CHAPTER 3

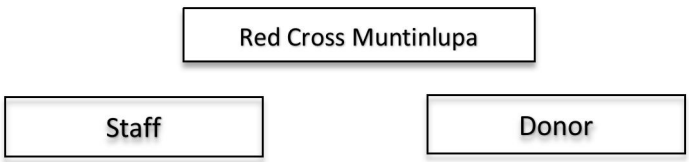
METHODOLOGY

In this chapter, the methodologies used throughout the study are described together with the diagram presentation. Here are the following sections that will be discussed in this chapter: Requirements Analysis, Requirement Documentation, Design of Software, System Product and/or Process, Development and Testing and Implementation Plan.

REQUIREMENTS ANALYSIS

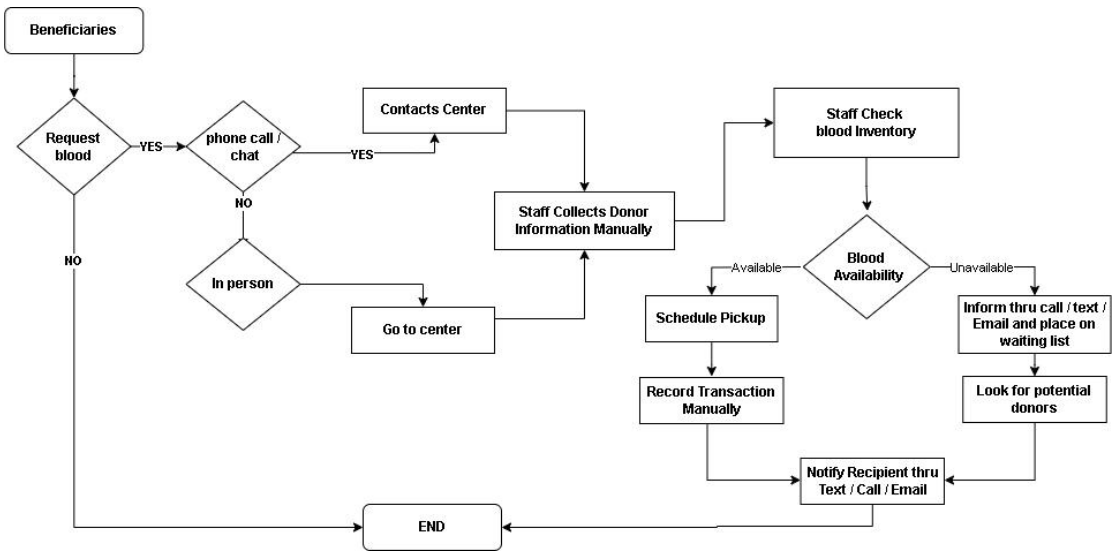
The Red Cross Muntinlupa Center faces significant challenges in managing blood donations, particularly due to manual appointment scheduling and communication gaps between donors and recipients.

Figure 1.0 Appointment Scheduling



Manual appointment scheduling at the Red Cross Muntinlupa Center involves donors contacting the center via phone calls or in-person visits, where staff manually collect their information and check available time slots. This process is time-consuming and prone to inefficiencies. There is no automated system for reminders, leading to higher no-show rates as staff may not always have the resources to manually remind donors. On the donation day, staff manually confirm appointments, causing potential delays, and post-donation details are also recorded manually, increasing the risk of errors. Overall, the manual scheduling process is inefficient and resource-intensive, highlighting the need for an automated system to improve efficiency and donor engagement.

Figure 1.1 Blood Request Process and Communication Between Donors and Recipients



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The blood request process at the Red Cross Muntinlupa Center begins when a recipient contacts the center, either by phone or in-person, to request blood. Staff collect detailed information from the recipient, including blood type requirements,

and manually check the blood inventory to determine availability. If the requested blood type is available, staff schedule a pickup or delivery time with the recipient, recording transaction details manually. However, if the requested blood type is not available, staff inform the recipient and may place them on a waiting list, reaching out to potential donors if necessary. Communication between donors and recipients relies on outdated methods such as phone calls and emails, where staff manually contact donors to coordinate donation appointments. Delays in communication often occur due to these manual methods, hindering quick mobilization of donors in response to urgent demands. There is a need to modernize and streamline this communication process to enhance efficiency and effectiveness in coordinating blood donation initiatives at the Red Cross Muntinlupa Center.

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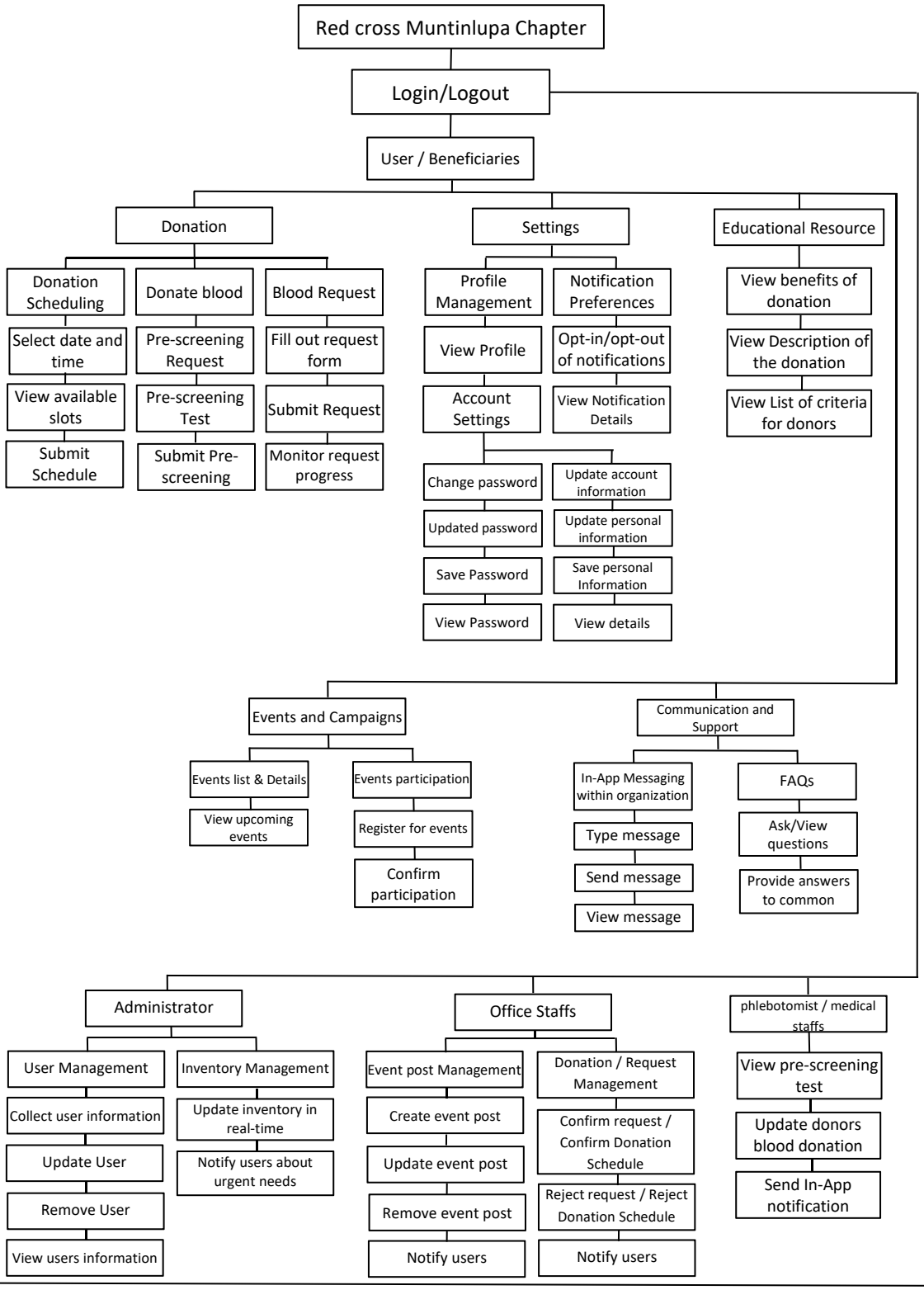
REQUIREMENT DOCUMENTATION



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SYSTEM ARCHITECTURAL DAIGRAM

Content Diagram Description

- N-Tier System Architecture

The content diagram describes a three-tier architecture for a blood donation management system. The Presentation Tier consists of a mobile application and a web interface. The mobile app includes features like user registration/login, donor information, blood availability, appointment scheduling, and notifications. The web interface offers an admin dashboard, donor/recipient management, and reporting and analytics.

The Application Logic Tier comprises several services: authentication for user management, donor management for updating donor information, blood inventory management to track and manage blood stocks, appointment scheduling for handling bookings and reminders, a notification service for sending alerts, and reporting and analytics for generating reports and analyzing data.

The Data Tier involves a database with tables for donor information, blood inventory, appointments, and user credentials, along with a backup and recovery system for data protection, and data analytics tools for report generation and analysis.

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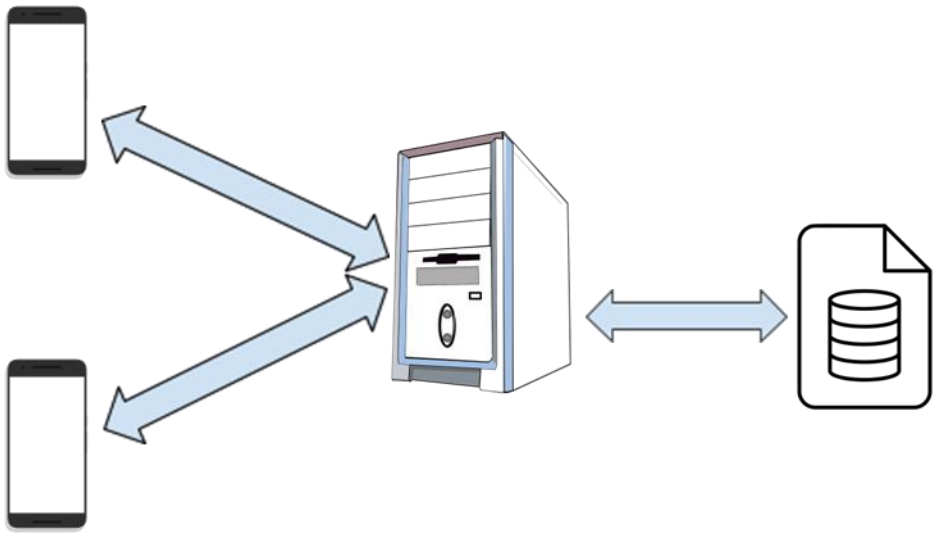


Application / Gui Tier Application Logic Tier Data Tier Discussion:

Presentation Tier (GUI):

The presentation tier includes the user interfaces for both the mobile application and the web interface. The mobile app allows users to register, log in, view donor information, check blood availability, schedule appointments, and receive notifications. The web interface provides additional functionalities for administrators, such as managing donors and recipients and generating reports.

Application Logic Tier (Business Logic):

This tier handles the core business functionalities of the application. The authentication service manages user access, the donor management service updates donor information, and the blood inventory management service tracks blood stocks. Appointment scheduling handles bookings and reminders, the notification service sends alerts, and the reporting and analytics service generates reports and analyzes

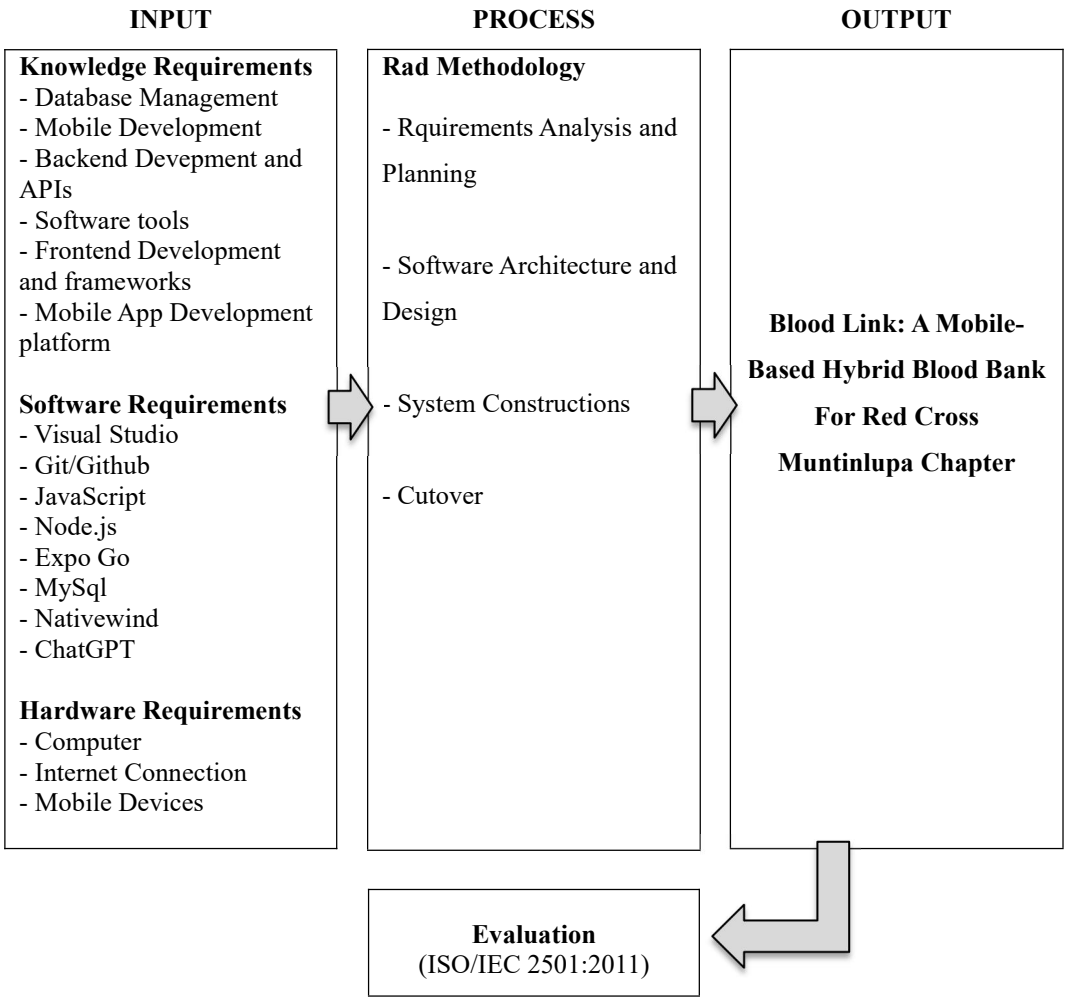
data. Each service is dedicated to a specific business function, ensuring efficient processing and organization.

Data Tier (Data Storage):

The data tier is responsible for data storage and retrieval. It includes databases to store donor information, blood inventory, appointments, and user credentials. The backup and recovery system ensures data integrity and availability through regular backups and disaster recovery plans. Data analytics tools facilitate data **analysis and** report generation, providing insights and supporting decision-making.

DESIGN OF SOFTWARE, SYSTEMS, PRODUCT AND/OR PROCESS

On the basis of foregoing concepts, theories and findings of related literature, Studies and insights taken from them a concept model was develop as shown below. It shows in the input the requirements used in the application by the developers such as knowledge algorithm, software requirements and the hardware requirements and the user will used it also includes the methodology and the researcher.



DEVELOPMENT AND TESTING

Project Development

The researchers use the Rapid Application for System Development life Cycle.

The Rapid Application Development(RAD) model is based on prototyping and iterative development with no specific planning involved. The process of writing the software itself involves the planning required for developing the product. Rapid Application development focuses on gathering customer requirements through

workshop or focus groups, early testing of prototypes by the customer using interactive concepts reuse of existing prototypes(components) continuous integration and rapid delivery.

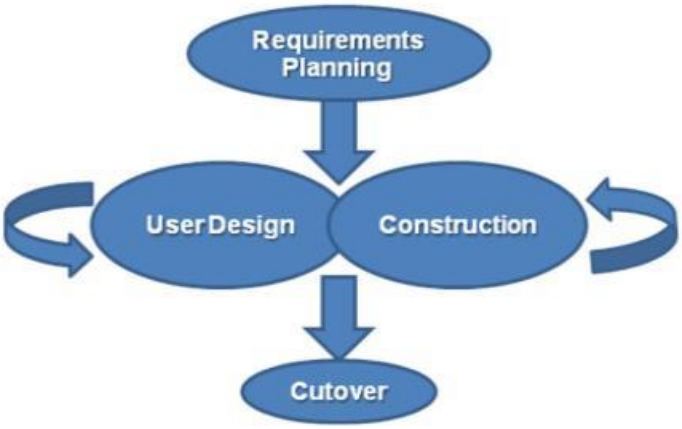


Figure 1. Phase of Rapid Application Development

Phase 1: Requirements Planning

The researcher first gathers data and plans to develop the system using React Native for the application's development.

In any case, probably in proposing a system the developers should have talked about the mechanics of the plans first before doing the system. The developers should know the problem of the users and even more in the selected beneficiary. The researchers identify that problem and plans its best solution. To develop the application, the researcher gathered/prepared all the requirements to start the application development.

Phase 2: Design phase

The design phase focuses on translating requirements into detailed design specifications. User interface designs, system architecture, and database schema are established during this phase, ensuring a clear roadmap for implementation.

React Native is chosen as the development framework for the mobile application interface due to its ability to provide cross-platform capabilities. This allows the team to develop a single codebase that can run on both iOS and Android devices, streamlining development efforts and reducing time-to-market. React Native's component-based architecture facilitates the creation of reusable UI elements, ensuring consistency across different screens and functionalities within the blood bank application.

Phase 3: Construction

During the construction phase, the actual development of the mobile-based hybrid blood bank system takes place. Using the React Native framework, the researchers implement features such as donor registration, appointment scheduling, real-time inventory updates, and communication tools. Continuous integration allows for rapid prototyping and iterative development.

Phase 4:Cutover Phase

The cutover phase involves transitioning from the existing blood bank system to the new mobile-based hybrid system. Data migration, user training, and system testing are conducted to ensure a smooth transition. Stakeholder engagem

ent and feedback play a crucial role in validating system functionality and usability.

Testing Procedure

When testing the application to find out where the system fault occurs, a testing technique is required. Even while it cannot ensure that all flaws in a program will be eliminated, if the software is tested effectively and precisely, it can minimize the amount of defects to the absolute minimum.

To ensure that a program and the system it controls can operate as intended, program tests were carried out in a predetermined order.

Table 1

Alpha Testing

Aspect	Alpha Testing
Purpose	Identify and fix bugs, enhance features, and ensure the system meets requirements
Participants	Developers, testers, and selected internal users
Scope	All major features including Database Connection
Focus Areas	Functionality, usability, performance, and security
Duration	Typically shorter, lasting a few weeks
Feedback	Collected from development team
Issue Resolution	Immediate and iterative, as issues are reported and fixed quickly

Output	Improved and more stable version of the system

Table 2
Beta Testing

Aspect	Alpha Testing
Purpose	Validate the system's performance, usability, and reliability in real-world scenarios
Participants	A broader group of actual end-users
Scope	Real-world usage of the system by actual users
Focus Areas	User experience, system performance, and overall reliability
Duration	Typically longer, lasting several weeks to months
Feedback	Collected from actual end-users
Issue Resolution	Issues are documented for post-beta fixes and improvements
Output	Final adjustments and fixes leading to the official release

Project Evaluation

The evaluation instrument was based on the characteristics and sub-characteristics provided by ISO/IEC 25010:2011.

Respondents of the study were the individual users of the system such as the 10 Information Technology (I.T.) experts and 20 actual users. Purposive sampling was used to select the number of respondents. Purposive sampling is a non-probability

sampling technique; it is a form of sampling in which the selection of the sample is based on the judgment of the researchers as to which subjects.

Table 3

System Evaluation Characteristics ISO/IEC 25010:2011 Software Evaluation for both Users and IT Experts

Software Characteristics	Description
Functionality Suitability	Degree to which a product or system provides functions that meet stated and implied needs when used under specified conditions.
Performance Efficiency	Performance relative to the amount of resources used under stated conditions
Compatibility	Degree to which a product, system or component can exchange information with other products, systems or components and/or perform its required functions, while sharing the same hardware or software environment
Usability	Degree to which a product or system can be used by specified users to achieve specified goals with effectiveness, efficiency and satisfaction in a specified context of use
Reliability	Degree to which a system, product or component performs specified functions under specified conditions for a specified period of time
Security	Degree to which a product or system protects information and data so that persons or other products or systems have the degree of data access appropriate to their types and levels of authorization
Maintainability	Degree of effectiveness and efficiency with which a product or system can be modified by the intended maintainers
Portability	Degree of effectiveness and efficiency with which a system, product or component can be transferred from one hardware, software or other operational or usage environment to another

The statistical tool were used in the interpretation of data is weighted arithmetic mean as shown at table 3. Arithmetic mean is used to determine the average responses of the five option in each item, namely, 5(excellent), 4(very good), 3(good), 2(fair) and 1(poor). The arithmetic means for each software characteristics were computed. These were used to derive the overall evaluation mean.

Table 4

Likert Scale

Scale	Range of Mean Value	Interpretation
5	4.51 – 5.00	Excellent
4	3.51 – 4.50	Very Good
3	2.51 – 3.50	Good
2	1.51 – 2.50	Fair
1	1.00 – 1.51	Poor

IMPLEMENTATION PLAN

After finalizing the Blood Link system, it will be presented to the Red Cross Muntinlupa Center for evaluation. If approved for implementation, the complete system and its documentation will be submitted to the Red Cross Muntinlupa Center for deployment.

Table 5

Implementation Table

Strategy	Activities	Persons Involved	Duration
Approval from the company	Send letters for the approval of Administrators	Researchers, Administrator	1 – 2 Days

System Installation	Installation of the system and checking of the facility that needs an upgrade (software and hardware).	Researchers, Administrator	2 - 3 Days
Information Distribution	Send Flyers, Brochures, Posters, and User Manual	Researchers, Administrator	1 Day
3- Day Training	Hands-on Training and System Demo/ Lectures	Researchers, Adviser, Officer and Administrator	3 Days