A Project Report on

Eshop:Comprehensive Blockchain based Web Framework for E-commerce

Submitted in partial fulfillment of the requirements for the award of the degree of

Bachelor of Engineering

in

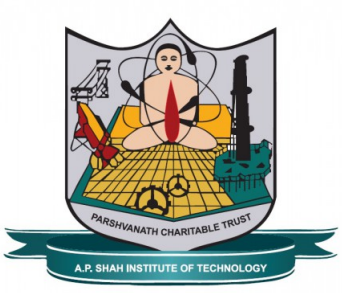
Information Technology

by

Sakshi Shinde(19104055)
Anurag Singh(19104003)
Shubhangi Lanke(19104064)

Under the Guidance of

Prof. Manjusha Kashilkar



Department of Information Technology
NBA Accredited
A.P. Shah Institute of Technology
G.B.Road,Kasarvadavli, Thane(W), Mumbai-400615
UNIVERSITY OF MUMBAI

Academic Year 2022-2023

Approval Sheet

This Project Report entitled ***"Eshop:Comprehensive Blockchain based Web Framework for E-commerce"*** Submitted by ***"Sakshi Shinde"(19104055),"Anurag Singh (19104003), "Shubhangi Lanke"(19104064),***is approved for the partial fulfillment of the requirenment for the award of the degree of ***Bachelor of Engineering*** in ***Information Technology*** from ***University of Mumbai***.

(Prof.Manjusha Kashilkar)
Guide

Dr.Kiran Deshpande
Head Department of Information Technology

Place:A.P.Shah Institute of Technology, Thane
Date:

CERTIFICATE

This is to certify that the project entitled ***"Eshop:Comprehensive Blockchain based Web Framework for E-commerce"*** submitted by ***"Sakshi Shinde" (19104055), "Anurag Singh" (19104003),"Shubhangi Lanke" (19104064),*** for the partial fulfillment of the requirement for award of a degree ***Bachelor of Engineering*** in ***Information Technology***,to the University of Mumbai,is a bonafide work carried out during academic year 2022-2023.

(Prof.Manjusha Kashilkar)
Guide

Dr.Kiran Deshpande
Head Department of Information Technology

Dr.Uttam D.Kolekar
Principal

External Examiner(s)

1.

2.

Place:A.P.Shah Institute of Technology, Thane
Date:

Acknowledgement

We have great pleasure in presenting the report on **Eshop:Comprehensive Blockchain based Web Framework for E-commerce.**We take this opportunity to express our sincere thanks towards our guide **Prof. Manjusha Kashilkar** Department of IT, APSIT thane for providing the technical guidelines and suggestions regarding line of work. We would like to express our gratitude towards his constant encouragement, support and guidance through the development of project.

We thank **Dr. Kiran B. Deshpande** Head of Department,IT, APSIT for his encouragement during progress meeting and providing guidelines to write this report.

We thank **Prof. Sonal Jain** BE project co-ordinator, Department of IT, APSIT for being encouraging throughout the course and for guidance.

We also thank the entire staff of APSIT for their invaluable help rendered during the course of this work. We wish to express our deep gratitude towards all our colleagues of APSIT for their encouragement.

Student Name1: Sakshi Shinde
Student ID1: 19104055

Student Name2: Anurag Singh
Student ID2: 19104003

Student Name3: Shubhangi Lanke
Student ID3: 19104064

Declaration

We declare that this written submission represents our ideas in our own words and where others' ideas or words have been included, We have adequately cited and referenced the original sources. We also declare that We have adhered to all principles of academic honesty and integrity and have not misrepresented or fabricated or falsified any idea/data/fact/source in our submission. We understand that any violation of the above will be cause for disciplinary action by the Institute and can also evoke penal action from the sources which have thus not been properly cited or from whom proper permission has not been taken when needed.

_____

(Sakshi Shinde - 19104055)

_____

(Anurag Singh - 19104003)

_____

(Shubhangi Lanke - 19104064)

Date:

Abstract

Counterfeit products play an important role in product manufacturing industries. Products that are counterfeit are significant to the manufacture of goods. This has an impact on a company's brand, sales, and bottom line. Block chain technology is used to identify genuine goods and identify counterfeit goods. A functional block chain technology is used to prohibit product counterfeiting and assure the identification of genuine products throughout the supply chain. Whenever a product's QR code is linked to a Block Chain Based Management (BCBM) system, a QR code reader may discover counterfeit goods. Therefore, the suggested system may be typically used to store product information and its unique code as database blocks. Consumer demand for safe and open online transactions has expanded as e-commerce has grown. A potential answer to these issues is blockchain technology. We introduce Eshop, a full web framework for e-commerce, in this project. A blockchain-based platform called Eshop offers a decentralised and safe setting for companies and customers to conduct online transactions. The platform includes components like smart contracts, and a decentralised storage system, giving business owners an intuitive interface for setting up and running their online storefronts. With tamper-proof and immutable data provided by the blockchain-based design of Eshop, the whole e-commerce process is transparent and accountable. The suggested architecture is an important step towards developing a reliable, decentralised e-commerce ecosystem that is advantageous to all parties.

Contents

1 Introduction **1**

2 Literature Review **3**

3 Project Design **8**
3.0.1 Existing System 8
3.0.2 Proposed System 8
3.0.3 System Diagram 10

4 Project Implementation **13**

5 Testing **21**
5.1 Functional Testing 21
5.1.1 Unit Testing 21
5.1.2 Various Testcases 22

6 Result **23**
6.0.1 Verify Product 23
6.0.2 Smart Contract 24
6.0.3 Blocks 25

7 Conclusions and Future Scope **27**

Bibliography **28**

Appendices **30**
Appendix-I 30

Publication **31**

List of Figures

3.1 Workflow 9
3.2 Activity Diagram 10
3.3 Use case Diagram 11
3.4 Sequence Diagram 12

4.1 Migration code 13
4.2 Smart Contract to manage Product 14
4.3 Deploying Smart Contract 15
4.4 Deploying Product Smart Contract on blockchain 15
4.5 Interacting with Smart Contracts 16
4.6 Properties and Methods for interacting with a Smart Contract. 16
4.7 Home Page 17
4.8 Add Product Page 17
4.9 Add Seller Page 18
4.10 Consumer Product History Page 18
4.11 Sell Product to Seller Page 19
4.12 Sell Product to Consumer Page 20

5.1 Testcases 22

6.1 Verify Product Page 23
6.2 Deploying smart contract on the blockchain network 24
6.3 Records uploaded on local blockchain 25

List of Abbreviations

E-commerce	Electronic Commerce
BCBM	Block Chain Based Management
DLT	Distributed Ledger Technology
IoT	Internet of Things
QR code	Quick Response Code
ETH	Ether
EVM	Ethereum Virtual Machine
GUI	Graphical User Interface
IPC	Inter Process Communication

Chapter 1

Introduction

Online encounters with strangers may be dangerous. Before committing to a purchase in the real world, we may get reviews on a vendor from former clients. People therefore choose to buy from well-regarded merchants since doing so reduces their risk of suffering significant losses from untrustworthy suppliers. A block chain technology is a blockchain platform that records transactions in a peer-to-peer global network that is autonomous. Block chain is a decentralized distributed ledger system that really is primarily focused on online transactions.

Similar to this, in the cyber world, we prefer to pre-evaluate the trustworthiness of a possible seller with the assistance of reputation systems, since they are made to assist consumers in prejudging the worthiness of unidentified vendors. Blockchain is a system for storing data that makes it challenging or difficult to alter, hack, or defraud the organization.A blockchain is simply a network of computer systems that copy and disseminate a computational record of transactions across the whole network. Multiple transactions are included in each block of the chain, and each time a new transaction takes place on the blockchain, a record of that transaction is added to the records of all participants. Distributed Ledger Technology (DLT) refers to the distributed blockchain that is controlled by several users (DLT). Transactions on a blockchain are recorded with an irrevocable cryptographic signature referred as a hash.

There has been a lot of interest in blockchain technology. To identify counterfeit transactions and activities that differ from typical patterns of activity, a variety of strategies have been suggested and put into practice. In a world where everything is done digitally, maintaining security, accuracy, dependability, and openness among the market's participating stakeholders is essential. Data cannot be deleted once it has been input. Numerous sorts of information fraud can be prevented by maintaining track of actions that are taken permanently, implicitly, and definitively.Since each transaction must be carried out by a team of miners, fraudulent transactions cannot exceed cumulative guarantees and guarantees. Hacking and breaches are all feasible with modest data storage and institutional arrangements, but the frequently used blockchain compliance mechanism avoids this.

Any commodity, service, or asset can indeed be directed fraud, theft of identities, and network or system failure. Identity theft, fraud, and system or network infiltration are all examples of hostile activity on the Internet. Trading on the blockchain experiences challenges such identity theft, internet fraud, and fraud. We'll look about how blockchain technology handles fraud detection.The word "block chain" refers to a collection of transactions that are

structured into blocks, every of which is linked to the one preceding it in an irreversible chain. Due to block chain's distributed nature and peer-confirmed assurances, when compared to typical blockchains, the information cannot be managed. When someone wishes to conduct a transaction, they go straight to the network, wherein algorithms determine the transaction's legitimacy. A chain of transactions is created by connecting the new one with the earlier one after the transaction has been validated. The blockchain technology is the name of this network.

The term "Smart Contract" refers to a contract between two parties that is embodied by computer code. They are stored in a public database that cannot be altered because they operate on the block chain. Block chain technology and smart contracts work together to increase design, development, and implementation flexibility while lowering costs. Smart contracts built on the blockchain provide a lot of benefits, including high precision, no middlemen, little cost, and realtime refurbishment. Permissioned smart contracts are used in more delicate business sectors including banking, the Internet of Things (IoT), and supply chains.

Chapter 2

Literature Review

The purpose of literature review is to gain an understanding of the existing research on Blockchain in E-commerce and debates relevant to area of study. The literature review helped in selecting appropriate smart contracts and suitable feature extraction process for getting efficient results.

- In Paper [1] written by Prabhu Shankar,R. Jayavadivel, there are so many things available on the black market and online, counterfeit goods are expanding tremendously. Therefore, there is a critical need to solve the difficulties of identifying fake goods and develop the necessary technologies to increase detection precision. In the modern world, this is one of the important fields of research being investigated. This essay explores a number of methods for spotting fake goods.

- In Paper [2] written by Si Chen; Rui Shi; Zhuangyu Ren; Jiaqi Yan; Yani Shi; Jinyu Zhang, the proposed methodology will serve as a theoretical foundation for supply chain intelligence quality management using blockchain technology in this article. Additionally, it offers a platform for ideas to be developed on the management of information resources in distributed, virtual enterprises.

- In Paper [3] written by Jinhua Ma, Xin Chen, hung-Min Sun, any application that uses Blockchain technology as its foundational design guarantees the integrity of its data. Utilizing blockchain technology will ensure that customers do not solely depend on retailers to verify the authenticity of their purchases. With a decentralized system that includes product anti-counterfeiting, producers may leverage it to supply authentic goods without having to oversee directly owned storefronts, which can drastically lower the cost of product quality assurance.

- In Paper [4] written by Yuanfeng Cai and Dan Zhu, A viewpoint from the blockchain industry new chances for reworking the reputation system are made possible by blockchain technology. Blockchain technology is highly good at stopping objective information fraud, such the falsification of loan application information. In subjective information fraud, such as rating fraud, where the underlying truth is difficult to verify, their

impact is still restricted. Blockchain-based solutions are good at stopping smear campaigns and whitewashing efforts, but they have trouble spotting ballot stuffing during persistent, malicious attacks.

- In Paper [5] written by M.C. Jayaprasanna; V.A. Soundharya; M. Suhana; S. Sujatha, The current worldwide development of a technology or product is always fraught with risk factors including duplication and counterfeiting, which can harm the brand, business income, and customer health. The hardest task is determining a product's genuineness. A significant decline in the international market is being generated by counterfeit and duplicate goods. Thus, enormous losses and earnings are what product manufacturers aim for. These items are now being fought against by India and other nations.

- In Paper [6] written by Thomas Bocek, Bruno B Rodrigues, Tim Strasser, Burkhard Stiller, A framework for salient research topics By Horst Treiblmaier, Christian Sillaber , A viewpoint from the blockchain industry Vote- stuffing fraud is less resistant to badmouthing than blockchain-based reputation systems. Conclusions New chances for reworking the reputation system are made possible by blockchain technology. Blockchain technology is highly good at stopping objective information fraud, such the falsification of loan application information. However, in subjective information fraud, such as rating fraud, where the underlying truth is difficult to verify, their usefulness is constrained. Blockchain systems have a limited ability to detect ballot stuffing under caused by malicious assault, continual attacks, and camouflage attack. However, they are successful in avoiding badmouthing and white-washing attacks.

- In Paper [7] written by Vinay Chamola, Vikas Hassija, Vatsal Gupta, Mohsen Guizani, Products that are counterfeit are significant to the manufacture of goods. This has an impact on a company's brand, sales, and bottom line. Blockchain technology is used to identify genuine goods and identify counterfeit goods. Blockchain technology is a distributed, distributed, and digital ledger that keeps track of transactions in a number of databases that are linked together through chains. Since blockchain technology is safe, no block can be altered or compromised. Customers or consumers may certify the safety of a product without relying on third-party sources by adopting blockchain technology.

- In Paper [8] written by Khaled Salah, Nishara Nizamuddin, Raja Jayaraman, Mohammad Oma, This paper is the first Blockchain system that proposes a fully functional anti-product forgery system. By paying a very low transaction fee, users of our system no longer need to be concerned about the possibility of acquiring a counterfeited product. The system provides identity verification by using digital signatures. There are no other means to decrypt the private key of the key owner unless the key owner accidentally leaks his key. System can effectively lower the threshold of the anti-counterfeiting of branded goods and provide the companies with limited financial resources an as well an easier approach to provide consumers with the confidence that they will not

purchase counterfeited goods.

- In Paper [9] written by Mallegowda, Anita Kanavalli, MN Thippeswamy, Kushagra Gupta, Lakshya Khandelwal, Vishal Bhattad, Himanshu Vaswani, The immutable decentralised and fast nature of blockchain has given rise to numerous applications based on this technology. The integrity of its data is one of the primary features of blockchain technology. Quick Response (QR) codes offer a powerful method to tackle the practice of product counterfeiting thanks to new developments in wireless and mobile technologies. Counterfeit goods may be found using a QR code scanner, which connects the product's QR code to a Blockchain. Therefore, this technique might be used to construct blocks in the database using the product's unique codes and record the product's details. It gathers the user's individual code and runs it against records in the Blockchain database.

- In Paper [10] written by Feng Tian, For the past few years, food safety has become an outstanding problem. Since traditional agri-food logistics pattern can not match the demands of the market anymore, building an agri-food supply chain traceability system is becoming more and more urgent. In this paper, demonstrated the building process of this system. It can realize the traceability with trusted information in the entire agri-food supply chain, which would effectively guarantee the food safety, by gathering, transferring and sharing the authentic data of agri-food in production, processing, warehousing, distribution and selling links.

- In Paper [11] written by Roshan Jadhav, Altaf Shaikh, MA Jawale, AB Pawar, P William, Counterfeit items have become more prevalent in the industrial industry in recent years. This has an effect on the company's name, sales, and profit. Blockchain technology is used to authenticate and identify counterfeit items.Using blockchain technology, transactions are recorded in the form of blocks in a distributed, decentralized, and digital ledger. A block cannot be changed or hacked since blockchain technology is secure. Blockchain technology eliminates the need for customers or users to rely on third parties to verify the product's safety. In light of current advancements in mobile and wireless technologies, quick response (QR) codes provide a promising technique for addressing the practice of counterfeiting in this project. This is done by scanning a QR code, which is linked to a Blockchain, to identify counterfeit goods. As a consequence, this method may be used to record product information and generate a unique identifier for each product in a database.

- In Paper [12] written by Nidish Vashistha, Muhammad Monir Hossain, Md Rakib Shahriar, Farimah Farahmandi, Fahim Rahman, Mark M Tehranipoor, Counterfeit electronic devices can cause a significant revenue loss and brand value damage to the original component manufacturers. Existing methods for device authenticity verification are either destructive, require an advanced electrical test or physical inspection infrastructure.This paper presents a blockchain-centric solution to address these limitations to verify electronic devices. A detailed study is presented to transform an existing supply chain into a trustworthy distributed ledger framework called eChain.

A fully functional prototype of eChain is developed to demonstrate the feasibility and efficacy of the proposed solution.

- In Paper [13] written by Aman Thakkar, Nilay Rane, Amey Meher, Swapnil Pawar, In recent years, Counterfeit goods play a vital role in product manufacturing industries. This Phenomenon affects the sales and profit of the companies. To ensure the identification of real products throughout the supply chain, a functional block chain technology used for preventing product counterfeiting. By using a block chain technology, consumers do not need to rely on the trusted third parties to know the source of the purchased product safely. Any application that uses block chain technology as a basic framework ensures that the data content is "tamper-resistant".

- In Paper [14] written by Adnan Qayyum, Junaid Qadir, Muhammad Umar Janjua, Falak Sher, Counterfeiting is a global issue affecting a wide range of industries including luxury goods, clothing and pharmaceuticals among others. Proving or disproving the authenticity of an asset can be a challenge because traditional supply chains are long, complex and lack transparency. However, placing the supply chain on a decentralized technology like blockchain will ensure that goods will have provenance due to its immutable transaction history, which in turn makes it difficult to masquerade counterfeit products as real and take their place in the supply chain. Blockchain can bring all entities like the manufacturers, suppliers and distributors together in a close-knit and transparent manner.

Objectives

Objectives refer to specific goals which are aimed to achieve within a given period. These goals are usually specific, measurable, achievable, relevant, and time-bound and serve as a guide to focus efforts and resources towards a desired outcome. They provide direction and a clear sense of purpose for individuals and teams, and are used to evaluate progress and success towards achieving a desired outcome

In this project implementation we intend to fulfil the following objectives:

- To ensure everyone's access to original and safe products one e-commerce portal:
  To provide every individual an access of e-commerce portal which is safe and can guarantee to buy an original and tamper-proof product.

- To improve the product supply chain ecosystem's trust and transparency from manufacturer to consumers:
  To ensure trasparent supply chain of products from the Manufacturer to the end Consumer of any product

- To provide information about traceability of product:
  To trace the product at any point of the supply chain with it's necessary information.

- To prevent consumer from receiving counterfeit products:
  To prevent the whole idea of counterfeiting from e-commerce portals an provide a trustworthy platform to shop

- To secure product details using a QR code:
  To provide security of products by attaching it with unique QR codes.

Chapter 3

Project Design

The project's key features, structure, criteria for success, and major deliverables are all planned out in this steps. The aim is to develop design in a way so that it can differ from existing system that can be used to achieve the desired project goals.

3.0.1 Existing System

- The traditional system for product anticounterfeiting monitoring involves using a barcodes, which contains a detailed list of products and entities involved throughout the supply chain.
- Manual product anticounterfeiting can be time-consuming and product data is only available after the product is purchased, making it harder to track products in real-time.
- Organizations face various challenges with traditional manual product anticounterfeiting systems, including the possibility of errors, manipulation, and lack of transparency.
- The traditional method of storing the product details is not secure.Their is a risk of high securities issues like manipulating the products and ownership.
- Some use RFID technology to verify the product which is also not secure. Anyone can falsify while verifying the product.

3.0.2 Proposed System

E-commerce platforms are popular and dependable for regular buying. It means that you must be extremely careful while selecting your platform and brand. The spread of counterfeit has had a significant impact on businesses, producers, and customers globally. It takes into account both the organization's impact and the welfare of the customers. This tendency has started to emerge in India in recent years. The suggested system is intended for consumer items, and it aids in product tracking by preserving the integrity of the product and the supply chain through the use of Blockchain. Customers now have the ability to use blockchain and QR codes to trace the history of an entire product from maker to customer. Our product anti-counterfeiting system based on Blockchain is composed of three roles, The Manufacturer Role, The Seller Role, and The Consumer role.

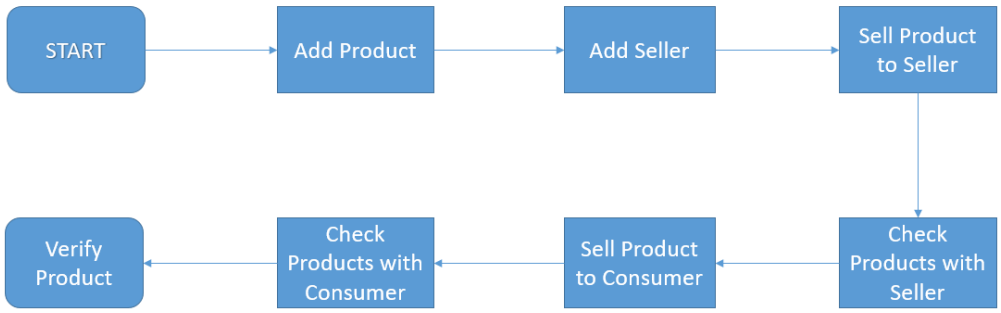


Figure 3.1: Workflow

- Manufacturer:

  Manufacturer logs into the manufacturer account and adds other required details of the product to add catalogue in the website. Manufacturer is the main entity who creates the blockchain and push the starting values into it.

  1. Add Product : Add product details to blockchain and generate QR code
  2. Add Seller : Add Seller details to blockchain
  3. Sell Product to Seller : Sell product to any added seller and generate QR code
  4. Query Seller : Check how many sellers are added with the manufacturer

- Seller:

  Supplier logs into supplier account and Seller is the intermediate identity who takes the authority from Manufacturer and sells the product to the consumer.

  1. Show Products for Sale : Check added products with them
  2. Can sell product to consumer and generate QR code

- Consumer:

  Customers can check the integrity of the product by scanning QR code which will list the history of transactions and thus verifying the genuinity of the product.Consumer is the end user here who will check the genuineness of product.

  1. Consumer Purchase History: Check products added with them
  2. Product Verification: Scan QR code and identifies product as Real or Fake

3.0.3 System Diagram

- Activity Diagram

Activity diagrams are often used to model complex workflows, such as those found in business processes, software systems, or even daily routines. They provide a visual representation of the steps involved in a process or system, along with the relationships between those steps, and can help developers and stakeholders better understand and communicate the flow of activities. It consist of a set of activity nodes, which represent individual actions or steps in the process, and connectors that define the relationships between these nodes. The connectors may include arrows, lines, and other symbols to show the order and direction of the activities.

The figure shown is the complete system diagram of the proposed system.First the user will be assigned with the roles like Manufacture, Seller and Consumer .The home page would be displayed. By selecting the roles we can perform the different actions respective to the roles. Every module is connected with each other. Later on we can move between the roles anytime and perform any action. The verification result of products will be displayed on the web page.

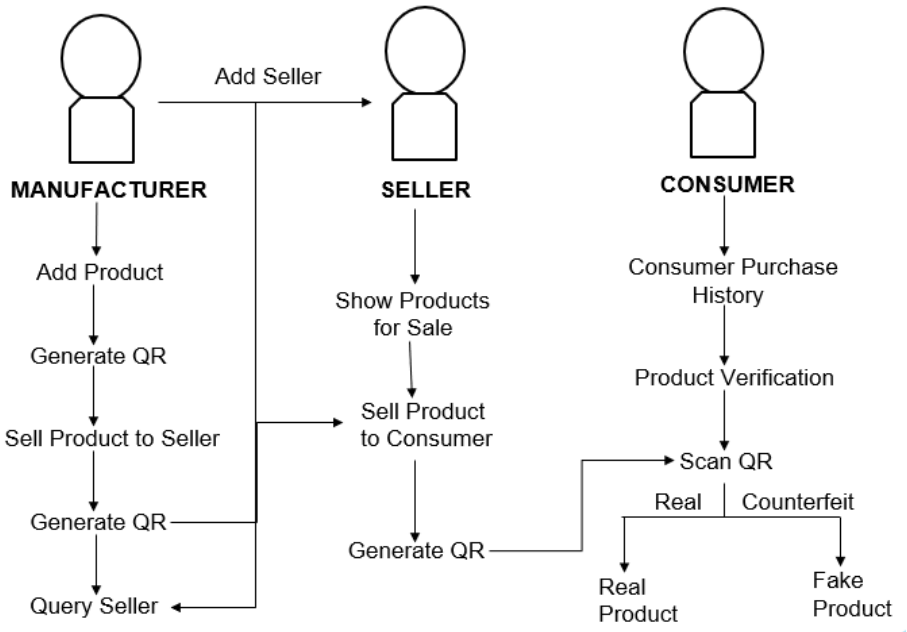


Figure 3.2: Activity Diagram

- Use Case Diagram

  Use case diagrams are often used to model the requirements and functionality of a system, and provide a high-level overview of the system's behavior from the user's perspective. They consist of actors, use cases, and relationships between them. Use case diagrams are useful for identifying the features and functionalities of a system or application, as well as the various actors that interact with it. They are also useful for identifying potential errors or flaws in the system's design, and can help developers and stakeholders better understand the system's behavior and requirements.

  The Use Case Diagram below shows different actors as Manufacturer, Seller and Customer. The relation between actors and what they can do with the system. The Manufacturer will start the transaction and seller will pass that authority to Customer and at last, Customer verifies the product . A use case diagram shows various use cases and different types of users the system has and will often be accompanied by other types of diagrams as well. Use case diagrams are used to gather the requirements of a system including internal and external influences. These requirements are mostly design requirements.

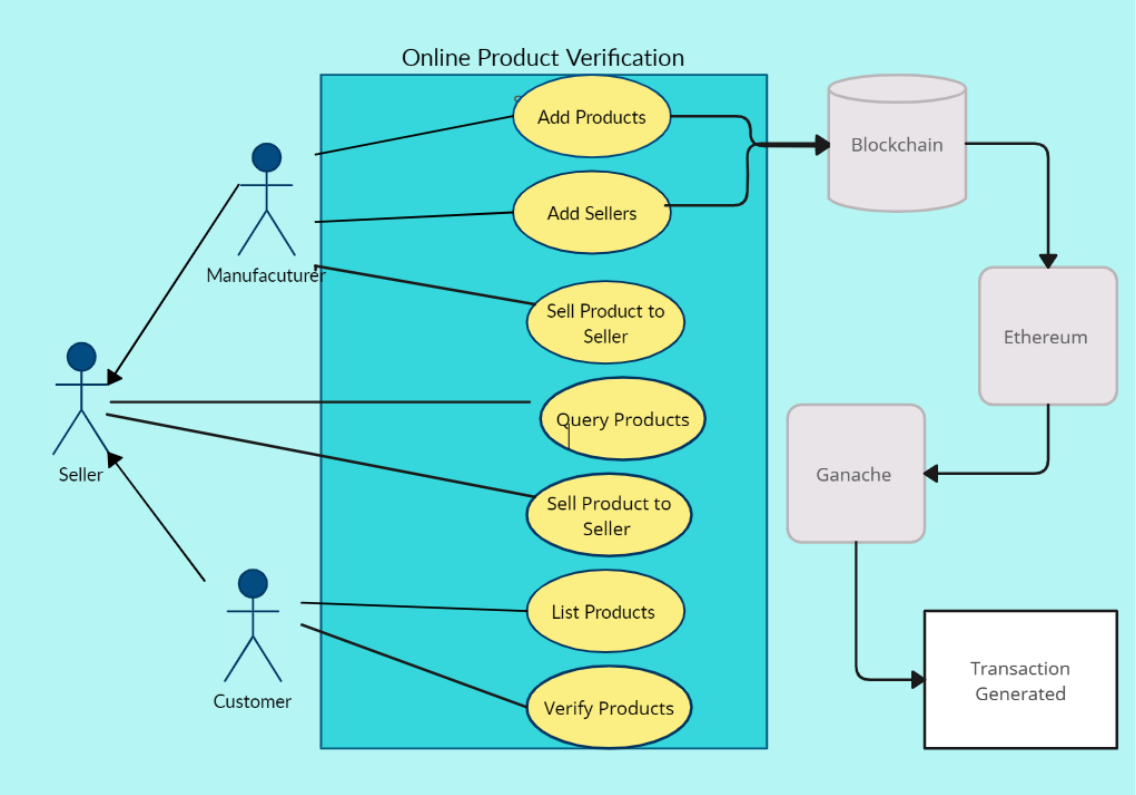


Figure 3.3: Use case Diagram

- Sequence Diagram

  The sequence diagram below shows the entire sequence of flow of the data in the system. In the initial step the Manufacutrer will add product and sellers with their details. Then only Manufacture can sell that added product to any particular Seller with the alloted seller code. Manufacture can also check the added Seller details. Next, Seller can check Products for Sale and he can also sell that product to the Consumer. Finally, Consumer can check the products with him and can verify any product using QR code.

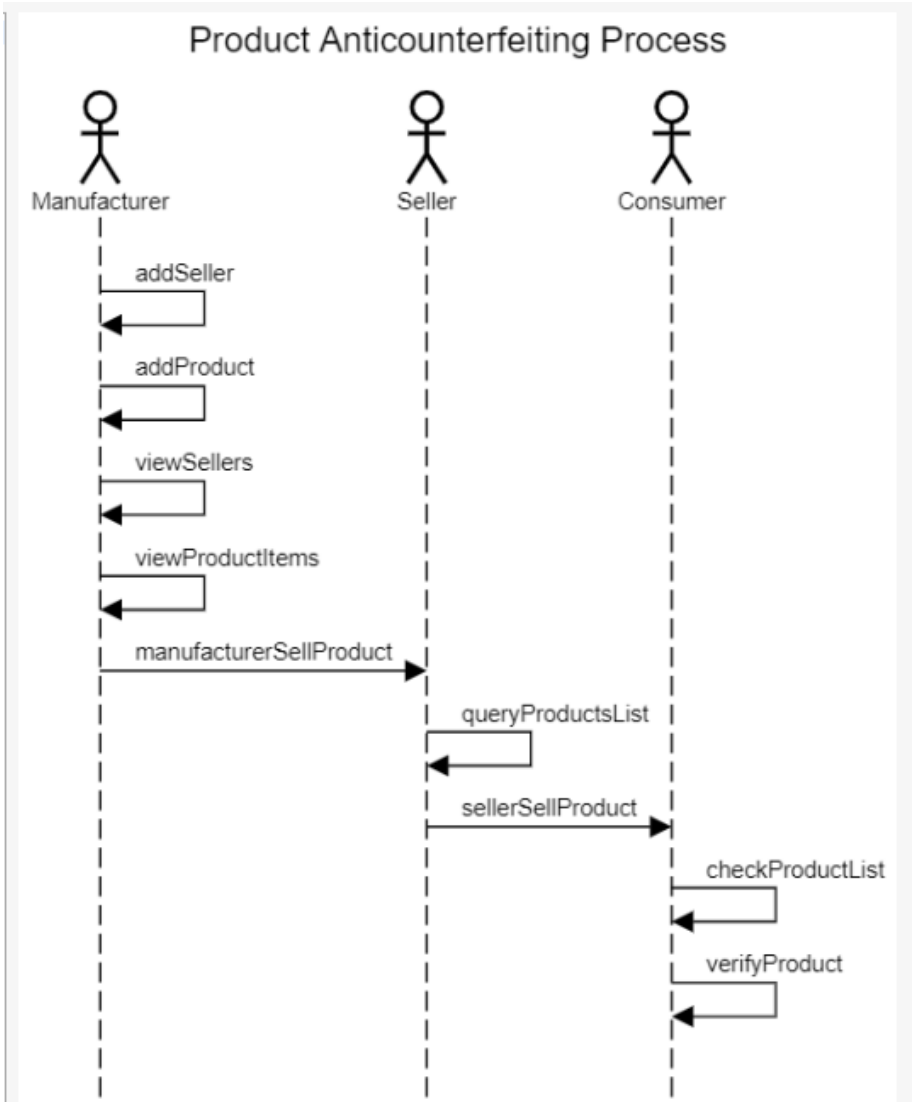


Figure 3.4: Sequence Diagram

Chapter 4

Project Implementation

Project implementation consists of visions and plans with which we are supposed to build the end product. This includes the logical conclusion, after evaluating, deciding, visioning, planning and finding the other resources for the project. Technical implementation is one of the major aspects of executing a project.

In fig. 4.1 code is implementing a smart contract in the Solidity programming language. The smart contract is called "Migrations".

contracts > Migrations.sol

```
1  // SPDX-License-Identifier: MIT
2  pragma solidity >=0.4.22 <0.9.0;
3
4  contract Migrations {
5    address public owner = msg.sender;
6    uint public last_completed_migration;
7
8    modifier restricted() {
9      require(
10       msg.sender == owner,
11       "This function is restricted to the contract's owner"
12     );
13     _;
14   }
15
16   function setCompleted(uint completed) public restricted {
17     last_completed_migration = completed;
18   }
19 }
20
```

Figure 4.1: Migration code

This code declares multiple mappings that are used to manage a product inventory system in Solidity.

contracts > product.sol

```
pragma solidity ^0.8.12;

contract product {

    uint256 sellerCount;
    uint256 productCount;

    struct seller{
        uint256 sellerId;
        bytes32 sellerName;
        bytes32 sellerBrand;
        bytes32 sellerCode;
        uint256 sellerNum;
        bytes32 sellerManager;
        bytes32 sellerAddress;
    }
    mapping(uint=>seller) public sellers;

    struct productItem{
        uint256 productId;
        bytes32 productSN;
        bytes32 productName;
        bytes32 productBrand;
        uint256 productPrice;
        bytes32 productStatus;
    }

    mapping(uint256=>productItem) public productItems;
    mapping(bytes32=>uint256) public productMap;
    mapping(bytes32=>bytes32) public productsManufactured;
    mapping(bytes32=>bytes32) public productsForSale;
    mapping(bytes32=>bytes32) public productsSold;
    mapping(bytes32=>bytes32[]) public productsWithSeller;
    mapping(bytes32=>bytes32[]) public productsWithConsumer;
    mapping(bytes32=>bytes32[]) public sellersWithManufacturer;

```

Figure 4.2: Smart Contract to manage Product

This code deploys the "Migrations" contract to the blockchain network using the Truffle framework, which allows developers to easily deploy, test, and interact with smart contracts.

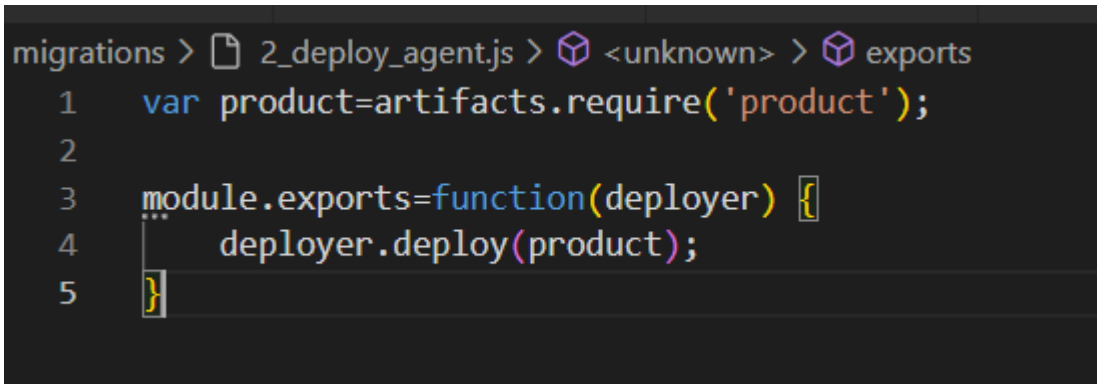


Figure 4.3: Deploying Smart Contract

Code that uses the Truffle framework to deploy a smart contract called "product" to a blockchain network.

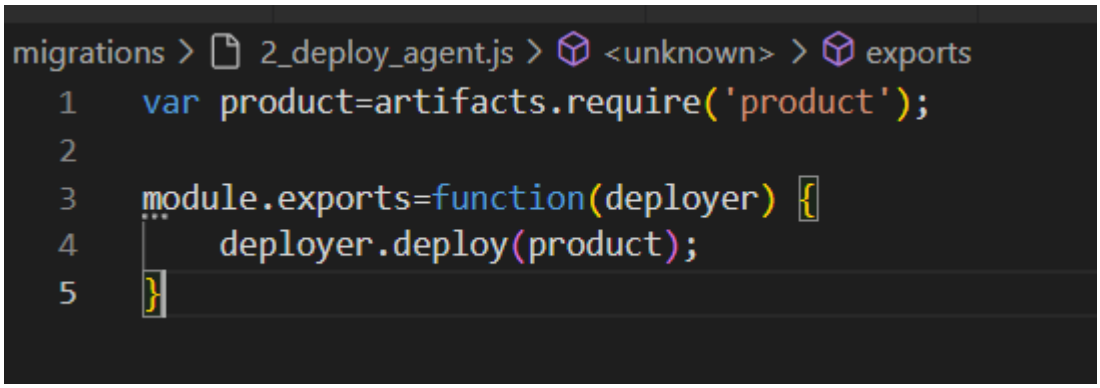


Figure 4.4: Deploying Product Smart Contract on blockchain

JavaScript code that defines a module for interacting with Ethereum smart contracts.

truffle-contract.js

src > js > truffle-contract.js > 1 > <function> > <function>

```
(function e(t,n,r){function s(o,u){if(!n[o]){if(!t[o]){var a=typeof require=="function"&&require;if(!u&&a)return
(function (global){
var ethJSABI = require("ethjs-abi");
var BlockchainUtils = require("truffle-blockchain-utils");
var Web3 = require("web3");

// For browserified version. If browserify gave us an empty version,
// look for the one provided by the user.
if (typeof Web3 == "object" && Object.keys(Web3).length == 0) {
  Web3 = global.Web3;
}

var contract = (function(module) {

  // Planned for future features, logging, etc.
  function Provider(provider) {
    this.provider = provider;
  }

  Provider.prototype.send = function() {
    return this.provider.send.apply(this.provider, arguments);
  };
```

Figure 4.5: Interacting with Smart Contracts

A JavaScript code that defines an object App with properties and methods for interacting with a smart contract.

verifyProduct.js

src > js > verifyProduct.js > $() callback

```
App = {
    web3Provider: null,
    contracts: {},

    init: async function() {
        return await App.initWeb3();
    },

    initWeb3: function() {
        if(window.web3) {
            App.web3Provider=window.web3.currentProvider;
        } else {
            App.web3Provider=new Web3.providers.HttpProvider('http://localhost:7545');
        }

        web3 = new Web3(App.web3Provider);
        return App.initContract();
    },

    initContract: function() {

        $.getJSON('product.json',function(data){

            var productArtifact=data;
```

Figure 4.6: Properties and Methods for interacting with a Smart Contract.

Here, is the home page of the e-commerce website as shown in Fig 4.7

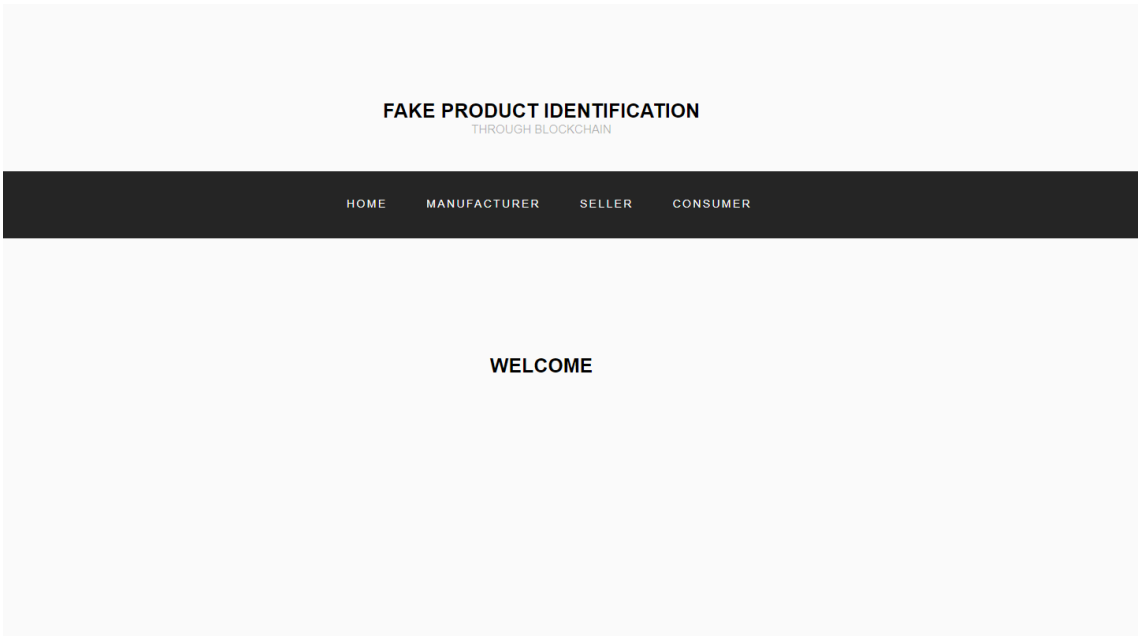


Figure 4.7: Home Page

This is the add product page where Manufacturer can add products to the database with all the required details and it will generate a QR code as shown in fig. 4.8

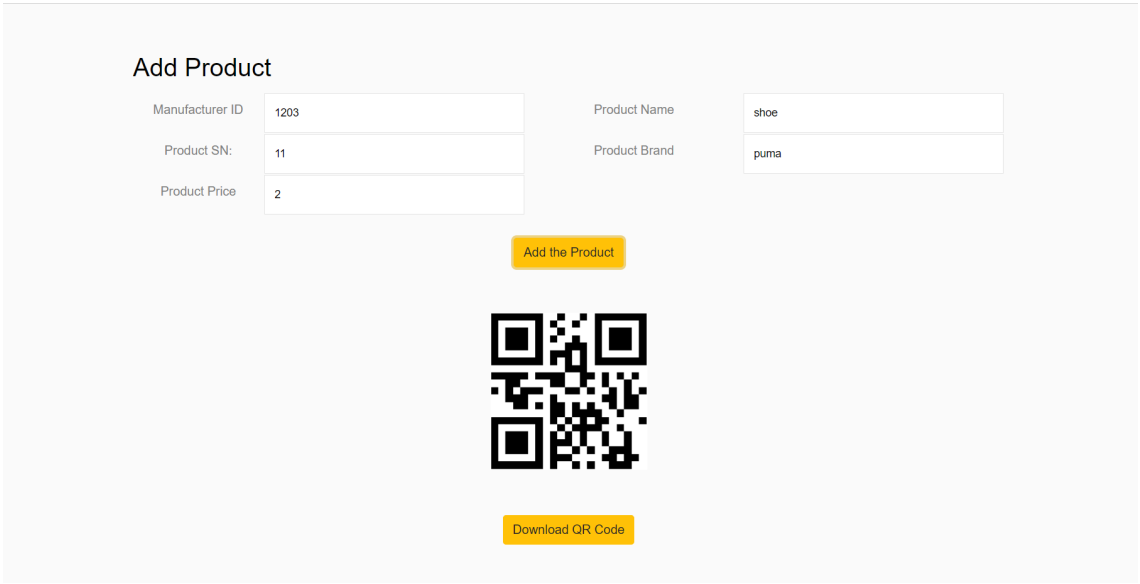


Figure 4.8: Add Product Page

This is the add seller page where Manufacturer can add seller to the database with all the required details and it will generate a QR code as shown in fig. 4.9

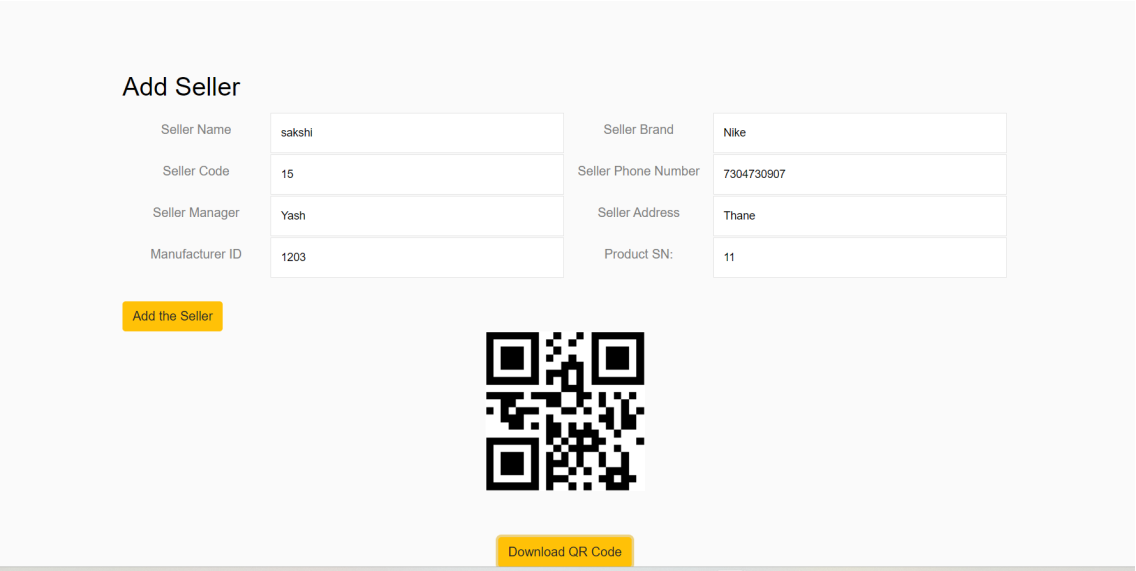


Figure 4.9: Add Seller Page

This is the consumer product history page, where consumer can submit their code and get the list of products bought by them

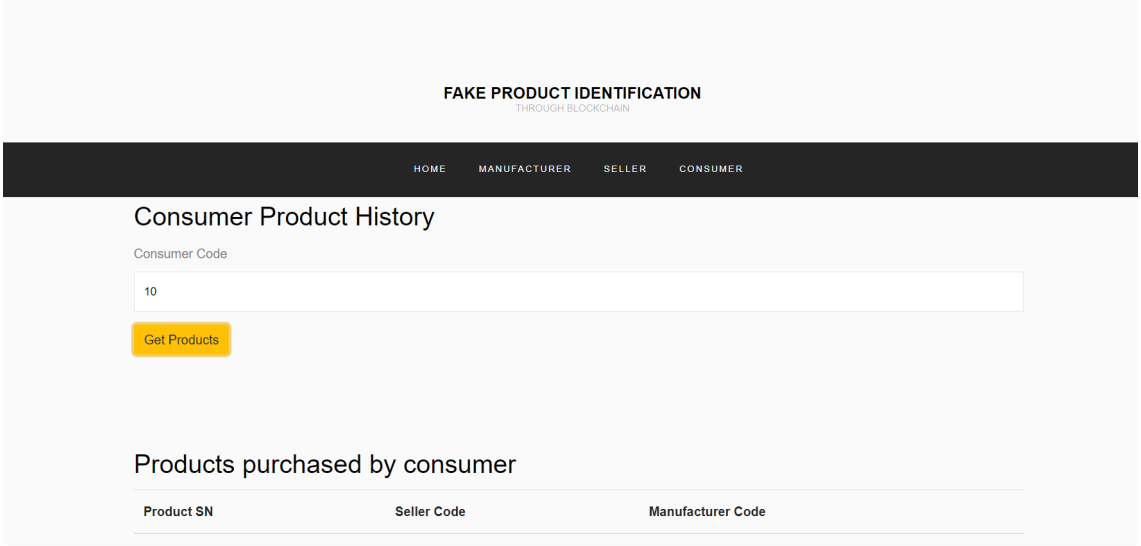


Figure 4.10: Consumer Product History Page

This is the sell product to seller page, where Manufacturer can add QR code generated in previous step and and seller code to whom the product authority should be given.

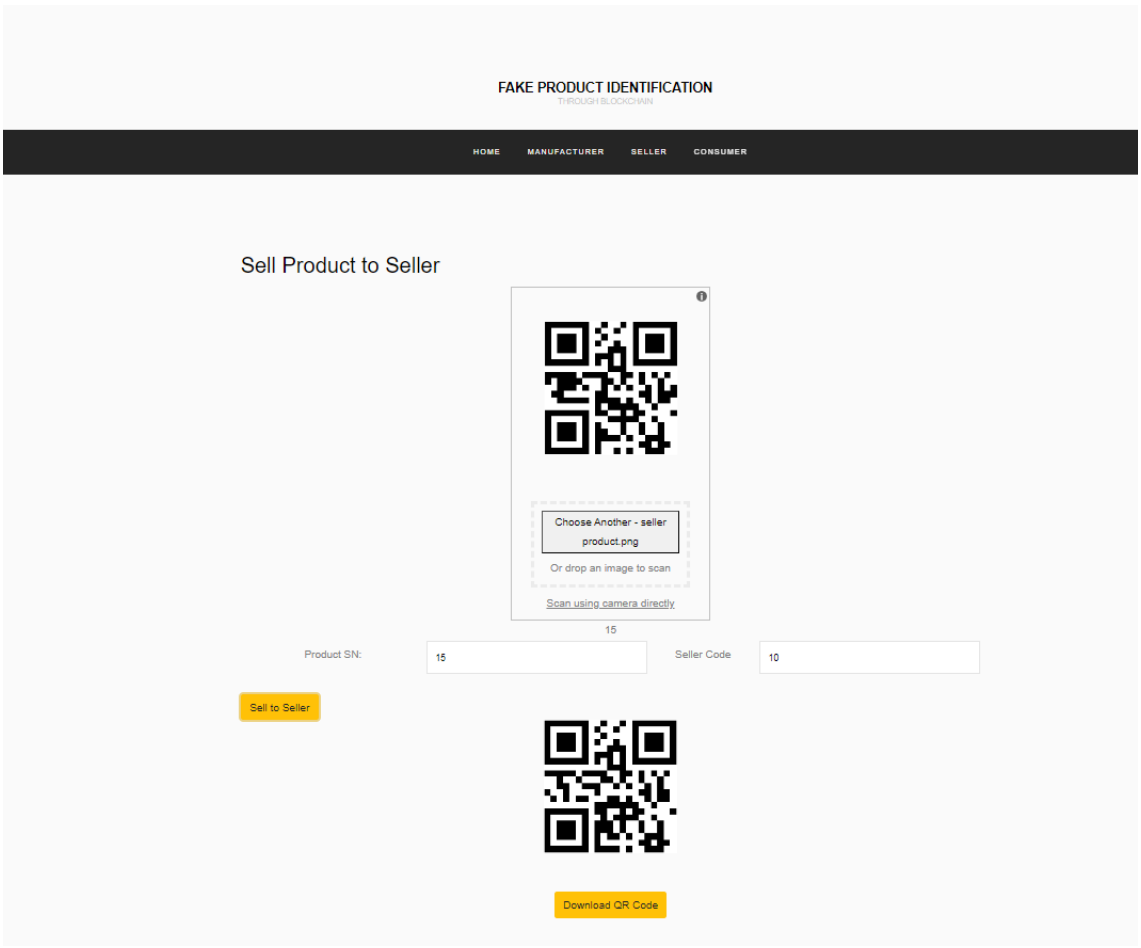


Figure 4.11: Sell Product to Seller Page

This is the sell product to consumer page, where Seller can add QR code generated in previous step and and consumer code to whom the product authority should be given.

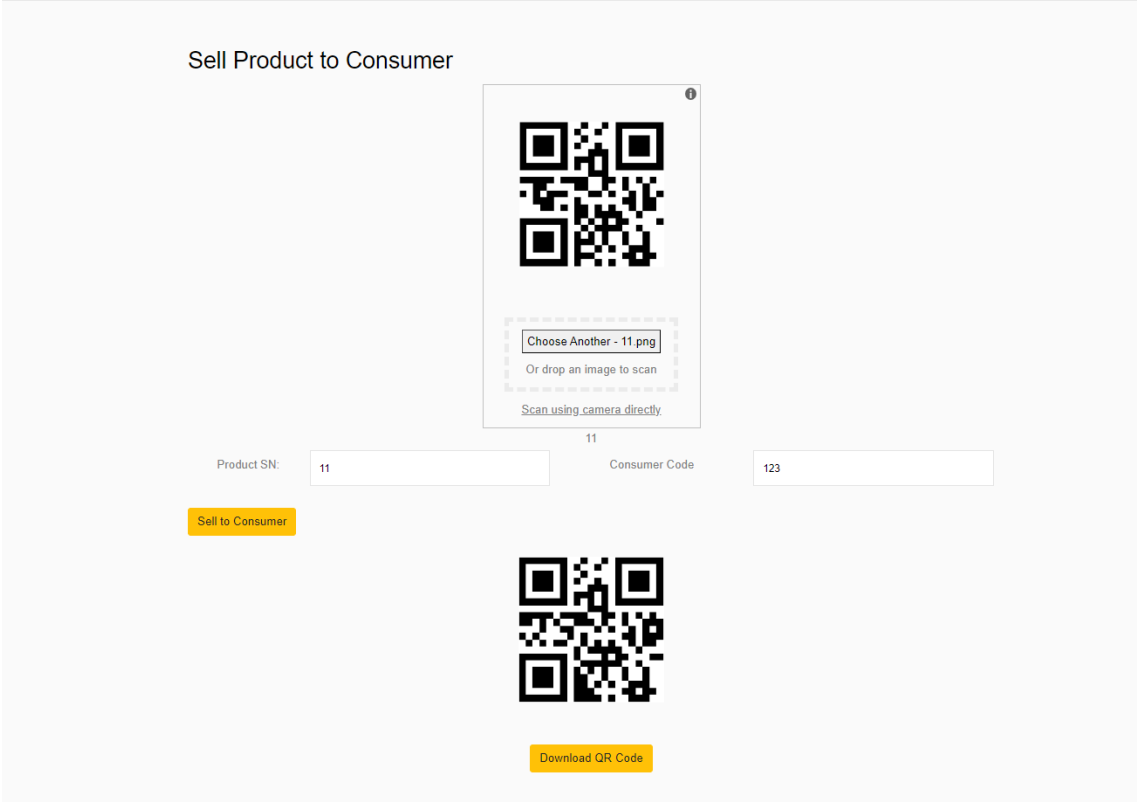


Figure 4.12: Sell Product to Consumer Page

Chapter 5

Testing

Testing is an organized summary of testing objectives, activities, and results. It is created and used to help stakeholders (product manager, analysts, testing team, and developers) understand product quality and decide whether a product, feature, or a defect resolution is on track for release. Test documentation includes all files that contain information on the testing team's strategy, progress, metrics, and achieved results. The combination of all available data serves to measure the testing effort, control test coverage, and track future project requirements.

5.1 Functional Testing

5.1.1 Unit Testing

Unit testing is the first level of testing, which is typically performed by the developers themselves. At the code level, it is the process of ensuring that individual components of software are functional and work as intended. Unit testing can be done manually, however automating the process will reduce delivery times and boost test coverage. Because flaws will be detected earlier in the testing process and will take less time to fix than if they were discovered later, debugging will be easier as a result of unit testing. It helped us understand the desired output of each module, which we had broken down into separate units. It helped us in classifying the product categories on the basis of algorithm that we have used. The main objective of unit testing is to isolate written code to test and determine if it works as intended. Unit testing is an important step in the development process, because if done correctly, it can help detect early flaws in code which may be more difficult to find in later testing stages.

5.1.2 Various Testcases

Test Case no.	Test Condition	Test Steps/ Procedure	Test Data	Expected Results	Actual Result	Pass/Fail
1	Successful authentication of a genuine product	Verify that the product's blockchain record is valid and matches the details displayed on the app.	QR code from a genuine product	The product details and blockchain record are displayed correctly on the website.	Genuine Product message	Pass
2	Authentication of a fake product	Verify that the product's blockchain record is not valid or does not match the details displayed on the app.	QR code from a fake product	The website should display a warning message indicating that the product is fake.	Fake Product message	Pass
3	Authentication of a product with a valid blockchain record but incorrect product details	Verify that the product's blockchain record is valid and matches the details displayed on the website.	QR code from a genuine product with incorrect details	The website should display a warning message indicating that the product details are incorrect.	Fake Product Message	Pass

Figure 5.1: Testcases

Chapter 6

Result

6.0.1 Verify Product

QR codes plays a very important role in determining Genuine and Fake producuts. QR code generated in the last step should be submitted to fetch the product id and the by providing Consumer code we can check that Is the product sold to consumer is fake or not.

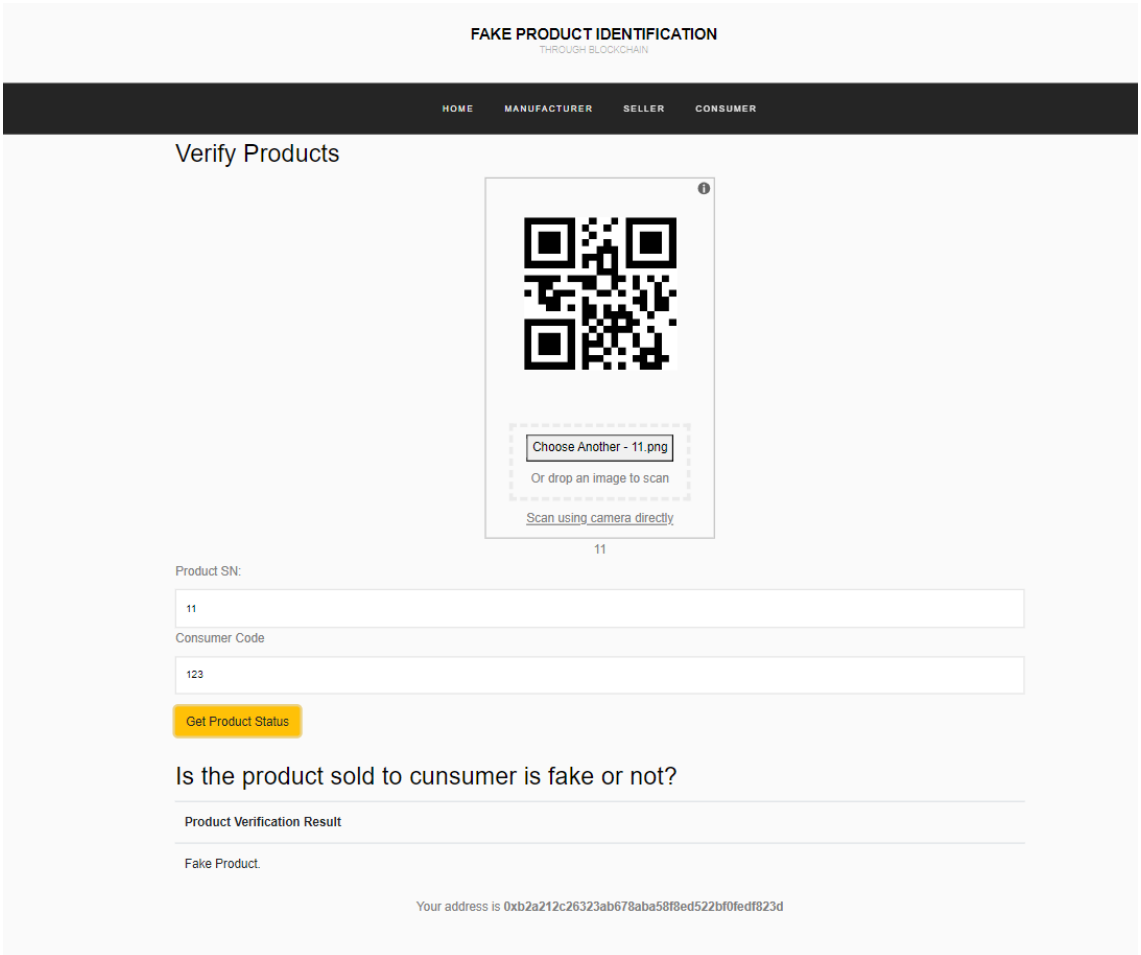


Figure 6.1: Verify Product Page

6.0.2 Smart Contract

After accumulating product data, the data generated is sent on to the Ethereum blockchain using smart contracts. Smart Contracts in Blockchain are the program files that are used to build the conditions for the program in order to run the system. Smart Contracts are written in solidity language which is set up and compiled on platforms like Remix IDE. In this system, smart contracts are used for initializing the series of transactions to be performed between all the entities. The contracts would be defining the attendance records for the particular class. After the contracts are designed, they are compiled and tested using any faucet and in this case which is Ether. Ganache is used for testing smart contract locally. The deployment of smart contract on Ganache can be seen in fig. below

Figure 6.2: Deploying smart contract on the blockchain network

6.0.3 Blocks

After a successful deployment of smart contract over ganache, blocks are being generated. In a blockchain database, blocks are data structures where transaction data is permanently stored. Blocks are incredibly important in determining transaction parameters as data stored on the blocks is immutable under any circumstances. All the information is securely saved in a block and kept up to date. The block's data, hash value, and block size is also provided to the peers. Blocks general characteristics can be seen in fig. below

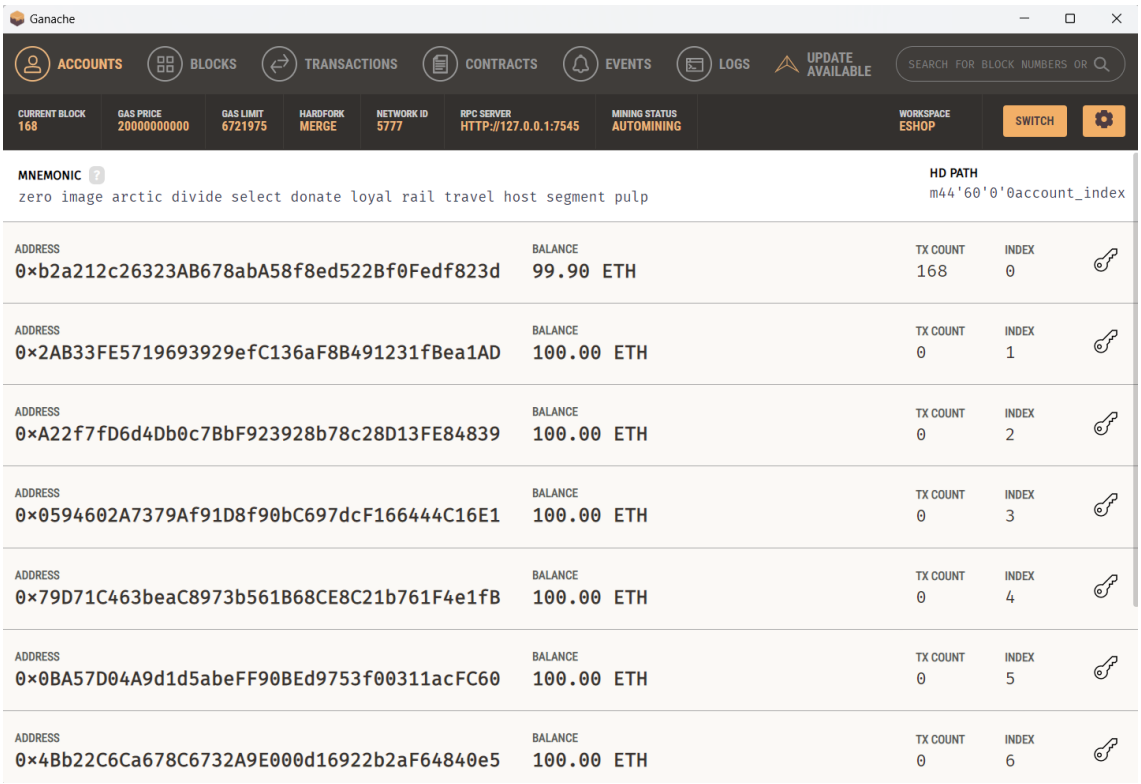


Figure 6.3: Records uploaded on local blockchain

Deploying an Blockchain based web framework for e-commerce using Truffle and Ganache involves several steps. Firstly, the Truffle framework needs to be installed on the local machine, along with Ganache, which is a personal blockchain for Ethereum development. Once the installation is complete, a new Truffle project can be initialized, and smart contracts can be written to define the attendance system's functionality. After compiling and testing the smart contracts, they can be migrated to Ganache to create a new blockchain network. The Ganache GUI can be used to interact with the smart contracts and simulate transactions, which can be used to test the system's functionality. Finally, the product authentification sytem can be integrated with a user interface, such as a web application, to allow users to interact with the system and record the product details. Overall, deploying an attendance monitoring system using Truffle and Ganache requires a good understanding of blockchain development and smart contract programming, but it offers a secure and transparent solution for monitoring attendance.

Finally, Product Authentifacation system for e-commerce is built using HTML, CSS, Javascript and the recorded data is stored on blockchain. The home page contains the information of the website with different modules. In Manufacture module, he can add product and seller by adding necessary information. Manufacturer can also sell a particular product to Seller by providing Seller code. Seller then can sell that product to the end Consumer. Finally Consumer can verify the product as Genuine or Fake using QR code authentification.

Chapter 7

Conclusions and Future Scope

Here we are proposing the solution for counterfiting chain of products in the market by providing verified products only. E-commerce platform has a large consumer number so it is needful for the Seller as well as consumer to maintain a transparent and secure cycle of transaction. It will be useful to make a change in the society by adopting a new trend on e commerce shopping platforms. By leveraging the immutability and transparency of blockchain, customers can be assured of the authenticity of the products they purchase, while sellers can also benefit from increased trust and credibility.

The project is designed for E-commerce shopping platforms but it has a wide scope in many of the domains such as transportation, logistics and transaction related businesses as well. The business which needs transparency and security throughout the process can use this. The fake product recognition system using blockchain technology on e-commerce platforms has a promising future with the potential to revolutionize the way we verify the authenticity of products in online transactions. The integration of other emerging technologies will further enhance its capabilities, making it an indispensable tool for ensuring consumer trust and confidence in e-commerce transactions.

Bibliography

[1] B.Prabhu Shankar, Dr. R.Jayavadivel, "A Survey Of Counterfeit Product Detection", International Journal of Scientific and Technology Research Volume 8, 12, December 2019.

[2] Si Chen; Rui Shi; Zhuangyu Ren; Jiaqi Yan; Yani Shi; Jinyu Zhang, "A Blockchain-Based Supply Chain Quality Management Framework", 2017 IEEE 14th International Conference on e-Business Engineering (ICEBE), 04-06 November 2017.

[3] Jinhua Ma; Shih-Ya Lin; Xin Chen; Hung-Min Sun; Yeh-Cheng Chen; Huaxiong Wang, "A Blockchain-Based Application System for Product Anti-Counterfeiting", IEEE Access (Volume: 8), 06 February 2020.

[4] Yuanfeng Cai and Dan Zhu, "Fraud detections for online businesses: a perspective from blockchain technology", Financ Innov 2 Springer, 06 December 2016.

[5] M.C. Jayaprasanna; V.A. Soundharya; M. Suhana; S. Sujatha, "A Block Chain based Management System for Detecting Counterfeit Product in Supply Chain", 2021 Third International Conference on Intelligent Communication Technologies and Virtual Mobile Networks (ICICV), 04-06 February 2021.

[6] Thomas Bocek, Bruno B Rodrigues, Tim Strasser, Burkhard Stiller, "Blockchains everywhere - a use-case of blockchains in the pharma supply-chain", 2017 IFIP/IEEE Symposium on Integrated Network and Service Management (IM), 2017.

[7] Vinay Chamola, Vikas Hassija, Vatsal Gupta, Mohsen Guizani, "A comprehensive review of the COVID-19 pandemic and the role of IoT, drones, AI, blockchain, and 5G in managing its impact", IEEE Access, vol. 8, 2020.

[8] Khaled Salah, Nishara Nizamuddin, Raja Jayaraman, Mohammad Omar, "Blockchain-based soybean traceability in agricultural supply chain", IEEE Access, vol. 7, 2019.

[9] Mallegowda, Anita Kanavalli, MN Thippeswamy, Kushagra Gupta, Lakshya Khandelwal, Vishal Bhattad, Himanshu Vaswani, "Fake Product Identification System Using Blockchain", 2022 4th International Conference on Circuits, Control, Communication and Computing (I4C), 2022.

[10] Feng Tian, "An agri-food supply chain traceability system for China based on RFID and blockchain technology", 2016 13th International Conference on Service Systems and Service Management (ICSSSM), 2016.

[11] Roshan Jadhav, Altaf Shaikh, MA Jawale, AB Pawar, P William, "System for Identifying Fake Product using Blockchain Technology", 7th International Conference on Communication and Electronics Systems (ICCES), 2022.

[12] Nidish Vashistha, Muhammad Monir Hossain, Md Rakib Shahriar, Farimah Farahmandi, Fahim Rahman, Mark M Tehranipoor, "eChain: a blockchain-enabled ecosystem for electronic device authenticity verification", IEEE Transactions on Consumer Electronics, vol. 68, February 2022.

[13] Aman Thakkar, Nilay Rane, Amey Meher, Swapnil Pawar, "Application for Counterfeit Detection in Supply Chain using Blockchain Technology", International Conference on Advances in Computing, Communication, and Control (ICAC3), 2021.

[14] Adnan Qayyum, Junaid Qadir, Muhammad Umar Janjua, Falak Sher, "Using blockchain to rein in the new post-truth world and check the spread of fake news", IT Professional, vol. 21, no. 4, 1 July-Aug. 2019.

Appendices

Appendix-I: Installation of libraries

1. Install Node from its official website https://nodejs.org/en
2. **pip install npm**
3. **pip node app.js**
4. **pip npm init**
5. **pip install os**
6. **pip install web3**
7. **pip install -g truffle**
8. **pip install -g ganache-clim**
9. **pip install -g lite-server**
10. **truffe init**
11. **truffe compile**
12. **truffe migrate**

Publication

Paper entitled **"E-Shop:Comprehensive Blockchain based Web Framework for E-Commerce"** is submitted at **"7th Edition Of ITC (IEEE International Test Conference of India 2023)"** by **"Sakshi Shinde, Anurag Singh, Shubhangi Lanke and Prof. Manjusha Kashilkar".**