

**DHA Suffa University**  
**Department of Computer Science**  
**Final Year Project**



**Medi Secure**  
**P-2024**  
**Software Design Specifications**

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**Document Sign off Sheet**

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## Revision History

Date	Version	Description	Author
25/Dec/2023	1.0	Initial Draft	Hamza,shaheryar,ahmed ,saad amin

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22/jan/2024	1.2	Final Document	Hamza,shaheryar,ahmed ,saad amin

## Definition of Terms, Acronyms, and Abbreviations

Term	Description
Medicine traceability	A comprehensive solution addressing black market medicine trade
Black Market Medicine Trade	The illegal trade of pharmaceuticals outside authorized channels, often associated with counterfeit or substandard products.
Block chain	A decentralized and secure digital ledger technology that facilitates transparent and tamper-resistant recording of transactions
React	Facebook frontend framework
Node JS and express JS	Backend framework
Medicine counterfeiting	unauthorized reproduction or replication of pharmaceutical products

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## 3 Introduction

### 3.1 Purpose of Document

Medi-Secure addresses the rise in black market medicine trade and fake medicine production, particularly during the COVID-19 crisis. The platform utilizes blockchain to automate and secure transactions, ensuring trust and traceability in the medicine supply chain. It includes a user-friendly web and app interface for seamless communication among pharmaceutical stakeholders. A notable feature is the introduction of a chatbot, empowering pharmacists to assist financially constrained consumers in finding affordable alternatives. The goal is to automate and secure transactions using blockchain, enhance pharmaceutical accessibility, and maintain a record of medicine stock levels. The platform promotes transparency, security, and affordability in the pharmaceutical industry.

### 3.2 Intended Audience

- Pharmaceutical industry professionals
- Pharmacists and distributors
- Healthcare providers and practitioners
- Researchers and developers in blockchain technology
- Regulatory authorities and policymakers in healthcare
- Consumers and patients concerned about medication authenticity

### 3.3 Document Convention

The font is Arial and font size is 10.

### 3.4 Project Overview

The Medi-Secure is to save medicines from black market as black market of medicines in COVID'19 was on its peak like mask, different tablets and oxygen cylinder in Pakistan were not available in market but illegally sold on higher rates and many people adopted this approach as a business and started investing in black market. This black market of medicines is frequent and increasing day by day so we need to solve this problem.

The objective is based on automating medicine and save transactions on block chain from production to pharmacist as block chain increases trust, security and traceability, and keeping record of medicines stock in and stock out. The Medi-Secure contains a web and app GUI for the interaction with company, distributor/pharmacist and user/patient.

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### 3.5 Scope

- Pharmaceutical Companies will manufacture medicines and all the record will be stored in the blockchain.
- Similarly, All the pharmacies will keep a record in the blockchain about the medicines being acquired by the manufacturers.
- There will be a blockchain that will keep the record of the trust factor between the company and the store.
- If the trust factor is above the threshold, then the store will stay in the smart contract and if it isn't, then the company will not keep the store in the contract and vice versa

### 3.6 Assumptions and Dependencies

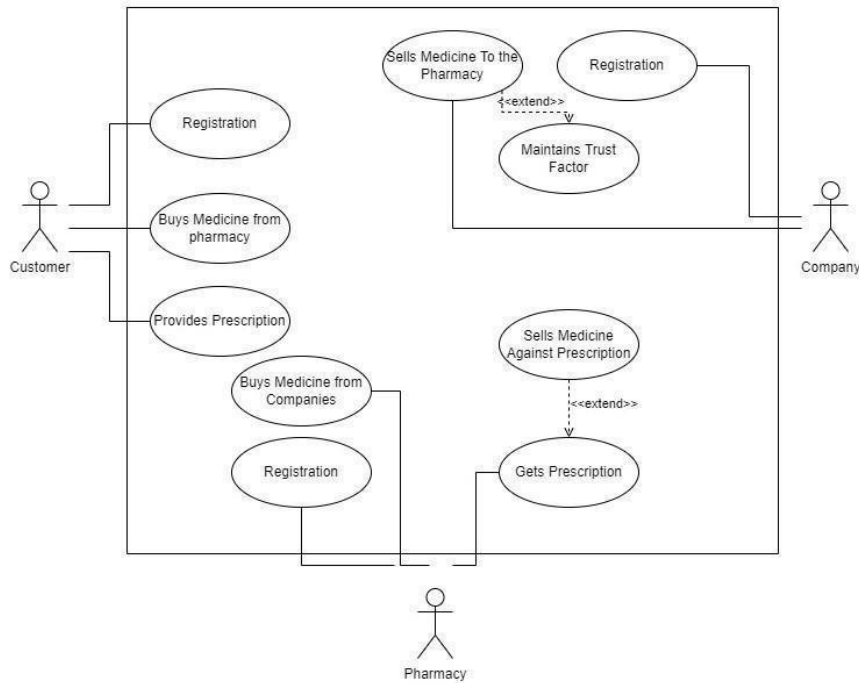
The assumptions made are that the company on the portal will be registered by the government and also the pharmacies being registered are authentic.

### 3.7 Risks and Volatile Areas

Risk Type	Probability	Effect
Data Security	Moderate	High
Blockchain Integration	High	Moderate
User Acceptance	Moderate	High
Regulatory Compliance	Low	Severe
Technology Scalability	High	Moderate

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## 4 System Architecture



### 4.1 System Level Architecture

- **User Interfaces:**

**Web Application:** Provides a user-friendly interface accessible via web browsers for pharmaceutical stakeholders, including companies, distributors/pharmacists, and users/patients.

**Mobile Application:** Offers a dedicated app interface for users on mobile devices, ensuring seamless communication and access to features.

**Blockchain Integration:**

**Transaction Chain:** Implements a blockchain ledger to record and secure transactions from the production of medicines to the pharmacist. This ensures transparency, traceability, and security in the entire medicine supply chain.

**Smart Contracts:** Utilizes smart contracts to automate and enforce agreements between different stakeholders in the pharmaceutical ecosystem, enhancing the reliability of transactions.

- **Medicine Record Keeping:**

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**Inventory Management:** Tracks and manages the stock of medicines using the blockchain, recording stock-in and stock-out transactions. This feature ensures an accurate and real-time record of medicine availability.

**Traceability:** Enables the traceability of each medicine batch from production to distribution, helping identify and eliminate counterfeit or duplicate medicines.

- **Authentication and Authorization:**

**Secure Access Control:** Implements a robust authentication and authorization system to ensure that only authorized personnel can access sensitive information and perform specific actions within the platform.

- **Security Measures:**

**Data Encryption:** Secures sensitive data, such as patient information and transaction details, through encryption protocols to prevent unauthorized access.

**Blockchain Security:** Utilizes the inherent security features of blockchain technology to safeguard against tampering and unauthorized changes to transaction records.

- **Integration with External Systems:**

**Pharmaceutical Company Integration:** Allows seamless integration with pharmaceutical companies' existing systems for production and distribution, ensuring a smooth flow of information.

**Regulatory Compliance Integration:** Incorporates interfaces for regulatory bodies to monitor and ensure compliance with pharmaceutical regulations.

- **Reporting and Analytics:**

**Data Analytics Module:** Provides a reporting and analytics module to generate insights into medicine transactions, inventory levels, and user interactions. This aids in decision-making and identifying areas for improvement.

- **Scalability and Flexibility:**

**Modular Design:** Adopts a modular design to facilitate easy scalability and the addition of new features as the platform evolves to meet changing needs.

**Cloud Integration:** Utilizes cloud infrastructure for scalability and flexibility, ensuring the system can handle increased transaction volumes and user base.

## 4.2 Software Architecture



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## 1. User Interface Layer (UI):

**Web Application:** A user-friendly web application accessible through web browsers.

**Mobile Application:** A dedicated mobile app interface for users/patients.

- This layer consists of user interface components such as screens, forms, buttons, and input fields. □
- It handles user interactions, including input validation, capturing user preferences, and displaying information.
- The User Interface Layer communicates with the Middle Tier to request data and perform actions based on user inputs.

## 2. Middle Tier (Application Server):

- Handles business logic and processes user requests.
- Manages communication between the User Interface Layer and the Data Access Layer.
- The Middle Tier contains business logic components responsible for processing user requests and managing system functionality. □
- The Middle Tier communicates with the User Interface Layer for receiving user inputs and rendering appropriate responses.

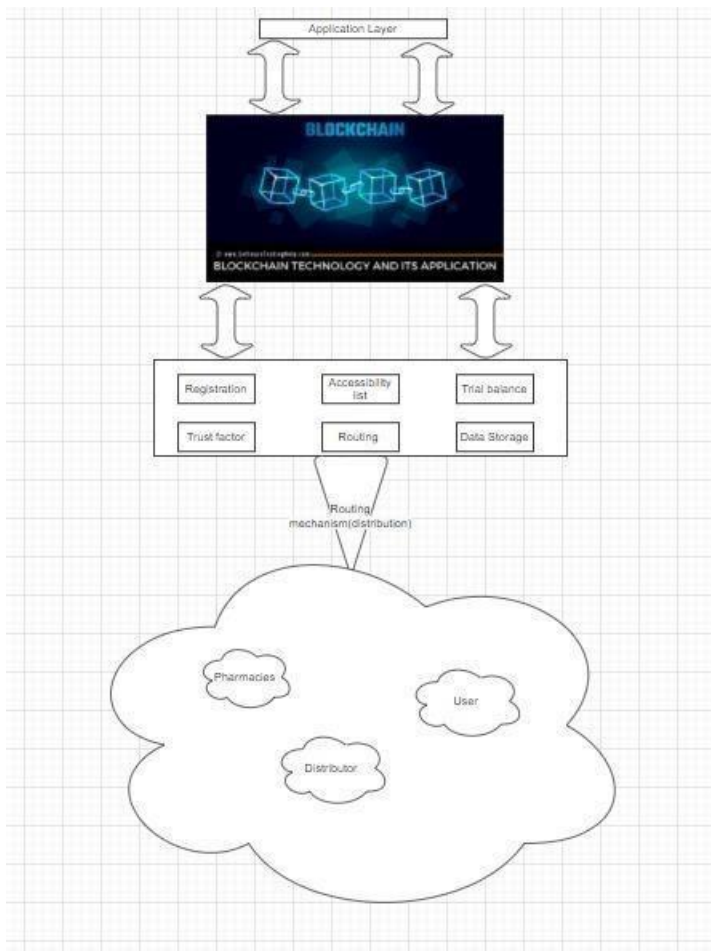
## 3. Data Access Layer (Blockchain and Database):

**Blockchain Integration:** Utilizes blockchain technology for securing and automating transactions, ensuring trust and traceability in the medicine supply chain.

**Database:** Manages the record of medicines stock in and stock out

- The Data Access Layer manages the interaction with the database, handling data retrieval, storage, and updates. □
- The Data Access Layer communicates with the Middle Tier to receive data requests and returns data responses.

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## 5 Design Strategy

- **Component-based Design:**

**Modular Structure:** The system is designed with a modular architecture, where major functionalities are encapsulated as separate components or modules. This modular design supports easy extension and enhancement, allowing for scalability and adaptability to future requirements.

- **User Interface Paradigm:**

**Responsive Web Design:** The user interfaces follow a responsive web design paradigm, ensuring a consistent and user-friendly experience across various devices and screen sizes. This approach aligns with the goal of providing seamless communication among pharmaceutical stakeholders and promotes accessibility.

- **Data Management:**

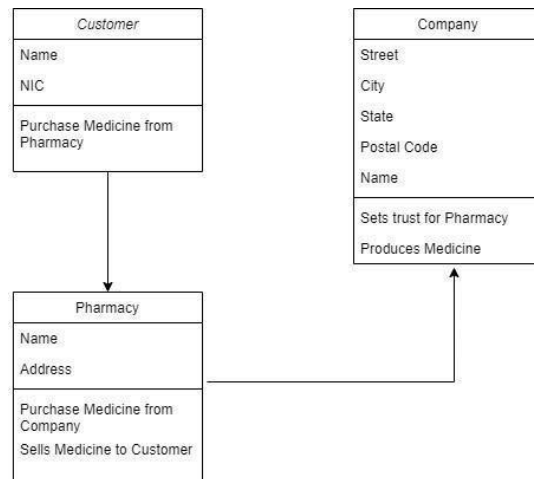
**Blockchain for Secure Transactions:** Blockchain is employed for data storage and distribution due to its security features. It ensures the security and immutability of transaction records, providing a tamper-resistant audit trail from medicine production to the pharmacist. This enhances trust, security, and traceability in the medicine supply chain.

## 6 Detailed System Design

In future, we have thought that we will launch our product in the global market to be acquired by the medicine companies globally. The system can be integrated within a pharmacy or a company. Each module will have a database and a blockchain.

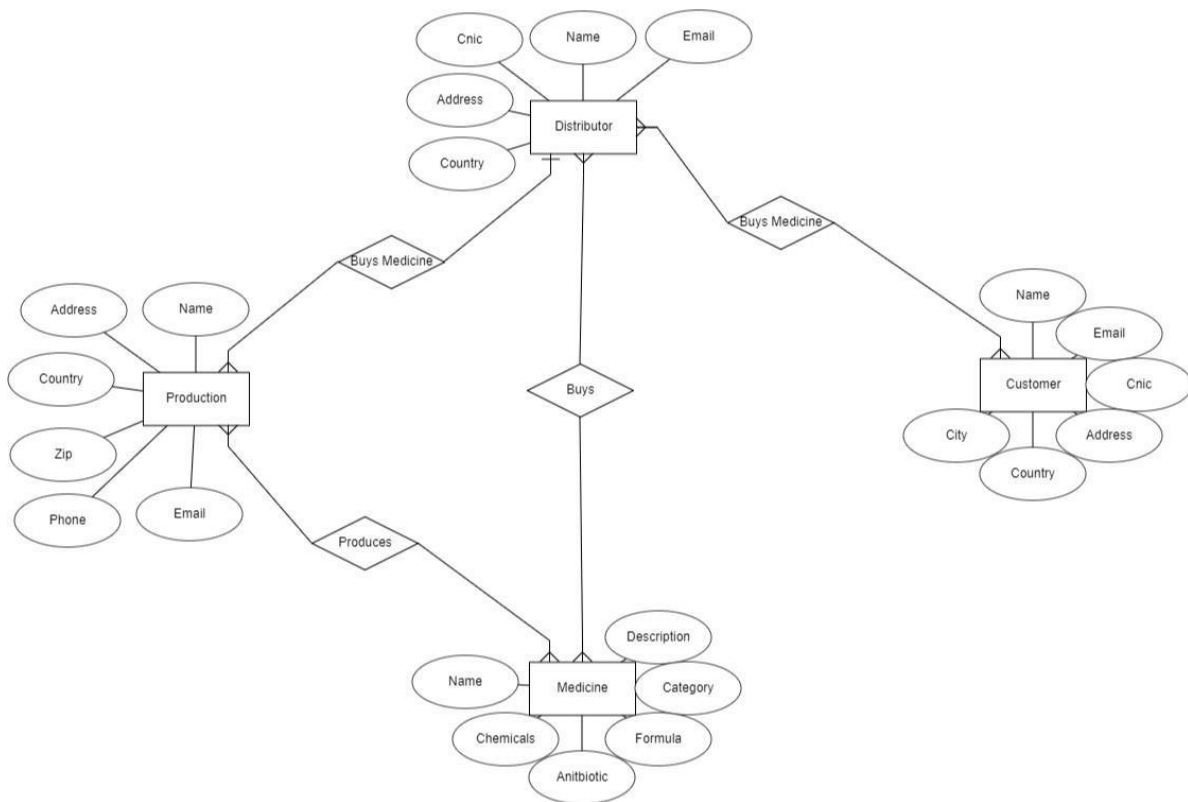
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## 6.1 Design Class Diagram

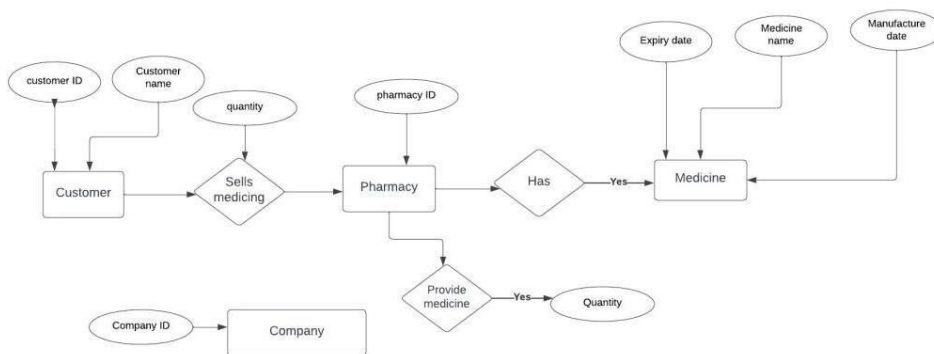


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## 6.2 Database Design



### 6.2.1 ER Diagram



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## 6.2.2 Data Dictionary

< Data 1>	
<b>Name</b>	MedicineTransactionData
<b>Alias</b>	TransactionData, MedTransaction
<b>Where-used/how-used</b>	Input to the blockchain for recording medicine transactions
<b>Content description</b>	MedicineTransactionData = { TransactionID: Unique identifier for each transaction, MedicineBatchID: Identifier for the batch of medicines, TransactionType: Type of transaction (e.g., stock-in, stock-out), TransactionDate: Date and time of the transaction, PharmacyID: ID of the pharmacy involved in the transaction, Quantity: Number of medicines involved in the transaction, Amount: Total transaction amount, Notes: Additional notes or comments for the transaction }

Column Name	Description	Type	Length	Null able	Default Value	Key Type
<i>TransactionID</i>	<i>Unique identifier for each transaction</i>	<i>INT</i>	-	<i>No</i>	-	<i>PK</i>
<i>MedicineBatchID</i>	<i>Identifier for the batch of medicines</i>	<i>VARCHAR</i>	<i>20</i>	<i>No</i>	-	-
<i>TransactionType</i>	<i>Type of transaction (e.g., stock-in, stock-out)</i>	<i>VARCHAR</i>	<i>15</i>	<i>No</i>	-	-
<i>TransactionDate</i>	<i>Date and time of the transaction</i>	<i>DATETIME</i>	-	<i>No</i>	-	-
<i>PharmacyID</i>	<i>ID of the pharmacy involved in the transaction</i>	<i>INT</i>	-	<i>No</i>	-	<i>FK</i>
<i>Quantity</i>	<i>Number of medicines</i>	<i>INT</i>	-	<i>No</i>	-	-

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	<i>involved in the transaction</i>					
<i>Amount</i>	<i>Total transaction amount</i>	<i>DECIMAL(10,2)</i>	-	<i>No</i>	-	-
<i>Notes</i>	<i>Additional notes or comments for the transaction</i>	<i>TEXT</i>	-	<i>YES</i>	-	-

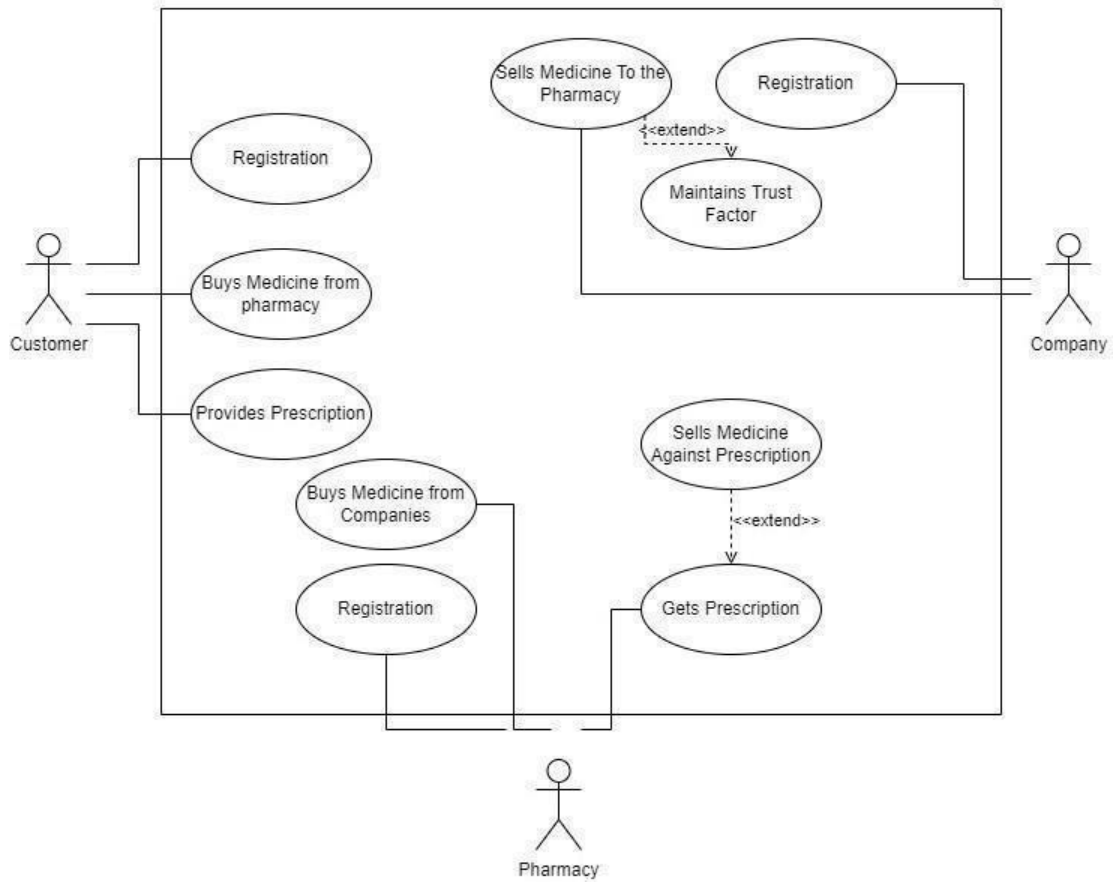
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< Data 2>						
<b>Name</b>	PharmacyData					
<b>Alias</b>	PharmData					
<b>Where-used/how-used</b>	As a store for pharmacy information.					
<b>Content description</b>	PharmacyData = { PharmacyID: Unique identifier for each pharmacy, PharmacyName: Name of the pharmacy, Location: Location of the pharmacy, ContactNumber: Contact number of the pharmacy, Email: Email address of the pharmacy }					
Column Name	Description	Type	Length	Null able	Default Value	Key Type
<i>PharmacyID</i>	<i>Unique identifier for each pharmacy</i>	<i>INT</i>	-	<i>No</i>	-	<i>PK</i>
<i>PharmacyName</i>	<i>Name of the pharmacy</i>	<i>VARCHAR</i>	<i>50</i>	<i>No</i>	-	-
<i>Location</i>	<i>Location of the pharmacy</i>	<i>VARCHAR</i>	<i>100</i>	<i>No</i>	-	-
<i>ContactNumber</i>	<i>Contact number of the pharmacy</i>	<i>VARCHAR</i>	<i>15</i>	<i>No</i>	-	-
<i>Email</i>	<i>Email address of the pharmacy</i>	<i>VARCHAR</i>	<i>50</i>	<i>YES</i>	-	-



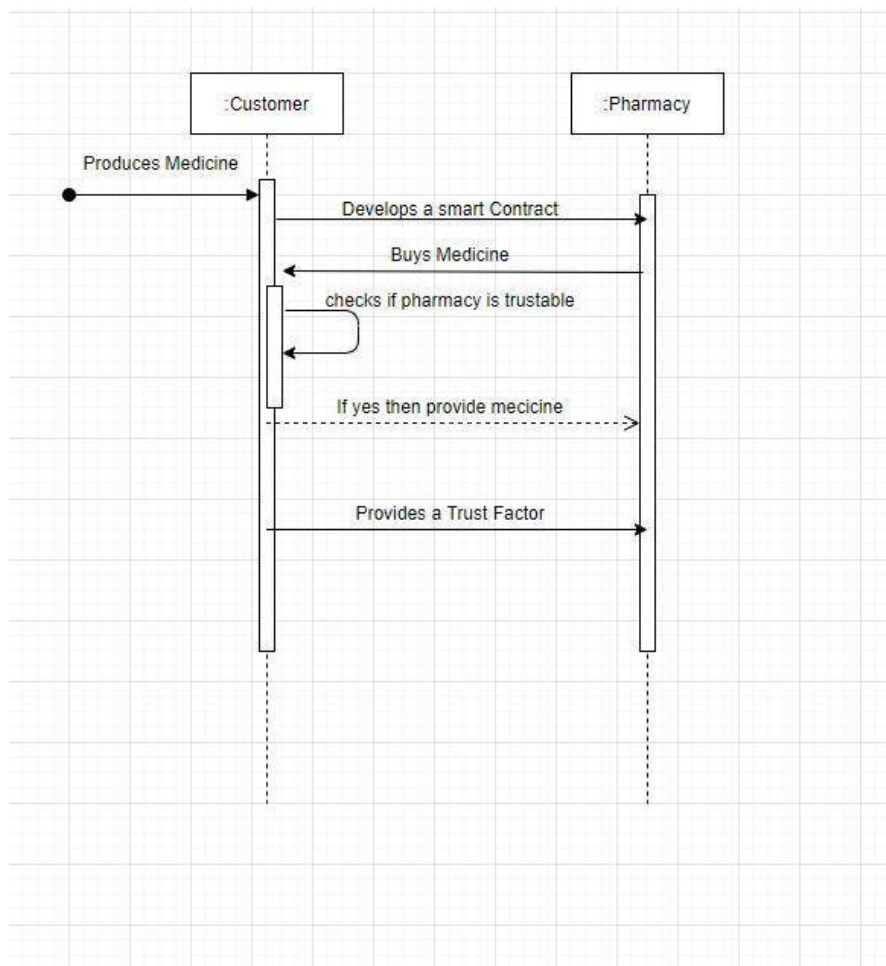
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## 6.3 Application Design



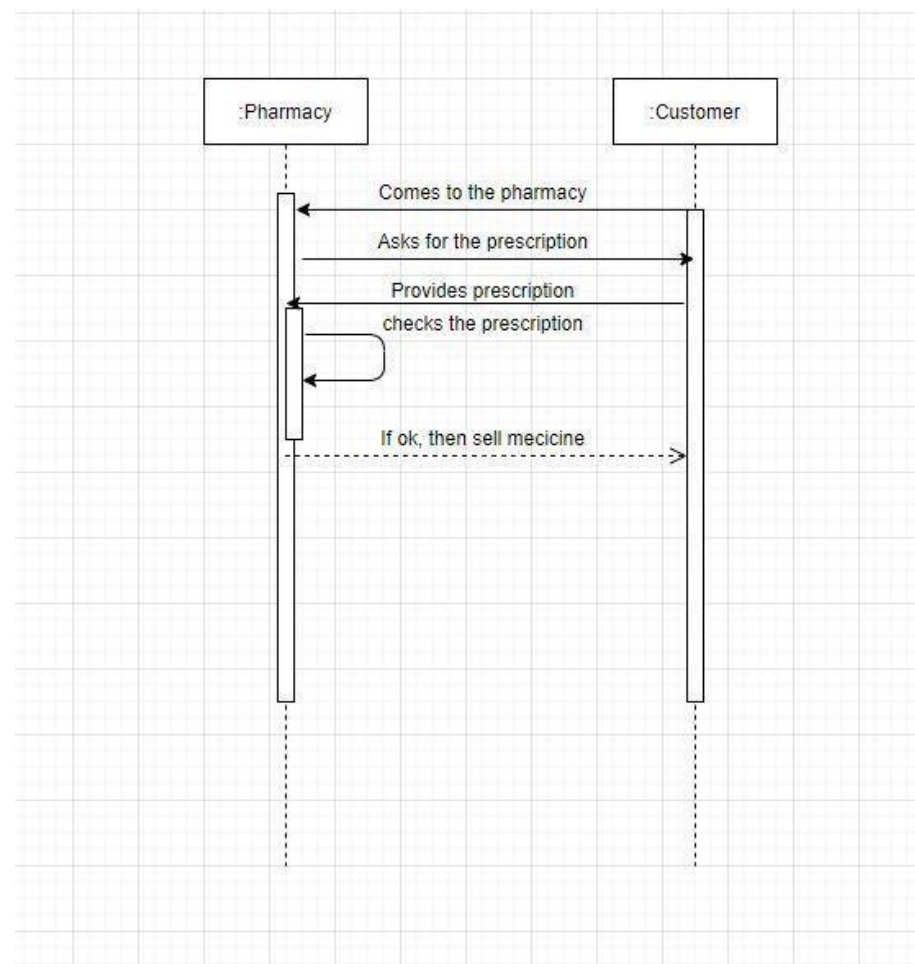
### 6.3.1 Sequence Diagram

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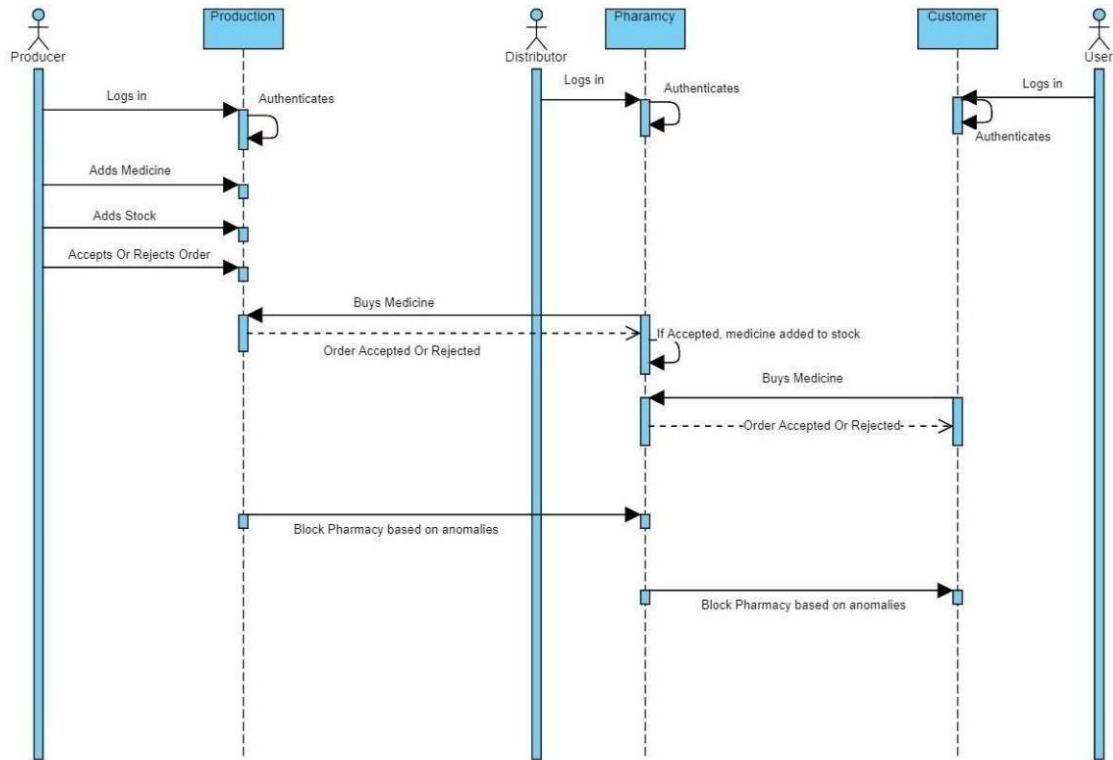
### 6.3.1.1 Sequence Diagram 2

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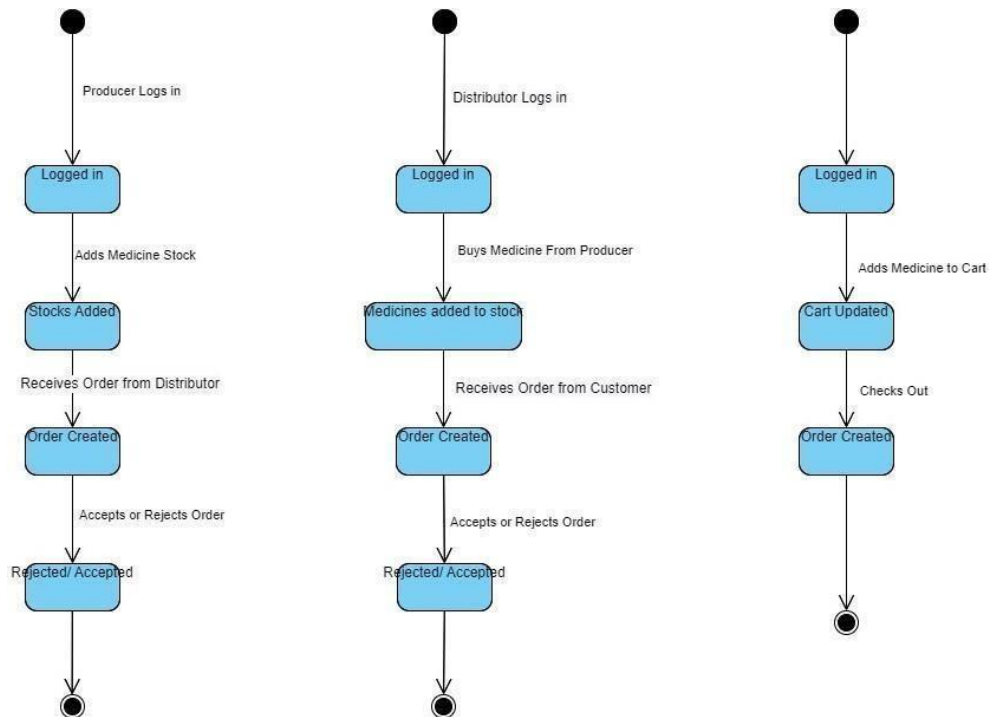
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### 6.3.1.2 Sequence Diagram



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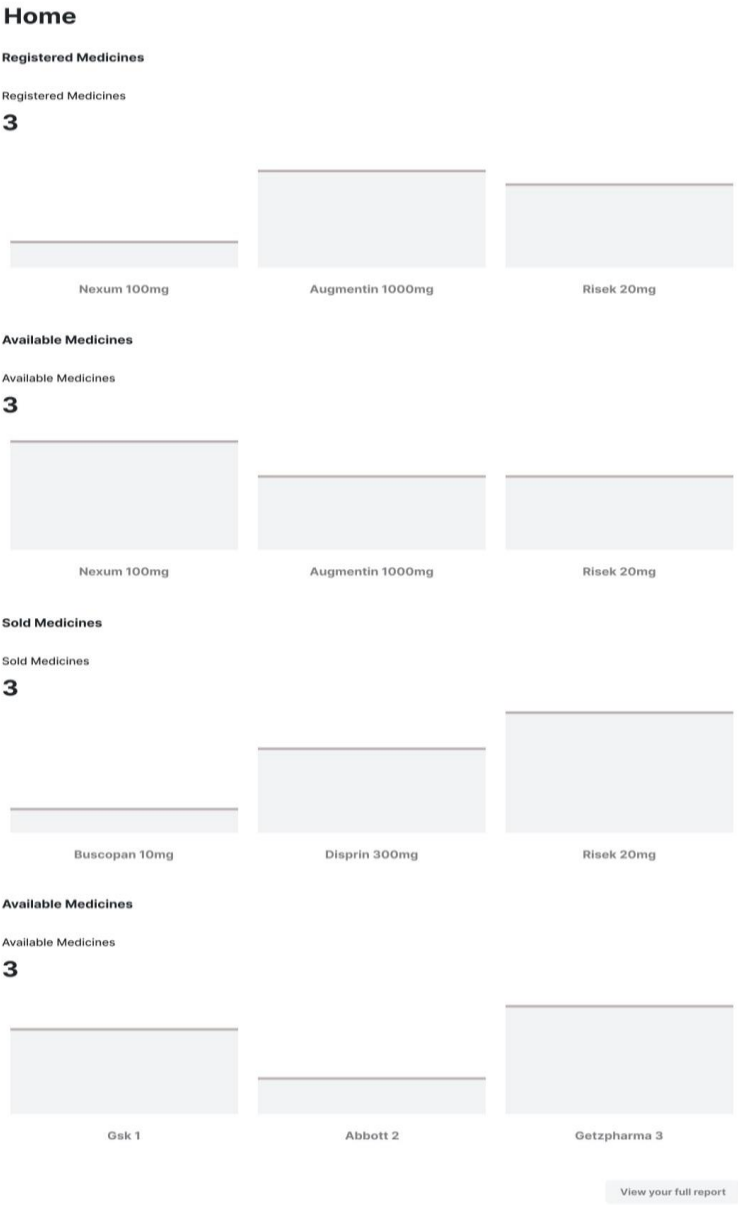
## 6.3.2 State Diagram



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## 6.4 GUI Design

### Dashboard



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### 6.4.1 Adding stocks

Company Name

Gsk

Dashboard

Medicines

Orders

Shipments

Settings

Medicine

Medicine Information

Medicine Name

Enter Name

Medicine Description

Enter description

Medicine Image URL

Enter Image URL

Medicine Price

Medicine Price

Enter Price

Medicine Quality

Enter Quality

Medicine Information

Medicine Information

Enter Information

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**Mobile:**





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<https://doi.org/10.1007/s10916-018-0997-3>
- Chen, Y., Ding, S., Xu, Z. et al. Blockchain-Based Medical Records Secure Storage and Medical Service Framework. J Med Syst 43, 5 (2019).<https://doi.org/10.1007/s10916-018-1121-4>

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## 7 Appendices

### 7.1 Appendix: Glossary

<i>Blockchain</i>	<i>A distributed ledger technology for secure and transparent record-keeping.</i>
<i>Smart Contract</i>	<i>Self-executing contracts with the terms of the agreement directly written into code.</i>
<i>Data Encryption</i>	<i>The process of converting readable data into unreadable characters to secure information.</i>
<i>Blockchain Security</i>	<i>Security measures inherent in blockchain technology to prevent unauthorized access and tampering.</i>
<i>Traceability</i>	<i>The ability to trace and track the history, distribution, and location of a product.</i>
<i>Data Dictionary</i>	<i>A structured description of the data or control items used in a system, including names, aliases, and usage.</i>
<i>Data Access Layer</i>	<i>The layer responsible for managing interaction with the database and handling data retrieval and updates.</i>

### 7.2 Appendix: Technical Specifications

- **Software Tools Requirements:**

1. **React JS:**

- a. Version: Latest stable version
- b. Purpose: Front-end development for the web application.

2. **Node JS:**

- a. Version: Latest LTS version
- b. Purpose: Server-side JavaScript runtime for building scalable network applications.

3. **Ethereum/Solidity:**

- a. Version: Compatible with the latest Ethereum network
- b. Purpose: Smart contract development and integration for blockchain transactions.

4. **React Native:**

- a. Version: Latest stable version
- b. Purpose: Mobile application development for Android and iOS.

5. **Visual Studio Code:**

- a. Version: Latest stable version
- b. Purpose: Integrated development environment (IDE) for coding, debugging, and version control.

- **Budget/Costing**

1. Total Hours: 300 hrs

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2. Per Hour Rate: 500 Rs
3. Total Hours Rate: 150,000 Rs
4. Hardware Cost: 0 Rs (No specific hardware requirements)
5. Other Resources: 50,000 Rs
6. Total Estimated Cost: 200,000 Rs