Mobile Blood Donor

By

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CERTIFICATION OF APPROVAL

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A project dissertation submitted to the
Information & Communication Technology Programme
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in partial fulfilment of the requirement for the
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Approved:

_____

(Dr. Helmi Md Rais)
Project Supervisor

UNIVERSITI TEKNOLOGI PETRONAS

TRONOH, PERAK

September 2013

CERTIFICATION OF ORIGINALITY

This is to certify that I am responsible for the work submitted in this project, that the original work is my own except as specified in the references and acknowledgements, and that the original work contained herein have not been undertaken or done by unspecified sources or persons.

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Nur Nadzirah Binti Suman

ABSTRACT

Today, many people died due to blood shortage and about every 2 seconds someone would necessitate blood. Hence, it is impossible for human to live without blood. A major concern for these communities is the access to the advanced technology services to slightly support the shortage of blood supply. Therefore, this report discusses the research done, which is Mobile Blood Donor (MBD) examines the role of mobile application in order to overcome the deficiency of getting blood donor in an emergency case. MBD is one of the technology methods and act as other alternative for people in Malaysia in order to find blood donor through a simple and quick searching application.

The objectives of this project are to provide a platform for individual to search for blood request and also to save lives through a simple and quick blood donors search application. The problem statements of this project are there is a barrier between donors and patients in order to help them find blood donors or donate blood. The scope of study for this project is searching donors in immediate need of blood with the target users; android users. The literature review component talks about using mobile technology as method to improve healthcare sector are further discussed in detail. In the methodology section, it is discussed about the software development methodology applied in developing this project which is Rapid Application Development. In the recommendations section, all the related recommendations and some improvements that can be done for the future of this project are listed and elaborated. The conclusion section concludes the overall project. By exploring the experience of smartphone users, a group of 69 people participating in an online survey to identify their familiarity and awareness on mobile application in healthcare sector.

ACKNOWLEDGEMENTS

First and foremost, Alhamdulillah and thanked to Allah the almighty for His consent and plentiful of endowment, that allows me to complete this project. I would like to thank my supervisor, Dr. Helmi Md Rais for his guidance and continuous support in completing this project. His constructive ideas and suggestions were shared to me by her on how to further enhance the project and on how to conduct a good research. His understandings and encouragement have been inspiring me to be more creative in this project. His advices motivate me to do my best in trying to complete the whole project. Thank you for this great opportunity.

I owe my deepest gratitude to my friend, Safuan Bin Yahaya for his help, support and motivation contributed, to this project. His advices always encourage and motivate me to be strong until I finish this project, even though there are a lot of challenges up ahead and I almost give up. Thank you for the support, time, money and energy to help me.

In addition, the success of this project depends largely on the encouragement and guidelines of many others. Therefore, I would like to take the opportunity to thank to other final year students especially Yeoh Chie Yee and Hani Yasmin Bt Ahmad Zaki who had been developing a mobile native application specifically for Android as well for their willingness in sharing their ideas and suggestions throughout the completion of this project. From this, different perspectives and views about it were being discussed together for the betterments and improvements of this project

Not forgotten, I bid my highest appreciation to both of my parents; Mr. Suman Bin Selamat and Mrs. Nor Lizawati Binti Hashim who have continuously support me both mentally and psychologically throughout the development of the Mobile Blood Donor and the completion of this dissertation. Last but not least, thank you to all who had been involved directly or indirectly in this project. May Allah S.W.T. repay your kindness.

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ABBREVIATIONS AND NOMENCLATURES

et al.	And others
etc.	Et cetera
MBD	Mobile Blood Donor

CHAPTER 1

INTRODUCTION

1.1 Background of Study

Blood is a special resource for lives where we cannot live without it. It fights infections, heals wounds and carries nutrients through our bodies. Today, more than one in seven people entering a hospital for care will need blood. Other people receive blood transfusions to fight life-threatening disease. This blood will be used for cancer patients, leukaemia, for those undergoing surgery, to treat accident and burns victims, to treat shock, to provide clotting factors for people with bleeding disorders, including haemophilia and etc.

Everywhere in the world, health and social care is getting bigger – more patients, more caregivers, more facilities, more drugs, more cost. Unless we want to further disrupt already fragile national economies, it's time for us to get smarter about care. We must move rapidly to tap technology to get smarter about care. It's the right thing to do for the economy. It's the right thing to do for society and most important, it's the right thing to do for the individual. Mobile Blood Donor is essential for anyone who wishes to tackle an emergency situation in which a blood donor is needed.

1.2 Problem Statements

In today's urbanization world, the implementation of technology in every aspect of a person's life received the highest demand from everybody especially to those who are affordable and capable enough in adapting themselves easily with the new come out of technology. With the existence of internet, users can easily carry out their tasks as well as getting tremendous of information from around the world. These have made their life much simpler as everything needs not to be done manually anymore. In advance, inventors have successfully come out with a new technology which allows people to have a more flexible medium in accessing to the internet which is through the phone. The problem statements of this project are:

- There is a barrier between donors and patients to help them find or donate blood.

Thus, as a solution to counter these problems, Mobile Blood Donor will be developed. As it is difficult in recruiting and retaining the next generation of blood donors, MBD is designed in attracting both new and repeat donors. In this case, smartphone application can be used as a platform for an emergency blood supply and all of this can be achieved by using Mobile Blood Donor. Mobile Blood Donor is an innovative mobile application that enables the user to find the blood donors who are nearer to the location. It acts as the intermediate between the blood seeker and blood donors. Apart from that, donors will be providing details such as location, organizing party, date and time to notify the public on every available blood donation drives as the problem nowadays is the public is not well notified and informed of available blood donation drives.

1.3 Objectives and Scope of Study

In conjunction with the revolution of internet that can be accessed through Smartphone or tablets as well as to provide a portable and handy assistant to the individuals, this project is aimed to develop an Android application which can help every users to communicate with the donor. Therefore, below shows the main objective of this project:

- To provide a searching platform for individual to find blood donor as an easy alternative.
- To provide details to blood donor on next blood donation schedule, incentives given, and events information which align with National Blood Bank.

The scope of project is a boundary for the system. The Mobile Blood Donor is essential for anyone who wishes to tackle an emergency situation in which a blood donor is needed. It helps to search donors in immediate need of blood instantly to nearest blood donor. Hence, it also provides information about the timing and locations of blood donation drives.

The targeted users for this Mobile Blood Donor are android user's aged between 18 years old to 60 years old which can make a useful of this Mobile Blood Donor as a platform for them to help others in save lives.

1.4 Project Feasibility

The introduction on Mobile Blood Donor take the service into the community is a key approach to increasing access and making it more convenient for people to donate blood. Addressing the problems that donors perceive to be important will go long way to building donor loyalty and encouraging more regular donation.

The benefit from this project can be obtained from donors, patients, and also healthcare organizations in Malaysia. Donors can cut down the time spent searching for location, organizing party, date and time where they can easily found the information they need within their fingertips. These indirectly helps the patients with easily reach to donors. Apart from that, it also gives an advantage to the organizations whereby Mobile Blood Donor can be taken as one of the incentive for them to find blood donors and cut cost spending for campaign, advertisements, event, etc.

Within eight months, this project can be completed at least to the minimum requirements. It also depends on the amount of scope creep that would be encountered which is inevitable. Due to the scope creep and testing difficulties, it is also difficult to gauge how perfect the system can be within the time frame.

CHAPTER 2

LITERATURE REVIEW

2.1 Understanding Technology in Healthcare

2.1.1 Mobile Technology

Advance in mobile technology has changed the devices from electronic address books to powerful tools with wireless network connectivity. Mobile technology has the capacity of accessing Internet, sending and receiving email/text messages and functioning as information repository and this was related to healthcare industry [16]. The technology in simple terms provides access to a wealth of medical information.

In all areas where handheld technology has been implemented whether medical or otherwise, their main strengths have been portability, easy to access to data, user friendly, ease of data entry and sharing. Lopez, I.M (2011), suggested that mobile application in crucial in a healthy way as it delivers actions to users anytime and anywhere. Mobile applications are able to offer that constant feature as users carry their smart phone everywhere which gives mobile application a positive effect on user trying to keep a healthy lifestyle.

Mobile application present a positive energy to a user as mobile application displays some sort of goal setting and rewards. [12]. Mobile application allows user to know what they need to achieve and will also track and record the user's performance so that users are to know current progress. Feedback is a positive reinforcement one that can be given by a mobile application.

2.1.2 Impact of Mobile Technology

The technology has been applied even in other fields apart from medical sector. Zanzueta (2005) demonstrated the use of mobile technology in agricultural records and programmes. He points out trends in application of advanced mobile

technology. The convergence of mobile technology with wireless networks, better software development tools and broad based.

Mobile devices are a revolution as it has become an object or a tool used in our daily life use for communication purposes and to access information. The combination of mobile devices, third generation wireless services with multimedia capabilities, and Internet and portal technology, this allows data and information to be received “anywhere”, “anytime”, and by “anyone”. [3] As the ability to retrieve data increase so will the need to retrieve data. This will result in application being built to cater to those needs thus having positive effect on the community as a whole.

There a number of successful projects in health sector where mobile technology was used as the main tool to collect, process and manage medical information in a professional manner. In Tanzania, the food and manage medical information in a collecting drug usage, track adverse reactions, track stock balances and other pharmaceutical data. In Bangladesh, handheld technology has been used successfully to collect data related to programme management at reproductive health.

	Percentage of hand phone users		
	2010	2011	2012
Smartphone	14.0	12.0	26.0
Feature phone	86.0	87.3	74.0
Don’t Know	-	0.7	-

Figure 1: Percentage of hand phone users in Malaysia

Times have changed. Today's clinicians now can do everything with a smartphone, from chatting with colleagues to pulling up medical records to locating needed supplies. Without exception, Malaysia is one of the countries riding the wave of telecommunication evolution. With the sheer size of smartphone market, it influences the economic growth in a country and provides job opportunities in the economic chain [5].

2.1.3 Android as Leading Mobile Operating system

Android is open source and Google releases the code under the Apache License.[1] This open-source code and permissive licensing allows the software to be freely modified and distributed by device manufacturers, wireless bearer and buff developers. Moreover, Android has a large community of applications developers that extend the usage of devices, written primarily in a customized version of the Java programming language.[15] In October 2012, there were huge a number of apps available for Android, and the approximation number of applications downloaded from Google Play, Android's primary app store, was 25 billion.[8][9] A developer survey conducted in April–May 2013 found that Android is the most popular platform for developers, used by 71% of the mobile developer population.[4]

Android is software for mobile devices that has operating system, middleware and key applications. The architecture of the Android is like a stack with Application being the top layer and Linux Kernel being the bottom layer of the Android. [13] Core applications of Android include email client, SMS program, calendar, maps, browsers and contacts which are mostly text input based.

According to the International Data Corporation (IDC) Worldwide Quarterly Mobile Phone Tracker, smart phone market will record a growth rate four times faster than the overall mobile phone market. The growth of smart phone market is catalysed by the acceptance of consumers and enterprise users in turning their feature phones for smart phones with more advanced features. Below table shows that Android will have the biggest market share by 2015, which indicates that the needs for Android applications and games will increase.

Top Smartphone Operating Systems, Shipments, and Market Share, 2013 Q3 (Units in Millions)

Operating System	2Q13 Unit Shipments	2Q13 Market Share	2Q12 Unit Shipments	2Q12 Market Share	Year-over-Year Change
Android	187.4	79.3%	108	69.1%	73.5%
iOS	31.2	13.2%	26	16.6%	20.0%
Windows Phone	8.7	3.7%	4.9	3.1%	77.6%
BlackBerry OS	6.8	2.9%	7.7	4.9%	-11.7%
Linux	1.8	0.8%	2.8	1.8%	-35.7%
Symbian	0.5	0.2%	6.5	4.2%	-92.3%
Others	N/A	0.0%	0.3	0.2%	-100.0%
Total	**236.4**	**100.0%**	**156.2**	**100.0%**	**51.3%**

Source: IDC Worldwide Mobile Phone Tracker, August 7, 2013

Figure 2: Global Smartphone Operating System in Market Share

From the figure, we can see that the number of Android platform Smartphone will be more other OS in few years' time. Hence, there is a need of applications for and highly relevant to do project for Android OS Smartphone.

2.2 Blood Transfusion in Healthcare

Most of medical advances nowadays have greater the medication of serious disease and injuries have risen the need for blood transfusion for patients endurance, to support them through recovery or to preserve their health. Surgery, trauma and cancers, for all of which there is a high probability of the need for blood transfusion, are replacing contagious disease as leading causes of decease[20].

Blood donation is a prosaically act which imposes a cost to the individual but benefits others. Most blood is donated to be used in other individuals [14]. Basically most donors simply want to help their fellow human beings and to have safety of supply. This basic motivation you cannot change, but other factors you can influence.

Although blood banks are account with preparing sufficient blood supplies, they have to content with a permanent shortage of blood. Even though many efforts in blood transfusion must be maintained, there is now also a need to develop plans to ensure that the blood supply is adequate to provide for ageing populations [5].

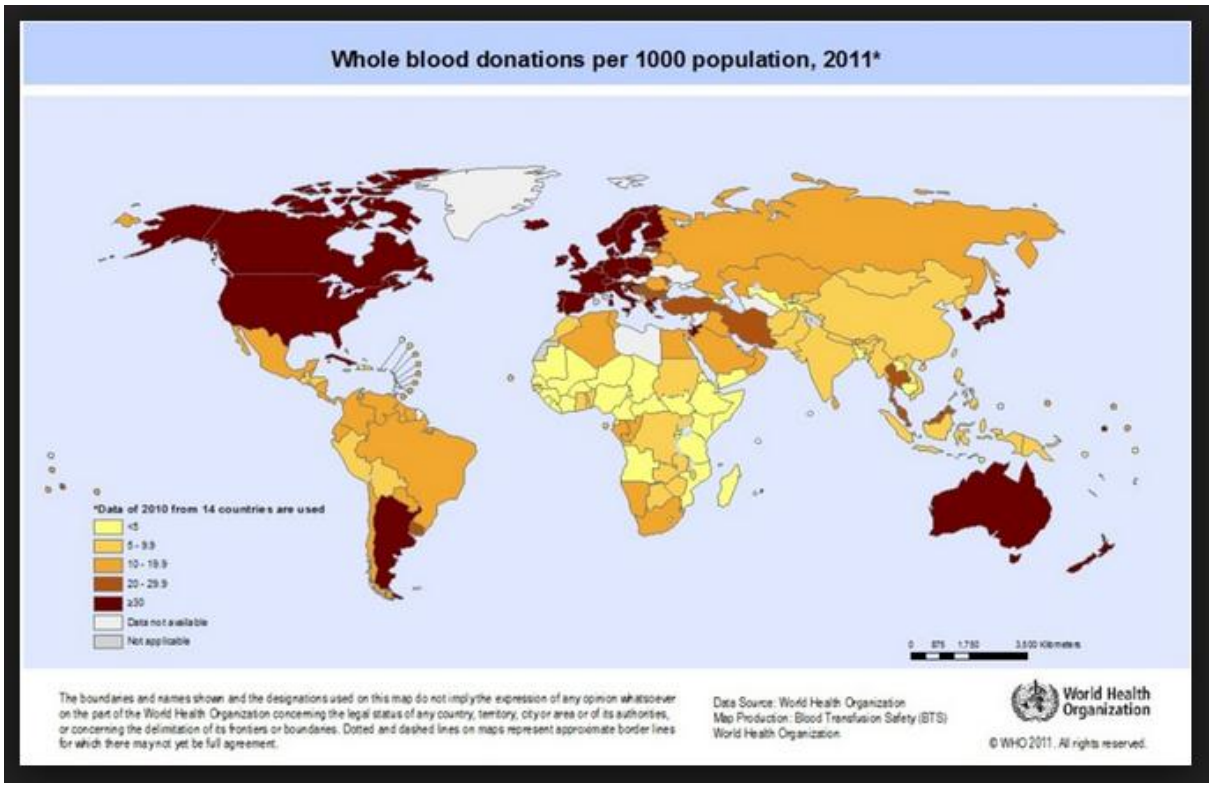


Figure 3: Whole blood donations per 1000 population

2.3 Mobile Blood Donor

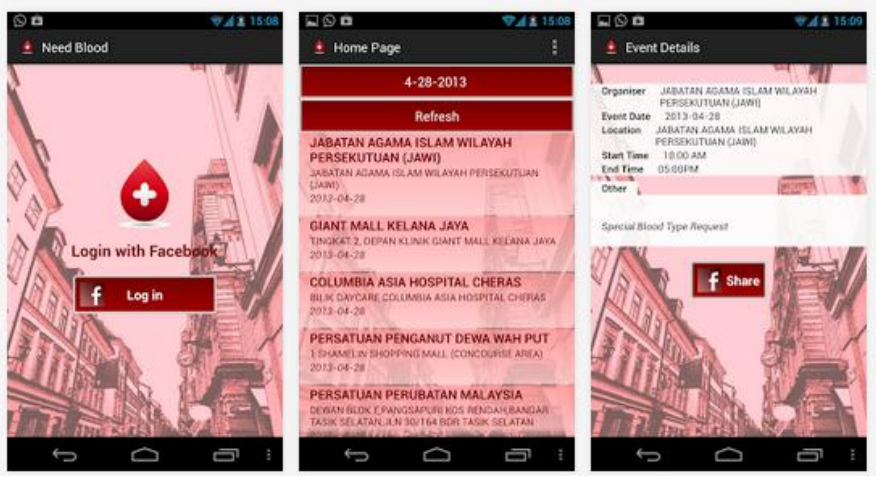
2.3.1 Mobile Blood Donor for User

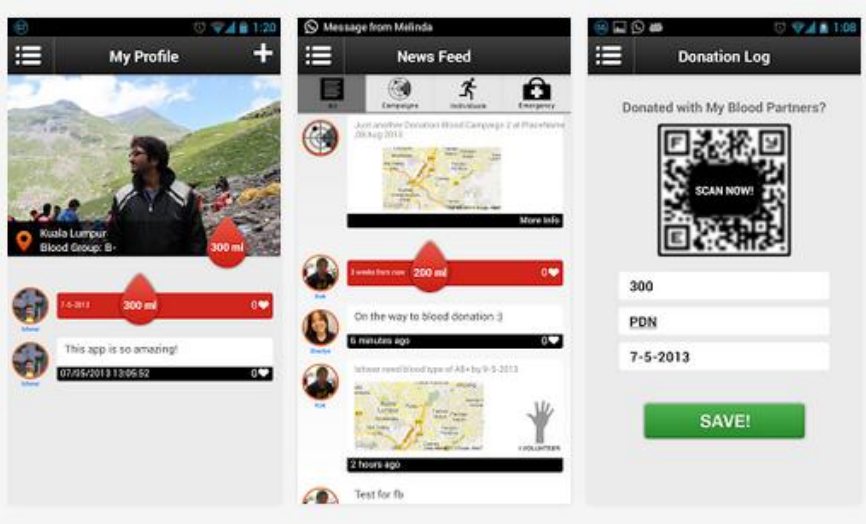
Information systems/Information Technology have played a central role in enabling organizations across segments to address many business challenges and achieve a lot of sustainable comparative advantage [12]. Mobile Blood Donor is a fast and simple tool for anyone who already is a blood donor or wants to become one. In case there is need of a blood donation, this is the easiest and fastest way to find a donor. Mobile Blood Donor helps the user to find the blood donors who are all nearer to the user location. By using geographical position, user can locate blood donors. Surely, Mobile Blood Donor has offered similar benefits to the blood donor.

Recipient can only communicate with registered donors and request them to make a donation using email as a platform communication. Furthermore, it is recipient responsibilities to provide donor the location of blood donation, patient ID, message, etc. However, providing recipients phone number is an optional and it is under their own risks.

Mobile Blood Donor bridges the gap between an organizations and donors to facilitate innovation through mobile application development. This mobile application notifies users the schedules and location of every blood donation drives as published by National Blood Bank of Malaysia. Details such as location, organizing party, date and time are utmost imperative to notify the users on every available blood donation drives as the problem nowadays is the public is not well notified and informed of available blood donation drives.

2.3.2 Existing Mobile Web Application

Interface	Features of Application
	**NeedBlood** • Notifies users in Malaysia on the schedules and location of every blood donation drives as published by National Blood Bank of Malaysia (http://www.pdn.gov.my/). • Facebook share and blood donation guides are available.

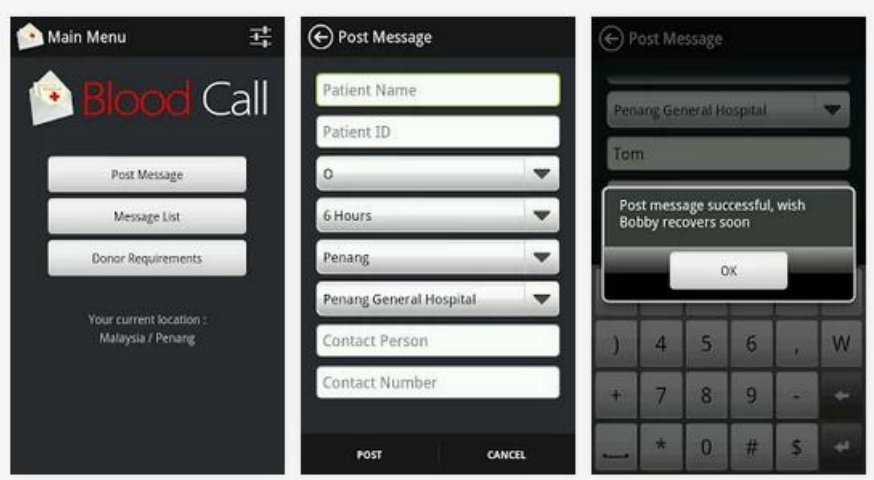


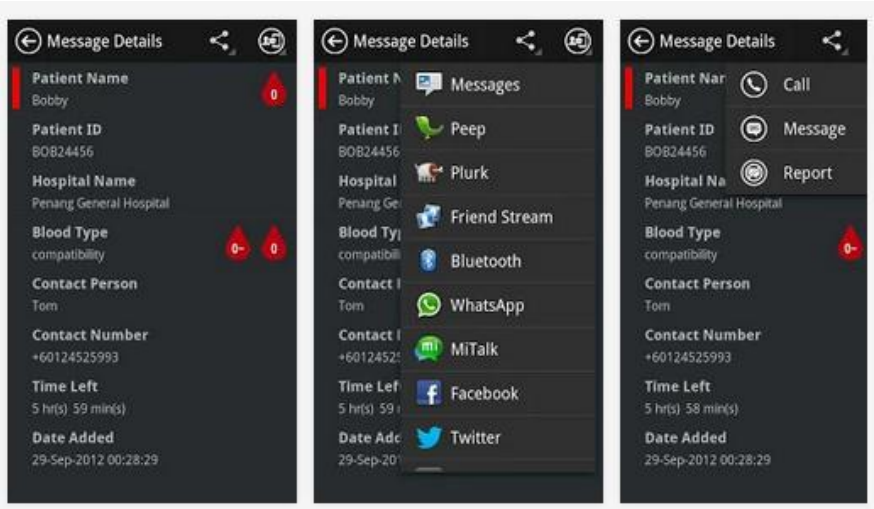
MyBlood

- Keeps you updated with latest campaigns by PDN, lets you request blood from fellow Malaysians.

- Navigate yourself with your preferred GPS app or even Google Maps to the nearest camp.

- Reminds you once you are eligible to donate blood after the time period has elapsed after a donation.





Blood Call

- Provide information in the shortest possible time to locate the patient's blood requirement.
- Contact suitable blood donors as well as expanding the assistance network.
- Official Website: http://www.bloodcall.com.my/
- Facebook: https://www.facebook.com/bloodcallapp

CHAPTER 3

METHODOLOGY

Methodologies mean ways of how the process of the system will be made. In process of making a system, there are numerous types of software development methodologies. Methodology is generally a guideline system for solving a problem with specific components such as phases, tasks, methods, techniques, and tools. In other words, it is the analysis of the principles of methods, rules, and postulates employed by a discipline [18]. Before a system or an application is able to be developed, a developer has to identify the right methodology to be used during the development as well as before the development which will usually be called as Research Methodology. This kind of methodology requires techniques to be used to conduct research prior to the development of the system or application. It includes the type of data to be collected, the method of data collection and other variables that may help to the research and development processes.

3.1 Project Activities

Frequently, a web-based system or an application no matter mobile web application or mobile native application will be developed based on System Development Life Cycle (SDLC) which made up of different phases like Planning Phase, Analysis Phase, Design Phase, Build Phase, Testing Phase, Implementation Phase, and Maintenance Phase. As the author has decided to finish up her final year of study within three semesters, therefore, this project will be developed between two of the semesters of time frame which broke up into Final Year Project (FYP) I and Final Year Project (FYP) II. It is suggested that the author should be able to carry out her FYP I till the Design Phase of the SDLC follow by FYP II for the rest of the phases as shown in the figure below.

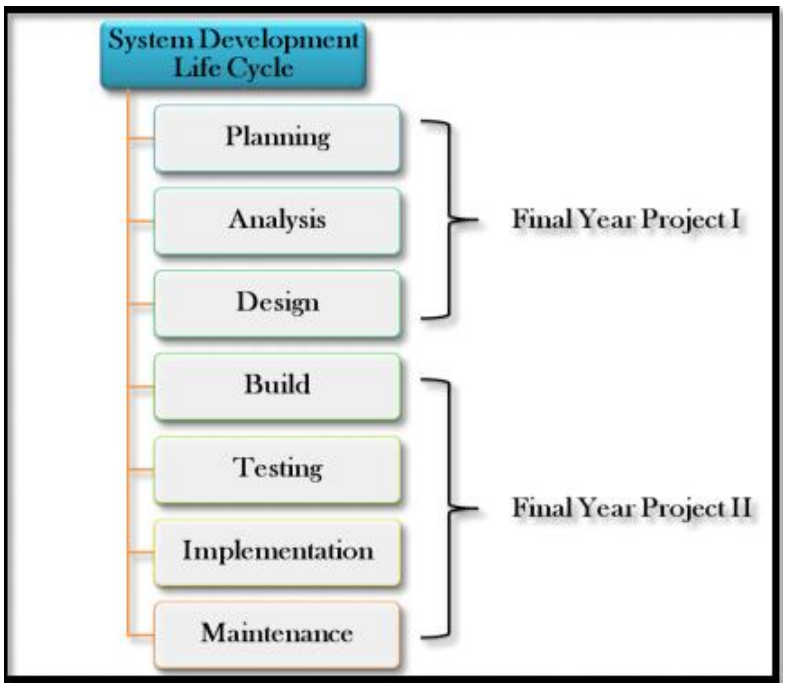


Figure 4: Implementation of SDLC in the development of Mobile Blood Donor

As there are different types of methodologies to conduct a complete SDLC for the development of typical web-based systems, mobile web applications or mobile native applications, the author has decided to use Rapid Application Development (RAD) methodology which is Prototyping in order to develop Mobile Blood Donor. Since this kind of methodology allows the author to perform the Analysis Phase, Design Phase, and Implementation Phase concurrently throughout the development of the application until it is completed, it eventually helps the author to more quickly refine the application's real requirements. Rather than attempting to understand a system specification on paper, the users can interact with the prototype to better understand what it can and cannot do.

Nevertheless, the author would have to bear in mind about the risks of using this methodology where its fast-paced application releases challenges attempts to conduct careful, methodical analysis. Often the prototype undergoes such significant changes 27 that many initial design decisions become poor ones. This can cause problems in the development of the application because fundamental issues and problems are not recognized until well into the development process. The figure below shows the Prototyping Methodology being applied for the development of Mobile Blood Donor.

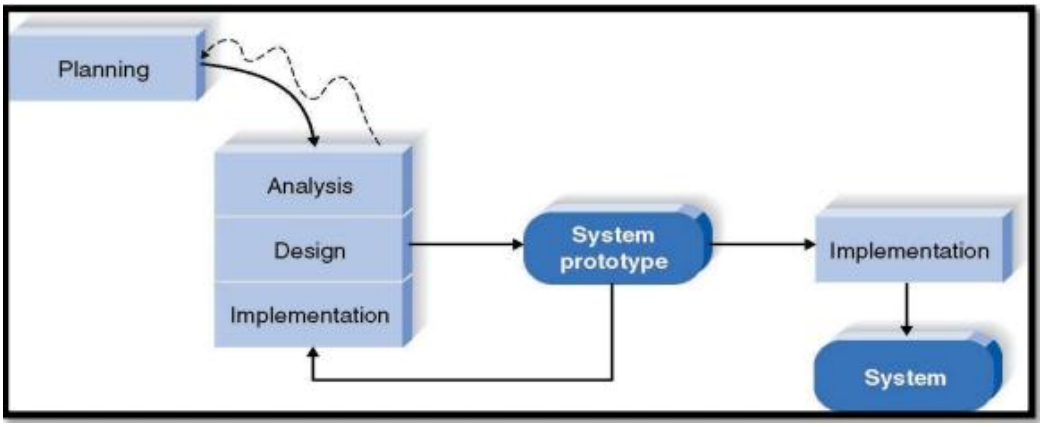


Figure 5: Prototyping Methodology for the development of Mobile Blood Donor

3.1.1 Planning Phase

Before this native mobile application is able to be developed, the author has to conduct a feasibility analysis in ensuring a smooth development on it. This has been described in Chapter 1 Section 1.5 where the results show that the author should proceed with the development of the application. In addition, during this phase also, the author has to schedule a proper planning in ensuring a successful development of the application. This can include the development of the Key Milestones as well as Gantt Chart where both of these can become a reference to the author in ensuring the completeness of every single task on particular time frame. The figures below show the Key Milestones and Gantt Chart for respective semesters for the development of Mobile Blood Donor.

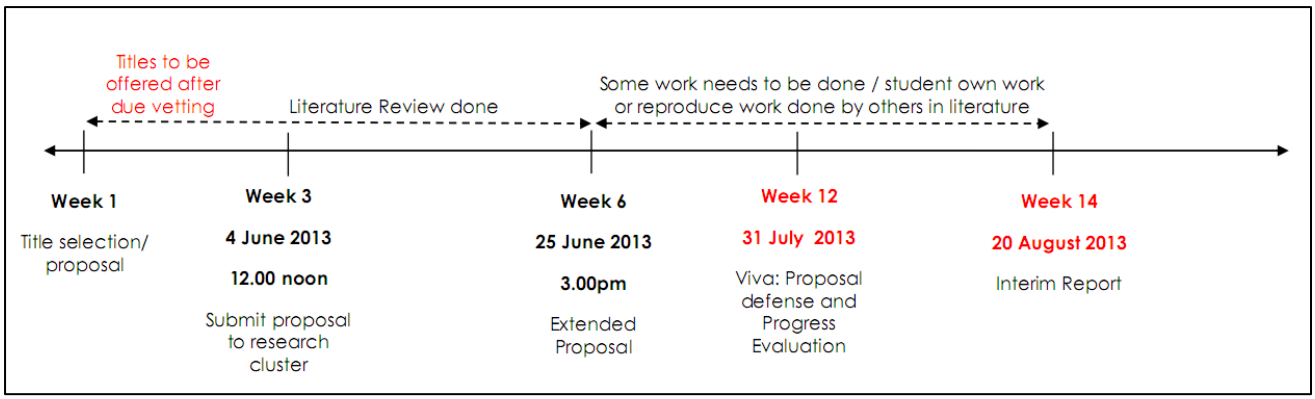


Figure 6: Key Milestones for the development of Mobile Blood Donor in 1st Semester

(FYP I)

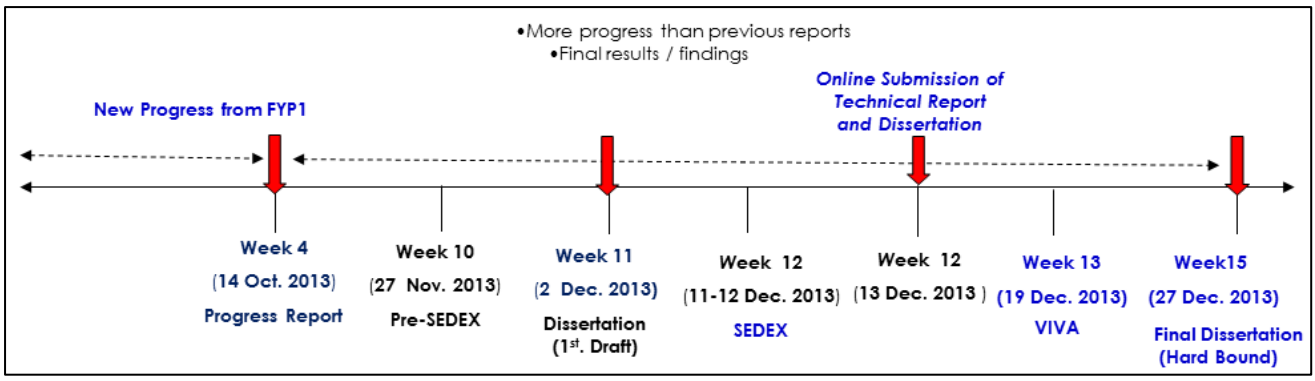


Figure 6: Key Milestones for the development of Mobile Blood Donor in 2nd Semester

(FYP II)

No.	Project Activities (FYP1)	Week 1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	**Selection of Project Title**														
	Search for Project Title														
2	**Planning & Research Analysis**														
	Conduct interview and questionnaire														
	Define system scope														
	Determine system outline														
	Literature review research														
3	**User Design**														
	Design storyboard diagram														
	Preliminary screen layout														

Process

Suggested Milestone

Table 1: Gantt Chart FYP1

No.	Project Activities (FYP2)	Week 1	2	3	4	5	6	7	8	9	10	11	12	13	14
4	**System Construction**														
	• Build														
	Develop User Interface														
	Create pages in Flash according to storyboard														
	Write coding in Action Script 3.0														
	• Demonstrate														
	Run simple test to show the workability														
	Ensure all components interrelated and working														
	• Refine														
	Fix coding error														
	Reconstruct the system														
5	**System Cutover**														
	Testing system functionality and usability														
	Check system specification aligned with requirements														
	System implementation														

Process

Suggested Milestone

Table 2: Gantt Chart FYP2

3.1.2 Analyse Phase

As the author has successfully identified the application to be developed as her FYP and passed through the Planning Phase of SDLC, she will then have to move on to the next phase which is the Analyse Phase in ensuring a successful development of Mobile Blood Donor. During this phase, the most important thing that has to be conducted by the author will be the requirements determination for the application.

In order to collect generalizable data that represent the whole population from the samples, questionnaire survey was adopted as a data collection method. Apart from that, questionnaire survey is a commonly used in similar research. This study collected primary data through questionnaire survey that targets at individual users.

3.1.2.1 Results of Online Survey

3.1.2.1.1 Profile of Respondents

Demographic variables indicate the profile of respondents, which could also be helpful for the understanding of the subsequent analysis of the outcomes. Below figure shows the demographic of the respondents. The statistic shows approximately 90% of the respondents are below 30 years old. This result is consistent to previous studies which found that majority of the smartphone users are teenagers and younger adults [20].

With total number of 69 respondents in which 36 are males and 33 are females, the pie charts below show the percentage of the respondents with different genders, age, and profession that have smartphone.

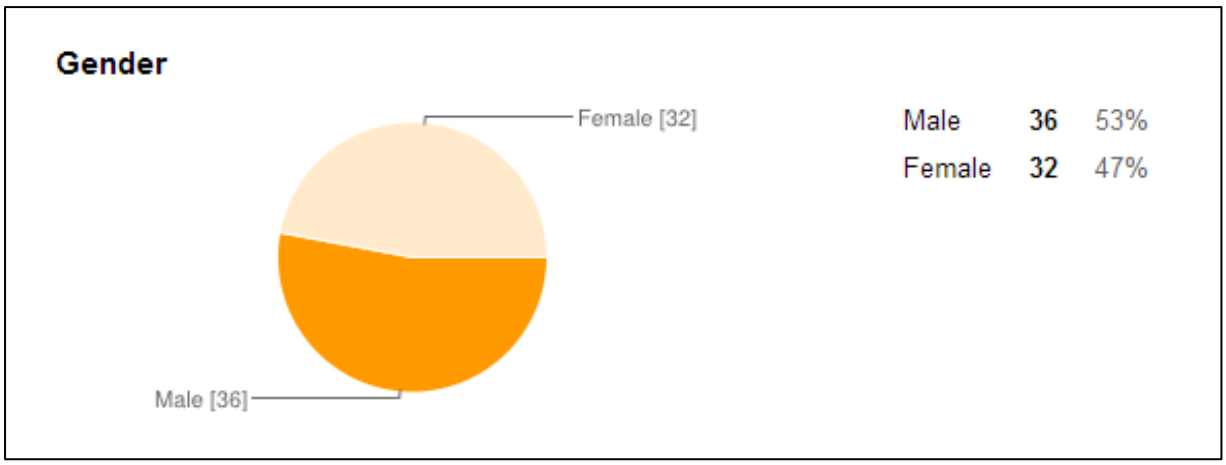


Figure 8: Percentage of Respondents with different genders

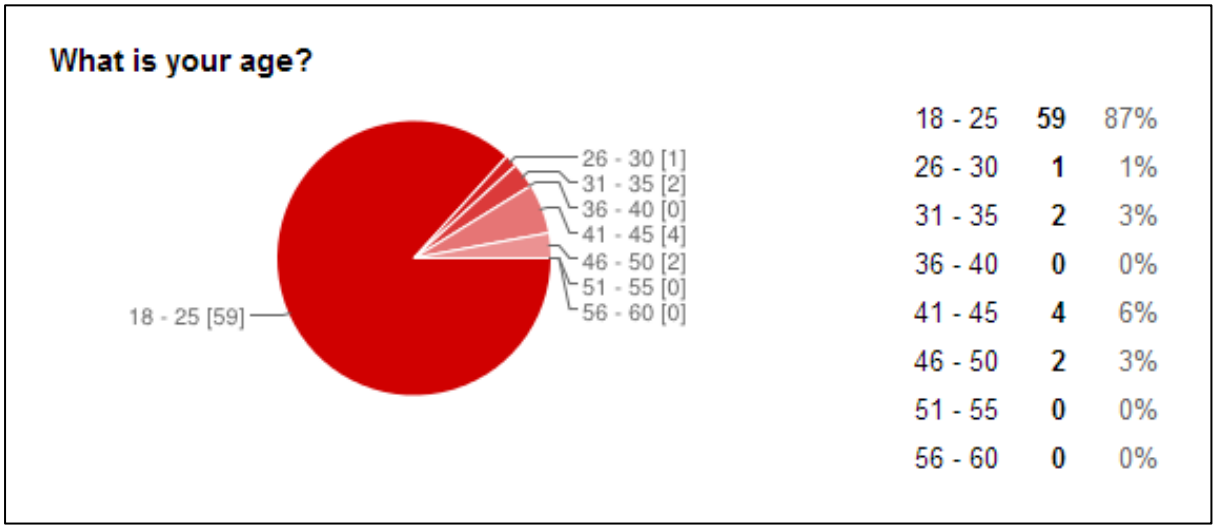


Figure 9: Percentage of Respondents with different ages

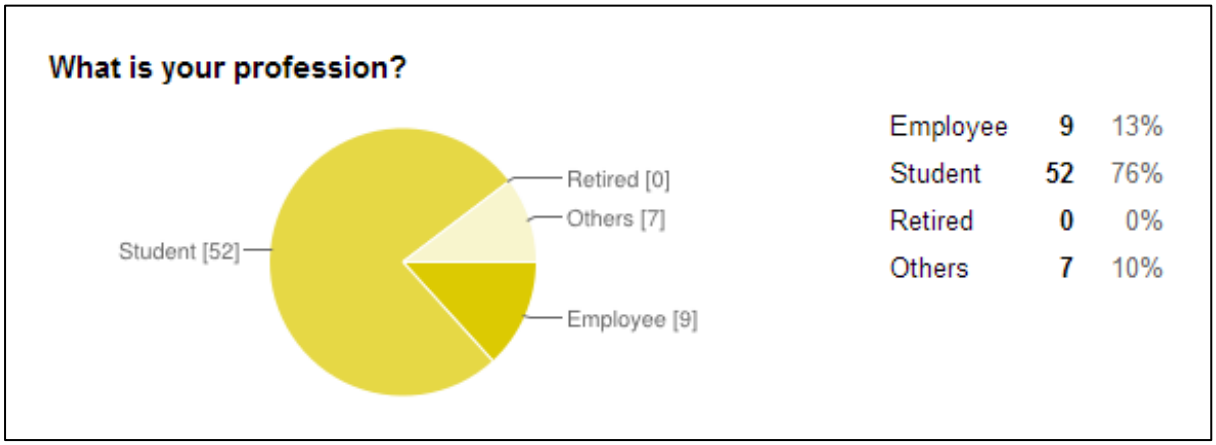


Figure 10: Percentage of Respondents with different professions

3.1.2.1.2 Familiarity towards Smartphone

Figure 11 illustrates the familiarity of respondents toward smartphone. The data shows that approximately 87% of respondents using smartphone as their primary phone while about 13% of the respondents are not. Hence, figure 8 has pointed out that with a difference of 39%, this has approved that Android are the leading OS for Smartphone. With all of the calculated percentages, these can in turn become the strong points and reasons for the author to proceed with the development of the application.

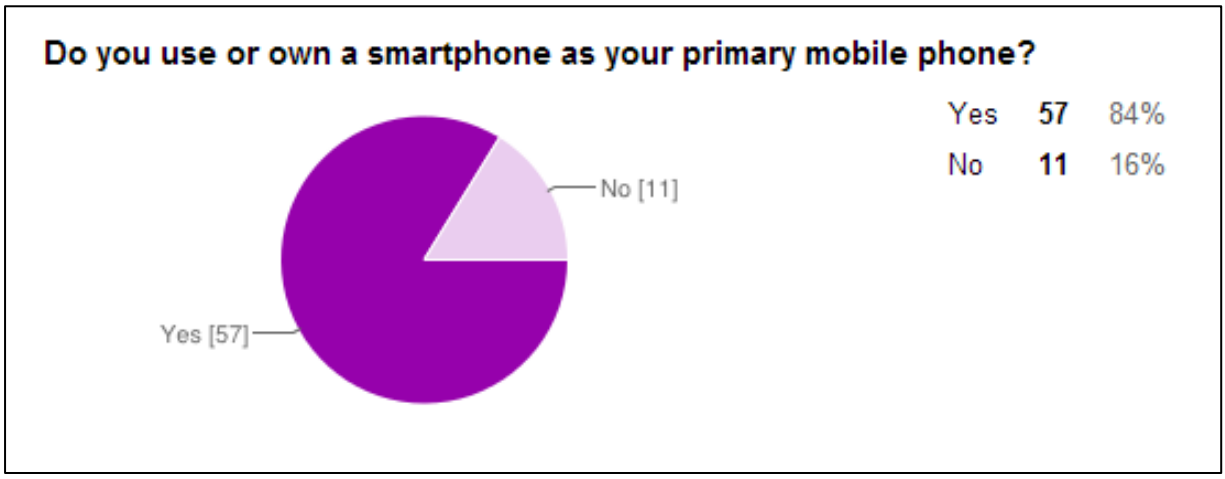


Figure 11: Percentage of Respondents who use smartphone as primary phone

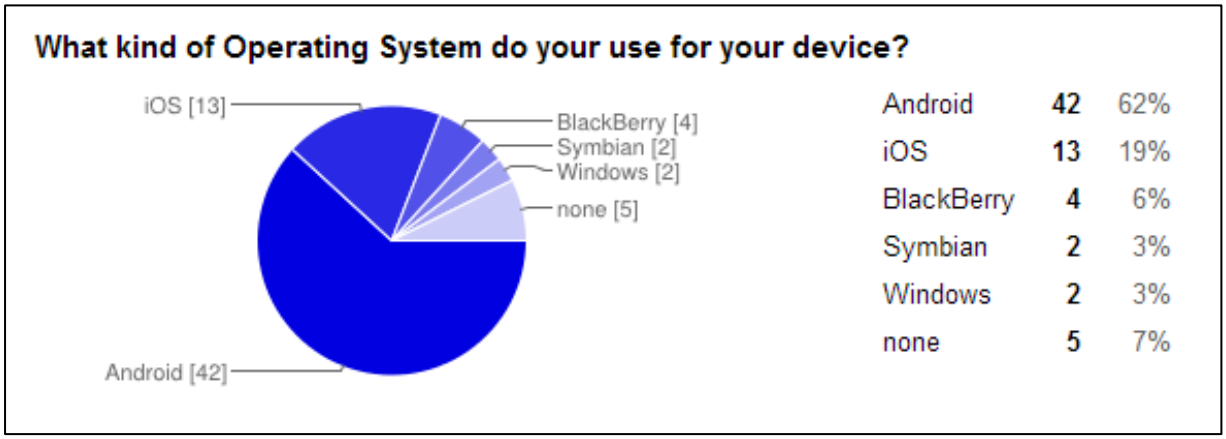


Figure 12: Percentage of Respondents with different kind of Operating System

3.1.2.1.3 Awareness of Respondents

Figure 13 shows that most of the respondents which are 60% of them does not have an experienced on blood donation and 63% of them choose others as their reason towards barriers for them to be a blood donor. About 28% of the respondents do think that the reason why people donate blood is to help other people.

Smartphones represent a truly revolutionary form of health information technology (HIT). Surprisingly, figure 9 indicates that out of 62 respondents, 53% of them aware with the availability of mobile application in healthcare. Apart from that, 93% of respondents give their good responds on Mobile Blood Donor would be helpful and useful not only for patients but also in healthcare organizations.

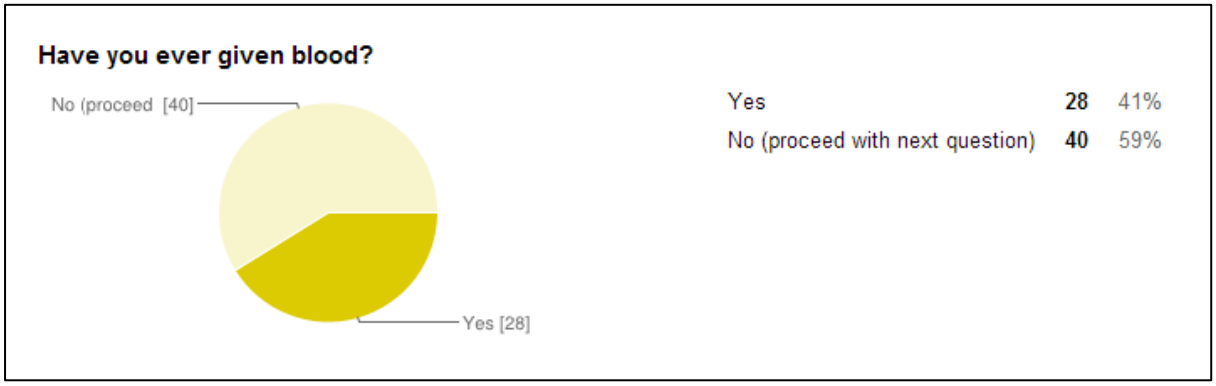


Figure 13: Percentage of Respondents who ever give blood

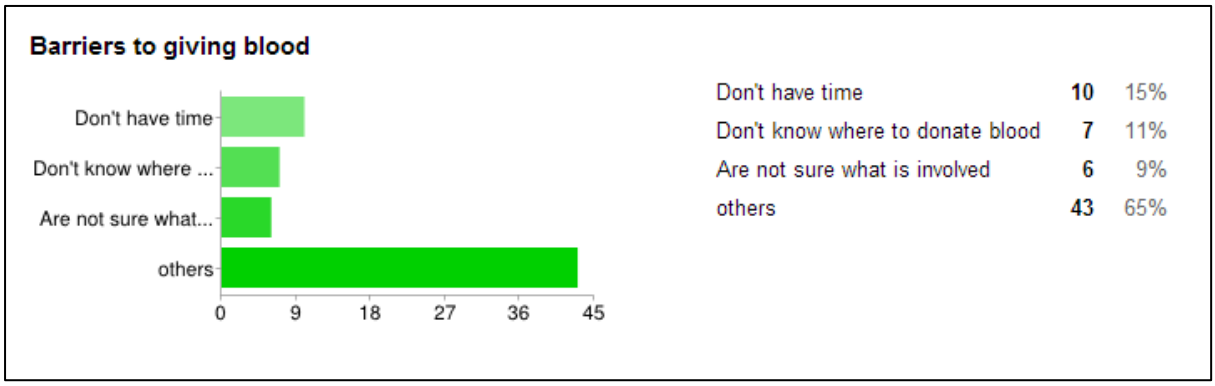


Figure 14: Percentage of Respondents who have not given blood

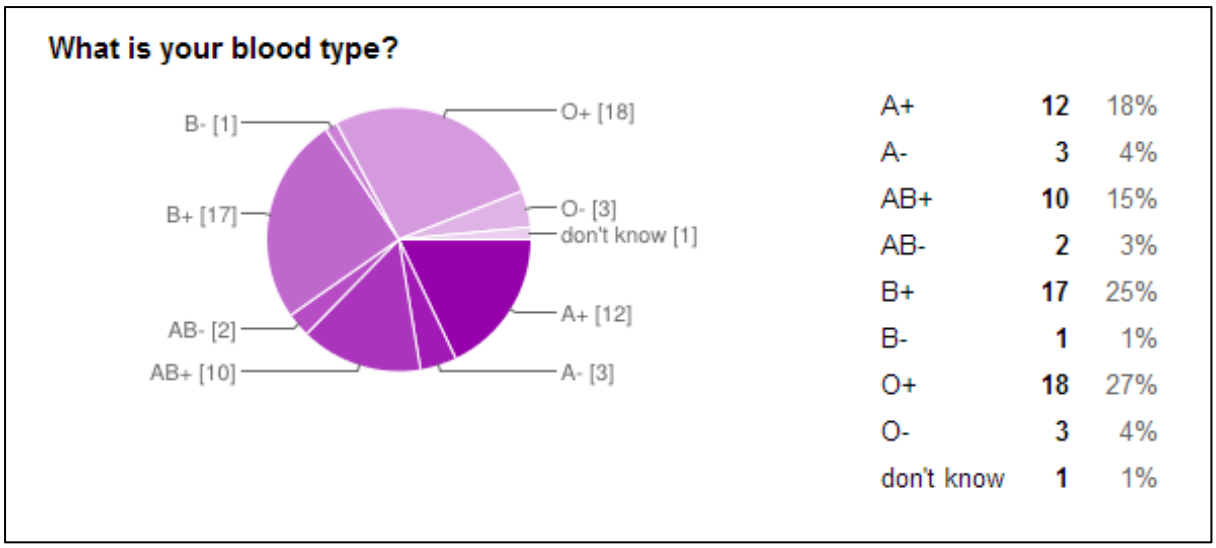


Figure 15: Percentage of Respondents with different blood type

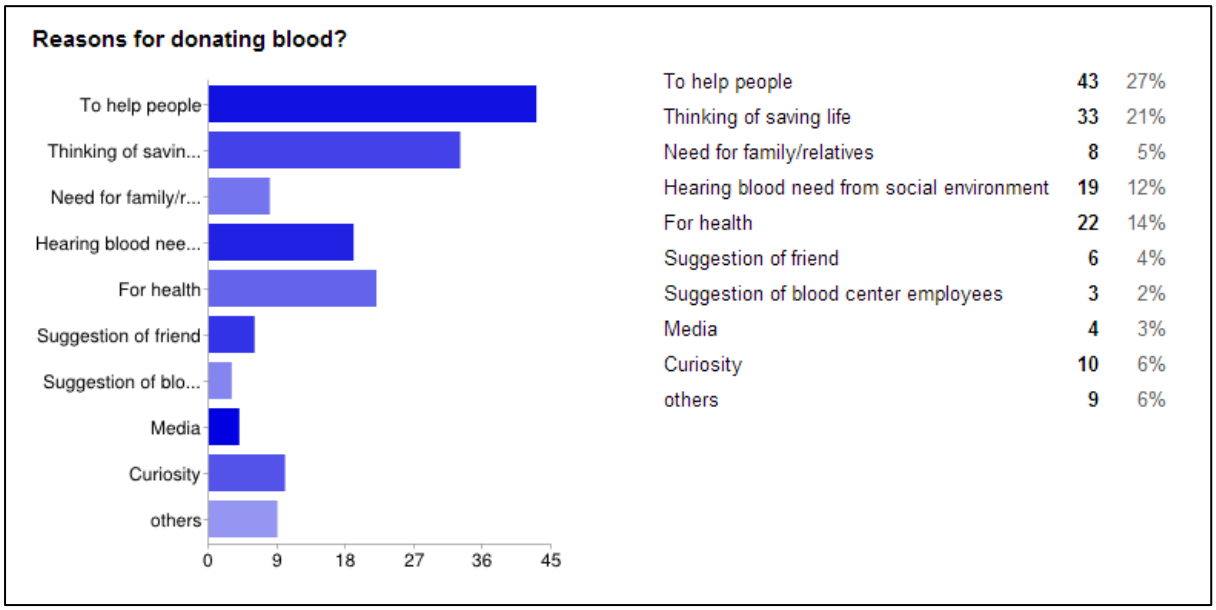


Figure 16: Percentage of Respondents with reasons for donating blood

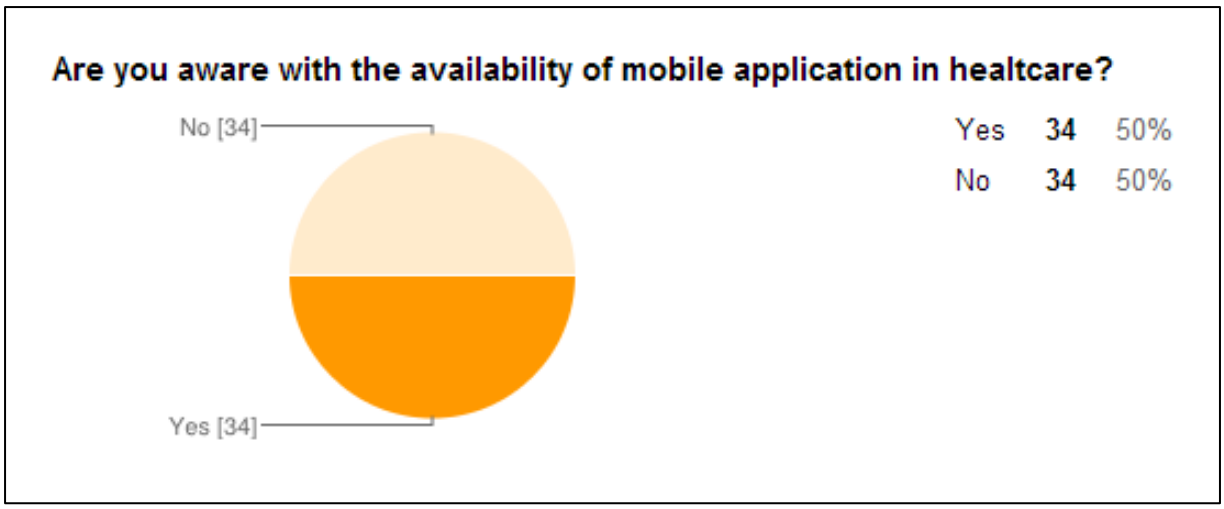


Figure 17: Percentage of Respondents who aware on mobile application in healthcare

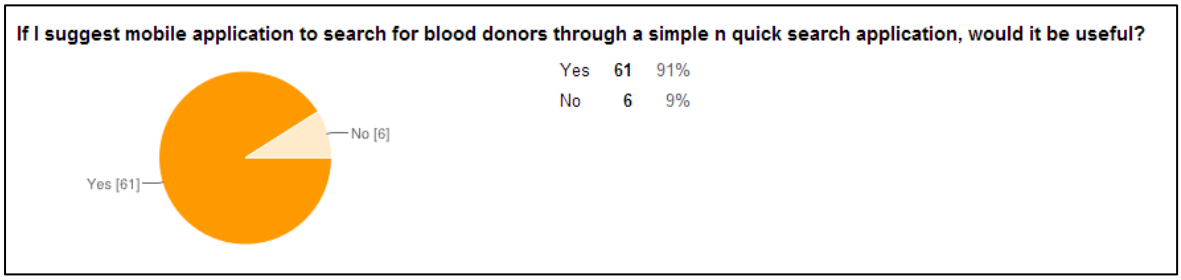


Figure 18: Percentage of Respondents who think Mobile Blood Donor would be useful

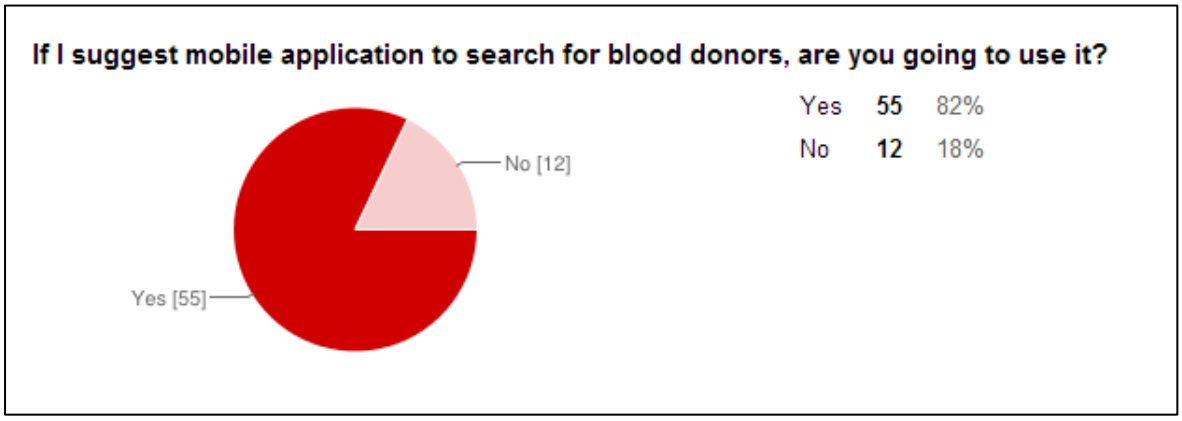


Figure 19: Percentage of Respondents who are willing to use Mobile Blood Donor

3.1.2.2 Interview Finding

In order to determine the requirements needed for the Mobile Blood Donor, short interviews had been conducted with Hospital Ampang and few more hospitals through social media messages. However, only Hospital Ampang gave their short feedback. Below are the interview questions that has been asked to the Hospital Ampang through social media messages, and also the results gathered through the interview session:

- Questions

I'm Nur Nadzirah Binti Suman, final year student of Universiti Teknologi PETRONAS.
Currently i'm doing research about Blood Donation and i want to interview you with some questions related to my topic. Hopefully you may help me on this research.

1. Why is blood donation important and how important it is?

2. Which blood type is most rare?

3. Which blood type is the most needed?

4. Who would need blood transfusion the most?

5. How frequent they need blood transfusion?

6. Is it illegal to doing business with blood transfusion?For example selling or buying blood directly from individual. If it is, why there is exist such business in private sector?

8. If i suggest mobile application to search for blood request through a simple and quick blood donors search application, will it be useful? And what will be your requirement for the mobile application?

Highly appreciate if you could assist me. Thank you.

Figure 20: Questions for short interview session

- Answer:
  Ampang Hospital by Dr Rosvinder Singh (Pegawai Perubatan Jabatan O&G)

1) to preserve blood supply in blood bank, to enhance healthcare, to save lives

2) 0 negative

3) 0

4) ill patient , hypovolemic patient, poly trauma,obstetric patient, thalasemia patient

5) all transfusion should be done only when clinically indicated

6) yes - illegal

7) useful - blood grouping, rhesus factor, infection screening

- Answer:
  Columbia Asia Hospital by Manjit Singh (Medical Laboratory Technologist)

1) It is important because there is constant needs of blood transfusion in all hospital. By doing blood donation campaign, the donors able to donate blood more frequently and easier. By this blood bank able to collect donor's data and store them especially if the donor has rare type of blood. This is a continuous process because blood donated have a lifespan approximately 20-30 days only.

2) Blood groups divided to A, B , O, and AB with the Rhesuses Positive or Negative. The most rare blood is usually the Negative group example A-, B-, O- and AB-. The rareness usually according to country depending on the communities of donor. But in Malaysia, AB - and O - are the most rare.

3) It should be O- (Negative) because this blood group does not contain any antibodies that can cause Transfusion Reaction. This blood group can be transfuse to all type of patient and most importantly during emergencies.

4) Usually bleeding cases:
   a. Labor process
   b. Accident cases
   c. Anemia Patient
   d. Thalassaemia Patient
   e. Upper Gastro-intestinal Bleed (UGIB)
   f. Newborn babies (Neonatal) with High Serum Bilirubin level

5) Its depending on cases, if the bleeding stopped and the Hemoglobin level in blood back to normal then blood transfusion is not needed anymore.

6) So far there is no illegal business regarding blood transfusion detected because patient can received it free from government hospital. Some private hospital do pay donors for their blood if they have rare type of blood. I do not see any profit can be made because the cost of processing blood product is high and the lifespan of blood is short.

7) It might be but all donor's details are Private and confidential. It might be useful for blood bank to search patient blood type more easier and contact the donor immediately. Requirements:
    a. Blood stock easily monitored
    b. Patient contacts
    c. Donors contacts
    d. Blood transfusion statistics
    e. connections with social media so that having any blood donation campaign can be easily send out or link so that more people can join

3.1.2.3 Use Case Diagram for Mobile Blood Donor

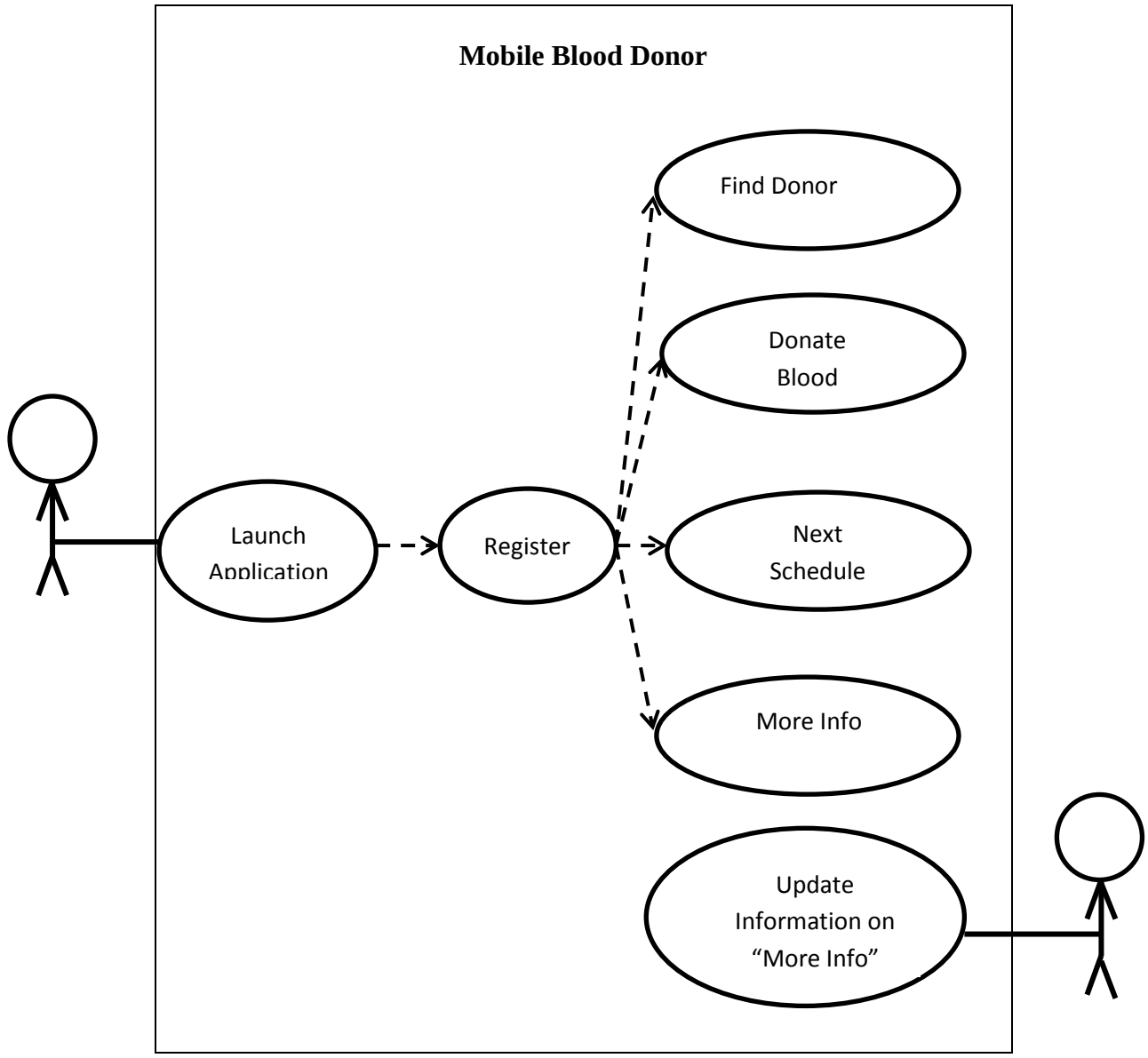


Figure 21: Use Case Diagram for Mobile Blood Donor

3.1.3 Design Phases

After the author has successfully gather all of the requirements and come out with designs of functional models, she will now able to move on to the Design Phase and come out with the physical and conceptual designs as well as interfaces of Mobile Blood Donor. In addition, in order to develop this application successfully, she has decided to use the software of Eclipse as the platform for the development and of course, an Android Smartphone will be required as well. The figures below show the system architecture of this project.

3.1.3.1 System Architecture

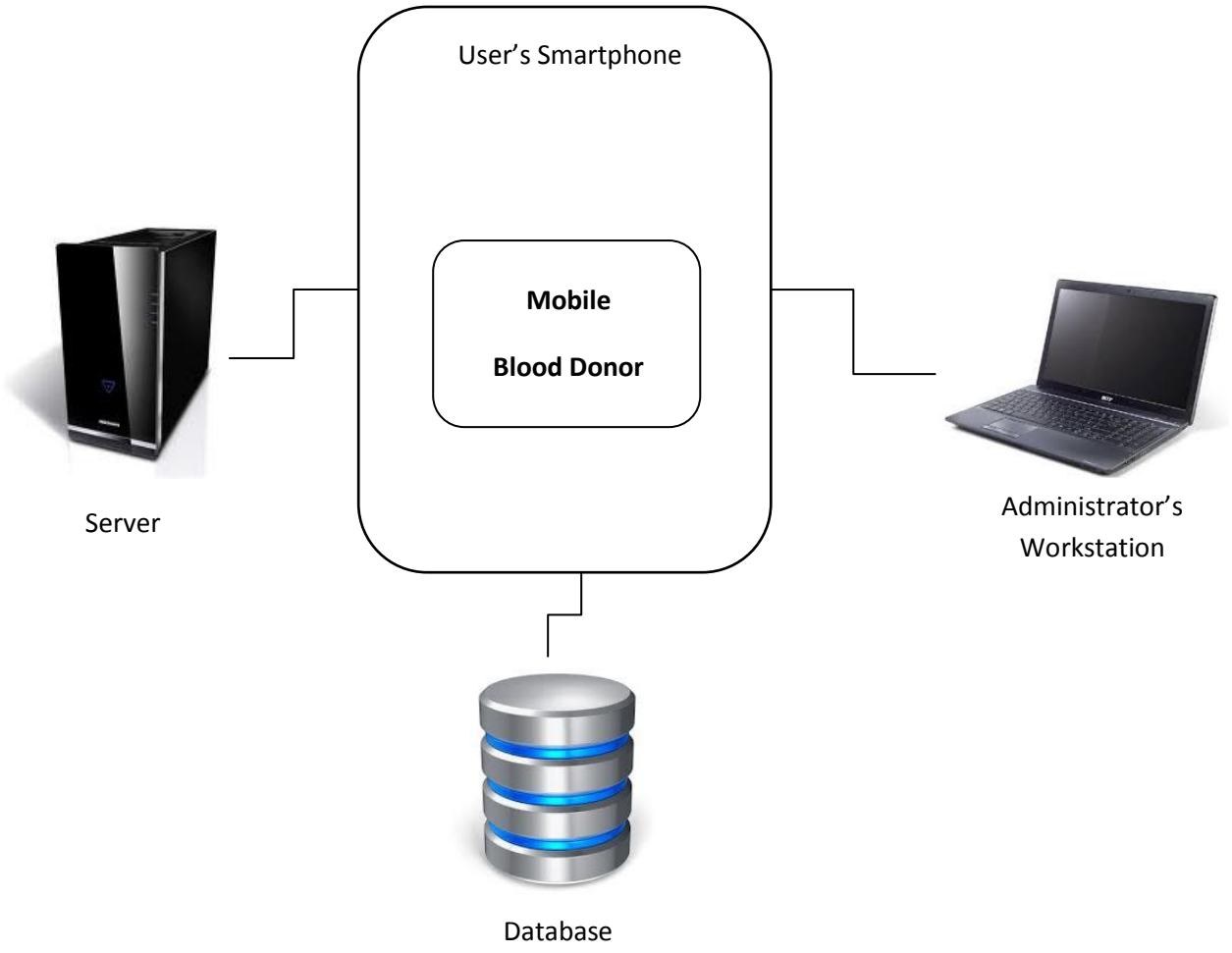


Figure 22: System Architecture of Mobile Blood Donor

3.1.3.2 Physical Design

Mobile Blood Donor will be developed by using a personal laptop as an official workstation for the author. Therefore, Eclipse would have to be installed in it. With this software, the author will be able to see the results of the development piece by piece through the Android Emulator. Nevertheless, by plug in USB driver between the Android Smartphone and the laptop, the author will be able to look for live results from the development. In addition, before begin the development, in order to develop an attractive Graphical User Interface (GUI) for this application, apart from using the features provided in App Inventor, the author has decided to use some elements offered in Adobe Photoshop. Table below shows the hardware and software specifications for this application.

Tools	Specifications
Hardware	Acer Personal Laptop and Android Smartphone
Software	Eclipse, Android Emulator

Table 3: Hardware and Software Specifications for Mobile Blood Donor

3.1.3.3 Conceptual Design

Conceptual design can be described as a description of the proposed system in terms of a set of integrated ideas and concepts about what it should do, act, and look like that will be understandable by the users. There are three different perspectives that will help the author to develop conceptual models which are interaction mode, interface metaphor, and interaction paradigm. Interaction mode describes how a user invokes actions when interacting with the system or application while interface metaphor help in combining familiar knowledge with new knowledge in a way that helps a user to understand the system. On the other hand, interaction paradigm assists in particular ways of thinking about interaction design. Below are the models.

3.1.3.3.1 Storyboard

An application storyboard is an illustration of the relationships between the functions that constitute the application of Mobile Blood Donor. It is developed to assist in designing interfaces in the future as well as to ensure the flows are as intended. Basically, there are four different flows in the to-be application that can be depicted in a storyboard as shown below.

1. **Find Donor**

   User has to select blood type and city in order to find nearest blood donor.

   User will be given a list of possible blood donor.

   User can communicate with the blood donor through email.

2. **Donate Blood**

   User will be able to find potential place for blood donation which is organized by blood bank.

3. **Next Schedule**

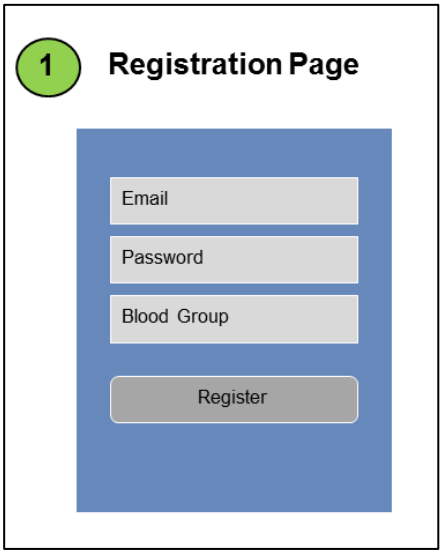
   User may calculate their next schedule to donate blood.

4. **More Info**

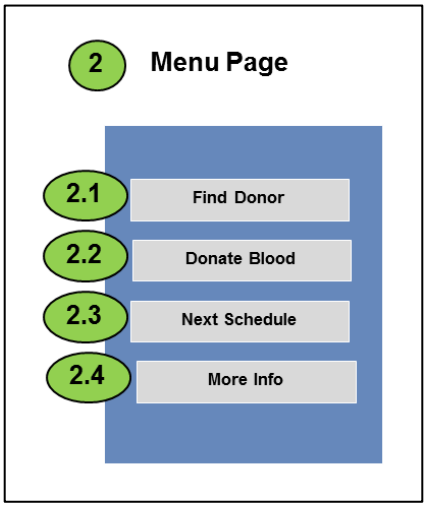
User may find benefits that they will gain being as blood donor and they also will find rules and regulations to be a donor.

3.1.3.3.2 Interface Designs

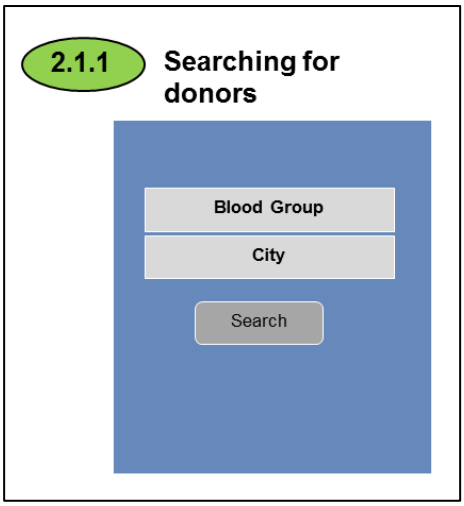
- Registration Page



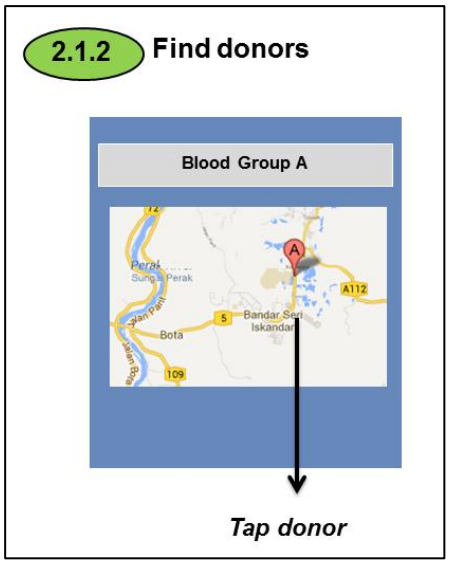
- Menu Page



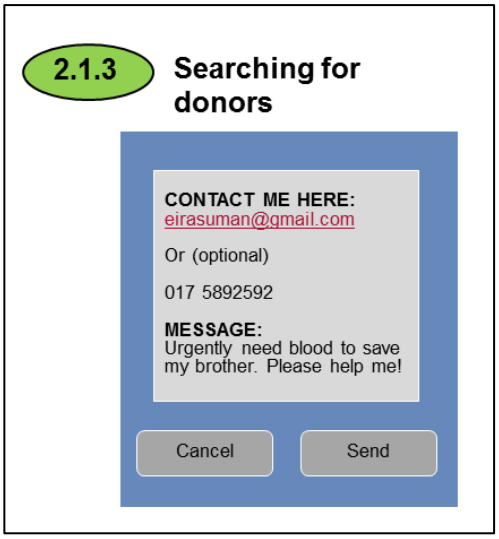
- Situation 1: Find Donors



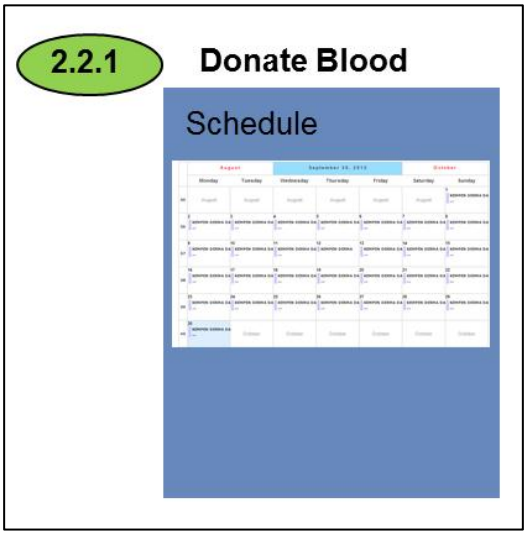
- Potential Blood Donors



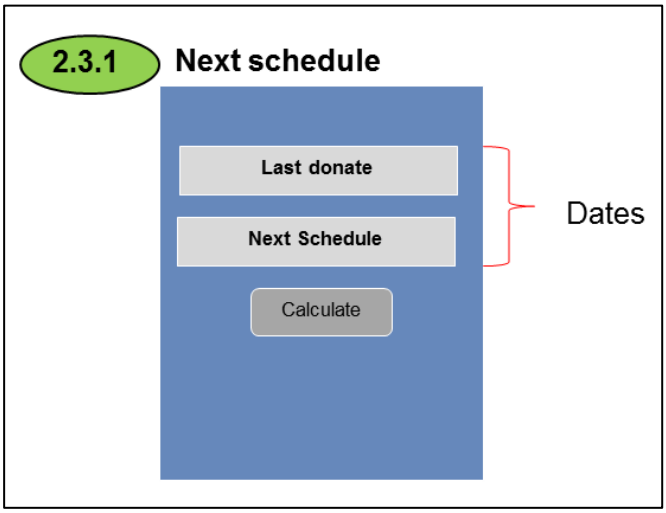
- Communicate with Blood Donor



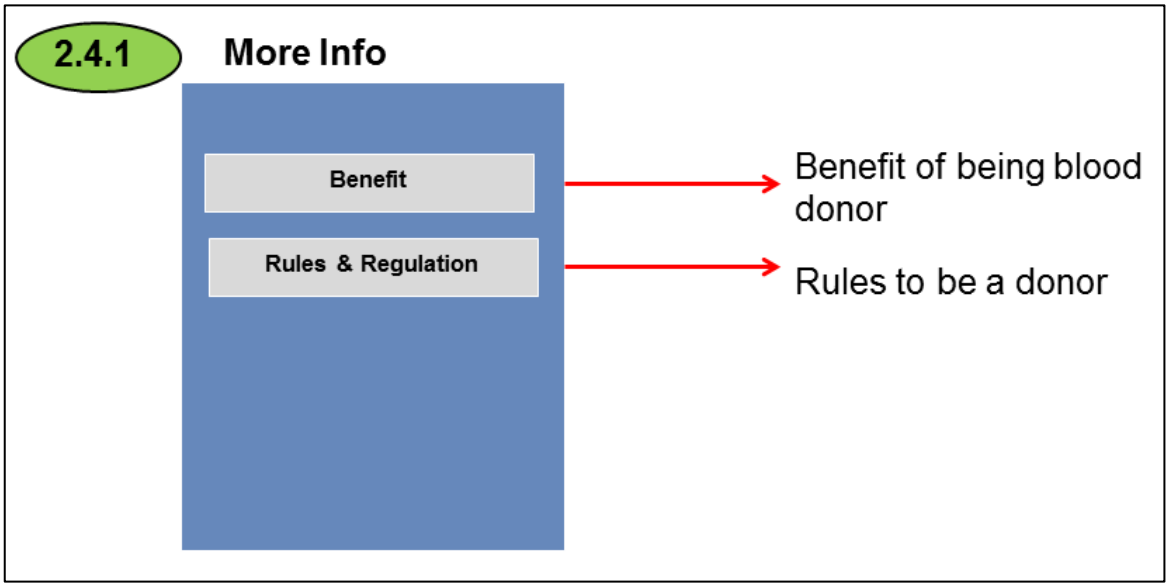
- Situation 2: Donate Blood



- Situation 3: Next Schedule



- Situation 4: More Info



3.1.4 Build Phase

Before a system or an application is able to be built, requirements gathering as well as creation of different models and designs will have to be done in order to avoid from any conflicts and issues throughout the development later. These will eventually assist a developer by providing a clear overview about the to-be application especially in ensuring its ability to meet the targeted objectives. As the author had successfully come out with the Requirements Definitions, Functional Decomposition Diagram, Activity Diagram, and Use Case Diagram as described in the previous chapters, the author can now move on to the next phase of the development of Mobile Blood Donor which is Build Phase.

This application will be developed by using the author's personal workstation which is an Acer laptop together with an Android Smartphone to get the live results while developing. Instead of using App Inventor, Adobe Flash Professional, and Basic4Android, the author decides to use Eclipse IDE for the development of Mobile Blood Donor due to its drag-and-drop interface.

The Build Phase starts with the development of the application's interfaces as per described in the previous chapter. In conjunction with the development of the interfaces, the author decides to use Adobe Photoshop for the enhancement of the images to be used. Since the author chose Prototyping Methodology for the development of this application, continuous refinement on the prototype will have to be conducted till it meets the users' expectation and satisfaction. Changes will be happened throughout the whole development process to ensure all of the targeted functions work as per required. Some of them are done prior to their functionalities while additional features will be added based on necessity. The prototype of Mobile Blood Donor is to be discussed further in Chapter 4: Results and Discussion.

3.1.5 Testing Phase

Testing is a must before a system or an application is able to be implemented in the production environment. It uncovers as many errors as possible and therefore, it has to be done systematically and the results should be documented. There are generally four stages of tests which are Unit Test, Integration Test, System Test, and Acceptance Test. Each of the tests is having different objectives but with the same goal which is to uncover as many errors as feasible.

By the time the author has successfully developed a prototype with all the targeted functionalities, testing on it will have to be carried out. Hence, a test plan which defines a series of tests will be required throughout the process of testing. For Mobile Blood Donor, the author had decided to carry out only three of the tests which are Unit Test, Integration Test as well as Acceptance Test. To be specific, Unit Test and Integration Test will be done by the author herself while Acceptance Test will be conducted by several selected testers, particularly those who own at least a cat. The results of the testing are to be discussed further in Chapter 4: Results and Discussion.

3.1.6 Implementation Phase

During this phase, Mobile Blood Donor should be 100% complete through the prototype developed and has been undergone the different stages of tests in order to uncover as many errors as feasible. As a result, the author will be able to make improvements and enhancements on the prototype to become a complete application before it is able to be launched in the production environment, specifically to the targeted users.

3.1.7 Maintenance Phase

Maintenance Phase will be the last phase in SDLC and therefore, when Mobile Blood Donor is successfully delivered to the users, the author should always be responsible towards maintaining it especially on the information provided. Up-to-date information is a must in meeting the objectives of this application. Apart of that, the author should be able to cater all of the feedbacks received from the users about the application either positive feedbacks or negative feedbacks. These can be used for improvements and enhancements in Mobile Blood Donor which can also be considered as another step of maintaining it in the production environment.

CHAPTER 4

RESULTS AND DISCUSSIONS

As prove of development for the interface designs sketched in the previous chapter, the author will discuss about the prototype that has been successfully built in this chapter. In addition, the results of testing for the prototype of Mobile Blood Donor will be included as well. Below are the results stated in the Build Phase and Testing Phase.

4.1 Data Collection and Research

4.1.1 Literature Review Findings

From literature review research, the findings are:

- The world is running out of blood supply where the demand of it still high.
- Cancer patients need blood from eight people every week.
- By using technology, there must be a way to get donors in an emergency case.
- In order to help patients search for blood donors, Mobile Blood Donor will be a good solution.

4.1.2 Online survey Findings

From online survey research, the findings are:

- 54% of the respondents are male and 46% are female.
- 89% of the respondents are aged between 18 – 25 years old.
- 78% of the respondents are students.
- 86% of the respondents using smartphone as their primary phone.
- 63% of the respondents using android as their operating system.
- 60% of the respondents never had experienced on blood donation while 40% of the respondents have given their blood.
- Rather than choosing does not have time to donate blood, do not know where to donate blood, and not sure what is involved in blood donation, approximately 60% of the respondents choose others as their barriers to be a blood donor.

- Approximately 28% of the respondents says that the reason behind why they donate blood is because to help people.
- 51% of the respondents aware on healthcare mobile application.
- 92% of the respondents agreed that Mobile Blood Donor would be useful in healthcare industry.
- 83% of the respondents willing to use Mobile Blood Donor in future.

4.2 Prototype

A prototype is an early sample or model built to test a concept or process or to act as a thing to be replicated or learned from. It is a term used in a variety of contexts including semantics, design, electronics, and software programming. Moreover, a prototype is designed to test and trial a new design to enhance precision by the system analysts and the users. Prototyping serves to provide specifications for a real, working system rather than a theoretical one [22]. Therefore, below are the descriptions of the prototype for Mobile Blood Donor which had been developed throughout the whole semester. Figures below show that when user enters the system.

4.2.1 Registration Page

The first page which is ***registration page*** will be displayed. Upon registration, user has to register details such as email address, password, and blood group type and click button register. It access through the few details of the user for first time. Only users aged 18 and above can able to register as blood donor in the application.

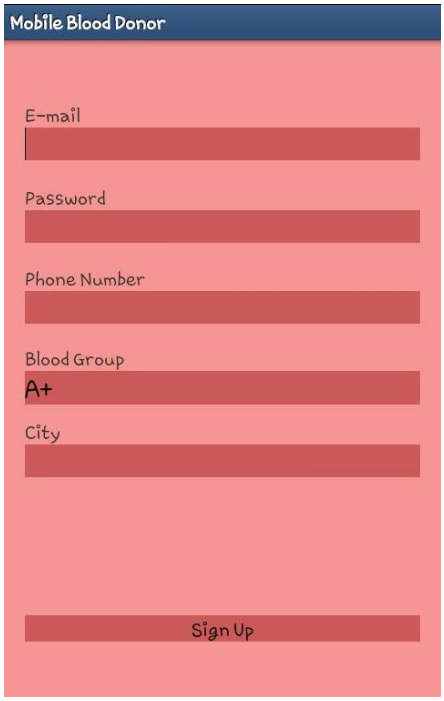


Figure 23: Mobile Blood Donor on Registration Page

4.2.2 Menu Page

Menu page consist of buttons that will proceed to next page. Each button in menu page will display different type of activities. The buttons are ***Find Donor***, ***Donate Blood***, ***Next Schedule***, and ***More Info***. If user clicks the "***Find Donor***" button, the system will proceed to searching for donor page. "***Donate blood***" button consist of details on events, campaigns, and etc. on blood donations information. "***Next Schedule***" button will show and display the next date of blood donation and as for "***More Info***" button will display terms and regulation on blood donation and incentives they will gain from blood donation which hopefully can boost donor rates without compromising the safety of the blood supply.

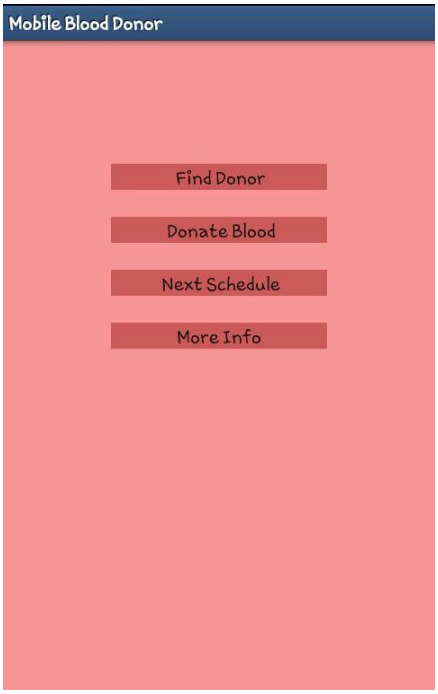


Figure 24: Mobile Blood Donor on Menu Page

4.2.3 Find Donors

Find Donors page will display the closest matching donors with the compatible blood type and allow the user to send a donation request to donor. To search for blood donors, user has to select the blood group and city at the top of the list. After the search, blood donors who are all available will be shown. User can locate blood donors by their geographical position. User has to select the blood group to find the location of the blood donors. User can contact the blood donors by tapping the marker and sending them an email.

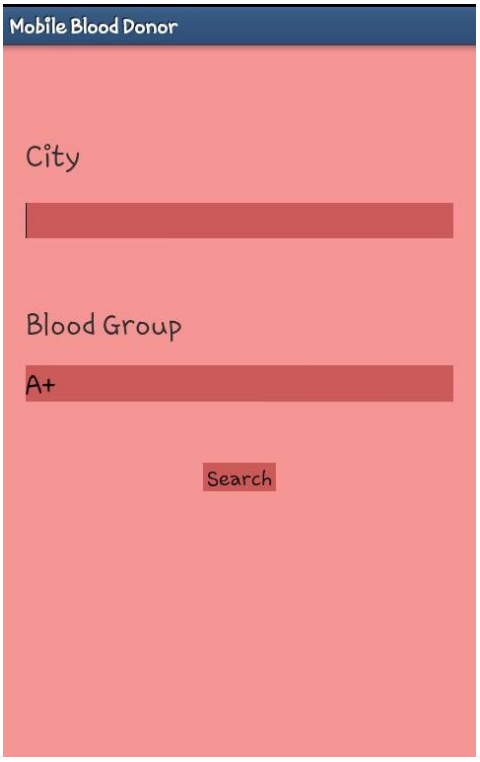


Figure 25: Mobile Blood Donor on Searching for Donors

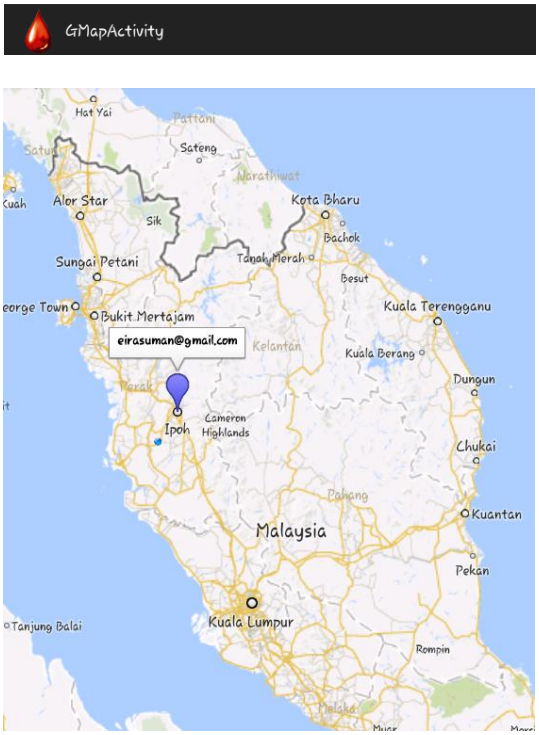


Figure 26: Mobile Blood Donor on Find Donors

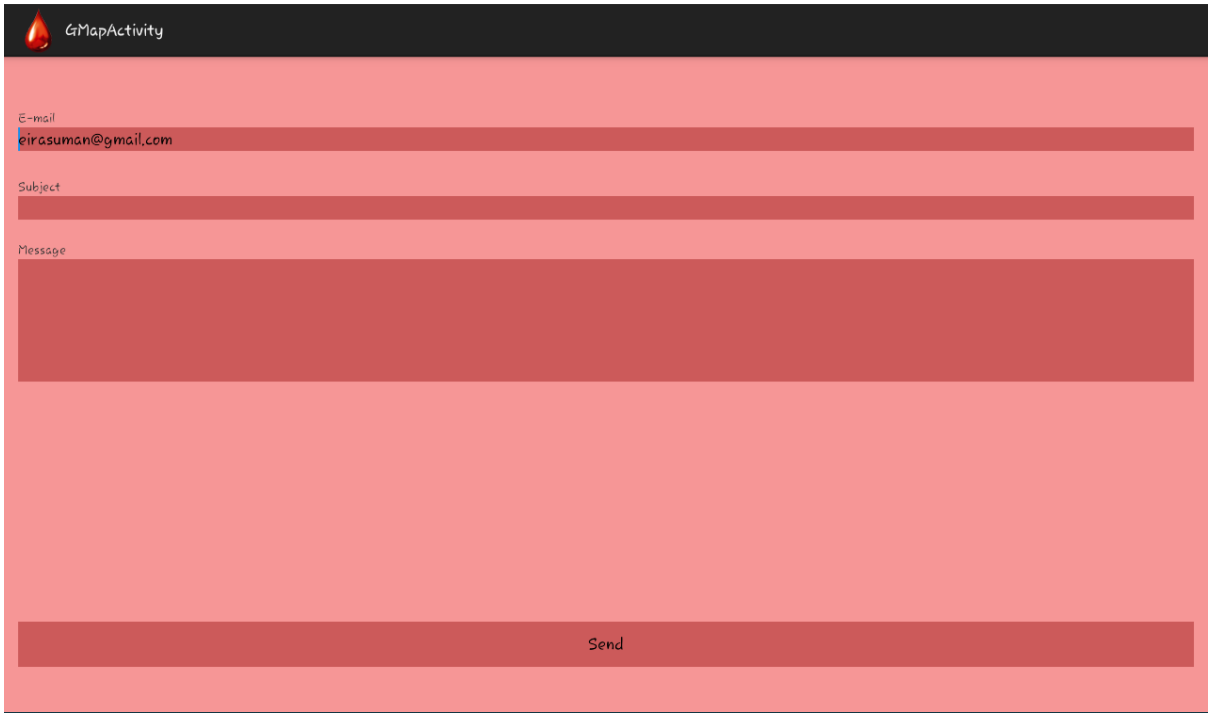


Figure 24: Mobile Blood Donor on Communicates Through Email

4.2.4 Donate Blood

Donate Blood page will show any available events and information on blood donation campaign that provided by blood bank.

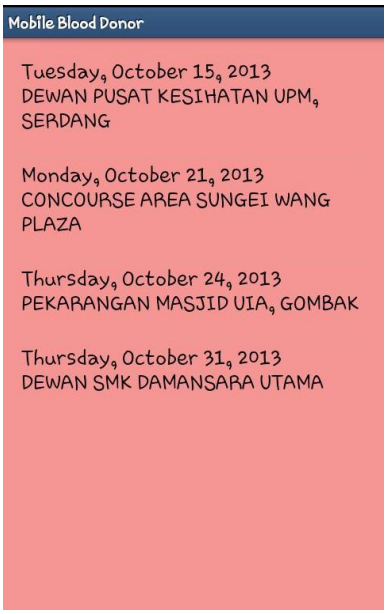


Figure 28: Mobile Blood Donors on Blood Donation Campaigns and Events

4.2.5 Next Schedule

In ***Next Schedule*** page, user has to key in their last date of blood donation in order to know their next schedule.

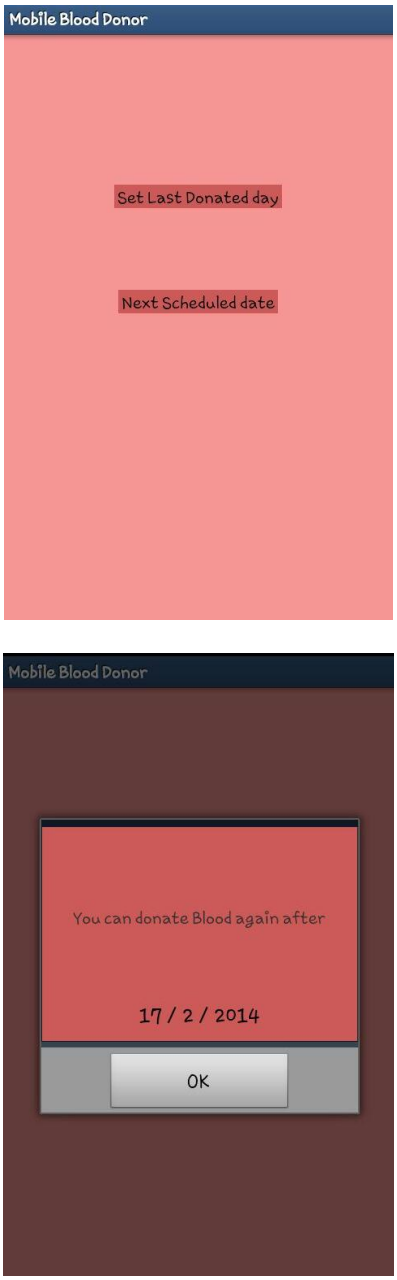


Figure 29: Mobile Blood Donor on Next Schedule

4.2.6 More Info

More Info page consists of "***Benefit***" button and "***Rules&Regulation***" button. ***Benefit*** button will show all the benefit and incentives that donors will gain if they be a loyal blood donor especially to government hospital.

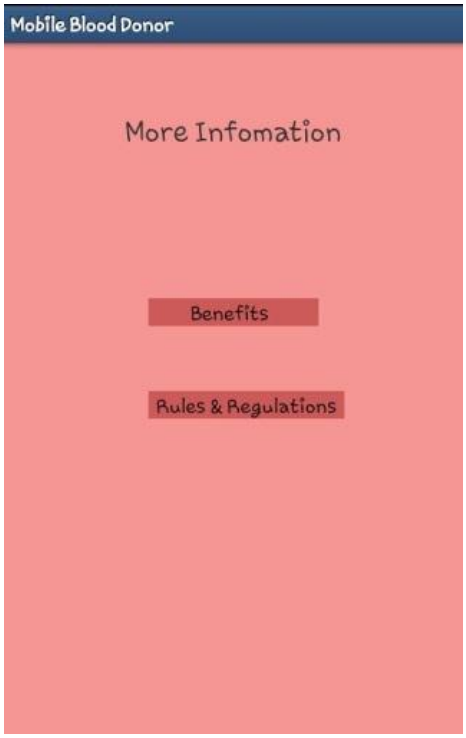


Figure 30: Mobile Blood Donor on More Info

4.3 Testing

Testing should not be confused with debugging in which the former is a process of finding "unknown" errors while the latter is a process of removing "known" errors. Generally, the objective of testing is to find errors in a system or an application and to see not only if the system or application does not do what it is supposed to do (a deficiency) but if it does what it is not supposed to do (a malfunction). In contrast, the objective of debugging is to identify the type and location of the "found" errors and subsequently remove it by a re-definition, re-design or re-code, depending on the level of testing through which the errors were found.

For Mobile Blood Donor, three different testing had been conducted by the developer which is Unit Test, Integration Test, and Acceptance Test. Unit Test is a process of testing the individual subunits, subroutines or procedures of a system or an application. Its purpose is to ensure that the unit does not contradict with the system or application's internal specifications. It is performed during the development phase where different units can be tested in isolation simultaneously. It makes the debugging tasks much easier as it only involves a single unit and when an error is found, the error should be located within that particular unit.

On the other hand, Integration Test is conducted to explore the incompatibility of the interfaces between the system and application's components. They must work together without any errors. Integration Test will ensure that the interfaces and linkages between different parts of the system or application work properly. At this point, the interfaces have passed their Unit Test.

Acceptance Test is done primarily by the users to confirm the system or application is totally complete, meets the users' requirements that prompted the system or application to be developed, and is acceptable by the users. Therefore, for Mobile Blood Donor, the developer had selected three testers whom have donated blood before. Generally, there are three different phases carried out by the developer in order to have a complete Acceptance Test.

First and foremost, the developer had briefed the testers about the overview of the application. Then, the testers were given the application to be tested. While they were conducting the testing, the developer will take note or jot down their suggestions or attitudes towards the tested application. From this, the developer will be able to identify the usability

of the application to them. Lastly, the developer gave a survey form as attached in the Appendix 2 to the testers which required them to fill in as a feedback about the application. All of the results will be used for the betterment and improvement of Mobile Blood Donor. Below are the results of the testing.

Table 4: Summary of Feedbacks from Acceptance Test for the prototype Mobile Blood Donor

Respondent 1
• Provide more activities on the app itself such as games, quiz, etc. • Interface should be more users friendly to understand the application easier.
Respondent 2
• Provide a guideline for 1st time blood donor. • Provide a reminder on upcoming event. • Application should be more users friendly.
Respondent 3
• Provide more information on blood donor benefits, risks, etc. • Improve the interface to be more attractive.

Table 5: Survey Form's Feedback for the prototype Mobile Blood Donor

Question	Respondent 1	Respondent 2	Respondent 3
User-Friendliness **Strongly Disagree 1 2 3 4 5 Strongly Agree**			
1. The application has user-friendly Graphical User Interface (GUI).	**4**	**4**	**4**
2. It is easy to navigate from one screen to another screen through the application.	**4**	**4**	**4**
Informativeness **Strongly Disagree 1 2 3 4 5 Strongly Agree**			
3. The application will help blood requester in terms of finding the blood donor.	**5**	**4**	**4**
4. The information	**5**	**5**	**4**

provided is simple and easy to understand.			
User Feedbacks Strongly Disagree 1 2 3 4 5 Strongly Agree			
5. You are interested to use this application.	**5**	**4**	**4**
6. Do you know any web-based systems or mobile applications exist for blood donor?	**3**	**3**	**3**
7. Please leave your comments about Mobile Blood Donor for the betterment and improvement of this application.	none	This application can be enhanced by adding more functions. For example, this application should give a guideline to a first-time blood donor about the procedures to donate their blood. To be more user-friendly, this application should also provide a reminder to the blood donor regarding the upcoming events to donate their blood. Thus, they can prepare themselves a day before they donate their blood and avoid them from forgetting about the events.	I think maybe can put more info on about blood donor such as venue and activity. The interface can also be improve

CHAPTER 5

RECOMMENDATION AND CONCLUSION

There are several recommendations to be made regarding this project. Recommendations are not meant to be used to change this project wholly, but to allow improvements in certain aspects and to put some factors into considerations before proceeding with the development of the software.

One of the recommendations is the data gathering process for this project should not be limited to only giving out questionnaires and interviewing the end user. Other than those two methods, research data gathering by facilitate group interview with individuals that have something in common, for example a group of cancer patient's family members should be help. Besides that, in order to complete the project early and more effective, the development phase need to be done within the time frame as what has been planned. This project can be completed at least to the minimum requirements. It also depends on the amount of scope creep that would be encountered which is inevitable. The requirements are quite a challenge so it is also difficult to gauge how perfect the system can be within the time frame. For future plan, it is recommended this Mobile Blood Donor to be developing in iOS and BlackBerry application version so that it might get high demand from the users. Next, set up an online donor registration system to enable existing donors to update their personal details, make or change appointment, check when they are next due to donate or view their donation history. Other than that, Mobile Blood Donor should be expanding in terms of contents. It should not be limited to what it is and adding more variety to the module so that Mobile Blood Donor can look more attractive.

As conclusion, this project will be a good project in order to cater an emergency needs of blood shortage in future demand, and Mobile Blood Donor will improve the usage of technology in healthcare sector in Malaysia. In this extended proposal, it explained details about the project itself. Begin with project abstract, background of study, problem statements, and also objectives. Furthermore, the methodology also has been selected in completing this project. By the end of the stage, the system should work fine as it is intended for and the objectives of this project shall be achieved successfully.

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