

# **MED ON TIME**

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## DECLARATION

We hereby certify that this project and all the artifacts associated with it are our own work and it has not been submitted before nor is currently being submitted for any other degree program.

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## **ABSTRACT**

In an age where healthcare management is increasingly reliant on technology, the MedOnTime project stands as a practical and innovative solution to address the challenges of medication adherence. This report captures the journey of our team's efforts in conceptualizing, analyzing, and designing a user-friendly mobile application aimed at helping individuals manage their medication schedules more effectively.

The report begins by examining the current limitations of existing medication management practices, based on insights drawn from surveys and user interviews. These findings have been translated into a set of user requirements, illustrated through detailed diagrams and descriptions, which guide the development of the MedOnTime application. The project aims to revolutionize medication management by providing customizable reminders, refill alerts, and a reliable platform for users to ensure they never miss a dose.

This document covers the project's background, problem definition, system analysis, software requirements, and design architecture, providing a detailed roadmap from concept to implementation. It outlines the progress made so far, highlighting the design of intuitive user interfaces, the creation of wireframes, and the initiation of the development phase.

Ultimately, the MedOnTime project demonstrates how technology can enhance healthcare by offering a solution that prioritizes user convenience, safety, and well-being.

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## **CHAPTER 01 - INTRODUCTION**

This chapter delves into the origins of the MedOnTime project, exploring the inspiration behind the idea and the current practices in medication management. It examines the limitations of existing systems and outlines the key problems that MedOnTime seeks to address. Additionally, this chapter discusses the project's goals and objectives, providing a clear understanding of what the project aims to achieve. It also defines the boundaries of the project, ensuring a focused and practical approach to improving medication management for users.

### **1.1 Project Background**

The idea for the MedOnTime project originated from the growing need for a reliable solution to help people manage their medication schedules more effectively, especially for those with chronic conditions or complex treatment plans. The concept evolved during discussions on the limitations of existing medication management apps, highlighting a significant gap in the market. The existing solutions often lack comprehensive features to ensure adherence to treatment plans, leaving many users struggling with missed doses, late refills, or inconvenient access to medications.

Many current apps in the market, like Medisafe and MyTherapy, provide basic functionalities such as reminders and health tracking but fail to address key user pain points. These apps lack options for uploading prescriptions, integrating with pharmacies for direct medication delivery, and supporting flexible payment systems, leaving users to manage these critical tasks independently. This creates an inconvenient and fragmented experience for individuals, especially those managing multiple medications.

MedOnTime emerged to bridge these gaps by offering a complete, easy-to-use platform that provides personalized medication reminders, real-time tracking, and a seamless connection with pharmacies for medication delivery and refills. The project prioritizes user convenience, allowing individuals to upload prescriptions, track their medication intake, and receive real-time alerts, all while ensuring their data is secure and accessible. This solution aims to empower users by making medication management more efficient, reliable, and stress-free,

ultimately improving adherence to prescribed treatments and enhancing overall health outcomes.

## 1.2 Problem Definition

The primary goal of the MedOnTime project is to transform how people manage their medication schedules by addressing key shortcomings in current solutions. Existing medication management methods, including popular apps, are often fragmented, lacking comprehensive features to help users efficiently manage their prescriptions, refills, and medication intake. Users are left to manually track their medications, visit pharmacies for refills, and handle complex dosage schedules, which can lead to missed doses, late refills, and ultimately poor treatment outcomes.

The MedOnTime project aims to bridge this gap by offering an integrated, reliable, and user-friendly solution that not only reminds users to take their medications but also streamlines the entire process of prescription management, delivery, and tracking. By addressing these pain points, MedOnTime aspires to improve adherence to treatment plans, reduce health complications due to missed medications, and enhance the overall experience for individuals managing complex medication regimens.

## 1.3 Aims and Objectives

**Design and Implement an Intuitive Mobile Application:** Create a user-friendly mobile app that integrates key features such as medication reminders, refill alerts, and customizable notifications. The app will be designed with an intuitive interface to ensure users of all ages can easily navigate and manage their medication schedules effectively.

**Enable Prescription Uploading Functionality:** Allow users to upload their medical prescriptions directly through the app, select their preferred pharmacy, and place medication orders. This feature will eliminate the need for physical visits to pharmacies, providing users with the convenience of managing prescriptions from their mobile devices and having medications delivered to their doorstep.

**Facilitate an Effortless Medication Delivery Service:** Provide a seamless medication delivery service that ensures users receive their medications promptly and reliably. This will eliminate the need for users to travel to pharmacies, ensuring convenience and timely delivery of medications right to their homes.

**Provide Timely Arrival Alerts for Medication Reminders:** Implement a real-time alerting system that sends timely notifications to remind users to take their medications. This system will be customizable, allowing users to set personalized reminders based on their specific medication schedules. The reminders will improve adherence to treatment plans, reducing the risk of missed doses and health complications.

**Develop Real-Time Medicine Tracking:** Incorporate a comprehensive tracking system that monitors users' daily medication intake, providing real-time updates on medication adherence. Additionally, the app will maintain a medication usage history, which can be shared with healthcare providers when necessary.

**Ensure a Secure Platform for User Data Protection:** Build a secure platform that protects user data through advanced security measures such as encryption and secure authentication. This will ensure the integrity and confidentiality of sensitive information, including medical records and payment details, fostering user trust and ensuring compliance with data protection regulations.

## **1.4 Scope with Clear Boundaries**

The MedOnTime project is focused on simplifying and improving the management of medication schedules through a reliable and intuitive mobile application. While the project aims to address key challenges in medication management, it has well-defined limitations that set its boundaries. The following points outline the scope of the project:

**Exclusion of Direct Medical Advice:** The MedOnTime app is designed to help users manage their medication schedules, but it does not provide or substitute professional medical advice. Users are expected to consult healthcare providers for medical decisions, and the app does not diagnose, treat, or offer medical recommendations.

**Limitation to Medication Management:** The project specifically addresses the reminder, tracking, and delivery aspects of medication management. It does not extend to managing other healthcare needs such as dietary or exercise tracking, and its focus remains solely on medication adherence and prescription refills.

**Pharmacy Network Limitations:** While MedOnTime facilitates pharmacy selection and medication delivery, its network is limited to participating pharmacies. Users must choose from pharmacies available within the app, and the project does not cover or integrate pharmacies outside the supported network.

**Exclusion of Real-Time Health Monitoring:** The app helps users track their medication intake, but it does not include real-time health monitoring features like measuring vitals or symptoms. Users will need to use other devices or apps for tracking their health metrics.

**Exclusion of Card Payment Options:** The app supports cash on delivery as the sole payment method. Users are not provided with card payment options or integration with payment gateways for online transactions.

**User Responsibility for Accurate Data Entry:** The responsibility for entering correct information regarding prescriptions, medication schedules, and personal details lies with the users. MedOnTime is a tool to assist in medication management, but users are responsible for ensuring the accuracy of the data they input into the app.

In summary, the MedOnTime project is dedicated to providing a seamless and efficient medication management solution within these defined boundaries, focusing on medication reminders, tracking, and delivery while excluding areas beyond its core functionalities.

## **1.5 Organization of the Dissertation**

This dissertation is structured into distinct chapters, each exploring key aspects of the MedOnTime project, from its conception to implementation and evaluation. The organization of the dissertation is as follows:

## **Chapter 01: Introduction**

This chapter lays the groundwork for the MedOnTime project by introducing its background, defining the core problem it aims to solve, and outlining the project's aims and objectives. Additionally, the scope of the project, along with any limitations, is clearly defined to set the context for the rest of the report.

## **Chapter 02: System Analysis and Requirements**

This chapter delves into a detailed analysis of the system requirements. It presents a comprehensive assessment of user needs, supported by data gathered from target audiences. The Software Requirements Specification (SRS) will be documented here, covering functional and non-functional requirements, followed by alternative approaches for meeting these needs. Diagrams such as Use Case and Activity diagrams will further illustrate the system's structure.

## **Chapter 03: System Design and Architecture**

This chapter focuses on the design and architectural aspects of MedOnTime. It outlines the design process for both the user interface and the system architecture, including a prototype of the mobile application. The chapter also provides technical details about the system's architecture, describing how different components work together to deliver the desired functionality.

## **Chapter 04: Implementation and Testing**

This section explains how the design was transformed into a working system. It includes details of the tools, programming languages, and frameworks used. The chapter also covers the testing phase, outlining the testing strategies and methodologies employed to ensure system reliability and performance.

## **Chapter 05: Conclusion and Future Directions**

The final chapter summarizes the project, reflecting on its achievements and addressing the challenges encountered during development. It also explores potential enhancements that

could be implemented in the future to improve the functionality, usability, and scalability of MedOnTime. The chapter concludes by evaluating the extent to which the project has met its initial goals.

## **Summary**

The introduction chapter provided an overview of the MedOnTime project, starting with the project background, highlighting the limitations of existing medication management systems, and the challenges people face in adhering to medication schedules. The chapter defined the primary problem MedOnTime aims to solve, outlined the key aims and objectives of the system, and established the clear scope and boundaries of the project. Finally, the organization of the dissertation was discussed, providing a roadmap for the remaining chapters.



## **CHAPTER 02 - SYSTEM ANALYSIS**

In this chapter, a comprehensive analysis of the system requirements for the MedOnTime project will be conducted. The chapter begins by outlining the facts-gathering techniques employed to understand user needs and technical specifications. This analysis is followed by detailed use-case diagrams and descriptions, activity diagrams, and other relevant models that illustrate the key functionalities and requirements of the system. Furthermore, the Software Requirements Specification (SRS) will be outlined, offering a detailed technical roadmap for the system's development. Lastly, alternative approaches to fulfilling the identified requirements will be discussed, culminating in a feasibility study to select the most suitable path forward.

### **2.1 Facts Gathering Techniques Used**

A combination of fact-gathering techniques was employed to gain a comprehensive understanding of the requirements for the MedOnTime project. These techniques included surveys, interviews with patients and caretakers, and discussions with pharmacies. Each method played a critical role in collecting relevant data, ensuring the solution meets the needs of its intended users.

#### **1. Surveys**

Surveys were used to gather quantitative data from a wide range of medicine users who require medication management. This method allowed us to collect structured data on common challenges users face, such as forgetfulness in medication intake, preferences for reminder systems, and expectations regarding medicine delivery services. By deploying surveys both online and offline, we were able to reach diverse groups, ensuring comprehensive insights into user preferences, daily routines, and common issues in managing medication.

Surveys helped quantify key issues such as:

- Percentage of users forgetting medication doses.
- Interest in receiving mobile alerts for refills and medication intakes.
- Preferences regarding medication delivery options.

## **2. Interviews with beneficiaries**

To gain deeper insights, one-on-one interviews were conducted with both patients and caretakers. These interviews were semi-structured, allowing us to explore specific problems users encounter in managing medications and the solutions they currently use. It also allowed participants to express their views on the features they would like to see in an app like MedOnTime. This method provided qualitative insights into the emotional and practical aspects of medication management, such as the stress of remembering to take medicine or the difficulties faced by caretakers managing medication for others.

Key topics covered in interviews included:

- Personal experiences with medication management.
- Preferred methods for receiving on time medication reminders.
- Perceptions of existing medication management tools and areas for improvement.

## **3. Discussions with pharmacies**

Pharmacies play a critical role in the medication supply chain, and thus, in-depth discussions were held with pharmacy staff to understand their perspectives on medication delivery and management. These discussions were aimed at understanding the logistical challenges of offering home delivery, order fulfillment times, and potential collaboration between pharmacies and the app. Pharmacies also provided input on prescription management systems and how MedOnTime could streamline the process of prescription uploads, refills, and delivery scheduling.

Topics covered in pharmacy discussions included:

- Feasibility of integrating prescription uploads with pharmacy systems.
- Delivery logistics, including expected timelines and delivery options.
- Preferred modes of payment and reconciliation processes for cash on delivery.

## **2.2 Detailed Analysis of the Gathered Facts**

Based on the gathered data from surveys, interviews, and discussions with pharmacies, several challenges and user requirements were identified. These insights reveal the gaps in

current medication management practices and highlight the essential features needed in a comprehensive solution like MedOnTime.

### **2.2.1 Identified Challenges**

**Missed Medications:** A significant number of users reported forgetting to take their medications on time, especially those on complex or long-term treatment plans.

**Lack of Refill Reminders:** Patients often struggle to keep track of when their prescriptions need to be refilled, leading to missed doses or delays in treatment.

**Inconvenience of Pharmacy Visits:** Both patients and caretakers expressed difficulty in physically visiting pharmacies, especially for elderly or disabled individuals.

**Limited Communication Between Pharmacies and Patients:** Pharmacies currently lack an organized platform for managing orders, reminders, and deliveries, leading to inefficiencies in handling medication refills and communication with patients.

**Absence of Real-Time Alerts:** Many patients emphasized the need for real-time medication reminders and alerts, as current methods (such as phone alarms or physical reminders) are not as effective.

### **2.2.2 Identified User Requirements**

**Medication Reminders:** The system should provide real-time, customizable reminders for taking medications based on individual schedules.

**Refill Alerts:** Users need timely notifications when their prescriptions are about to run out, ensuring they can place refill orders before their medication supply runs out.

**Prescription Upload and Management:** The platform should allow users to upload and store their prescriptions digitally, making it easier for them to manage their medications and orders.

**Medicine Delivery:** Users should have the option to choose their preferred pharmacy for medication delivery. The system should allow users to place orders and ensure reliable delivery to their doorstep, without the need for real-time delivery tracking.

**Easy Access to Pharmacy Services:** Users require a system that simplifies the ordering of medications from pharmacies, offering delivery options that save time and effort.

**Secure Data Management:** Given the sensitivity of medical data, the system must ensure secure storage and handling of user information, adhering to data protection standards.

**User-Friendly Interface:** The solution must be accessible to users of all ages, providing an intuitive design that makes navigation simple, especially for elderly users or those with limited tech experience.

**Flexible Payment Options:** Given the needs of different users, the system should accommodate cash-on-delivery payments, excluding card payment methods.

These identified challenges and requirements shape the foundation for the design and functionality of the MedOnTime solution, ensuring that the final product addresses real-world issues and enhances users' medication management processes.

### **2.2.3 Use-Case Diagrams**

The user requirements extracted from surveys, interviews, and discussions with key stakeholders were translated into clear and concise Use-Case diagrams and descriptions. These diagrams capture the interactions between different users and the MedOnTime medication management system, illustrating how various features such as medication reminders, prescription uploads, and medication orders are integrated. Each use case provides a detailed breakdown of the steps involved in the system's functionality, reflecting the user-centric design of the application.



Figure 1: Use-case diagram

## 2.2.4 Use Case Descriptions

Below is each Use-Case description that provides an in-depth narrative of the user's goals and the system's responses.

Table 1: Use-case description for login

Use Case ID	UC001
Use Case Name	Login
Description	Allows the user to access the system by entering valid credentials.
Actor	Patient, Pharmacy, Admin
Relationships	Include: Validate credentials
Pre-Conditions	The user must have a registered account.
Post Conditions	The user gains access to their respective dashboard upon successful login.
Main Flow	<ol style="list-style-type: none"> <li>1. User accesses the login page.</li> <li>2. User enters valid credentials (username/password).</li> <li>3. System verifies credentials.</li> <li>4. System grants access.</li> </ol>
Alternative Flows	Invalid credentials: Error message is shown, and user is prompted to retry.

Table 2: Use-case description for register

Use Case ID	UC002
Use Case Name	Register
Description	Users can create a new account by providing personal information and setting login credentials.
Actor	User, Pharmacy
Pre-Conditions	User must provide the required registration information.
Post Conditions	A new user account is created and available for login.
Main Flow	<ol style="list-style-type: none"> <li>1. User accesses the registration page.</li> <li>2. User enters personal information.</li> <li>3. System validates the information.</li> <li>4. System creates the new account.</li> </ol>
Alternative Flows	Missing or invalid information: The system prompts the user to correct the errors.

Table 3: Use-case description for password recovery

Use Case ID	UC003
Use Case Name	Password Recovery
Description	Allows users to recover their accounts in case they forget their password by sending a recovery link to their registered email.
Actor	User, Pharmacy
Pre-Conditions	User must have an active account with a valid email address.
Post Conditions	The user can reset the password and regain access to the account.
Main Flow	<ol style="list-style-type: none"> <li>1. User accesses the password recovery page.</li> <li>2. User enters their registered email.</li> <li>3. System sends a recovery link to the email.</li> <li>4. User resets their password via the link.</li> </ol>
Alternative Flows	Invalid email: System shows an error.

Table 4: Use-case description for medication detail entering

Use Case ID	UC004
Use Case Name	Enter Medication Details
Description	Users can enter details about their medications, including dosage and frequency.
Actor	User (Patient or Caretaker)
Pre-Conditions	The user must be logged in.
Post Conditions	Medication details are saved in the system.
Main Flow	<ol style="list-style-type: none"> <li>1. User selects “Enter Medication Details.”</li> <li>2. User inputs medication name, dosage, and schedule.</li> <li>3. System saves the medication details.</li> </ol>

Table 5: Use-case description for prescription upload

Use Case ID	UC005
Use Case Name	Upload Prescriptions
Description	Allows users to upload their medical prescriptions for verification and order placement.
Actor	User (Patient or Caretaker)
Pre-Conditions	User must have a valid prescription.
Post Conditions	Prescription is uploaded and stored in the system.
Main Flow	<ol style="list-style-type: none"> <li>1. User selects “Upload Prescription.”</li> <li>2. User uploads a scanned copy of the prescription.</li> <li>3. System stores the prescription and marks it for verification.</li> </ol>

Table 6: Use-case description for placing orders

Use Case ID	UC006
Use Case Name	Place Medication Order
Description	This use case describes the process of how a user places a medication order through the MedOnTime app. The user selects the required medications, confirms the delivery address, and submits the order. The pharmacy verifies the prescription before proceeding. Additionally, both the user and the pharmacy have the option to cancel the order during the process if necessary.
Actor	User (Patient or Caretaker)
Relationships	<p>Include:</p> <ul style="list-style-type: none"> <li>• Confirm Delivery Address: Ensures that the user's delivery address is confirmed before the order is processed.</li> <li>• Verify Prescription: The pharmacy verifies the uploaded prescription to ensure that the medications are dispensed accurately.</li> </ul>



Pre-Conditions	<p>the user must be logged into the system.</p> <p>The user must have uploaded a valid prescription for prescription-only medications.</p> <p>The user must have a registered delivery address in the system.</p>
Post Conditions	<p>If the process is successful, the order is placed, and the user receives a confirmation with delivery details.</p> <p>If the order is canceled by either the user or the pharmacy, the process terminates without completing the order.</p>
Main Flow	<ol style="list-style-type: none"> <li>1. The user accesses the "Place Order" section in the app.</li> <li>2. The system displays available medications and allows the user to select the desired medications and quantity.</li> <li>3. The system includes the Confirm Delivery Address use case to confirm the accuracy of the delivery address.</li> <li>4. The user uploads a valid prescription for the selected medications (if required).</li> <li>5. The system includes the Verify Prescription use case, where the pharmacy checks and verifies the prescription for accuracy.</li> <li>6. Upon successful verification, the user confirms the order, selecting cash on delivery as the payment option.</li> <li>7. The system finalizes the order and sends an order confirmation to the user with delivery details.</li> </ol>
Alternative Flows	<p>If the user cancels the order at any stage, the system terminates the process, and the order is not placed.</p> <p>If the pharmacy cancels the order (e.g., due to an invalid prescription or stock issues), the system notifies the user, and the order is not placed.</p>

*Table 7: Use-case description for setting reminders*

Use Case ID	UC007
Use Case Name	Set Reminders

Description	Users can set medication reminders based on their prescription schedule.
Actor	User (Patient or Caretaker)
Pre-Conditions	User must have entered medication details.
Post Conditions	Reminder is set in the system.
Main Flow	<ol style="list-style-type: none"> <li>1. User selects “Set Reminder.”</li> <li>2. User customizes the frequency and timing of reminders.</li> <li>3. System saves the reminder settings.</li> </ol>

*Table 8: Use-case description for receiving alerts*

Use Case ID	UC008
Use Case Name	Receive Alerts (Refill and Reminders)
Description	Users receive notifications for their medication reminders and refills.
Actor	User (Patient or Caretaker)
Pre-Conditions	Reminders must be set.
Post Conditions	Alerts are sent to the user.
Main Flow	<ol style="list-style-type: none"> <li>1. System sends medication alert based on the set schedule.</li> <li>2. User acknowledges the alert.</li> </ol>
Alternative Flows	User ignores the alert: System logs the missed dose.

*Table 9: Use-case description for choosing a pharmacy*

Use Case ID	UC009
Use Case Name	Select Pharmacy
Description	Users can browse and select a pharmacy to order medications from.
Actor	User (Patient or Caretaker)
Pre-Conditions	User must have a prescription or medication to order.

Post Conditions	Pharmacy is selected for the order.
Main Flow	<ol style="list-style-type: none"> <li>1. User selects “Choose Pharmacy.”</li> <li>2. User browses the list of available pharmacies.</li> <li>3. User selects a pharmacy.</li> </ol>
Alternative Flows	No available pharmacies: System shows an error message.

*Table 10: Use-case description for viewing history*

Use Case ID	UC010
Use Case Name	View Medication History
Description	Allows users to view their past medications and related activities.
Actor	User (Patient or Caretaker)
Pre-Conditions	The user must have entered or ordered medications previously.
Post Conditions	Medication history is displayed.
Main Flow	<ol style="list-style-type: none"> <li>1. User selects “View Medication History.”</li> <li>2. System retrieves and displays medication history.</li> </ol>

*Table 11: Use-case description for securing user information*

Use Case ID	UC011
Use Case Name	Secure User Information
Description	Ensures user data is securely managed and protected.
Actor	Admin
Pre-Conditions	User data must be stored in the system.
Post Conditions	User data remains secure.
Main Flow	<ol style="list-style-type: none"> <li>1. Admin monitors system security.</li> <li>2. Admin applies data protection measures.</li> </ol>

Table 12: Use-case description for verifying pharmacy

Use Case ID	UC012
Use Case Name	Verify Pharmacies
Description	Admin verifies the legitimacy of registered pharmacies.
Actor	Admin
Pre-Conditions	Pharmacies must have applied for verification.
Post Conditions	Pharmacy is verified or rejected.
Main Flow	<ol style="list-style-type: none"> <li>1. Admin reviews pharmacy registration details.</li> <li>2. Admin verifies or rejects the pharmacy.</li> </ol>

Table 13: Use-case description for verifying prescriptions

Use Case ID	UC013
Use Case Name	Verify Prescription
Description	Pharmacies verify user prescriptions before processing medication orders.
Actor	Pharmacy
Pre-Conditions	User must have uploaded a prescription.
Post Conditions	The prescription is verified and start to process the order.
Main Flow	<ol style="list-style-type: none"> <li>1. Pharmacy receives the uploaded prescription.</li> <li>2. Pharmacy verifies the prescription.</li> </ol>
Alternative Flows	Invalid prescription: Pharmacy rejects the order.

Table 14: Use-case description for canceling an order

Use Case ID	UC014
Use Case Name	Cancel Medication Order

Description	User or pharmacy can cancel a medication order.
Actor	User (Patient or Caretaker), Pharmacy
Pre-Conditions	Order must have been placed.
Post Conditions	Order is canceled.
Main Flow	<ol style="list-style-type: none"> <li>1. User or pharmacy initiates cancellation.</li> <li>2. System cancels the order.</li> </ol>

*Table 15: Use-case description for tracking medication*

Use Case ID	UC015
Use Case Name	Track Medication Intake
Description	This use case describes how the MedOnTime system tracks users' medication intake. The system monitors user activity and updates medication history based on their input. Additionally, the system provides alerts and reminders to ensure users adhere to their medication schedules. The system also allows users to view their medication history to track their adherence over time.
Actor	System, User (Patient or Caretaker)
Relationships	<p>Extend:</p> <p>Receive Alerts: The system extends the functionality to send alerts when medications are due based on user input and schedule.</p> <p>View Medication History: The system extends this use case by allowing users to view their previous medication intake records for better tracking and analysis.</p>
Pre-Conditions	<p>The user must have entered their medication details, including dosage and schedule.</p> <p>The system has access to updated medication data for the user.</p> <p>The reminders and alerts are properly configured.</p>
Post Conditions	The user's medication intake is tracked, and the system updates the medication history.

	<p>The user receives alerts and reminders for upcoming doses.</p> <p>The user can view their medication intake history at any time.</p>
Main Flow	<ol style="list-style-type: none"> <li>1. The user enters their medication details, including dosage, intake schedule, and special instructions.</li> <li>2. The system tracks the medication intake schedule based on the user's input.</li> <li>3. The system extends the Receive Alerts use case to notify the user if a medication intake is due.</li> <li>4. The system extends the Receive Reminders use case to send timely reminders to users for upcoming doses.</li> <li>5. The system logs each confirmed medication intake, updating the user's medication history.</li> <li>6. The system extends the View Medication History use case to provide users access to their detailed medication intake records.</li> </ol>
Alternative Flows	<p>If the user misses a scheduled dose, the system logs the missed dose in the medication history and sends a follow-up alert.</p> <p>If the user takes medication earlier or later than the scheduled time, the system adjusts the tracking accordingly and updates the medication history.</p>

### 2.2.5 Activity Diagrams for Use-Cases

Activity diagrams have been prepared for each identified use case to provide a clear understanding of the functional workflows within the MedOnTime system. These diagrams visually represent the sequence of activities and decision points involved in various interactions between the system and its users, such as placing medication orders, setting reminders, and uploading prescriptions. By mapping the flow of actions and system responses, the diagrams offer a detailed view of how users interact with the system, ensuring all operational aspects are captured. These diagrams also highlight the roles of different actors and system components in achieving user objectives efficiently.

## Activity Diagram for User Profile Setup and Login

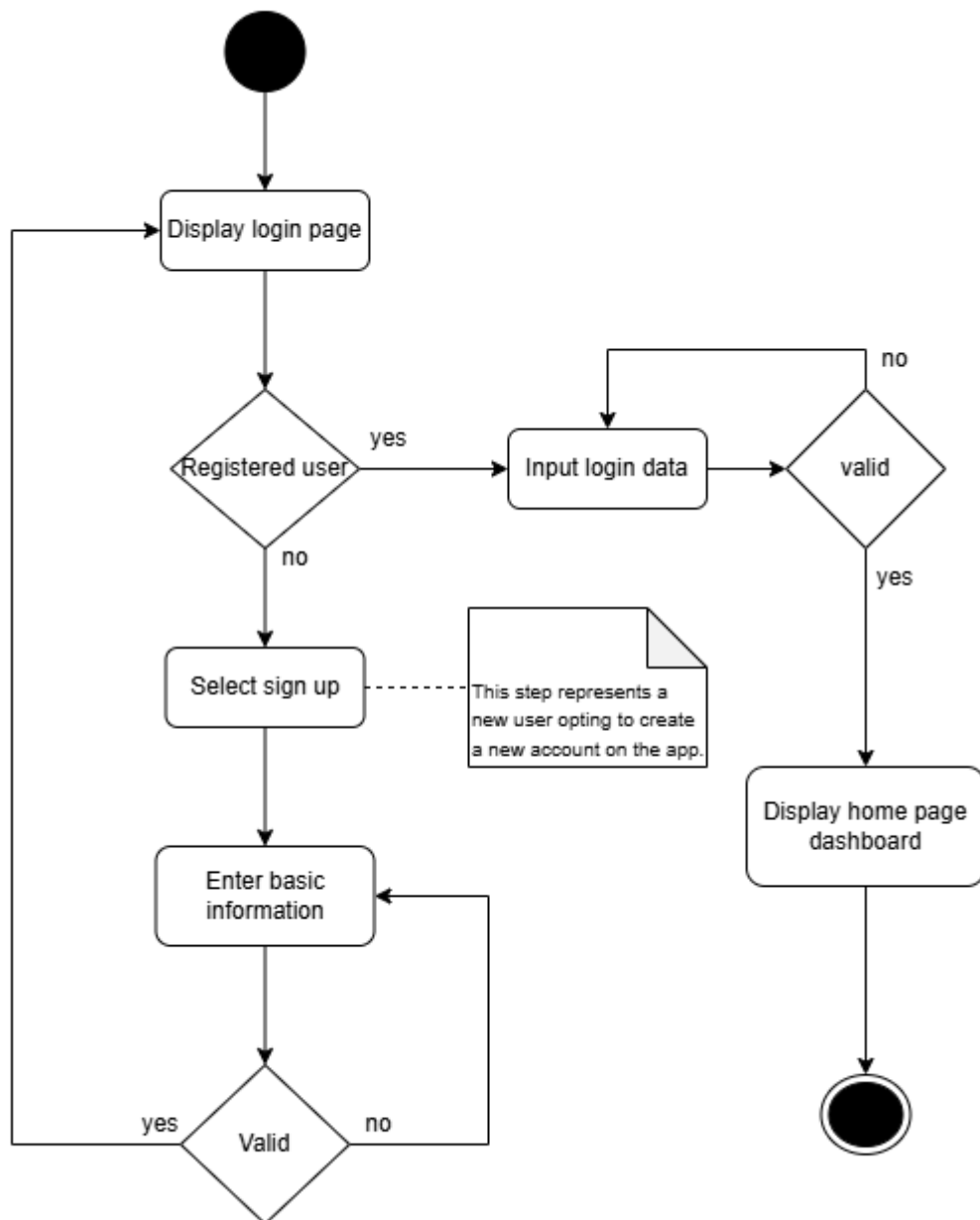


Figure 2: Activity diagram for user profile set up and login

### Activity Diagram for Pharmacy Profile Setup and Verification

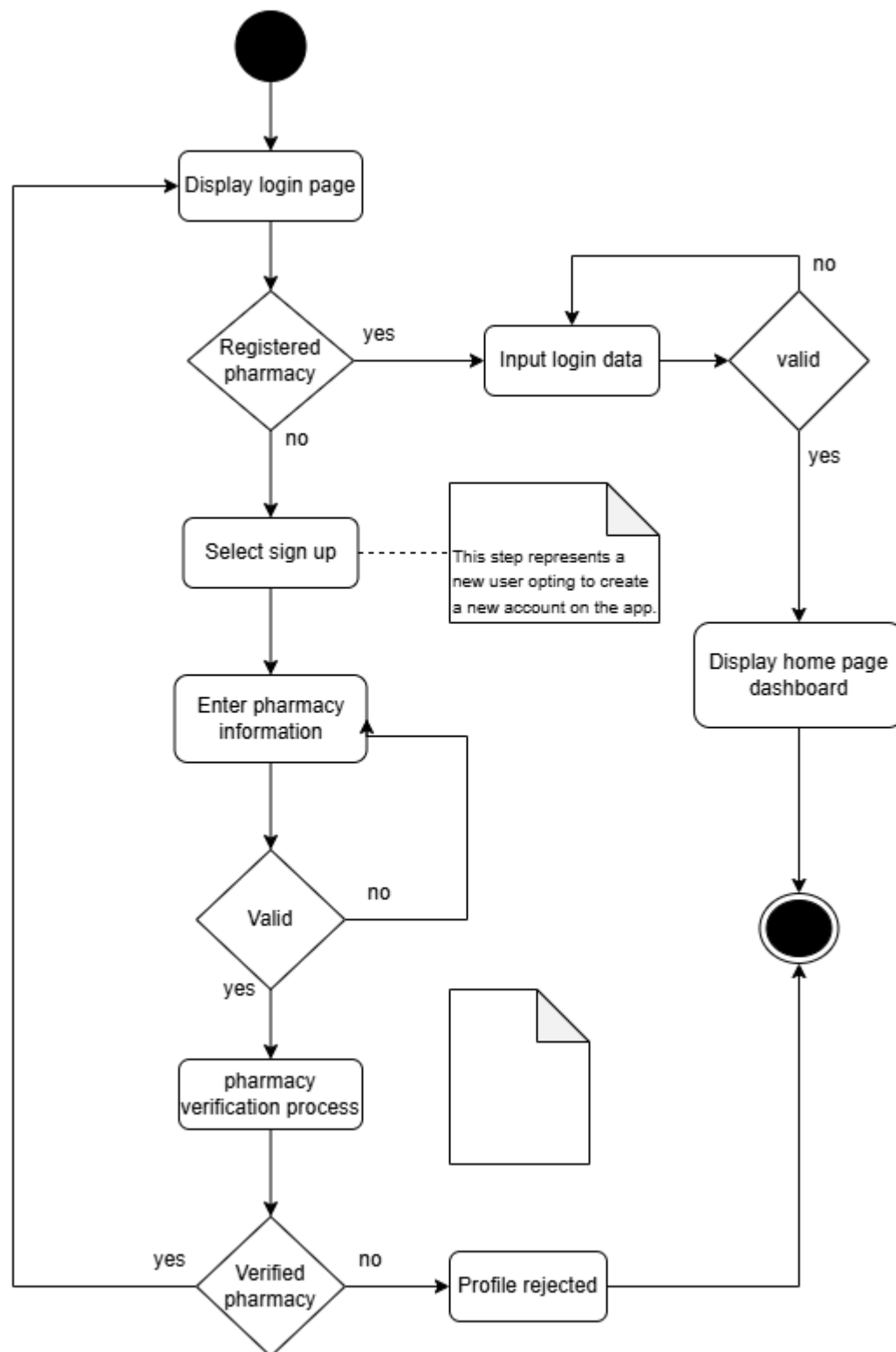


Figure 3: Activity diagram for pharmacy profile set up and verification



## Activity Diagram for Mobile Application

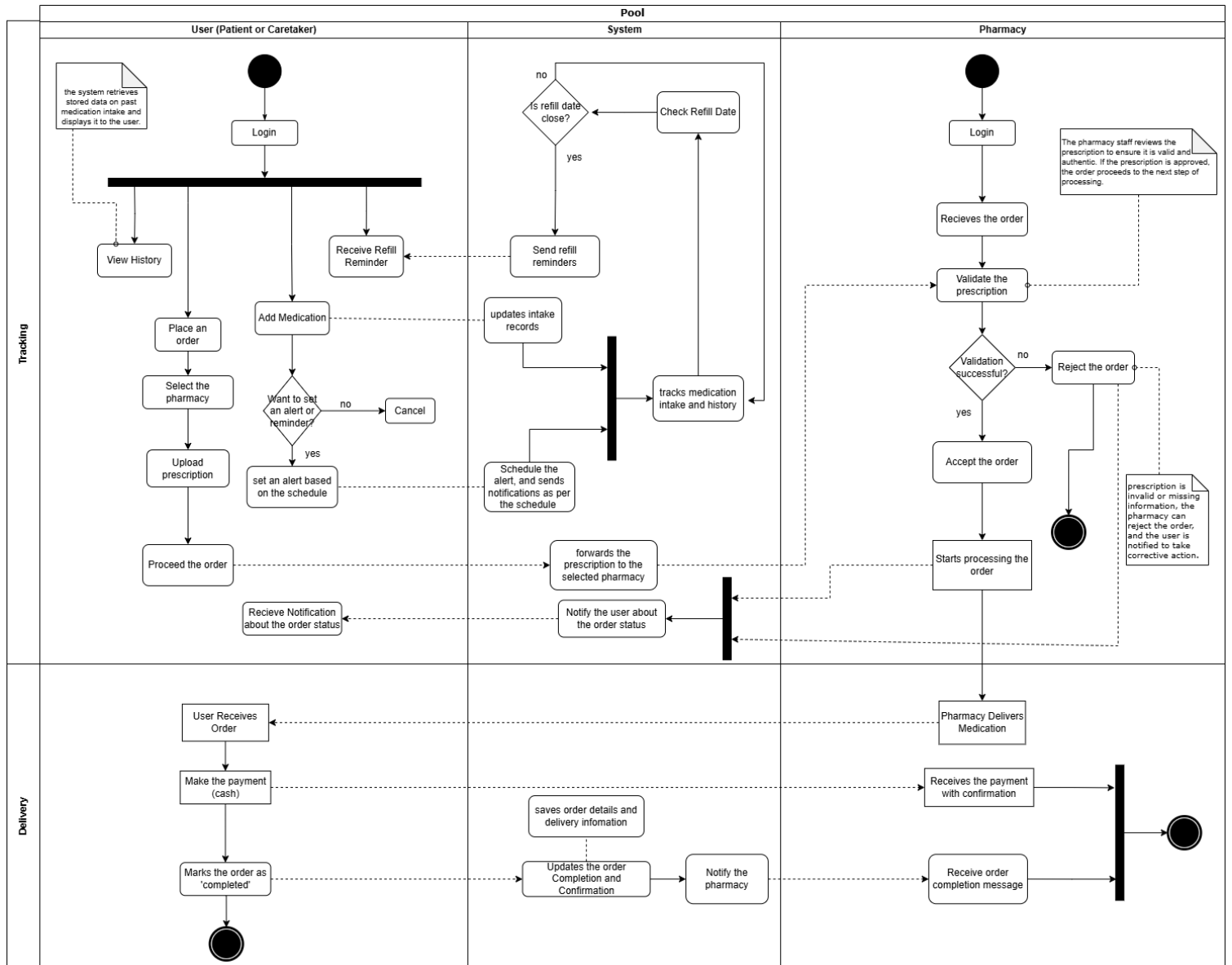


Figure 4: Activity diagram for mobile app

## Summary

In this chapter, various fact-gathering techniques, such as surveys and interviews, were employed to capture the user requirements. The gathered facts were thoroughly analyzed, and the requirements were documented using Use-Case Diagrams and descriptions, illustrating the interactions between users and the system. Activity Diagrams were created to describe the functionality of the identified use cases, ensuring a visual understanding of system processes. The chapter also utilized other diagrams to clarify requirements, providing a detailed system analysis for MedOnTime.

## 2.3 Software Requirement Specification

### 2.3.1 Functional Requirements

#### Users (Patients and Caregivers):

- User Registration and Login:

Users should be able to create an account by providing personal details (name, phone number, etc.) and set a password and recover their password if forgotten.

- Prescription Upload:

Patients and caregivers should be able to upload medical prescriptions as image files or PDFs. The pharmacy will validate the uploaded prescription before processing it.

- Medication Management:

Users can enter their prescribed medication details, including dosage, frequency, and intake times. They can further view their medication schedules and update medication details when necessary.

- Refill Reminders:

The system should automatically send refill reminders based on the medication intake pattern and remaining supply. Users can adjust reminder times and frequencies as needed.

- Order Medication:

Users should be able to select a preferred pharmacy, place orders for their medications, confirm delivery addresses, and receive order status updates.

- Track Medication Intake:

The system should track whether the patient took their medication on time and log this information for future reference. Users can manually confirm or dismiss reminders.

- View Medication History:

Users should have access to a detailed history of their medication intake, orders, and refill actions.

- **Cancel Orders:**

Users should be able to cancel a medication order before the pharmacy processes it.

#### Pharmacies:

- **Prescription Verification:**

Pharmacies should verify uploaded prescriptions to ensure they are valid before proceeding with the order.

- **Manage Orders:**

Pharmacies can view incoming orders, process them, and update the order status (e.g., preparing, dispatched, delivered). They should also be able to manage order cancellations by either the user or the pharmacy itself.

- **Deliver Medication:**

Once an order is processed, pharmacies are responsible for arranging medication delivery. The delivery status should be updated within the system.

- **Manage Stock Availability:**

Pharmacies should have the ability to manage their inventory and notify users if a requested medication is unavailable.

- **View Pharmacy Profiles:**

Pharmacies can manage their profiles (contact details, delivery zones, etc.) to ensure accurate service delivery.

### **2.3.2 Non-Functional Requirements**

- **Performance:** The system should respond to user actions (e.g., placing an order, setting reminders) within 3 seconds. The platform should support up to 10,000 concurrent users without performance degradation.
- **Usability:** The user interface must be intuitive and accessible to all users, including elderly patients with limited technology experience. A clean, straightforward design with large buttons and easily navigable menus is essential.

- **Security:** Sensitive data such as medical information and user credentials should be encrypted using industry-standard encryption protocols (e.g., AES-256). The system should implement multi-factor authentication for added security.
- **Scalability:** The system architecture must support easy scaling to accommodate increasing numbers of users, pharmacies, and data. It should allow for the integration of additional features and services as the app evolves.
- **Reliability:** The system should have an uptime of at least 99.9%, with backups in place to prevent data loss in case of server failures. Refill reminders and alerts must be reliable, with minimal delays or missed notifications.
- **Platform Compatibility:** The mobile application should be compatible with both Android and iOS platforms, ensuring smooth operation across multiple device types and screen sizes.

### 2.3.3 Data Flow and Storage Requirements

- **Data Collection:** The system will collect user data such as personal details, prescription information, medication schedules, and order history. Prescription data will be stored securely and shared only with pharmacies during the verification process.
- **Data Storage:** All user and prescription data must be stored in a secure, encrypted database. Data should be backed up regularly to prevent loss due to system failures or breaches.
- **Data Privacy:** User data must be handled in compliance with relevant data protection regulations ensuring that personal and medical information is safeguarded. Users should have control over their data, with options to view, update, or delete their information from the system.
- **Data Access:** Only authorized users, such as patients, caregivers, and pharmacies, should have access to specific data. Administrative functions for data access and management should be restricted to designated system administrators.
- **Data Flow:** Data flows between the user interface (e.g., the mobile app) and the backend server for processing. Prescription data flows from users to pharmacies for verification, and order data flows between users and pharmacies for order processing and delivery.

#### 2.3.4 External Interface Requirements for Patients and Caregivers

- **User Interface (UI):**

Patients and caregivers will primarily interact with the system through a mobile application interface.

The UI should be responsive, allowing users to easily input medication data, set reminders, and place orders with minimal steps.

- **Mobile Notifications:**

The system must support push notifications to remind users about upcoming medication times, refill needs, and order status updates.

- **Device Compatibility:**

The application should be compatible with mobile devices running Android and iOS, with support for various screen sizes and resolutions.

- **Prescription Upload:**

Patients and caregivers should have the ability to upload prescriptions by taking a picture or selecting a file from their mobile device.

- **Order and Payment Confirmation:**

Although payment is made in cash, users will receive order and payment confirmation via the app once the order is processed.

#### 2.3.5 External Interface Requirements for Pharmacies

- **Web Portal:** Pharmacies will interact with the system through a web-based portal where they can manage incoming orders, verify prescriptions, and process deliveries.
- **Prescription Verification Interface:** The system should provide a streamlined interface for pharmacies to view uploaded prescriptions, validate them, and either approve or reject orders based on the verification outcome.
- **Order Management System:** Pharmacies will use the system to track incoming medication orders, update the status (e.g., processing, dispatched, delivered), and

manage stock availability. They should also have the ability to notify users if certain medications are out of stock or unavailable.

- **Delivery Management:** Pharmacies will coordinate delivery logistics using the system, ensuring that medication is delivered to the correct address and updating the delivery status in real-time.
- **Admin Access for Pharmacy Profiles:** Pharmacies will have access to their profile in the system, allowing them to update delivery zones, contact details, and available medications as necessary.

## **2.4 Alternative Ways of Satisfying the Requirements**

### **2.4.1 SMS-based Medication Reminders**

For users who may not be comfortable with smartphones or mobile apps, especially elderly users, SMS-based medication reminders offer a simple and effective alternative. Instead of receiving push notifications through an app, users will get text messages reminding them to take their medications on time. This approach is highly accessible as it does not require an internet connection or a smartphone, making it easier for a broader range of users to benefit from the reminder system. However, the downside is that SMS reminders are limited to text, lack interactive features like confirmation or adjustment, and can be more costly to maintain due to SMS service charges.

### **2.4.2 Calendar Integration for Refill Reminders**

Another option for refill reminders is to integrate them with users' personal calendar apps, such as Google Calendar or Apple Calendar. This alternative allows users to receive notifications directly from systems they are already familiar with, making it easy to manage reminders alongside other daily activities. The advantage of this method is that it builds on existing notification systems and does not require users to adapt to a new interface. However, the downside is that calendar apps may offer limited flexibility in terms of customizing reminders specifically for medication needs, such as adjusting based on dosage schedules or refill dates.

## **2.5 Feasibility Study and Selection of the Most Appropriate Design**

A comprehensive feasibility study was conducted to evaluate the MedOnTime solution's viability. Various aspects such as technical feasibility, economic viability, and legal compliance were thoroughly examined. The study provided valuable insights into the potential challenges and benefits, helping guide the selection of the most appropriate design. This ensured that the chosen solution would effectively meet user needs, address medication management issues, and function within the existing healthcare and technological landscape.

### **2.5.1 Technical Feasibility**

The MedOnTime system will be developed as a web application using React.js for the frontend and Java for backend services. This web app will later be converted into a mobile application to ensure cross-platform compatibility. The backend will utilize cloud infrastructure such as AWS or Google Cloud for hosting, along with secure and scalable database management systems like MySQL or PostgreSQL for handling user data, prescriptions, and order histories. Integrating features like SMS-based reminders, calendar integration, and prescription uploads is technically feasible within this framework. Converting the web app into a mobile app will streamline the development process while maintaining essential functionalities. Additionally, implementing cash-on-delivery as a payment option is feasible using secure delivery processes, eliminating the need for complex payment gateways.

### **2.5.2 Economic Feasibility**

By adopting a freemium model, the platform remains economically feasible. The free version of the app will offer essential features, making it accessible to a broad user base without requiring upfront payments. Premium features, such as advanced customization or additional functionality, can be offered as paid options, generating revenue. This model ensures that users who need only the basic features can benefit from the app at no cost, while premium users contribute to the app's financial sustainability. Additionally, partnerships with pharmacies or ad revenue can help offset initial development costs, and the system may

also contribute to reducing healthcare expenses associated with medication non-adherence, such as hospital visits.

### **2.5.3 Legal Feasibility**

The system must comply with healthcare regulations such as HIPAA (Health Insurance Portability and Accountability Act) in the U.S., or similar laws in other regions, ensuring the secure storage and handling of sensitive patient data. It must also adhere to e-prescription laws and pharmacy regulations. These compliance measures are feasible and necessary to protect user data and maintain the system's credibility.

### **2.5.4 Selection of the Most Appropriate Design**

Considering the feasibility study, the design combining a web-based application that will be converted into a mobile app, with in-app alerts for medication reminders and prescription management, emerges as the most suitable solution. This approach effectively balances user accessibility, technical implementation, and cost-efficiency. The integration of secure data management and compliance with legal standards further supports this design as the optimal choice for MedOnTime.

## **Summary**

This chapter explored the different ways to satisfy the requirements outlined in the system analysis. It presented alternative solutions such as SMS-based reminders and calendar integration for refill reminders. A feasibility study was conducted, covering technical, economic, and operational aspects, and the most appropriate approach for the MedOnTime system was selected. The chapter concluded with a detailed analysis of the functional and non-functional requirements, data storage needs, and external interface requirements for both patients and pharmacies.



## CHAPTER 03 - SYSTEM DESIGN

The System Design chapter plays a pivotal role in developing MedOnTime, turning the conceptual framework into a structured solution. This chapter provides an overview of the design process, covering use case diagrams, finalized user interfaces, and the high-level software architecture through context, container, component, and class diagrams.

### 3.1 Use Case Diagrams for the Proposed System

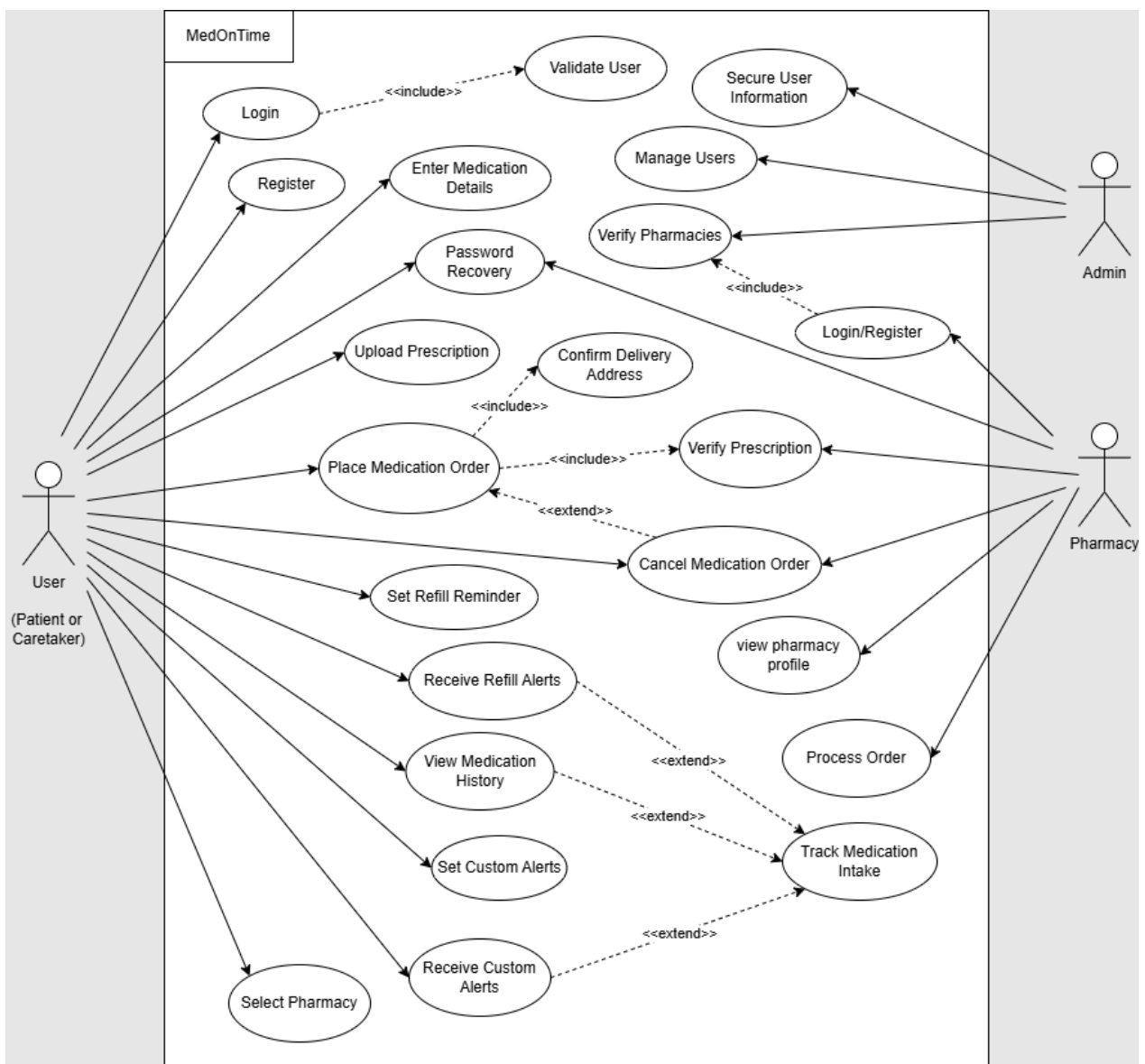


Figure 5: Use-case diagram

## 3.2 Finalized User Interfaces

### 3.2.1 Common User Interfaces



Figure 7: start-up page 1

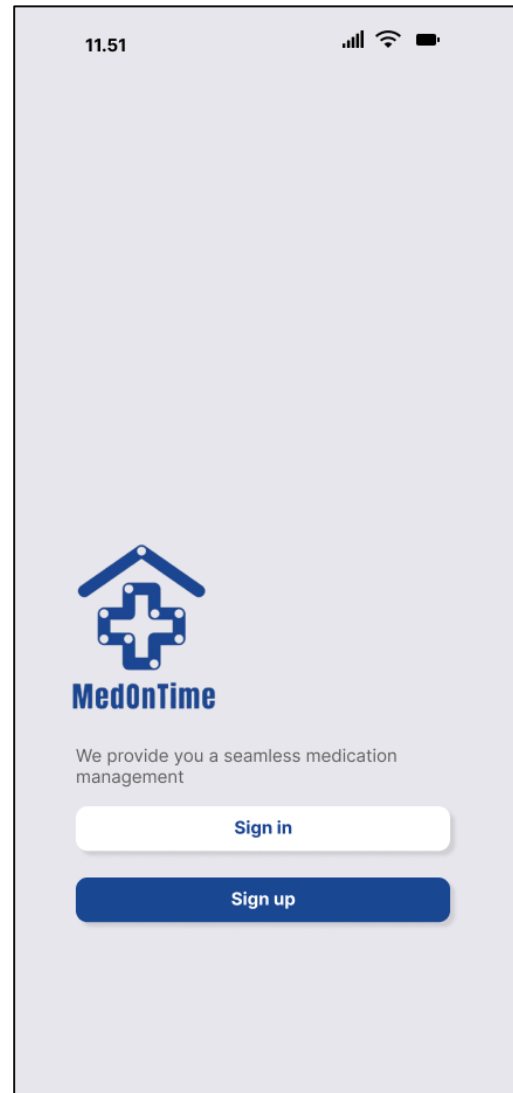
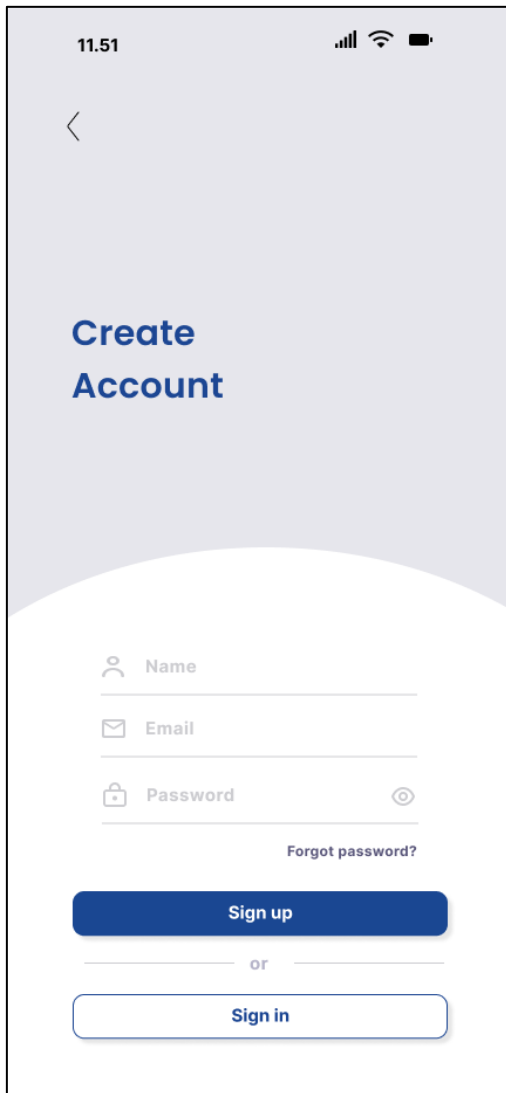



Figure 6: Start-up page 2






11.51

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## Create Account

 Name

 Email

 Password 

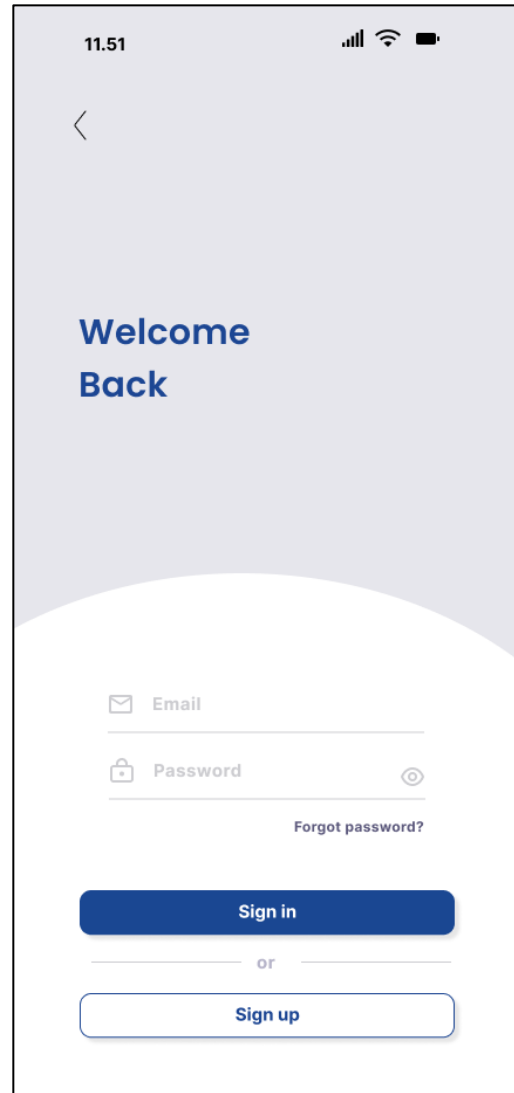
[Forgot password?](#)

**Sign up**

or

**Sign in**


Figure 9: Sign up page





11.51

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## Welcome Back

 Email

 Password 

[Forgot password?](#)

**Sign in**

or

**Sign up**

Figure 8: Sign in page

3.2.2 Patient or Caretaker View

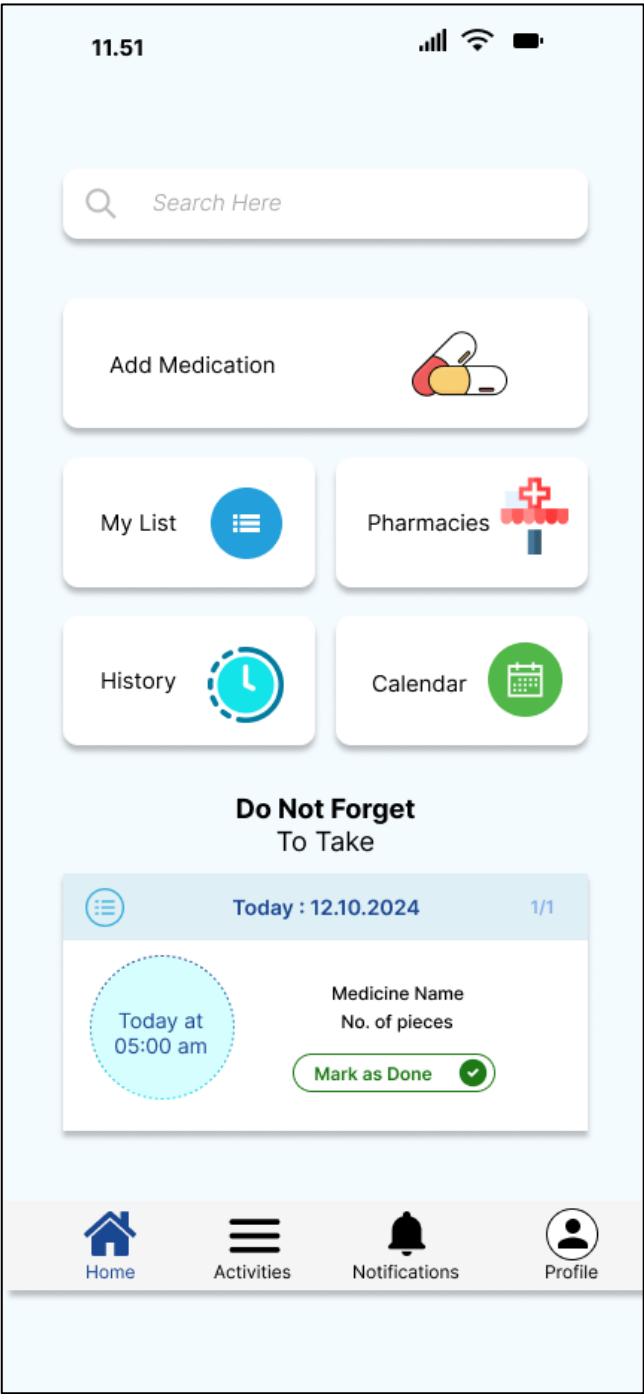


Figure 10: Home view

11:51

⏮ Add Medication

Medication Details

Medicine Name:

Dosage:

Form of Medicine:

Strength of Medicine

Quantity of Medicine

Schedule Information

Start Date:

Figure 12: Add medication view

Medication Details

Medicine Name:

Dosage:

Form of Medicine:

Strength of Medicine

Quantity of Medicine

Schedule Information

Start Date:

End Date:

Start Date:

Save Set Alert 🔔

Figure 11: Add medication form

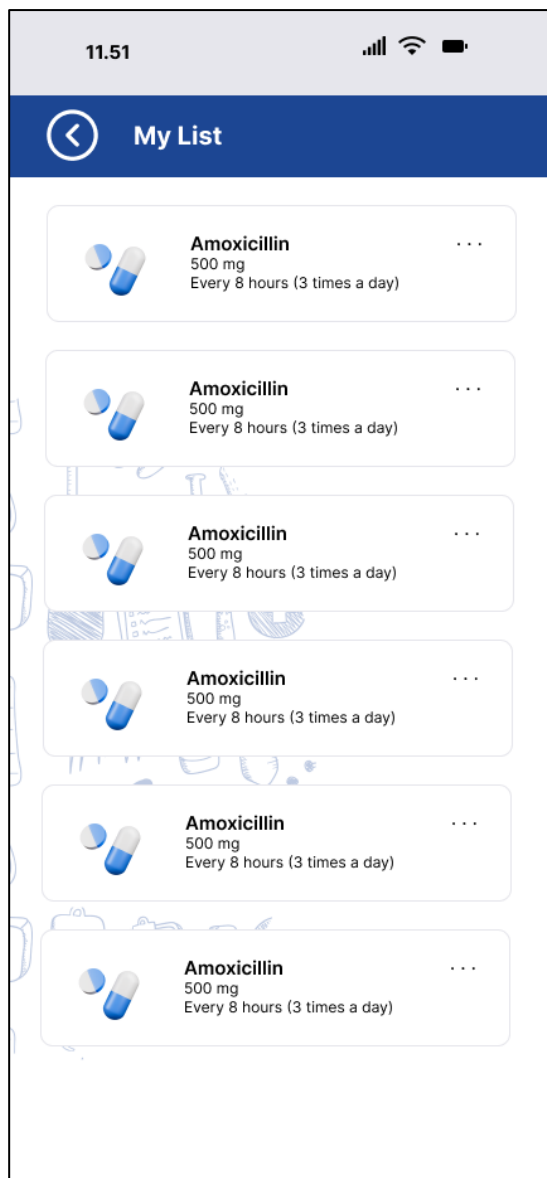


Figure 13: My list view

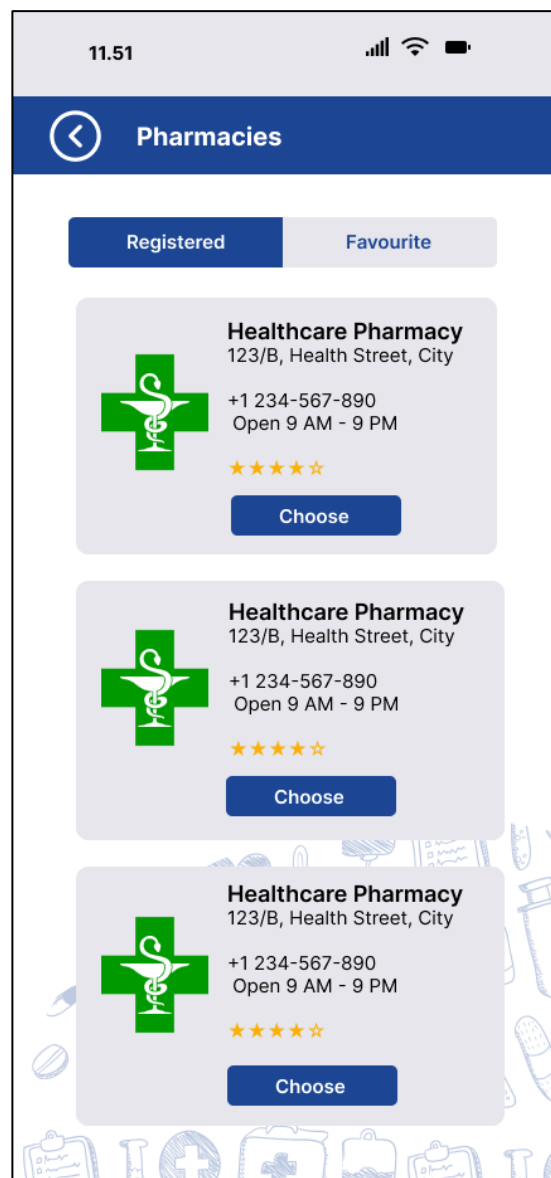


Figure 14: Pharmacy view

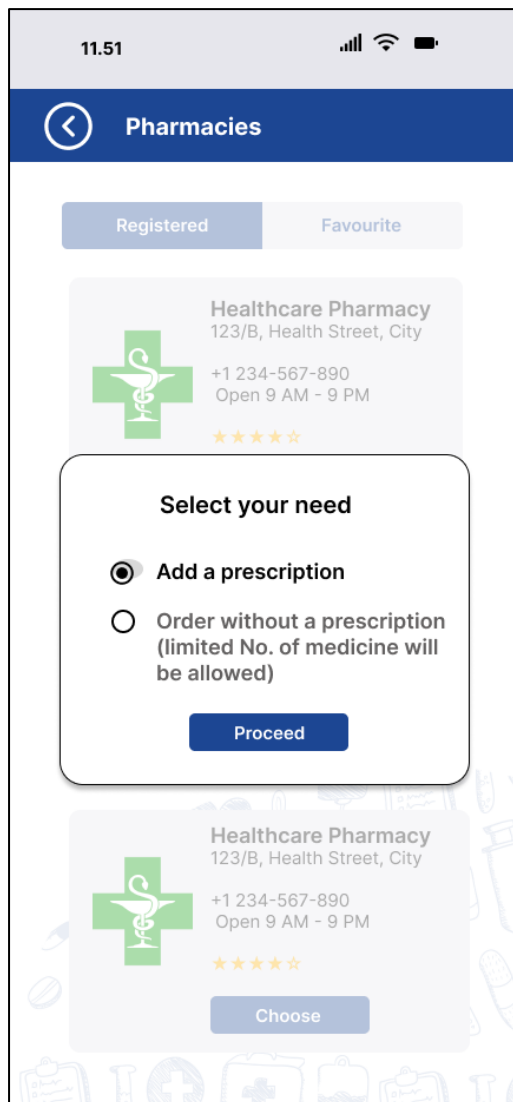


Figure 15: Pharmacy view - pop up

Figure 16: Pharmacy view form for prescription upload

## Healthcare Pharmacy

———— Patient Information ————

Patient Name:

Date of Birth:

Contact Number:

———— Prescription Details ————

Doctor's Name:

Prescription issued Date:

Upload Prescription

No File Chosen

Figure 17: Pharmacy form for medication order

11.51

Order Processing

### Pending

Order is processing ....  
You receive progress shortly

From	User Name
To	User Name

Figure 18: Order Processing - Pending view



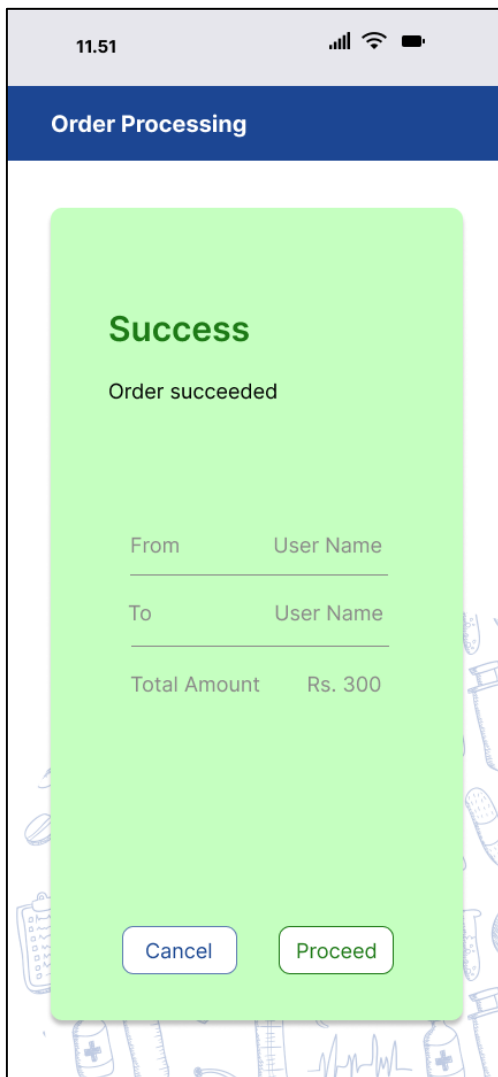


Figure 20: Order processing - success view

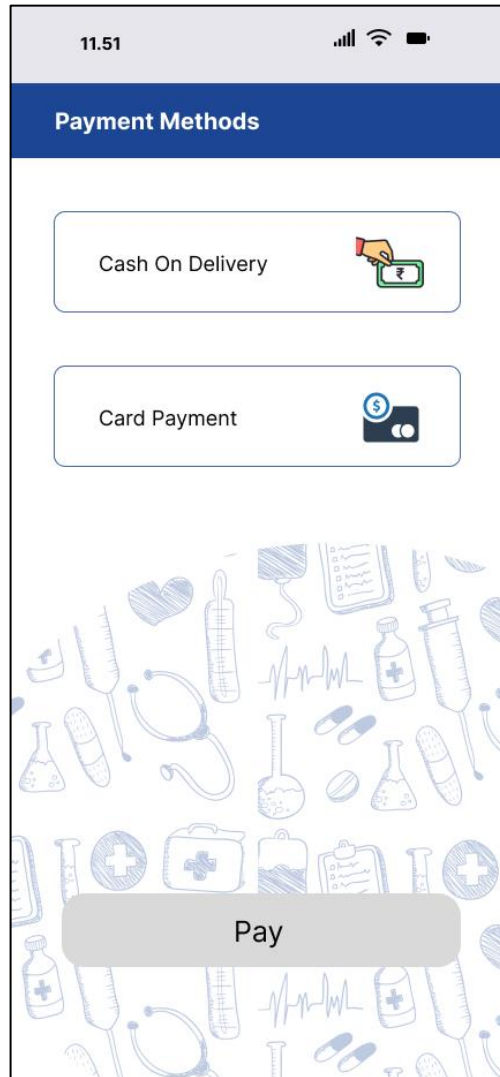


Figure 19: Payment methods

3.2.3 Pharmacy Point of View

11.51

⏪

Register

Pharmacy Information

Pharmacy Name:

Address:

Contact Number:

Verification Details

Certification No:

Certified Date:

Upload Certificate:

Choose File

No File Chosen

Figure 22: Pharmacy registration

Pharmacy Information

Pharmacy Name:

Address:

Contact Number:

Verification Details

Certification No:

Certified Date:

Upload Certificate:

Choose File

No File Chosen

Cancel

Submit

Figure 21: Pharmacy registration form

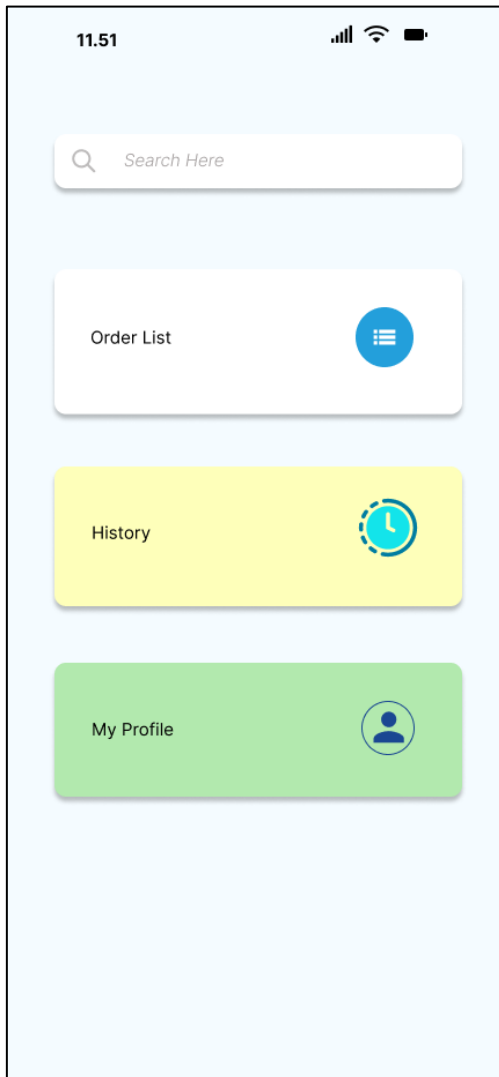


Figure 23: Pharmacy home page

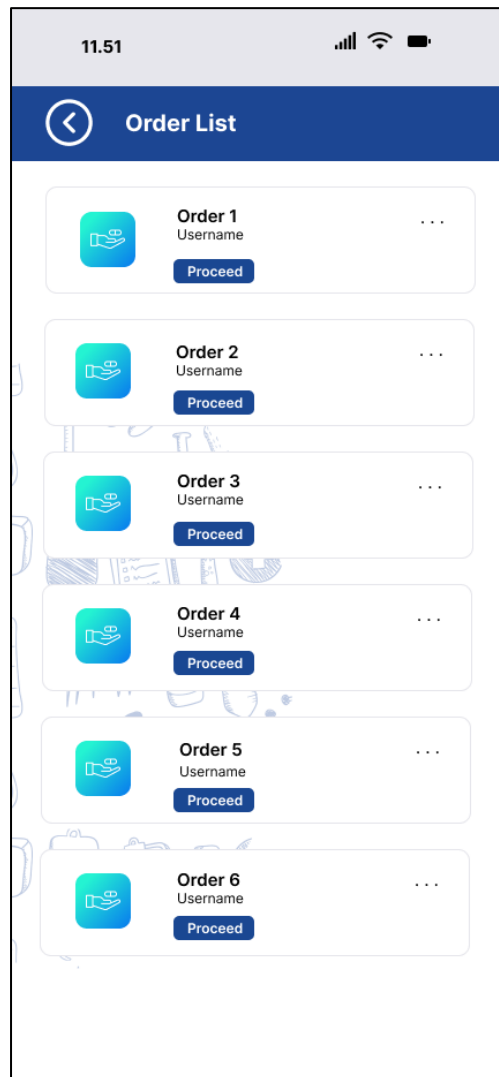


Figure 24: Pharmacy order list

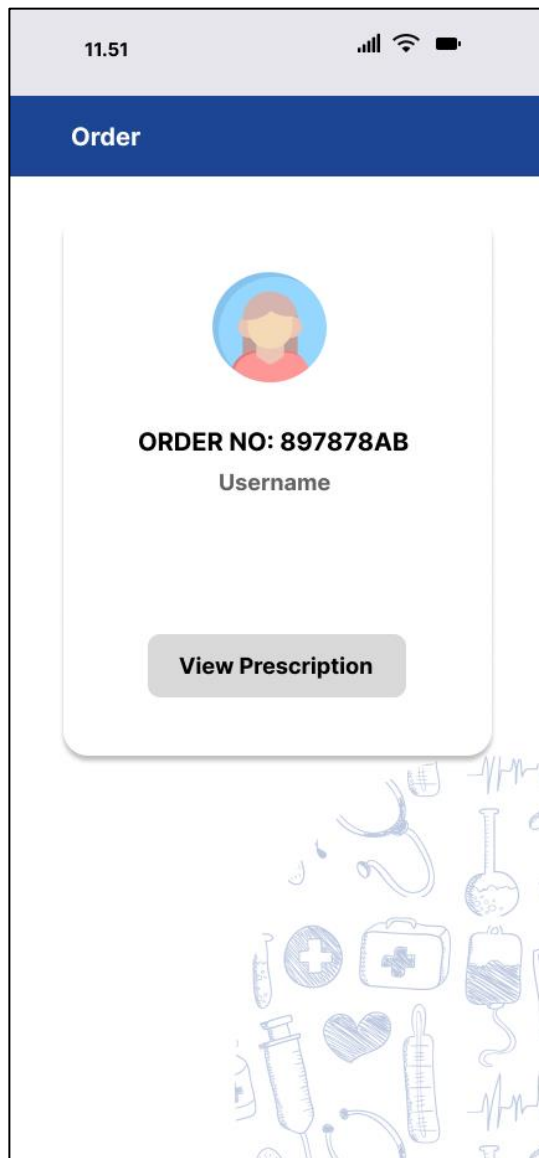


Figure 26: Prescription

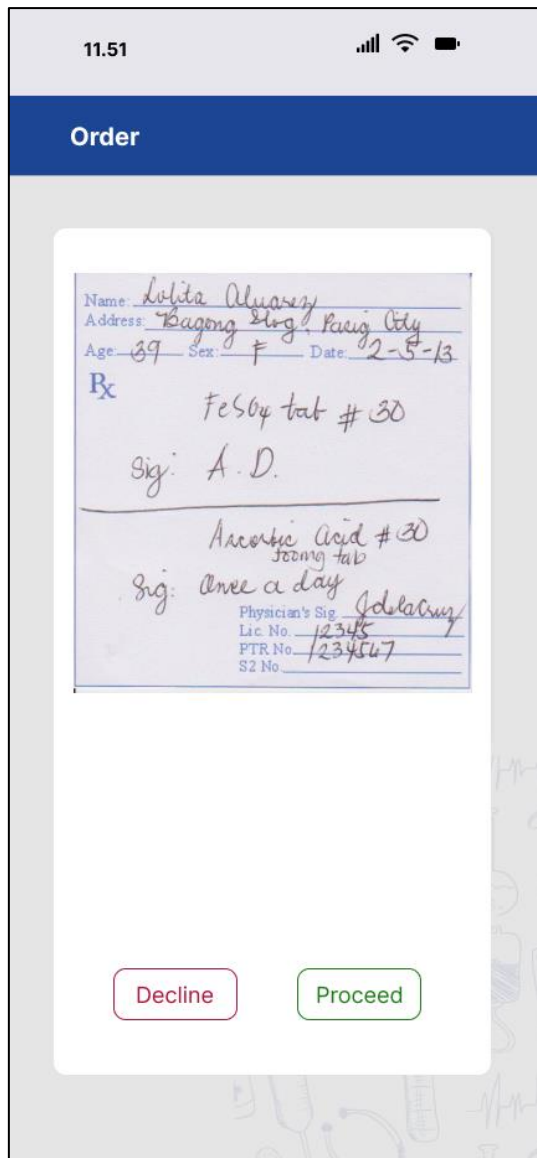


Figure 25: Prescription view

### 3.2.4 Admin Point of View

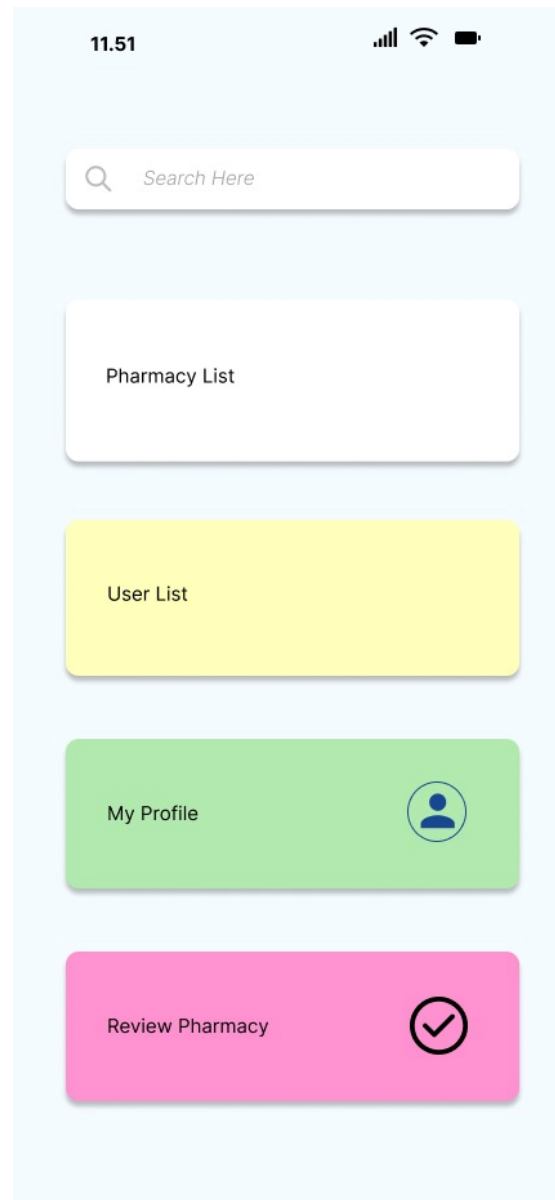


Figure 27: Admin home page

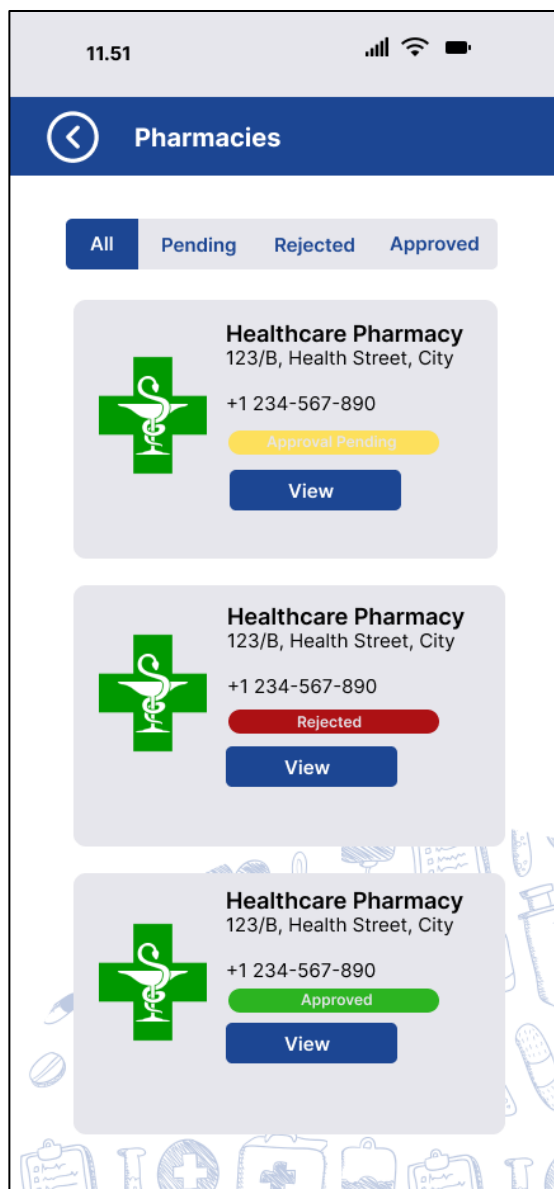


Figure 29: Pharmacy list

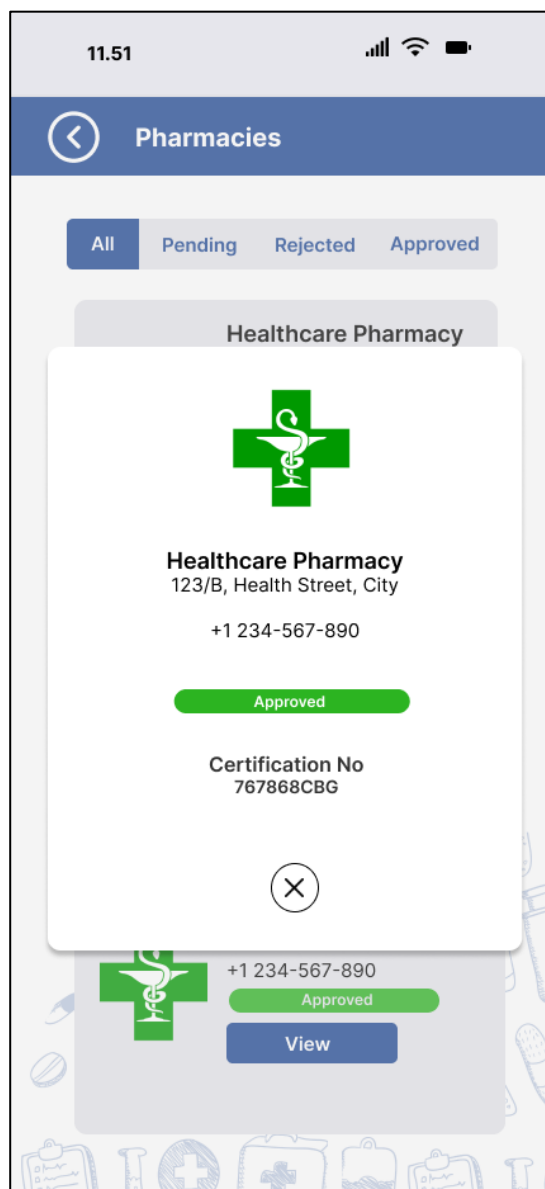


Figure 28: View pharmacy pop-up

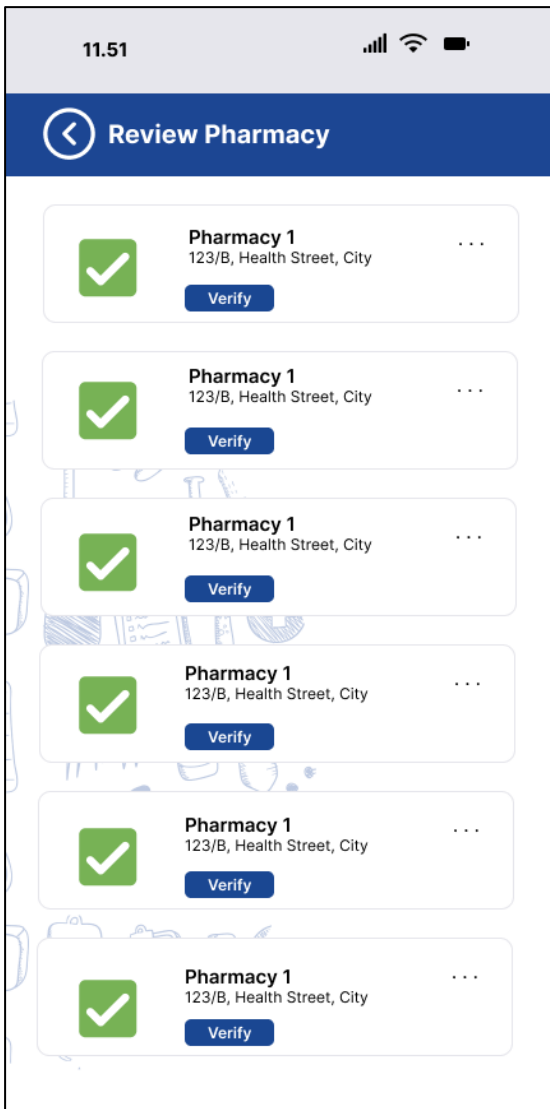


Figure 31: Review pharmacy

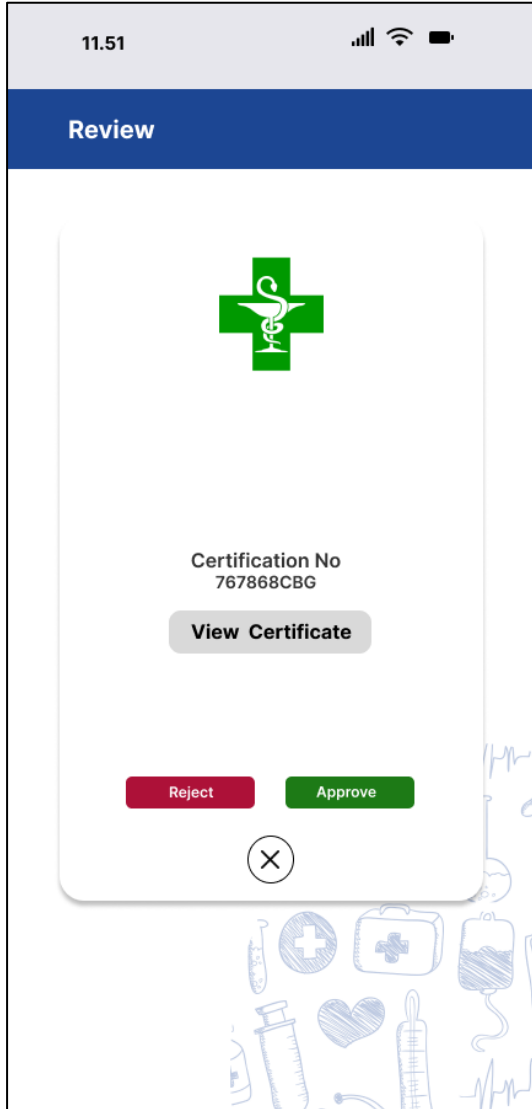


Figure 30: Verify pharmacy

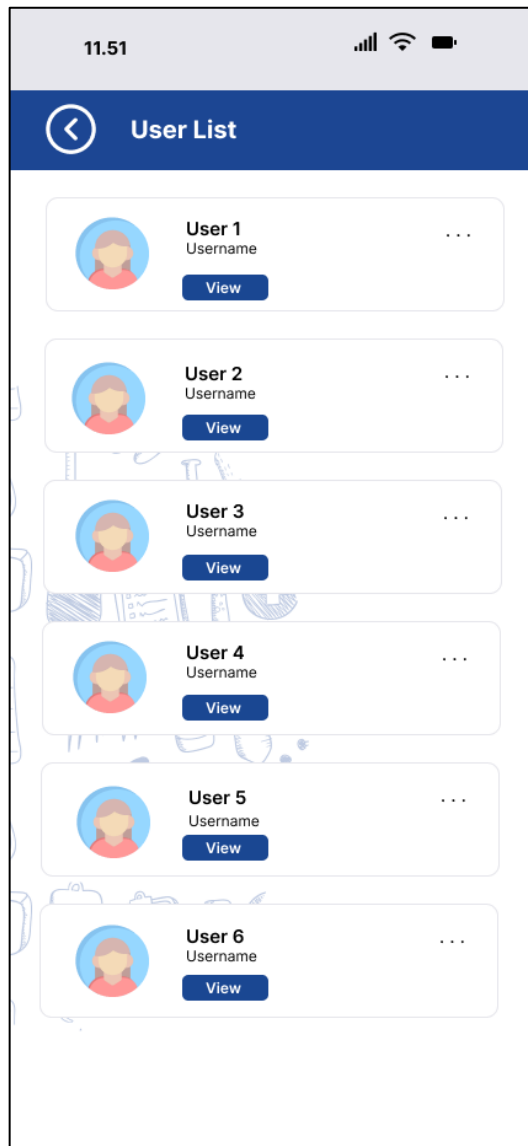


Figure 32: User list



### 3.3 High-Level Software Architecture

#### 3.3.1 Context Diagram

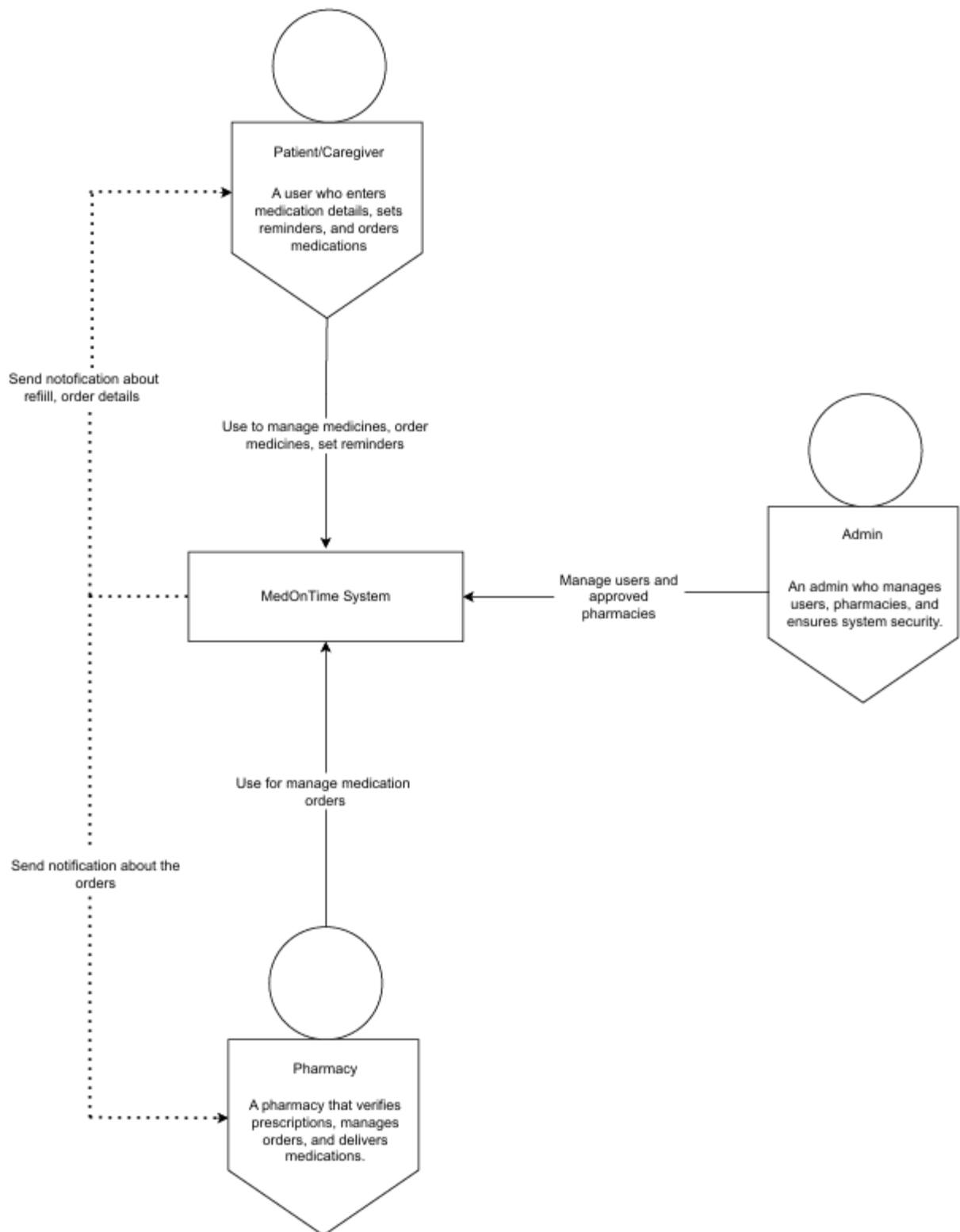


Figure 33: Context diagram

### 3.3.2 Container Diagram

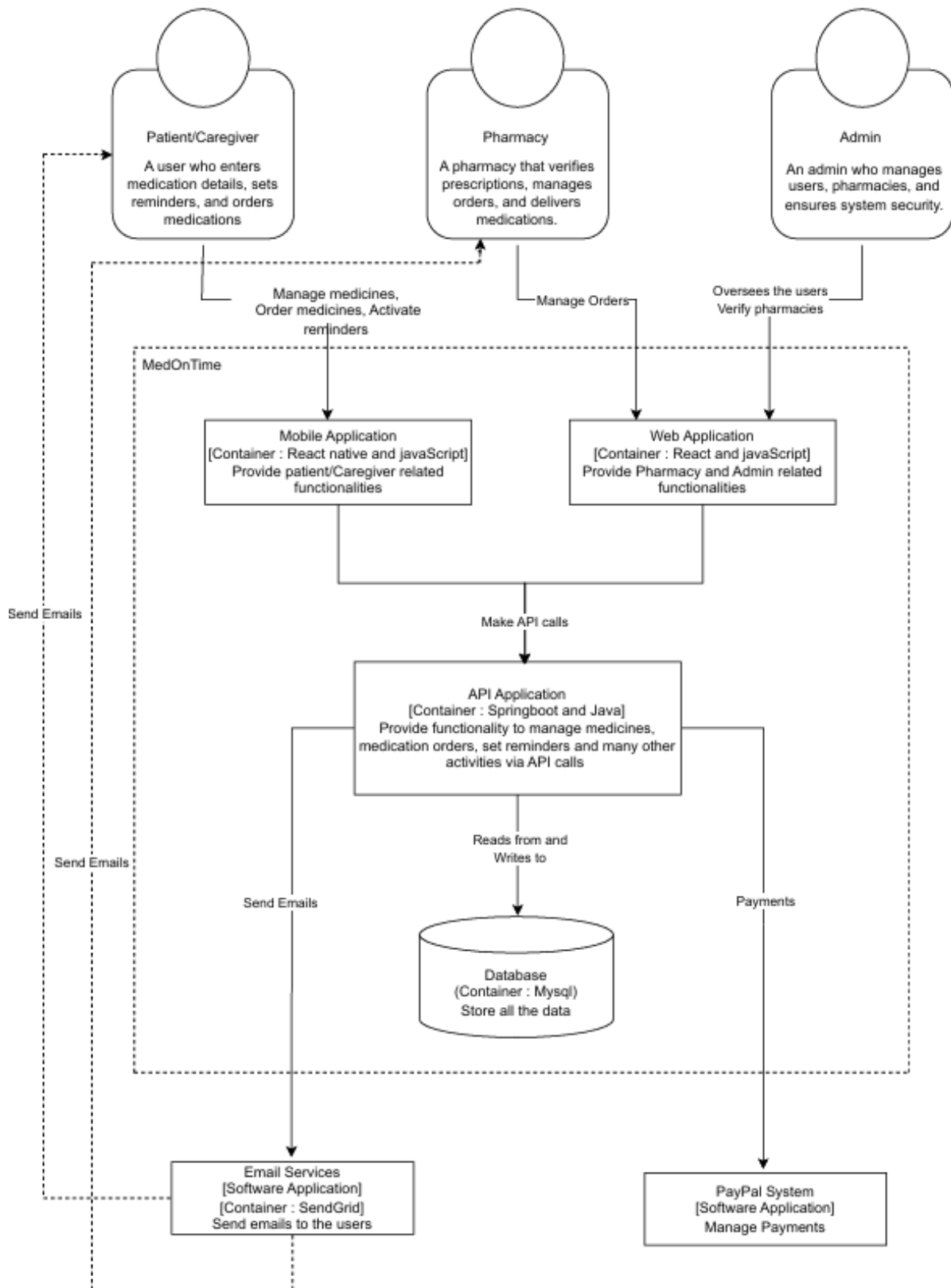


Figure 34: Container diagram

### 3.3.3 Class Diagram

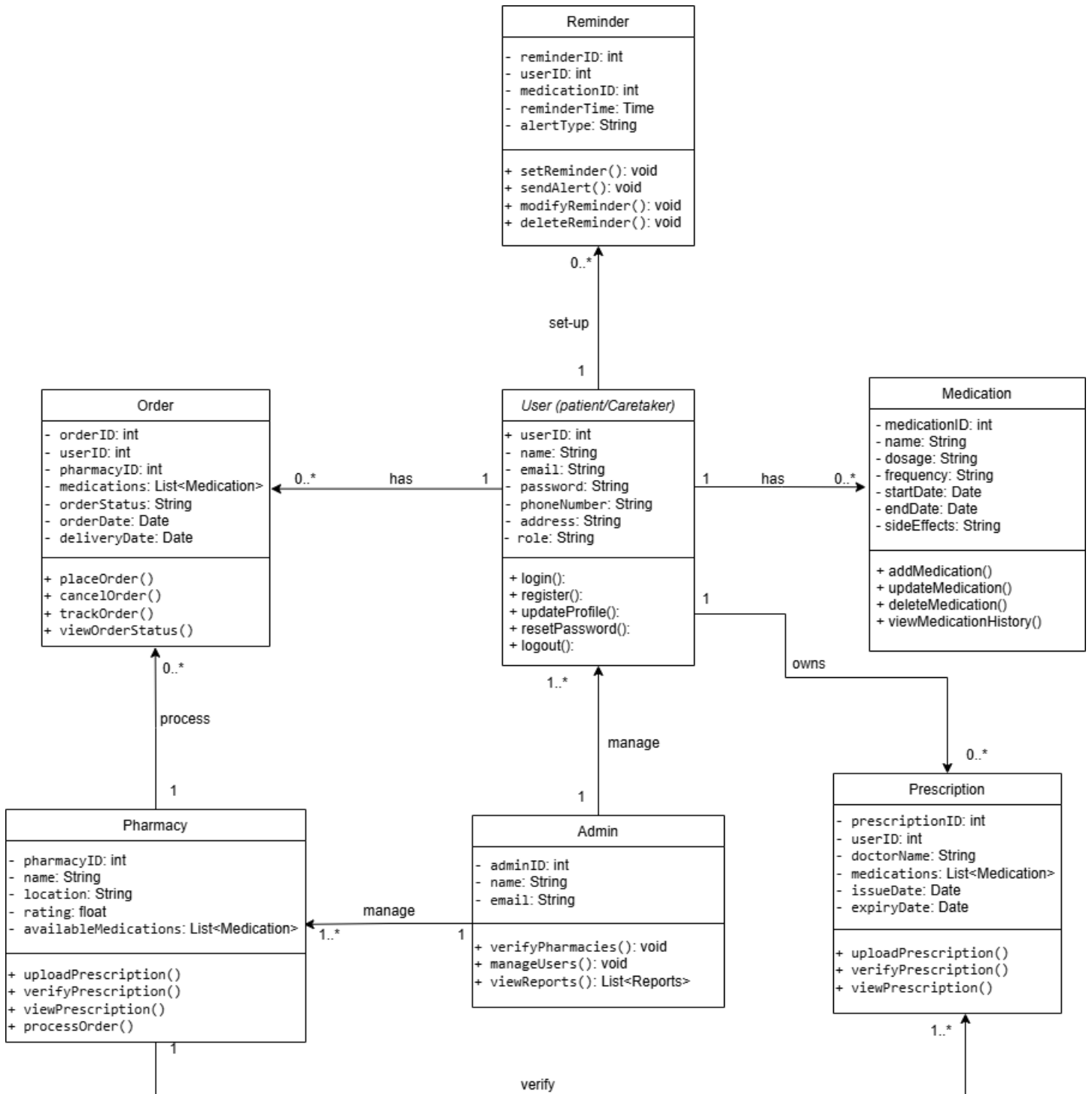


Figure 35: Class diagram

## **Summary**

In this chapter, the focus shifted to the detailed design of the MedOnTime system. User interface wireframes and a High-Level Software Architecture were described using C4 diagrams, highlighting the maintainability and extensibility of the proposed design. Furthermore, the chapter identified key classes, their attributes, and methods, illustrated in the Class Diagram, demonstrating the communication between classes.

## **CHAPTER 04 – CONCLUSION**

The concluding chapter reflects on the exploration of the MedOnTime project's outcomes and prospects. This section includes an evaluation of the extent to which the project objectives have been accomplished, an assessment of the system's usability, accessibility, reliability, and user-friendliness, and an honest examination of its limitations and drawbacks. Additionally, it provides insight into potential future enhancements and extensions. This chapter encapsulates the journey and evolution of the MedOnTime system as a comprehensive solution for medication management.

### **4.1 Degree of Objectives Met**

The MedOnTime project successfully achieved its core objectives as outlined at the start of the project. The main aim of developing a user-friendly medication management system was realized, providing users with an effective way to manage their medication schedules. The app enables users to track their medication intake, receive timely reminders, and place medication orders with integrated prescription management. Additionally, the functionality to select preferred pharmacies and order medicine for delivery enhances convenience.

The system's real-time reminders, refill notifications, and easy prescription uploads fulfill key user requirements. The objectives were largely met despite challenges during the development phase, such as ensuring seamless integration with backend services and maintaining secure data handling. The integration of customizable alerts, medication history tracking, and pharmacy verification processes further supports achieving the project's primary goals.

While the project adhered to most of the initial design and functionality objectives, a few features such as expanding support for pharmacies and improving the mobile app's user interface present opportunities for future development. Overall, the project objectives were successfully met, delivering a comprehensive solution to users' medication management challenges.

## **4.2 Usability, Accessibility, Reliability and Friendliness**

The MedOnTime system was designed with user-centric features, ensuring that it is intuitive and easy for people of all age groups, especially patients and caregivers. The interface emphasizes simplicity, allowing users to effortlessly navigate through functions such as entering medication details, setting reminders, and uploading prescriptions. The app's usability was further enhanced by offering customizable alerts, enabling users to tailor the system according to their specific medication needs.

Accessibility is another core strength of MedOnTime. The web application is accessible across various devices, and plans are underway to convert it into a mobile app for enhanced convenience. For users who may not be familiar with advanced technologies, the system's design ensures minimal complexity. However, a key limitation is the absence of SMS-based alerts, which could further enhance accessibility, particularly for non-smartphone users.

In terms of reliability, MedOnTime demonstrates robust performance in delivering real-time notifications and reminders, ensuring that users do not miss critical medication doses. The app's backend, powered by cloud services, provides reliable data storage and seamless access to medication history, prescriptions, and pharmacy information.

The system also maintains a friendly user experience by offering secure, personalized features. Its adherence to security standards ensures that sensitive medical information is protected, contributing to the reliability and trustworthiness of the platform.

Overall, MedOnTime strikes a balance between usability, accessibility, reliability, and a user-friendly design, addressing the essential needs of its target users.

## **4.3 Limitations and Drawbacks**

Despite MedOnTime offering a comprehensive solution for managing medication schedules, several limitations and drawbacks were identified during the design phase. One significant limitation is the system's dependency on internet connectivity for essential functionalities, such as placing medication orders, receiving reminders, and uploading prescriptions. Users in areas with poor or inconsistent internet access may face challenges in effectively utilizing these features, thereby limiting the system's offline capabilities.

Another notable limitation is the decision to rely exclusively on in-app alerts for medication and refill reminders. While this approach helps to reduce operational costs, it may limit accessibility for users who are unfamiliar with smartphones or prefer simpler communication methods, such as SMS. Elderly users or individuals without regular access to mobile apps may find in-app alerts less convenient compared to SMS-based reminders, which were deliberately excluded from the design.

The initial design also restricts payment options to cash-on-delivery, as there are no integrated online payment systems. Although practical for some users, the absence of digital payment methods may pose a drawback for those who prefer the convenience of paying online, thereby limiting flexibility in the purchasing process.

Lastly, since the system was initially developed as a web application, there may be responsiveness issues when it is converted into a mobile app. Until the mobile version is fully optimized, users could encounter challenges related to the app's responsiveness and user experience on different devices.

## **4.4 Future Modifications, Improvements, and Extensions Possible**

### **Fix Responsiveness Issues**

As MedOnTime is currently designed as a web application, it needs to be converted into a fully responsive mobile app. Addressing responsiveness issues will ensure the application functions seamlessly across different devices and screen sizes, improving the overall user experience, especially for mobile users.

### **Add SMS-Based Alerts for Urgent Reminders**

Although the current system relies solely on in-app alerts, incorporating SMS-based reminders for urgent situations can make the system more accessible, particularly for elderly users or those unfamiliar with smartphones. This modification would also improve the accessibility of reminders in areas with limited app usage.

### **Add More Payment Options**

Expanding beyond cash-on-delivery by introducing online payment methods, such as credit/debit cards and digital wallets, would provide users with more flexibility and

convenience when placing medication orders, enhancing the system's appeal to a wider audience.

### **Add Real-Time Delivery Tracking with Google Maps Integration**

Real-time tracking would allow users to monitor the status and location of their medication deliveries, fostering trust and transparency in the delivery process. This feature would be particularly useful for urgent medication needs and provide peace of mind to users awaiting deliveries.

### **Suggest Best Pharmacies Using AI Algorithms**

Implementing AI-based suggestions for pharmacies based on user location, previous interactions, and pharmacy ratings would personalize the medication ordering experience. The system would help users make more informed choices and streamline the ordering process by offering users recommendations for the best-rated and most convenient pharmacies.

## **Summary**

The concluding chapter evaluated the degree to which MedOnTime met its objectives, emphasizing the system's usability, accessibility, and reliability. The limitations encountered during the design phase, such as reliance on internet connectivity and the absence of online payment options, were highlighted. Future modifications, such as addressing responsiveness issues, integrating SMS-based alerts for urgent reminders, adding more payment options, and leveraging AI for pharmacy recommendations, were suggested. This chapter summarized the work completed and provided insights into potential areas for improvement and extension in the future.



## APPENDICES

### **Appendix 1: Survey**

The survey used to gather participant feedback and insights is available at the following link:

[Survey](#)

### **Appendix 2: Figma Workspace**

The Figma workspace containing design wireframes, and interface prototypes can be accessed here: [Figma Workspace](#)