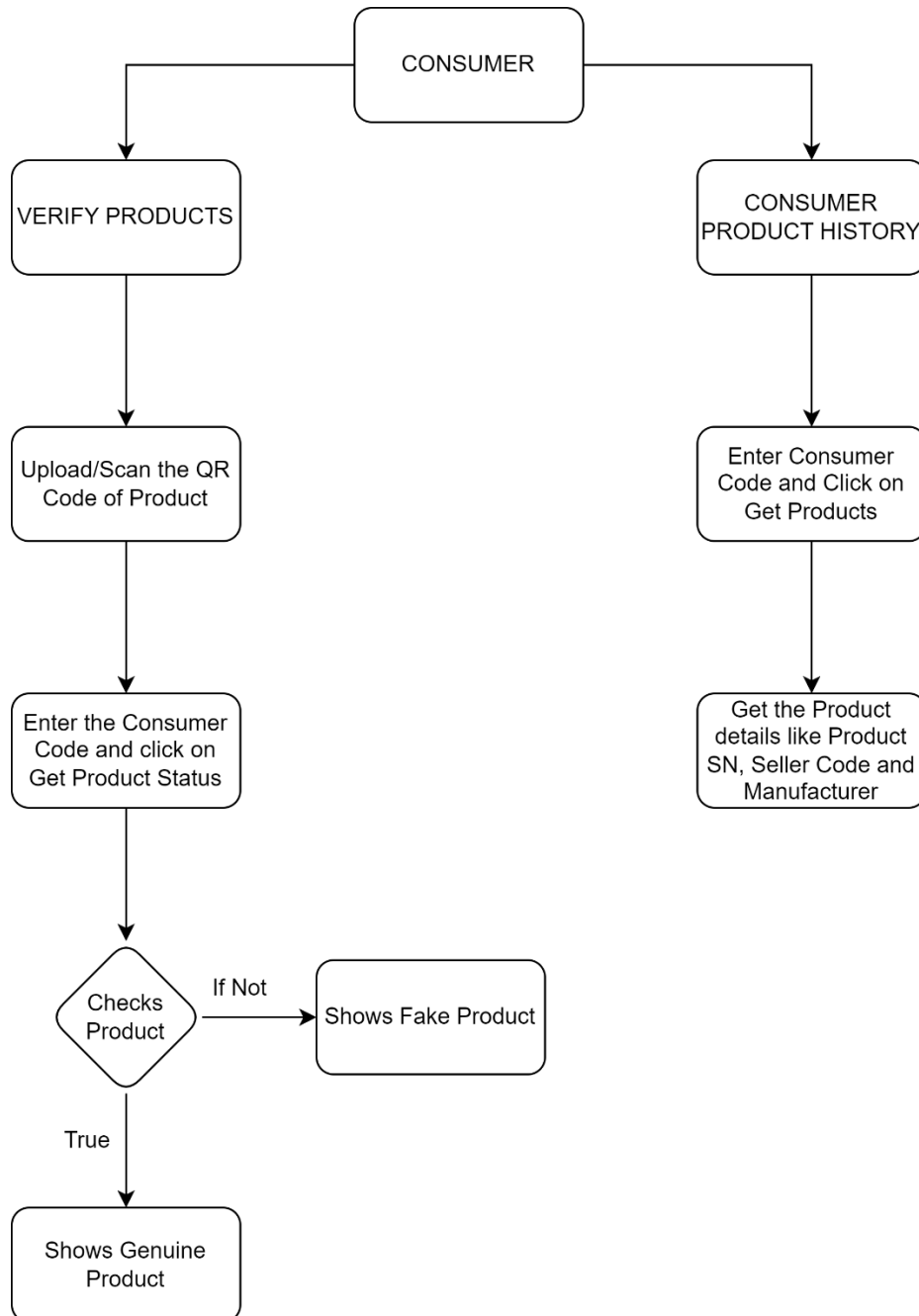


Figure 3.4: Consumer User Flow



# **CHAPTER 4**

## **DEPLOYMENT**

## 4.1 REQUIREMENTS

- 1) Truffle v5.6.7 (core: 5.6.7)
- 2) Ganache v7.5.0
- 3) Solidity v0.5.16 (solc-js)
- 4) Node v15.8.0
- 5) Web3.js v1.7.4
- 6) npm 7.5.1

Other Requirements:

- 7) Any chromium based browser (like Chrome)
- 8) Metamask browser extension

## 4.2 INSTALLATION

1. To install Node.js on your system, follow these steps:

- 1) Visit the official Node.js website: <https://nodejs.org>
- 2) On the website's homepage, you will see two options for downloading Node.js: LTS (Long-Term Support) and Current. It is recommended to download the LTS version for stability and compatibility with most projects. Click on the "LTS" button to download the LTS version.
- 3) Once the download is complete, locate the installer file in your downloads folder or the location where you saved it.
- 4) Run the installer by double-clicking on the file. This will start the Node.js installation wizard.
- 5) Follow the installation wizard's instructions. The default installation settings should work fine for most users, so you can typically proceed with the default options.
- 6) During the installation, you may be prompted to choose additional components or features. You can review these options and select or deselect them based on your requirements.
- 7) After completing the installation, open your terminal or command prompt and run the following command to verify that Node.js is installed:

*node -version*

This command will display the installed version of Node.js if the installation was successful.

With these steps, you should have Node.js successfully installed on your system. You can now use Node.js and npm to run JavaScript code and manage packages for your projects.

2. To install Truffle, follow these steps:

- 1) Ensure that you have Node.js and npm (Node Package Manager) installed on your system. You can check their versions by running the following commands in your terminal:

```
node -version
```

```
npm --version
```

- 2) If you have Node.js and npm installed, open your terminal and run the following command to install Truffle globally:

```
npm install -g truffle@5.6.7
```

This command will install Truffle version 5.6.7 globally on your system.

- 3) After the installation is complete, verify that Truffle is installed by running the following command:

```
truffle version
```

This command will display the Truffle version if the installation was successful.

With these steps, you should have Truffle installed on your system. You can now use Truffle for developing, testing, and deploying Ethereum smart contracts.

3. To install Ganache, follow these steps:

- 1) Visit the official Ganache website: <https://www.trufflesuite.com/ganache>

- 2) On the Ganache website, you will find different versions of Ganache available for download. Choose the version that is compatible with your operating system (Windows, macOS, or Linux).
- 3) Once you have selected the appropriate version, click on the download button to start the download.
- 4) After the download is complete, locate the installer file in your downloads folder or the location where you saved it
- 5) Run the installer by double-clicking on the file. This will start the Ganache installation process.
- 6) Follow the installation wizard's instructions. The default installation settings should work fine for most users, so you can typically proceed with the default options.
- 7) After completing the installation, you should be able to find Ganache in your list of installed applications or programs. Launch Ganache by clicking on its icon.
- 8) When Ganache starts, you will see a user interface that displays a local blockchain network. Ganache provides you with pre-funded accounts, private keys, and a local Ethereum blockchain for development and testing purposes.

With these steps, you should have Ganache successfully installed on your system. You can now use Ganache to simulate a local blockchain environment and interact with it during your Ethereum development and testing processes.

4. To install the MetaMask extension on Chrome, follow these steps:

- 1) Open the Chrome web browser on your computer.
- 2) Go to the Chrome Web Store by entering the following URL in the address bar: <https://chrome.google.com/webstore/category/extensions>
- 3) In the Chrome Web Store search bar, type "MetaMask" and press Enter.
- 4) From the search results, click on the "MetaMask" extension.
- 5) On the MetaMask extension page, click the "Add to Chrome" button.
- 6) A confirmation dialog will appear. Click "Add extension" to proceed with the installation.
- 7) Chrome will start downloading and installing the MetaMask extension.

- 8) After the installation is complete, you will see the MetaMask icon added to the top-right corner of your Chrome browser, next to the address bar.
- 9) Click on the MetaMask icon to open the extension.
- 10) The MetaMask welcome screen will appear. Read and review the information provided, then click on the "Get Started" button.
- 11) You will be prompted to either import an existing MetaMask account or create a new one. Follow the on-screen instructions to set up your MetaMask account.

Once your MetaMask account is set up, you can start using the extension to manage your Ethereum accounts, interact with DApps, and perform Ethereum transactions.

### 4.3 SETUP

After you have set up your Truffle project, including the contract files, and have the necessary configurations in place. Start the setup process step-by-step:

- 1) Open your terminal and navigate to the project directory. Then run the following command to install the required node modules:

*npm install*

- 2) Compile the contract source files using Truffle. Run the following command:

*truffle compile*

- 3) Open Ganache, the local blockchain:
  1. Create a new workspace.
  2. Add the `truffle-config.js` file from your Truffle project to the workspace.
  3. Change the port in the server settings to 7545, which should match the port specified in `truffle-config.js`.

- 4) Open MetaMask in Chrome:
  1. Add a new test network using the following details:
  2. Network ID: 5777 (taken from Ganache Server settings)
  3. RPC Server: *HTTP://127.0.0.1:7545* (taken from Ganache Server settings)
  4. Chain ID: 1337
  5. Import an account into MetaMask using the private key of any account from the local blockchain available in Ganache.
  
- 5) In the terminal, run the following commands:
  1. Run migrations to deploy the contracts:

*truffle migrate*

- 6) Start a server that will open the homepage ('index.html') file in the default browser:

*npm run dev*

- 7) Login to MetaMask and connect the added account to the local blockchain (i.e., localhost:3000).

Interact with the website opened in your browser, which should now be connected to the local blockchain.

**CHAPTER 5**  
**IMPLEMENTATION**  
**&**  
**RESULT ANALYSIS**

## 5.1 ADD SELLER

- 1) Navigate to the "Add Seller" Tab: Log in to the web page as a manufacturer and navigate to the "Add Seller" section or tab.

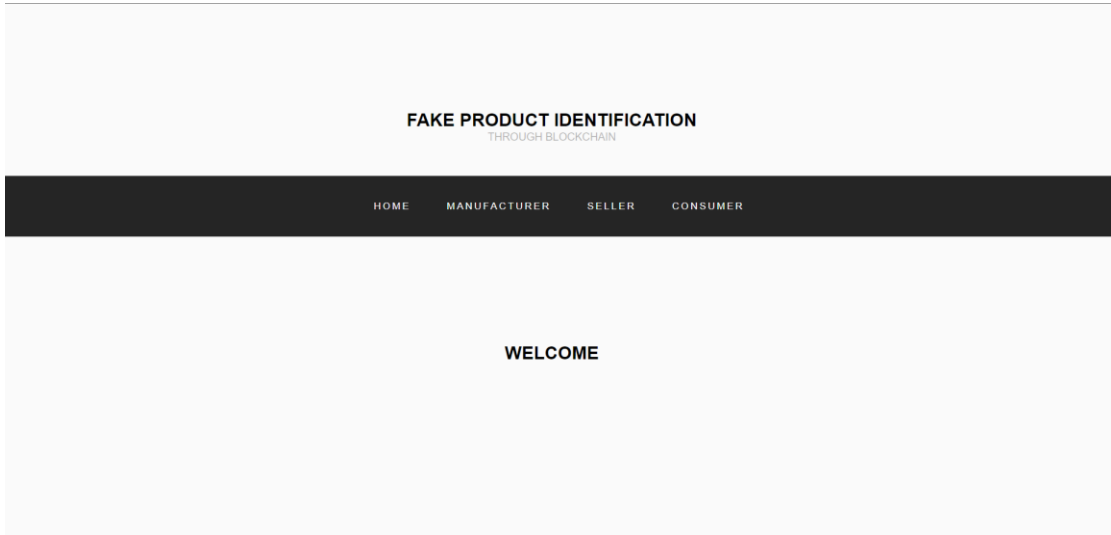


Figure 5.1: Home Page

- 2) Fill in Seller Details: In the "Add Seller" form, enter the required details of the seller, such as their business name, contact information, address, and any other necessary information. Ensure that the form captures all the relevant data needed to add the seller to the system.

The screenshot shows the 'Add Seller' form within the 'FAKE PRODUCT IDENTIFICATION THROUGH BLOCKCHAIN' system. The navigation bar is the same as in Figure 5.1. The form is titled 'Add Seller' and contains two columns of input fields. The left column includes: 'Seller Name' (Ritesh Manusmare), 'Seller Code' (200), 'Seller Manager' (Tejas Gatkal), and 'Manufacturer ID' (256). The right column includes: 'Seller Brand' (Nike), 'Seller Phone Number' (7768809442), and 'Seller Address' (Warora). A yellow 'Add the Seller' button is located at the bottom left of the form.

Figure 5.2: Add Seller Tab



- 3) Connect Metamask Account: Click on the "Connect Metamask" button or link provided on the web page. This will prompt you to log in to your Metamask account and grant permission for the web page to access your Ethereum address.
- 4) Confirm Transaction: Once connected to your Metamask account, review the details of the transaction on the Metamask pop-up window. Confirm the transaction by clicking the "Confirm" button. This will initiate the transaction to add the seller to the system.

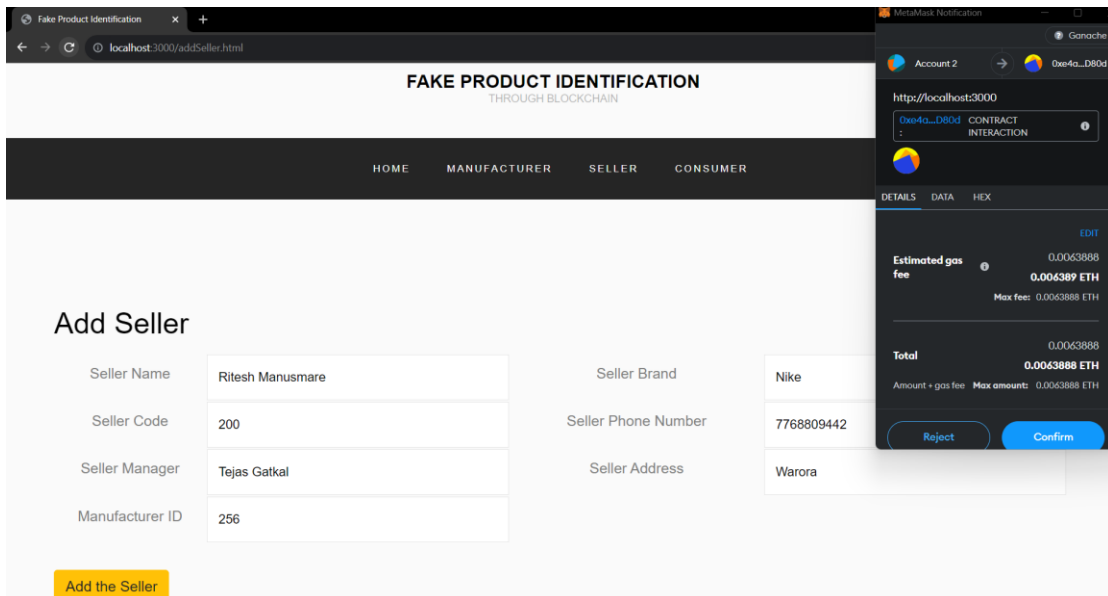


Figure 5.3: Seller Confirmation By Metamask

- 5) Wait for Transaction Confirmation and Success Notification: After confirming the transaction, wait for the transaction to be processed and confirmed on the blockchain. This may take a few seconds to a few minutes depending on the blockchain network's speed. Once the transaction is successfully confirmed, you will receive a notification or confirmation message on the web page indicating that the seller has been added to the system. This confirms that the seller's details are now recorded on the blockchain and they are officially part of the system.

## 5.2 ADD PRODUCT

- 1) Navigate to the "Add Product" Tab: Log in to the web page as a manufacturer and navigate to the "Add Product" section or tab.
- 2) Fill in Product Details: In the "Add Product" form, enter the required details of the product, such as its name, description, unique identifier, source chain

information, and any other relevant information. Make sure to provide accurate and comprehensive details about the product.

**FAKE PRODUCT IDENTIFICATION**  
THROUGH BLOCKCHAIN

HOME    MANUFACTURER    SELLER    CONSUMER

### Add Product

Manufacturer ID	256	Product Name	Shoes
Product SN:	187	Product Brand	Nike
Product Price	1779		

[Add the Product](#)

Figure 5.4: Add Product Tab

- 3) Confirm Transaction: Once connected to your Metamask account, review the details of the transaction on the Metamask pop-up window. Confirm the transaction by clicking the "Confirm" button. This will initiate the transaction to add the product to the system.

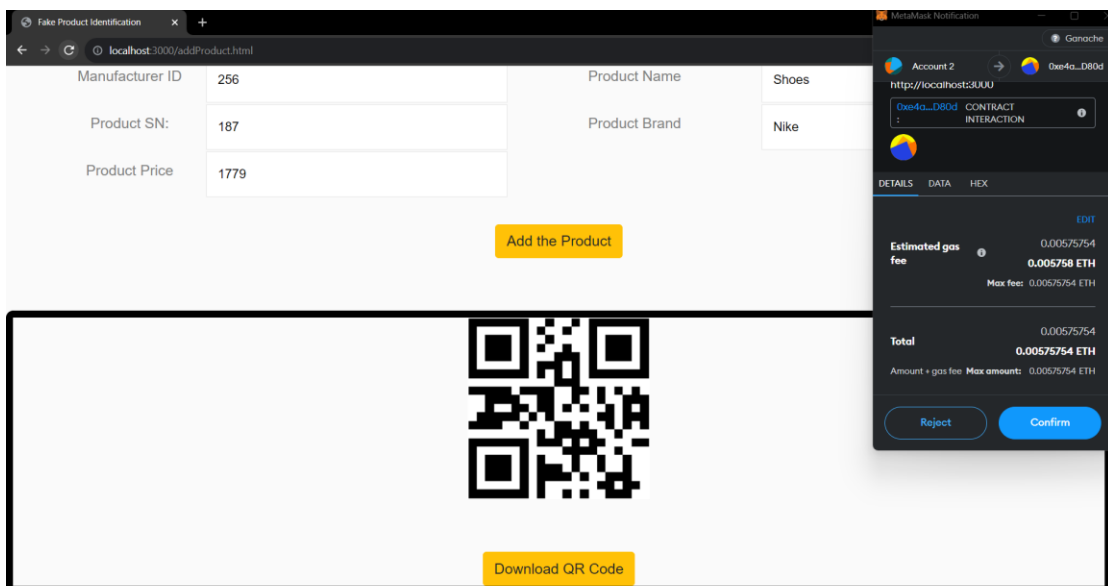


Figure 5.5: Product Confirmation

- 4) Wait for Transaction Confirmation and Success Notification: After confirming the transaction, wait for the transaction to be processed and confirmed on the blockchain. Once the transaction is successfully confirmed, you will receive a notification or confirmation message on the web page indicating that the product has been added to the system. This confirms that the product's details are now recorded on the blockchain and it is officially part of the system.

### 5.3 SELL PRODUCT TO SELLER (MANUFACTURER)

- 1) Navigate to the "Sell Product" Tab: Log in to the web page as a manufacturer and navigate to the "Sell Product to Seller" section or tab in Manufacturer section.
- 2) Scan QR Code: Use the QR code scanner feature on the web page to scan the QR code of the product. This QR code contains the product's unique identifier.

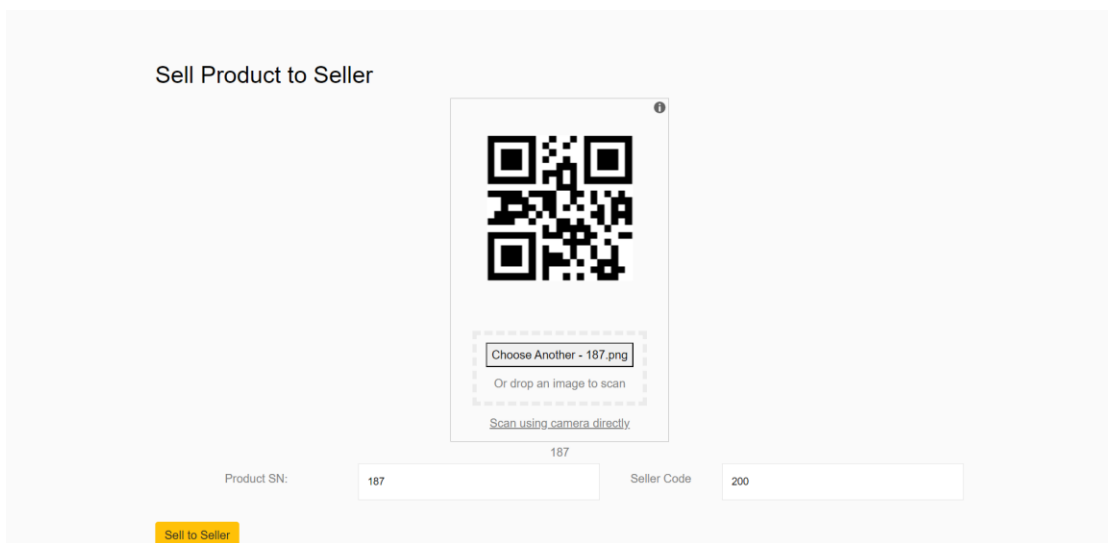


Figure 5.6: Sell Product to Seller

- 3) Enter Seller Code: In addition to scanning the product's QR code, enter the seller code associated with the seller you want to sell the product to. This code serves as an additional verification and ensures the correct seller is selected for the transaction.

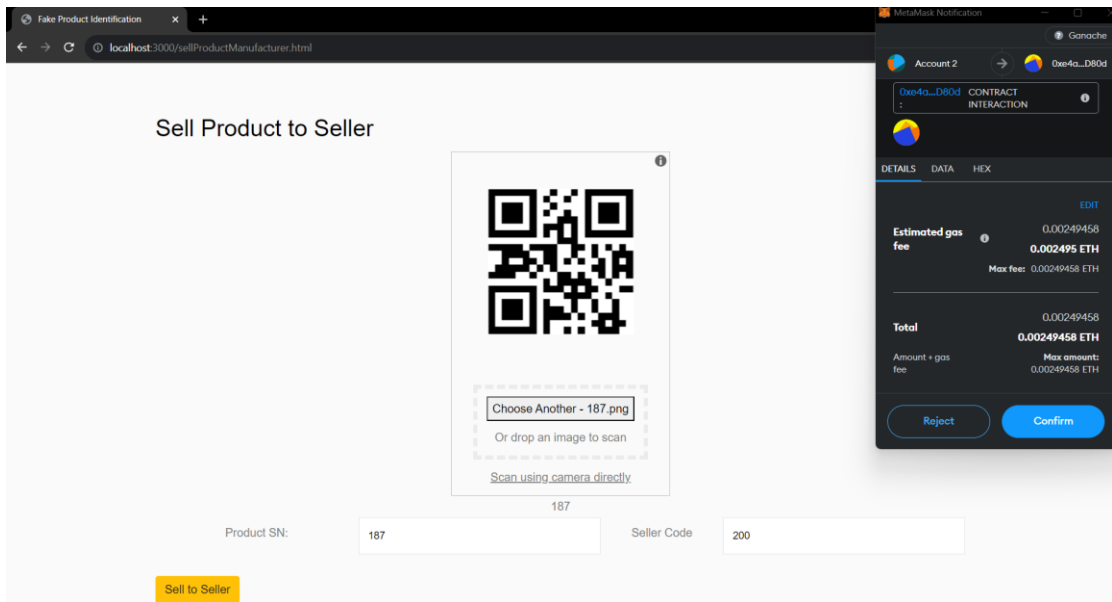


Figure 5.7: Confirm Product Sale to Seller

- 4) Confirm Transaction: After scanning the product's QR code and selecting the seller, connect your Metamask account and confirm the transaction. Wait for the transaction to be processed and confirmed on the blockchain, indicated by a notification or confirmation message on the web page. This ensures the secure transfer of ownership to the seller.

#### 5.4 SELL PRODUCT TO CONSUMER (SELLER)

- 1) Scan Product QR Code: Use the web page's QR code scanner to scan the QR code of the product that the consumer wants to purchase.

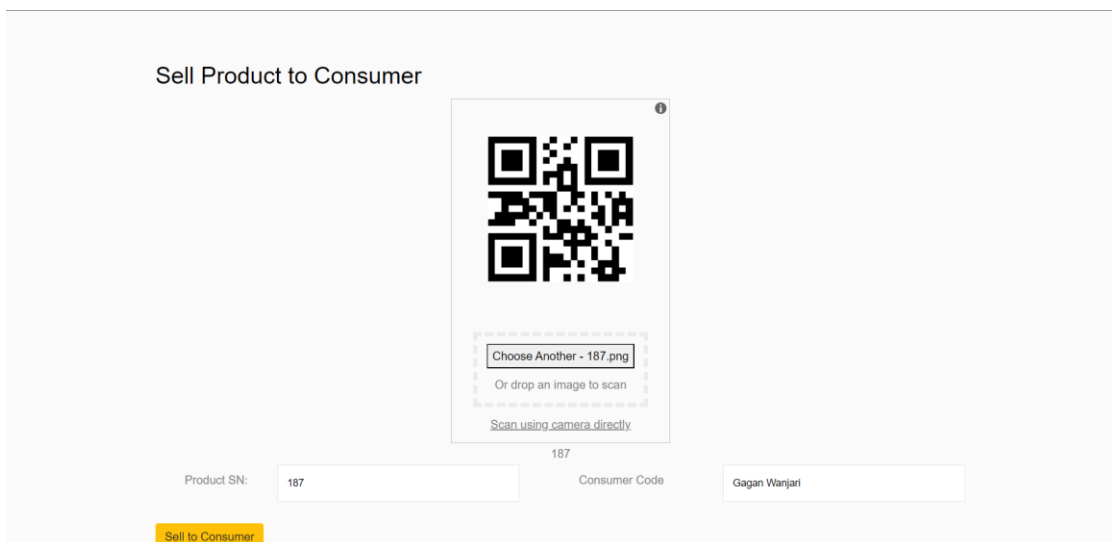


Figure 5.8: Sell Product to Consumer

- 2) Connect Metamask Account: Click on the "Connect Metamask" button or link to log in to your Metamask account and grant permission for the web page to access your Ethereum address.
- 3) Confirm Transaction: Review the transaction details on the Metamask pop-up window and confirm the transaction. Wait for the transaction to be processed and confirmed on the blockchain, as indicated by a notification or confirmation message on the web page.

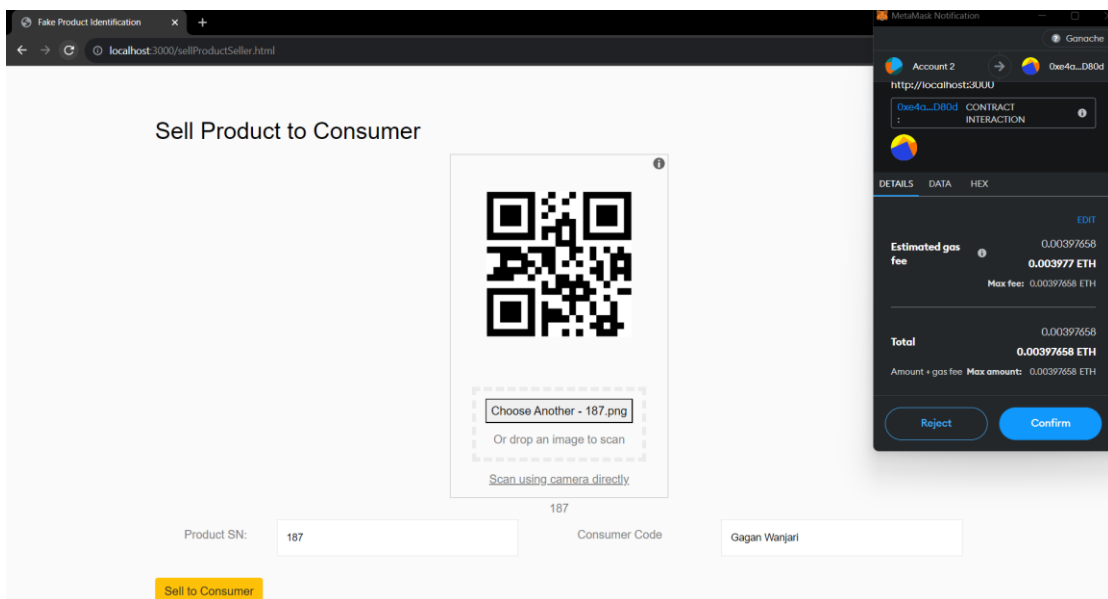


Figure 5.9: Confirm Product Sale to Consumer

- 4) Success Notification: Once the transaction is confirmed, the consumer will receive a notification or confirmation message on the web page indicating that the product has been successfully purchased. This confirms the transfer of ownership from the manufacturer to the consumer.

## 5.5 QUERY SELLERS REGISTER (MANUFACTURER)

This tab in Manufacturer section provides the list of all Seller under that manufacturer just by putting the "Manufacturer Id".

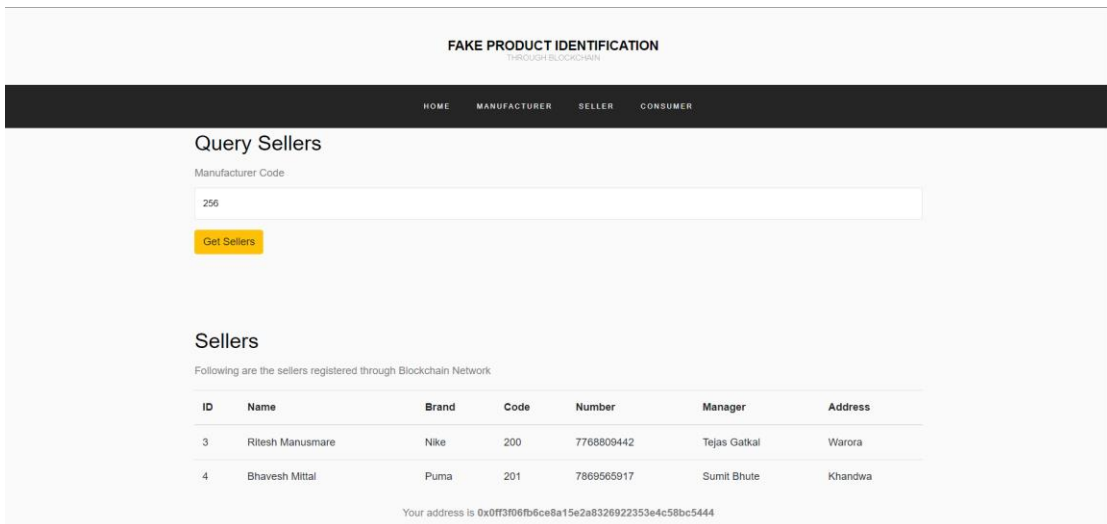


Figure 5.10: The Seller Register

### 5.6 QUERY PRODUCT REGISTER (SELLER)

This tab in Seller section provides the list of all Products under that Seller just by putting the “Seller Id”.

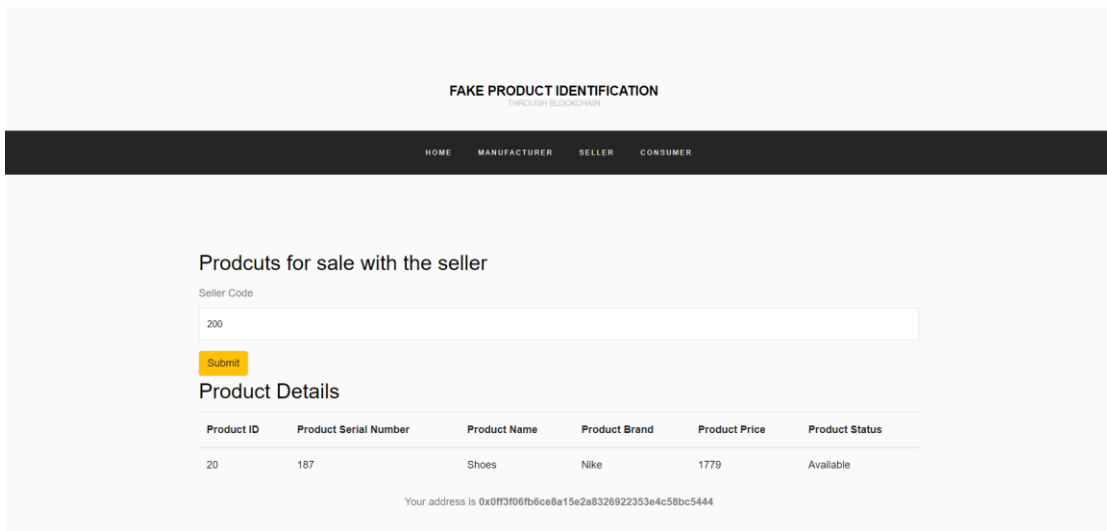


Figure 5.11: The Product Register

### 5.7 VERIFY PRODUCTS

- 1) Scan Product QR Code: Use a QR code scanner on your mobile device or a web page feature to scan the QR code on the product.
- 2) Connect Metamask Account: If the verification process involves interacting with the blockchain, click on the "Connect Metamask" button or link to log in

to your Metamask account and grant permission for the web page to access your Ethereum address.

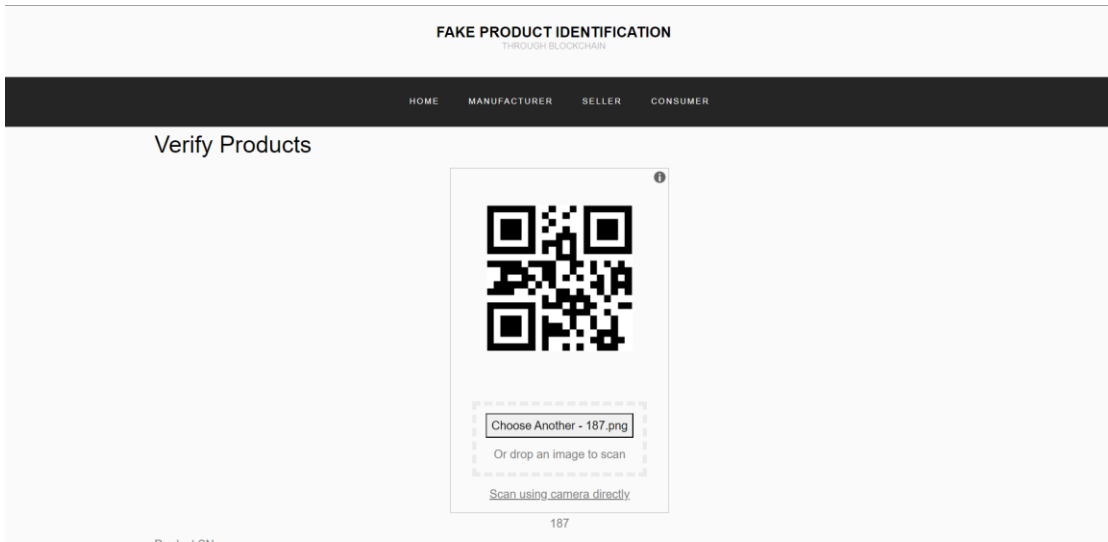


Figure 5.12: Scan Product QR

- 3) Verify Product Authenticity: The Authenticity of the product will be either displayed as "Genuine" Or "Fake".

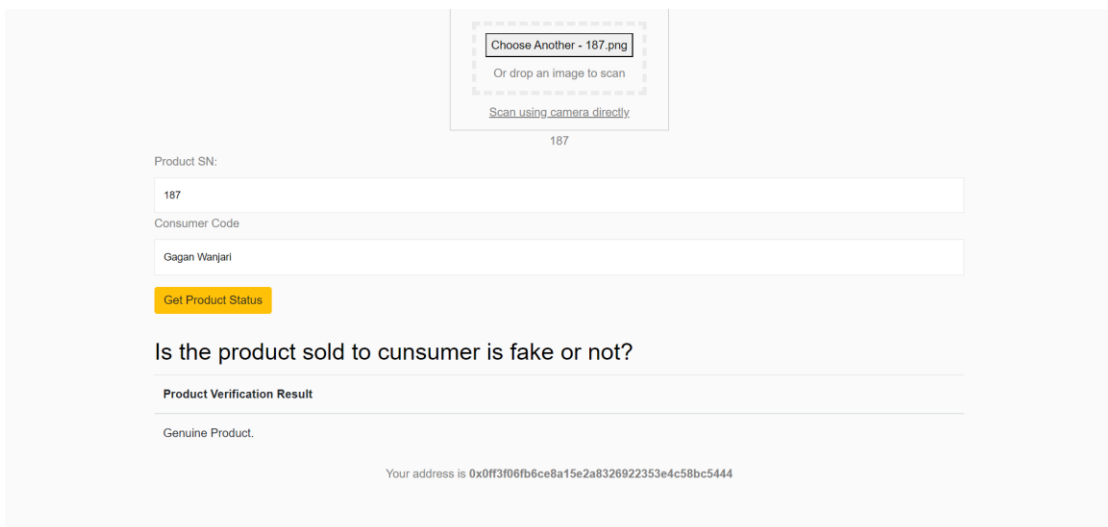


Figure 5.13: Product Status

## 5.8 CONSUMER PRODUCT HISTORY

This tab in Consumer section provides the list of all products purchased by the Consumer just by putting the “Consumer Id”.

FAKE PRODUCT IDENTIFICATION  
THROUGH BLOCKCHAIN

HOME MANUFACTURER SELLER CONSUMER

### Consumer Product History

Consumer Code

Get Products

#### Products purchased by consumer

Product SN	Seller Code	Manufacturer Code
187	200	256

Your address is 0x0ff3f06fb6ce8a15e2a8326922353e4c58bc5444

Figure 5.13: Consumer Product History



## **5.9 RESULT ANALYSIS**

1. **Reduction in Counterfeiting:** Evaluate the overall impact of the blockchain-based product identification system on reducing counterfeit products in the market. Compare the prevalence of counterfeit incidents before and after the implementation of the system to measure its effectiveness.
2. **Consumer Trust:** Assess the level of trust gained from consumers as a result of the blockchain-based product identification system. Conduct surveys or collect feedback to determine if consumers feel more confident in purchasing products knowing that their authenticity can be verified through blockchain technology.
3. **Legal Enforcement:** Analyze the impact of the blockchain system on facilitating legal actions against counterfeiters. Assess whether the blockchain-generated evidence has been successfully used in legal proceedings to prosecute counterfeiters and protect the rights of legitimate product manufacturers.
4. **Market Response:** Examine how the market has responded to the implementation of the blockchain-based product identification system. Evaluate if there has been an increase in demand for products with verified authenticity, leading to a shift in consumer behavior and market dynamics.
5. **Scalability and Interoperability:** Consider the scalability and interoperability of the blockchain-based product identification system. Evaluate if the system can accommodate the growing number of transactions and handle multiple products and industries simultaneously. Also, analyze if it can seamlessly integrate with existing supply chain systems and databases.
6. **Return on Investment:** Evaluate the financial impact of implementing the blockchain system. Compare the costs associated with implementation, maintenance, and ongoing operations with the benefits gained, such as reduced losses due to counterfeiting, increased consumer trust, and improved brand reputation.

By analyzing these aspects, stakeholders can assess the overall success and effectiveness of the blockchain-based product identification system in combating counterfeiting, protecting brand reputation, and ensuring consumer confidence. This analysis can guide further improvements and adjustments to enhance the system's performance and address any identified shortcomings.

**CHAPTER 6**  
**CONCLUSION**

## **6.1 CONCLUSION**

The proposed blockchain-based anti-counterfeiting system offers a reliable and cost-effective solution for combating the global issue of counterfeit products. By leveraging blockchain technology, users can confidently make purchases without the fear of acquiring counterfeit goods. The system provides transparency in product sales, allowing manufacturers to store and share relevant information on the blockchain. Through digital signatures and secure key management, the system ensures identity verification and protection against unauthorized access. The cost analysis demonstrates the economic benefits of the system, particularly for companies with limited financial resources. Overall, the proposed system enhances consumer trust, protects brand reputation, and establishes a more secure and transparent supply chain ecosystem.

## **6.2 FUTURE SCOPE**

In addition to the functional anti-counterfeiting system presented, there are several areas that can be explored and improved in the future. Simplifying the codebase and enhancing usability should be a priority to make the system more accessible and increase its effectiveness among a wider user base. Furthermore, the integration of genuine product warranties within the blockchain-based system can significantly enhance consumer experiences and provide an additional layer of assurance against counterfeit goods. Additionally, the system holds potential in contributing to the establishment of a global framework for cross-border product tracing. This can be achieved through international collaborations and data sharing mechanisms, enabling regulatory authorities worldwide to access accurate and comprehensive information on products and sellers. Such advancements will require collaborative efforts, including regulatory support, continuous system development, and effective data sharing protocols. By pursuing these avenues, the proposed system can evolve further and continue to play a significant role in combating counterfeiting, ultimately creating a safer marketplace for both consumers and businesses.

**CHAPTER 7**  
**REFERENCES**

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**CHAPTER 8**  
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DOI: 10.48175/IJAR SCT-9263  
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# Fake Product Identification using Blockchain

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**Abstract:** Blockchain technology is the distributed, decentralized, and digital ledger that stores transactional information in the form of blocks in many databases which is connected with the chains. Blockchain technology is secure technology therefore any block cannot be changed or hacked. By using Blockchain technology, customers or users do not need to rely on third-party users for confirmation of product safety. In this project, with emerging trends in mobile and wireless technology, Quick Response (QR) codes provide a robust technique to fight the practice of counterfeiting the products. counterfeit products are detected using a QR code scanner, where a QR code of the product is linked to a Blockchain. It collects the unique code from the user and compares the code against entries in the Blockchain database. If the code matches, it will give a notification to the customer, otherwise it will give the notification to the customer that the product is fake.

**Keywords:** Counterfeit (Fake) product, QR code, Blockchain, Supply Chain, Transaction history

## I. INTRODUCTION

Every time a product is developed, there are risk elements like copying and counterfeiting that could harm the brand name, income, and consumer happiness. The sale and promotion of fake goods are expanding quickly. A fully working blockchain system is suggested to ensure the identification and monitoring of fake items or products as well as to combat this situation. Businesses may stop worrying about fake goods by investing very little time and money. Because consumers mistakenly believe that the product is a legitimate offering from the company, counterfeit products have a significant negative impact on manufacturers' reputations and brand values. Blockchain is a decentralized, distributed technology that uses chains to connect blocks of data stored in a database. Every time new data is added to databases, it is combined with the already existing data by chaining new blocks together. Every time data is added to an existing block of data using blockchain, no user is permitted to edit the data. As a result, the data in the blockchain cannot be deleted or modified, ensuring data security and protection. Blockchain assists in addressing the issue of counterfeit goods.

## II. BLOCKCHAIN BACKGROUND

A decentralised system called a blockchain is spread among the machines in a computer network. Blockchains act as databases, storing data in the form of blocks and chains. Cryptocurrency like bitcoin is one of the blockchain's most widely used and successful real-world applications. The technique used by blockchain to store transaction records is more safe and secure. Our data is guaranteed to be secure by blockchain.

Traditional databases and blockchain databases are very similar. The main distinction between both is how the data is organised in databases, even though both are used to store data. A typical database keeps data as it is entered by the user, whereas a blockchain stores data in units called blocks that are connected to one another by chains. Hashing is the technology used in block and chain systems. Each block has its own capacity and information. When a block is fully filled, a new block is linked to it, and the newly added information is placed there. This process is repeated as long as new data are added.

Blockchain offers us a distributed, decentralised database that is noneditable, which is one of its key benefits. As a result, the blockchain does not give us the functionality to update our existing data.

## III. HOW DOES BLOCKCHAIN WORK?

As we see from the discussion above, the main objective of blockchain is to make recorded data irrevocable. The approximately five steps that make up how a blockchain operates are as follows:

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70

- A user must be authenticated by the transaction blockchain before they can input data..
- A new block is created with transaction data stored after authentication is complete.
- Every node of the computer network receives a copy of the newly created block.
- With the aid of chaining techniques, the authorised nodes carry out their processes for confirming the transaction, after which the transaction's details are added to already-existing blocks.
- Once more, updates are dispersed throughout the network.

The transaction history is thus finally finalised to be maintained in blockchain databases. The subsequent picture displays the same procedures.

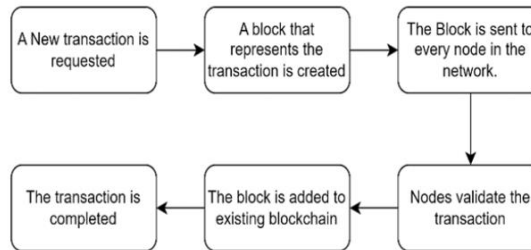


Figure 1. Working of Blockchain.

#### IV. BENEFITS OF BLOCKCHAIN

- **Accuracy:** Since the blockchain is a distributed system, the blockchain's database is split among several nodes on computer networks. This implies that the user will never learn where the blockchain's database originates. Because fewer people are involved in the development of this technology, there are fewer opportunities for human mistake, which reduces computational error caused by blockchain technology and increases accuracy.
- **Cost Savings:** Because blockchain does not require the involvement of third parties like banks, it can significantly lower transaction costs. For instance, the bank will take a small percentage of the money paid to business owners each time they accept credit card payments. Yet, because blockchain lacks a centralised authority, transaction fees will either be nonexistent or extremely low.
- **Decentralization:** As we can infer from the definition of blockchain provided above, it is a decentralised distributed system. The blockchain database is therefore duplicated and dispersed among other machines in computer networks. So, each computer must update its blockchain to reflect the change whenever a new block needs to be added to the database. Blockchain becomes harder to tamper with as a result. Even if a hacker attempted to change the blockchain, only that copy would be altered; the rest would remain unchanged. Hence, the decentralisation feature of blockchain contributes to data security.
- **Efficient Transaction:** Transactions on the blockchain are efficient because they are decentralised and not controlled by a single entity. Since authorities only conduct transactions during business hours, if we begin a transaction on Friday, it will take three days to complete, or until Monday. However, the blockchain is operational around-the-clock. The transaction is also completed using blockchain in less than 10 minutes. Blockchain similarly speeds up cross-border transactions that would often take longer to complete if handled by traditional authorities due to issues with time zones and other factors. Blockchain thus offers a reliable method for transactions.
- **Transparency:** Transparency is made possible by blockchain because the majority of them are open-source databases. This will enable us to review the code and provide suggestions for how to make blockchain technology better. As a result, blockchain is totally transparent to the user. Only if the majority of network users agree will the suggestions be implemented.

#### V. PAPER SURVEY

Paper [1] gives us a straightforward flowchart that helps us determine whether or not we need blockchain for our

initiatives. It offers various scenarios, and by ignoring them, you may determine whether or not blockchain technology is necessary.

Paper [2] [3] gives us a thorough explanation of blockchain technology. It provides comprehensive details regarding the blockchain's history, advantages, disadvantages, architecture, and security.

Paper [4] presented a system for identifying counterfeit goods. The suggested system is to create a QR code for a product that contains all of its information and store that QR in a blockchain database. When a customer or distributor purchases the same product and scans the QR code that is embedded in the product, the system determines whether the product is genuine or fake based on whether it matches the stored QR code.

Paper [5] [6] [9] gives us details about the blockchain-based supply chain management solution. Blockchain technology has the potential to improve product traceability, authenticity, and legality in a more cost-effective manner by creating a permanent, shareable, auditable record of products across their supply chain.

Paper [7] [8] gives us details regarding the texture of QR codes and their authenticity. It is simpler to counterfeit critical printed material, such as important documents, the anti-counterfeit label on merchandise, packaging, etc., due to the widespread use of high-quality printing and scanning QR codes.

Paper [10] offered a straightforward QR code-based method in which the consumer validates the product's authenticity by comparing its QR codes to those stored on their device.

Literature Survey

### VI. COMPARISONS OF DIFFERENT ANTI-COUNTERFEITING TECHNOLOGIES

Several anti-counterfeiting systems are displayed in the following table [1], along with comparisons between them.

Index	Technology	Product Type	Advantage	Limitation	Blockchain
1.	Magnetic Strips	Hotel key Cards	1. More Secure than barcodes. 2. Fast and Easy to use.	1. Perhaps harmed even by minor scratches. 2. Does not function from far away	No
2.	RFID	Any	Dependable track and trace in any setting.	1. Reader collision. 2. Transmitting through metal things is impossible	No
3.	Security Hologram	Currency	If tried to remove it leaves residue behind.	1. Producing takes a lot of time and money. 2. Easy to clone.	No
4.	Barcodes	Daily use products	1. Simple implementation. 2. Scalable	1. Easy to replicate. 2. Editable	No
5.	Laser Engraving	Metal Products	1. Permanency 2. Fast Development speed	1. Expensive 2. Can be replicated	No
6.	DNA Coding	Medicines	1. Very difficult to replicate. 2. Easy to encrypt data.	Unstable and sensitive to harsh environment	No
7.	Digital Watermark	Digital Documents	1. Easy to implement 2. Hard to remove	Limited to digital world only.	No
8.	Hashing Algorithm	Digital Biodata	Hard to replicate	1. Easy to encrypt and decrypt 2. Security issues	No
9.	Fingerprinting	Digital Content	1. High security. 2. Non-transferable	1. System failure 2. High cost	No

10.	Blockchain	Any	1. Can be used when making something. 2. Once stored, data cannot be changed.	1.Demands high memory. 2. Expensive to implement.	Yes
-----	------------	-----	--	--	-----

**VII. METHODOLOGY**

**7.1 Proposed System**

We need to create a complete application system that will enable us to recognize these counterfeit goods because their prevalence is expanding globally. The system that is suggested in this paper will store the product's source chain and preserve the items' ownership histories. In order for the buyers who purchase these goods to examine all of the product's details and make an informed decision about whether the thing is legitimate or not. To validate the products and add product information, we will employ QR codes. Also, we need to employ a mechanism to store product data that prevents unauthorized users from altering the data; blockchain technology can help with this. So, to identify bogus products in this suggested system, we are employing blockchain and QR codes.

**7.2 System Model**

Blockchain is built for the proposed system utilizing a piece of personal software named Ganache. A blockchain network created by Ganache is employed for recording and overseeing transactions. We must utilize the ganache software, which facilitates the implementation of blockchain, in order to use the Ethereum blockchain. A web browser extension called Metamask serves as a conduit between a website and the blockchain. Both the web page and the blockchain's smart contracts are created using the node.js and solidity programming languages, respectively.

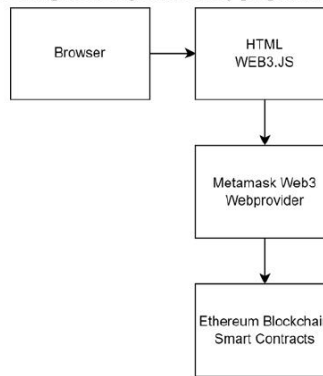


Figure 2: System model of Proposed System

**7.3 Tools Requirement**

- **Ganache:** A software package called Ganache is used to create your own Ethereum blockchain. Your blockchain is deployed to the network using this method. It facilitates Ethereum blockchain stimulation so that you may communicate with your blockchain-based smart contracts.
- **Metamask:** A web browser extension called Metamask serves as a conduit between the browser and the Ethereum blockchain and facilitates the use of an Ethereum blockchain wallet by the user.
- **Truffle Suite:** A framework called truffle allows us to create a setting for creating blockchain-based smart contracts.
- **NodeJS:** Nodejs is a framework that is used to develop the web page of the website.
- **Solidity:** Solidity is a programming language. It is used to write smart contracts in blockchain.

**7.4 Flow of Proposed System**

The system keeps track of the product's ownership status, including the manufacturer, the current owner, the product's ownership history, and a QR code.

Stage 1: Procedure for registering a product: The maker will be the product's initial owner. In order to upload fresh product data to the blockchain, the manufacturer will put a QR code to the product and add it to the blockchain's database.

Stage 2: Chains of distributors: The manufacturer will send the product to the distributor in the following stage. The distributor will scan the QR code when he receives the product and add a new chain with his network data, product ownership, time stamp, and date.

Stage 3: Final User: At the end of the supply chain, the customer will take the product, visit the website, upload the QR code, and then be able to access all the product's information, from the producer to the final store. He had the option to purchase the product after receiving the information.

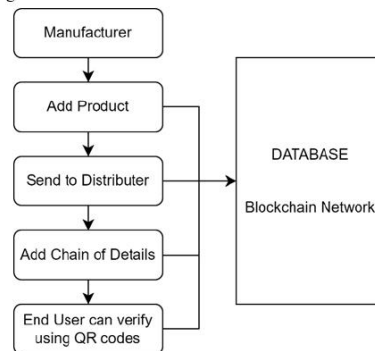


Figure 3: Block Diagram of Proposed System

**VIII. LIMITATIONS AND FUTURE WORK**

The suggested system indeed protects retailers, manufacturers, and customers from products that are counterfeited, but it fails when a QR code is taken from a legitimate product and given to a false product, making the product that is sold first genuine regardless of whether it is genuine or fake. Also, because every product's supply chain must be stored, this 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.

**IX. CONCLUSION**





As a result of the discussion above, we can conclude that creating a fully functional application that can determine whether a product is genuine or fake actually aids in the expansion of the retail industry, gives the consumer confidence that the product he is purchasing is authentic and branded, and aids manufacturers in upholding the reputation and value of their brands. The only new technology in the world of current technology that offers additional functionality and security for data that is kept is blockchain. Thus, blockchain-based applications are a godsend for all buyers and producers.

We have shown a fully working application in this study that enables users to determine if a product is authentic or phoney. The producer created an integrated QR code to allow third parties to add additional details to the product for the first time and recorded the information in the blockchain. Other parties will add their ownership information to the goods at the time of delivery. At the end, the client may scan the QR code, look up the product's history, and determine whether or not the goods is authentic.

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