HALAL TESTING SYSTEM

IMPLEMENTING BLOCKCHAIN

Session 2017 - 2021

Project Supervisor

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Submitted By

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Department of Computer Science

University of Karachi

_____ Date

Department of Computer Science,

University of Karachi

HALAL TESTING SYSTEM

IMPLEMENTING BLOCKCHAIN

Project Supervisor	**Sir Farhan**
Team leader	**Osama Muhammad**
Team members	**Meraj A Khan** **Hamza Javed**
Submission Date	

Supervisor Signature:

……..

Department of Computer Science

University of Karachi

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We would like to thank the following people for their tremendous help in the development of this project:

Sir Farhan. Without his assistance and encouragement, this endeavor would not have been successful. He kindly explained everything and pointed us in the right direction. Living under his guidance taught us a lot. He led us through the final year project documentation, tips for preparing reviews and presentations, and implementations with his professional advice on project selection and success metrics.

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Abstract:

The main reason for doing this project is to help the Muslim community whatever meat they are buying is Halal or Haram. The need of working on this project is to learn and to construct modern solution for buyers. We will be following a Waterfall model approach for the completion of this project and it will be in a systematic way. The possible achievements during this project will be team-work, learning new technologies, efficient time management, report writing and enhancement of research skills.

Chapter One: INTRODUCTION

1.1 Purpose:

Islamic food laws are based on Halal, Sanitation and Purity and most important among them is Halal meal. The need for proper monitoring of authenticity of Halal meat is a serious matter to the European country Muslims. The Software is design to examine whether the meat is Halal or not. Muslim or a person can verify the meat is Halal or not by Scanning the barcode and it provide all details about it (Halal or Not) plus (best before time).Slaughter house provides the packet of meat to supplier and supplier can further distribute it into supermarket, store or local market. By implementing the BLOCK CHAIN technology, no supplier or sealer able to tamper any type of data in it, to make it Halal product or any type of other useful data. So that any Muslim customer can take their decision easily without any hesitation

For example, if meat is not received properly or misplaced in a warehouse, the supply chain may be slowed or disrupted. These systems are critical in ensuring that these processes work smoothly by tracking inventory and making sure that goods are stored and sorted properly, as well as shipped and tracked accurately.

1.2 Need Assessment:

Many people buying the meat have the doubt that whether the product/meal is halal or haram and it is common issue in European country and many come up with idea and solution but they are time consuming but the management system save their time as well as energy. Management system can be of many different type (Nadra, Hospital, School, etc.). By designing the management system that is secure and tamper less can solve this problem easily.

1.3 Intended Audience and Reading Suggestions:

Halal Testing System is Management System, Basically it help the buyer what product(meat) He/She is buying is Halal or Haram and it can clear all their doubt regarding the product (meat).

1.4 Project Scope:

In this project, we will develop a web application which will check whether the product the people are purchasing is halal or Haram. It is intended for the use of people living abroad in non-Muslim countries.

The application will be web based and will require a web browser to run. The user will scan the QR code or barcode of the product through the application. Then the application will provide the user with all the information regarding the product e.g. halal or haram, date of manufacture, location of manufacturer, expiry date etc.

This web application will implement block chain as its core technology. The purpose of block chain in this project is to ensure additional data security and data integrity. By the use of block chain, authentic information of the product entered by the manufacturer in the system will propagate down the chain to the consumer. No data tampering of the core information of product can be done by the chain of suppliers or distributers.

At the end of this project, we will be having a prototype of a web application for the consumer and a minimum of 3 computers running the block chain network

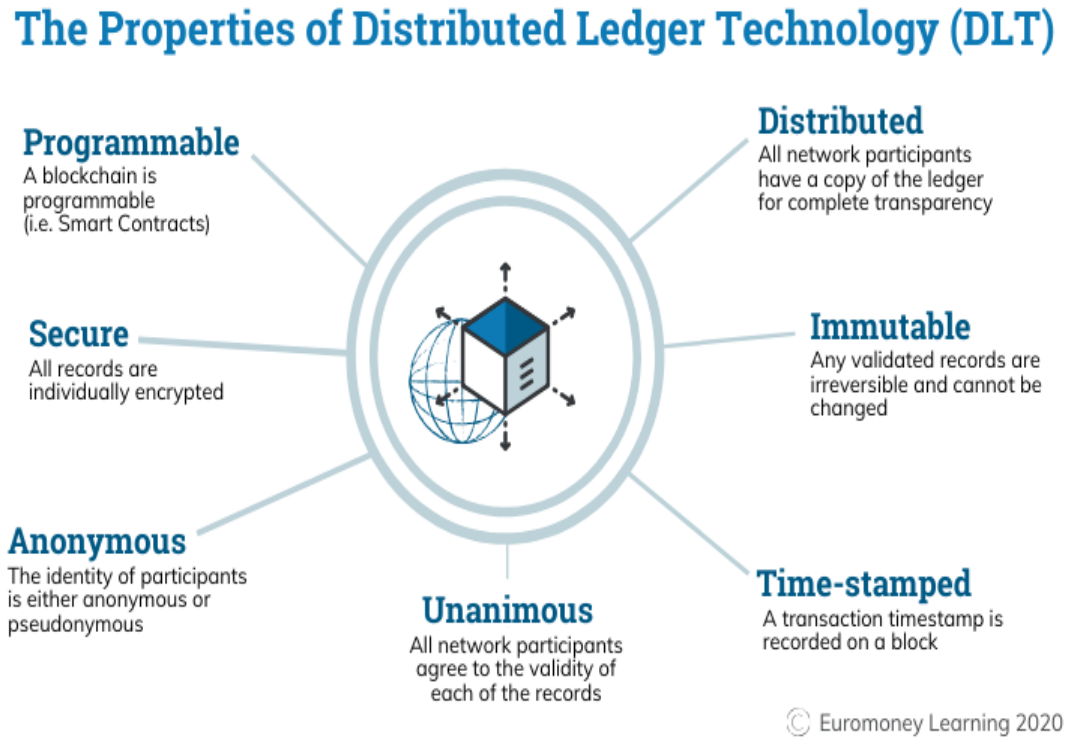
1.5 Block Chain Details:

1.5.1 What is Block Chain?

Block chain is a system of recording information in a way that makes it difficult or impossible to change, hack, or cheat the system.

A block chain is essentially a digital ledger of transactions that is duplicated and distributed across the entire network of computer systems on the block chain. Each block in the chain contains a number of transactions, and every time a new transaction occurs on the block chain, a record of that transaction is added to every participant's ledger. The decentralized database managed by multiple participants is known as Distributed Ledger Technology (DLT).

Block chain is a type of DLT in which transactions are recorded with an immutable cryptographic signature called a hash.



What is...
...a Blockchain?

1

A Digital Ledger

A Blockchain is a digital ledger which keeps records of all transactions taking place on a peer to peer network.

2

Encrypted Information

All Information transferred via blockchain is encrypted and every occurrence recorded, meaning once the block is created and added to the chain, it cannot be altered.

3

Peer to Peer

Lets you interact or send transactions with a peer, without an intermediary. Removes the middle man.

4

Data Sharing

The blockchain can be used for more than the transfer of currency. It can also be used to share contracts, records and any other type of data.

BLOCKCHAIN.WTF

5

Decentralization

The blockchain is decentralized, so there isn't a need for a central, certifying authority.

(1.5.2) How Does Block Chain Work:

The name block chain is hardly accidental: The digital ledger is often described as a “chain” that’s made up of individual “blocks” of data. As fresh data is periodically added to the network, a new “block” is created and attached to the “chain.” This involves all nodes updating their version of the block chain ledger to be identical.

How these new blocks are created is key to why block chain is considered highly secure. A majority of nodes must verify and confirm the legitimacy of the new data before a new block can be added to the ledger. For a cryptocurrency, they might involve ensuring that new transactions in a block were not fraudulent, or that coins had not been spent more than once. This is different from a standalone database or spreadsheet, where one person can make changes without oversight.

“Once there is consensus, the block is added to the chain and the underlying transactions are recorded in the distributed ledger,” says C. Neil Gray, partner in the finTech practice areas at Duane Morris LLP. “Blocks are securely linked together, forming a secure digital chain from the beginning of the ledger to the present.”

Transactions are typically secured using cryptography, meaning the nodes need to solve complex mathematical equations to process a transaction.

“As a reward for their efforts in validating changes to the shared data, nodes are typically rewarded with new amounts of the block chain’s native currency—e.g., new bitcoin on the bitcoin block chain,” says Sarah Shtylman, finTech and block chain counsel with Perkins Coie.

(1.5.3) Public vs Private Chain Work:

There are both public and private block chains. In a public block chain, anyone can participate meaning they can read, write or audit the data on the block chain. Notably, it is very difficult to alter transactions logged in a public block chain as no single authority controls the nodes.

A private block chain, meanwhile, is controlled by an organization or group. Only it can decide who is invited to the system plus it has the authority to go back and alter the block chain. This private block chain process is more similar to an in-house data storage system except spread over multiple nodes to increase security.

(1.5.4) Is Block Chain Secure?

Block chain technology achieves decentralized security and trust in several ways. To begin with, new blocks are always stored linearly and chronologically. That is, they are always added to the “end” of the block chain. After a block has been added to the end of the block chain, it is extremely difficult to go back and alter the contents of the block unless a majority of the network has reached a consensus to do so. That’s because each block contains its own hash, along with the hash of the block before it, as well as the previously mentioned time stamp. Hash codes are created by a mathematical function that turns digital information into a string of numbers and letters. If that information is edited in any way, then the hash code changes as well.

Let’s say that a hacker, who also runs a node on a block chain network, wants to alter a block chain and steal cryptocurrency from everyone else. If they were to alter their own single copy, it would no longer align with everyone else’s copy. When everyone else cross-references their copies against each other, they would see this one copy stand out, and that hacker’s version of the chain would be cast away as illegitimate.

Succeeding with such a hack would require that the hacker simultaneously control and alter 51% or more of the copies of the block chain so that their new copy becomes the majority copy and, thus, the agreed-upon chain. Such an attack would also require an immense amount of money and resources, as they would need to redo all of the blocks because they would now have different time stamps and hash codes.

Due to the size of many cryptocurrency networks and how fast they are growing, the cost to pull off such a feat probably would be insurmountable. This would be not only extremely expensive but also likely fruitless. Doing such a thing would not go unnoticed, as network members would see such drastic alterations to the block chain. The network members would then hard fork off to a new version of the chain that has not been affected. This would cause the attacked version of the token to plummet in value, making the attack ultimately pointless, as the bad actor has control of a worthless asset. The same would occur if the bad actor were to attack the new fork of Bitcoin. It is built this way so that taking part in the network is far more economically incentivized than attacking it.

(1.5.5) Supply Chain Using Block Chain:

As in the IBM Food Trust example, suppliers can use block chain to record the origins of materials that they have purchased. This would allow companies to verify the authenticity of not only their products but also common labels such as “Organic,” “Local,” and “Fair Trade.”

As reported by Forbes, the food industry is increasingly adopting the use of block chain to track the path and safety of food throughout the farm-to-user journey

(1.5.6) Why Implementing Block Chain:

The project is based on block chain. It's an open, distributed database. The data is distributed across many computers, and the whole block chain is entirely decentralized. This means no one person or entity (say, a government or corporation) has control over the block chain; this is a radical departure from the centralized databases that are controlled and administered by businesses and other entities.

These features make block chain irresistible in diverse scenarios and mark itself as the best possible solution.

- Immutability:

Block chain is immutable. This opens a lot of opportunities for platforms that need immutable traits to make their system more functional in a highly competitive market.

- Transparency:

Another crucial aspect that makes block chain so important is transparency. There are different types of block chain. Public block chain provides transparency due to its nature.

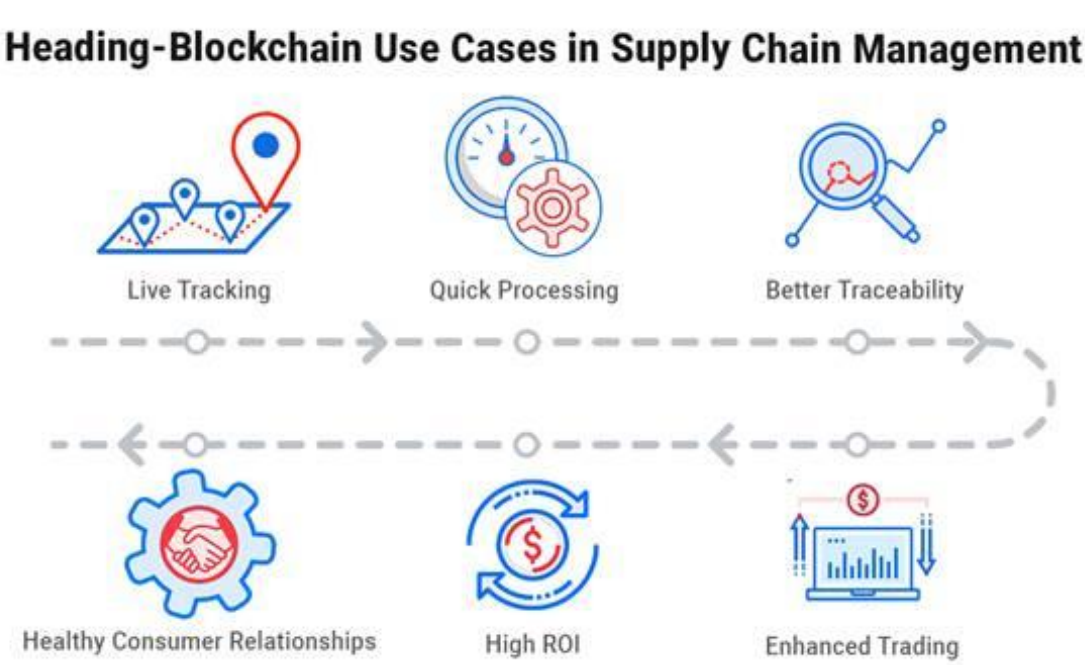
- Better Security:

Block chain uses cryptography to add a layer of security to the data stored on the network. Also, each block on the network carries a unique hash, which means that no data can be forged or changed by malicious actors or hackers.

(1.5.7) Objective and Reason:

The purpose of the block chain technology in halal testing system would be to make use of the block chain technologies within the preserving, handling and recording the information and details within an efficient and effective method. The goals could be outlined as:

- To protect the information and data within a practical and useful approach.
- To make use of the block chain within achieving goal.
- To ensure that the block chain can provide the reasonable steps those might additionally safeguard the data security and safety of health for users.


Heading-Blockchain Use Cases in Supply Chain Management
Live Tracking
Quick Processing
Better Traceability
Healthy Consumer Relationships
High ROI
Enhanced Trading

1.6 Project Overview:

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At the end of this project, we will be having a prototype of a web application for the consumer and a minimum of 3 computers running the block chain network

Chapter Two: Overview of the Project

2.1 Advantages of Project:

This project may be helpful for Europeans Country Muslims. As there is a lot of Halal Food issue and Meat is one of the most important among them. By scanning barcode they can verify either the meat is Halal or not. They can also verify the product best before data. By implementing Block Chain technology no can temper data of product. So that any Muslim customer can take their decision easily without any hesitation.

2.2 No of Modules in Project:

• This project is divided into 7 modules:

1. Admin Registration Module
2. Data Entry (regarding Product) Module
3. QR Code Generation Module
4. QR Code Verify Module
5. User Module
6. QR Code Scan Module
7. Product Detail Module

2.3 Module Description:

- **Admin Module:**

- Registration
  - Admin must sign up into the system to use it.
- Product Information
  - User/Slaughterhouse enters data into the system providing the information regarding the product including expiry date, meat category, halal or haram.
- Product Category
  - Products will be divided into categories and subcategories like Halal Meat or Haram
- Activity Logs
  - Slaughterhouse can record supplier details and product details.

- **Warehouse Operations:**

- Product Inward
  - Details of product stock at the time of entry.
- Dispatch Order
  - When the order is dispatch from the warehouse with all details.

- **User Module**

- Barcode/QR code scan
  - User can scan the barcode/QR code on the product to check product information.
- Maintaining History
  - History will be maintained of the scanned products. User can view previously scanned products details and clear the log.

2.4 Operating Environment:

Operating environment for the E-Commerce Store is as listed below.

- Client/server system
- Operating system: Web
- Database: Block Chain Database
- Platform: React and Block Chain
- Hosting: Localhost

➢ Client/server system:

Client-server denotes a relationship between cooperating programs in an application, composed of clients initiating requests for services and servers providing that function or service.

Categories of Client-Server Computing

There are four main categories of client-server computing:

- One-Tier architecture: consists of a simple program running on a single computer without requiring access to the network. User requests don't manage any network protocols, therefore the code is simple and the network is relieved of the extra traffic.
- Two-Tier architecture: consists of the client, the server, and the protocol that links the two tiers. The Graphical User Interface code resides on the client host and the domain logic resides on the server host. The client-server GUI is written in high-level languages such as C++ and Java.
- Three-Tier architecture: consists of a presentation tier, which is the User Interface layer, the application tier, which is the service layer that performs detailed processing, and the data tier, which consists of a database server that stores information.
- N-Tier architecture: divides an application into logical layers, which separate responsibilities and manage dependencies, and physical tiers, which run on separate machines, improve scalability, and add latency from the additional network communication. N-Tier architecture can be closed-layer, in which a layer can only communicate

with the next layer down, or open-layer, in which a layer can communicate with any layers below it.

- Operating system: Web:

An Operating System is a system software that acts as an interface between computer hardware and programs requesting I/O. It manages computer hardware, software resources and allows other programs to run.

A Web Operating System is an internet based user interface that allows people to access applications not stored on their computers but completely or partly on Internet. It is a dummy operating system that does not directly interact with computer hardware and depends on traditional operating system to work. In other words, it is an interface for distributed computing system such as cloud.

- Database: Block Chain Database:

To understand what block chain databases are, it is crucial to understand what a block chain is. Block chains are used as a digital ledger to store transactional information. The data is stored as signed blocks, which link to each other, creating a chain of immutable interconnected data entries.

To sign a new block, a node needs to find an SHA-256 signature that matches specific criteria. To do so, it will use the nonce field to brute force possible solutions. Any new block needs to be validated with the majority of the validation nodes forming the block chain. Once the block has been validated, it is added to all the nodes of the block chain. This way of validating

new blocks is called the proof of work (POW) and was very prevalent in the early days of block chain technology. Nowadays, other methods for validating have emerged, such as the proof of stake (PoS).

If any of the information in the data inside the block is altered, the signature becomes invalid. To make the block valid again, this signature would need to change. To ensure that the following blocks still work, a new signature would also need to be generated for each of them. Even if a node could regenerate those signatures, the changes would need to be accepted by a majority of the nodes hosting the block chain.

For these reasons, block chains are immutable. No information that is included in the data of the blocks can be changed. They are also managed by a set of decentralized nodes, removing the need for a central authority to control all the transactions. This immutability is why block chains have gained popularity in industries such as finances and real estate.

Thanks to the way that block chains work, they are ideal for storing asset information. In a block chain, one can create and transfer assets over to another entity. These movements are referred to as transactions.

Block chains can seem like a great solution to store information, but they do come with a price. The main limitation is around the performance when it comes to querying the database. Any new transactions need to be validated by all the nodes, and this can be a lengthy process, depending on the size of the blockchain itself. Querying the data can also be challenging, and the speed of read operations is nowhere near that of a database. This is where block chain databases come into play.

By combining the power of modern databases with the integrity of block chains, block chain databases offer a way to securely store data while still providing easy ways to query the data from the transactions.

- Platform: React and Block Chain:

  - REACT:

    React is a free and open-source front-end JavaScript library for building user interfaces based on UI components. It is maintained by Meta and a community of individual developers and companies. React can be used as a base in the development of single-page or mobile applications

  - Block Chain:

    A block chain is a distributed database that is shared among the nodes of a computer network. As a database, a block chain stores information electronically in digital format.

- Hosting: Localhost:

  In computer networking, localhost is a hostname that refers to the current device used to access it. It is used to access the network services that are running on the host via the loopback network interface. Using the loopback interface bypasses any local network interface hardware.

2.5 Design and Implementation Constraints:

2.5.1 Technology Constraints: Proposed web application can be implemented with React for front end design purpose and for the database purpose, we opt Block Chain DB.

2.5.2 Interface Constraints: Since, this is a WEB application so it should work on all Web browsers.

2.6 Assumptions and Dependencies:

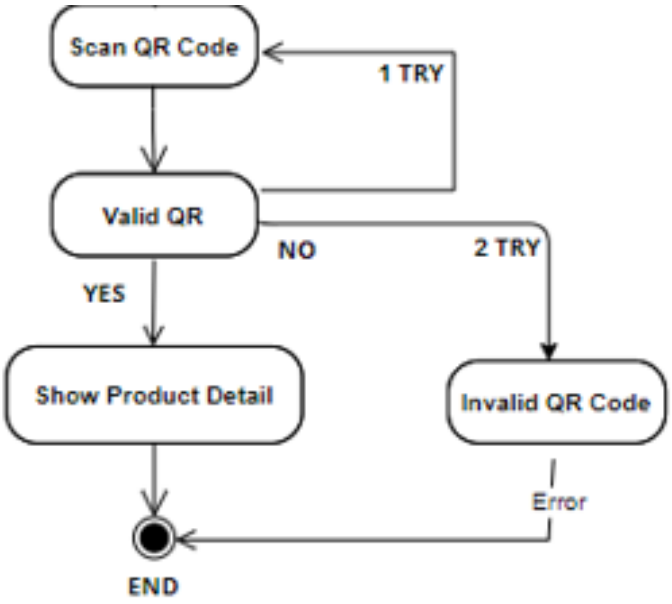
- All the Customers/Sellers have a web browser.
- All of them have access to internet.
- The software will have 99% uptime.

Chapter Three: Activity Diagrams

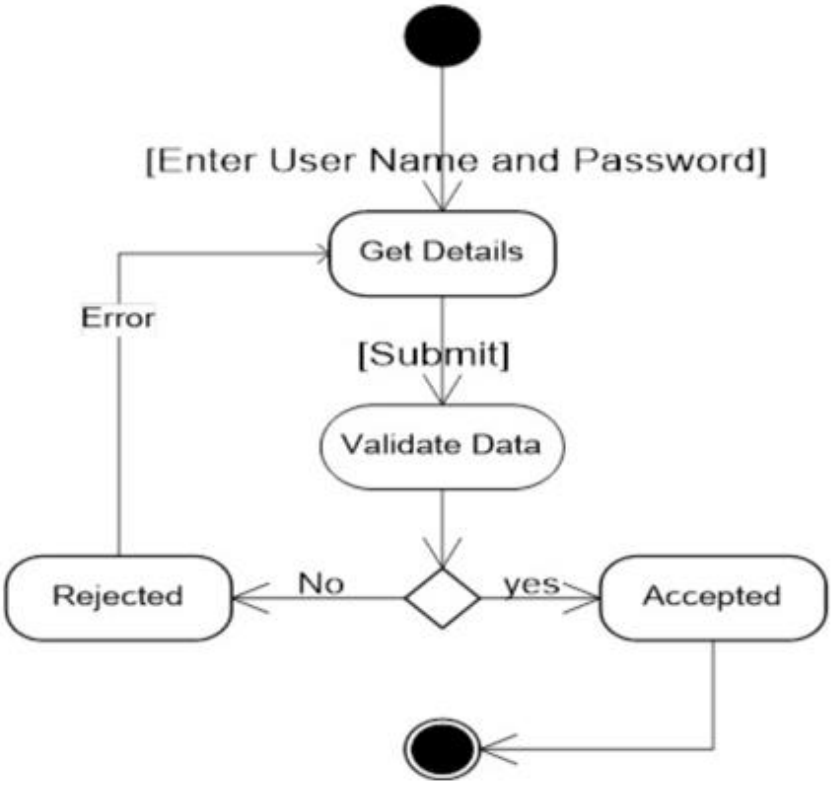
What is Activity Diagram?

Activity diagram is another important behavioral diagram in UML diagram to describe dynamic aspects of the system. Activity diagram is essentially an advanced version of flow chart that modeling the flow from one activity to another activity.

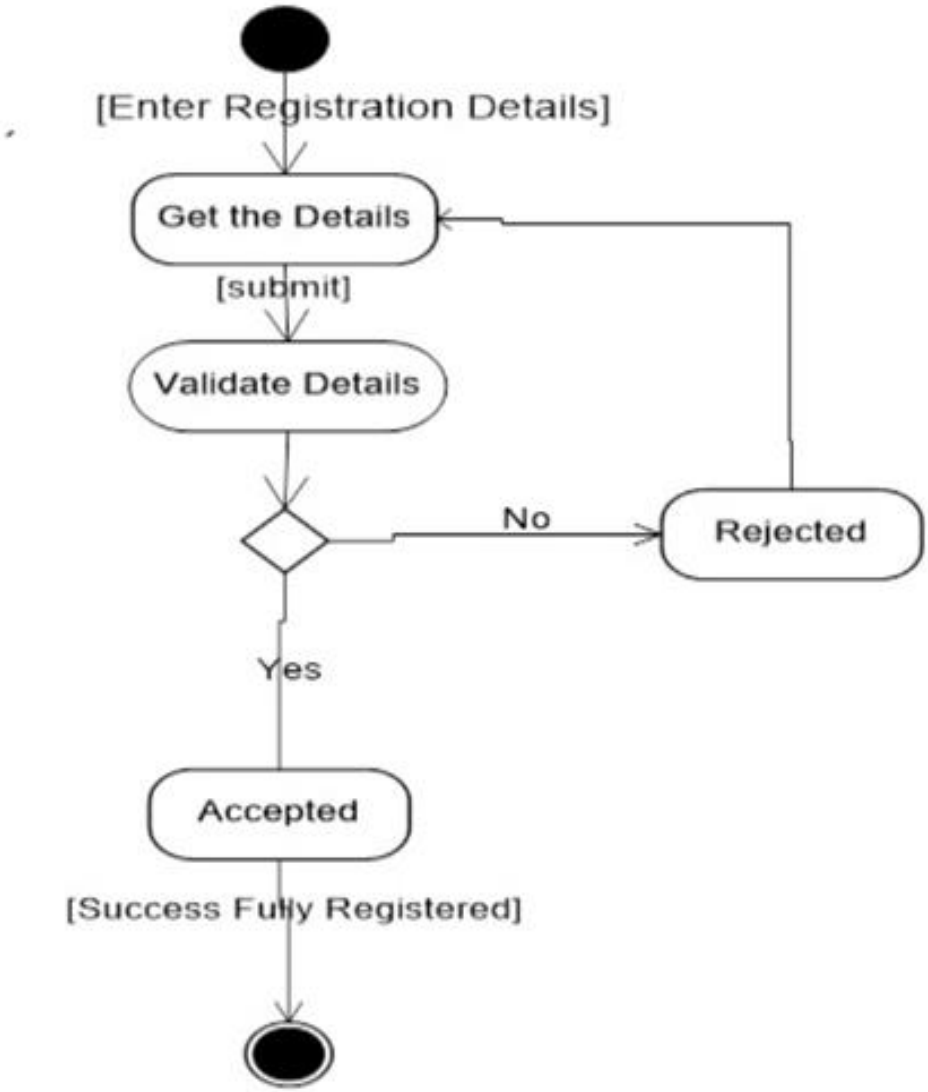
3.1: User Activity:



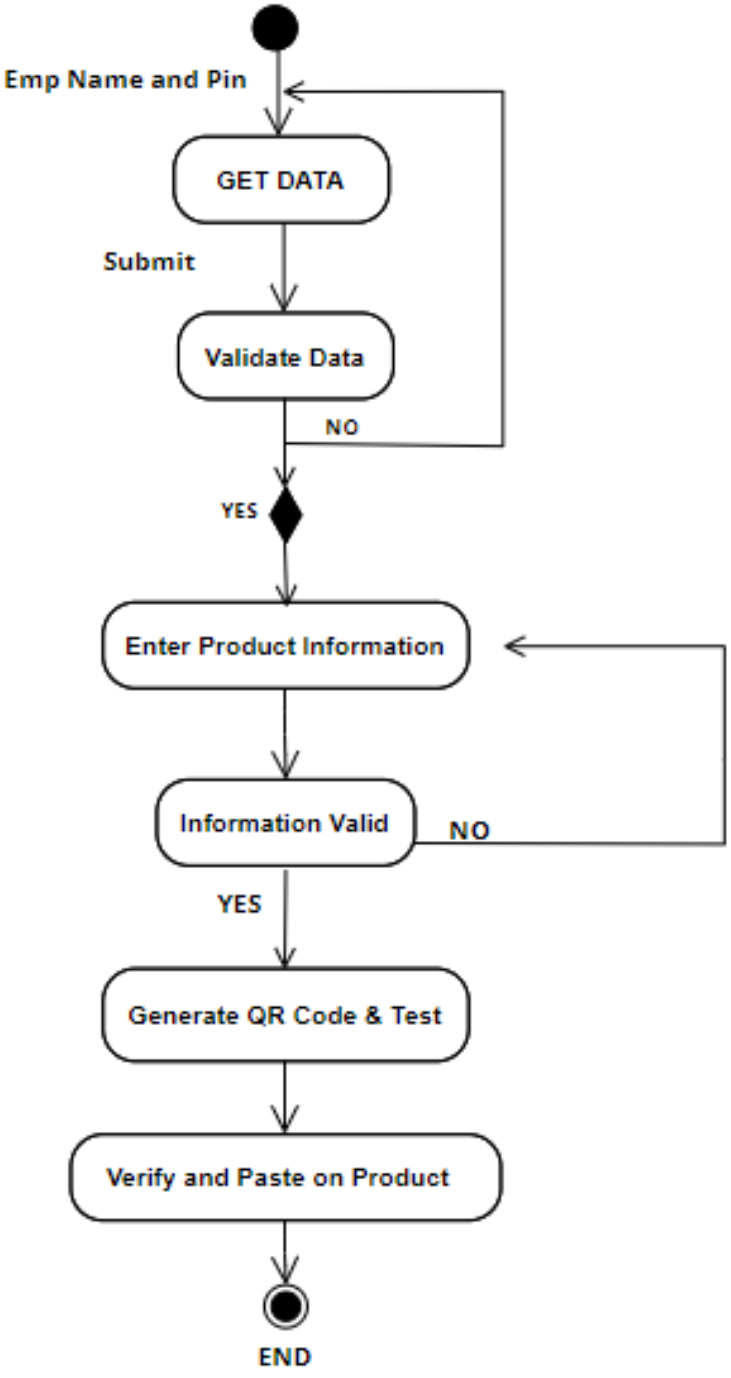
3.2: Admin Login Activity



3.3: Admin Registration Activity:



3.4: Admin Activity:



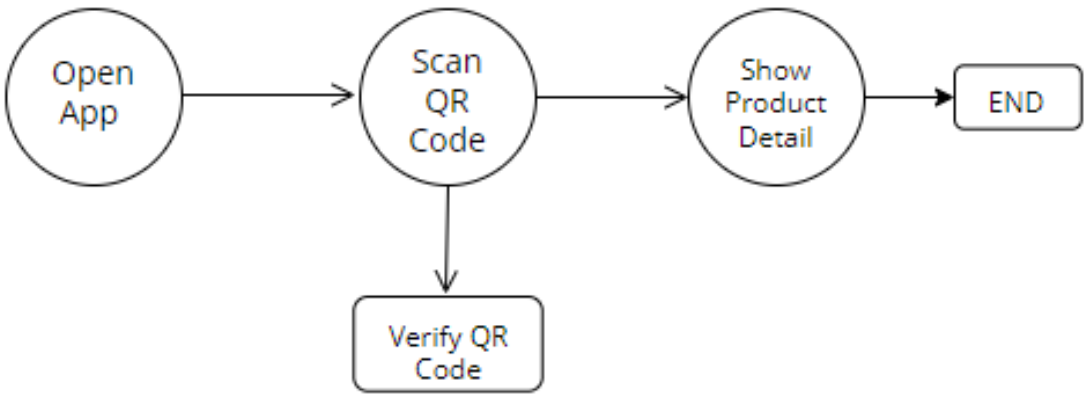
Chapter Four: DFD (Data Flow Diagram)

What is Data Flow Diagram?

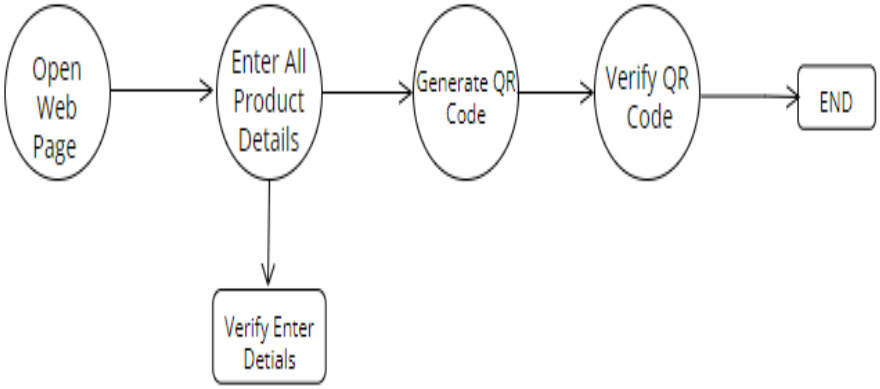
Also known as DFD, Data flow diagrams are used to graphically represent the flow of data in a business information system. DFD describes the processes that are involved in a system to transfer data from the input to the file storage and reports generation.

Data flow diagrams can be divided into logical and physical. The logical data flow diagram describes flow of data through a system to perform certain functionality of a business. The physical data flow diagram describes the implementation of the logical data flow.

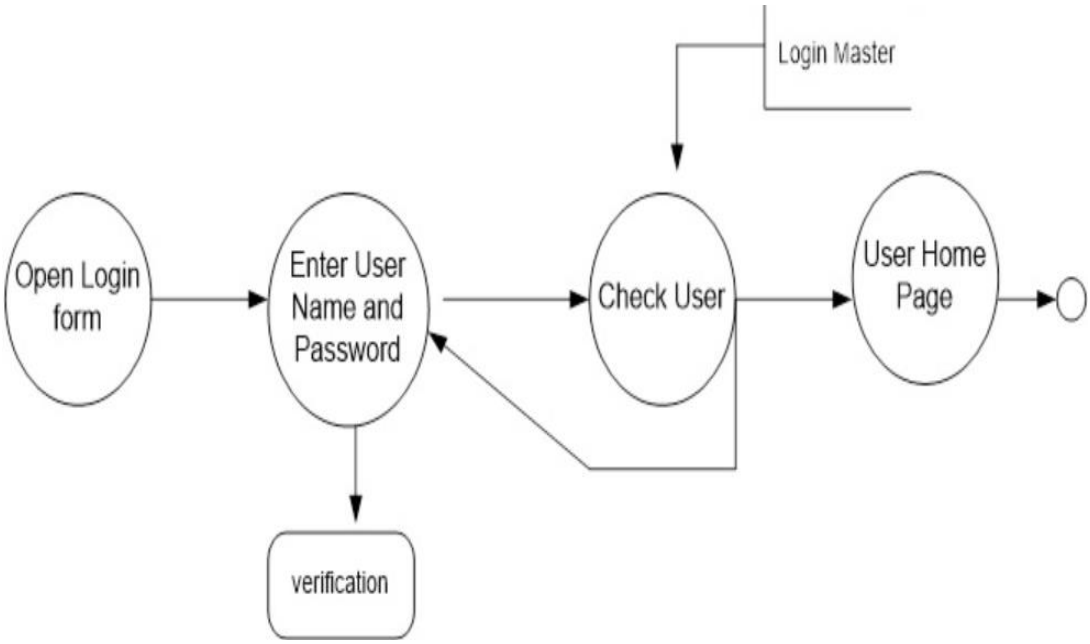
4.1 User Activity DFD:



4.2 Admin Activity DFD:



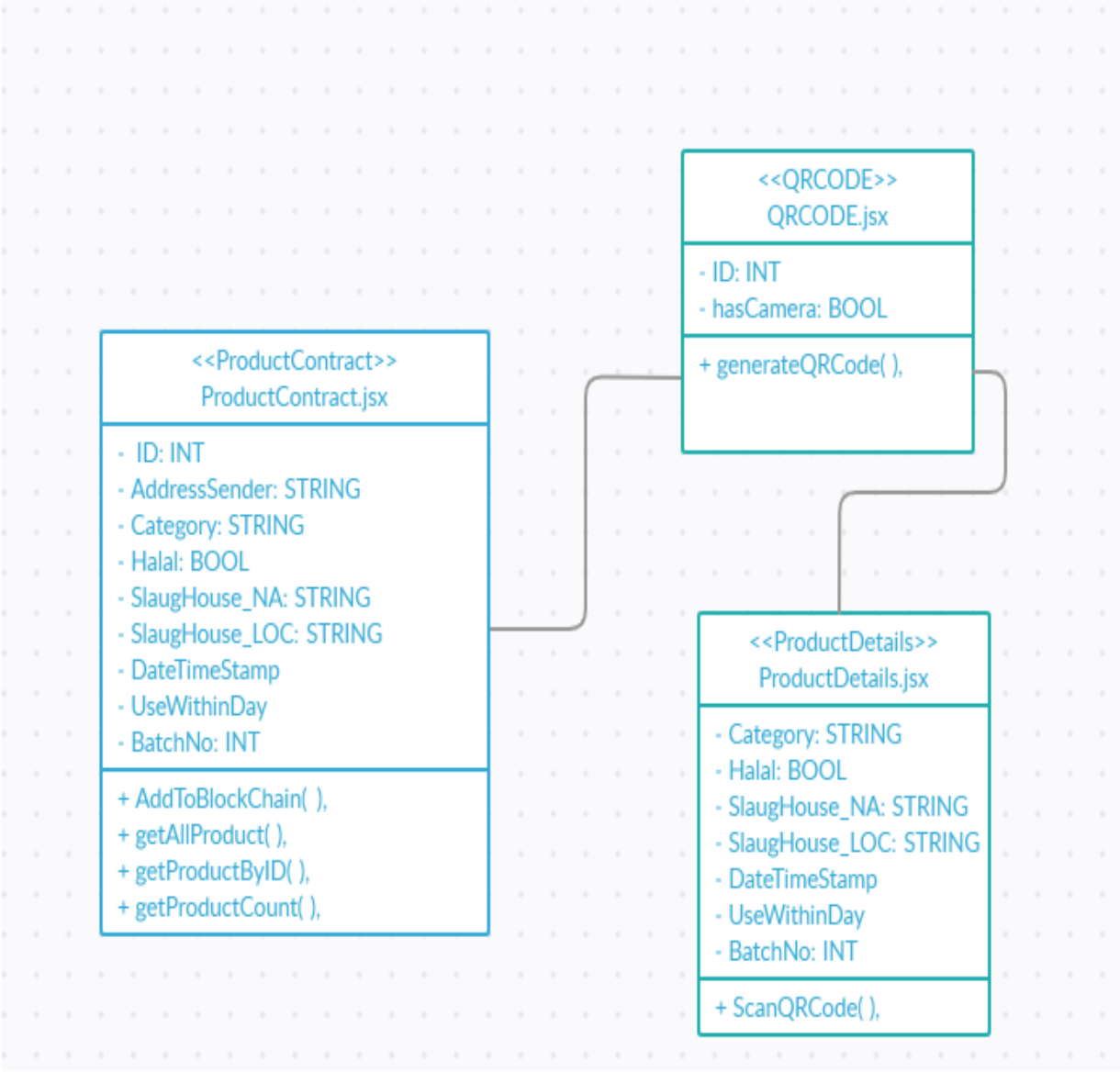
4.3 Admin and User login Activity DFD:



Chapter Five: UML (Unified Memory Language):

What is UML?

The Unified Modeling Language is a general-purpose, developmental, modeling language in the field of software engineering that is intended to provide a standard way to visualize the design of a system.



Chapter Six: Some Important Feature:

6.1 APP.jsx:

App.jsx

src > App.jsx > ...

```jsx
import { useState, useContext, useEffect } from "react";
import "./App.css";
import { ProductsContext } from "./context/ProductsContext";
import InputForm from "./components/InputForm";

function App() {
  const { connectWallet, currentAccount, productIDforQR } =
    useContext(ProductsContext);

  const downloadQR = () => {
    saveAs(
      `https://chart.googleapis.com/chart?chs=300x300&cht=qr&chl=${productIDforQR}`,
      `QR code (${productIDforQR}) .png`
    );
  };

  return (
    <div className="App">
      <header className="App-header">
        <div>
          {!currentAccount ? (
            <button className="connect" type="button" onClick={connectWallet}>
              Connect to Wallet
            </button>
          ) : (
            <InputForm />
          )}
        </div>
      </header>
    </div>
  );
}
```

6.2 ProductInfo.jsx:

ProductInfo.jsx

src > components > ProductInfo.jsx > ...

```jsx
const ProductInfo = (props) => {
  const { productInfo } = props;

  return (
    <div className="pd30">
      {productInfo?.id ? (
        <div>
          <p>
            <span>
              <b>Category: </b>
            </span>
            {productInfo.category}
          </p>
          <p>
            <span>
              <b>Halal: </b>
            </span>
            {productInfo.halal ? "yes" : "no"}
          </p>
          <p>
            <span>
              <b>Slaughter House Name: </b>
            </span>
            {productInfo.slaughterhouseName}
          </p>
          <p>
            <span>
              <b>Slaughter House Location: </b>
            </span>
            {productInfo.slaughterhouseLocation}
          </p>
          <p>
```

6.3 QRCode.jsx:

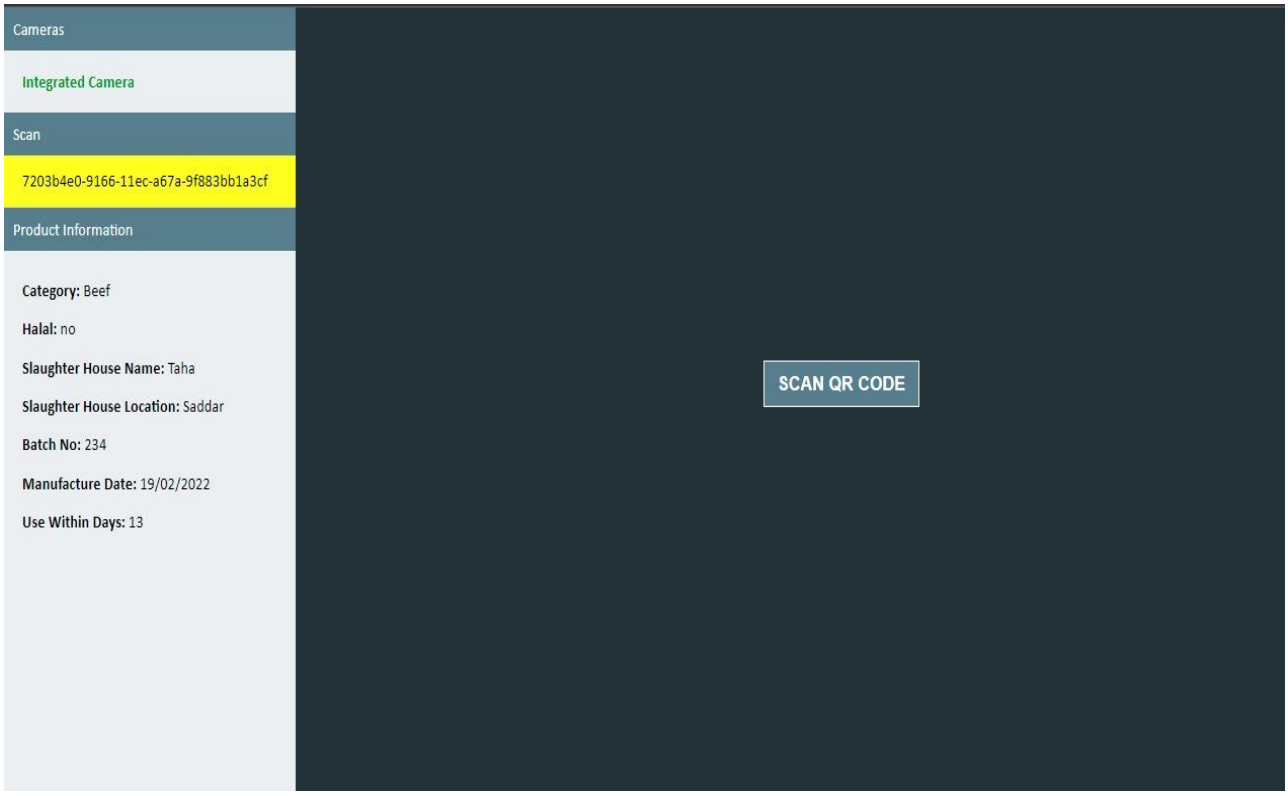
QrScanBox.jsx

src > components > QrScanBox.jsx > ...

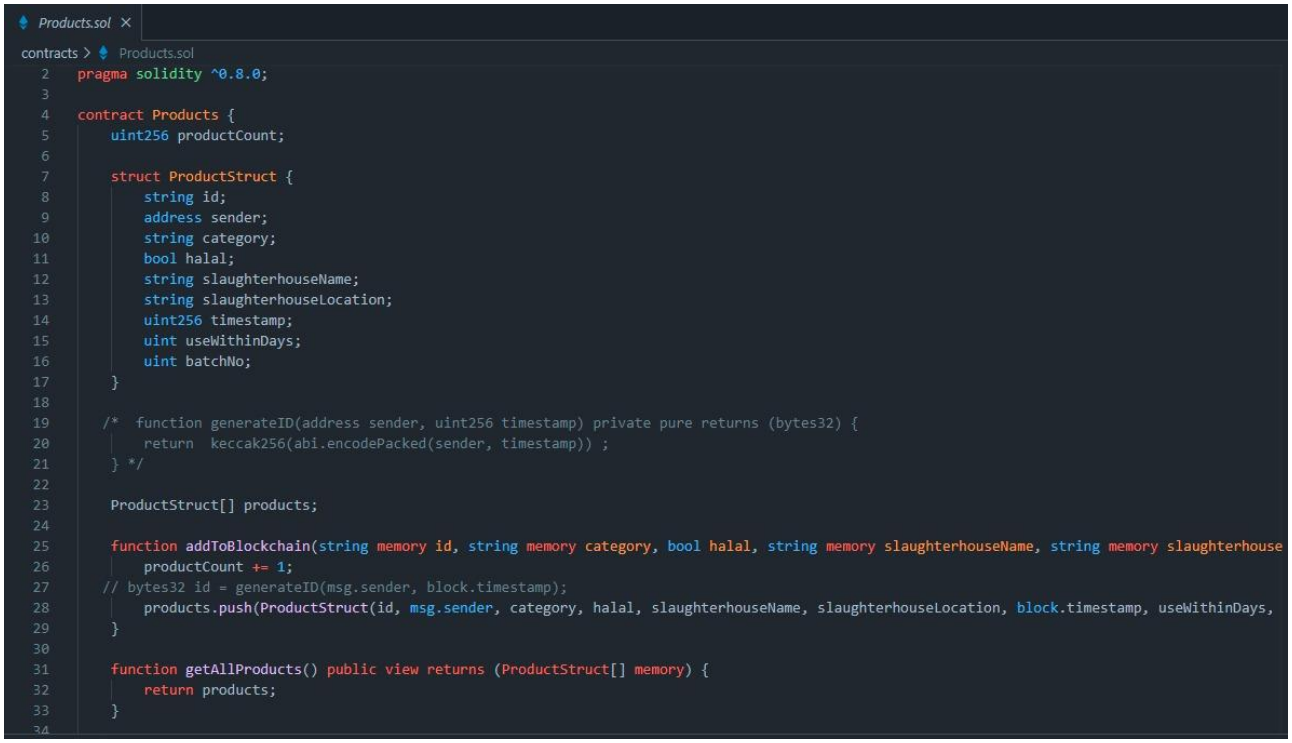
```jsx
const QrScanBox = () => {
  let navigate = useNavigate();
  const [qrId, setqrId] = useState(0);
  const [camera, setCamera] = useState(false);

  useEffect(async () => {
    try {
      const hasCamera = await QrScanner.hasCamera();
      setCamera(hasCamera);
      if (hasCamera) {
        const qrScanBox = document.getElementById("qrScanBox");
        const qrScanner = new QrScanner(
          qrScanBox,
          (result) => {
            renderQrResult(result, qrScanner);
          },
          { highlightScanRegion: true }
        );
        qrScanner.start();
      }
    } catch (err) {
      console.log(err);
    }
  }, []);

  const renderQrResult = (result, qrScanner) => {
    setqrId(result?.data);
    if (result.data) {
      qrScanner.stop();
      navigate("/", {
        state: {
          qrId: result.data,
```


Cameras
Integrated Camera
Scan
7203b4e0-9166-11ec-a67a-9f883bb1a3cf
Product Information
Category: Beef
Halal: no
Slaughter House Name: Taha
Slaughter House Location: Saddar
Batch No: 234
Manufacture Date: 19/02/2022
Use Within Days: 13
SCAN QR CODE

6.4 ProductContext.jsx:



```sol
Products.sol
contracts > Products.sol
pragma solidity ^0.8.0;

contract Products {
    uint256 productCount;

    struct ProductStruct {
        string id;
        address sender;
        string category;
        bool halal;
        string slaughterhouseName;
        string slaughterhouseLocation;
        uint256 timestamp;
        uint useWithinDays;
        uint batchNo;
    }

    /*  function generateID(address sender, uint256 timestamp) private pure returns (bytes32) {
        return  keccak256(abi.encodePacked(sender, timestamp)) ;
    } */

    ProductStruct[] products;

    function addToBlockchain(string memory id, string memory category, bool halal, string memory slaughterhouseName, string memory slaughterhouse
        productCount += 1;
    // bytes32 id = generateID(msg.sender, block.timestamp);
        products.push(ProductStruct(id, msg.sender, category, halal, slaughterhouseName, slaughterhouseLocation, block.timestamp, useWithinDays,
    }

    function getAllProducts() public view returns (ProductStruct[] memory) {
        return products;
    }
```

```sol
Products.sol
contracts > Products.sol

    function getProductCount() public view returns (uint256) {
        return productCount;
    }

    function getProductById(string memory ID) public view returns (ProductStruct memory) {
        ProductStruct memory prod;
        for(uint i =0; i < products.length; i++) {
            if(keccak256(abi.encodePacked( products[i].id)) == keccak256(abi.encodePacked(ID))
            ) {
                prod = products[i];
                break;
            }
        }
        return prod;
    }

}
```

Slaughter House

Name

Enter your Name

Location

Enter your Location

Days

Enter Used Within Days

Batch No:

Enter batch No

Halal Haram

Food Category

Beef

Submit

Chapter-Seven:

Conclusion:

The project focuses according to problem of customer and it will definitely help the problem of customer and quite use full for the Muslim community and they can take their decision without any hesitation. Secondly there is no data tamper possible in project if any one try to do it. So it is false data free.