



# **COUNTERFEIT PRODUCT DETECTION USING BLOCKCHAIN**

**APRIL, 2021**

**BHAGWAN ARIHANT INSTITUTE OF TECHNOLOGY**

**SURVEY NO. 149, NR. VIP ROAD, VESU-BHARTHANA, SURAT, GUJARAT, INDIA**



# **“Counterfeit Product Detection using Blockchain”**

## **A PROJECT REPORT**

**Submitted by**

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Prof. Monali Panchal

In fulfillment for the award of the degree

Of

**BACHELOR OF ENGINEERING**

In

**COMPUTER ENGINEERING**



**BHAGWAN ARIHANT INSTITUTE OF TECHNOLOGY**

**BMEF Campus, VIP road, Bharthana Vesu, Surat, Gujrat, INDIA**

**Gujarat Technological University, Ahmedabad**

**April, 2021**



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*This is to certify that the **PROJECT** entitled “**Counterfeit Product Detection using Blockchain**” has been carried out by **Smit Patel (171390107034)**, **Umesh Prajapati (171390107037)**, **Tilak Sabhadiya (171390107039)** students of BE IV, Semester VIII under my guidance in fulfilment of the degree of Bachelor of Engineering in Computer Engineering (8<sup>th</sup> Semester) of Gujarat Technological University, Ahmedabad during the academic year 2020-21.*

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Signature of Guide

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3. The project work is not copied from any previously done projects directly. (Same project can be done in different ways but if it has been done in same manner before then it may not be accepted)
4. **SELF** to the best of my knowledge is a genuine industry engaged in the professional service/social organizations.
5. We understand and accept that he above declaration if found to be untrue, it can result in punishment/cancellation of project definition to me/we including failure in the subject of project work.

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## **ABSTRACT**

Companies have been battling counterfeiters for years, investing significant time and resources to guard against the risk of defective and fake parts entering the production system and to prevent clever look-alikes and reverse-engineered goods from stealing sales. For much of that time, companies have been forced to operate partly in the dark, because fragmented data, networks, and sourcing arrangements make it difficult to trace and authenticate. Two technologies now give manufacturers and stakeholders the ability to shine a light on fraudulent activity. Advances in blockchain counterfeit detection provide at-a-glance visibility, tracing, and recording of provenance data from source to sale and beyond. The scale of the benefits will vary across businesses, but our research suggests that blockchain could be a source of significant financial and competitive advantage for many.

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# **CHAPTER 1: INTRODUCTION**

# **1. Introduction**

Global losses incurred due to counterfeiting amounted to USD 323 billion in 2017, according to the 2018 International Full Counterfeiting Survey, with purse companies responsible for \$20 billion of that. The counterfeit market and counterfeit product area unit Alone Worldwide are on the rise. Area units of government and state-owned entities take measures to stop this. In the counterfeit market, a commodity sold is also counterfeit or original, although this can be seen as a breach of a sales regulation. The counterfeit marketplace will have an impact on rustic growth. Fake or illegal replicas of a significant product in the counterfeit product area unit. Counterfeit goods are commonly manufactured to take advantage of the superior price of the imitated product. Almost every company faces a counterfeit threat as a consequence of the sales of a company is not only poignant, but also harms the reputation of the brand. The rest of the area unit of the company do not owe this loss. Every area unit of the leading business is making multiple attempts to prevent consumers from endangering this counterfeit product and causing significant physical harm to the bound product. On a strict economic note, a counterfeit Grammar Check operation would directly harm the company's growth and survival with an increasingly competitive market and declining margins. Sectoral companies have taken advantage of many trendy innovations to avoid counterfeit goods and programs. However, several new technologies are being introduced by the company that makes the product, which is uncommon for customers to believe in a product. The barcode and QR code, for example. Customers see their mobile application as a solution that helps to recognize the authenticity of goods for businesses and customers.

## **1.1 Problem Summary & Introduction**

Counterfeit products have long impacted supply chains in the pharmaceutical, jewelry, electronics, and retail sectors. Fraudsters are able to easily implement fakes or cheap item copies at different stages of the supply chain process due to insufficient control in tracking the movement of goods. There is a 20 percent rise in the black market for counterfeits and their illegal trade each year, resulting in billions of lost revenues.

## **1.2 Aim and Objectives of Work**

**Aim:** Automate and integrate interactions across the availability chain between vendors, producers, distributors, distribution hubs, retailers, and customers. Provide useful methods for verification of the authenticity of product lifecycle management & components.

**Objective:** Using an innovative blockchain protocol to ensure safe storage of information on the manufacturer and origin of the product. It enables goods from manufacturing lines to distribution centers to the point of sale and customers to be tracked and monitored.

### **1.3 Problem Specification**

- In many cases, customers seek to purchase counterfeit goods for a reason, such as lower price or as a substitute for the original, with the online marketplace becoming the dominant marketplace for purchasing counterfeit goods. In fact, the demand for counterfeit goods is driven by the demand others, such as textiles over luxury watches. Different types of counterfeit goods garner different profit margins. Different strategies have emerged from the perspective of the counterfeiter: dis-aggregators, imitators, fraudsters, desperados, and smugglers.
- Duplicate branded goods are most commonly sold unfortunately, not only the stalls on open-air markets but also customers shopping outlets and well-known retail chains. The problem is made worse by some retailers who willingly buy fake goods in order to achieve higher profit margins.

**Solution:**

- 1) Each item is labeled with a unique ID called QR code tag.
- 2) The tag is used at all stages of the supply chain for recording the history of transfers, ownership, locations, etc. and permanently on the blockchain.
- 3) On being identified, Products can then be easily cross-checked and verified online through a database at every point of the supply chain. When identification numbers match database content, the particular product can be regarded as authentic.

### **1.4 Brief Literature Review & PSAR**



#### **Patent: 1**

- **Patent No:** US 8,917,159 B2
- **Patent Title:** fully secure item-level tagging
- **Inventor/s Details:** Clarke William McAllister, Eugene, OR (US); Daniel Shihady Campbell, Boston, MA (US)

- **About Invention:** The present invention provides value to brand owners, retailers, and consumers through the use of radio frequency identification, Stenography, nanolithography, fingerprints, novel heuristic threat evaluation, indication, and detection model. Additionally, using cryptography, tag passwords are formulated and identities are reversibly flipped, thus allowing item identities to remain secret to unauthorized observers. This unique combination of heuristics and authentication technologies provides an efficient means of finding and stopping the flow of counterfeit products throughout global supply chains. The present invention includes radio frequency identification (RFID) tags, encoders, servers, identity changers, and authenticity verifiers to make this task a viable and adaptive weapon against the elusive counterfeiters. The present end-to-end RFID system offers unprecedented security for retailers and consumers, while remaining efficient and Scalable.

## **Patent: 2**

- **Patent No:** WO 2017/116303 A1
- **Patent Title:** Secure dual-mode anti-counterfeit product authentication methodology and system
- **Inventor/s Details:** Liyu Liu, Kok Leong TOH
- **About Invention:** An anti-counterfeit product identification system and method for determining the authenticity of a product using Near Field Communication (NFC) technologies, Smartcard technology, mobile devices and integrated software applications. The manufactured product contains a manufacturer identification code included during the manufacturing process, from the manufacturer. The same product is embedded with a tag enabled with NFC technology and marked with a unique identification number and an encrypted secret code. An authentication client contains an authentication software application which will be activated to read the manufacturer identification code and the data found in the said tag. The authentication client and the said tag will undertake a series of mutual authentication processes before verifying the authenticity of the product. Thereafter, the first-level authenticity result will be transmitted to the user. The user can proceed to authenticate further by going online and being connected to a secure encrypted authentication server. By going on line, the user will engage the configured application in the authentication client to communicate with the encrypted authentication server and compare the paired data from the

first-level authenticity step with the secured code in the server, thereby fully authenticating the product and which the second-level authenticity result is transmitted to the user through the authentication client.

### **Patent: 3**

- **Patent No:** US 201600.98723A1
- **Patent Title:** System and method for block-chain classification verification of goods
- **Inventor/s Details** Patrick Joseph Feeney, Stamford, (US)
- **About Invention:** A method for block-chain verification of goods includes Scanning, by a computing device, using a code scanner, an address from a code affixed to a product, Verifying, by the computing device, that the address is associated with a crypto-currency transaction recorded at a transaction register, obtaining, by the computing device, at least one current transaction datum, and determining, based on the Verification and, the at least one current transaction datum, that the product is authentic.

### **Patent: 4**

- **Patent No:** USOO9635.000B1
- **Patent Title:** BLOCKCHAIN IDENTITY MANAGEMENT SYSTEM BASED ON PUBLIC IDENTITIES LEDGER
- **Inventor/s Details:** Sead Muftic, Rockville, MD (US)
- **About Invention:** The invention describes an identity management system (IDMS) based on the concept of peer-to-peer protocols and the public identities ledger. The system manages digital identities, which are digital objects that contain attributes used for the identification of persons and other entities in an IT system and for making identity claims. The identity objects are encoded and cryptographically encapsulated. Identity management protocols include the creation of identities, the validation of their binding to real-world entities, and their secure and reliable storage, protection, distribution, verification, updates, and use. The identities are included in a specially constructed global, distributed, append-only public identities ledger. They are forward- and backward-linked using the mechanism of digital signatures. The linking of objects and their chaining in the ledger is based on and reflect their mutual validation

relationships. The identities of individual members are organized in the form of linked structures called the personal identities chains. Identities of groups of users that validated identities of other users in a group are organized in community identities chains. The ledger and its chains Support accurate and reliable validation of identities by other members of the system and by application services providers without the assistance of third parties. The ledger designed in this invention may be either permissioned or unpermissioned. Permissioned ledgers have special entities, called BIX Security Policy Providers, which validate the binding of digital identities to real-world entities based on the rules of a given security policy. In unpermissioned ledgers, community members mutually validate their identities. The identity management system provides Security, privacy, and anonymity for digital identities and satisfies the requirements for decentralized, anonymous identities management systems.

#### **Patent: 5**

- **Patent No:** US 8,140,852 B2
- **Patent Title:** Authenticating serialized commodities
- **Inventor/s Details** Erich Guenter, Mark Edmund Maresh, Thomas S. Mazzeo
- **About Invention:** A system for authenticating a serialized commodity is presented. A fixed identification, serial number, and authentication code are received for a serialized commodity to be checked for authenticity. A reference table is searched for an entry that matches the received fixed identification. In response to finding an entry in the reference table that matches the received fixed identification, a fixed identification key is retrieved from the reference table that is associated with the received fixed identification. A recreated authentication code is generated for the serialized commodity using the retrieved fixed identification key, the received fixed identification, and the received serial number. Then, it is determined whether the recreated authentication code matches the received authentication code. In response to determining that the recreated authentication code does match the received authentication code, an authentication code match message is outputted to authenticate the serialized commodity.



## 1.5 Plan of Work

Sr. No.	Task Name	Month	Week
1.	Research about Supply Chain	January	First
2.	Team Formation		Last
3.	Select the Domain and Research Project	February	First
4.	Initial Project Presentation		Last
5.	Research about Asset tracking	March	First
6.	Implementing Supply Chain in Blockchain		Third
7.	Improve Blockchain Database		Third
8.	Implementation of Business Model Canvas		Last
9.	Implementing Product Search Page	April	First
10.	Prepare Project Report		First

**Table 1.1: Gantt Chart**

## **1.6 Tools Require**

### **1.6.1 Hardware Requirement**

- Monitor: Any Monitor
- Smart Phone
- Minimum RAM: 1 GB
- Hard Disk: 40GB
- Processor Size: 32bit or above
- Operating System: Windows XP or above

### **1.6.2 Software Requirement**

- Front End: Flask
- Back End: Python
- Editor: PyCharm / VS Code
- Documentation: MS office 2019
- Browser: Web Browser (Any Compatible Browser)
- QR Code Scanner
- Server
- Cloud Database

# **CHAPTER 2: REQUIREMENT ANALYSIS & DESIGN**

## 2.1 Requirement Analysis Model

### 2.1.1 E-R Diagram

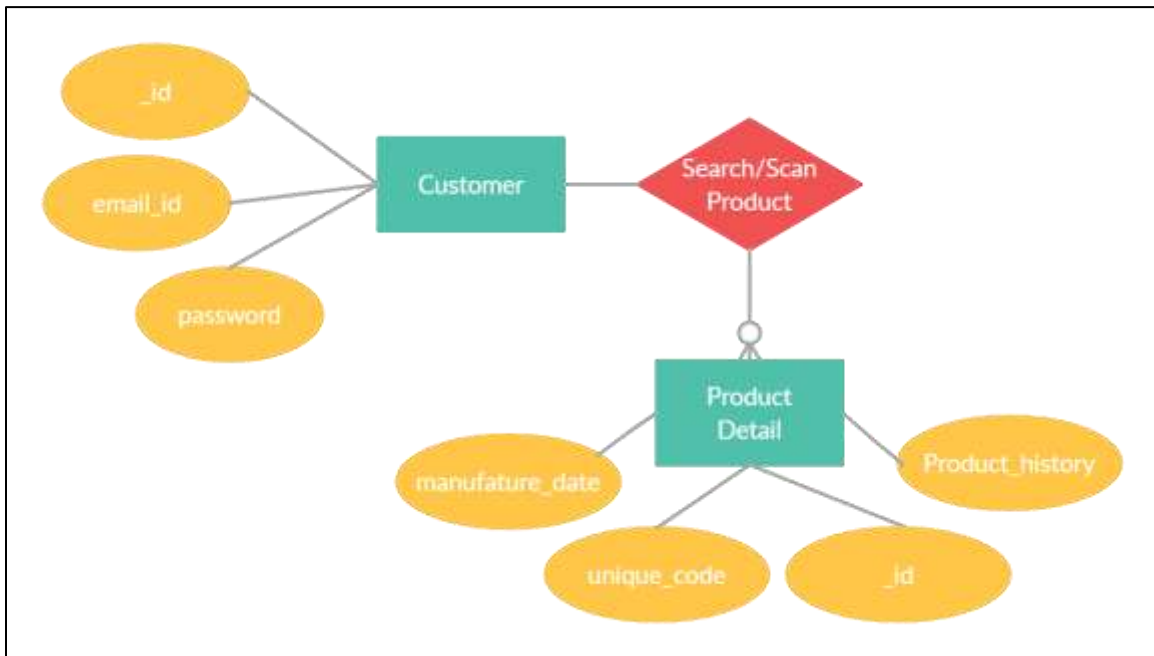


Figure 2.1 : Customer side ER-diagram

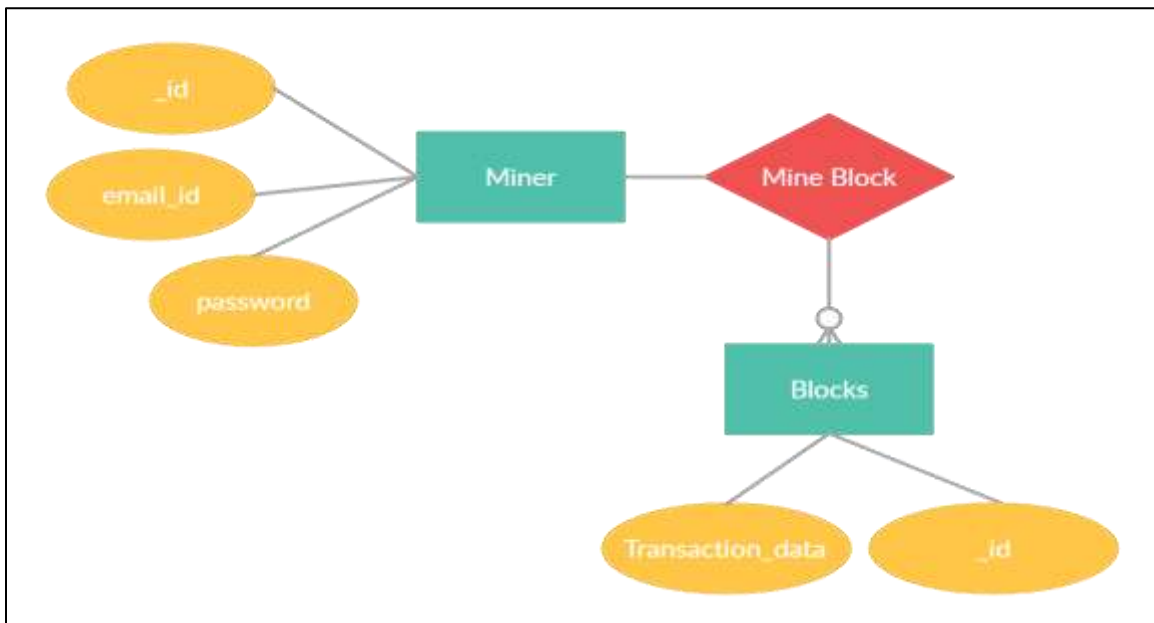


Figure 2.2: Miner side ER diagram

## 2.1.2 Data Flow Diagram

### DFD Level 0

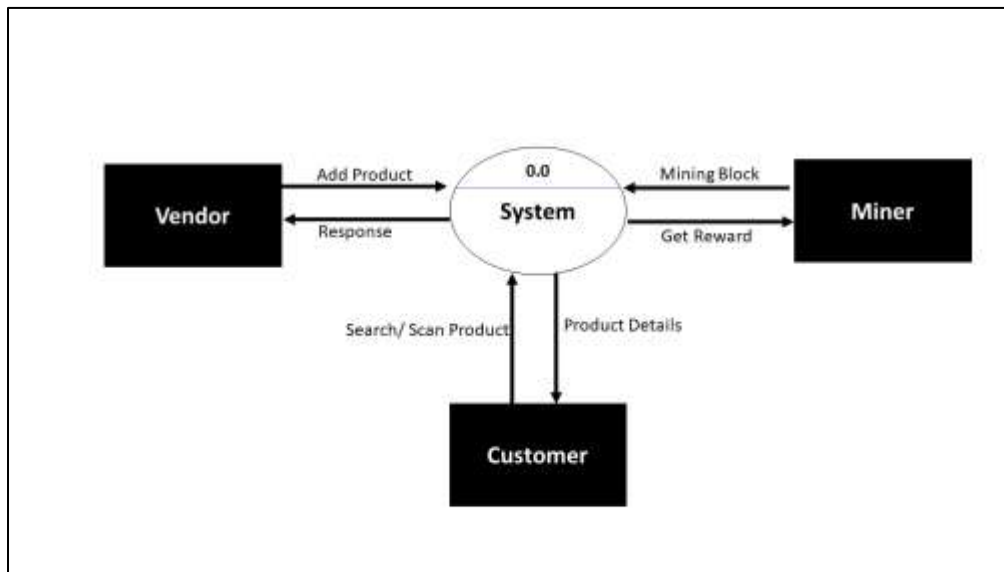


Figure 2.3 : DFD level 0

### DFD Level 1

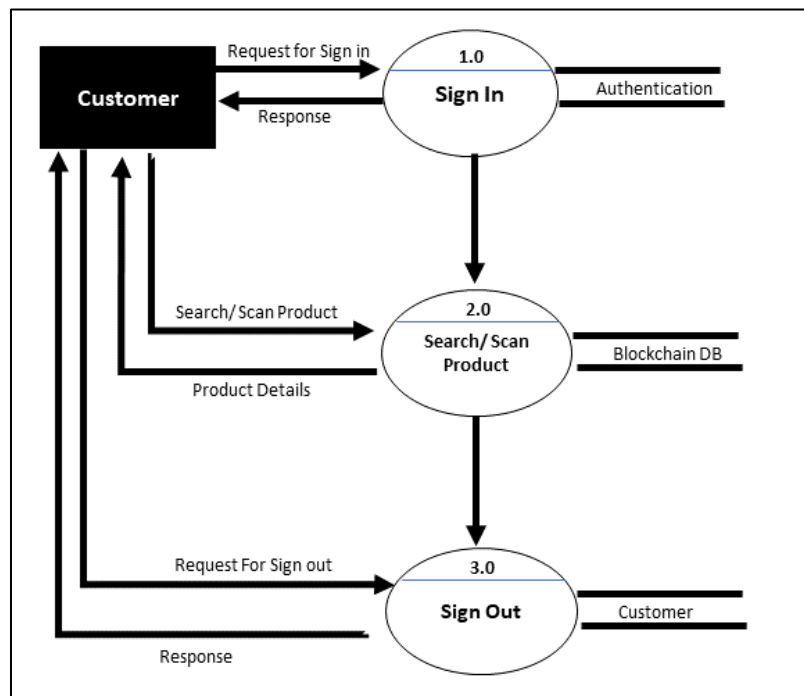


Figure 2.4 : DFD level 1 for Customer

## DFD Level

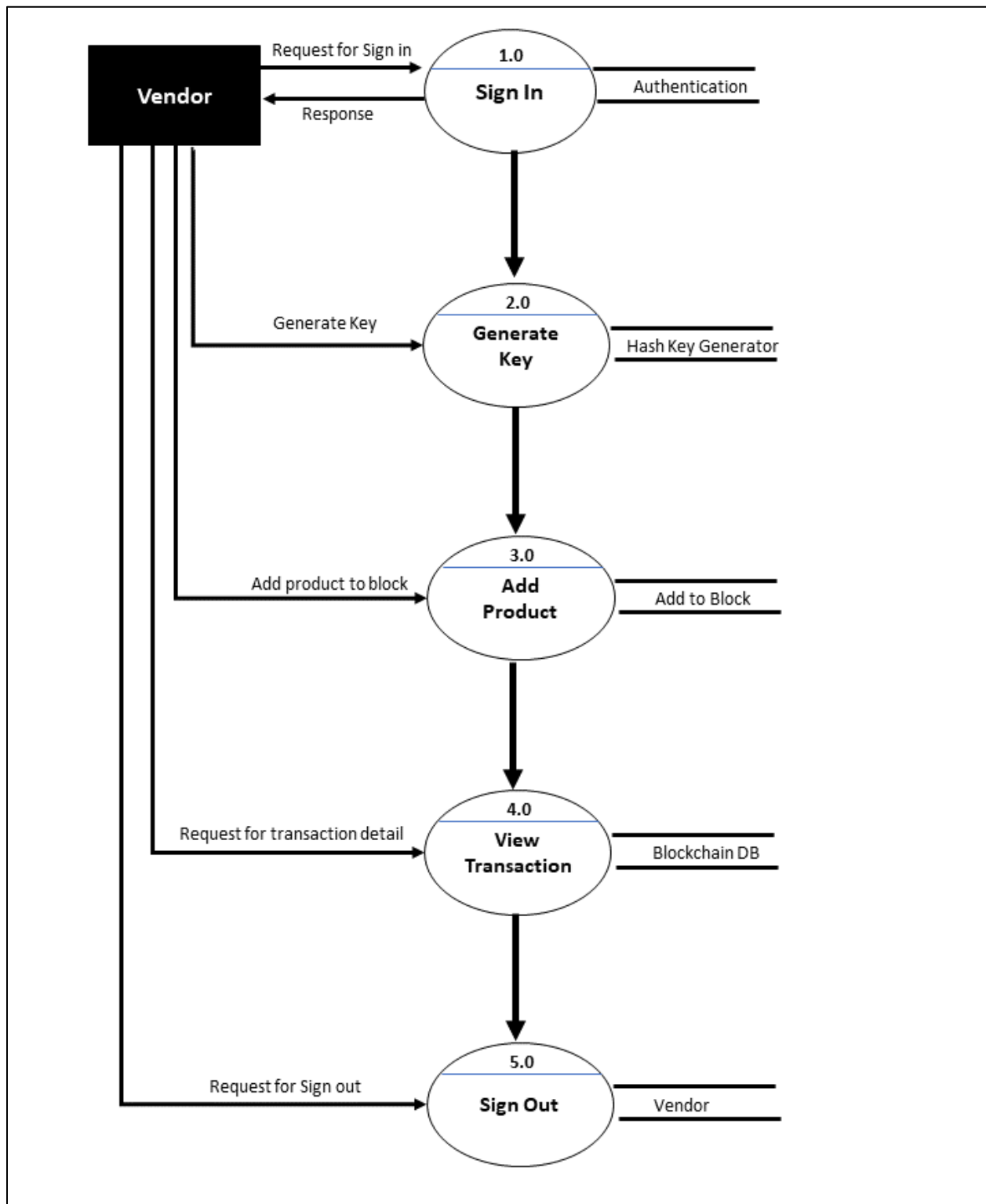


Figure 2.5 : DFD level 1 for Vendor

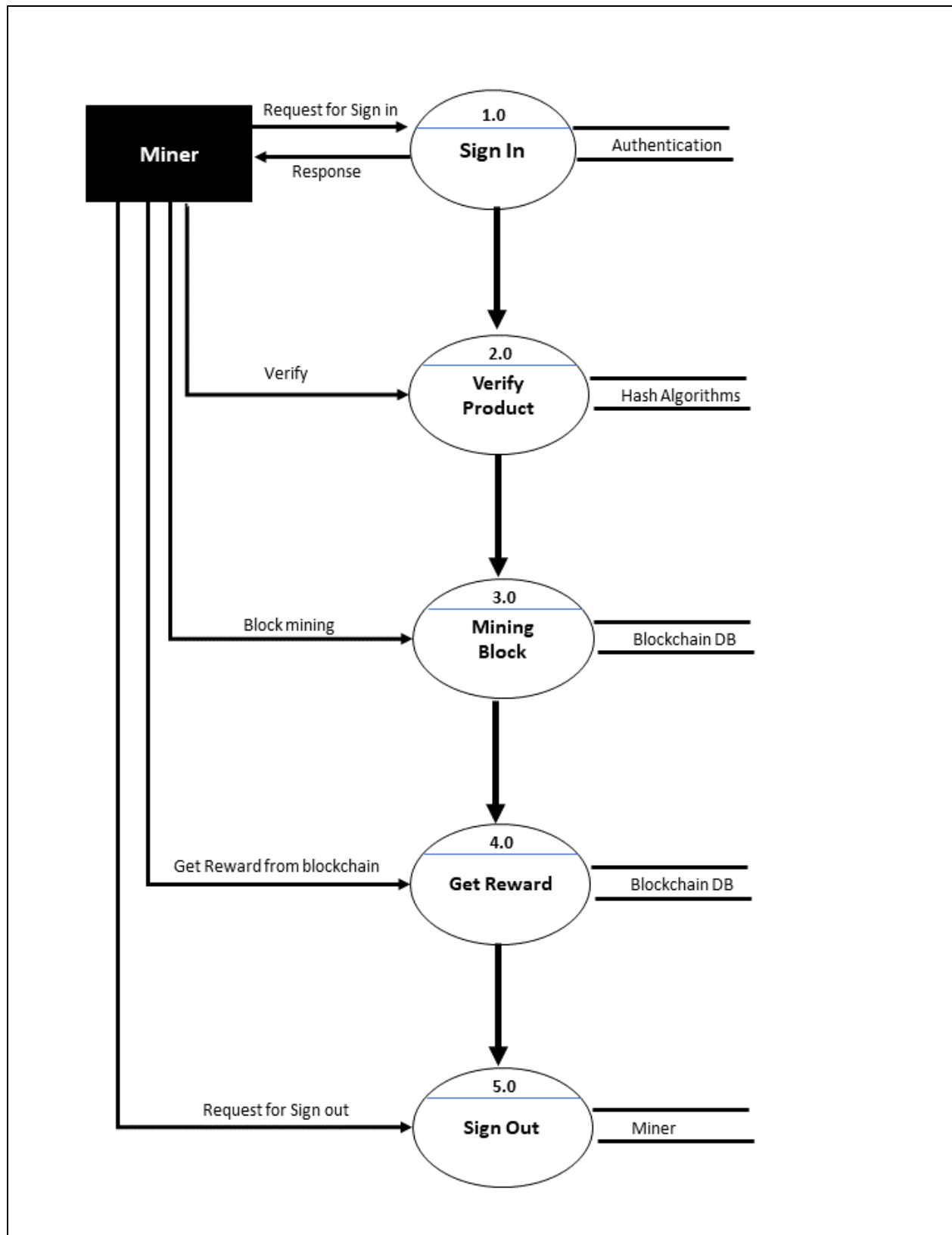


Figure 2.6 : DFD level 1 for Miner

### 2.1.3 Use Case Diagram

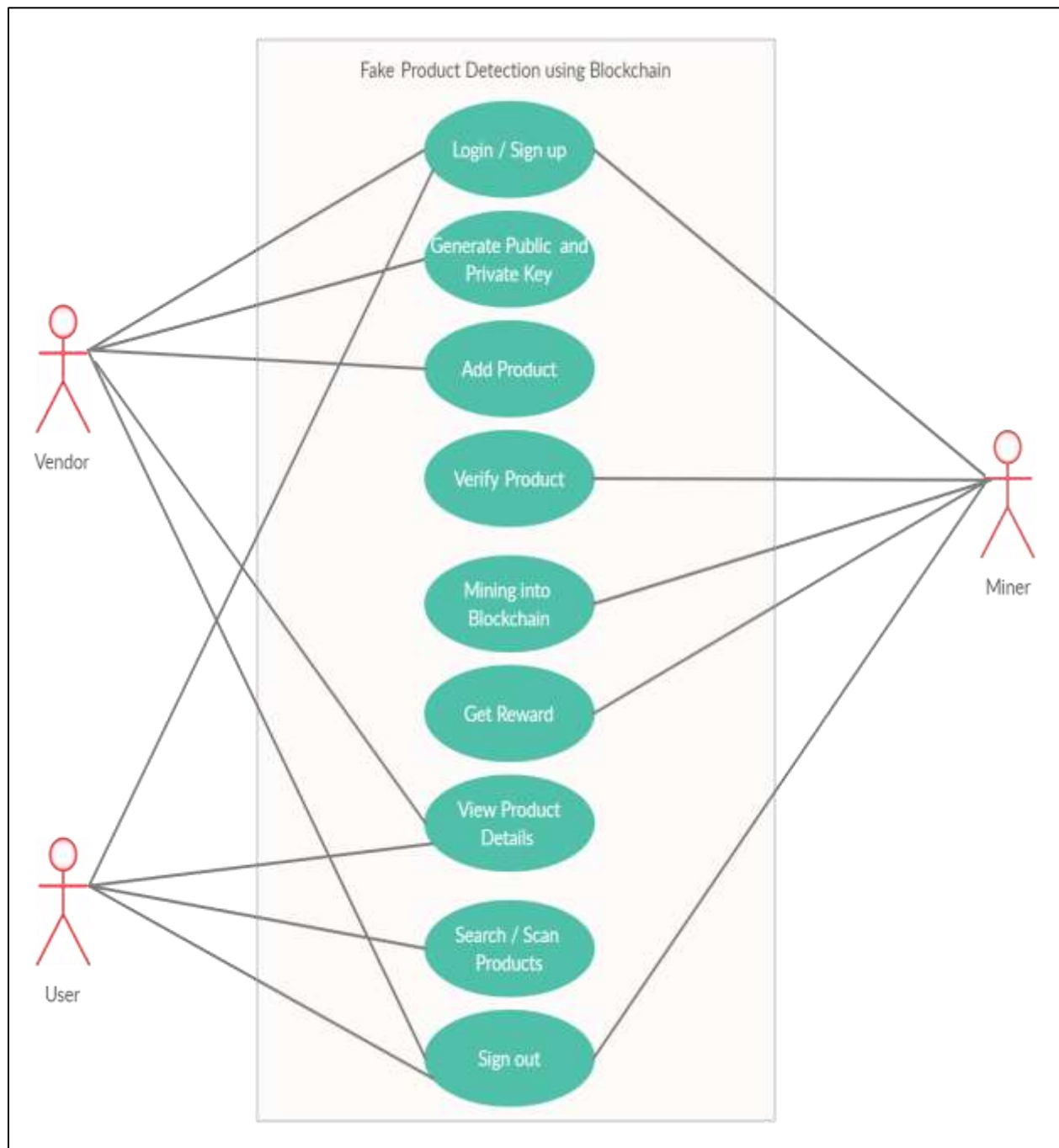


Figure 2.7 : Use Case diagram



## 2.1.4 Sequence Diagram

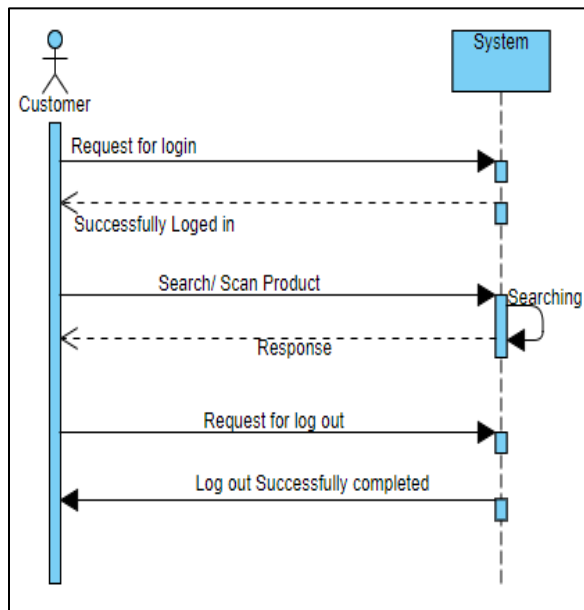


Figure 2.8: Sequence diagram for Customer

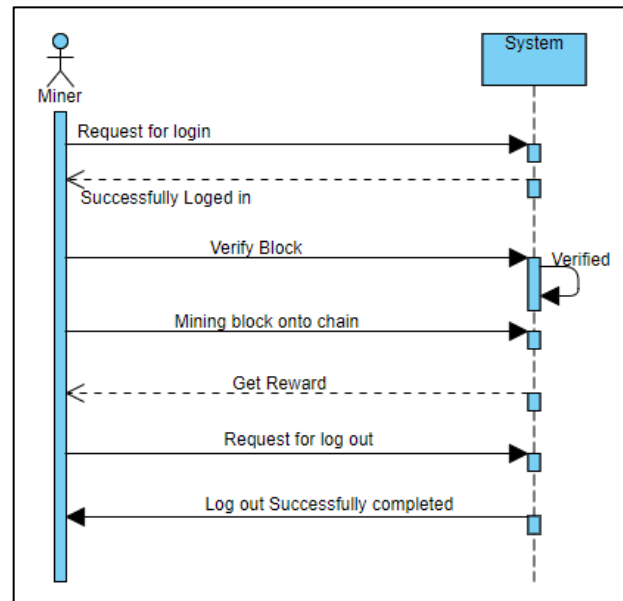


Figure 2.9 : Sequence diagram for Miner

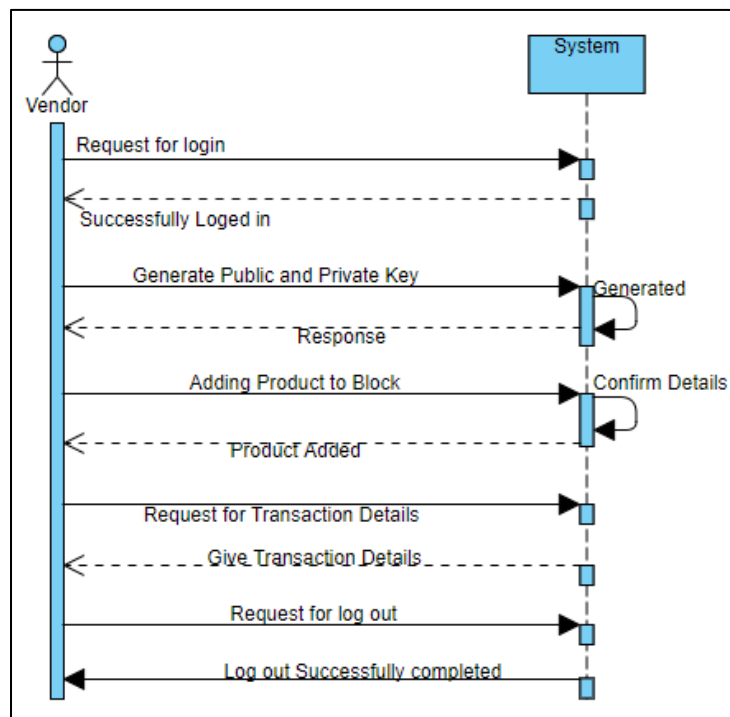


Figure 2.10 : Sequence diagram for Vendor

### 2.1.5 Activity Diagram

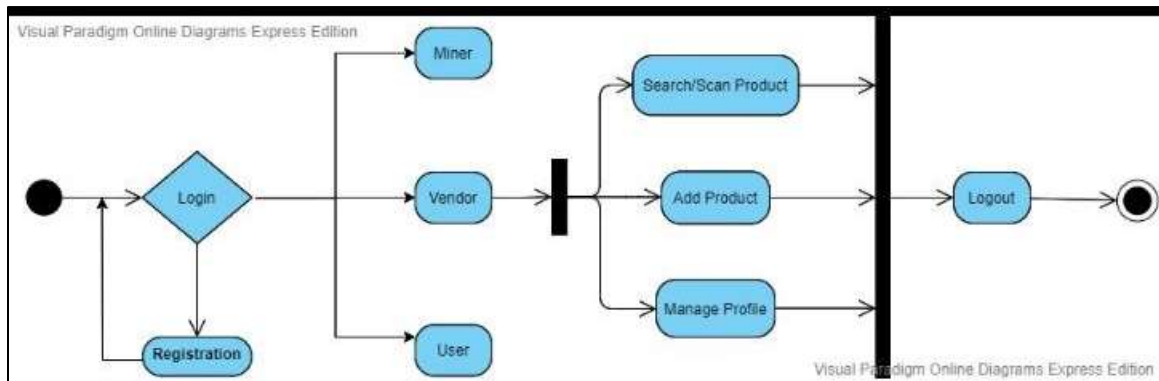


Figure 2.11 : Vendor side activity diagram

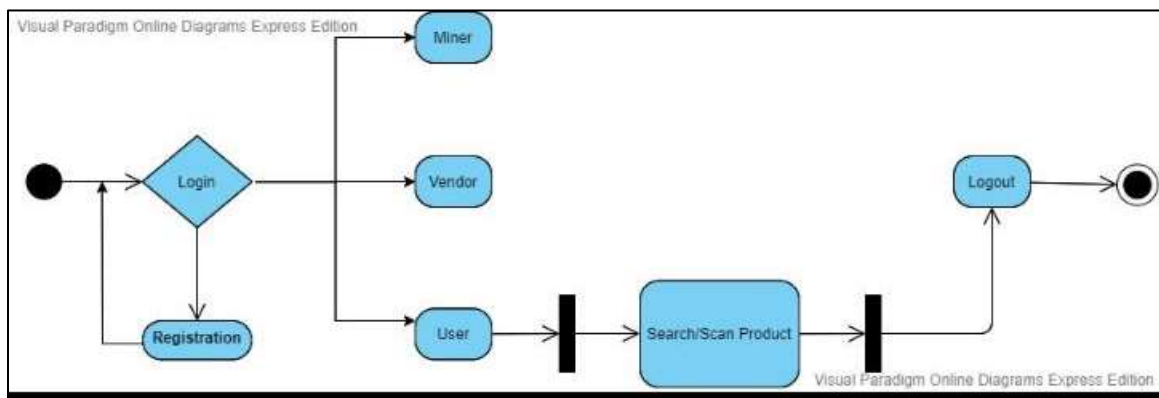


Figure 2.12 : User side activity diagram

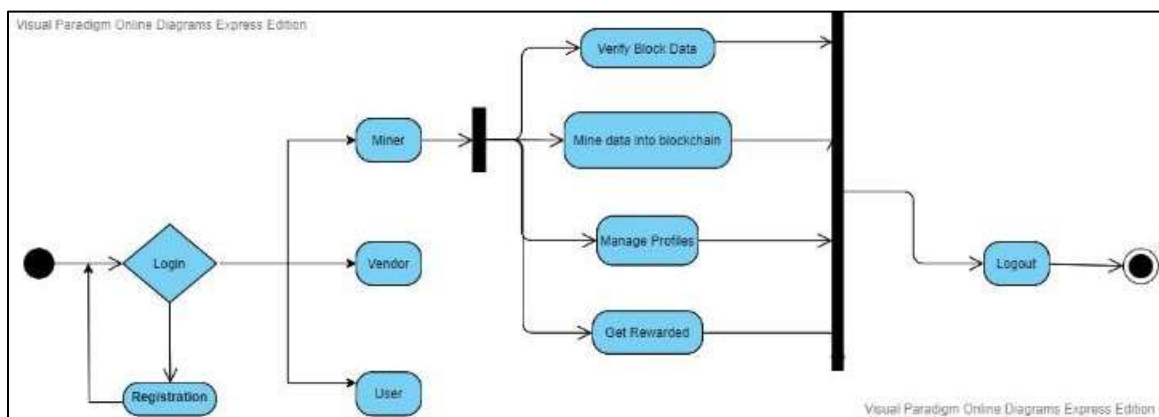


Figure 2.13 : Miner side activity diagram

### 2.1.6 Data Dictionary

column	type	null
u_id	number	no
user_name	varchar(15)	no
email_	varchar(10)	no
password	password	no

**Table 2.1: User Data**

column	type	null
pulic_key	string	no
userEmail	varchar(15)	no
timeStamp	date	no

**Table 2.2: Users Public Key**

column	type	null
b_id	number	no
transaction_data	array	no
timestamp	date	no
index	number	no
hash	string	no
Nonce	number	no
previous_hash	string	no

**Table 2.3: Blockchain Data**

## 2.2 Requirement Analysis Design

### 2.2.1 AEIOU Canvas

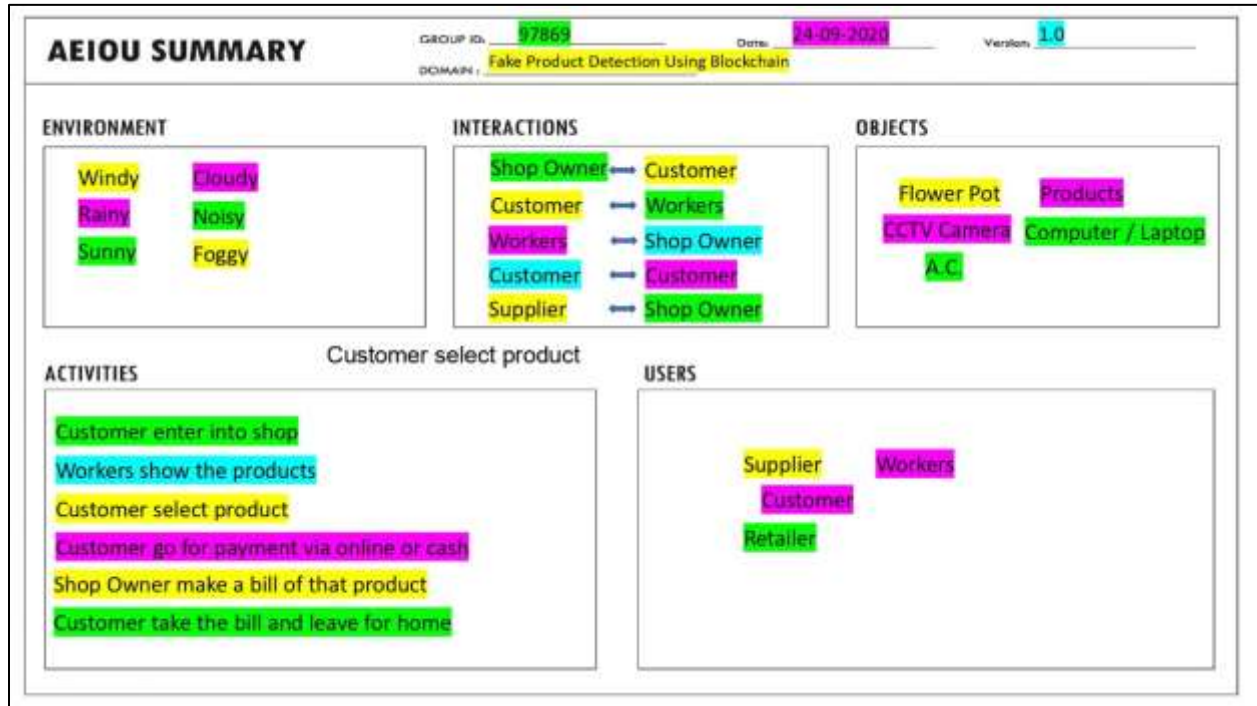


Figure 2.14 : AEIOU Canvas

#### Description:

AEIOU stands for “Activities Environment Interactions Objects and Users”. In AEIOU there were 5th phase Activity, Environment, Interaction, Object, User there for we pass with all phase and one by one check and note down all information of all phase. All phase is described in below. Environment define as when we select domain first visit that place. Interaction between two or more persons and something else; but it is very important for finding problem. And we also know about how people work in that area. Object is a thing. When we visit the domain place then we note all objects which are connected with that domain. In this part what types of activities occurs on that place. And note that activity for our domain. And check that activity useful for us or not. Users are the people whose behaviors, preferences, and needs are being observed. There were many types of user so note down users and check them profession and personality because these two things create a difference there for, we can easily find them.

## 2.2.2 Empathizing Canvas

Empathizing Canvas	
Design For Fake Product Detection Using Blockchain	Design By 97869
Date 25-09-2020	Version 1.0
<b>USER</b> Supplier Workers Customer Retailer	<b>STAKEHOLDERS</b> Supplier Workers Customer Manufacturer Retailer
<b>ACTIVITIES</b> Customer enter into shop Workers show the products Customer select product Customer go for payment via online or cash Customer take the bill and leave for home Shop Owner make a bill of that product	
<b>STORY BOARDING</b> <b>HAPPY</b> Mohammed wanted to buy a brand new watch he saw on TV so he went to the nearest watch store. He found the exact watch he wanted so he decided to buy it but the watch didn't have the right time and had a minor defect on the back, so anxious Mohammed asked the shopkeeper about his concern so he replied it was nothing and was normal scratch. But Mohammed did not believe him and he scanned the QR tag on the watch and found it was not from the original brand he wanted to buy from. This saved him a fortune of money.	
<b>HAPPY</b> Moin went to shop at Big Bazaar and liked the brand new pair of shoes on display, but he was doubtful of the originality of the product. A nearby salesman saw his interest and asked if he needed any help. Moin represented his concern and immediately the salesman took his phone and told him to scan the QR code up on the shoes, Moin did that and found the shoes on the original brand website with the same price and same description. He bought those shoes happily and went back home.	
<b>SAD</b> Pawan wanted to impress his classmates, so he wanted to buy a brand new Nike sneakers. He went to a footwear shop nearby his house and liked the very first pair he saw and immediately he bought it out of excitement. Later that day when he went back home and saw the expensive pair of shoes again, he noticed a slight difference in logo and finally he realized that they were counterfeit shoes.	
<b>SAD</b> Pawan wanted to impress his classmates by showing off his new hair shades, so he went to his old and faithful barber to get his shades done. After getting his hair bleached, after a few hours his head felt itchy but he thought it was normal and came back home. But the itching won't go away, so he decided to take a shower and when he applied shampoo to his hair they started to come off and within a week he went half bald. The reason later found was that the barber used fake bleach which caused a temporary hair loss.	

Figure 2.15 : Empathizing Canvas

### Description:

Empathy Map is the canvas where designer has to observe and understand the user and we try to solve them. Empathy Map can help up for what kind of need of users. It is a tool which helps us summarize our idea, observation and take out unexpected solution with no restriction & any bound. Here, what kind of users will affect with our solution, research or analysis? Stakeholder is

a person, group, employee or organization with an interest in a domain/project we find the user who will be directly or indirectly related to above users. For example: owner of car. In this session we write 2-4 incidents in life of users based on our observation of users and there are some incidents are happy and some are sad and that incidents are occurs in real life.

### 2.2.3 Ideation Canvas

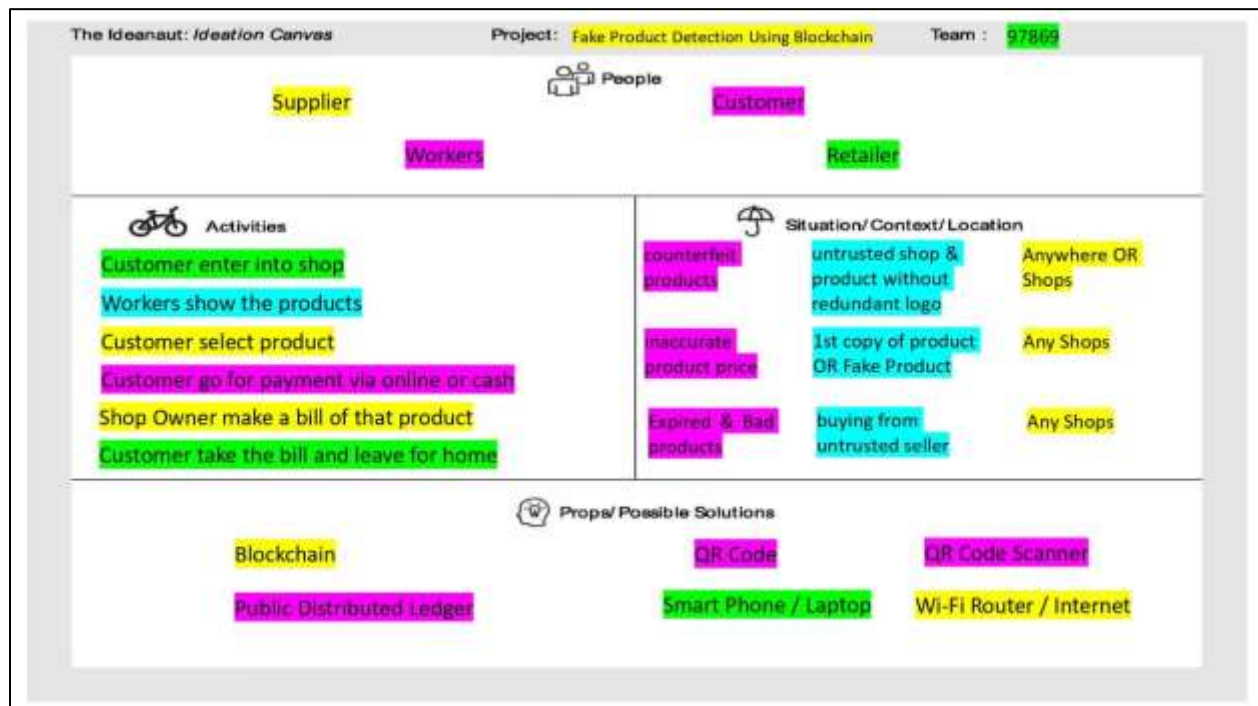


Figure 2.16 : Ideation Canvas

#### Description:

We analyzed all the factors associated with our project like people, activities performed, in which situation/context/ location these activities are performed. Considering all these factors, and we scrutinized proposed solutions for all factors associated with our project. To implement any solution or suggestion to achieve goal as per pre decided achievements.

## 2.2.4 Product Development Canvas

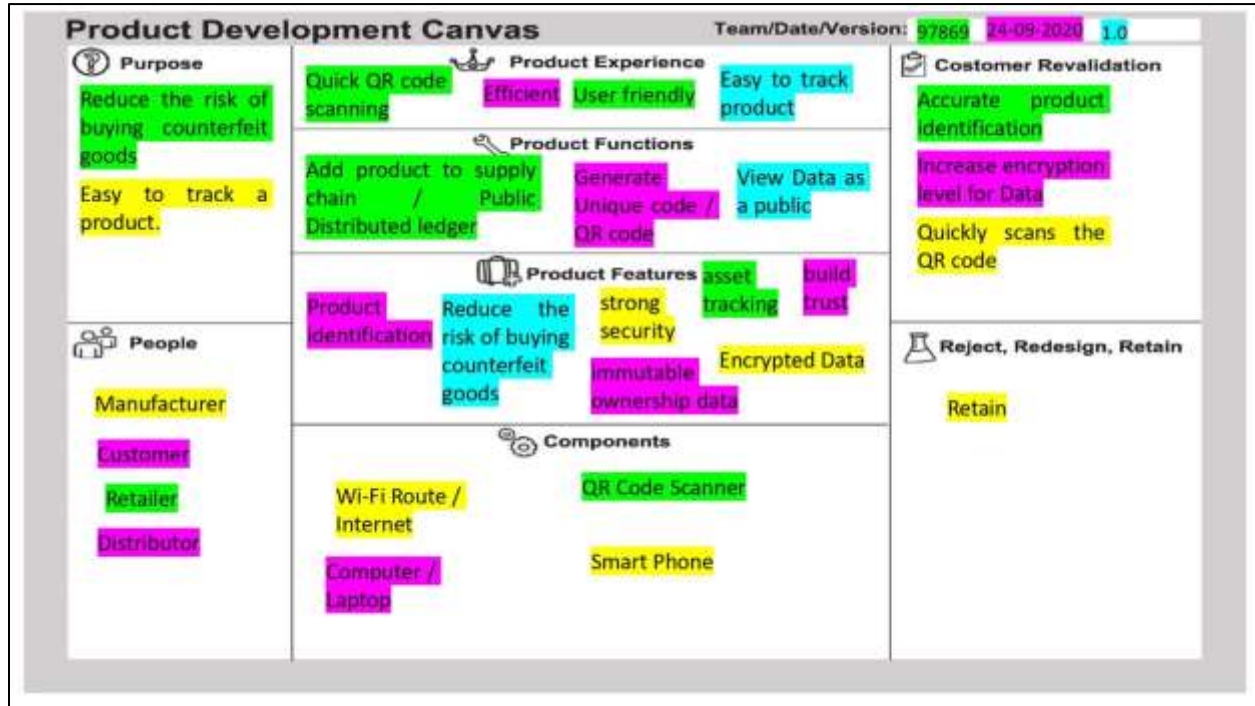


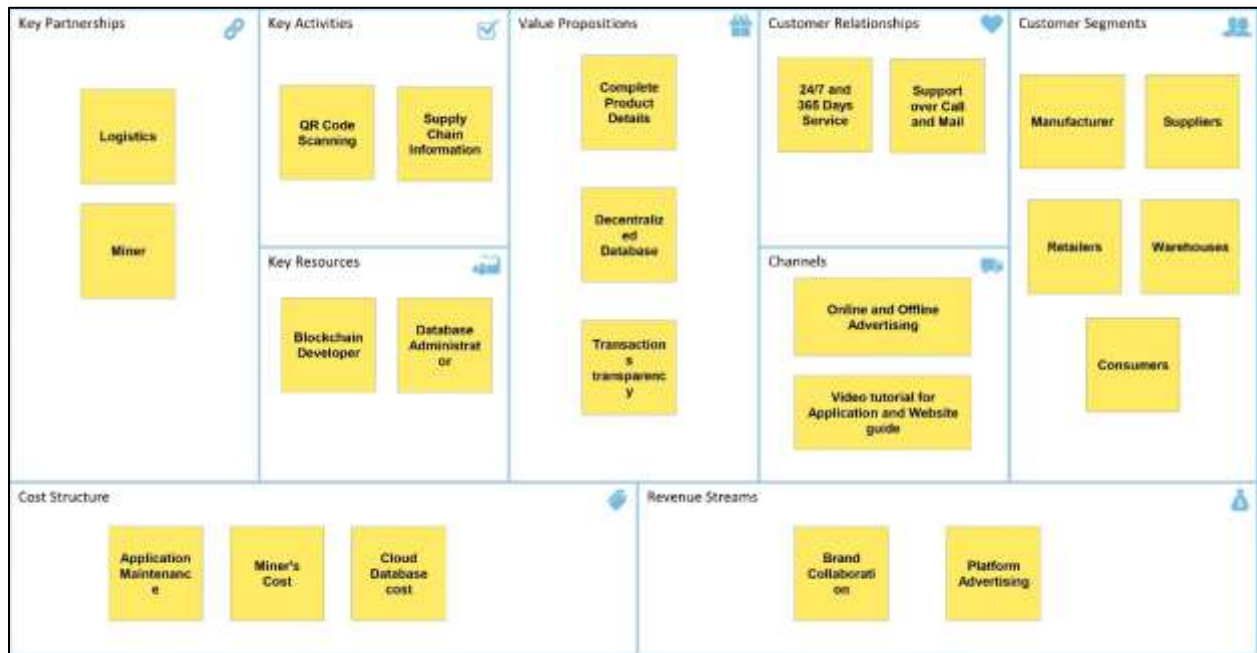
Figure 2.17 : PDC Canvas

### Description:

In this canvas there are seven steps: purpose, people, product experience, product function, component, customer revalidation and reject/redesign/retain. A product development canvas is the ground where in the best possible ideas after the ideation session there for it helpful to develop project. What is the purpose of our product? What problem section we want to target? These two questions mostly create in our mind so that main goal of purpose is why we create a product. We note down the kind of people we have in mind while developing the product and also the people for whom connected with our problems there for we use them resolving the problem. Focus on how the customer feels for our product/service concept. We note down every kind of experience we would want our user to feel, enjoy or sad. Product functions depend on the product experience. Mostly the user experience or needs will be our product functions. Features are the power the product functions. We find best feature for users. Our product gives best feature keeping people in focus. Customer Validation is that customer-facing our product tests then after they give a feedback on product quality, features, and functionality. Each test done by unique user there for we know that what kind of feedback we give from user.



## 2.2.5 Business Model Canvas



**Figure 2.18: BMC**

### **Description:**

A corporate management template for creating innovative business models and recording existing ones, the Business Model Canvas. It provides a visual map that includes components that describe a firm's or product's value proposition, infrastructure, consumers, and financing, aiding firms in aligning their operations by highlighting possible trade-offs.

The Business Model Canvas is used to print data on a broad surface so that groups of people can begin sketching and debating business model elements together using post-it notes or board markers. It's a hands-on instrument that encourages comprehension, debate, imagination, and study. A web-based software version of the Business Model Canvas is also available on the internet.



# **CHAPTER 3: IMPLEMENTATION**

Blockchain Client

Wallet GeneratorMake TransactionView Transactions

Wallet Generator

Click on the button below to generate your blockchain wallet

Generate Wallet

Public Key:

Private Key:

**Figure 3.1: Generation of Wallet**

Blockchain Client

Wallet GeneratorMake TransactionView Transactions

Send Coins

Enter transaction details and click on "Generate Transaction" button to generate your transaction

Sender Public Key:

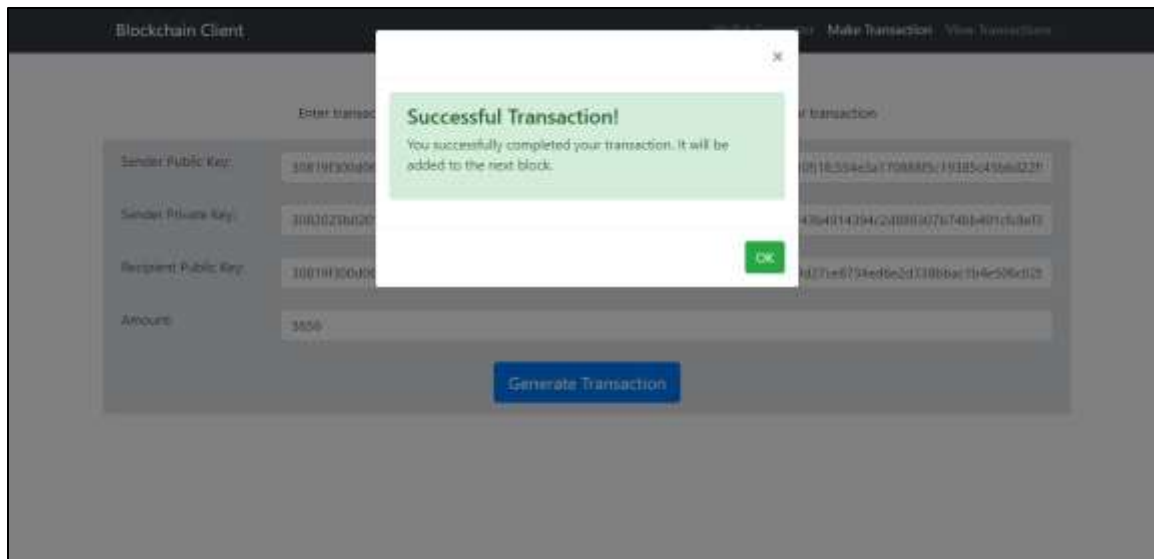
Sender Private Key:

Recipient Public Key:

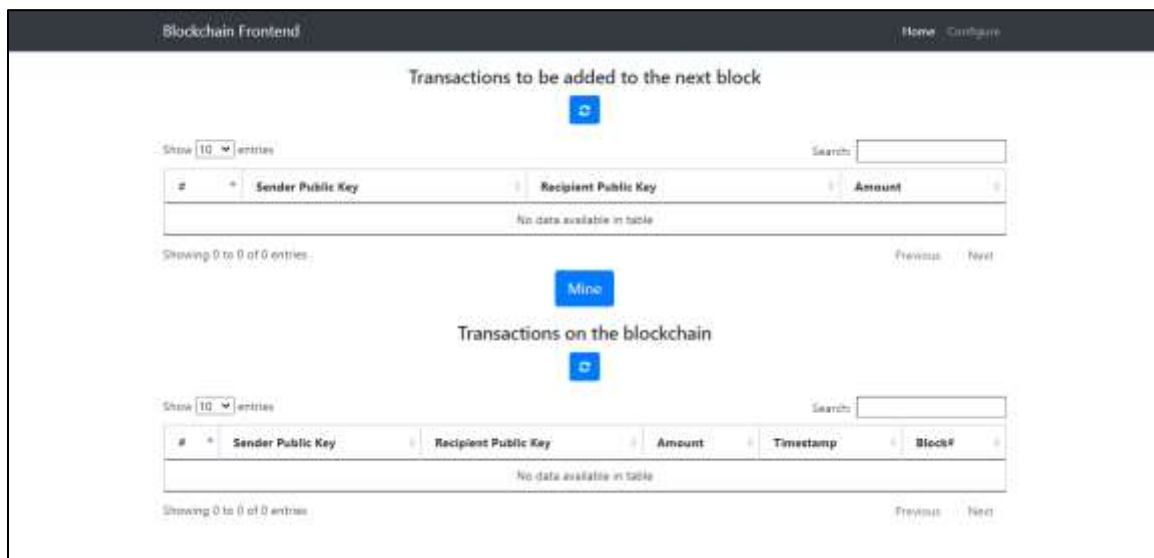
Amount:

Generate Transaction

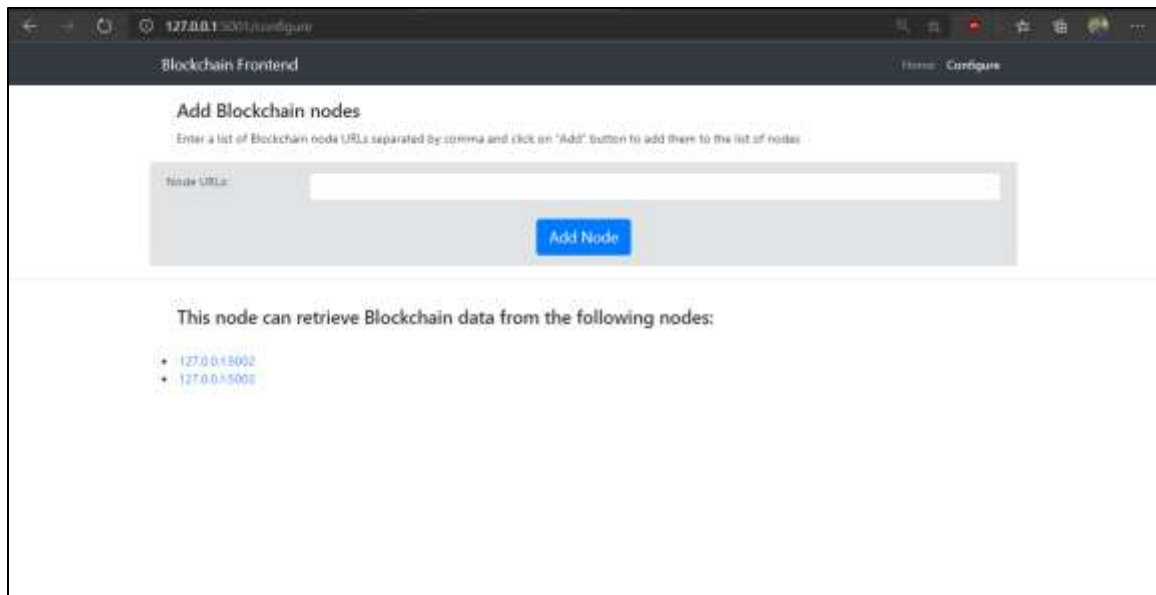
**Figure 3.2: Make transaction**



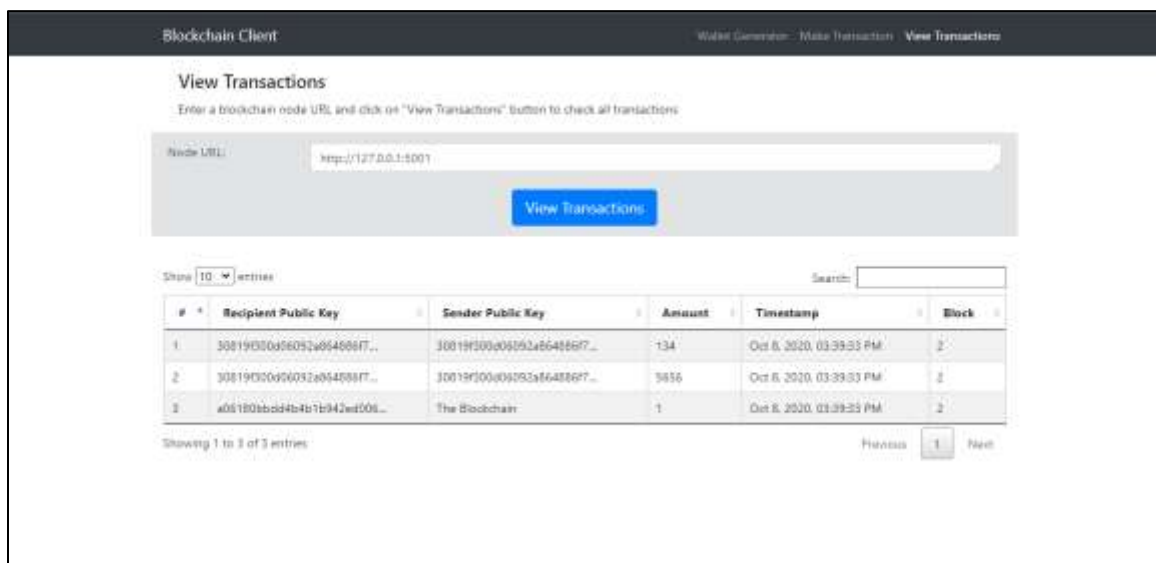
**Figure 3.3: Transaction Successful**



**Figure 3.4: Transaction Added into block**



**Figure 3.5: Add blockchain node**




**Figure 3.6: Transaction Details**

Collection Name	Documents	Documents Size	Documents Avg	Indexes	Index Size	Index Avg
<a href="#">B_user</a>	12	1.29KB	111B	1	32KB	32KB
<a href="#">chain_db</a>	12	15.11KB	1.26KB	1	36KB	36KB
<a href="#">miners</a>	1	83B	83B	1	32KB	32KB
<a href="#">u_public_keys</a>	10	3.65KB	374B	1	32KB	32KB

**Figure 3.7: Database**

Blockchain Client

Home



Email

Password


Sign In

Don't have an account? [Sign Up](#)

**Figure 3.8: Login Page**

Blockchain Client

Home



Name

Email

Category

Supplier

Password

Sign Up

Don't have an account? [Sign In](#)

### Figure 3.9: Signup Page

A screenshot of a web application titled "Blockchain Client". The top navigation bar contains links for "Wallet Generator", "Make Transaction", "View Transactions", and "Profile". The main content area displays a "User Profile" card for "Smit Patel", who is a "Manufacturer". The card shows an email address "smitp90333@gmail.com" and a blue "Logout" button.

**Figure 3.10: Profile Page**

Anti Counterfeit Blockchain
Search
About us

Search Product
608640e7692176a91781a3
Search

Block Number:
g

Time:
Mon Apr 26 09:55:41 2021

Product Name:
P 11

Product Details:
test p 11

Amount:
1111

Sender Public Key:
30819f300d06092a864886f70d010101050003818d0030818902818100d65bf5eb35ec951efde3aeb020b10c38e8386a539cc22f9c5203b9c355375225828e9aeb85c45bb14c8ecc8545a83f5321bed1c2531ce34d58154beffad0579337fdaa53a04fbd26a0e5ef37be564e54c88a9e24b6b01f27be51bd1793ecef70b8b88ffbd008721ef8373ff3b4b1e0cb1d55d4055f4c1989bd444774f41b9db0203010001

Recipient Public Key:
30819f300d06092a864886f70d010101050003818d0030818902818100d65bf5eb35ec951efde3aeb020b10c38e8386a539cc22f9c5203b9c355375225828e9aeb85c45bb14c8ecc8545a83f5321bed1c2531ce34d58154beffad0579337fdaa53a04fbd26a0e5ef37be564e54c88a9e24b6b01f27be51bd1793ecef70b8b88ffbd008721ef8373ff3b4b1e0cb1d55d4055f4c1989bd444774f41b9db0203010001

**Figure 3.11: Product Details**

Anti Counterfeit Blockchain
Search
About us

Welcome to the Block-Chain world!

You can easily authenticate product based on Blockchain.

You need to enter product id and you'll get product details.

Search Product
Search

Block Number:

Product Name:

**Figure 3.12: Search Page**

# **CHAPTER 4: PROJECT SUMMARY AND FUTURE WORK**



## **4.1 Features**

- Multi user login facility for each user.
- Universal access to manufacturers details & distribution history
- QR code for package verification and tracking
- Search Product Details
- Digital identities for supply chain participants
- Stores, generates and retrieves accurate -data of product.
- Identification of product.
- Reduce the chance of purchasing counterfeit goods.
- Strong security
- Immutable ownership data
- Asset tracking
- Build trust
- Encrypted data
- Counterfeit control

## **4.2 Advantages**

- Using QR codes to track and counterfeit product detection
- Results ready in less than a second
- User gets genuine reviews about the product.
- User can spend money on valuable products.

## **4.3 Future Scope**

- To track every genuine product that is to be sold.
- Implement this idea in other fields.
- Use QR codes which have secure graphic
- Implement our own tokens which can be sold to users so that they can purchase ownership of a product using tokens which helps in insurance processing.

#### **4.4 Conclusion**

The technology of Blockchain is groundbreaking. It will make life easier and safer, improve the way personal information is stored and make transactions for the good and services. Blockchain technology establishes a permanent and immutable record of each transaction. This impenetrable digital ledger makes fraud, hacking, data theft and loss of information impossible. Technology can impact every industry in the world, including manufacturing, retail and transport. So, by developing the following blockchain, we have made an attempt to reduce counterfeiters and their scam, so that customers can recover their confidence in the brands and their respective original items. Saving money for their reputation and original products as well. On the other side, it is as easy to use this blockchain as using a basic mobile calculator, all you have to do is open the application and scan the code from your product. Plus, since blockchain is a type of distributed ledger, as opposed to individual copies, all network participants share the same documents. So, the openness is incontrovertible. In addition to the fact that information is stored on a computer network rather than on a single server, it is very difficult for hackers to compromise the transaction information and thereby make it safer in terms of security reliability.



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# APPENDIX

## APPENDIX

**GTU - Project Monitoring and Mentoring System**

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Periodic Progress Report (PPR)

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**Discipline** : BE  
**Semester** : Semester 7

**Project Name** : fake product detection using blockchain  
**Team ID** : 97869

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1	Fully secure item-level tagging		59/709,713	Reviewed		<a href="#">View</a>		<a href="#">View</a>	<a href="#">Download</a>
2	Smart contract execution on a blockchain		15/884,111	Reviewed		<a href="#">View</a>		<a href="#">View</a>	<a href="#">Download</a>
3	A method for secure peer-to-peer communication on a blockchain		16/092,737	Reviewed		<a href="#">View</a>		<a href="#">View</a>	<a href="#">Download</a>
4	Distributed manufacturing & blockchain enabled packaging		PCT/US2017/054543	Reviewed		<a href="#">View</a>		<a href="#">View</a>	<a href="#">Download</a>
5	System and method for block-chain verification of goods		14/563,179	Reviewed		<a href="#">View</a>		<a href="#">View</a>	<a href="#">Download</a>



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1	Systems and methods for anti-counterfeit authentication through communication networks		PCT/IN2012/028575	Reviewed		<a href="#">View</a>		<a href="#">View</a>	<a href="#">Download</a>
2	Systems and methods for tracking and transferring ownership of connected devices using blockchain ledgers		14/536,833	Reviewed		<a href="#">View</a>		<a href="#">View</a>	<a href="#">Download</a>
3	Secure dual-mode anti-counterfeit product authentication methodology and system		PCT/SG2015/050513	Reviewed		<a href="#">View</a>		<a href="#">View</a>	<a href="#">Download</a>
4	Transparent self-managing rewards program using blockchain and smart contracts		14/942,326	Reviewed		<a href="#">View</a>		<a href="#">View</a>	<a href="#">Download</a>
5	Authenticating serialized commodities		US 8,140,852 B2	Reviewed		<a href="#">View</a>		<a href="#">View</a>	<a href="#">Download</a>



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4	METHOD AND SYSTEM FOR BLOCKCHAIN - BASED COMBINED IDENTITY, OWNERSHIP, INTEGRITY AND CUSTODY MANAGEMENT	US10121143B1	16 / 032, 480	Reviewed		<a href="#">View</a>		<a href="#">View</a>	<a href="#">Download</a>
5	Blockchain identity management system based on public identities ledger	US9103500B1	15/163,922	Reviewed		<a href="#">View</a>		<a href="#">View</a>	<a href="#">Download</a>



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