Software Design Document

SDD - WAREED APP

02

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1. introduction

A blood bank system plays a crucial role in ensuring the availability of safe and adequate blood supply for transfusion needs. Every year, millions of people worldwide rely on donated blood for various medical treatments and emergencies. A well-managed blood bank system acts as a lifeline, connecting voluntary donors with patients in need, and maintaining a steady inventory of blood components. By providing a centralized source of blood collection, testing, storage, and distribution, a blood bank system plays a vital role in saving lives and improving the quality of healthcare services. In this introduction, we will explore the key components, functions, and importance of a comprehensive blood bank system in today's healthcare landscape.

1.1 scope

A blood bank system plays a critical role in the healthcare sector by ensuring the availability of safe and adequate blood supply to those in need. It is an essential component of any medical infrastructure, contributing to saving lives and improving patient outcomes.

1.2 document structure

1. Introduction:
This section provides an overview of the blood bank system, highlighting its software concept, functionalities, and features.
2. Description Overview:
In this section, we present a comprehensive overview of the blood bank system, including the key functional aspects, the types of users involved, and the necessary tools for software implementation.
3. User Requirements:
This section outlines the specific requirements of the blood bank program or system, detailing its objectives and intended purpose.
4. Use Cases:
Here, we illustrate the interaction between users and the blood bank system, presenting various scenarios and actions performed by different users.

5. External Interface Requirements:
This section specifies the components that interface with the blood bank system, encompassing the user interface, hardware, and software integrations.
6. Nonfunctional Requirements:
These requirements encompass the limitations and specifications imposed on the blood bank system, encompassing factors such as security, performance, and data protection

1.3 constraints

The program comes with certain restrictions that users should take into consideration. These include the requirement of an internet connection to access time and location information, as well as personal data like phone numbers, email addresses, and blood type.

1.4 References

- https://fluttertalk.com/best-database-for-flutter/
- https://www.geeksforgeeks.org/functional-vs-non-functional-requirements/

1.4 Software Process Activities and Models

The **Waterfall Model** is chosen for a blood donation application based on a number of key factors. It is a sequential and linear approach with well-defined phases (requirements, design, implementation, testing, and deployment). This model is appropriate when the application's requirements are stable and can be clearly defined ahead of time. The emphasis on detailed documentation throughout each phase is especially beneficial for regulatory compliance, ensuring strict adherence to standards and facilitating future maintenance. The predictability of the model and its clear development timeline make it useful for planning, especially when faced with external constraints or deadlines. The Waterfall Model's emphasis on delivering a complete system at the end aligns well with project goals if the blood donation application has fixed, well-defined requirements.
Furthermore, due to increased client involvement during the testing phase and compatibility with well-established organizational processes, the Waterfall Model is a natural fit for projects with clear and unambiguous project scopes, reducing the need for frequent reassessment and adjustments.

1.5 ETHICS

Privacy and Confidentiality:

- Ensure that sensitive user data, such as personal information and medical records, are securely stored and transmitted.

Reliability and Safety:

- Develop the blood bank system with a focus on reliability and safety to ensure accurate and dependable operation.

User Accessibility and Inclusivity:

- Design the user interface and functionality of the blood bank system with considerations for accessibility and inclusivity.

Ethical Use of Data:

- Clearly communicate to users how their data will be used and obtain their informed consent for data processing activities.

2. System Overview Description

"Wareed," our user-friendly blood bank application, simplifies the blood donation process by connecting donors with those in need. It not only makes scheduling appointments easy but also informs you when you are eligible to donate again. Through real-time matching, "Wareed" ensures that your blood donations have an immediate impact, and timely notifications keep you updated on nearby donation opportunities and emergency requests. Blood banks benefit from improved inventory management, while you, as a donor, play a vital role in saving lives in your community. "Wareed" is all about simplicity, efficiency, and making a meaningful impact through blood donation.

2.1 Product Perspective

1. Donors:
   - Perspective: Donors view "Wareed" as a user-friendly platform for blood donation.
   - Key Focus: Convenience in registering, scheduling appointments, and receiving timely notifications about donation events.
   - Value: A seamless and accessible way to contribute to the noble cause of blood donation.
2. Blood Bank Administrators:
   - Perspective: Administrators see "Wareed" as a comprehensive tool for blood inventory management.
   - Key Focus: Efficient tracking of blood inventory, reporting capabilities, and coordination of blood drives.
   - Value: Effective resource allocation, minimizing waste, and supporting healthcare facilities.
3. Hospitals and Healthcare Professionals:
   - Perspective: Hospitals view "Wareed" as a vital resource for blood supply management.
   - Key Focus: Real-time blood availability, streamlined blood requests, and integration with patient management systems.
   - Value: Ensuring timely and safe blood transfusions for patients in need.

2.2 Product Function

1. Donor Registration and Profiles:
   - Allows individuals to register as blood donors.
   - Manages donor profiles with personal information, contact details, and blood type.
   - Stores donation history and eligibility status.

2.Donation Scheduling:
   - Enables donors to schedule appointments for blood donations.
   - Provides a calendar and notification system for upcoming donation events.

3.Real-Time Blood Availability:
   - Offers hospitals and healthcare facilities access to real-time data on blood availability.
   - Allows for immediate requests for specific blood types and products.

4.Donor Notifications and Engagement:
   - Sends timely notifications to donors about upcoming donation appointments, blood drives, and urgent blood requests.
   - Encourages regular participation and engagement with the cause.

5.Health Check and Eligibility Screening:
   - Administers health assessments and eligibility screenings to ensure donors meet necessary health criteria before donating blood.

6.Security and Data Protection:
   - Implements robust security measures to protect donor and patient information.
   - Ensures compliance with data privacy regulations and standards.

7.Compliance and Regulations:
   - Ensures that the application complies with all relevant regulations and standards for blood donation and healthcare data.

2.3 User Classes and Characteristics

In the "Wareed" application, there are different types of users, each with specific roles. Blood donors are individuals who willingly sign up to donate blood, receiving notifications about nearby donation drives and managing their appointments. Recipients, typically healthcare facilities, request blood and get real-time notifications about available donors. Blood banks and administrators handle inventory, process donations, and ensure data security. Altogether, these user classes work together to maintain a steady blood supply and promote voluntary blood donation through "Wareed."

2.4 Design and Implementation Constraints

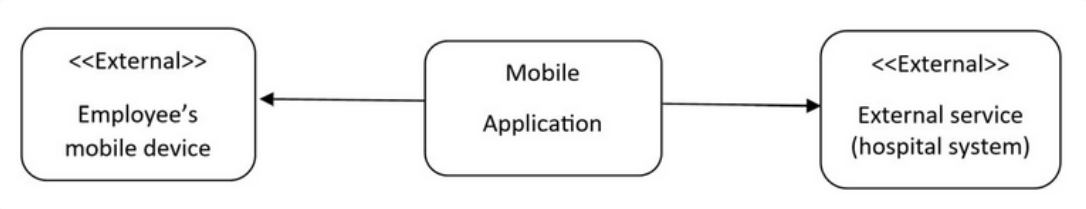
We've developed our software using the open-source Flutter framework, which is powered by the user-friendly Dart programming language. Our primary objective is to expand the reach of our software, making it compatible with both the IOS and Android operating systems. Thanks to Flutter's modern approach, we can effortlessly create applications for mobile and desktop platforms. Our application is equipped to handle substantial volumes of data, particularly concerning donor information. To manage this data effectively, we've integrated SQLite, a reliable database system, into our Flutter apps for efficient data storage and retrieval.

2.5 Assumptions and Dependencies

Our application is designed with a strong focus on user accessibility and a personalized experience. To achieve this, we've integrated features that synchronize with the user's location, date, and time. With the user's explicit permission, this synchronization allows us to provide highly accurate and timely information.
For example, by knowing the user's location, we can suggest nearby blood donation drives or facilities, making it more convenient for them to contribute. The real-time synchronization with the date and time ensures that users receive notifications and updates at the right moments, such as reminders for upcoming donation appointments or urgent blood requests.

3. System Architecture and Components Design

3.1 Architecture Description:



3.1.1 Client-Side Application

Native programming technologies such as Swift for iOS and Kotlin for Android will be used to create the client-side application. The program will be designed according to the MVVM Model

The MVVM (Model-View-ViewModel) architecture model is more suitable for designing an app for a blood bank. MVVM contains 3 main parts (model – view - ViewModel) and it is separates the user interface (View) from the data and business logic (Model) through the use of a ViewModel. This helps in maintaining a clean and organized codebase, making it easier to develop, test, and update the app.

Here's the 3 main components in MVVM:

1. Model: The Model represents the data and business logic of the application. It encapsulates the data structures, operations, and rules that govern the application's behavior. The Model may interact with databases, web services, or other data sources.

2. View: The View represents the UI elements and defines how the user interface should look. It is responsible for displaying data to the user and capturing user input. In MVVM, the View is typically implemented using declarative UI frameworks like XAML or XML.

3. ViewModel: The ViewModel acts as an intermediary between the View and the Model. It exposes data and commands that the View can bind to. The ViewModel contains the presentation logic and state of the View, and it may transform or format the data from the Model to make it suitable for the View.

3.1.2 The server-side

for a blood bank app refers to the backend infrastructure and processes that handle the core functionality and data management of the app. It primarily deals with managing requests from the client-side, processing data, and interacting with databases. Here are some key components and functionalities of the server-side for a blood bank app:

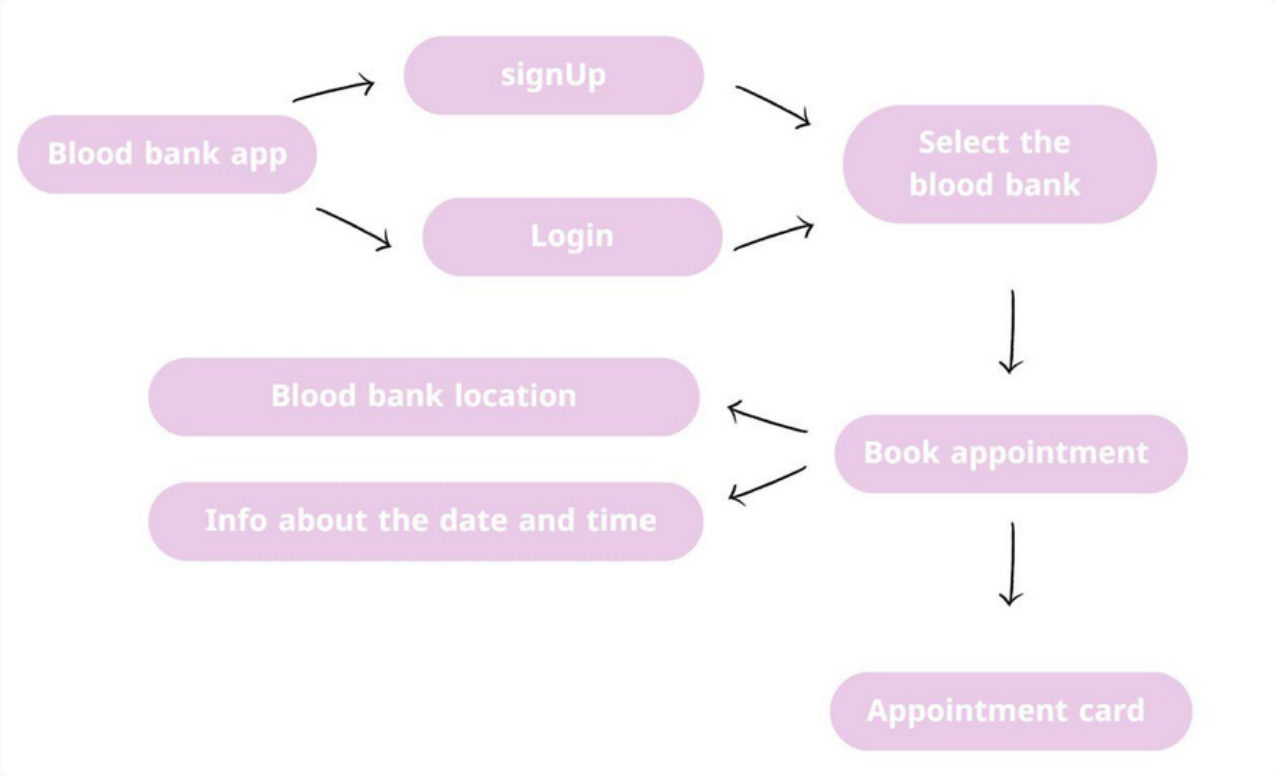
1. Database Management: The server-side utilizes a database to store and manage various data related to blood donors, recipients, inventory, blood types, locations, and other relevant information. It includes functionalities for creating, updating, and fetching data from the database.

2. User Authentication: The server-side handles user registration, login, and authentication processes.

3. Search and Matchmaking: The server-side allows users to search for available blood donors or recipients based on specific criteria like blood type, location, and availability. It performs matching algorithms to identify the most suitable donors for the requested blood type and location, increasing the chances of successful transfusions.

4. Analytics and Reporting: The server-side collects and analyzes data to generate reports, statistics, and insights related to blood donations, inventory levels, user demographics, and other key metrics. These analytics can help optimize operations and improve the efficiency of the blood bank app.

3.2 Component Decomposition Description:



3.3 Detailed Components Design Description:

3.3.1 - Registration component:
The user logs in by his phone number and then he/she receives the OTP, then start the sign up process, if the user signed up before this step will be skipped. The requirements for the sign up are: The national ID number, the full name, gender and the blood type.

3.3.2 - Selection component:
The user selects the blood bank he/she wants to donate at, based on his/her personal preference. The app shows the nearest blood bank to the user to ease the selection for the user.

3.3.3 - Reservation component:
User must choose the necessary information to complete the reservation which are: date, time and donation type (whole blood , platelet). User must confirm appointment message that appears saying if the appointment was successful or not.

3.3.4 - Reporting component:
Shows the important details of the appointment including: blood bank name, the location, the date & time and the appointment progress (check in , donation , following up , register donation).

3.4 Design Rational:

The architecture and design of our blood bank application (Wareed) were chosen based on precise considerations to satisfy the exact needs and requirements of the users of our app. And the main reasons behind our design decisions are:

3.4.1 - Compatibility and Efficiency:
a. The application is designed to be compatible with multiple operating systems (such as iOS and Android) to ensure it can reach a wider user base.
b. The app is optimized for efficient performance, minimizing resource usage and ensuring quick response times.
c. The design considers different screen sizes and resolutions to provide a seamless experience on different devices.

3.4.2 - Seamless User Experience:
a. The user interface is designed to be intuitive and user-friendly, allowing users to easily navigate and access the required information.

b. Visual hierarchy, clear icons, and appropriate color schemes are used to enhance readability and aid in information retrieval.

c. Interactive features like search functionality, filters, and notifications are incorporated to enhance the overall user experience.

3.4.3 - Data Management and Security:
a. The application securely stores and manages sensitive data, such as donor information, blood types, and medical histories.

b. Strong encryption techniques are employed to ensure data integrity and protect user privacy.

c. Regular data backups and disaster recovery mechanisms are implemented to prevent data loss in case of any unforeseen circumstances.

3.4.4 - Integration with External Services:
a. Our integration with Google Maps enhances the accuracy and reliability of our location-based services, like obtaining accurate directions to their desired locations, and it can be used to show the locations of donation centers in different regions.

b. APIs and web services are utilized to facilitate seamless data exchange and real-time updates between the application and external systems.

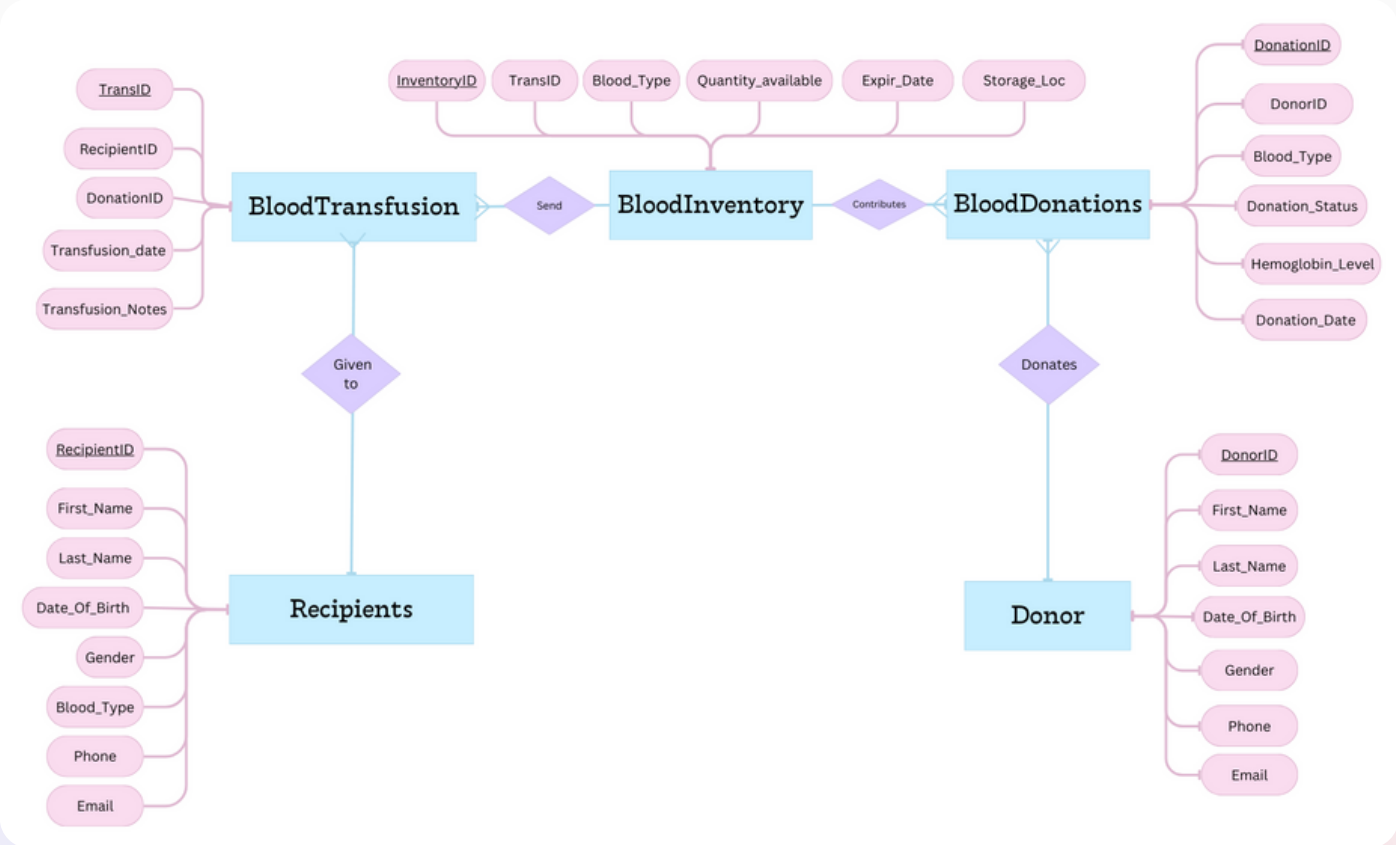
c. Authentication and authorization mechanisms are implemented to ensure secure access to external services and prevent unauthorized access.

4. Data Design

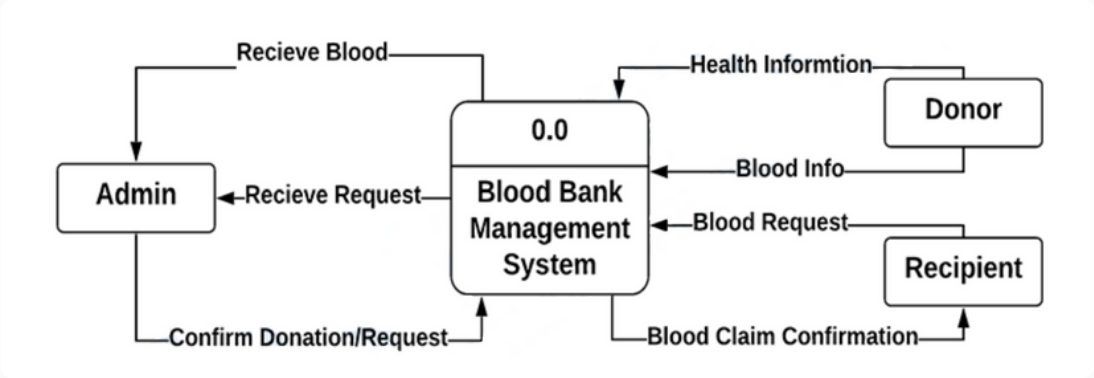
4.1 Database Description

The database encompasses tables for Donors, Blood Donations, Blood Inventory, Recipients, Blood Transfusions, and Staff. The Donors table stores donor information, while the Blood Donations table records donation specifics. Blood Inventory keeps track of available blood stock, and Recipients manages recipient details along with medical history. Blood Transfusions document transfusion events. The Staff table stores information about personnel and their roles in the process. Relationships include donors making multiple Blood Donations, Blood Donations populating the Blood Inventory, Blood Transfusions involving both Donors and Recipients, and Staff members responsible for various roles throughout the process, ensuring comprehensive management of blood donation and transfusion operations.

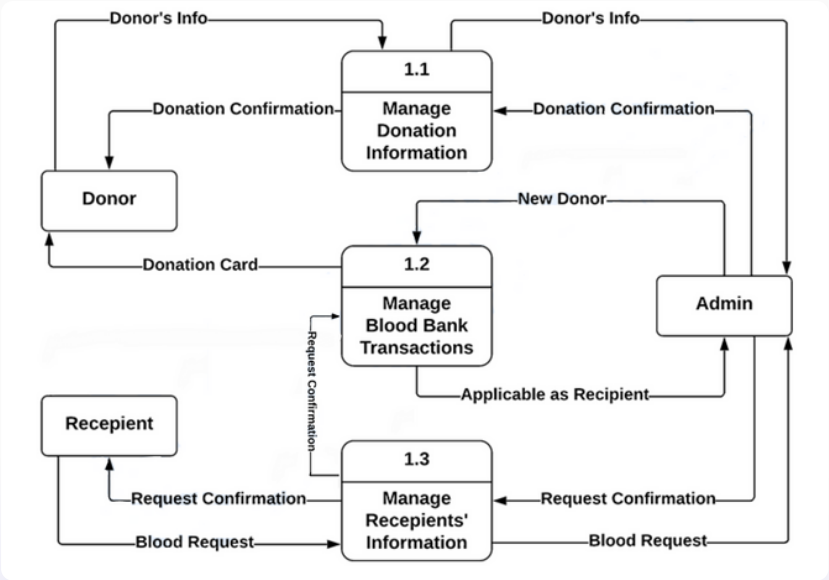
4.2 Data Structure



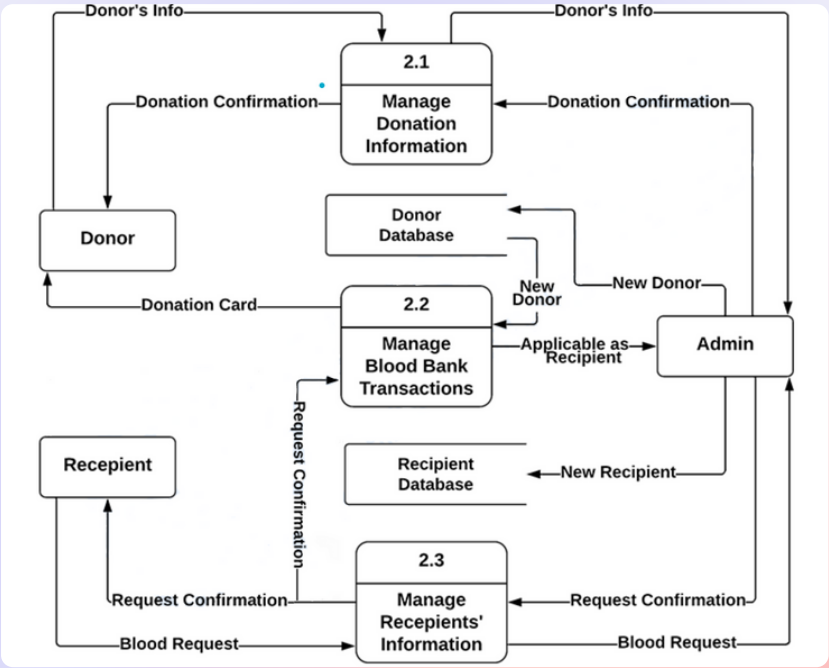
4.3 Data-flow Diagram (DFD)



Context diagram



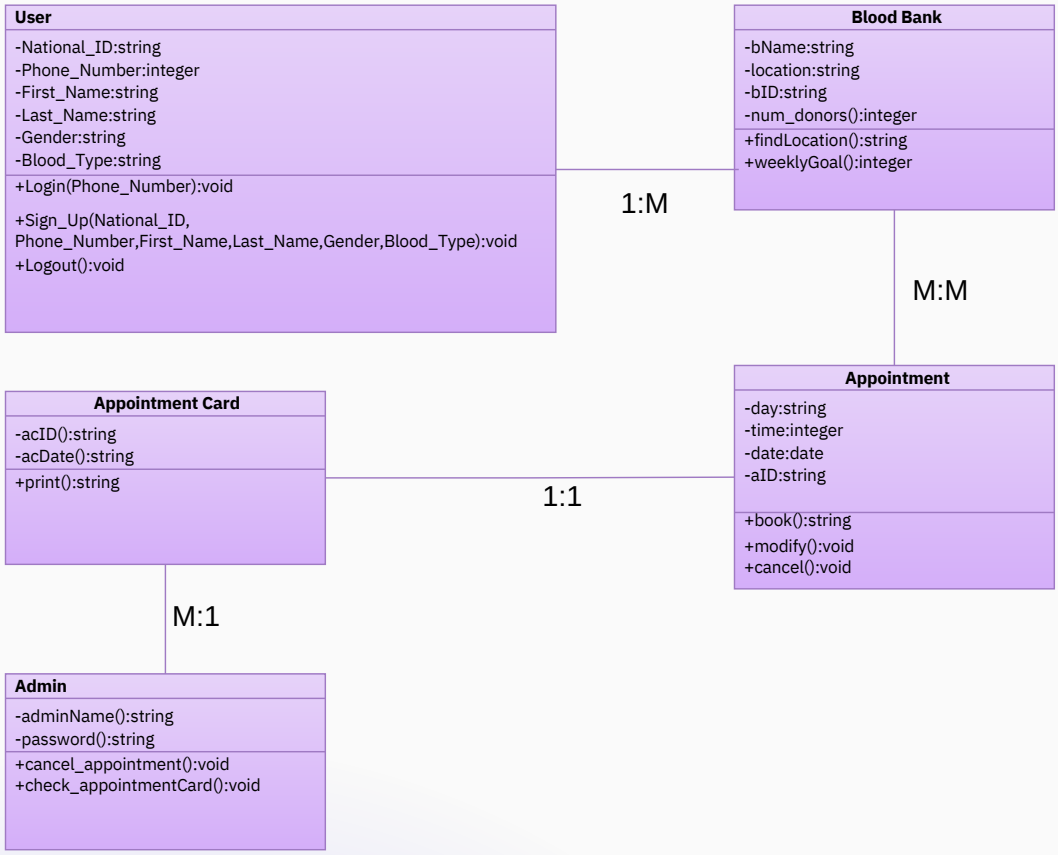
DFD level 1



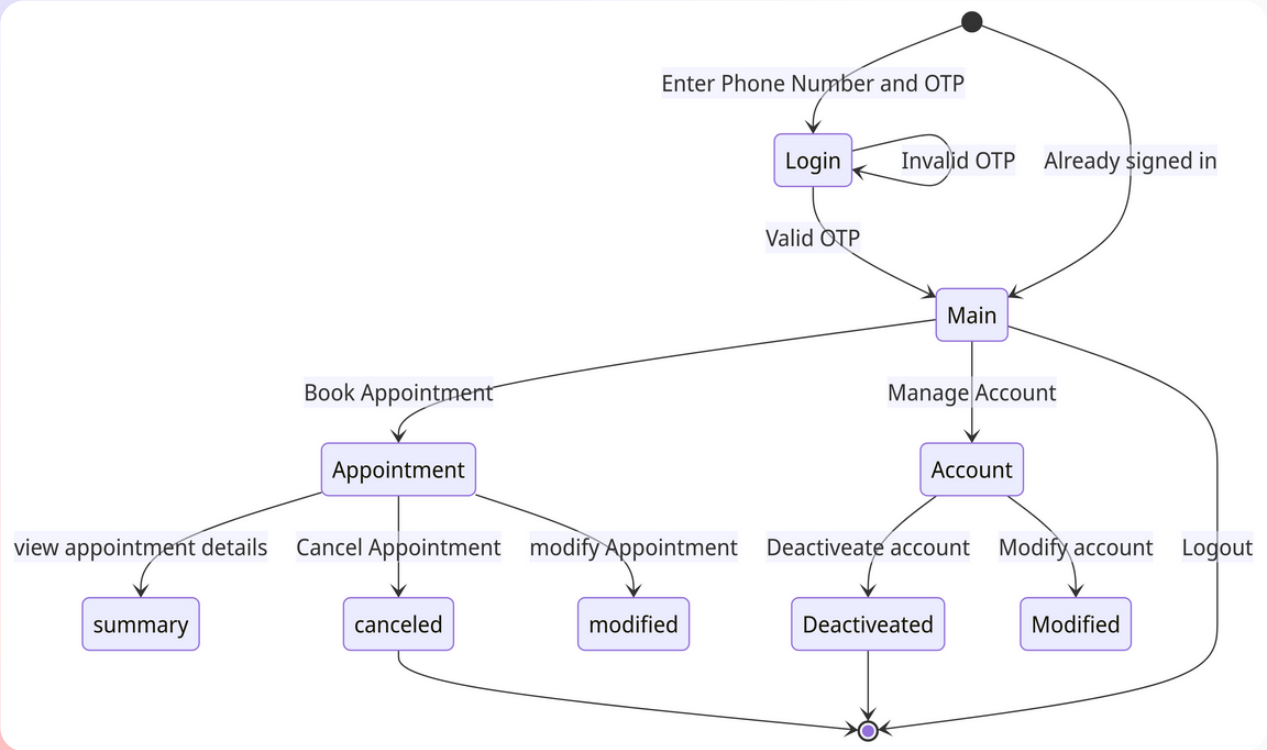
DFD level 2

5. Design Details

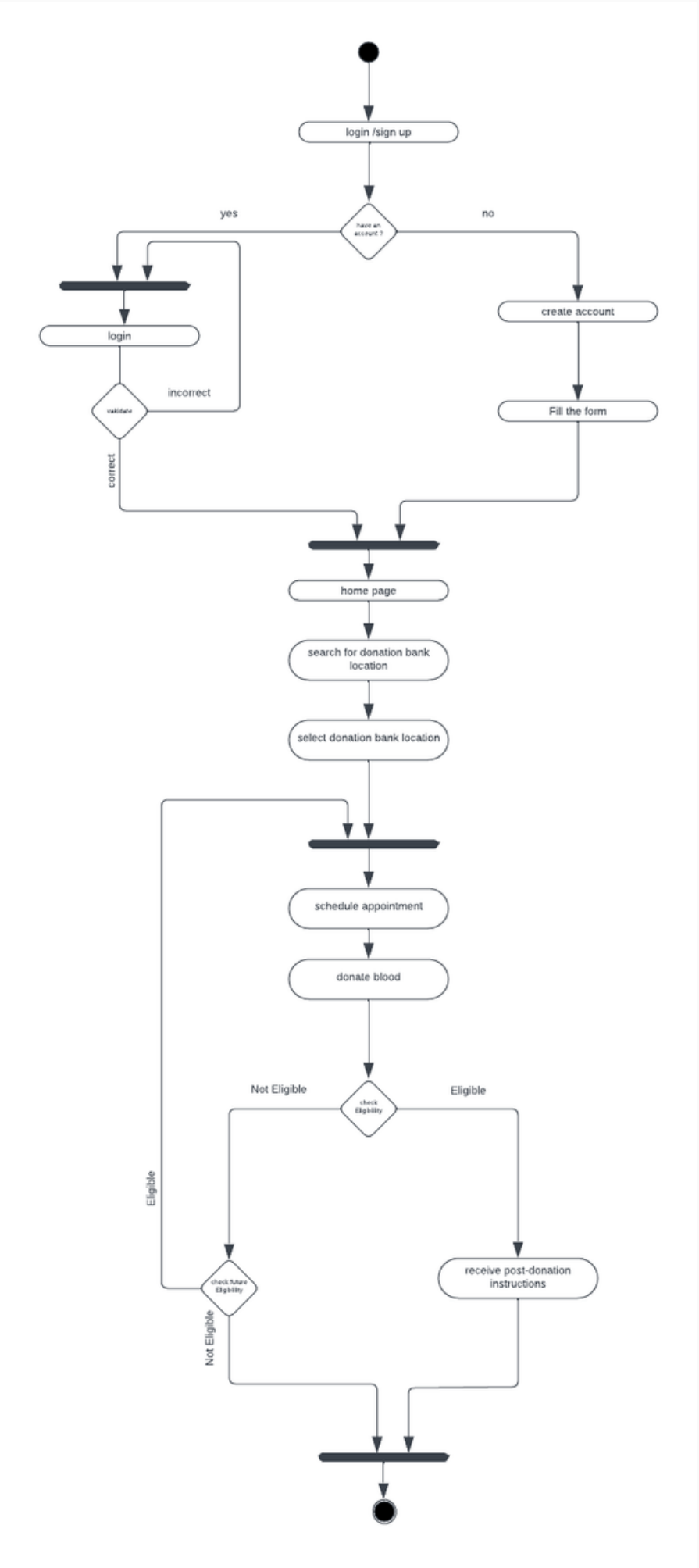
5.1 Class Diagram



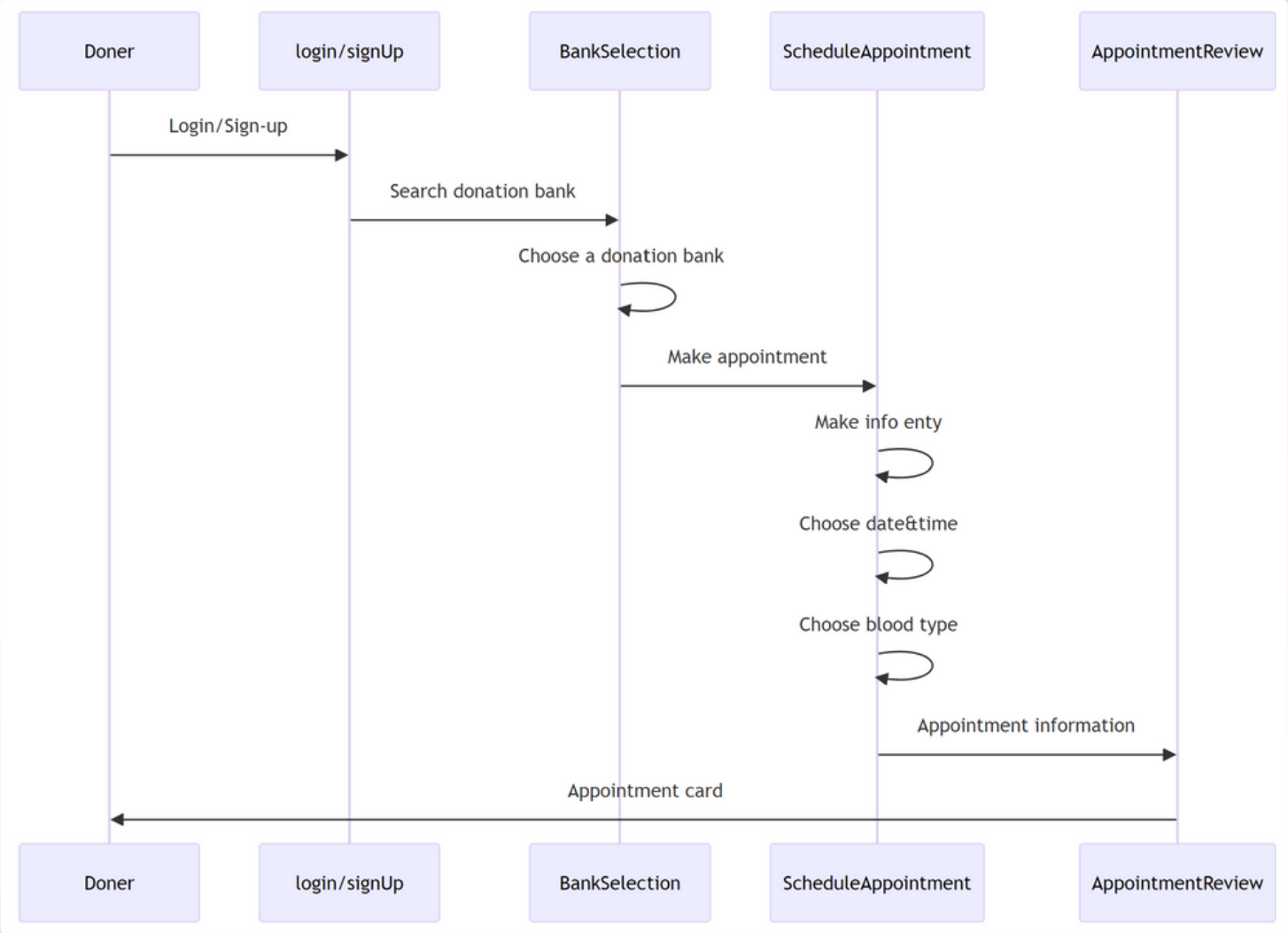
5.2 State Diagram



5.3 Activity Diagram



5.4 Sequence Diagram



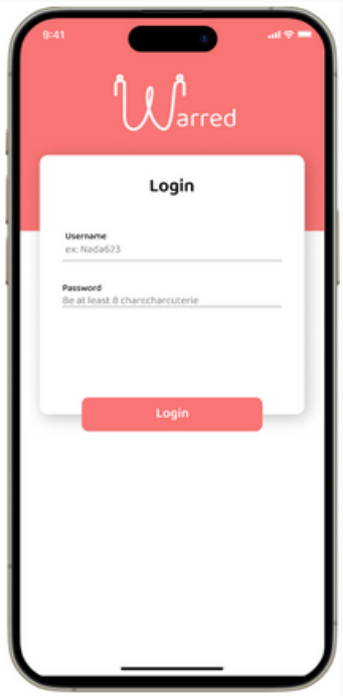
6. Human Interface Design

6.1 Overview of the User Interface

The Wareed blood bank app simplifies the blood donation process with an easy-to-use interface. Users can sign up, log in, and receive updates and urgent blood requests on their personalized dashboard. The app enables users to search for blood banks, hospitals, and specific blood types, manage their profiles, track donation history, and stay informed via a notification center. It may also facilitate appointment booking for donations, educate on blood type compatibility, and help locate nearby facilities with integrated maps. Additionally, it provides educational content on blood donation and allows users to give feedback and respond quickly to emergency requests.

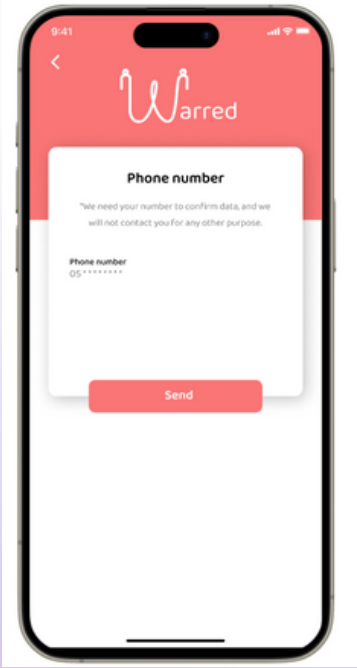
6.2 Detailed Design of User Interface

Warred's Logo screen



Login page:

the login page have fill-in form for the needed information (UserName, , PhoneNumber,Region and Password)



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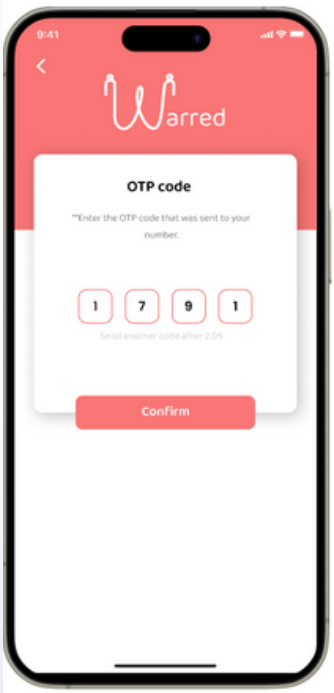
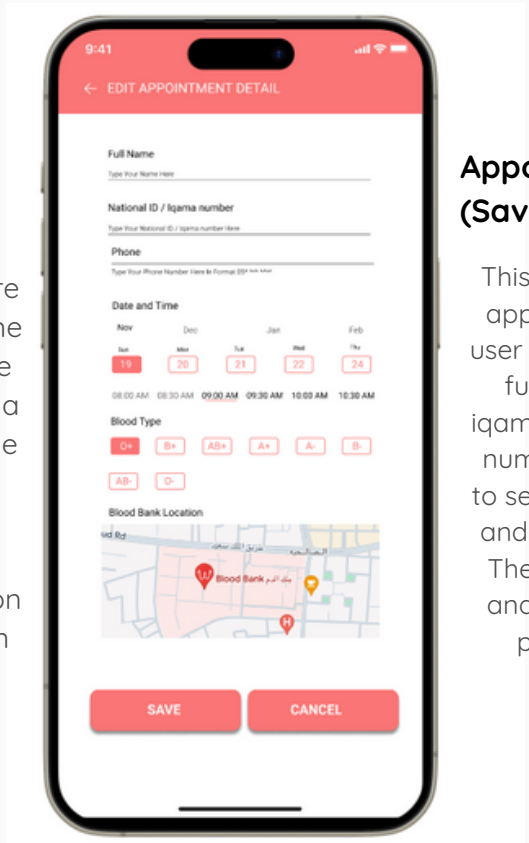


Authentication page:

The user needs to confirm his number by typing the OTP code that was sent to him

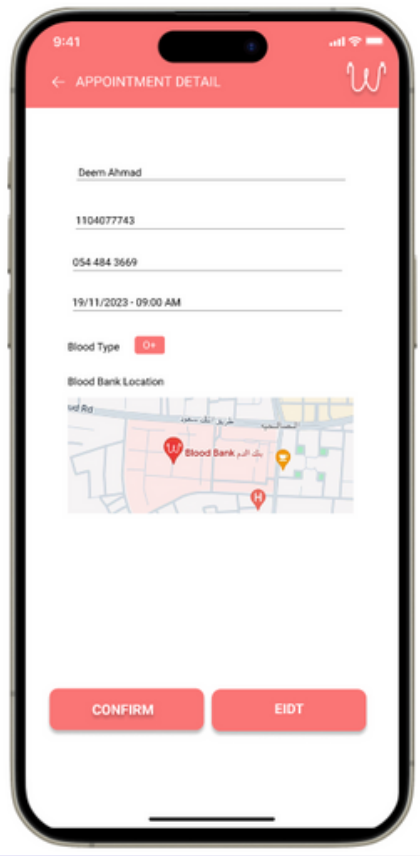
Home Page :

The closest blood donation locations are displayed on the home page. The users have the option to choose a donation center inside their city, or by selecting "Book Appointment," the closest blood donation center will be chosen as the location.



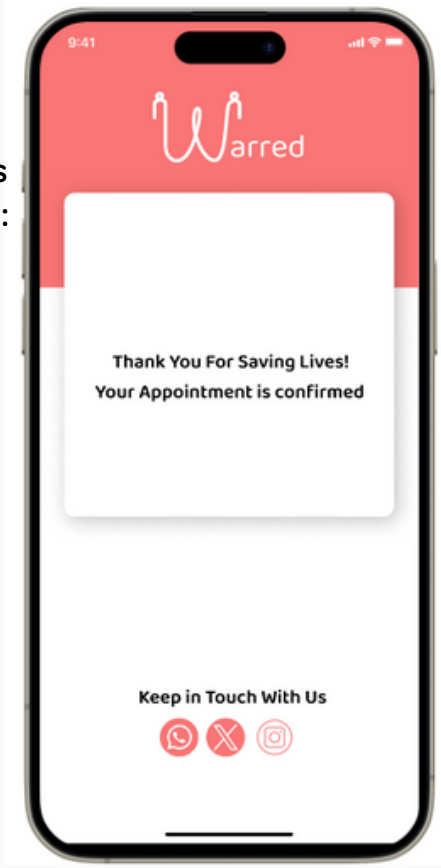
Appointment Details (Save/Cancel) Page:

This page will display the appointment details; the user has to enter his or her full name, national or iqama number, and phone number, as well as swipe to select an available date and time and blood type. The user can either save and proceed to the next page, or cancel the appointment.



Appointment Details (Confirm/Edit) Page:

This page displays the appointment details as well as the option for the user to either confirm the appointment or return to edit the appointment details.



Confirmation Page:

After the user confirms the appointment, the confirmation page and thank you messages will appear.

7. Work section

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System architecture State Digram	Shihanah Albadi
ERD Activity diagram	Deema Alnasser
DFD Activity diagram	Joud Alolayan
Class digram UI/UX	Deem Alghurair
Database description UI/UX	Reema Alnasser
Class digram Sequence diagram	Danah Alkughail
Class digram Sequence diagram	Seera Alhatlani
System architecture State Digram	Wareef Alolayan

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