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Blood Bank Volunteer Application

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Abstract

Blood donation stands as a cornerstone of global healthcare, but in the evolving landscape of medical complexity, the integration of technology becomes imperative. This study explores the transformative potential of Blood Bank Volunteer Apps, emphasizing their vital role in saving lives during emergencies. In Malaysia, the active promotion of blood donation and the commitment of institutions like Sultan Abdul Halim Hospital underlines the significance of community engagement in healthcare. The identified problem of limited mobile access to critical blood donation information is addressed through a proposed Blood Bank Volunteer App. It aligns with the Rapid Application Development (RAD) model, ensuring a user-friendly application that streamlines blood donation processes for donors and healthcare institutions. In conclusion, this project leverages technology to facilitate regular blood donation, ultimately improving healthcare services and benefiting society as a whole.

1. Introduction

The introduction serves as an entry point to the subject matter, gradually navigating from general information to the specific motivations, research questions, problem statements, hypotheses, objectives, and the expected outcomes of the study. Blood donation remains a crucial aspect of healthcare globally, with its significance evolving amidst the integration of technology [1]. As healthcare systems encounter increasing complexity, the integration of technology emerges as imperative, especially in facilitating blood donation processes. This study aims to explore the transformative potential of Blood Bank Volunteer Apps, emphasizing their pivotal role in emergency healthcare scenarios [2]. The evolving landscape of medical care highlights the necessity of innovative approaches to blood donation, specifically addressing the challenges of accessibility and information dissemination [3]. The identified problem of limited mobile access to critical blood donation information is a significant barrier addressed by the proposed Blood Bank Volunteer App [4]. Aligning with the Rapid Application Development (RAD) model, this application targets user-friendliness, intending to streamline blood donation processes for both donors and healthcare institutions [5]. The objectives encompass the creation of an application that enhances regular blood donation routines, thereby improving healthcare services and benefiting society on a larger scale [6].

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2. Related work

2.1 Blood Bank Management System

The healthcare landscape is increasingly reliant on modern technologies and automation, notably within Blood Bank Management Systems (BBMS) [1]. These systems play a pivotal role in overseeing the complete lifecycle of blood products, effectively streamlining processes from the initial collection stage to the eventual transfusion [2]. The automation integrated into BBMS encompasses various critical aspects such as inventory management, donor databases, and blood testing, leading to notable enhancements in precision and efficiency [3]. A marked transition is observed from traditional manual record-keeping methods to sophisticated online platforms within BBMS. This shift enables real-time tracking, facilitates donor scheduling, and offers comprehensive oversight of inventory [4]. Consequently, this transition significantly expedites responses to blood requests and ensures precise matching of blood types, thereby considerably improving patient care and safety during transfusions and various medical interventions [5].

2.2 Mobile Application Development

Blood Bank Mobile Apps are gaining significant popularity owing to their user-friendly interfaces and convenient functionality, allowing users to efficiently manage blood donations and requests via their mobile devices [1]. While relatively novel in some regions, these applications are swiftly becoming an integral component of the technological landscape [2]. Their simple yet intuitive interfaces, cost-effectiveness, and compatibility across various devices, including basic ones, position them as a preferred choice among developers [3]. This shift towards mobile apps is fundamentally transforming the operational dynamics of blood banks, streamlining the management of blood supplies for all stakeholders involved [4].

2.3 Android technology

Android, the versatile and widely adopted mobile operating system, serves as the foundation for numerous technologies, notably in healthcare applications such as blood donation systems [1]. Initially crafted for smartphones and tablets, Android stands as an open-source platform backed by Google, powering a diverse array of devices, each tailored with its unique interface [2]. Android applications are distributed in APK format across various app stores, predominantly Google Play and other digital platforms [3]. Within the healthcare sector, these apps, coupled with Firebase databases and mobile technology, have sparked a transformative shift in service delivery. They've evolved beyond traditional productivity tools to encompass real-time communication and seamless information sharing [4]. Firebase, with its scalable databases, plays a pivotal role in expediting app development, while mobile technology, especially through smartphones, ensures widespread accessibility and connectivity [5]. For institutions like Hospital Sultan Abdul Halim, these technological advancements pave the way for refined blood bank operations, ultimately fostering community well-being through the establishment of accessible and efficient systems [6].

2.4 Study of Existing Related System

Several existing blood donation applications showcase different strengths and limitations in facilitating blood donation processes. "Friends2Support.org" excels in global donor location but lacks updated information and messaging features, hampering user connection and data accuracy. The "Blood Donation Application" prioritizes user-friendly requests and inventory management but falls short in push notifications and donor information management. Meanwhile, "Blood Comfort - A Universal Blood Sharing Android Application" targets a broad user base with a friendly interface but lacks critical reporting and message receipt functionalities, potentially hindering effective coordination in the donation process. These apps aid blood donation but suffer from communication gaps and tracking limitations, impacting overall process efficiency. Refer to Table 1 for a detailed comparison between related applications and the proposed Blood Bank Volunteer Apps.

Table 1 *System comparison*

Software/ Features	Friends2Support (Case study 1)	Blood Donation application (Case study 2)	Blood Comfort (Case study 3)	Blood Bank Volunteer Apps (Proposed application)
Log-In/Register Account	Yes	Yes	Yes	Yes
Manage Donor Information	No	No	Yes	Yes
Receive A Push Notification	No	No	No	Yes
Send Reminder Successfully	No	No	Yes	Yes
View Donor Information	Yes	Yes	Yes	Yes
Blood Donation Report	Yes	Yes	No	Yes
Software/ Features	Friends2Support (Case study 1)	Blood Donation application (Case study 2)	Blood Comfort (Case study 3)	Blood Bank Volunteer Apps (Proposed application)
Log-In/Register Account	Yes	Yes	Yes	Yes

The Blood Bank Volunteer App stands out among its counterparts, offering a comprehensive suite of features crucial for users. It excels in account and donor information management, pushes notifications, reminder capabilities, and donor data accessibility. While other apps showcase strengths in isolated aspects like detailed donation reports or donor management, the Blood Bank Volunteer App consolidates these functionalities into a singular, user-friendly platform. Its holistic approach ensures a more inclusive and efficient experience for individuals involved in blood donation activities. With a focus on user needs, this app emerges as a reliable solution, addressing multiple facets crucial for effective blood donation coordination. Its versatility and user-centric design set it apart, creating a more seamless and encompassing tool for anyone engaged in the essential act of donating blood or supporting blood donation initiatives.

3. Methodology

Methodology serves as the roadmap for studying research problems or developing software applications. It's a systematic and structured approach that guides the methods chosen and the reasoning behind their selection. In research, it ensures rigor and reliability, while in software development, it outlines the framework for creating applications aligned with project objectives. The Rapid Application Development (RAD) model, as depicted in Figure 1, represents the phases utilized in this specific software development methodology.

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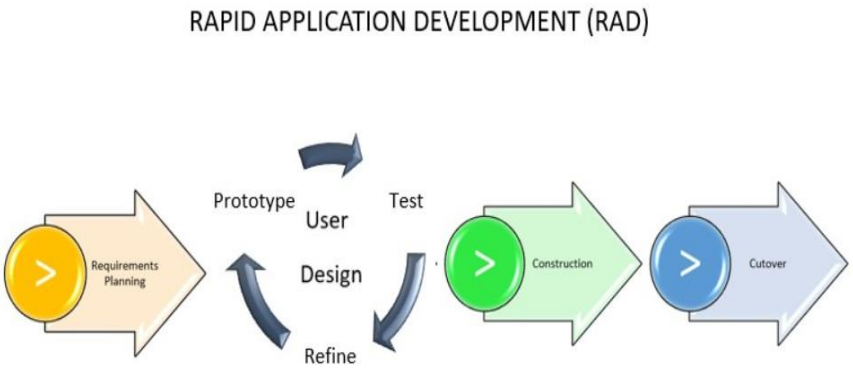

Fig. 1 *Rapid Application Development*

3.1 Requirement Planning

The requirement planning phase is a crucial step in ensuring the success of the Blood Bank Volunteers App. This phase involves developers, clients, and potential users working together to define objectives, standards, and addressing possible challenges. It includes three key components: comprehensive research to identify core issues, precise definition of project requirements, and formal validation of these requirements to secure buy-in from stakeholders and developers. Additionally, interviews were conducted with Dr. Sakinah bt Ahmad, which provided valuable insights into user expectations. This collaborative approach ensures well- defined project goals and proactively mitigates miscommunications, fostering a more efficient and prosperous development process. The interview question is attached to appendix A figure A.1.

3.2 User Design

Once the initial scoping is done, the Blood Bank Volunteers App project shifts to the production stage focused on user experience. Multiple prototypes are created and refined through ongoing collaboration between clients and developers. This process ensures that design changes align perfectly with stakeholders' needs and preferences. Users actively engage with prototypes, giving valuable feedback, while developers continuously improve elements based on these insights. This user-centric approach ensures that the app meets specific requirements, addresses issues early, and adapts smoothly to changes, strengthening its foundation for successful functionality.

3.3 Construction

During the Construction phase of software development, prototypes and beta systems evolve into a functional model swiftly. This phase advances rapidly, driven by iterative problem-solving. It starts with careful planning and involves a team of coders ensuring smooth functionality. Blood Bank Volunteer Apps prioritize customer input for continuous improvement. Supervised by developers, mobile apps take shape, resulting in a reliable final product. Testing is crucial to ensure optimal performance across devices and situations, exceeding user expectations in functionality and reliability.

3.4 Cutover

During the cutover phase, the completed product gets ready for distribution. Tasks include data conversion, extensive testing, system switch, and user training. It's the moment when all the hard work becomes a reality. Developers and clients ensure a flawless product, continuing testing to fix any remaining issues. Final changes are meticulously made to guarantee accuracy. This marks the point where the software is ready for deployment, highlighting the project's thoroughness and commitment to quality, meeting original goals and user needs.

3.5 Use Case Diagram

This case must be completed prior to the development of any solution. This graphic depicts the capabilities of each user, highlighting the differences between admins and users. The relationship that connects their work on this system is shown by the connection/arrow.

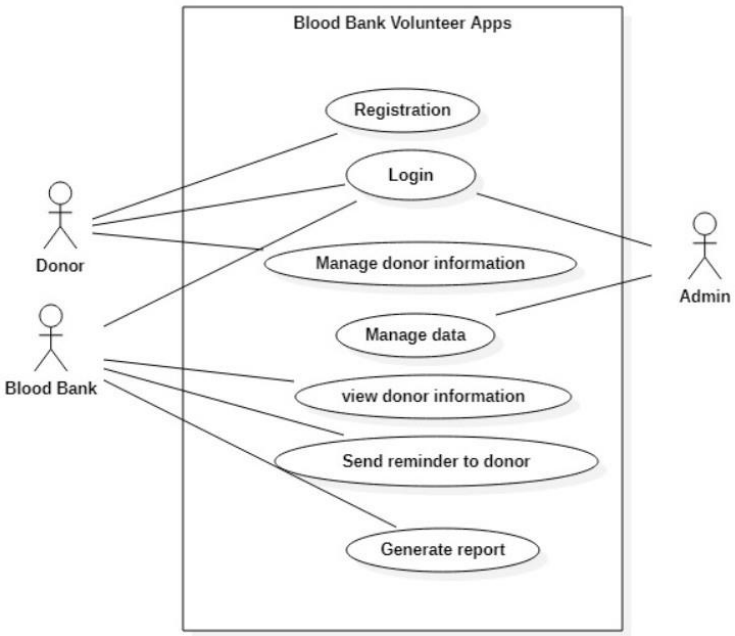

Fig. 2 *Use Case Diagram*

3.6 Use case Specification

A use case specification is a document that describes the interactions between users and a computer system, with the goal of achieving a specific goal or set of goals. It typically includes a description of the actors, the goals or objectives of the interactions, the steps that must be taken to achieve those goals, and any constraints or preconditions that must be met. As attach in appendix B figure B.1 until figure B.5 shows the use case sequence and activity diagram for each use case respectively.

3.7 Use case Specification

A class diagram, a type of diagram used in the Unified Modelling Language (UML), illustrates the classes, attributes, and relationships within a system to showcase its structure. It depicts the static structure of a system, not capturing its evolution over time, but rather its current state. Class diagrams can be used for both designing a system and documenting an already existing one. Figure 4.9 shows the class diagram of Blood Bank volunteer Application.

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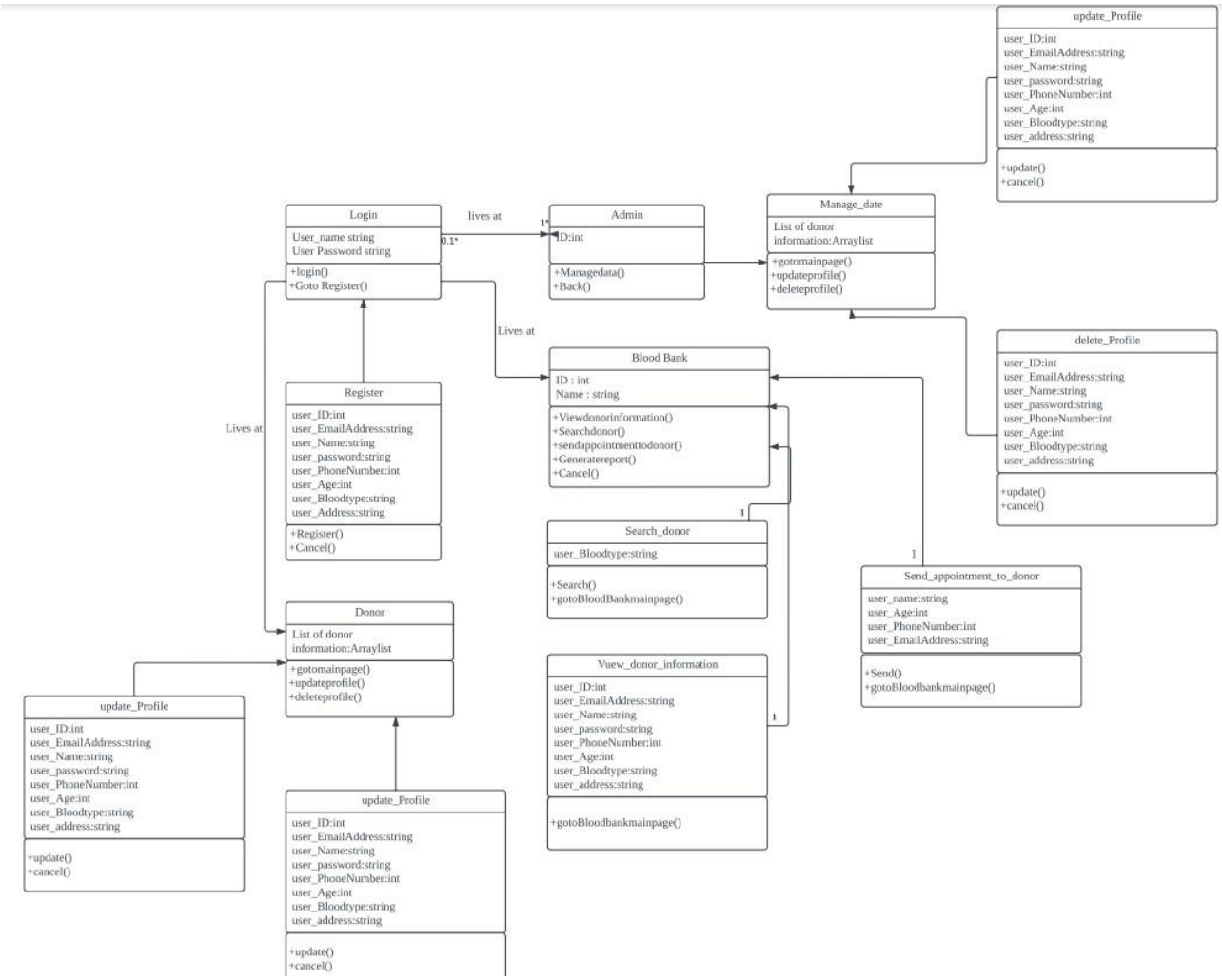

Fig. 3 *Class Diagram*

4. Result and Discussion

This section provides a concise overview of the User Acceptance Test results for each module, indicating the level of feedback value received. It can serve as a visual representation of the overall acceptance of the system's modules by the users.

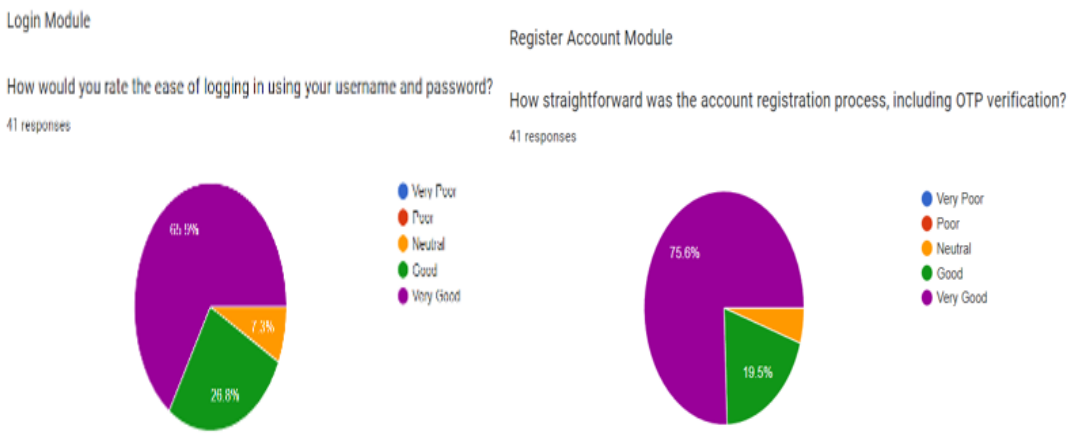

Fig. 4 *User acceptance test on Login and Register module*

Figure 4 shows that the feedback for the login module, the majority of users (65.9%, or 27 people) rated the ease of logging in with their username and password as "very good," indicating a highly satisfactory experience. Another 26.8% (11 people) found the login process "good," while 7.3% (3 people) rated it as "neutral," suggesting a generally smooth process with minor improvements possible. Overall, most users are very satisfied with the login experience.For the Register Account module, 75.6% (31 people) rated the account registration process, including OTP verification, as "very good," showing it was straightforward and efficient. An additional 19.5% (8 people) rated it as "good," and 4.9% (2 people) as "neutral," indicating the process was generally user-friendly with some room for improvement. Overall, the registration process is effective for the vast majority of users.

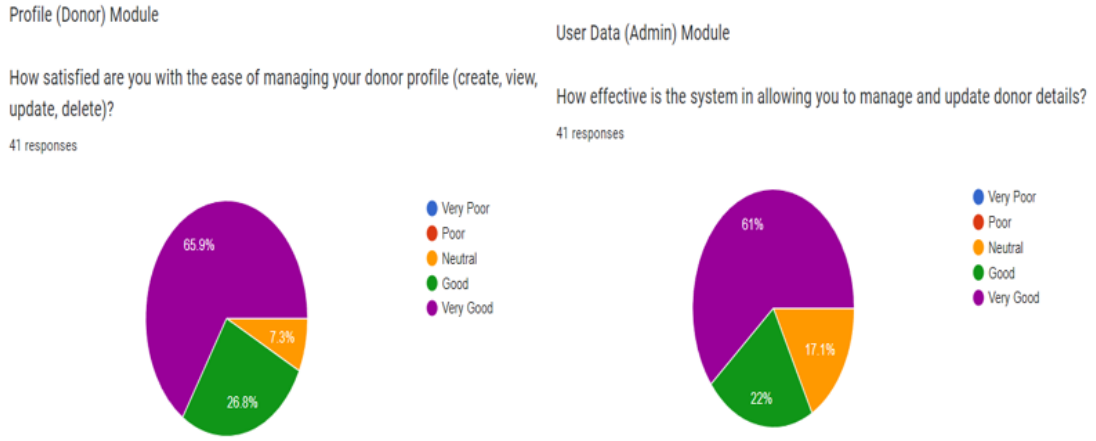

Fig. 5 *User acceptance test on Profile and user data module*

Figure 5 show that the Profile (Donor) module, 65.9% (27 people) rated the ease of managing their donor profile as "very good," indicating high satisfaction. Another 26.8% (11 people) found it "good," while 7.3% (3 people) were "neutral," suggesting overall user-friendliness with some room for improvement. Besides that,For the User Data (Admin) module, 61% (25 people) found the system very effective in managing and updating donor details, 22% (9 people) rated it as "good," and 17.1% (7 people) were "neutral." This feedback indicates that while the system is generally effective, there is potential for enhancement.

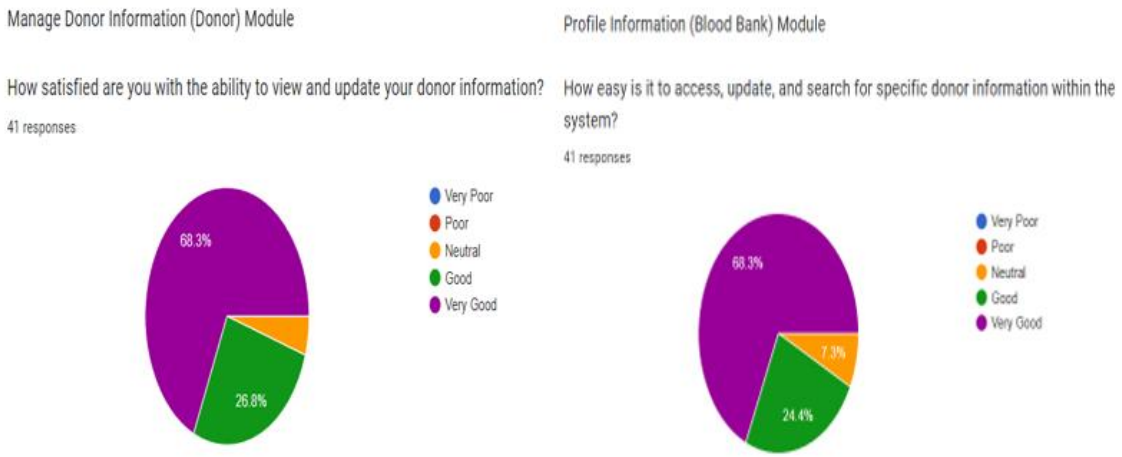

Fig. 6 *User acceptance test on Manage donor information and profile information module*

Figure 6 shows that the Manage Donor Information (Donor) module, 68.3% (28 people) rated their satisfaction with viewing and updating donor information as "very good," while 26.8% (11 people) rated it "good," and 4.9% (2 people) were "neutral." This indicates a high level of user satisfaction with minor room for improvement.For the Profile Information (Blood Bank) module, 68.3% (28 people) found it very easy to access, update, and search for donor information, 24.4% (10 people) rated it as "good," and 7.3% (3 people) were "neutral." This feedback reflects overall effectiveness with some potential for enhancement.

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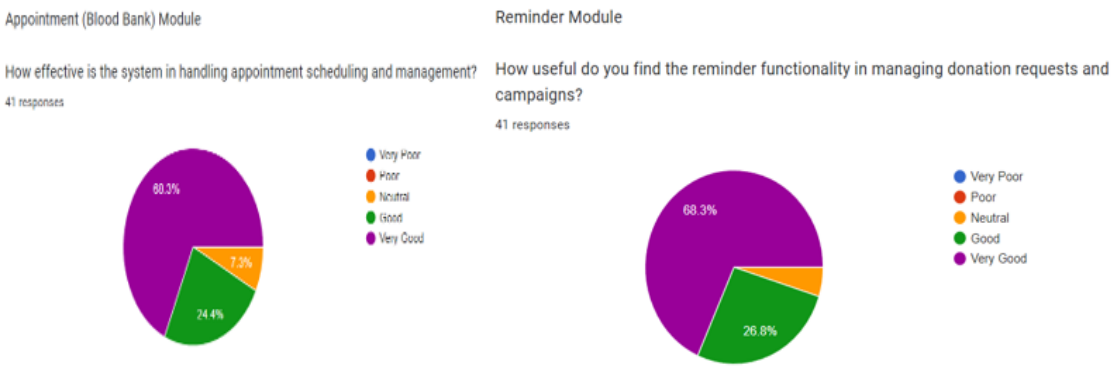

Fig. 7 *User acceptance test on Appointment and reminder module*

Figure 7 show that the Appointment (Blood Bank) module, 68.3% (28 people) found the system very effective for scheduling and managing appointments, 24.4% (10 people) rated it as "good," and 7.3% (3 people) were "neutral," indicating high overall satisfaction. For the Reminder module, 68.3% (28 people) found the reminder functionality very useful for managing donation requests and campaigns, 26.8% (11 people) rated it "good," and 4.9% (2 people) were "neutral," showing strong approval with minor areas for improvement.

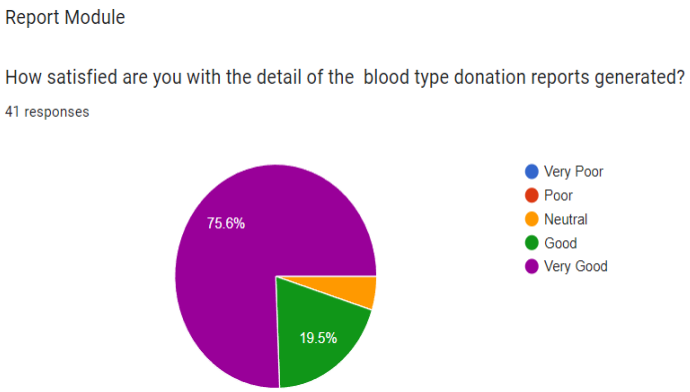

Fig. 8 *User acceptance test on Report module*

Figure 8 show that the Report module, 75.6% (31 people) were very satisfied with the detail of the blood type donation reports generated, 19.5% (8 people) rated it as "good," and 4.9% (2 people) were "neutral," indicating high overall satisfaction.

5. Conclusion

The app is tailored to streamline blood donation for administrators, blood banks, and donors. It handles data efficiently, ensures easy access to donor details, and enables effective communication via reminder notifications. Donors benefit from features like profile management, critical donation alerts, easy registration, and push notifications. Overall, it aims to create an organized, accessible, and efficient system, fostering community engagement, raising awareness about blood donation, and ultimately saving lives.

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Conflict of Interest

Authors declare that there is no conflict of interests regarding the publication of the paper.

Author Contribution

This journal requires that all authors take public responsibility for the content of the work submitted for review. The contributions of all authors must be described in the following manner:

The authors confirm contribution to the paper as follows: ***study conception and design:*** *Kanisha Gunasegaran, Nurezayana Zainal;* ***data collection:*** *Kanisha Gunasegaran;* ***analysis and interpretation of results:*** *Kanisha Gunasegaran;* ***draft manuscript preparation:*** *Kanisha Gunasegaran. All authors reviewed the results and approved the final version of the manuscript.*

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Appendix A

CLIENT NAME: DR SAKINAH BT AHMAD

HOSPITAL SULTAN ABDUL HALIM SUNGAI PETANI KEDAH

QUESTIONS	ANSWER
Could you introduce yourself madam?	Hi, my name is Dr. Sakinah bt Ahmad. I'm working as Head of Transfusion Medicine Unit in Hospital Sultan Abdul Halim Sungai Petani.
May I know how do you manage the blood bank information?	We manage information though by documentary.
What are the challenges you are facing currently to manage volunteer blood donors their blood bank status?	The one we face right now is requires more volunteer blood donor
Will you send reminder to user for the donation?	No, we don't send in direct but we update in social media.
How do you reach people to let them know about your campaign?	We just update in our social media.
Do you think, my proposed application would be beneficial to the blood donor?	Yes, because we can update the event and the donor can see in their phone

(DR SAKINAH BT AHMAD)

Ketua Unit Perubatan Transfusi

16.10.2023

DR. SAKINAH BT. AHMAD
Pakar Perubatan Transfusi UD56
Ketua Unit Perubatan Transfusi
Hospital Sultan Abdul Halim
Sungai Petani, Kedah.
Nomb MPM: 43729
Nomb NSR: 13424

Fig. A.1 *Interview Question's and answer*

Appendix B

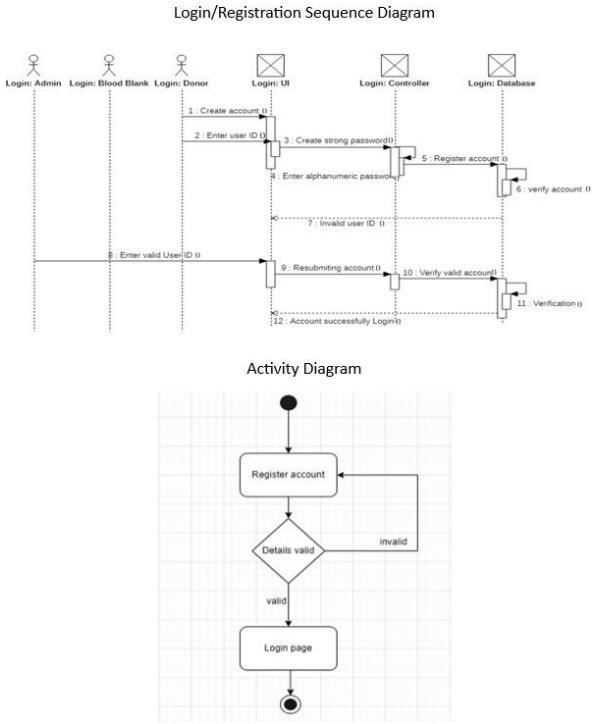

Fig. B.1 *Login/Registration Sequence Diagram*

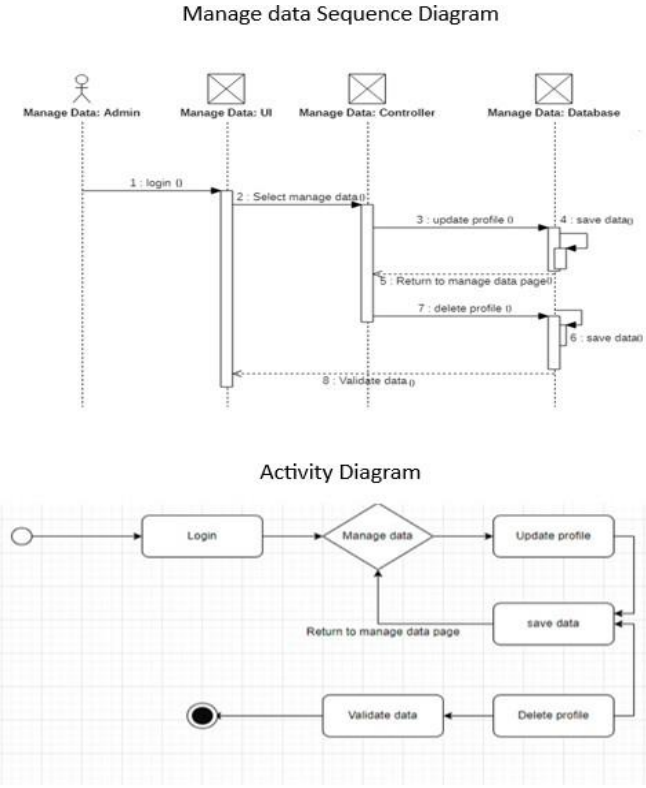

Fig. B.2 *Manage Data Sequence Diagram*

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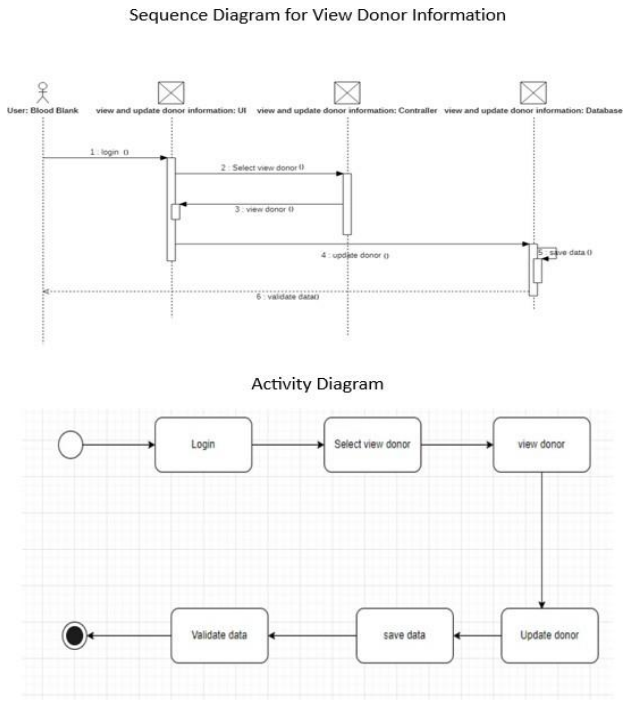

Fig. B.3 *Sequence Diagram for View Donor Information*

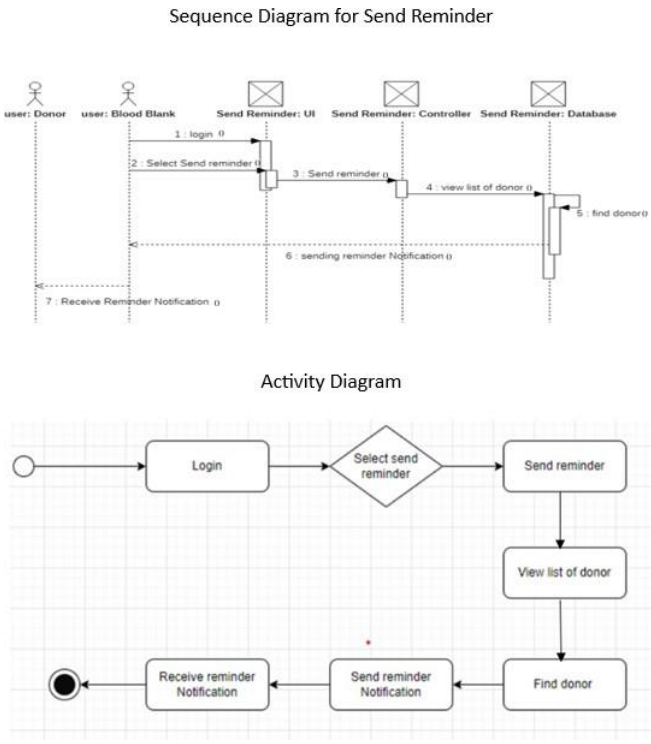

Fig. B.4 *Sequence Diagram for Send Reminder*

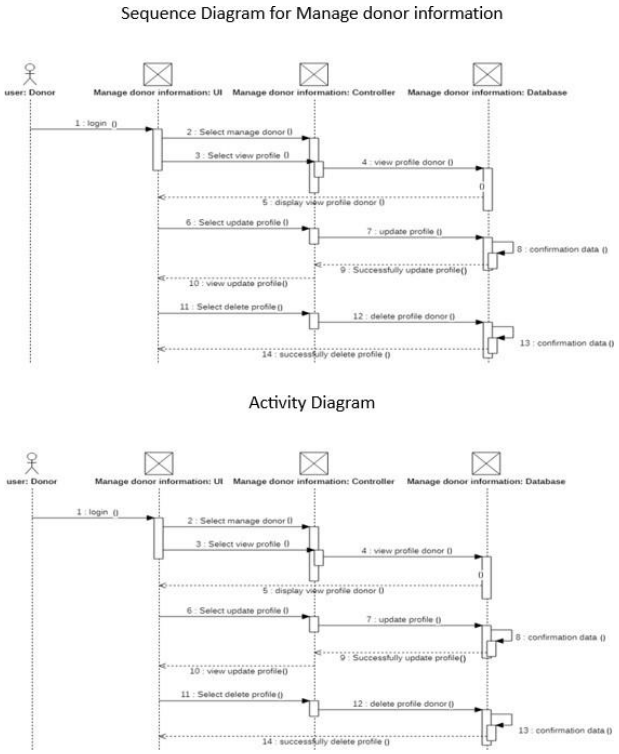

Fig. B.5 *Sequence Diagram for Manage donor information*

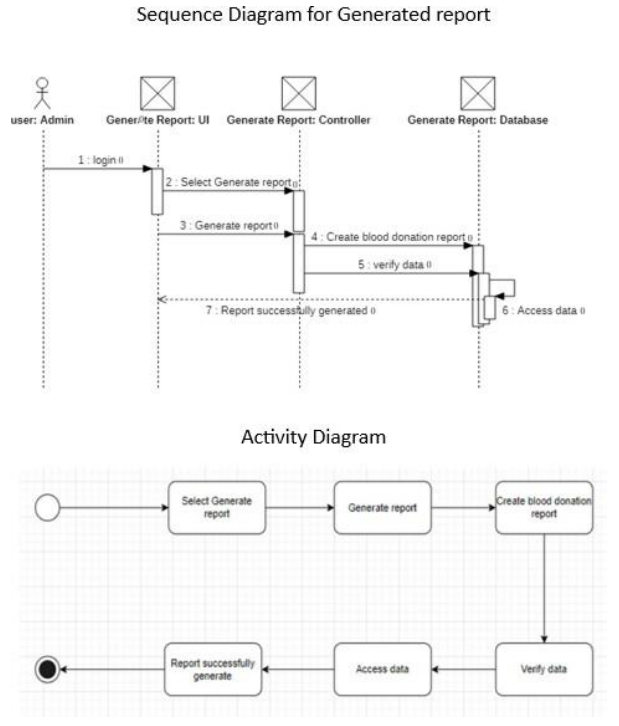

Fig. B.6 *Sequence Diagram for Generated report*

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Appendix C

Figure 4.10 Main page

Figure 4.11 Homepage

Figure 4.12 Login page

Fig. C.1 *User Interface*

Figure 4.13 Register page

Figure 4.14 Blood Bank page

Figure 4.15 Blood Bank page

Fig. C.2 *Blood Donor Interface*

Figure 4.16 Send reminder page

Figure 4.17 Donor Notification page

Figure 4.18 Admin page

Fig. C.3 *Admin and Donor Interface*