
# PAK BLOOD HUB (PBH)

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**Computer Science**

**Sir Syed University of Engineering & Technology**

PAK BLOOD HUB (PBH)

## Certification

This is to certify that **Minahil Waseem, Muhammad Umer Faridi, Rahaf Khan, and Sahil Advani** have successfully completed the final project **PAK BLOOD HUB,** at the **Sir Syed University of Engineering & Technology,** to fulfill the partial requirement of the degree **BSCS.**

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22.12.27

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# PAK BLOOD HUB (PBH)

## Sustainable Development Goals

(Please tick the relevant SDG(s) linked with FYDP)

| SDG No | Description of SDG | SDG No | Description of SDG |
|---|---|---|---|
| SDG 1 | No Poverty | SDG 9 | Industry, Innovation, and Infrastructure |
| SDG 2 | Zero Hunger | SDG 10 | Reduced Inequalities |
| SDG 3 | Good Health and Well Being | SDG 11 | Sustainable Cities and Communities |
| SDG 4 | Quality Education | SDG 12 | Responsible Consumption and Production |
| SDG 5 | Gender Equality | SDG 13 | Climate Change |
| SDG 6 | Clean Water and Sanitation | SDG 14 | Life Below Water |
| SDG 7 | Affordable and Clean Energy | SDG 15 | Life on Land |
| SDG 8 | Decent Work and Economic Growth | SDG 16 | Peace, Justice and Strong Institutions |
| | | SDG 17 | Partnerships for the Goals |

| Range of Complex Problem Solving | | | |
|---|---|---|---|
| | **Attribute** | **Complex Problem** | |
| 1 | Range of conflicting requirements | Involve wide-ranging or conflicting technical, engineering and other issues. | |
| 2 | Depth of analysis required | Have no obvious solution and require abstract thinking, originality in analysis to formulate suitable models. | |
| 3 | Depth of knowledge required | Requires research-based knowledge much of which is at, or informed by, the forefront of the professional discipline and which allows a fundamentals-based, first principles analytical approach. | |
| 4 | Familiarity of issues | Involve infrequently encountered issues | |
| 5 | Extent of applicable codes | Are outside problems encompassed by standards and codes of practice for professional engineering. | |
| 6 | Extent of stakeholder involvement and level of conflicting requirements | Involve diverse groups of stakeholders with widely varying needs. | |
| 7 | Consequences | Have significant consequences in a range of contexts. | |
| 8 | Interdependence | Are high level problems including many component parts or sub-problems | |
| **Range of Complex Problem Activities** | | | |
| | **Attribute** | **Complex Activities** | |
| 1 | Range of resources | Involve the use of diverse resources (and for this purpose, resources include people, money, equipment, materials, information and technologies). | |
| 2 | Level of interaction | Require resolution of significant problems arising from interactions between wide ranging and conflicting technical, engineering or other issues. | |
| 3 | Innovation | Involve creative use of engineering principles and research-based knowledge in novel ways. | |

| | | | |
|---|---|---|---|
| 4 | Consequences to society and the environment | Have significant consequences in a range of contexts, characterized by difficulty of prediction and mitigation. | |
| 5 | Familiarity | Can extend beyond previous experiences by applying principles-based approaches. | |

# Abstract

**Pak Blood Hub**, as the name speaks for itself will be the User-friendly central point for all hospitals/blood centers which provide blood bank facilities and universities that play a great role in blood drives. PBH would be a User-friendly platform where all universities and blood bank organizations can work together on arranging more successful blood drives. It's not just about arranging the drives, but the main purpose of this platform is to maintain the overall log of them which in future will be beneficial for every student, faculty and staff of the universities who are going to donate blood. Our platform changes the concept of blood donation into blood deposit. The donation will be a type of blood deposit as PBH would be maintaining every individual's count (x) of blood donations. This will help them and their acquaintances to redeem that amount (x) of blood through this platform whenever they require blood. It will be a great initiative for society as there is a need for blood donors every single day.

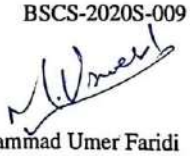
PAK BLOOD HUB (PBH)

## Undertaking

I certify that the project **PAK BLOOD HUB (PBH)** is our own work. The work has not, in whole or in part, been presented elsewhere for assessment. Where material has been used from other sources it has been properly acknowledged/ referred.

Minahil Waseem

BSCS-2020S-009



Muhammad Umer Faridi

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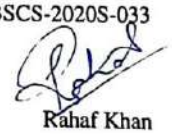

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# Acknowledgement

We truly acknowledge the cooperation and help make by **Ms. Ayesha Urooj, Assistant Professor** of **Sir Syed University of Engineering and Technology, Gulshan-e-Iqbal Block 5**.He has been a constant source of guidance throughout the course of this project. We would also like to thank **Dr. Waleej Haider, Chairman of CS Department** of **Sir Syed University of Engineering and Technology, Gulshan-e-Iqbal Block 5**. for his help and guidance throughout this project.

We are also thankful to our friends and families whose silent support led us to complete our project.

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# Chapter 1

## 1.1 Introduction

When it comes to medicine, blood banks are one of the most vital components. From gathering blood to giving it on the right time to the right location demands a specific measure of time and cost. A blood bank guarantees that any patient in need will have immediate access to fresh blood. The fact that it is dependent on life or death is the most important aspect. Time is one of the most important factors in this department because even a small delay in blood donation can result in death. Despite Pakistan's 1,830 blood banks, it is extremely difficult for the average person to obtain blood immediately. Even if they receive blood, the high cost makes the situation much more difficult for the average person to afford.

These two major factors will be reduced by our User-friendly Project "**Pak Blood Hub**" making it simpler to provide fresh blood to those in need. Our project will become the central point for all hospitals and universities when it comes to keeping blood drives. Universities are chosen so that hospitals can obtain fresh blood, as their age range typically falls between 20-26. It will be the platform where all universities and blood bank organizations work together on arranging more successful blood drives. In our project, a comprehensive log of all blood donors will be kept for future use. Our project transforms the concept of blood donation into blood deposit. Anybody giving blood will be able to redeem the same amount of blood back through our platform at whatever point they are out of luck. Time constraints can be completely eliminated with this idea as the customers will receive free blood right away because they will receive the same quantity of blood they donated, eliminating the cost issue. After donating blood through the application, our customers will receive a free blood report as well.

## 1.2 Statement of the problem

As we know currently in Pakistan there isn't any User-friendly central point which connects universities with blood centers to provide blood at the same platform. This makes it harder for the youth to give or get blood in their time of need. Our User-friendly platform gives the best solution for this problem. PBH not only connects everything at a central point but it also makes it easier as every person who will be donating blood will be depositing it at the same time. This means if at any point in time someone donated blood, they will be eligible to get it back anytime through our platform simply by the ID that is created of them.

## 1.3 Goals/Aims & Objectives

The objectives of our Pak Blood Hub project are as follows:

- Universities and Blood banks will be at the same platform.
- Every person who will be donating blood will be depositing it at the same time to get it back in case of their need.
- PBH focuses on undergrads at universities because fresh blood can be found there.
- Each person who donates blood through our platform will be given an identification number so that they can show it to get the blood they need.
- Time and cost constraints will be minimized.
- It will make it simpler for hospitals to organize blood drives and communicate with university administrators.
- Continuous blood drives will help with blood shortage.
- Every type of blood availability will be ensured at all times.
- User-friendly platform that will be easy to use for every person.
- Free blood reports will be generated after a person donates blood.

## 1.4 Motivation

The credit behind the motivation of this product, all goes to our supervisor. Our supervisor motivates us in each and every stage of the development. She reviews our progress, tells about our mistakes and provides recommendations.

## 1.5 Assumption and Dependencies

Assumptions and dependencies for the development of Pak Blood Hub include:

**Assumptions:**

- *User Engagement*: It is assumed that users will actively engage with the platform for blood donations, requests, and related activities.
- *Internet Accessibility*: Users are assumed to have reliable internet access to use the web application effectively.
- *Blood Bank and University Collaboration*: The success of the platform depends on collaboration with blood banks and universities for blood drives and donation initiatives.
- *Data Accuracy*: It is assumed that the data provided by users, blood banks, and universities is accurate and reliable.

*Security Compliance*: The application assumes that security measures, such as encryption and secure authentication, are in place to protect user data.

**Dependencies:**

- *Technology Stack:* The project is dependent on the MERN (MongoDB, Express.js, React, Node.js) stack for development, and any updates or changes to these technologies may impact the project.
- *External APIs:* Dependencies on external APIs, such as geolocation services for mapping blood drive locations, should be reliable and available.
- *Cloud Services:* Integration with cloud services (e.g., AWS, Azure) for hosting and scalability is a dependency, requiring consistent service availability.
- *User Adoption:* The success of the platform depends on users adopting and actively participating in blood donation activities.

Understanding and managing these assumptions and dependencies is crucial for the successful planning, development, and deployment of Pak Blood Hub. Regular monitoring and adaptation to changes in these factors are integral to project success.

## 1.6 Methods

The methods applied in the development of Pak Blood Hub include:

- *Agile Methodology*: Embracing an agile approach allows for iterative development, continuous feedback, and adaptability to changing requirements. It promotes collaboration among team members and stakeholders, ensuring a more responsive and efficient development process.
- *MERN Stack Development*: Leveraging the MERN (MongoDB, Express.js, React, Node.js) stack provides a robust and cohesive set of technologies for building scalable and feature-rich web applications. MongoDB serves as the NoSQL database, Express.js handles server-side logic, React manages the user interface, and Node.js supports server-side runtime.
- *Database Management*: Utilizing MongoDB, a NoSQL database, facilitates the efficient storage and retrieval of data related to blood donations, users, blood drives, and other critical information.
- *RESTful API Design*: Adopting a RESTful API design allows for seamless communication between the front-end and back-end components of the application. This promotes interoperability and simplifies the integration of different system modules.
- *Responsive Web Design (RWD*): Ensuring that the web application is accessible and functional across various devices and screen sizes is achieved through responsive web design. This is crucial for providing a consistent and user-friendly experience.
- *Security Measures*: Implementing security measures such as data encryption, secure user authentication, and authorization protocols helps safeguard sensitive user information and ensures the overall security of the platform.

- *Version Control (Git)*: Using version control systems like Git allows for collaborative development, easy code management, and the ability to roll back to previous versions if needed.

These methods collectively contribute to the development of a reliable, user-friendly, and scalable blood donation platform that aligns with the goals and objectives of Pak Blood Hub.

## 1.7 Report Overview

This report is structured to provide a comprehensive understanding of the project. Following this introduction, the subsequent sections delve into the background of digital blood hub, the technical details of the prototype, and the results obtained. The report also includes a critical analysis of the system, implications for real-world applications, and avenues for future development. Each section contributes to a holistic overview of the project, offering insights into its motivations, and methodologies.

# Chapter 2

# Literature Review

## 2.1 Existing Systems

### 2.1.1 Title: Health Solutions [1]:

A Virtual App Hospital provides all health facilities at doorsteps. Health Solutions App, an idea to serve humanity using smart technology. Nowadays, a pizza delivery or an Cab Service is guaranteed in 5 to 30 minutes but if someone needs blood or any other health-related solution, it is not available unfortunately.

**Salient Features:**

- It provides blood.
- It provides medical equipment.
- Ambulances service is available.

### 2.1.2 Title: Blood Bank Pakistan [2]:

An application to post blood donation request and register as a blood donor. Blood Bank Pakistan is an application to facilitate user for:

**Salient Features:**

- Subscribe as a donor
- Post blood donation request, application will send SMS for relevant donors
- Getting donor information

### 2.1.3 Title: Blood Help Pakistan – Blood do [3]:

The App is to facilitate people to reach out to blood donors easily and quickly in emergency cases. Pakistan's First app for blood donation, an android based Blood bank which will help a lot of peoples in emergency cases.

**Salient Features:**

- Get Active Blood Donors list of your city.
- Ad Sub donors, for example, your friends as donors from your account.
- Submit Blood Requests

## 2.2 Comparative Analysis:

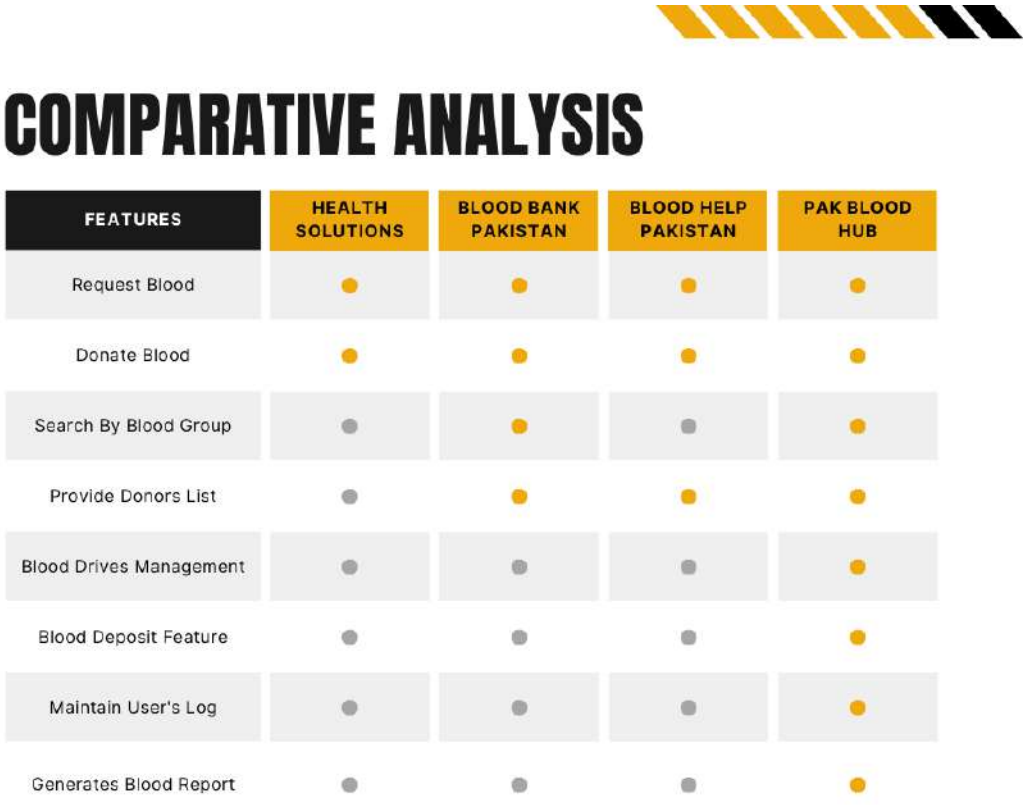


Fig 2.2.1 Comparative Analysis Diagram

# Chapter 3

# Requirement Analysis

### 3.1 External Interface Requirements

#### 3.1.1 User Interfaces

The user interface for Pak Blood Hub will be a Progressive Web App that will be accessible from any modern web browser on a phone. The logical characteristics of the interface between the software product and the users will be designed to be user-friendly, intuitive, and easy to use. The interface will include a dashboard where users can view the blood drives arranged via the platform, and it will allow them to register for blood donation. Users will also be able to view their blood donation history, the amount of blood they have donated, and the amount of blood they can redeem.

#### 3.1.2 Hardware Interfaces

The hardware interface for Pak Blood Hub will be minimal, as the software product will be accessible from any modern web browser on a phone. As such, there are no specific hardware requirements for users to interact with the software product.

#### 3.1.3 Software Interfaces

Pak Blood Hub will be based on the MERN stack, which consists of MongoDB for the database, Express for the server-side framework, React for the client-side framework, and Node.js for the runtime environment. The system will require connections to these specific software components to function properly. The database will store and manage blood donation history, user accounts, and other relevant data using MongoDB. The server-side framework will use Express to handle HTTP requests and responses. The client-side framework will use React to render the user interface and handle user interaction. Node.js will provide the runtime environment for the entire system.

In addition, the system will also require specific software components such as operating systems, libraries, and integrated commercial components. The exact

software components to be used will be determined during development. The system will be designed to run on modern web browsers on a phone, and the system's software requirements will be determined based on the latest browser versions available at the time of development.

#### 3.1.4 Communications Interfaces

Pak Blood Hub will require communication functions such as email and web browser communication protocols to facilitate user communication with the system. Users will receive email notifications regarding upcoming blood drives and other relevant information. The platform will use standard communication protocols such as HTTP/HTTPS for web browser communication. Message formatting will be defined based on the latest web standards. Communication security and encryption will be implemented to ensure user data privacy and protection. Data transfer rates will be determined based on the available network bandwidth. Synchronization mechanisms will be implemented to ensure data consistency between the platform and the user's device.

### 3.2 Functional Requirements

| ID | Requirement |
|---|---|
| FR_001 | User Management |
| FR_002 | Blood Drive Management |
| FR_003 | Blood Deposit and Redemption Management |
| FR_004 | Reporting and Analytics |

### 3.3 Other Nonfunctional Requirements

#### 3.3.1 Usability

- The platform should be easy to use and navigate for users of all ages and technical backgrounds.
- The interface should be visually appealing and responsive.
- The platform should provide clear and concise instructions for users at all stages of the blood donation process.

- The platform should be accessible and usable on various devices and screen sizes.

### 3.3.2 Performance

- The platform should be highly responsive and provide real-time updates to users.
- The platform should have a high uptime and be available to users at all times.
- The platform should be able to handle a large number of users and data processing requests.

### 3.3.3 Reliability

- The platform should be reliable and able to handle unexpected errors or failures without losing user data or affecting user experience.
- The platform should have robust backup and recovery mechanisms in place to prevent data loss in case of a system failure or disaster.

### 3.3.4 Security

- The platform should implement industry-standard security measures to protect user data and prevent unauthorized access.
- The platform should be compliant with relevant data protection regulations and guidelines.
- The platform should provide users with control over their data privacy preferences.

### 3.3.5 Maintainability

- The platform should be easy to maintain and update for developers.
- The platform should follow industry-standard coding practices and design patterns to facilitate maintenance and development.

### 3.4 Cost Estimation

| S.No | Project Expenditure | Cost in Rupees |
|---|---|---|
| 1 | **Deployment** | |
| | Registration for Google's developer account | 7500 |
| | Server hosting | 28000 |
| | **Sub Total** | **35,500** |
| 2 | **Printing** | |
| | FYP Wall Poster | 3500 |
| | FYP Standee | 1500 |
| | FYP Brochure | 1000 |
| | FYP Report 3 Copies | 4000 |
| | 2 DVDs | 500 |
| | **Sub Total** | **10,500** |
| | | |
| | **Grand Total** | **46,000** |

### 3.5 Project Plan with Gantt Chart

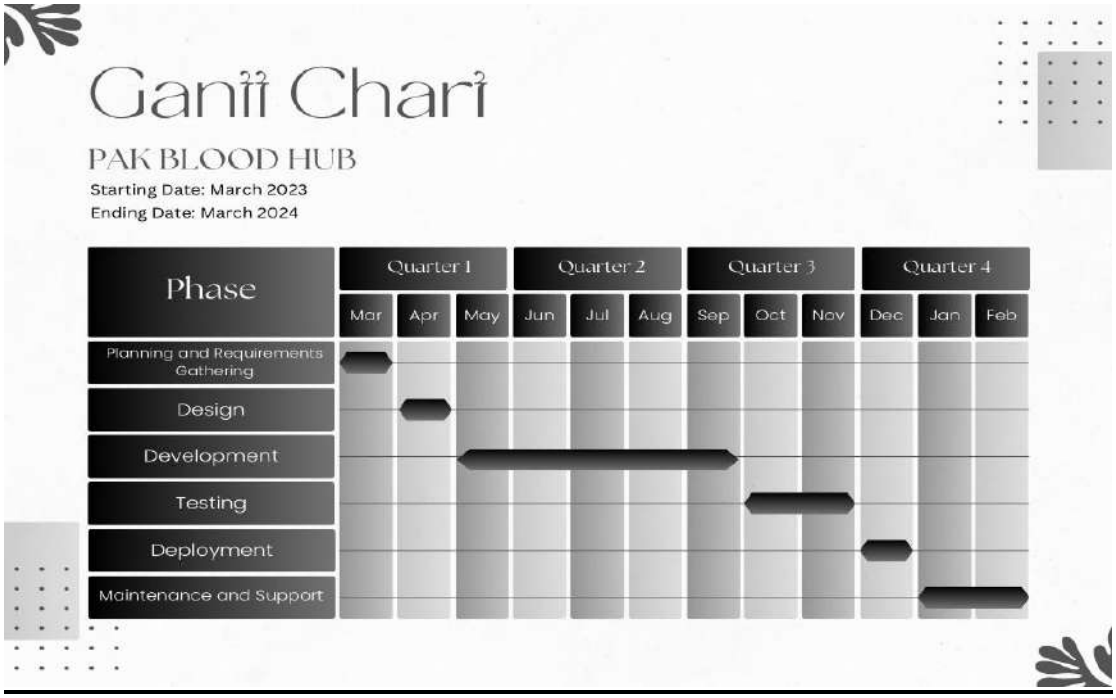


Fig 3.5.1 Gantt Chart for Pak Blood Hub

**Phase 1: Planning and Requirements Gathering (04 weeks)**

- Define project scope, objectives, and deliverables
- Identify stakeholders and gather their requirements
- Conduct market research and analysis
- Define user stories and acceptance criteria

**Phase 2: Design (04 weeks)**

- Create high-level and detailed design documentation
- Identify system architecture and components
- Develop UI wireframes and mockups
- Create database schema and data models

**Phase 3: Development (20 weeks)**

- Develop the frontend using ReactJS
- Develop the backend using NodeJS, ExpressJS, and MongoDB
- Develop API endpoints and integrate third-party services
- Implement user authentication and authorization
- Perform unit testing and code review

**Phase 4: Testing (08 weeks)**

- Develop and execute test cases and test scenarios
- Perform functional, regression, and performance testing
- Debug and fix any issues found during testing

**Phase 5: Deployment (04 weeks)**

- Create deployment package
- Deploy the system to the production environment
- Perform user acceptance testing

**Phase 6: Maintenance and Support (08 weeks)**

- Provide user training and support
- Fix defects and issues reported by users
- Perform periodic system maintenance and updates

### 3.6 Software Development Life Cycle Model


Fig 3.6.1 Agile Development Life Cycle Model

Agile development methodology is a popular approach to software development that emphasizes collaboration, flexibility, and continuous delivery of working software. It is an iterative and incremental approach that emphasizes on responding to change and customer feedback throughout the development process. Given the dynamic nature of the requirements of the Pak Blood Hub, Agile model can be a suitable choice for its development.

Here are some reasons why Agile model would be suitable for Pak Blood Hub:

- **Flexibility:** Since the requirements and scope of Pak Blood Hub may change during the development process, the Agile model is well suited to accommodate changes and respond to customer feedback.
- **Continuous Delivery:** The Agile model emphasizes the delivery of working software in small increments, which allows stakeholders to provide feedback early and often, thereby ensuring that the end product meets their expectations.
- **Collaboration:** The Agile model promotes collaboration and teamwork between developers, stakeholders, and customers, which is crucial for the success of a product like Pak Blood Hub.
- **Iterative Approach:** The Agile model's iterative approach allows developers to prioritize features and functionality and deliver them incrementally. This

ensures that the most critical features are delivered first, providing value to users early in the development cycle.

The Agile model has several phases, which are as follows:

- **Planning:** In this phase, the development team works with stakeholders to identify and prioritize the features and functionality required for Pak Blood Hub. This is also where the team establishes the project's scope, timelines, and budgets.
- **Requirements:** In this phase, the team gathers and documents the requirements for Pak Blood Hub in a product backlog. The backlog is a prioritized list of features that the team will develop over time.
- **Design:** In this phase, the team creates the design of the product, including its user interface, data model, and technical architecture. The design should be flexible enough to accommodate changes during the development process.
- **Development:** In this phase, the team develops the product in small increments or iterations. The team prioritizes the backlog and delivers working software at the end of each iteration.
- **Testing:** In this phase, the team tests the product to ensure that it meets the requirements and is free of defects. Testing is an ongoing process that occurs throughout the development cycle.
- **Deployment:** In this phase, the team deploys the product to a production environment, making it available to users.
- **Maintenance:** In this phase, the team provides ongoing maintenance and support to the product, including bug fixes and updates to the software.

Overall, the Agile model is well suited to the dynamic and evolving requirements of Pak Blood Hub. It provides a flexible, collaborative, and iterative approach to development that emphasizes continuous delivery of working software.

# Chapter 4

## Proposed Solution/ Result & Discussion:

### 4.1 System Architecture Diagram

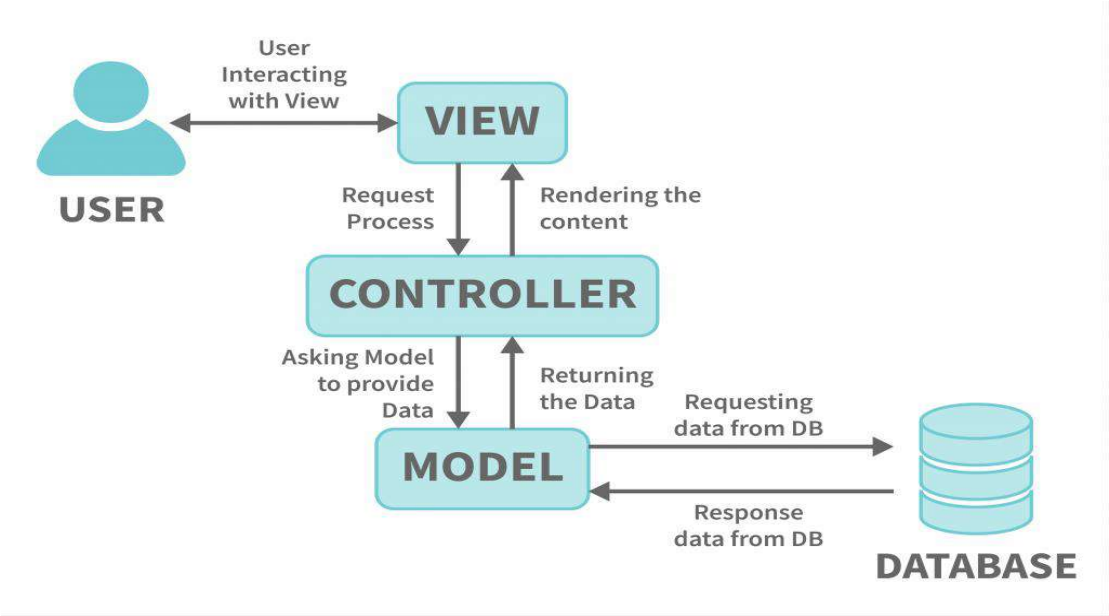


Fig 4.1.1 MVC System Architecture Diagram

The system architecture of Pak Blood Hub can be designed using the Model-View-Controller (MVC) architectural pattern. The MVC pattern divides the software application into three interconnected parts, which are responsible for different aspects of the application's functionality:

1. Model: The Model represents the data and business logic of the application. In the case of Pak Blood Hub, the Model will include the database, which will store information about blood donors, blood banks, universities, and blood drives. It will also contain the business logic, which will ensure that the rules and policies related to blood donation and deposit are enforced.
2. View: The View is responsible for presenting the data to the user in an understandable format. In the case of Pak Blood Hub, the View will include the user interface, which will allow users to register, sign in, and search for blood

drives. It will also display the users' blood donation count and other relevant information.

3. Controller: The Controller acts as the intermediary between the Model and the View. It receives user input from the View, processes it, and sends the appropriate commands to the Model. In the case of Pak Blood Hub, the Controller will manage the interactions between users, blood drives, blood banks, and universities.

The system architecture of Pak Blood Hub can also utilize the microservices architecture, which involves breaking down the application into a set of loosely coupled, independently deployable services. Each microservice can be designed to perform a specific function, such as user authentication, blood drive management, or blood donation tracking. This architecture allows for greater scalability, fault tolerance, and flexibility, as each microservice can be developed, tested, and deployed independently.

Overall, the system architecture of Pak Blood Hub will need to be designed to be scalable, reliable, and secure, in order to handle large volumes of data and users, and to protect sensitive information.

## 4.2 System Operations

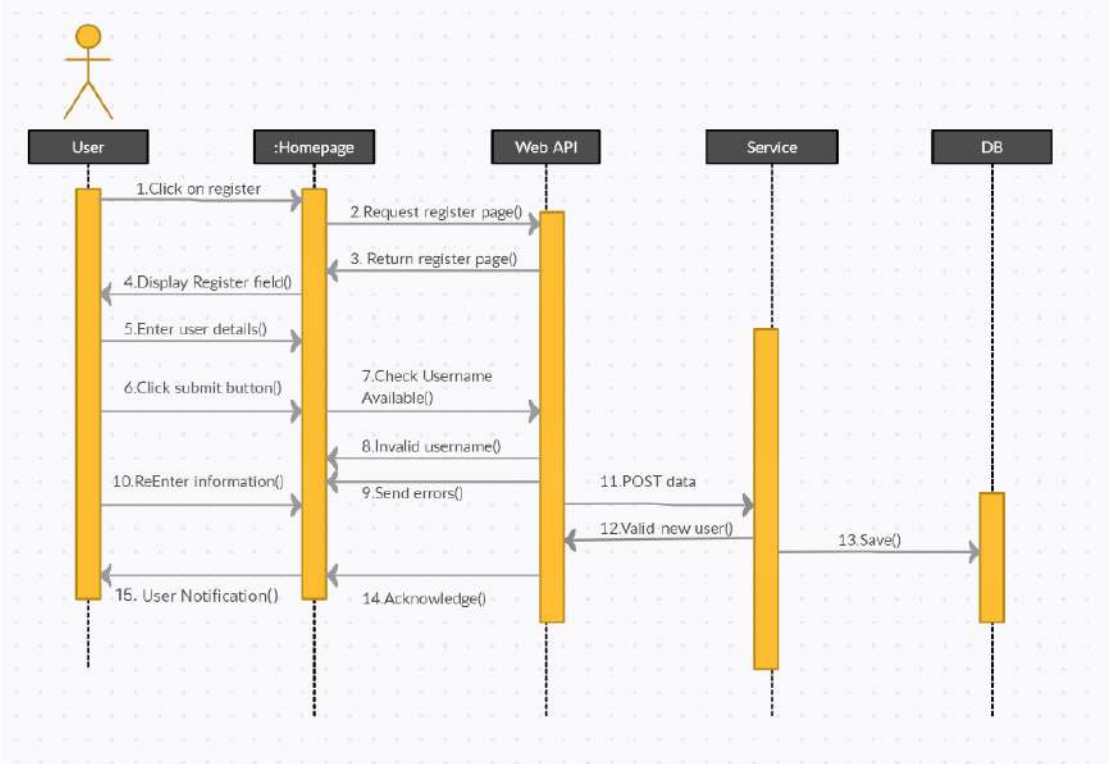


Fig 4.2.1 UML Sequence Diagram

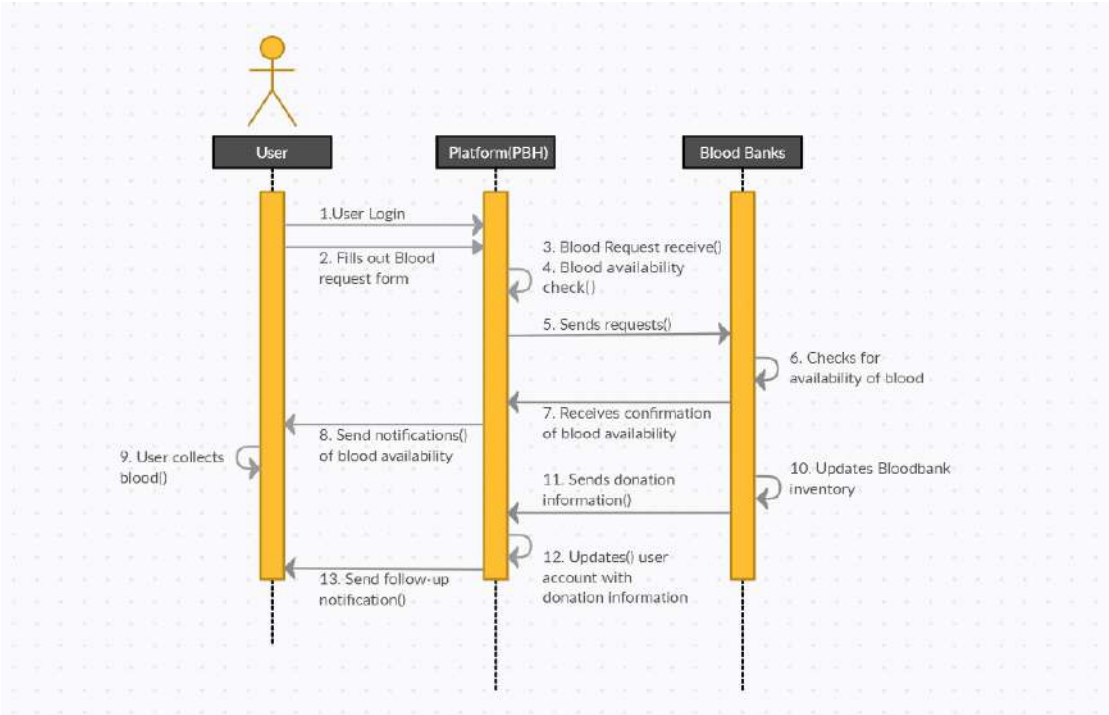


Fig 4.2.2 UML Sequence Diagram

The UML sequence diagram for Pak Blood Hub would depict the interactions between the different actors and components of the system as they work together to carry out the various use cases of the product.

Fig 4.2.1: A sequence diagram could show the steps involved in a user registering for an account on the platform. It would start with the user requesting the registration page, followed by the system responding with the appropriate form. The user would then fill out the form and submit it, triggering a sequence of events including validation of the user's information, creation of a new user account in the database, and a confirmation message being sent to the user.

Fig 4.2.2: A sequence diagram could depict the flow of events involved in a user requesting blood from the platform. This would involve interactions between the user, the platform's database, and the various blood banks and hospitals affiliated with the platform. The diagram would show the various steps involved in searching for and retrieving the requested blood, as well as any communications or notifications that occur between the different actors in the system.

Overall, the UML sequence diagram would provide a visual representation of the flow of events and interactions between the different components of the system, helping to identify potential issues or inefficiencies in the system design, and serving as a useful reference for developers and stakeholders throughout the development process.

### 4.3 System Model

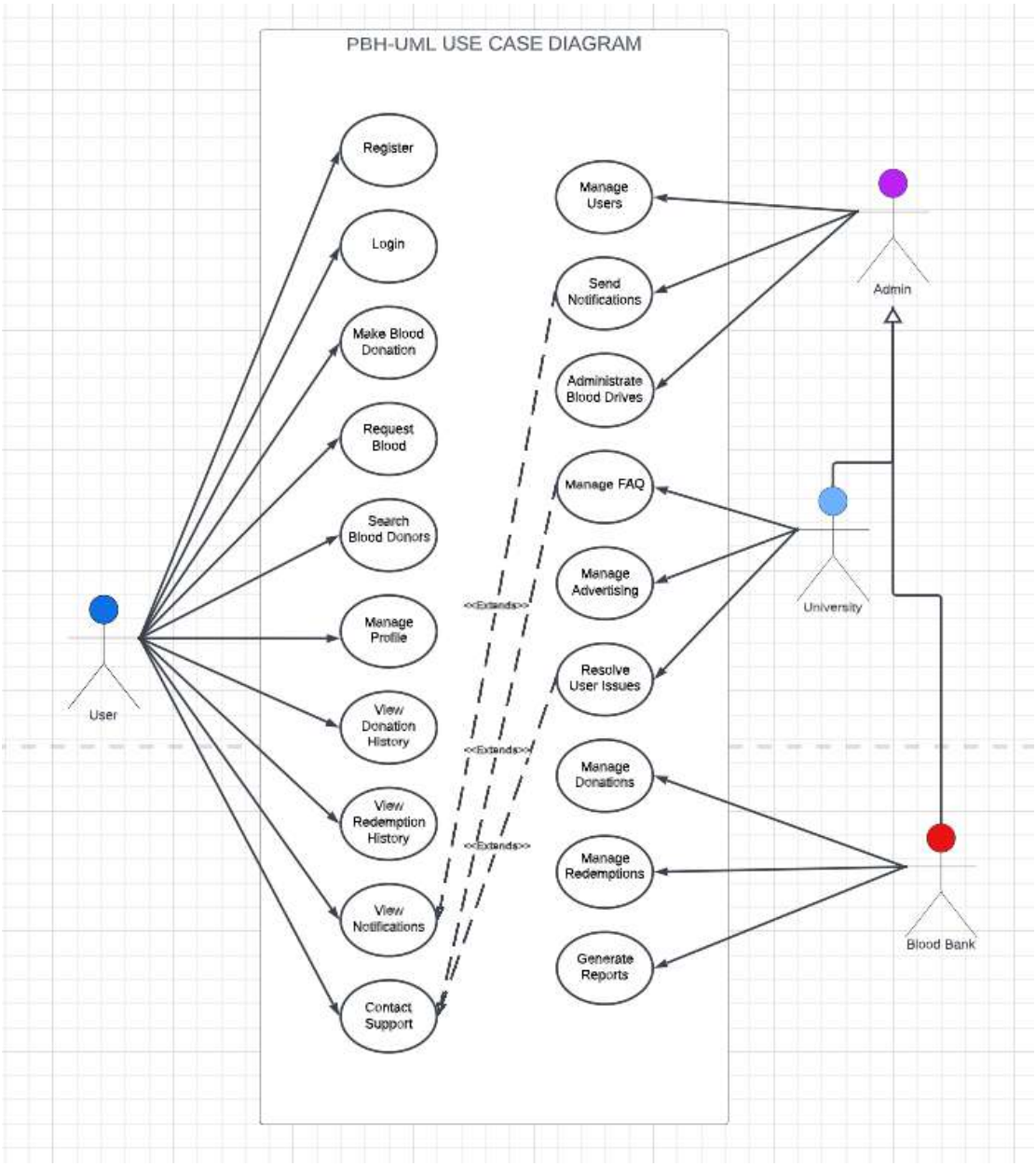


Fig 4.3.1 UML Use Case Diagram

The following use cases outline the key functionalities and interactions available to users within the Pak Blood Hub system and the key responsibilities and tasks of the Admin role in managing and maintaining the Pak Blood Hub platform.

User:

- Register User: Users can create a new account by providing their information, such as name, contact details, and blood type.
- Log In: Users can securely log in to their existing accounts using their credentials to access the system's features and functionalities.
- Make Blood Donation: Users can initiate the process of making a blood donation by providing relevant details such as the date of donation, blood type, and quantity.
- Request Blood: Users can submit requests for blood when they are in need, specifying their blood type and required quantity.
- Search Blood Donors: Users can search for potential blood donors based on specific criteria, such as blood type, location, and availability.
- Manage Profile: Users have the ability to manage their profile information, including updating personal details and contact information.
- View Donation History: Users can view a list of their previous blood donations, including details such as donation dates and quantities.
- View Redemption History: Users can view a list of their previous blood redemptions, which includes information about the date and location of redemption.
- View Notifications: Users can access a list of notifications received from the system, which may include information about upcoming blood drives, donation opportunities, or relevant updates.
- Contact Support: Users have the option to contact customer support or the system's support team to seek assistance or resolve any issues they may encounter.

Admin:

- Administrate Blood Drives: The admin can create and manage blood drive events, including scheduling drives, specifying locations, and managing participant registrations.
- Send Notifications: The admin can send notifications to users regarding upcoming blood drives, important information, or any updates related to the platform.

- Manage Users: The admin has the ability to view and manage user accounts, including creating new accounts, updating user information, and handling user-related issues.
- Manage Donations: The admin can view and manage blood donation records, including tracking donations, marking them as available or unavailable, and updating donation details.
- Manage Redemptions: The admin can view and manage blood redemption records, including marking redemptions as fulfilled, tracking redemption dates and locations, and managing redemption-related information.
- Generate Reports: The admin can generate reports on various aspects of the system, including blood donations, blood drives, and user statistics, to gain insights and monitor the performance of the platform.
- Manage FAQ: The admin can add, update, or delete frequently asked questions to provide users with relevant information and support.
- Monitor System Performance: The admin can monitor the performance and availability of the system, ensuring smooth operation and addressing any performance issues or downtime promptly.
- Resolve User Issues: The admin is responsible for handling user issues and inquiries, providing support, and resolving any problems or concerns raised by users.
- Manage Advertising: The admin can manage the advertisements displayed on the platform, including selecting appropriate ads, monitoring their performance, and ensuring compliance with advertising guidelines.

### 4.4 Object Model

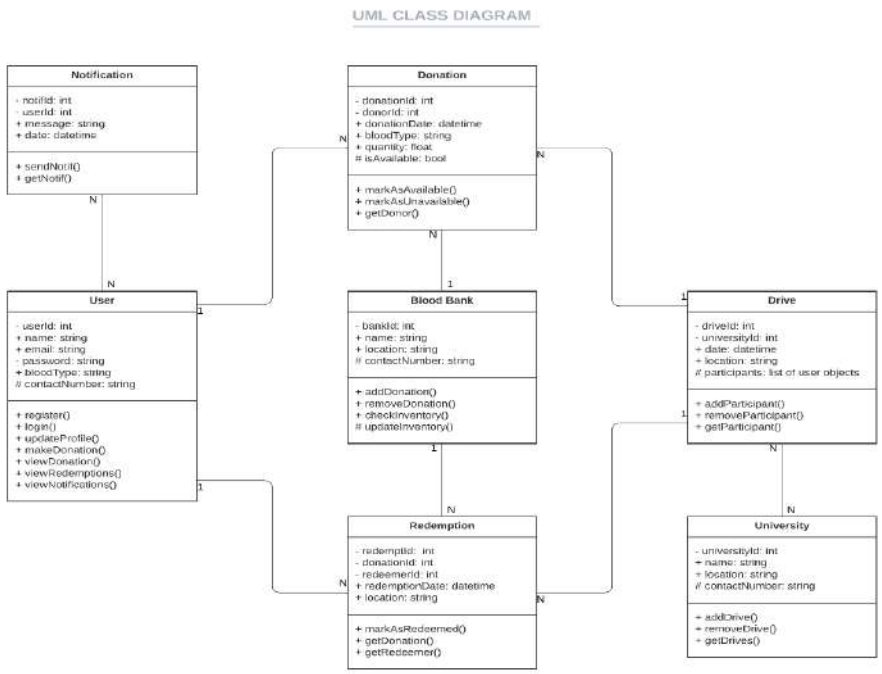


Fig 4.4.1 UML Class Diagram

This UML class diagram represents the entities, attributes, methods, and relationships involved in the Pak Blood Hub system. The system is designed to manage the process of blood donations and redemptions, as well as maintain a record of blood banks and universities organizing blood drives.

The diagram includes seven classes: User, Donation, Blood Bank, University, Drive, Redemption, and Notification. The User class represents the individuals who can register, login, make donations, and redeem donations. The Donation class represents the blood donations made by users and maintained by the blood bank. The Blood Bank class represents the blood bank, which maintains an inventory of available blood and manages the process of adding or removing donations. The University class represents universities that organize blood drives, maintain a schedule of upcoming drives, and manage the process of adding or removing drives. The Drive class represents a specific blood drive organized by a university and includes a list of participants who have registered for the drive. The Redemption class represents the process of redeeming a donation by a user. Finally, the Notification class represents the messages that the system can send to users.

Each class includes attributes and methods that allow the system to manage the specific tasks associated with each class. For example, the User class includes attributes such as name, email, password, blood type, and contact number, and methods such as register, login, updateProfile, makeDonation, and viewDonations. Similarly, the Donation class includes attributes such as donorId, donationDate, bloodType, and quantity, and methods such as markAsAvailable, markAsUnavailable, and getDonor.

The diagram also includes relationships between the classes. For example, the User class has a "has many" relationship with the Donation and Redemption classes, indicating that a user can make multiple donations and redemptions. The Donation class has a relationship with the Blood Bank class, indicating that the donation is maintained in the inventory managed by the blood bank. The University class has a relationship with the Drive class, indicating that the university can organize multiple drives. The Drive class has a relationship with the User class, indicating that users can register to participate in a specific drive. The Redemption class has relationships with the Donation and User classes, indicating that the redemption is associated with a specific donation and user. Finally, the Notification class has a relationship with the User class, indicating that notifications are sent to specific users.

### 4.5 Data Model

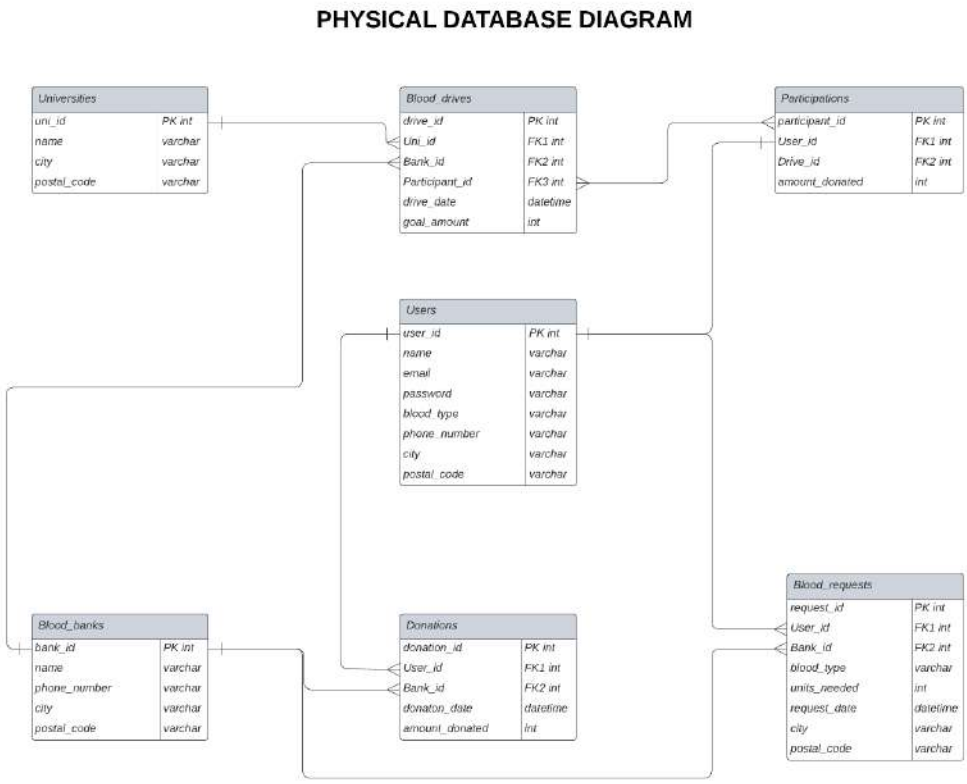


Fig 4.5.1 UML Sequence Diagram

In this database schema, the `users` table stores information about the blood donors, including their name, email, password, blood type, phone number, and location. The `donations` table tracks all donations made by users, including the amount donated, the date, and the associated blood bank. The `blood_banks` table stores information about each affiliated blood bank, including its name, phone number, and location.

The `universities` table stores information about each university that hosts blood drives, including its name, city, and postal code. The `blood_drives` table tracks each blood drive, including the associated university, blood bank, date, and donation goal. The `participations` table records the participation of each user in each blood drive, including the amount donated.

The `blood_requests` table tracks user requests for blood, including the user making the request, the requested blood type, the number of units needed, the date of the request, and the requested location.

The following relationships will be established between them:

- The users table has a one-to-many relationship with the donations table, as each user can make multiple donations, but each donation is associated with only one user.
- The blood_banks table has a one-to-many relationship with the donations and blood_drives tables, as each blood bank can receive multiple donations and host multiple blood drives, but each donation and blood drive is associated with only one blood bank.
- The universities table has a one-to-many relationship with the blood_drives table, as each university can host multiple blood drives, but each blood drive is associated with only one university.
- The users table has a many-to-many relationship with the blood_drives table through the participations table, as each user can participate in multiple blood drives, and each blood drive can have multiple participants.
- The users table has a one-to-many relationship with the blood_request_table table, as each user can make multiple blood requests, but each request is associated with only one user.
- The blood_banks table has a one-to-many relationship with the blood_request_table table, as each blood bank can fulfill multiple blood requests, but each request is associated with only one blood bank.

Overall, this database schema provides a solid foundation for managing blood donations and blood drives, and allows for easy tracking of user donations and participation in events.

### 4.6 User Interface Design

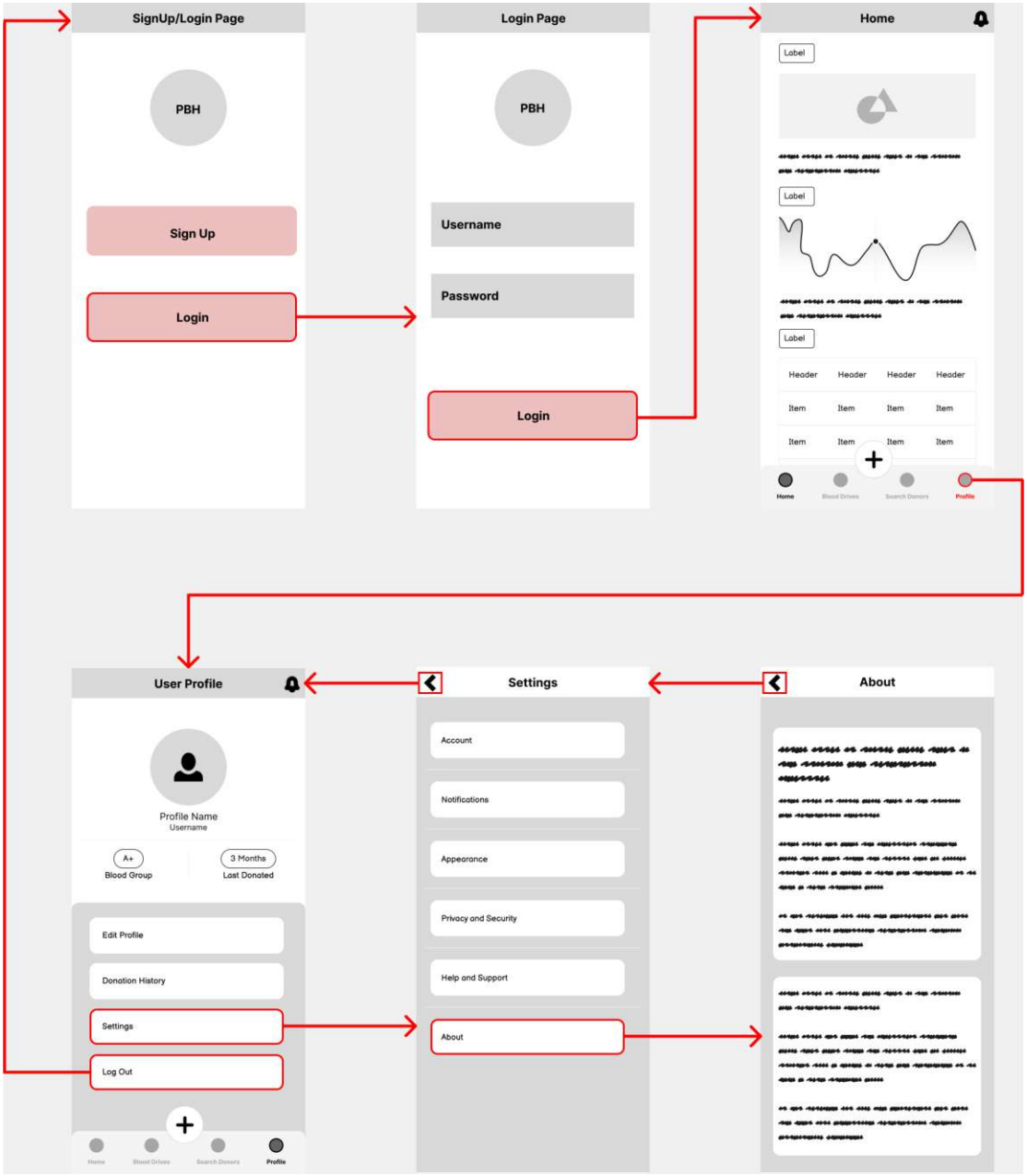


Fig 4.6.1 User Interface Design

User Flow:

1. User will select either to sign-up or login.
2. Enter credentials to login.
3. Home Screen will be displayed to the user having multiple features to access blood drives, search donors, profile, notifications etc.

4. User can access the profile displaying many user details and functionalities (i.e. edit profile, settings, logout)
5. Setting page gives a variety of options to users as they can manage their account credentials, notification settings, appearances according to their preferences etc.
6. User can navigate between pages.
7. About section displays the information about the product.

# Chapter 5

## 5.1 Summary and Future work

## Summary:-

The project report for Pak Blood Hub provides a comprehensive overview of the development of a web platform aimed at facilitating blood donations and requests. The report covers the motivation behind the project, its objectives, the target audience, and the technology stack used (MERN stack). It delves into the system architecture, including UML diagrams, classes, and relationships. The report outlines the features of the platform, including user registration, blood donation management, and collaboration with blood banks and universities. It also discusses the assumed user behaviors, dependencies on technology, APIs, and regulatory compliance. The report concludes by emphasizing the importance of user engagement and team expertise for the success of Pak Blood Hub.

## Future work:-

The future work for Pak Blood Hub involves continual enhancement and expansion of features. This includes refining the user interface for an optimal user experience, implementing advanced search algorithms for efficient blood donor matching, and incorporating real-time notifications for users and administrators. The platform's scalability will be addressed, allowing it to handle increased user traffic and data. Integration with additional blood banks, hospitals, and universities will be explored to broaden the platform's impact. Furthermore, future iterations may include the integration of machine learning algorithms for improved donor matching accuracy and the exploration of mobile application development to increase accessibility. Regular updates and feature additions will ensure the platform remains dynamic and responsive to user needs.

# Chapter 6

## 6.1 Conclusion & Recommendation

The conclusion of the Pak Blood Hub project report highlights the successful development of a comprehensive platform that facilitates blood donation and management. It emphasizes the achievement of key objectives, including user-friendly interfaces, efficient blood drive coordination, and effective donor and donation management. The recommendation encourages continuous improvements and updates to enhance user engagement and keep pace with technological advancements. Additionally, ongoing collaboration with blood banks, hospitals, and universities is advised to expand the platform's reach and impact. Regular user feedback and system monitoring will be crucial for identifying areas of improvement, ensuring Pak Blood Hub remains a vital tool in the realm of blood donation and management.

# References

[1] EngITech, ‘HealthSolutions - Apps on Google Play’, 2018. [Online]. Available: https://play.google.com/store/apps/details?id=com.healthSolutions&hl=en&gl=US . [Accessed: 17-Mar-2023].

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Available:
https://play.google.com/store/apps/details?id=com.bloodhelp.pakistan&hl=en&gl=US. [Accessed: 17-Mar-2023].

# General Guidelines for Writing Project's Thesis

## For convenient upload on PEC's e-Library

**Page Setup**

| | |
|---|---|
| Page Size: | A4 |
| Top margin: | 1.00 inch or 2.54 cm |
| Bottom margin: | 1.00 inch or 2.54 cm |
| Left margin: | 1.00 inch or 2.54 cm |
| Right margin: | 1.00 inch or 2.54 cm |

**Fonts and Styles:**

Use a standard font such as Times New Roman, Arial, or Calibri

Font size should be 12 points for the main text.

Use consistent font sizes and styles (bold, italics) for headings, subheadings, and content.

**Footer:** Each page shall have a footnote "Page number, right align".

**Header**: Each page shall have a header "Project/Thesis Title".

**Chapter Startup:** Each chapter shall be numbered as Chapter 1, Chapter 2, etc.

**Paragraph Formatting:**

Single-spaced, Line entered paragraph, left align or justified.

**Line Spacing:**

**1.5** spacing is required for the text. Only footnotes, long quotations, bibliography entries (double space between entries), table captions, and similar special material may be single spaced.

Maintain consistent spacing between paragraphs

**Images, Figures, Hyperlink:**

Ensure that images, figures, and hyperlink are of high quality and are properly labeled.

**Tables and Equations:**

Format tables with clear column and row headings.

Provide captions for each Table.

Label equations and provide clear explanations.

**Citations and References:**

Follow a standardized citation style (e.g., APA, MLA, PEC etc.) for references.

Include a separate references section at the end of the document.

**File Naming Convention:**

Submitted files are named with a clear and concise title that reflects the content of the paper or thesis.