ELDERCARE: A MOBILE APPLICATION FOR ELDERLY CARE

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ABSTRAK

Menurut kenyataan Jabatan Perangkaan Malaysia, populasi warga emas yang berumur 65 tahun ke atas semakin meningkat setiap tahun. Pada 2030, 15 peratus halangan akan dilalui manakala sekarang hanya 7 peratus. Dalam kalangan warga emas, kira-kira 85% daripada mereka memiliki telefon bimbit dan kira-kira 46% menggunakan telefon pintar. Pada masa kini, aplikasi mudah alih mampu memberi kemudahan kepada masyarakat khususnya warga emas. Masalah utama ialah warga emas terpaksa tinggal bersendirian manakala anak-anak mereka bekerja di kawasan bandar. Keselamatan dan emosi warga emas perlu dijaga. Mereka juga akan terlepas masa yang sesuai untuk makan ubat atau bahagian yang salah. Disebabkan masalah yang dinyatakan, projek ini mencadangkan dengan objektif utama untuk menyediakan aplikasi tertumpu kepada aplikasi mudah alih untuk penjagaan warga emas. Oleh demikian, warga tua dan ahli keluarga mereka boleh mempunyai fungsi pengesanan lokasi, peringatan tentang ubat, dan panggilan kecemasan dalam aplikasi ini. Aplikasi mudah alih akan memperoleh internet untuk memaparkan dan menjejak lokasi masa nyata dari dan ke pelayan pangkalan data awan. Pembangunan Aplikasi Rapid (RAD) telah dipilih sebagai metodologi projek ini. Empat fasa terlibat dalam model tersebut untuk memastikan aplikasi yang dibangunkan mencapai objektif yang dicadangkan. Sebagai kesimpulan, projek ini melaksanakan Sistem Penentududukan Global (GPS) dan teknologi mudah alih, yang boleh memberikan penjagaan warga tua berasaskan untuk warga tua dengan beberapa ciri dalam aplikasi, seperti penjejakan lokasi masa nyata dari mana-mana dan pada bila-bila masa, peringatan tentang ubat-ubatan dan panggilan kecemasan dengan menggunakan aplikasi mudah alih yang telah dibangunkan.

ABSTRACT

According to a statement from the Department of Statistics Malaysia, the ageing population which is aged 65 years and above, is growing every year. In 2030, 15 per cent of barriers will be crossed whereas now it is only 7 percent. Among the elderly, about 85% of them owned a mobile phone and about 46% used a smartphone. Nowadays, mobile applications can bring convenience to society, especially for the elderly. The main problem is that the elderly has been forced to live alone while their children work in the city area. The safety and the emotions of the elderly need to be taken care of. They also will miss the right time to take medicine or the wrong portion. Due to the mentioned problem, the project is proposed with the main objective of providing an application focused on a mobile application for elderly care. The elderly and their family member can have the function of location tracking, a reminder of the medication, and emergency call in this application. The mobile application will acquire the internet to display and track the real-time location from and to the cloud database server. Rapid Application Development (RAD) has been chosen for the methodology of this project. Four phases are involved in the model to ensure that the application developed achieves the proposed objectives. To conclude, this project implements the Global Positioning System (GPS) and mobile technology, which can give basic elderly care for the elderly with several features in the application, such as real-time location tracking from anywhere and at any time, a reminder of medication and emergency call by using the mobile application that has been developed.

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LIST OF ABBREVIATIONS

API	Application Programming Interface
APP	Application
COVID-19	Coronavirus Disease 2019
GPS	Global Positioning System
HTML	Hypertext Markup Language
IoT	Internet of Thing
JDBC	Java Database Connectivity
OS	Operating System
RAD	Rapid Application Development
SDLC	Software Development Life Cycle
UAT	User Acceptance Test
Wi-Fi	Wireless Fidelity

CHAPTER 1

INTRODUCTION

1.1 Introduction

According to a statement from the Department of Statistics Malaysia, the ageing population which is aged 65 years and above, is growing every year. In 2030, 15 per cent of barriers will be crossed whereas now it is only 7 percent (M. Uzir Mahidin, 2021). Among the elderly, about 85% of them owned a mobile phone and about 46% used a smartphone (P. Research, 2021). Nowadays, mobile applications can bring convenience to society, especially for the elderly. This will have a positive impact and carry some advantages for the elderly who live alone. They may realize it is beneficial to install an application on their smartphone. The most integral type of mobile application is a practical application that will make their lives easier and more efficient, such as helping them take note of where they parked their car, medication reminders, and trigger alerts in emergency situations. Internet services, such as email and texting, as well as music downloads, shopping, banking, and bill payments, have become a crucial aspect of the life of the elderly, particularly during the COVID-19 epidemic (Wallcook et al., 2021; Yang & Lin, 2019). When they are using this kind of application, they will feel safe and secure even if they are living alone at home by themselves. It is critical that mobile technology will also assist people in the care of the elderly (F.Jose et al., 2022).

Furthermore, most of the elderly are seeking a healthy, dignified life, and safety. Elderly care is critical and it is an umbrella for the elderly healthcare and safety. We all know that aging cannot be avoided, but we can learn how to handle it well for our loved ones. It will manage to care about the elderly in aspects of physical or mental health. The importance of elderly care is to secure and protect the elderly who are independently living alone to give them the convenience to them to have a better living environment.

"A software application built primarily for use on tiny, wireless computing devices, such as smartphones and tablets, rather than desktop or laptop computers" is described as a mobile application(Weichbroth, 2020). The mobile applications normally are designed with a particular purpose, which can be in a myriad of fields such as healthcare, management, entertainment, and others and resolving the issues or the real-time problem. Besides, mobile applications can be classified into three types by the technology used such as native application, web application and hybrid application. A native application is leading from these three types of applications in performance, giving users stability, speed, and specific features in different sectors. Meanwhile, APIs have been enlightening with the client-server communications architecture, and webapps developed with HTML5 run using APIs. Hybrid apps are a mix of native and web applications. Hybrid app developers write the majority of their software using web technologies like HTML5, Javascript, and so on, and the remainder utilizing native APIs as needed (Gunawardhana, 2021).

In this project, a mobile application is developed for the elderly care, for the elderly who are aged 65 years and above. This application can let them feel more safer while living alone at home. Medication is crucial for the elderly. The first feature is reminder feature in this application which will help the elderly to take the right medication at the right time. The elderly is allowed to setup the schedule of their medicine time into the reminder and it will remind them automatically. The elderly also is allowed to enter the information of the medication in this application. For the safety of the elderly, this application can allow the family member to track the location of the device of the elderly and the elderly can locate themselves, then the location will automatically shared to their family members manually since the elderly was joined the circle of family members. They can make an emergency call to emergency centre through this application. In this application, there are three main features: reminder for medication, location tracking and emergency call. There are two user types in this mobile application with different features which is the elderly and the family member.

1.2 Problem Statement

The major problem of them is they have been forced to live alone while their children were working in the city area. Elderly housing was affected from time to time. Independent living is not an easy task for the elderly, they will need to care about themselves. They may not feel safe while there are no children living with them, especially if they are not familiar with the devices. They don't know how to call their children and emergency centre with their devices or even if they are facing an emergency situation, they still need to search about their children in the contact list. This is a challenge for them. Besides, the emotions of the elderly also need to be taken care of. Social-psychological factors, such as feeling lonely and participating in entertainment, could affect independent living ability among elderly men (B. Wang et al., 2019). The mental health problem of the elderly is more dangerous as compared to adults. Bad behaviour will appear due to the negative emotional influence. The COVID-19 pandemic gave a tremendous impact to all aspects of life around the world at the beginning in early 2020. According to the survey, the prevalence rates of loneliness (56% to 95.5%), anxiety (3.6% to 38%), and depression (11% to 85.5%) in older people living in long term care settings are generally high (Sharifah Munirah Syed Elias, 2018). The elderly in Malaysia is highly susceptible to the adverse effects of COVID-19 like other areas of the world (N. Mustaffa,2020).

The next problem is the elderly will miss the right time to take the medicine or take the wrong portion of the medicine. There are 38.8% of elderly have a sign of forgetfulness, 14.3% of the elderly facing difficulties in managing medication and 10.3% was concerned with the side effect was pointed as the medication non-adherence factors (Gomes et al., 2020). An aging parent was exhibiting signs of forgetfulness, they may have forgotten to take their medicine with the right dose and at the right time. The average age was 47.2% male, functional health literacy and communicative health literacy were significantly associated with a high level of medication adherence (Ueno et al., 2021). Medicine has become a necessity for the majority of the elderly. For example, if the elderly who have diabetes, they need to take the medicine every time with the right portion. If not, the blood sugar level will be unstable, and this will lead to their life in danger such as increasing the risk of heart disease and stroke. They need to take medicine daily to maintain their blood sugar level. Next, many of the elderly are illiterate, so taking

notes or writing on the whiteboard is not a proper way for them to record their medicine time and portion.

The third problem is the children will worry about the safety of their parents since they are not live with their parents. An ageing society need a dependable solution for staying active for a long time, avoiding social isolation, and assisting people in conducting everyday activities independently in their own homes(Fahim et al., 2012). As mentioned above, if the children were not living at home with their parents, their parents are nobody can depend on it. They didn't know where their parents would go or if their parents got lost while going outside to buy food. While their parents didn't reply to their message or receive their phone call, they didn't know the real-time location of their parents. The elderly over the age of 65 are easy to get lost in term of age, amounting for more than 80% of the population. (S. Wang et al., 2021). Their children will be more concerned about their parents whether they're in danger or not.

1.3 Objectives

There are three objectives in this project which are:

1. To collect the functional and non-functional requirements for the development of ElderCare mobile application.
2. To develop ElderCare, a mobile application for elderly care.
3. To evaluate the functionality of the developed ElderCare mobile application for elderly care.

1.4 Scope of the project

1.4.1 User Scope

1. Elderly in age 60 above (MyGOV, 2022).
2. Elderly who are familiar with mobile technology.
3. Elderly who are living alone.
4. Adults where their parents are using this application.

1.4.2 System Scope

1. Covered reminders for medication, location tracking and emergency call only.

1.4.3 Development Scope

1. This application focused on a mobile application for elderly care.
2. The application will be developed on a mobile platform in Android.
3. Contains multimedia elements such as graphic, sound and text.
4. Android Studio, Firebase Realtime Database and SQLite Database will be used in this application.
5. Java programming language will be used to develop this mobile application.
6. Using technology such as Global Positioning System (GPS) and Mobile Technology in this application.

1.5 Significance of the project

1.5.1 Elderly / Parents

Elderly people can feel safe at all times by always have the location tracking, emergency call and they will feel the convenience of having daily reminders to take the right medication at the right time.

1.5.2 Adults / Children

Adults or children can have location monitoring for the elderly remotely, call the emergency call and they can record the information of medication then set the daily reminders.

1.6 Thesis Organization

This thesis consists of five chapters. Chapter one mainly discusses the introduction to the project including the Introduction, Problem Statement, Objectives, Scope of Project, Significance of the project and Thesis organization. Chapter two will focus on the literature review on three existing mobile applications for the elderly used and the critical review of the comparison including the advantages and disadvantages of the existing application in elderly care. Chapter three will discuss and explain the methodology used for developing the project. This project implements Rapid Application Development (RAD) methodology. After that, the hardware and software specification are clearly described in this chapter. Chapter four will explain the implementation, results, discussion based on the development phase and the testing part of this project. Chapter five will summaries the final outcome and result of this project.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

Nowadays, mobile applications for the elderly have been more focused by society. There are plenty of developers that developed an efficient elderly care mobile application. This chapter discuss three existing mobile applications that are relevant to the proposed mobile application and provide comparison on the advantages and disadvantages. Therefore, this chapter will look into the functionalities and features of these three mobile applications. After that, the advantages and disadvantages of these existing applications will be analyzed and the comparison of the relevant system also will be reviewed at the end of this chapter.

2.2 Three Existing Application

2.2.1 Senior Safety App

Senior Safety App is an Android-based and iOS-based mobile application for the elderly care to keep the elderly safe (M. Devikaa, 2022). This application was designed to be installed on the elderly devices. The application is popular with the concerned children of elderly and also the caregivers. Senior Safety App is able to let the concerned children or caregivers or monitor phone location, emergency medical information and alerts reports remotely. They will also receive an alert for emergency help requests or falls with the phone and the entry or exit of the geo-locations such as buildings, streets and cities through this application.

The Senior Safety App used the Geo-fence Zone technology and the Global Positioning System (GPS) to track the phone location of the elderly. The children or caregivers are allowed to configure a custom Geo-fence area and receive the alert when the elderly device is entering or leaving that area. After that, they can access the device location via any smart device or web browser and the history of the locations visited by the elderly also can be accessed through this way. Besides, the emergency medical information of this application includes doctors' information, medicine in use and the elderly diseases such as diabetes, high blood pressure and others. There are various types of the alert that will be provided in this application for example, automatic fall alerts, inactivity alerts, low battery alerts and high ambient noise alerts. All of the alert reports will be sent to their children or caregivers via email. The homepage and notification report provided in the Senior Safety App are shown in Figure 2.1 and Figure 2.2.

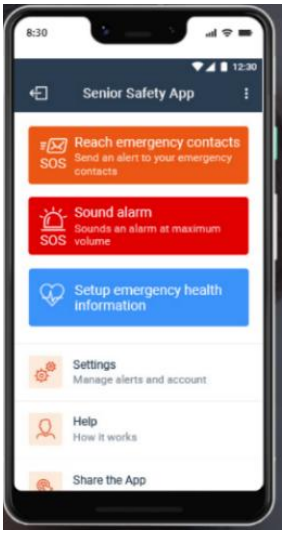


Figure 2.1: Home Page of Senior Safety App Mobile Application

Figure 2.2: Alert Email of Senior Safety App Mobile Application

2.2.2 Dosecast

Established in 2010, Dosecast is an easy-to-use Android-based and iOS-based application for the elderly to help them remember to take their medications or pills on time (M.Software, 2022) . This application is available in two editions which are the Free edition and the Pro edition. The features that are provided in the Free edition are reliable notifications, flexible scheduling, customizable dose amount and smart silencing.

As shown in figure 2.3, the Dosecast is able to send reminders to the elderly smart devices with or without internet connection and this is convenient for the elderly who are not familiar with mobile technology. The elderly is able to do the scheduling for their medicine such as scheduled doses on a daily or weekly schedule or every few days. Besides, it can also track the maximum number of doses allowed per day to avoid dangerous overdoses. With the features of customizable dose amount, the application is able to track the medicine name or medicine information that the elderly wants to take which will be displayed in the reminders for each dose. Then, if the elderly needs to turn off the notification at a certain time, they can activate the smart silencing to track the start and end of the bedtime of the elderly, so there are no unwanted alarms.

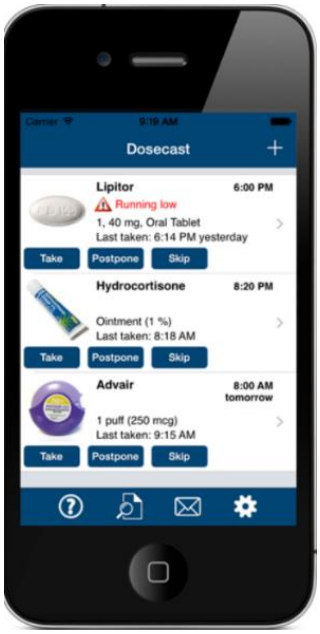


Figure 2.3: Dosecast Mobile Application

2.2.3 Elderly Care: for Senior Health, Wellbeing, Safety

Elderly Care: for Senior Health, Wellbeing, Safety is an Android-based mobile application that is an all-in-one elderly care application (LEVstone Ltd., 2022). This mobile application is designed to promote the elderly safety, senior health and senior living. Elderly Care also allows the family or caregivers to create a closed private care group for the elderly to ensure that they are connected in this application. There are several features provided in this application such as senior health, senior safety, senior care and elderly launcher.

Elderly Care can help the elderly establish and maintain their daily mental or physical health by using reminders to help the elderly improve their ability of self-care. The home IoT sensors will be used to monitor and detect the elderly mobile devices then the alert notification will be sent to the family or the caregivers in the private group when the elderly leaves home or back within the Geo-fencing area. After that, the emergency button is provided in this application when they are in danger. Besides, the family or the caregivers can receive the automatic notification when the elderly are woken up and login to this application, then the reminder for the medication is able to be set by them for the elderly. For the convenience of the elderly, a large button for making phone calls is designed in this application as shown in Figure 2.4 and Figure 2.5. It also can be set up remotely by family and caregivers.

Figure 2.4: Home Page of Elderly Care Mobile Application

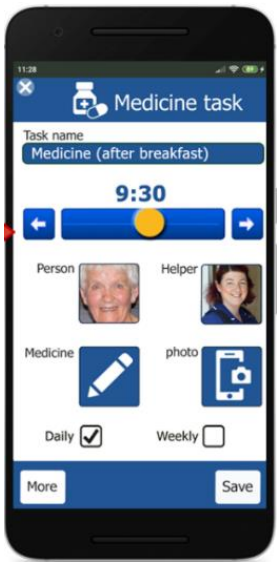


Figure 2.5: Medication Page of Elderly Care Mobile Application

2.3 Comparison Analysis

Table 2.1: Specification / Feature of Existing Application

Application Name	Senior Safety App	Dosecast	Elderly Care
User	• Elderly • Children • Caregivers	Elderly	• Elderly • Children • Caregivers
Platform	• Android • iOS	• Android • iOS	Android
Language	English	English	English
Connection Type	Online	• Online • Offline	Online
Check-in	Not Available	Not Available	Available
Location tracking	• Geo-fence Technology • Global Positioning System (GPS)	Not Available	Geo-fence Technology
Medication	• Medical Information • Doctor Information • Medicine In Use • Diseases of The Elderly	• Scheduling the medication reminder • Track the number of doses • Reminder of Medication • Smart Silencing	Reminder of Medication
Emergency	• Emergency Contact • Emergency Alert Notification • Emergency Medical Information	Not Available	Emergency Button to Call

2.4 Advantages and Disadvantages of Existing System

As mentioned in the Table 2.1, Senior Safety App is an Android-based and iOS-based application for the safety of the elderly which allows the concerned children or caregivers to monitor the elderly. The first advantage of this application is that the concerned children or caregivers can access the information of monitoring via web browser. The data of this application will be synced with the web application and this is convenient for the concerned children or caregivers to monitor the elderly without installing the application on their phone. The next advantage of this application is there are many kinds of alert features provided. The concerned children or the caregivers will instantly receive the alert notification while the elderly are in danger with different kinds of situations.

Apart from that, this application also has its disadvantages. The Senior Safety App has provided the medicine in use for the elderly but there is no medication reminder option. The elderly only allowed to view their medical information and need to install another application for the reminder. The next disadvantage is not check-in features in this application. The concerned children or caregivers are not able to monitor whether the elderly is woken up or login this application or not.

Dosecast is developed to help the elderly to remember to take their medications or pills on time. One of the advantages of this application is that the elderly is able to receive reminder notifications with or without the internet. This is beneficial for the elderly who don't have the mobile data, they will still receive the notification while they are out of the Wi-Fi area. The second advantage is the elderly can schedule their doses of medicine freely. The scheduling features can be in days, weeks or even months, this is useful for the elderly who are taking long-term medication.

Apart from that, there are a few disadvantages in this application. The first disadvantage is the interface of the Dosecast is not user friendly for the elderly. The elderly will face difficulties while using this application because of the interface and there are only a few icons provided then other is only wording. Besides, the next disadvantage is the smart silencing. The elderly would accidentally open these features and the reminder would automatically turn off. This is because all of the settings are only in normal wording and no icon.

Elderly Care: for Senior Health, Wellbeing, Safety is the all-in-one elderly care mobile application that urges the elderly safety, senior health and senior living. The first advantage of this application is the IoT sensor location technology, Geo-fence. The concerned children and the caregivers will receive the notification immediately when the elderly is entering or leave the Geo-fence area. The second advantage is that the private care group can be created by the family members. The notification will not only be sent to the certain family members and also sent to the others in that private care group.

Apart from that, this application has its own disadvantages. The first disadvantage is that no history location of the elderly for the members in the care group. The members are not able to know the last location that the elderly have been. The second disadvantage is no scheduling features for the medication. In this application, only the daily reminder of the medication for the elderly. They need to set every single day and it is not convenient for them. Table 2.2 describes the comparisons of Senior Safety App, Dosecast and Elderly Care in detail.

Table 2.2: Advantages and Disadvantages of Existing Application

Application	**Senior Safety App**	**Dosecast**	**Elderly Care: for Senior Health, Wellbeing, Safety**
Advantages	• Can be access by web browser • Many kinds of alert notification provided	• Can receive notification with or without internet • Can schedule the doses freely	• Internet of Thing (IoT) sensor location technology, Geo-fence • Can create a private care group
Disadvantages	• No reminder of medication • No check-in feature	• Not user-friendly interface • Smart Silencing	• No history location of the elderly • No scheduling features for the reminder of medication

2.5 Chapter Summary

This chapter discussed three existing mobile applications for the elderly care that have been developed which are Senior Safety App, Dosecast, Elderly Care: for Senior Health, Wellbeing, Safety. Based on these three existing mobile applications, it shows that each of the applications use different features for the elderly care. Besides, each of the mobile applications has their own advantages and disadvantages as compared to each other.

CHAPTER 3

METHODOLOGY

3.1 Introduction

A software product's full life cycle stages are defined by a software development life cycle (SDLC) model (Chowdhury et al., 2020). The time necessary for defining, developing, testing, deploying, operating, and maintaining software or systems is called the Software Development Life Cycle (SDLC) (Ergasheva & Kruglov, 2020). A well-articulated software development life cycle (SDLC) model is used to create high-quality software (Akinsola et al., 2020). The model is used to break down the project into many steps. Each activity is designed to ensure that the project is well-planned and managed. A particular software development life cycle will be chosen to ensure that the development process of this project is organized, well-planned, and always on the right track. A proper and appropriate model is critical for ensuring the delivery of a validated system that meets the customers' objectives and expectations without jeopardizing the project's budget and timeline. Currently, there are various types of methodologies that are designed for a precise aim, such as Waterfall, Iterative and Incremental, Spiral, Prototype, V-Shaped, Rapid Application Development (RAD), and Agile Model.

The Rapid Application Development (RAD) model will be the methodology of project development. Over a lengthy action and testing cycle, the Rapid Application Development (RAD) model is a progressive development paradigm that constantly emphasizes fast prototyping and quick feedback from clients. In this chapter, the methodology used in this project, the project requirement, the details of the proposed design, the hardware and software used, and the application prototype will be disclosed at the end of this chapter.

3.2 Methodology

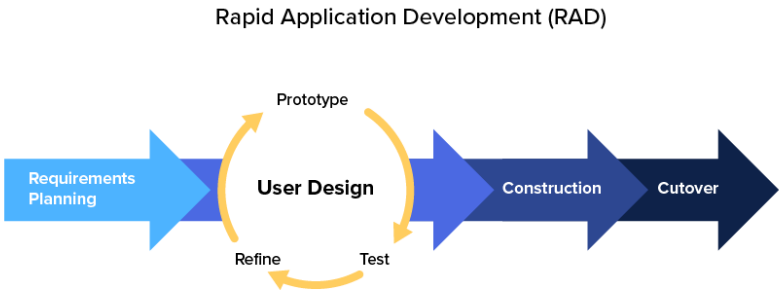


Figure 3.1: Lifecycle of Rapid Application Development (RAD)

Rapid Application Development is the methodology that was conceived in the 1980s and focused on fast building applications by stably releasing them and receiving continuous feedback. The main aim of the RAD model is to reduce planning to focus on a highly iterative design and construction process. It allows the teams to achieve more in less time while maintaining client satisfaction. This methodology follows four main phases, which are Requirements Planning, User Design, Construction and Cutover as shown in Figure 3.1.

First of all, the rapid application development cycles start with defining a set of project requirements in this planning phase. It is similar to how traditional development cycles begin with the project scope. The project's requirements and procedures for dealing with any challenges throughout development will be determined in this phase. Planning is an essential step for the success of the whole project. Besides, the problem statement, objectives, scopes, risks, and constraints of the ElderCare mobile application are clearly defined in this phase. This phase will also identify the hardware and software requirements since this is integral in the development phases. It is crucial that plan the project goals and expectations at this phase.

After that, the next phase is the User Design phase which is the main element of the rapid development cycles. There are three sub-phases in this phase: Prototype, Test, and Refine. In this phase, the ElderCare mobile application prototype model will be

designed once the project's scope has been defined. During this phase, the clients will work with developers to guarantee that their requirements are met in the design process. Instead of attempting to make abstract evaluations of a design document, the usage of prototypes can enable user interaction, testing, and feedback. The nature of this phase is to design the prototype and let the user test it, then refine the prototype on what is working and what doesn't. Then these steps are repeated in this phase. The developers may quickly assess the viability of complicated components through prototyping. As a result, the application is more reliable, less prone to errors, and better organized for future design enhancement.

Furthermore, the next phase is the Construction phase. The construction phase transforms the prototype and beta application into a functional model via coding, testing, and unit integration. The coding for ElderCare mobile application has occurred that will change the system design into the working model to demonstrate it to the user. In this phase, applications are rigorously tested to ensure that the final product meets the user's expectations and objectives. The feedback from the user on the interface and functionality will be collected, then the improvement of all aspects can be made in this phase.

Last but not least, the final phase of the rapid application development cycle is the Cutover phase. The final product is implemented and goes for deployment in this phase. In this phase, all of the requirements and satisfaction of the user are fully met and achieved. On the other hand, in this last stage of the rapid application development cycle is optimizing implementation to increase the stability and maintainability as the product is ready to launch.

3.3 Advantages and Disadvantages of the Rapid Application Development model

Every software development life cycle has its pros and cons. The first advantage of rapid application development is the requirements can be changed at any time. This is because the second phase of rapid application development is an iterative phase. The prototype is built in this phase depending on the feedback from the previous iteration, the requirement will be changed from time to time. Next, the second advantage is simple adaptability because it's flexible to change the criteria. Besides, the following advantage is that this software development life cycle is suitable for early system integration. Because of this, the risk of the project was dramatically reduced. Since each phase of the rapid application development model provides the user with the primary focus functionality, the user feedback will constantly be provided in each stage.

Apart from that, there are some disadvantages to rapid application development. The first disadvantages of the rapid application development is this model only suitable for projects which only have a short development time. Because the framework of rapid application development framework is always focused on speed, so it takes lesser time as compared to the other software development life cycle. Then, the rapid application development model is complex to manage when compared to other models since the requirements is changed from time to time. Furthermore, the rapid application development is difficult to manage with large scale project because its need a lots of prototype before the final product for the deployment. Moreover, its needs frequent interactions with the user. The user was able to offer feedback on what functions were needed throughout the development process. All of those features were quickly added as and when they were needed, and the product was eventually delivered to the user. The Table 3.1 shows the summary of the advantages and disadvantages of the RAD model.

Table 3.1: Advantages & Disadvantages of the RAD model

Advantages	Disadvantages
Requirements can be changed at any time	Only suitable for projects which only have a short development time
Simple adaptability	Complex to manage when compared to other models
Early system integration & risk reduction	Difficult to manage with large scale projects

Constant user feedback	Demands frequent interactions with the user

3.4 Work Breakdown Structure (WBS)

Placement in an appendix A.

3.5 Project Requirement

3.5.1 Functional Requirement

1. Authentication of the user when they login to the application.
2. Recording the information of the medicine.
3. Scheduling and setting reminders for medication.
4. The elderly are allowed to locate themselves
5. Joining the other user circle to track the real-time location.
6. Tracking the real-time of the device of the elderly.
7. Calling an emergency centre by clicking the emergency button.

3.5.2 Non-functional Requirement

1. Performance

When the user opens the application, the initial screen should not take more than 3 seconds to load.

2. Reliability

The user should access the features consistently without failure and error.

3. Usability

The user should easily determine and navigate the user interface.

4. Security

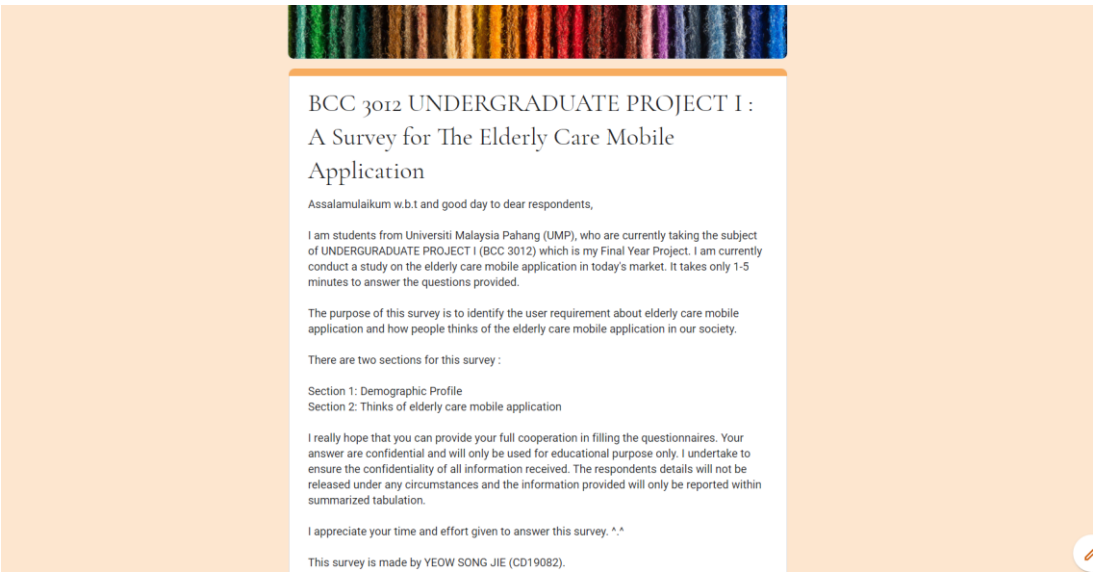
The user information should be encrypted and stored in the database confidentially.

3.5.3 Constraints and Limitations

1. The history of the location only stored in the database within 15 days.
2. The internet connection is needed when using the location tracking features.
3. The emergency button only can contact the family members and caregivers, no alert information is provided.

3.5.4 User Requirement

The first section is about the demographic profile of the respondents, and thinking of elderly care mobile applications is the second section. The method that has been used is the questionnaire. An evaluation with the user is carried out to ensure that the design and application actually behave as expected and meet the user requirement.



BCC 3012 UNDERGRADUATE PROJECT I : A Survey for The Elderly Care Mobile Application

Assalamulaikum w.b.t and good day to dear respondents,

I am students from Universiti Malaysia Pahang (UMP), who are currently taking the subject of UNDERGURADUATE PROJECT I (BCC 3012) which is my Final Year Project. I am currently conduct a study on the elderly care mobile application in today's market. It takes only 1-5 minutes to answer the questions provided.

The purpose of this survey is to identify the user requirement about elderly care mobile application and how people thinks of the elderly care mobile application in our society.

There are two sections for this survey :

Section 1: Demographic Profile
Section 2: Thinks of elderly care mobile application

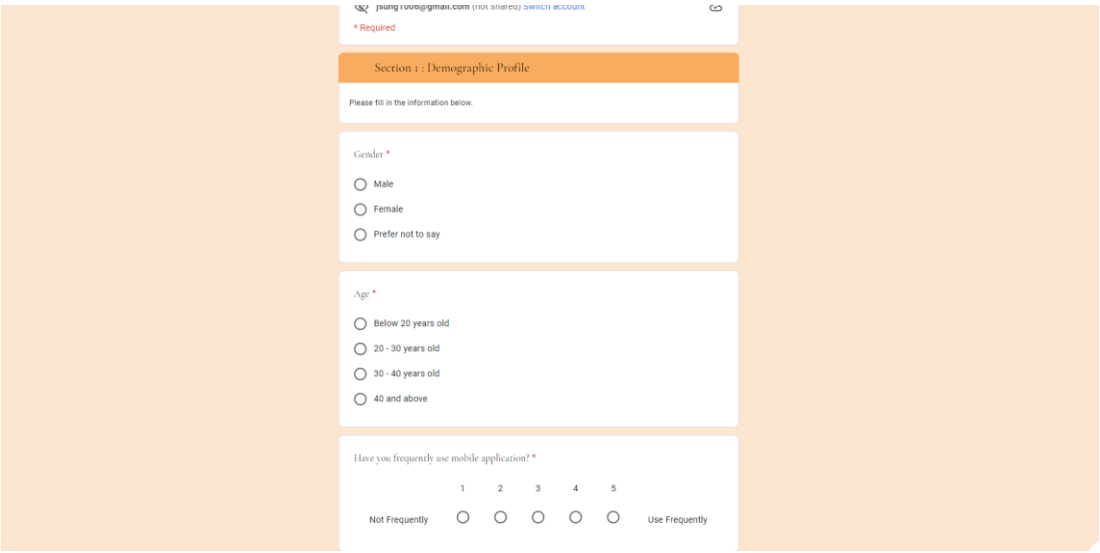
I really hope that you can provide your full cooperation in filling the questionnaires. Your answer are confidential and will only be used for educational purpose only. I undertake to ensure the confidentiality of all information received. The respondents details will not be released under any circumstances and the information provided will only be reported within summarized tabulation.

I appreciate your time and effort given to answer this survey. ^.^

This survey is made by YEOW SONG JIE (CD19082).

Figure 3.2: Questionnaire of User Requirement

3.5.4.1 Section 1



* Required

Section 1 : Demographic Profile

Please fill in the information below.

Gender *

- Male
- Female
- Prefer not to say

Age *

- Below 20 years old
- 20 - 30 years old
- 30 - 40 years old
- 40 and above

Have you frequently use mobile application? *

	1	2	3	4	5	
Not Frequently	○	○	○	○	○	Use Frequently

Figure 3.3: Questionnaire of User Requirement

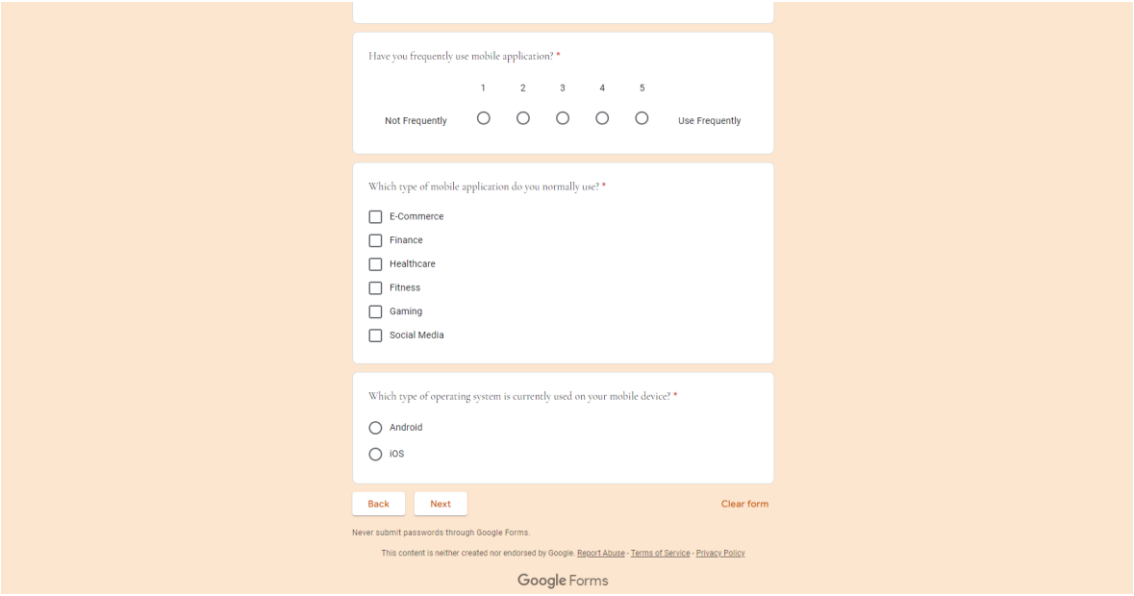


Figure 3.4: Questionnaire of User Requirement

3.5.4.2 Section 2

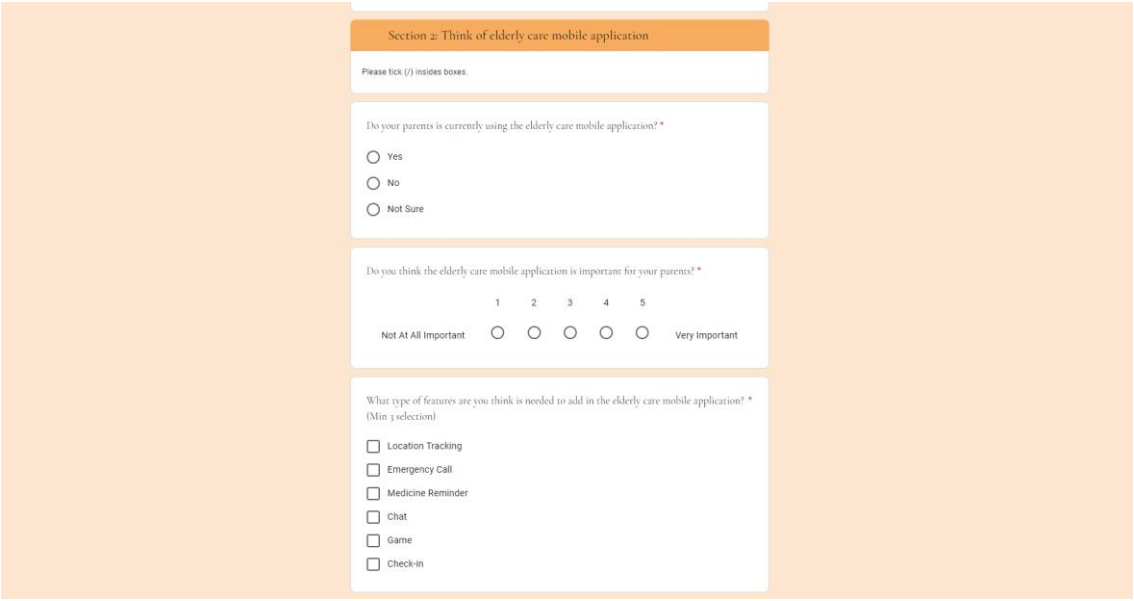


Figure 3.5: Questionnaire of User Requirement

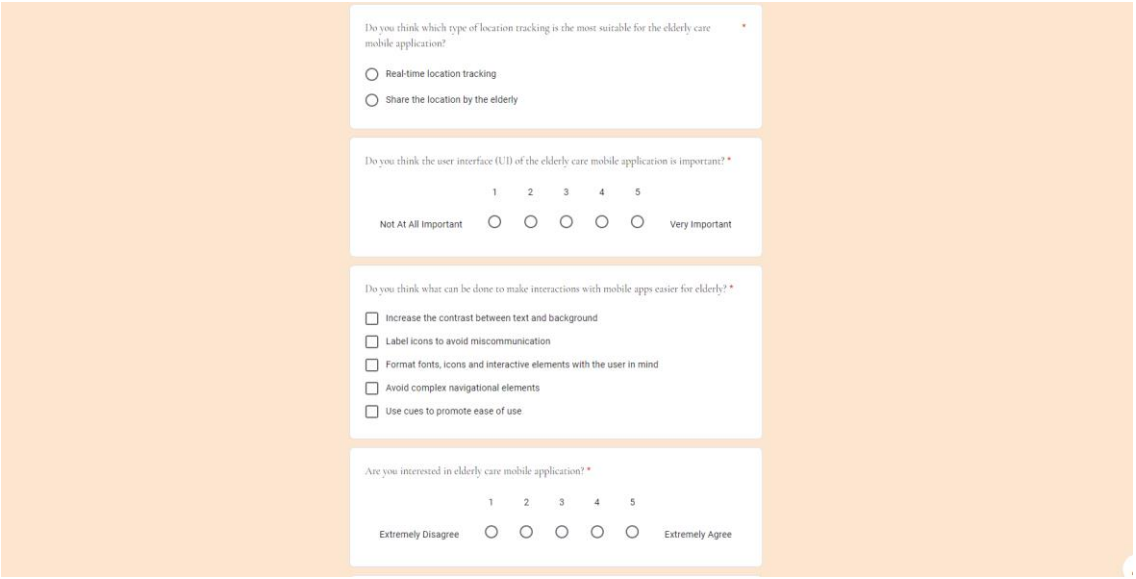


Figure 3.6: Questionnaire of User Requirement

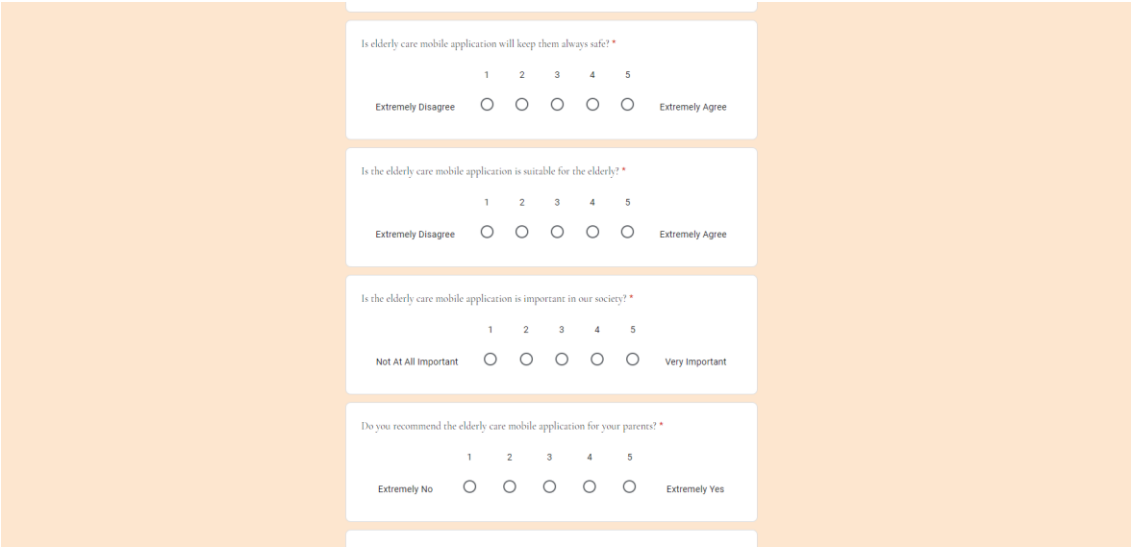


Figure 3.7: Questionnaire of User Requirement

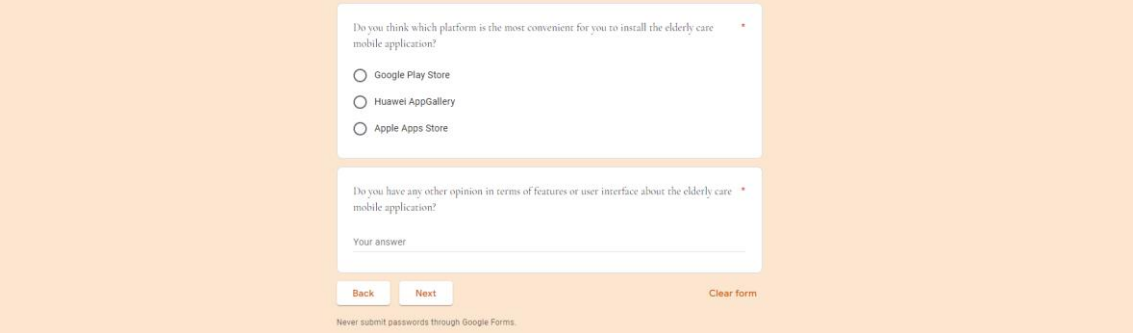


Figure 3.8: Questionnaire of User Requirement

3.5.5 Data Presentation

3.5.5.1 Section 1

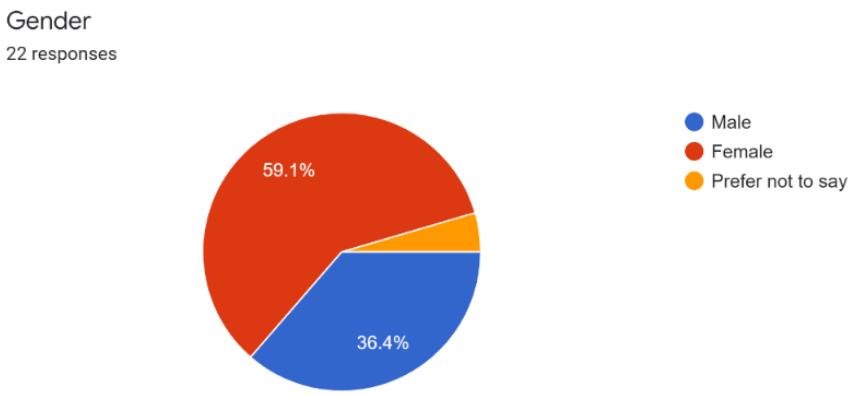


Figure 3.9: Question 1 in Section 1 of the questionnaire

13 out of 22 respondents which 59.1% are female, outnumbering the male respondents by 8 which 36.4% and others prefer not to say as shown in Figure 3.9.

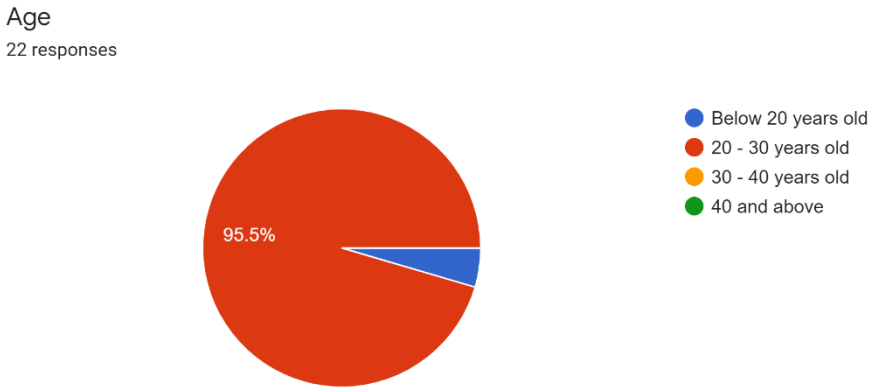


Figure 3.10: Question 2 in Section 1 of the questionnaire

The respondents of this survey are mostly from the age group between 20 to 30 years old which is 95.5%, whereas only 1 of them which is 4.5% are below the age 20 as shown in Figure 3.10.

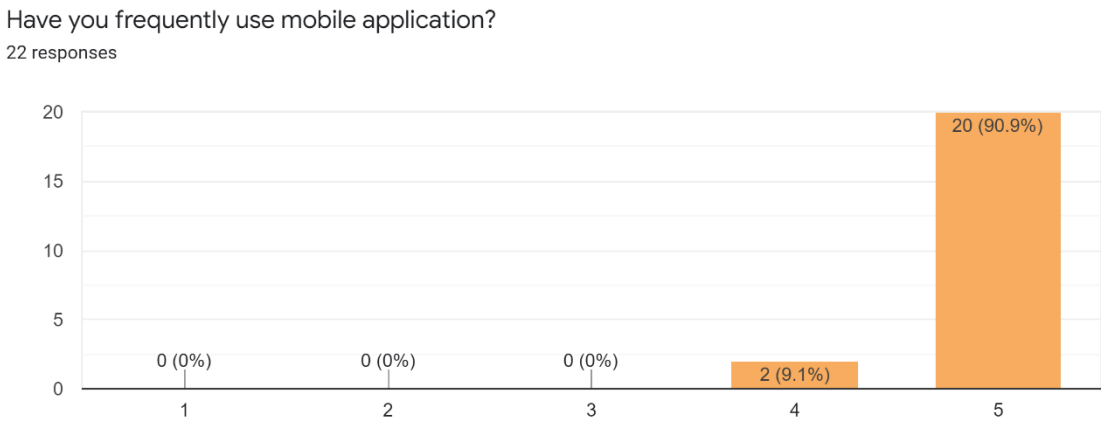


Figure 3.11: Question 3 in Section 1 of the questionnaire

There are 90.9% of respondents is the most frequently used mobile application whereas only 9.1% which is 2 out of 22 respondents are frequently use the mobile application as shown as Figure 3.11.

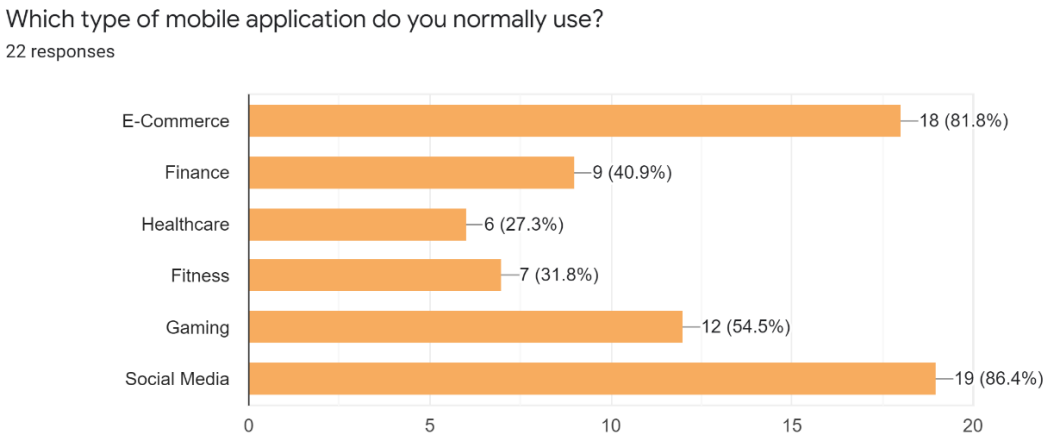


Figure 3.12: Question 4 in Section 1 of the questionnaire

Social media is the type of mobile application that respondents mostly use which 86.4% and there are 18 out of 22 respondents is normally using mobile e-commerce application. The Finance and Fitness type of mobile application is 40.97% and 31.8% of

respondents in this survey. Only 27.3% of respondents are normally using the mobile healthcare application as shown as Figure 3.12.

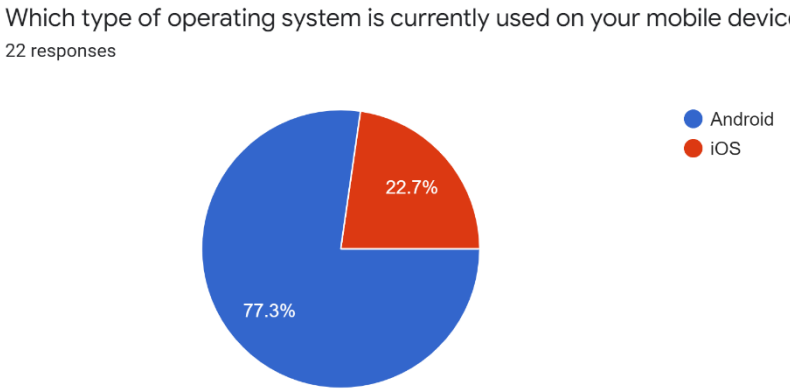


Figure 3.13: Question 5 in Section 1 of the questionnaire

17 of 22 respondents of this survey currently used the Android operating system on their mobile devices whereas only 22.7% of respondents used the iOS operating system on their mobile devices as shown as Figure 3.13.

3.5.5.2 Section 2

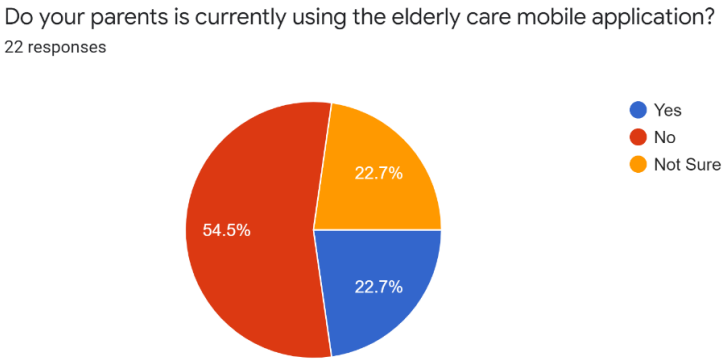


Figure 3.14: Question 1 in Section 2 of the questionnaire

The first question of section 2 is about the parents of the respondents. There are 54.5% of the respondents' parents currently is not using the elderly care mobile

application whereas there are only 5 out of 22 respondents is Yes and Not Sure as shown as Figure 3.14.

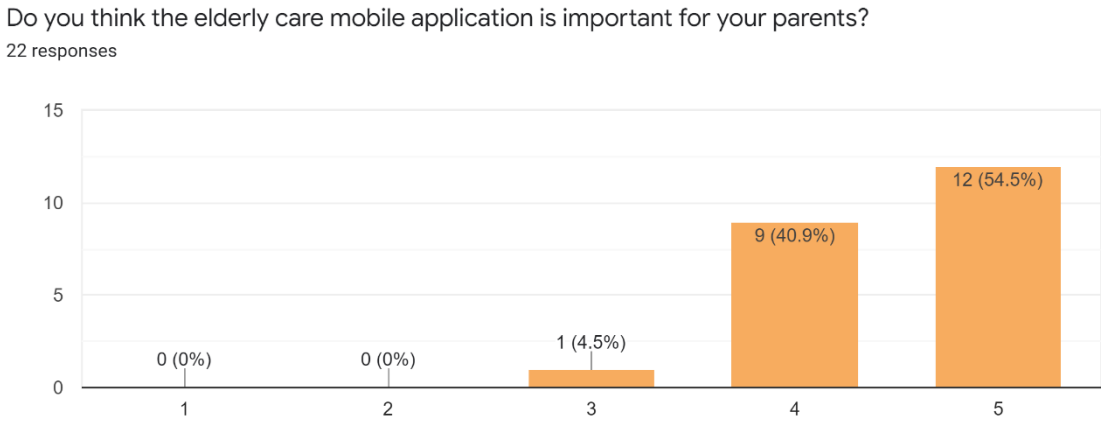


Figure 3.15: Question 2 in Section 2 of the questionnaire

12 out of 22 respondents thinks that the elderly care mobile application is very important for their parents whereas 40.9% of respondents thinks that the elderly care mobile application is important for their parents and only 1 respondent is neutral for this question as shown as Figure 3.15.

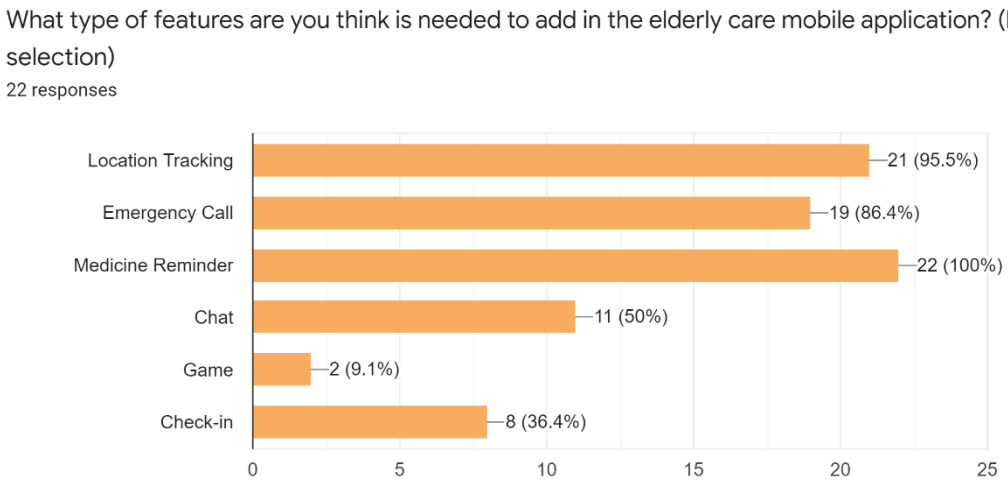


Figure 3.16: Question 3 in Section 2 of the questionnaire

The three most of the features selected by the respondents is Medicine Reminder, Location Tracking and Emergency Call, which is 100%, 95.5% and 86.4%. There are 11 out of 22 respondents selected Chat and 11 out of 22 respondents is selected Check-in. Only 9.1% of respondents selected Game features as shown as Figure 3.16.

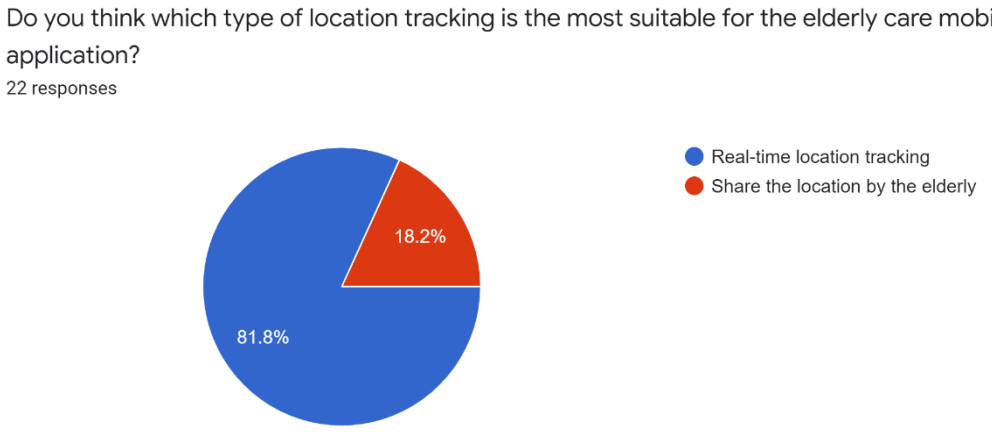


Figure 3.17: Question 4 in Section 2 of the questionnaire

18 out of 22 respondents which 81.8% thinks that real-time location tracking is the most suitable type of location tracking for the elderly care mobile application, where 4 of the respondents 18.2% thinks that sharing the location by the elderly is the most suitable type of location tracking for the elderly care mobile application as shown as Figure 3.17.

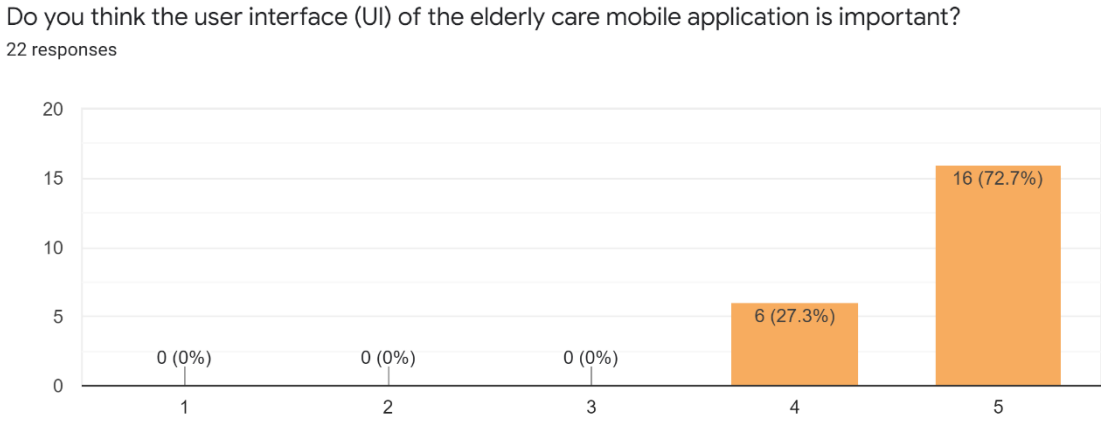


Figure 3.18: Question 5 in Section 2 of the questionnaire

16 out of 22 respondents which 72.7%, think that the user interface (UI) of the elderly care mobile application is very important, whereas 27.3% of respondents think that the user interface (UI) is important for the elderly care mobile application as shown as Figure 3.18.

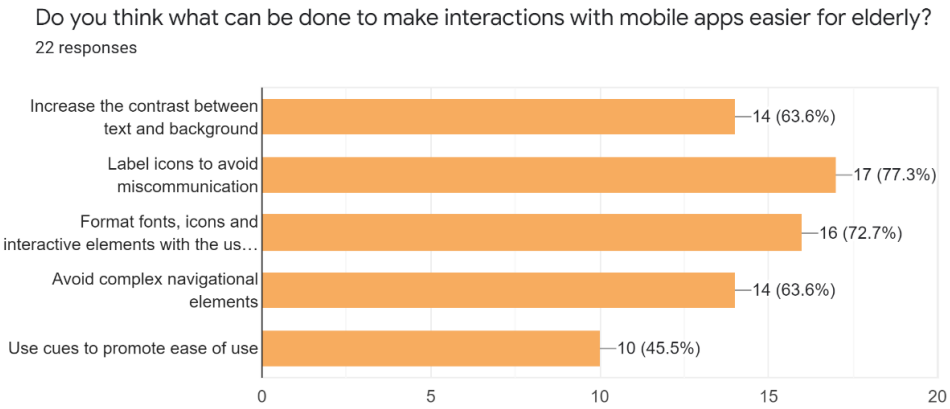


Figure 3.19: Question 6 in Section 2 of the questionnaire

There are 77.3% of respondents think that the label icons to avoid miscommunication is easier for the elderly and 16 out of 22 respondents think that format font, icon and interactive elements with the user in mind is easier for the elderly. There are the same number of respondents which is 14 out of 22 respondents is select to increase the contrast between text and background and avoid the complex navigational elements. Only 10 out of 22 respondents think that using cues to promote ease of use is easier for the elderly as shown as Figure 3.19.

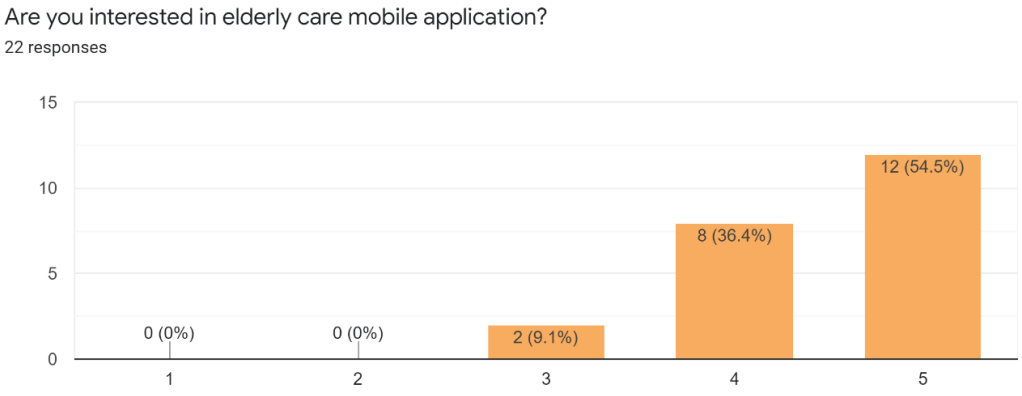


Figure 3.20: Question 7 in Section 2 of the questionnaire

12 out of 22 respondents are very interested in the elderly care mobile application whereas 36.4% of the respondents are interested in the elderly care mobile application. Only 9.1% of the respondents are neutral on this question as shown as Figure 3.20.

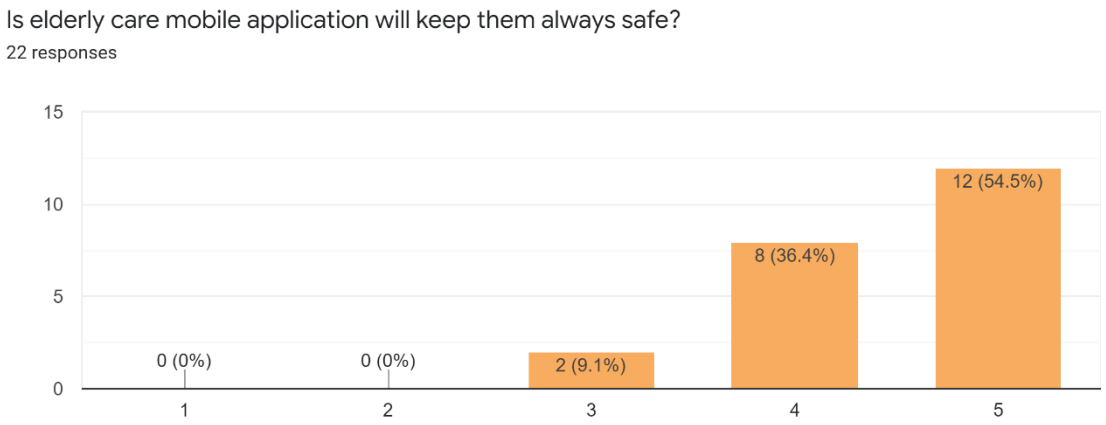


Figure 3.21: Question 8 in Section 2 of the questionnaire

There 54.5% of the respondents extremely agree that the elderly care mobile application will keep them always safe and 8 out of 22 respondents agree with the question. Only two respondents were neutral with the question as shown as Figure 3.21.

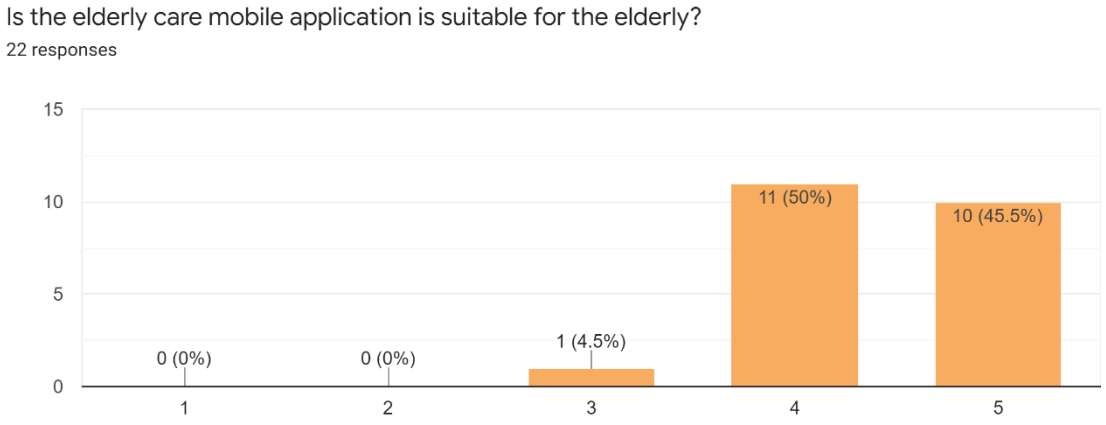


Figure 3.22: Question 9 in Section 2 of the questionnaire

11 out of 22 respondents agree that the elderly care mobile application is suitable for the elderly whereas 45.5% of the respondents agree that the elderly care mobile application is suitable for the elderly. Only one respondent was neutral with this question as shown as Figure 3.22.

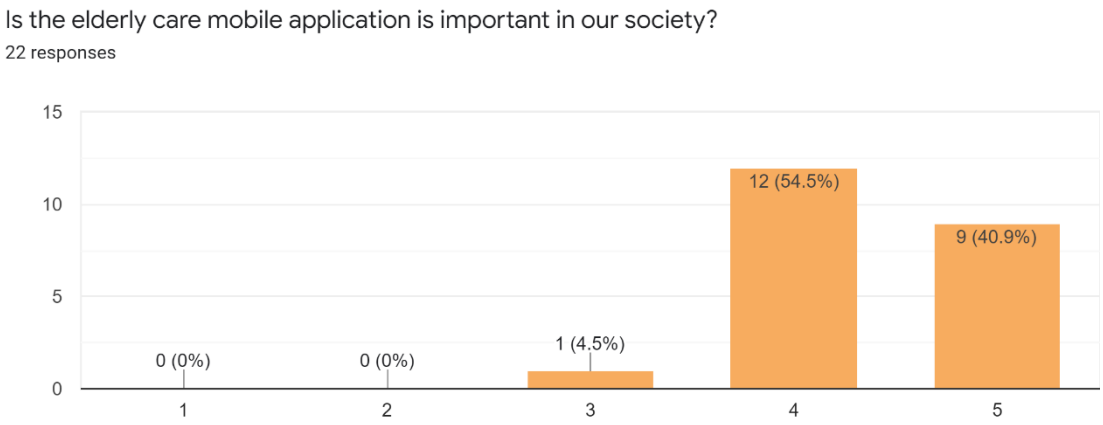


Figure 3.23: Question 10 in Section 2 of the questionnaire

54.5% of the respondents think that the elderly care mobile application is important in our society whereas 9 out of 22 respondents think that the elderly care mobile application is critical in our society. Only one respondent is neutral on this question as shown as Figure 3.23.

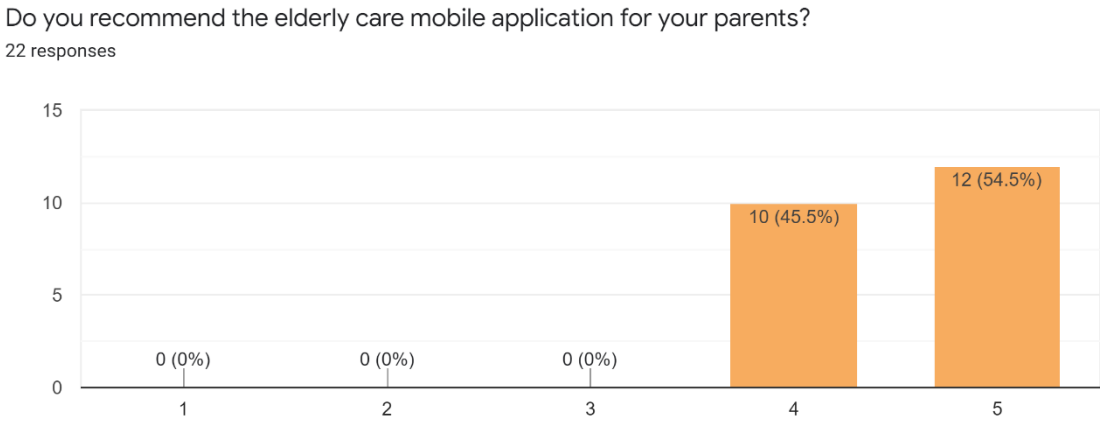


Figure 3.24: Question 11 in Section 2 of the questionnaire

12 out of 22 respondents think that they will highly recommend the elderly care mobile application for their parent, whereas 45.5% think they will recommend the elderly care mobile application for their parent as shown as Figure 3.24.

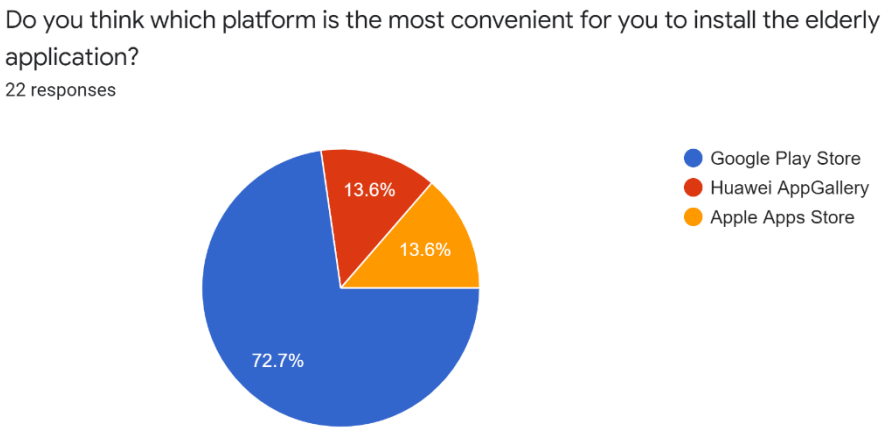


Figure 3.25: Question 12 in Section 2 of the questionnaire

There are 72.7% of the respondents think that Google Play Store is the most convenient for them to install the elderly care mobile application, whereas the same number of the respondents which is three respondents think that Huawei AppGallery and Apple Apps Store are the most convenient for them to install the elderly care mobile application as shown as Figure 3.25.

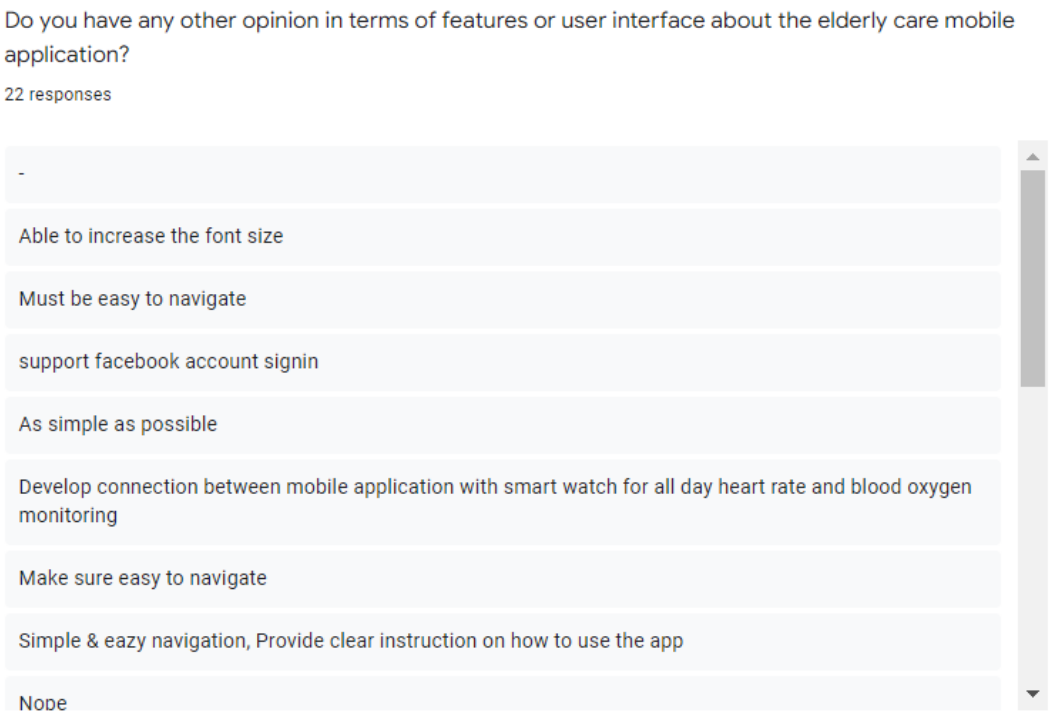


Figure 3.26: Question 13 in Section 2 of the questionnaire

Figure 3.27: Question 13 in Section 2 of the questionnaire

Figure 3.28: Question 13 in Section 2 of the questionnaire

These are 22 responses, which is their opinion regarding the features or user interface of the elderly care mobile application as shown as Figure 3.26, Figure 3.27 and Figure 3.28.

3.6 Proposed Design

3.6.1 General Architecture

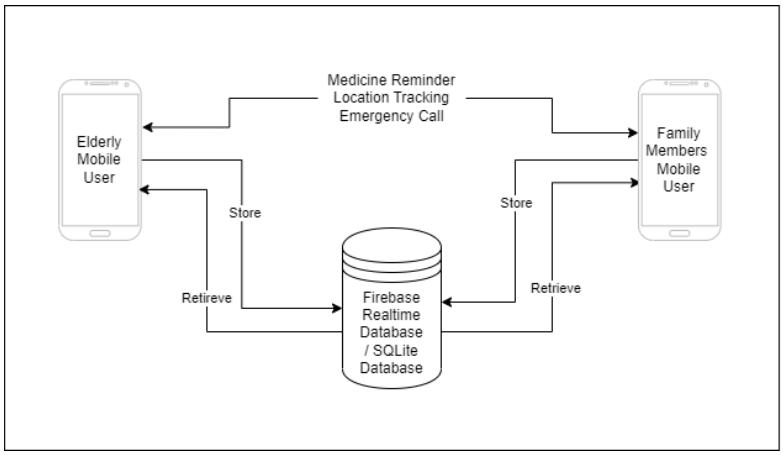


Figure 3.29: General Architecture of ElderCare Mobile Application

Figure 3.29 shows that the general architecture of this ElderCare mobile application project is that two types of users will use this application. The elderly user can use their mobile devices to open the application and then use the features implemented in this application such as medicine reminder, location tracking and emergency call. However, the family members can use their mobile devices to open the application and then use the features implemented in this application which same with the elderly. Then, the data of the location and the user will be stored in the Firebase Realtime Database. The data of the information of the medication will be stored in the SQLite Database. The user can store and retrieve the data in the application.

3.6.2 Flowchart

Placement in an appendix B. The flowchart shows the overall system flowchart of the proposed ElderCare Mobile Application. The system starts with the login of the user. If the user is registered, the user can log in to the application. If not the user needs to register an account and the user information will be saved in the database. After that, the user will navigate to the home screen. On the home screen, the user can view the application's settings and view the user profile that registered. In the settings menu, the user can manage account to edit the user information, search settings, manage the parent or family member and caregivers information which depends on the user type, manage code, manage notification, manage notification, manage privacy and security, view help and support, view about and the user logout.

Apart from that, from the home screen, the user may change the tab representing the four features, check-in, medicine reminder, location tracking and emergency call. Firstly, in the check-in feature, the user can click the button to check in the application, and then the email will be sent to the family members and caregivers as a notification for them. Next, the user can navigate to the medicine reminder by clicking the medicine reminder icon in the bottom menu. Then, the user can input the medicine information and schedule the date and time in this feature to set the reminder for the medicine.

Besides, the elderly can locate their location in the location tracking tab and share it with family members and caregivers. Meanwhile, the family member and caregivers can real-time track the location of the elderly and view the location history of the elderly. After that, in the emergency call tab, the elderly can call their family member or caregivers by clicking the same button as the family member and caregivers. They can click the button to call the elderly immediately by using this feature.

3.6.3 Context Diagram

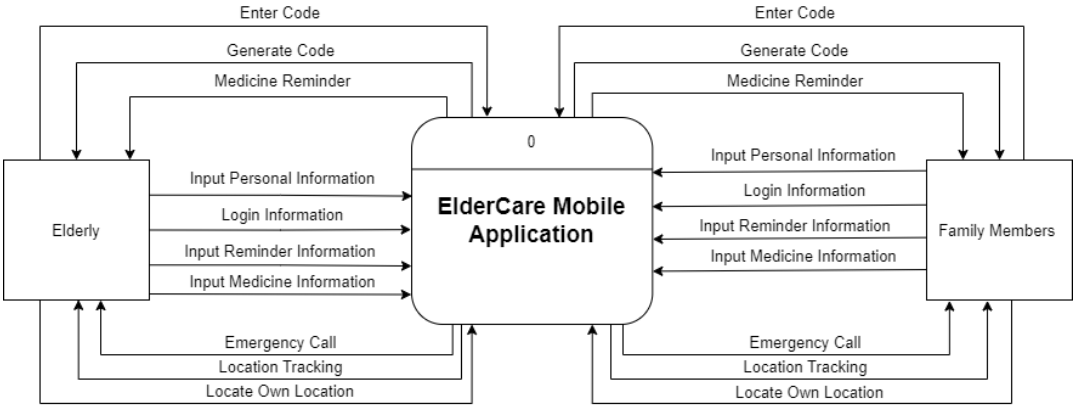


Figure 3.30: Context Diagram of ElderCare Mobile Application

Figure 3.30 shows the context diagram of the ElderCare Mobile Application that defines the general flow of data between the entities and the system. The ElderCare Mobile Application consists of two entities: the elderly and the family member. The elderly will input the personal information, login information, input reminder information, input medicine information, enter code into the system and locate own location. It will also receive the medicine reminder, emergency call, location tracking and the generated code from the system.

Meanwhile, the send and receive data for the family members is the same with the elderly in the system. The family members will receive the generated code from the system, emergency call, location tracking and medicine reminder. Then, the family members can send the personal information, login information, input reminder information, send medicine information, locate own location and enter the code into the system.

3.6.4 Use Case Diagram

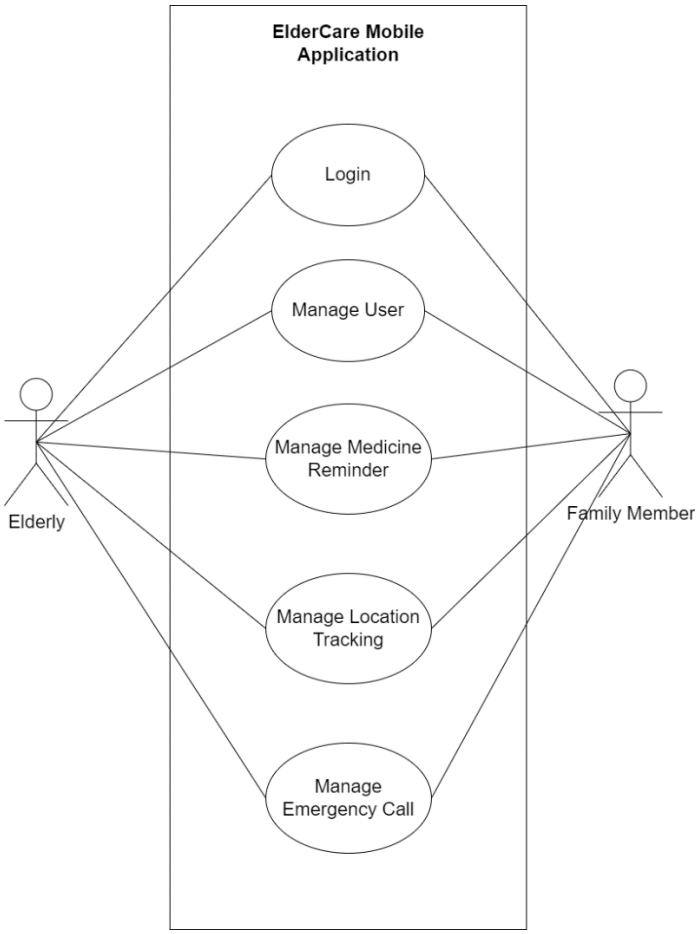


Figure 3.31: Use Case Diagram of ElderCare Mobile Application

Figure 3.31 shows the use case diagram of the ElderCare Mobile Application. The ElderCare Mobile Application consists of five main functionalities: login, manage user, manage medicine reminder, manage location tracking, and manage the emergency call. The actors of the ElderCare Mobile Application are the elderly and the family members. The elderly can assess login, manage user, manage medicine reminders, manage location tracking and manage emergency call functionalities. Meanwhile, the family member can assess the login, manage users, manage medicine reminder, manage location tracking and manage emergency call functionalities.

3.6.5 Activity Diagram

3.6.5.1 Login

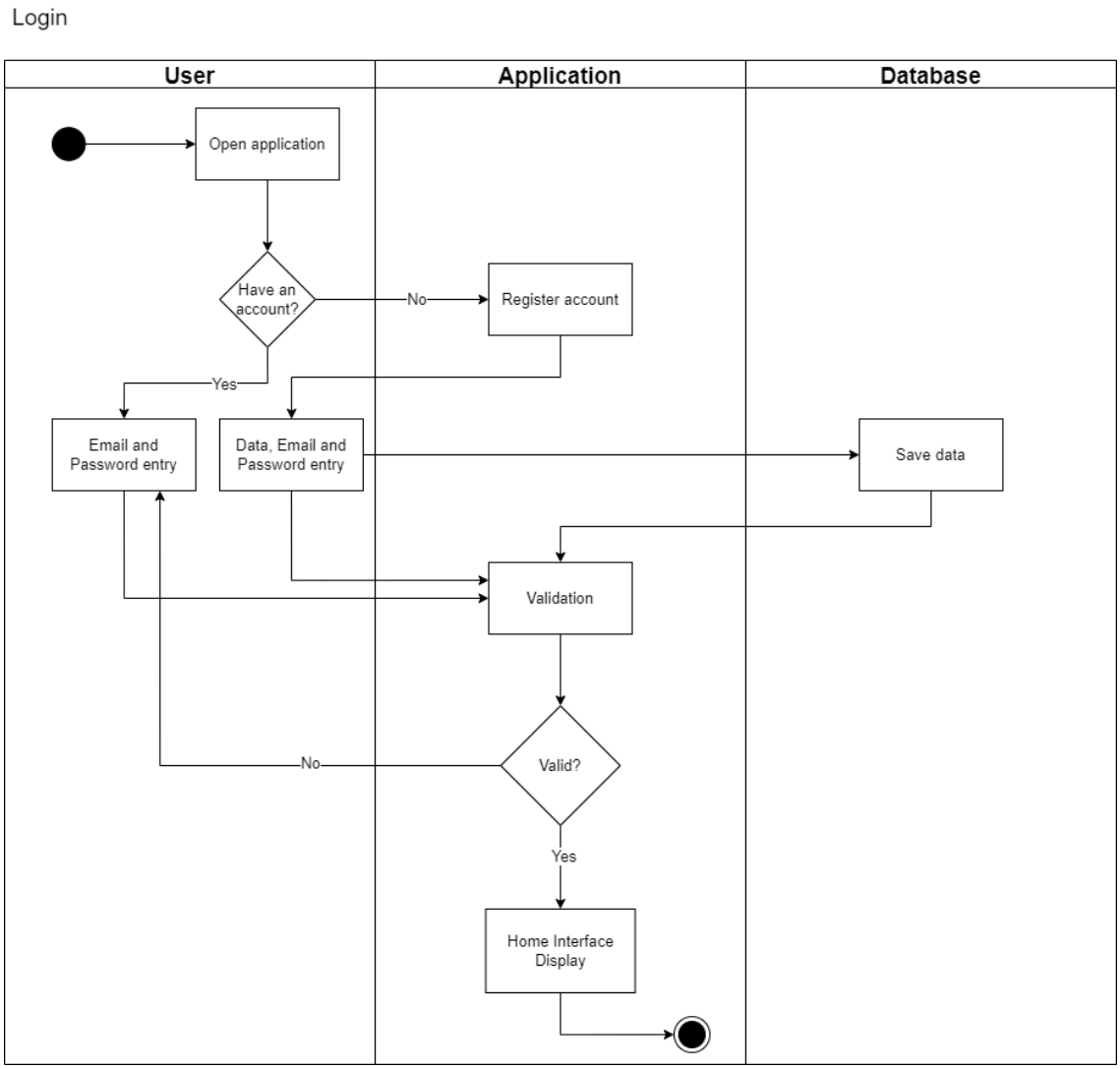


Figure 3.32: Activity Diagram of Login

3.6.5.2 Manage User

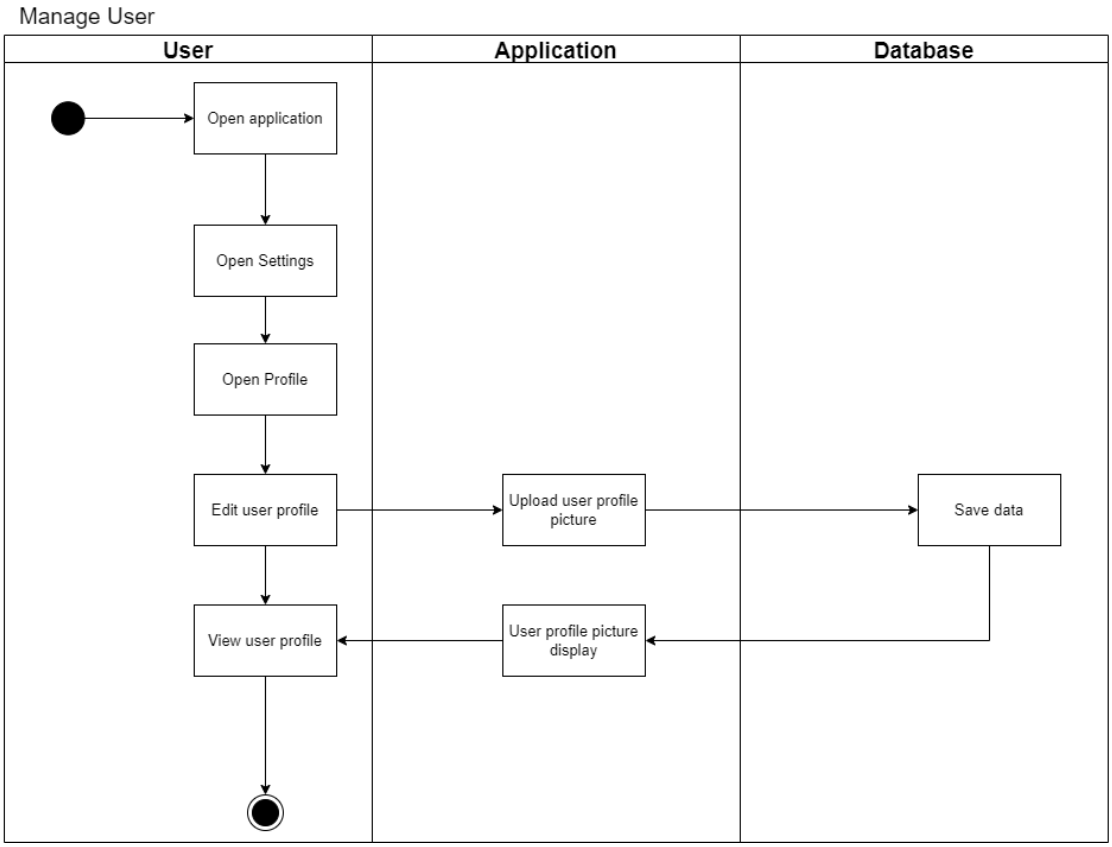


Figure 3.33: Activity Diagram of Manage User

3.6.5.3 Manage Medicine Reminder

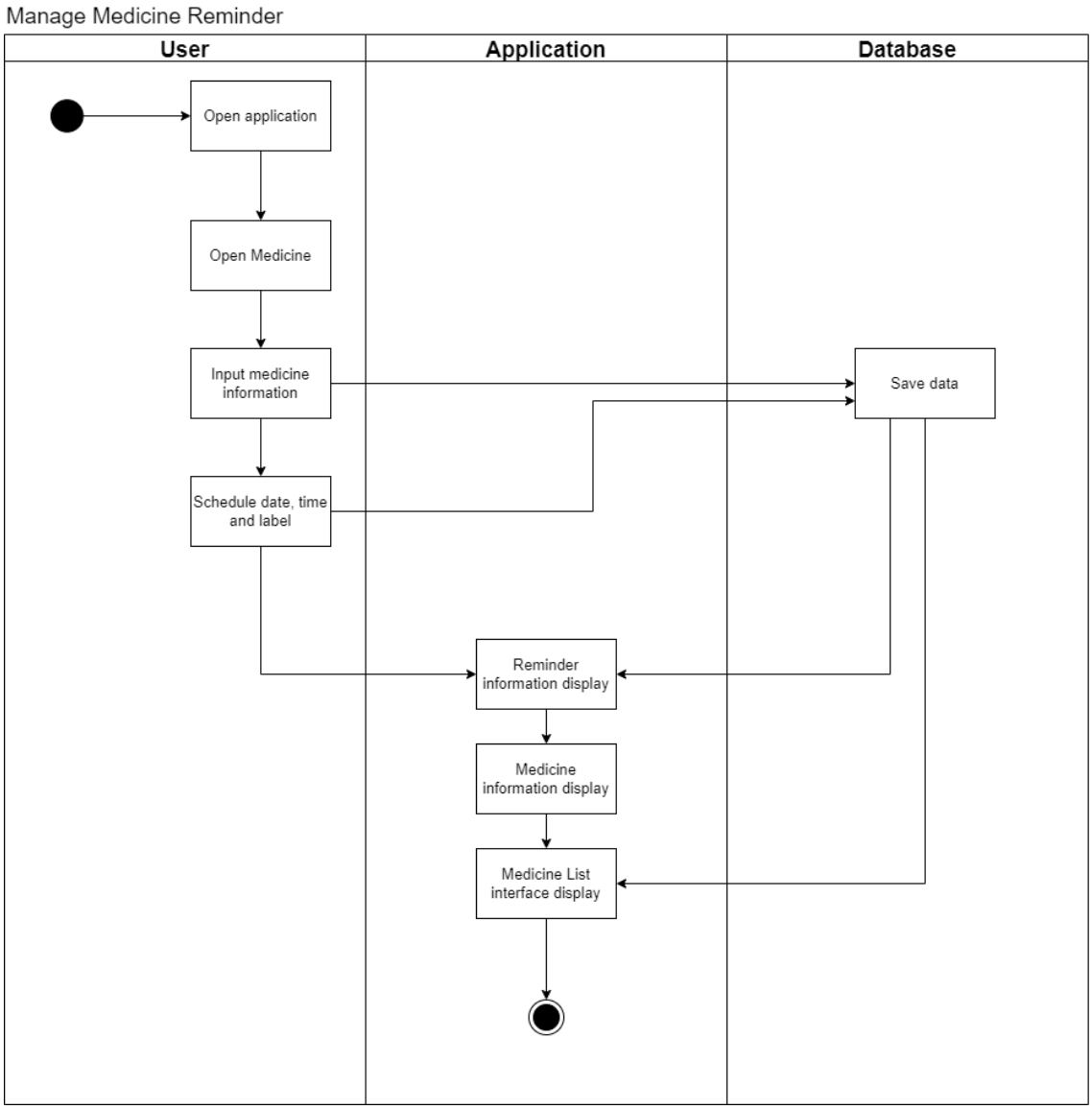


Figure 3.34: Activity Diagram of Manage Medicine Reminder

3.6.5.4 Manage Location Tracking

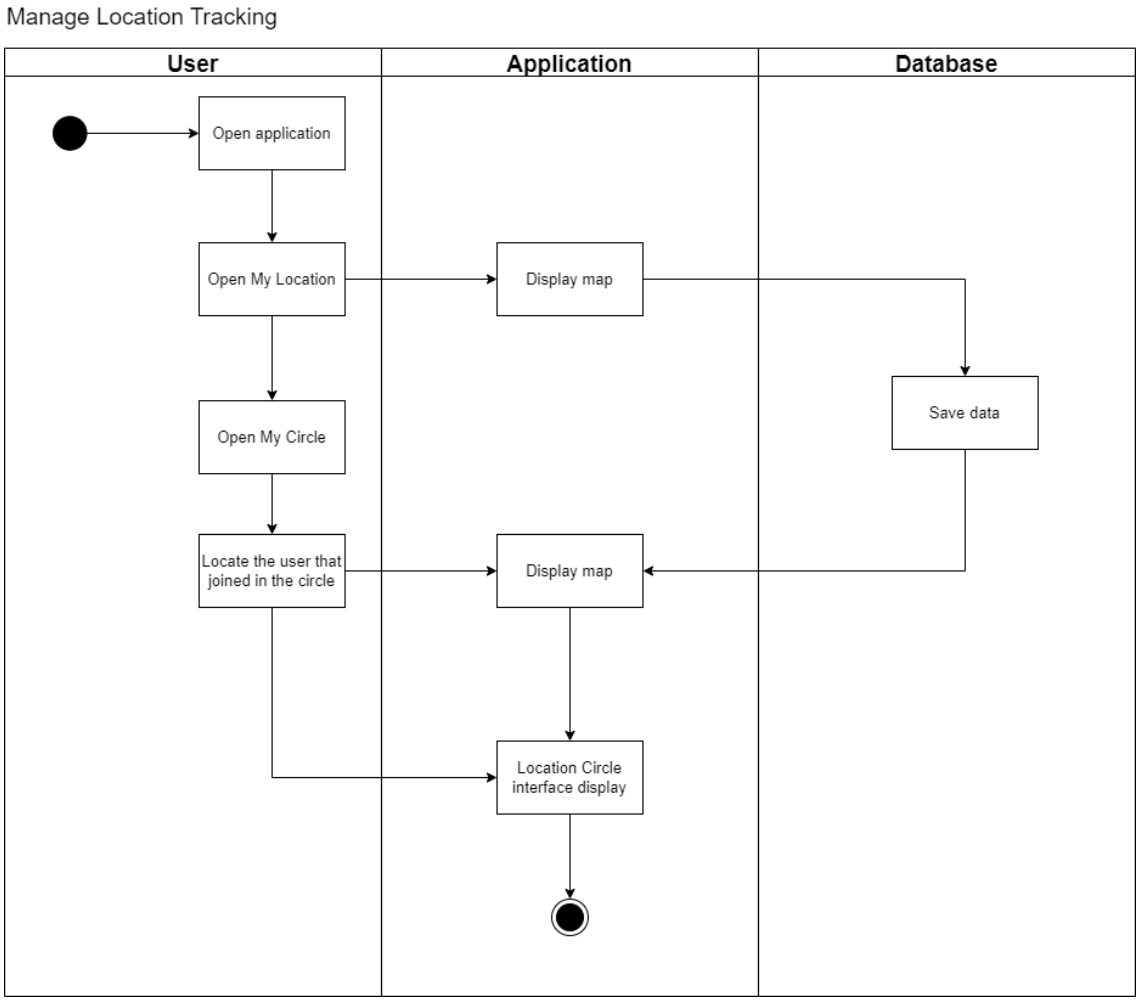


Figure 3.35: Activity Diagram of Manage Location Tracking

3.6.5.5 Manage Emergency Call

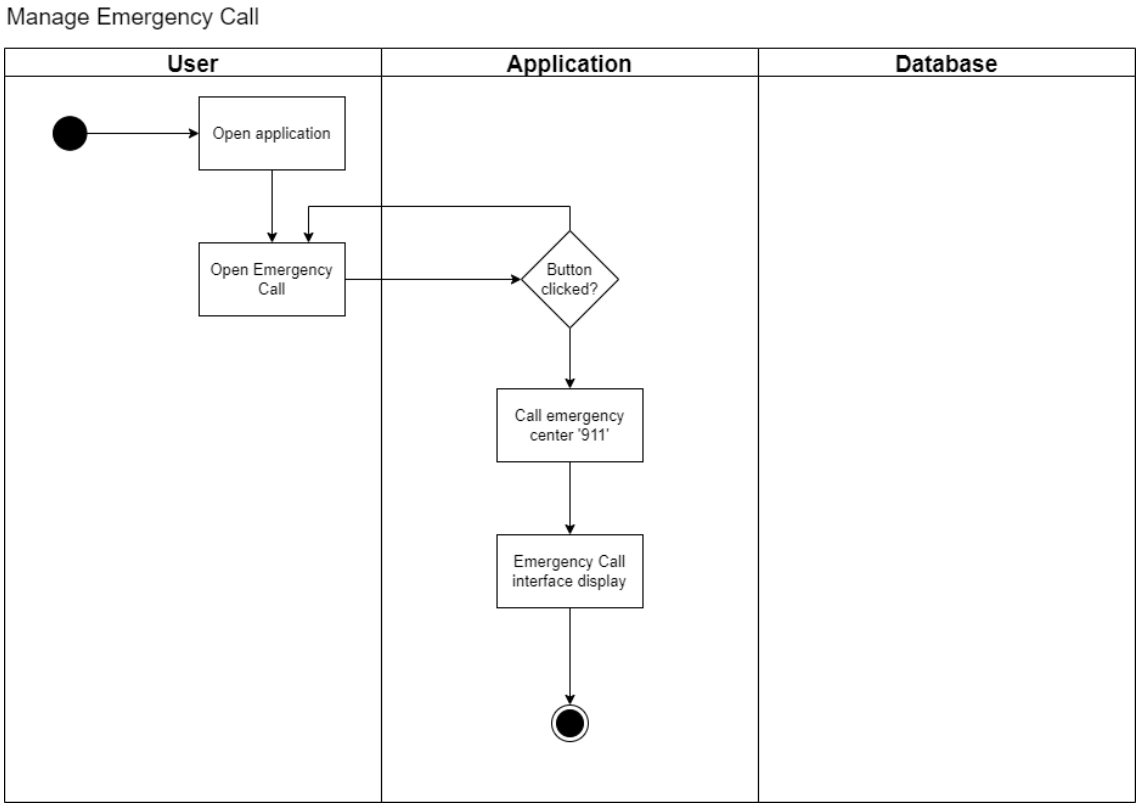


Figure 3.36: Activity Diagram of Manage Emergency Call

3.6.5.6 Login – Family Members

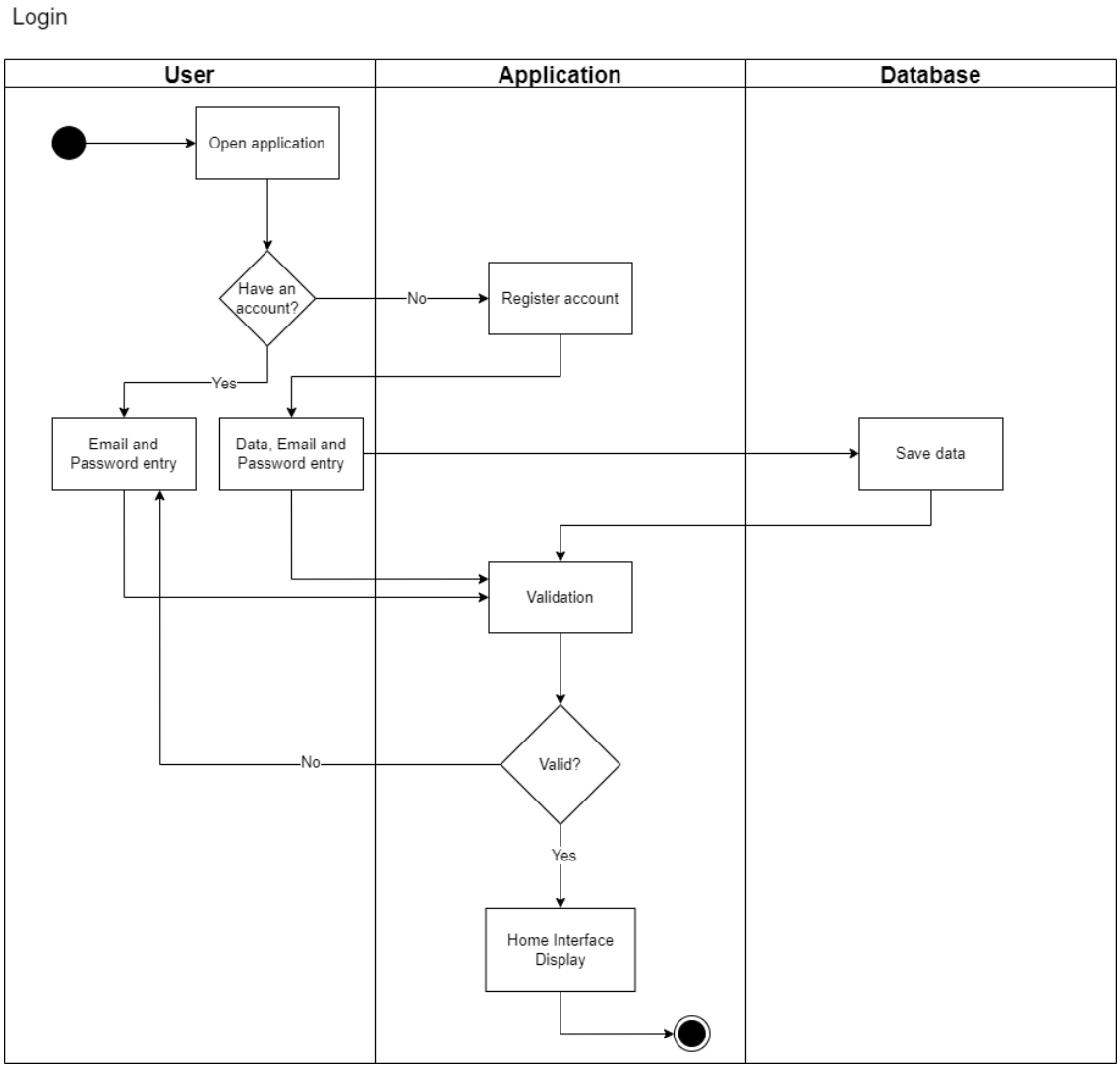


Figure 3.37: Activity Diagram of Login for the family members

3.6.5.7 Manage User – Family Members

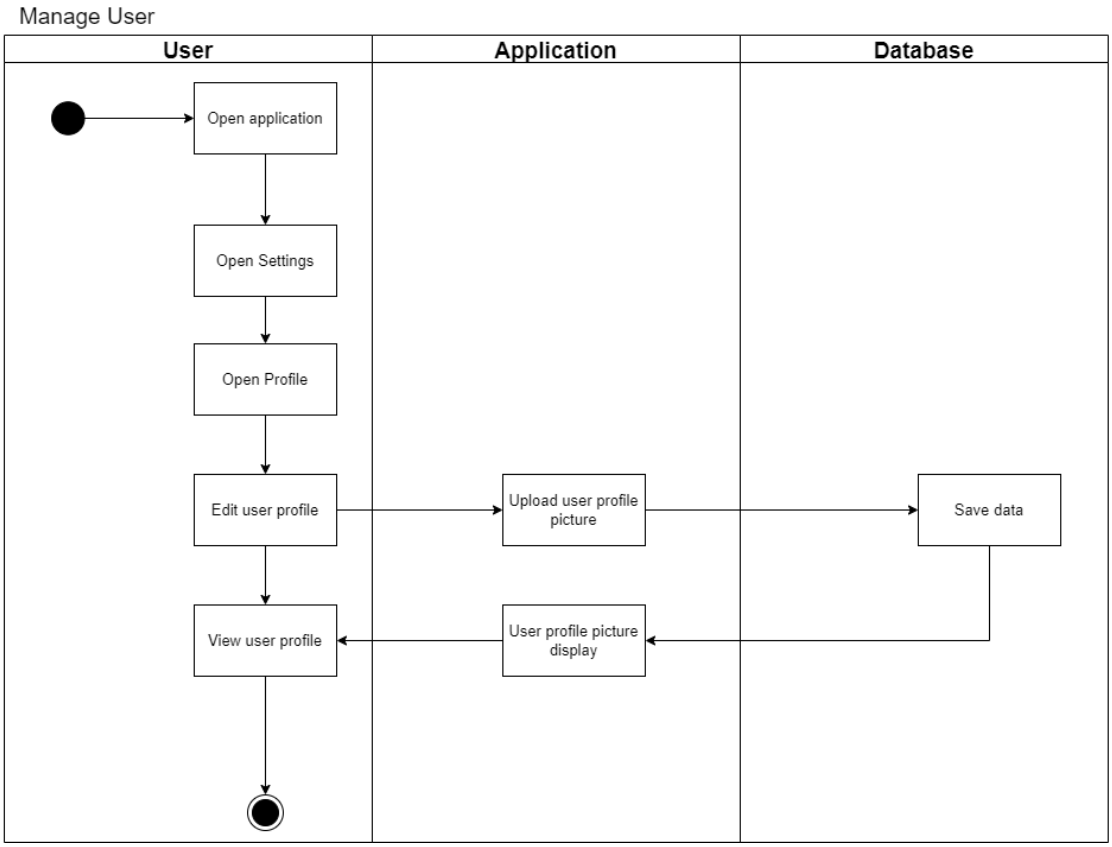


Figure 3.38: Activity Diagram of Manage User for the family members

3.6.5.8 Manage Medicine Reminder – Family Members

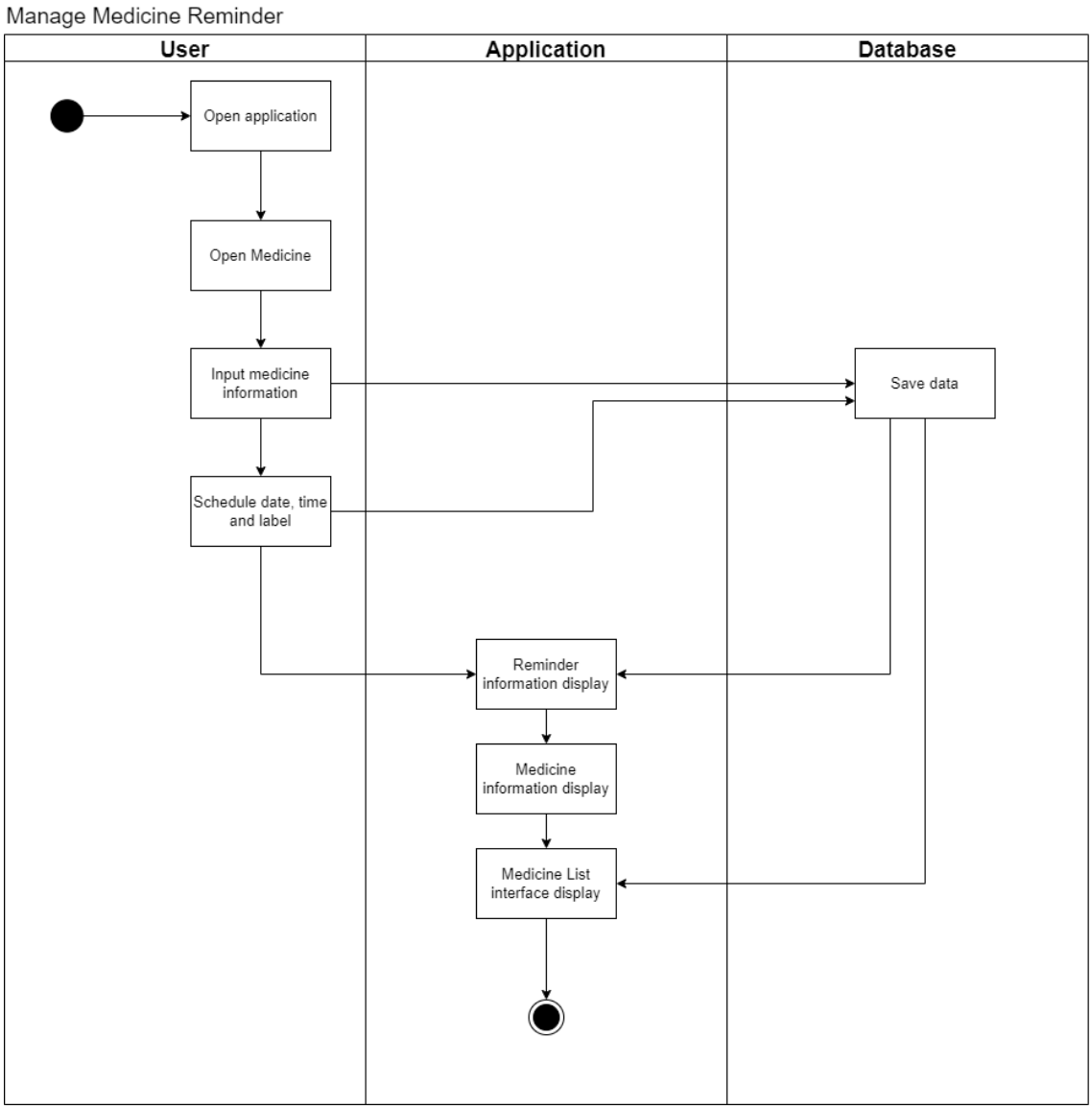


Figure 3.39: Activity Diagram of Manage Medicine Reminder for the family members

3.6.5.9 Manage Location Tracking- Family Members & Caregivers

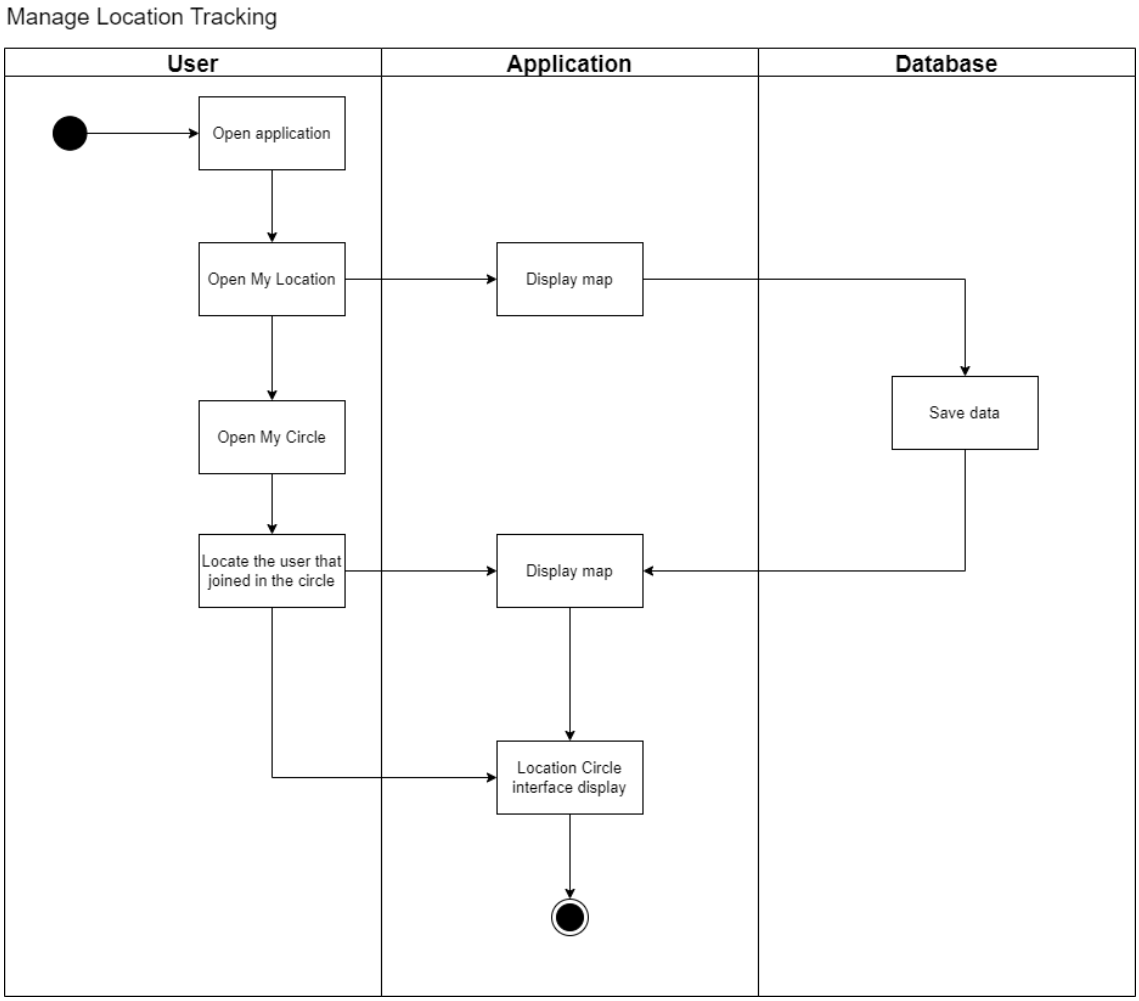


Figure 3.40: Activity Diagram of Manage Location Tracking for family members

3.6.5.10 Manage Emergency Call- Family Members & Caregivers

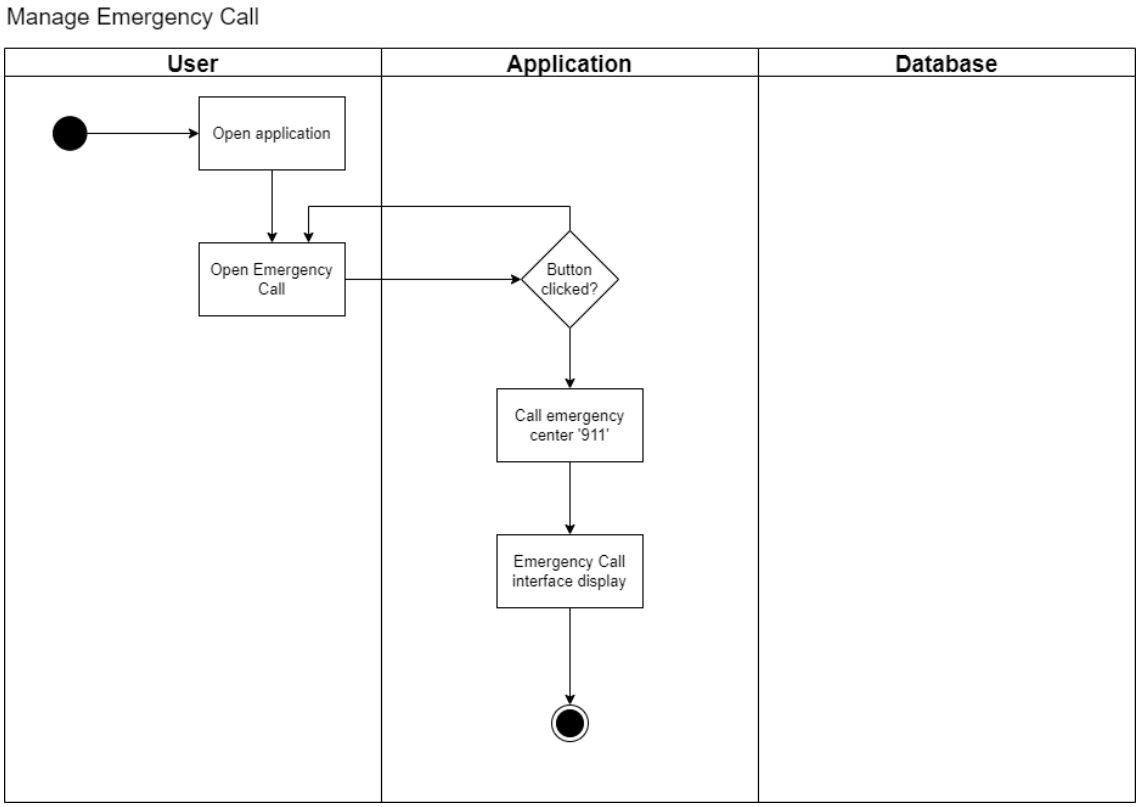


Figure 3.41: Activity Diagram of Manage Emergency Call for family members

3.7 Data Design

3.7.1 ERD Diagram

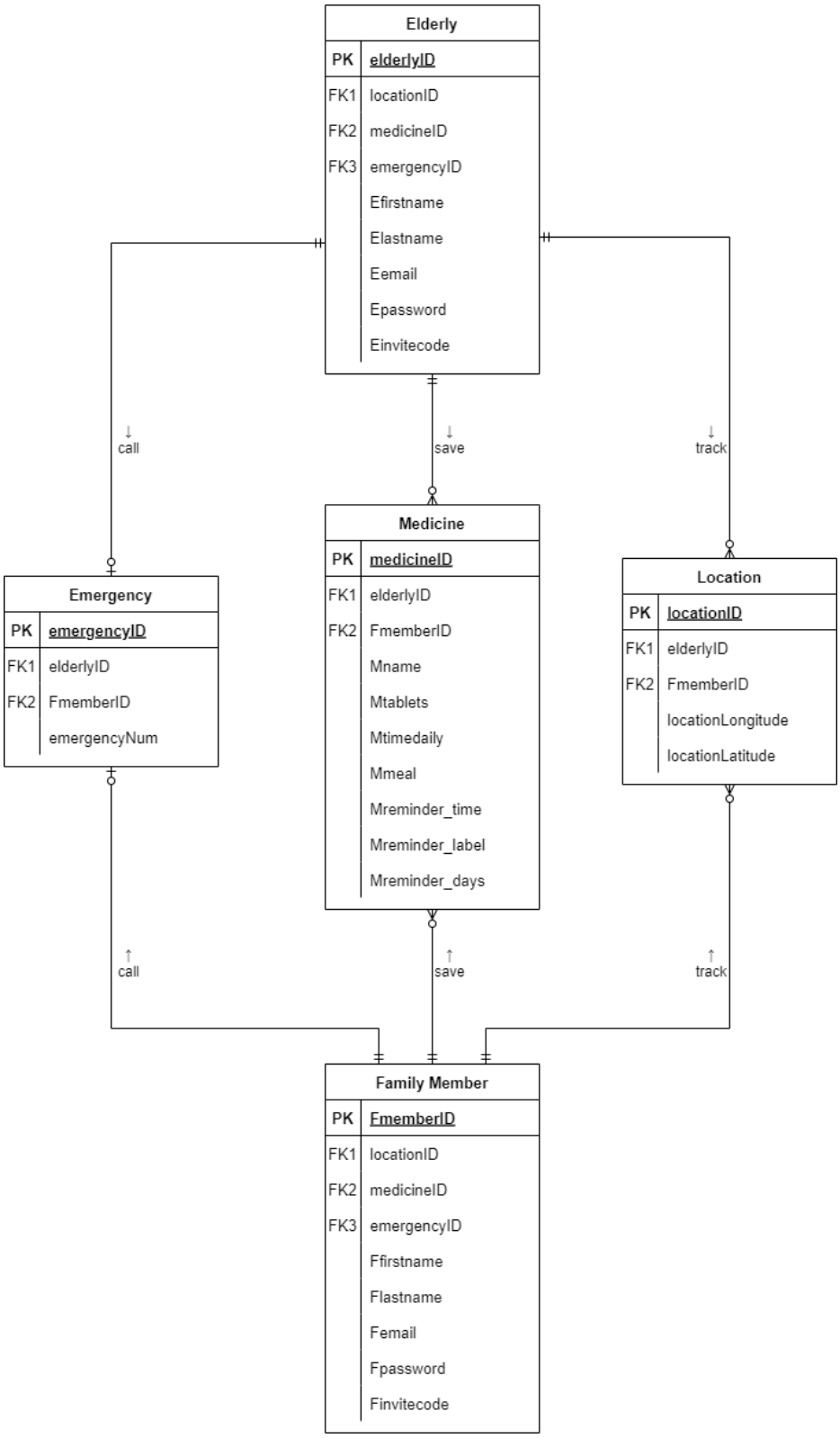


Figure 3.42: ERD Diagram of ElderCare Mobile Application

3.7.2 Database Dictionary (PK, FK)

3.7.2.1 Elderly

Table 3.2: Table of Data Dictionary of Elderly

Data Name	Data Type	Description	Constraint
elderlyID	VARCHAR(50)	Elderly ID	PK
medicineID	VARCHAR(50)	Medicine Reminder ID	FK1
emergencyID	VARCHAR(50)	Emergency Call ID	FK2
locationID	VARCHAR(50)	Location Tracking ID	FK3
Efirstname	VARCHAR(50)	First Name of the elderly	
Elastname	VARCHAR(50)	Last Name of the elderly	
Eemail	VARCHAR(25)	Email of the elderly	
Epassword	VARCHAR(50)	Password of the elderly	
Einvitecode	INT	Generated code for the elderly	

3.7.2.2 Family Member

Table 3.3: Table of Data Dictionary of Family Member

Data Name	Data Type	Description	Constraint
FmemberID	VARCHAR(50)	Family Member ID	PK
medicineID	VARCHAR(50)	Medicine Reminder ID	FK1
emergencyID	VARCHAR(50)	Emergency Call ID	FK2
locationID	VARCHAR(50)	Location Tracking ID	FK3
Ffirstname	VARCHAR(50)	First Name of the family member	
Flastname	VARCHAR(50)	Last Name of the family member	
Femail	VARCHAR(25)	Email of the family member	
Fpassword	VARCHAR(50)	Password of the family member	

Finvitecode	INT	Generated code for the family member	

3.7.2.3 Emergency

Table 3.4: Table of Data Dictionary of Emergency

Data Name	Data Type	Description	Constraint
emergencyID	VARCHAR(50)	Emergency Call ID	PK
elderlyID	VARCHAR(50)	Elderly ID	FK1
FmemberID	VARCHAR(50)	Family Member ID	FK2
emergencyNum	INT	Contact number for the emergency	

3.7.2.4 Medicine

Table 3.5: Table of Data Dictionary of Medicine

Data Name	Data Type	Description	Constraint
medicineID	VARCHAR(50)	Medicine Reminder ID	PK
elderlyID	VARCHAR(50)	Elderly ID	FK1
FmemberID	VARCHAR(50)	Family Member ID	FK2
Mname	VARCHAR(50)	Name of the medicine	
Mtablets	VARCHAR(10)	Number of tablets of the reminder	
Mtimedaily	INT	Times daily of the reminder	
Mmeal	VARCHAR(50)	Before or after meal of the reminder	
Mreminder_time	DATETIME	Time of the reminder	
Mreminder_label	VARCHAR(50)	Label of the reminder	
Mreminder_days	DATE	Repeated days of the reminder	

3.7.2.5 Location

Table 3.6: Table of Data Dictionary of Location

Data Name	Data Type	Description	Constraint
locationID	VARCHAR(50)	Location Tracking ID	PK
elderlyID	VARCHAR(50)	Elderly ID	FK1
FmemberID	VARCHAR(50)	Family Member ID	FK2
locationLongtitude	FLOAT	Longitude of the location	
locationLatitude	FLOAT	Latitutde of the location	

3.7.3 Databases Used in This Project

Figure 3.43: Logo of the Firebase Realtime Database

Firebase Realtime Database is a cloud-hosted database and it is a platform that stores and syncs the data in the cloud database. The data is synchronized in real-time across all of the users and it is still available while the application is offline. The data is stored locally, and real-time events continue to trigger even when the user is offline, providing a responsive experience. When the device regains connectivity, the Realtime Database immediately merges any discrepancies between local data changes and remote updates that happened while the client was offline. They are four main capabilities of the Firebase Realtime Database such as real-time, offline, accessible from client devices and scale across multiple databases.

The implementation path of the Firebase Realtime Database is first to integrate the Firebase Realtime Database SDKs into the Android Studio and then create the Realtime Database reference as JSON data. Next, the reference will be used to write the data and the data will be written to the device's local disk to enable the availability while offline.

Figure 3.44: Logo of the SQLite Database

SQLite database is an open-source database that occurred in Android which is used to store the data in the user's device and it will in the form of a text file. The basic operations on the data can be performed such as add the new data, read the data, update the old data and delete the specific data. SQLite database is an offline database which the data will locally stored in the user's device and the user didn't have to create any connection online to connect to this database. All of the data that stored in the SQLite database will be arranged in the form of tables where similar to an excel sheet. SQLite database is a native API and is not JDBC, which JDBC might too much aerial for the devices only have limited storage of memory. Since the Android SQLite is not a heavy weight database which comes with Android OS.

3.8 Design Prototype / Storyboard

3.8.1 Elderly

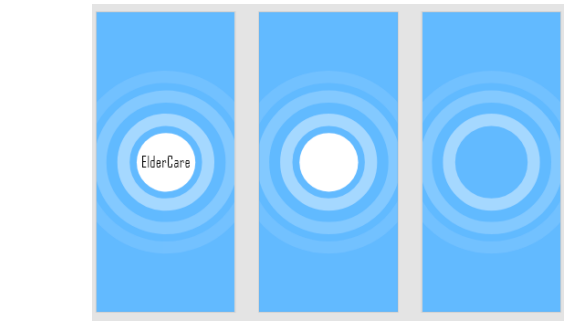
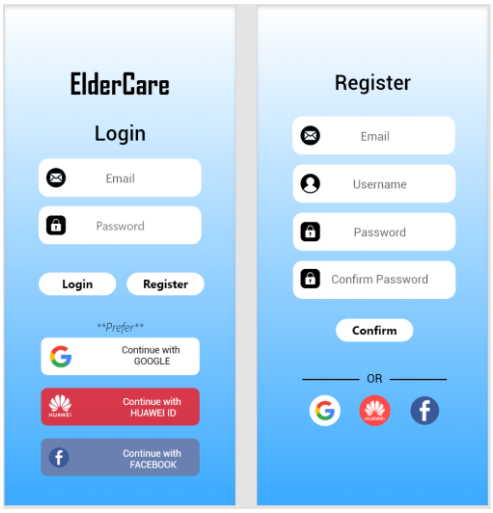
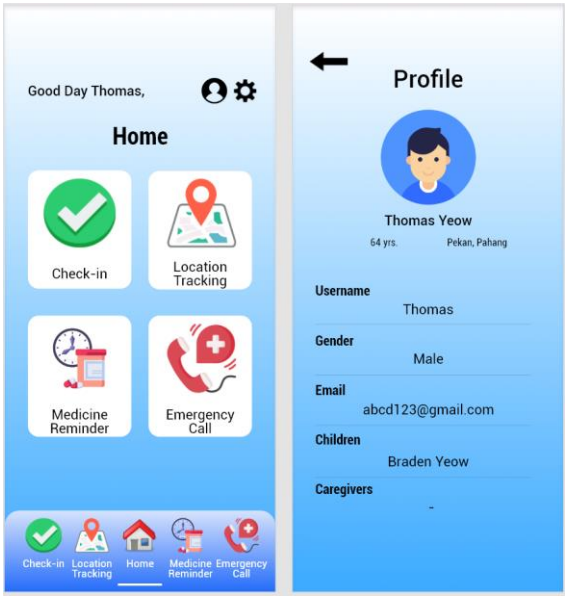
Figure	Description
Figure 3.45: Interface of Introductory Screen	
 	Figure 3.44 shows the introductory screen for the ElderCare mobile application. Once the user opens this application, before entering the login interface, there is a splash animation screen to show the logo of the ElderCare mobile application. The flow of the interface is from right to left.
Figure 3.46: Interface of User Type	
	Then, Figure 3.45 is the interface for the selection of the user type. The user can select Elderly or Family Members and Caregivers to have different features in the ElderCare Mobile Application.

Figure 3.47: Interface of Login and Register



When the user selects the Elderly user type, the user can log in with their email, but if the user is not registered yet, the user can register by clicking the 'Register' button. Besides, the user is allowed to continue login with the Google account, Huawei ID, and Facebook account, which goes to the new user's registration as shown as Figure 3.46.

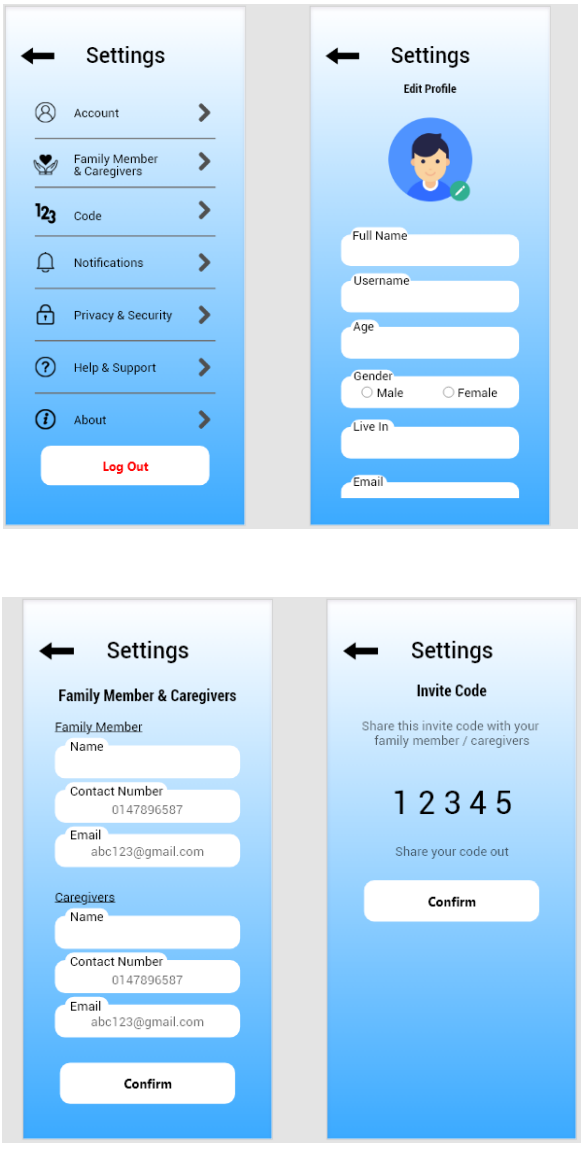
Figure 3.48: Interface of Home and User Profile



After that, the user will navigate to the Home interface. In the Home interface, the user can see the registered username shown on the top place and view their own user profile by clicking the account icon at the top side. Then, there are two options for the user to access the features. The user may navigate to the

	different features by clicking the main four square button or change the tab by clicking the small icon in the bottom menu bar as shown as Figure 3.47.

Figure 3.49 & Figure 3.50: Interface of Settings



Also, Figure 3.48 and Figure 3.49 shows the settings menu is provided at the right top side of the Home interface. In the settings menu, the user may manage their user information in the account tab, manage the family members and caregivers information, view the generated code and this will share to the family members and caregivers to connect both devices, edit the notification settings, edit password, review on the user manual or contact the company of the application, review the version of the application and logout

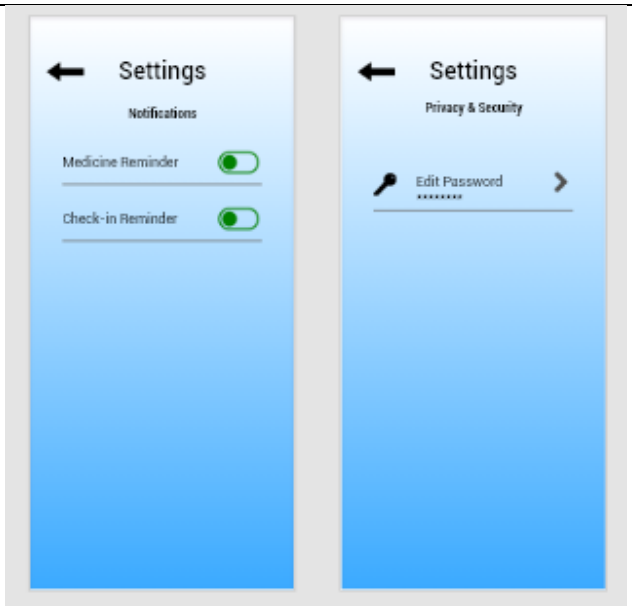
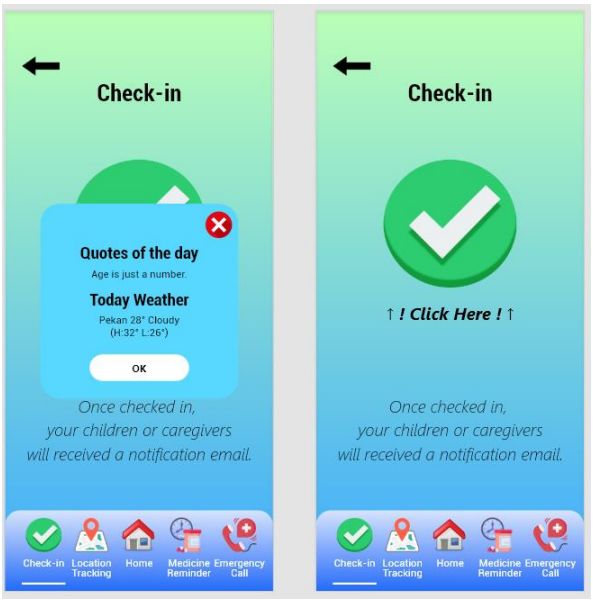
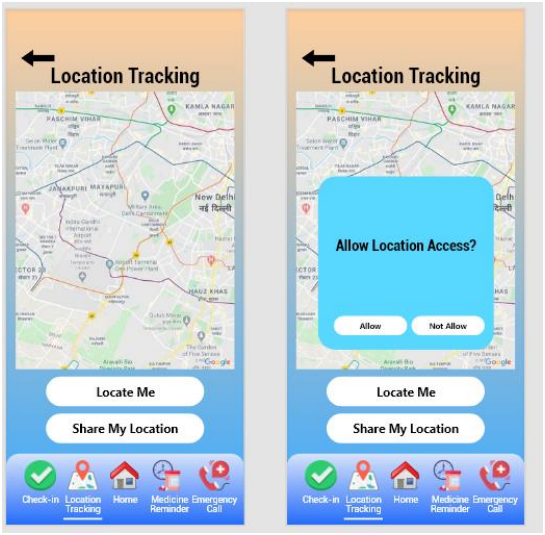
	the application. After the user logs out of the application, the user will be navigated to the login interface again to log in.

Figure 3.51: Interface of Check-in features



Firstly, Figures 3.50 shows the user navigates to the check-in features, one big green button is shown. By clicking this button, the elderly will receive a pop-out notification: the quote of the day and the weather of the day. Simultaneously, a notification email will be sent to the family member and caregivers, which was set in the settings.

Figure 3.52: Interface of Location Tracking



Next, Figure 3.51 shows the user may use the bottom menu bar to navigate the different features. The next feature is location tracking. When the user enters these features, the GPS notification will pop out to let the user allow access location of their mobile device. If the user is not allowed,

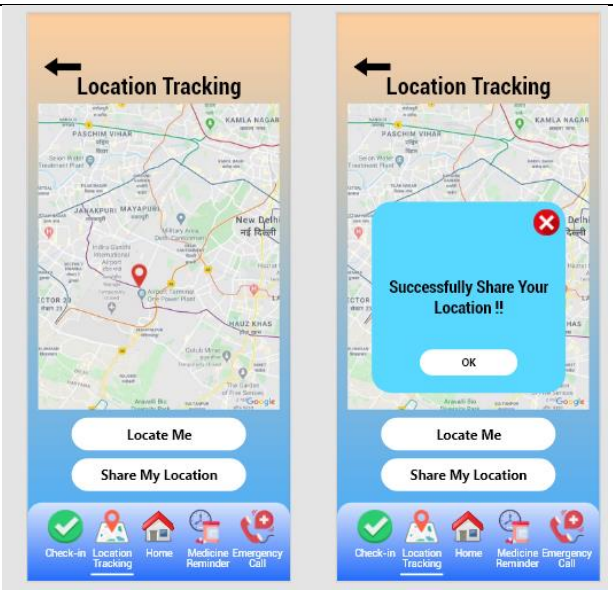
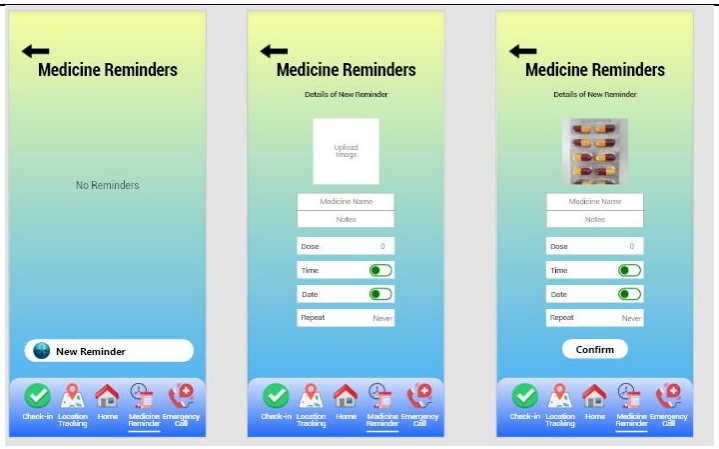
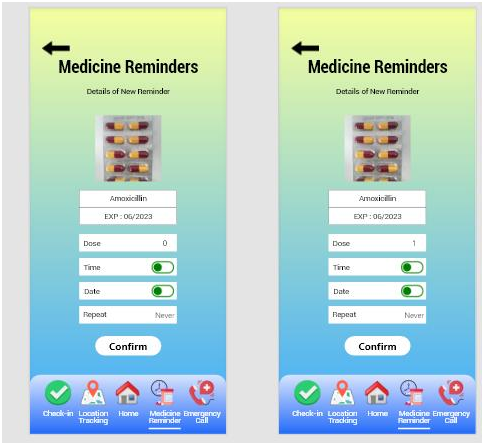
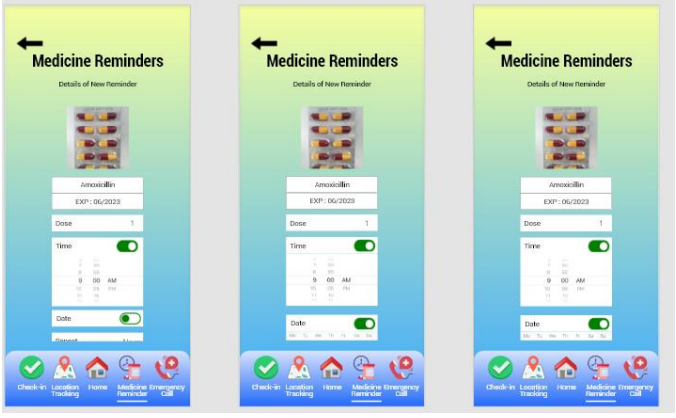
		the user will be navigated back to the home interface. The user may locate themselves in the maps view by clicking the 'Locate Me' button and manually sharing their location with family members and caregivers by clicking the 'Share My Location' button. The email will be sent when the notification pops out.

Figure 3.53 & Figure 3.54: Interface of Medicine Reminder







Furthermore, Figure 3.52 and Figure 3.53 shows the next feature is medicine reminder. The user may add a new reminder by clicking the 'New Reminder' button at the bottom part. After that, the user can upload the medicine image and input the medicine information. Then, the user may set the reminder by using the date, time and repeats. Once all of the information is inserted, the user will be navigated back to the main screen of the medicine reminder. The new reminder has been shown in the list. If the reminder is done or over time, the user may click the circle button on the left side to delete it or mark it as done. Then, the reminder will be deleted from the main medicine reminder screen.

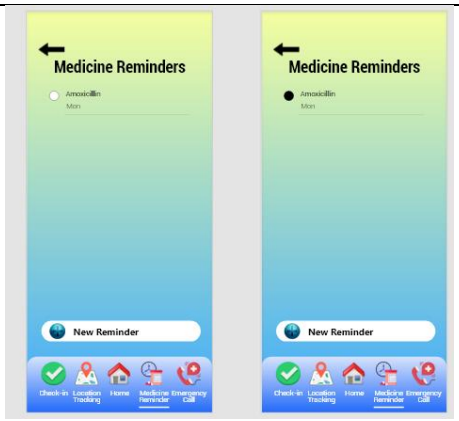
 Medicine Reminders Amoxicillin Mon New Reminder Check-in Location Tracking Home Medicine Reminder Emergency Call Medicine Reminders Amoxicillin Mon New Reminder Check-in Location Tracking Home Medicine Reminder Emergency Call	

Figure 3.55: Interface of Emergency Call

Finally, Figure 3.54 shows the emergency call is the last feature in the ElderCare Mobile Application. The user may call their family members or caregivers immediately by selecting the person who wants to call in the drop-down list and clicking the red call button. Then, the contact number is based on the family member and caregiver information in the settings menu. Meanwhile, the application will straight call the person whom the user selects.

3.8.2 Family Members and Caregivers

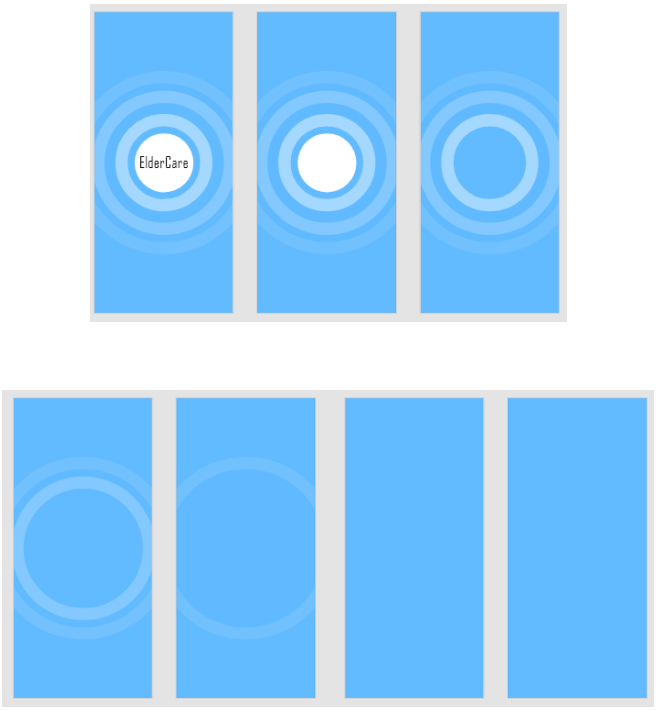
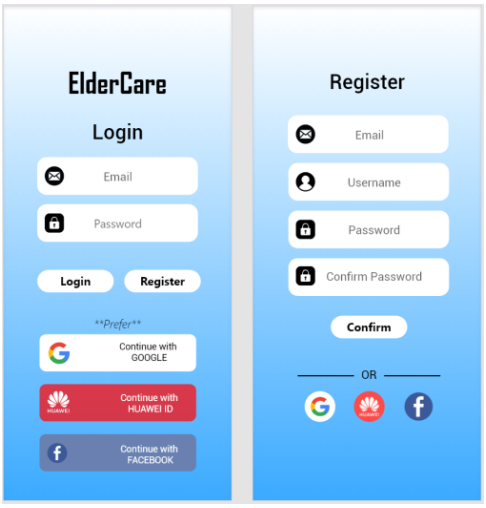
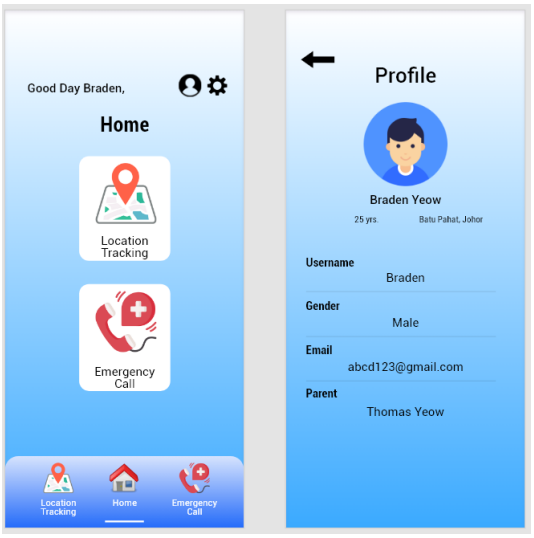
Figure	Description
Figure 3.56: Interface of Introductory Screen	
	Figure 3.55 shows the introductory screen for the ElderCare mobile application. Once the user opens this application, before entering the login interface, there is a splash animation screen to show the logo of the ElderCare mobile application. The flow of the interface is from right to left.
Figure 3.57: Interface of User Types	
	Then, Figure 3.56 shows the interface for selecting the user type. The user can select Elderly or Family Members and Caregivers to have different features in the ElderCare Mobile Application.

Figure 3.58: Interface of Login and Registration



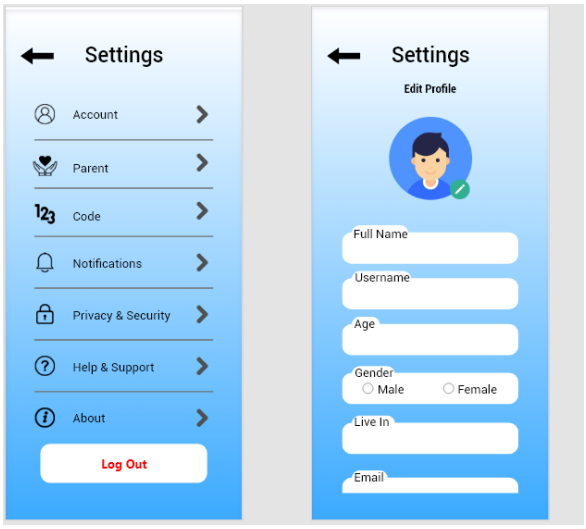
When the user selects the Family Member and Caregivers user type, the user can log in with their email, but if the user is not registered yet, the user can register by clicking the 'Register' button. Besides, the user is allowed to continue login with the Google account, Huawei ID, and Facebook account, which goes to the new user's registration as shown as Figure 3.57.

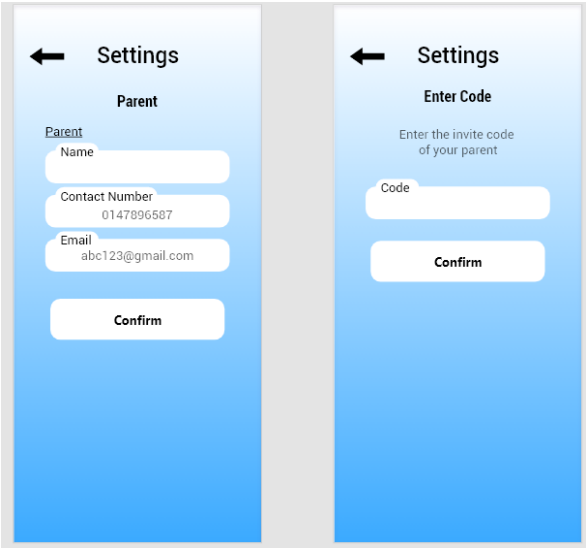
Figure 3.59: Interface of Home and User Profile



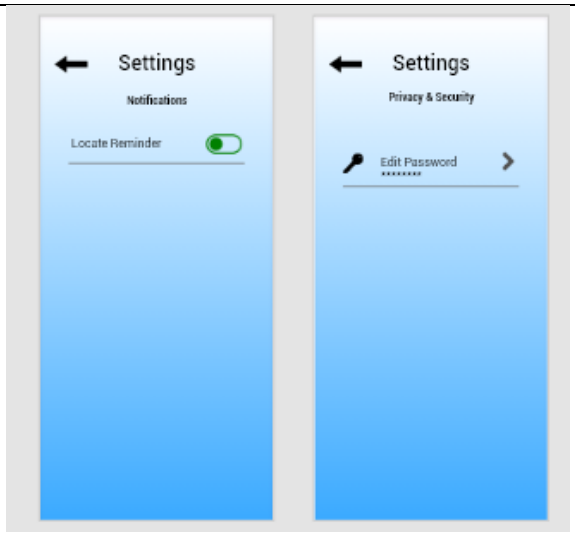
After that, the user will navigate to the Home interface. In the Home interface, the user can see the registered username shown on the top place and view their own user profile by clicking the account icon at the top side. Then, there are two options for the user to access the features. The user may navigate to the different features by clicking the main two square button or change the tab by clicking the small icon in the bottom menu bar as shown as Figure 3.58.

Figure 3.60 & Figure 3.61: Interface of Settings





Also, Figure 3.59 and Figure 3.60 shows the settings menu is provided on the right top side of the interface. In the settings menu, the user may manage their user information in the account tab, manage the dependent information, enter the code that shared by the elderly, edit the notification settings, edit password, review on the user manual or contact the company of the application, review the version of the application and logout the application. After the user logout the application, the user will navigate to the login interface again to log in.


Settings
Notifications
Locate Reminder
Settings
Privacy & Security
Edit Password

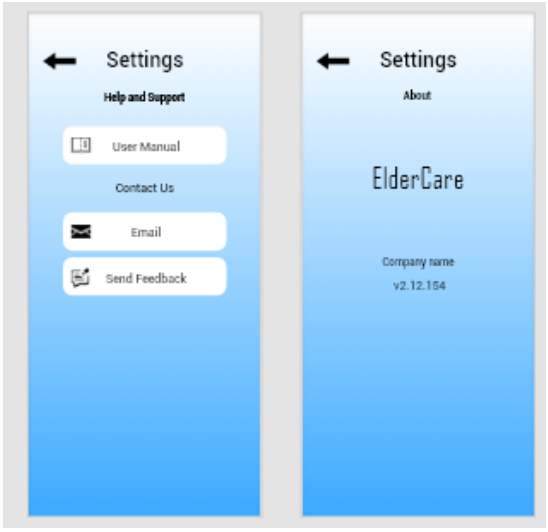

Settings
Help and Support
User Manual
Contact Us
Email
Send Feedback
Settings
About
ElderCare
Company name
v2.12.154

Figure 3.62: Interface of Location Tracking

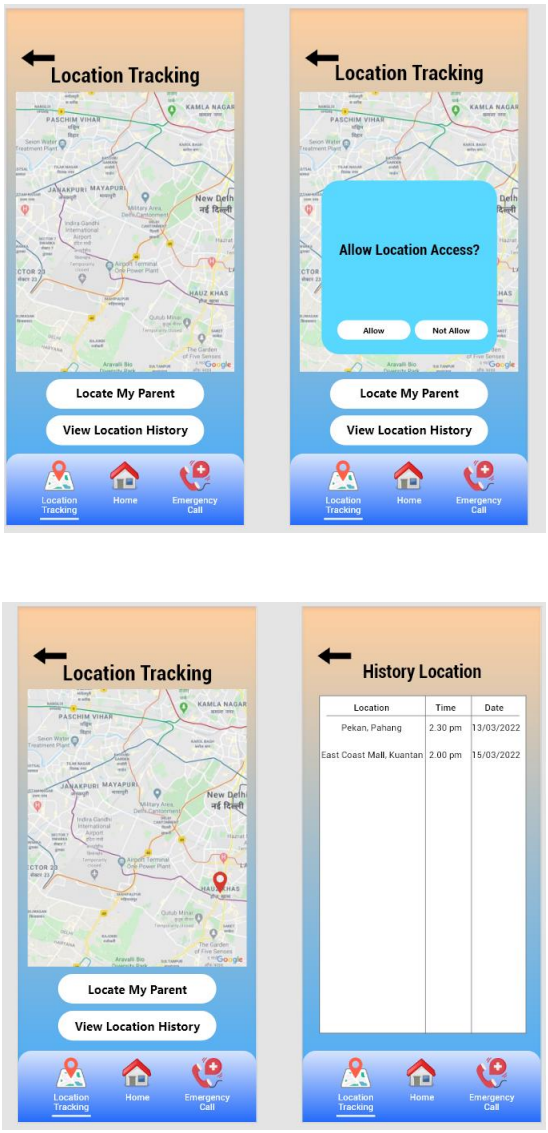


Figure 3.61 shows the first feature for the user is location tracking. The user may real-time track the location of the elderly by clicking the 'Locate My Parent' button and reviewing the location history by clicking the 'View Location History' button. Then, a table list is shown where the elderly have been.

Figure 3.63: Interface of Emergency Call

Then, Figure 3.62 shows the second feature is the emergency call. Same as the Elderly user type, the user can straight call the elderly by clicking the red call button and the person who wants to call is only the parent. The contact number is set in the patent information in the settings menu.

3.9 Testing Plan

3.9.1 Elderly

Table 3.7: Table of Testing Plan of Elderly

No.	Module	Activities	Status		Comments
1.	Login	The user can register account.	Yes (/)	No ( )	
2.		The user can login account.	Yes (/)	No ( )	Working
3.		The user can logout account.	Yes (/)	No ( )	
4.	Manage User	The user can view their profile and profile picture.	Yes (/)	No ( )	
5.		The user can edit their user profile picture.	Yes (/)	No ( )	
6.		The user can share their code.	Yes (/)	No ( )	
7.	Location Tracking	The map view functions well.	Yes (/)	No ( )	
8.		The user can locate the location.	Yes (/)	No ( )	
9.		The user can join others circle.	Yes (/)	No ( )	
10.		The user can locate the location of the user that joined into circle by clicking the button.	Yes (/)	No ( )	
11.	Medicine Reminder	The button is function well.	Yes (/)	No ( )	
12.		The user can input the medicine name.	Yes (/)	No ( )	
13.		The user can input the tablets of the medicine.	Yes (/)	No ( )	

14.		The user can input the times daily of the medicine.	Yes (/)	No ( )	
15.		The user can input the before / after meal information of the medicine.	Yes (/)	No ( )	
16.		The user can update the information of the medicine.	Yes (/)	No ( )	
17.		The user can delete the information of the medicine.	Yes (/)	No ( )	
18.		The user can set the time of the reminder.	Yes (/)	No ( )	
19.		The user can set the label of the reminder.	Yes (/)	No ( )	
20.		The user can set the repeat days of the reminder.	Yes (/)	No ( )	
21.		The user can delete the reminder.	Yes (/)	No ( )	
22.	Emergency Call	The button is function well.	Yes (/)	No ( )	
23.		The user can the emergency centre.	Yes (/)	No ( )	

This test has been performed by:

Name : YEOW SONG JIE

Signature :

Date :

3.9.2 Family Members

Table 3.8: Table of Testing Plan of Family Members

No.	Module	Activities	Status		Comments
1.	Login	The user can register account.	Yes (/)	No ( )	
2.		The user can login account.	Yes (/)	No ( )	Working
3.		The user can logout account.	Yes (/)	No ( )	
4.	Manage User	The user can view their profile and profile picture.	Yes (/)	No ( )	
5.		The user can edit their user profile picture.	Yes (/)	No ( )	
6.		The user can share their code.	Yes (/)	No ( )	
7.	Location Tracking	The map view functions well.	Yes (/)	No ( )	
8.		The user can locate the location.	Yes (/)	No ( )	
9.		The user can join others circle.	Yes (/)	No ( )	
10.		The user can locate the location of the user that joined into circle by clicking the button.	Yes (/)	No ( )	
11.	Medicine Reminder	The button is function well.	Yes (/)	No ( )	
12.		The user can input the medicine name.	Yes (/)	No ( )	
13.		The user can input the tablets of the medicine.	Yes (/)	No ( )	
14.		The user can input the times	Yes (/)	No ( )	

		daily of the medicine.			
15.		The user can input the before / after meal information of the medicine.	Yes (/)	No ( )	
16.		The user can update the information of the medicine.	Yes (/)	No ( )	
17.		The user can delete the information of the medicine.	Yes (/)	No ( )	
18.		The user can set the time of the reminder.	Yes (/)	No ( )	
19.		The user can set the label of the reminder.	Yes (/)	No ( )	
20.		The user can set the repeat days of the reminder.	Yes (/)	No ( )	
21.		The user can delete the reminder.	Yes (/)	No ( )	
22.	Emergency Call	The button is function well.	Yes (/)	No ( )	
23.		The user can the emergency centre.	Yes (/)	No ( )	

This test has been performed by:

Name : YEOW SONG JIE

Signature :

Date :

3.10 Potential Use of Proposed Solution

In this project, the proposed mobile application is ElderCare available for Android users. The main target user of this mobile application is the elderly and family members. The features covered are medication reminder, GPS location tracking and the emergency call with a button click. All of the features are important for elderly care. This application can be used with or without the internet, to use the GPS location tracking feature, an internet connection is needed.

For the first features covered in this project, the medicine reminder is necessary for the elderly to overcome and avoid the forgetfulness of the elderly. They will not remember which types of medicine need to be taken and when. In the medicine reminder, the elderly can upload the medicine image and input all of the medicine information in the reminder.

While the elderly are using ElderCare away from home, they will feel safer and they will not lose their way with the features that GPS location tracking. These features also provide a real-time location tracking of the elderly mobile device which allows their family members to monitor the location of the elderly. Moreover, the elderly are allowed to locate themselves , join their family members circle and share their location manually with the family member. Besides, the emergency call button is allowed the elderly to directly call the emergency center with a click of a button. Apart from that, the family member can also use this emergency button to call the emergency center immediately, bringing convenience to the user.

3.11 Gantt Chart

Placement in an appendix C.

3.12 Hardware and Software Specification

Table 3.9: Table of Software Specification

Software	Description
Android Studio	To develop the interface and the functionalities of the mobile application for ElderCare.
Android Emulator	A simulator that is used to simulate an android device and run the android application on the computer
Adobe XD	To develop a high-fidelity functional prototype of the mobile application for ElderCare.
Microsoft Office	To do the documentation for the project of the mobile application for ElderCare.
Firebase Realtime Database	A real-time database is a platform to store the data and retrieve it.

Table 3.10: Table of Hardware Specification

Hardware	Description
ASUS ROG Strix G531GD	To develop the whole project of the mobile application for ElderCare.
Mobile Devices	To test the Android Package on mobile devices.

3.13 Chapter Summary

In conclusion, this chapter discusses the methodology used to develop the ElderCare. The methodology that has been chosen is Rapid Application Development (RAD). This is because this methodology is focused on fast building applications by stably releasing them and receiving continuous feedback. Next, the project requirement, including the Functional Requirement, Non-functional Requirements and others will be described. The details of the proposed design and data design are also described in this chapter. Besides, the proof of the initial concept, prototype user interface design, will be presented in this chapter. After that, the draft of the testing plan and the proposed solution's potential use will also be described in this chapter. Lastly, this project's hardware and software specifications and the Gantt chart are described and designed at the end of Chapter 3.

CHAPTER 4

RESULTS AND DISCUSSION

4.1 Introduction

In this chapter will discuss on the implementation, results and discussion on ElderCare development. System design is essential for the development of the application to ensure that the user interface and features of the application are clear, then it will avoid the uncertainty during the implementation phase. The testing phase will come after the implementation phase is achieved and done completely. This is to assure that the application is able to work as specified in the application requirements and features. The user acceptance testing will be done after the development phase of the application is completed. The testing results of the application will be discussed at the end of the chapter.

4.2 Development Environment

This subchapter will define the development environment for ElderCare. A suitable software development tool must be selected to ensure the development phase of the application can be completed efficiently. The mobile application is consisting of the applciation and the database. As mentioned in the Chapter 3, ElderCare will be developed in Android Studio and the data will be stored in the Firebase Realtime Databse.

4.2.1 Software Development Tools

Android Studio has been chosen as the software development platform to develop the ElderCare mobile application. Based on IntelliJ IDEA, Android Studio is the recognised Integrated Development Environment (IDE) for creating the Android applications. Android Studio can support several operating systems such as Windows, MacOS and Linux. The core features of Android Studio is compose design tools, intelligent code editor, flexible build system, easily emulate any device and also Android App Bundle. Android Studio supports Java, Kotlin and C++, among other programming languages which Kotlin has replaced Java recently by Google as the preferred language for the developing the Android applications. It is also embed Git to let the user can upload their code to GitHub immediately. Over 365 various lint checks are included in the comprehensive static analysis framework which Android Studio supplies for the project. Additionally, it provides a number of quick fixes that enable the user to solve the problem across a range of areas with a single click, including performance, security, and correctness. Android Studio can be download at Android Developers website for different operating system as shown in figure below.

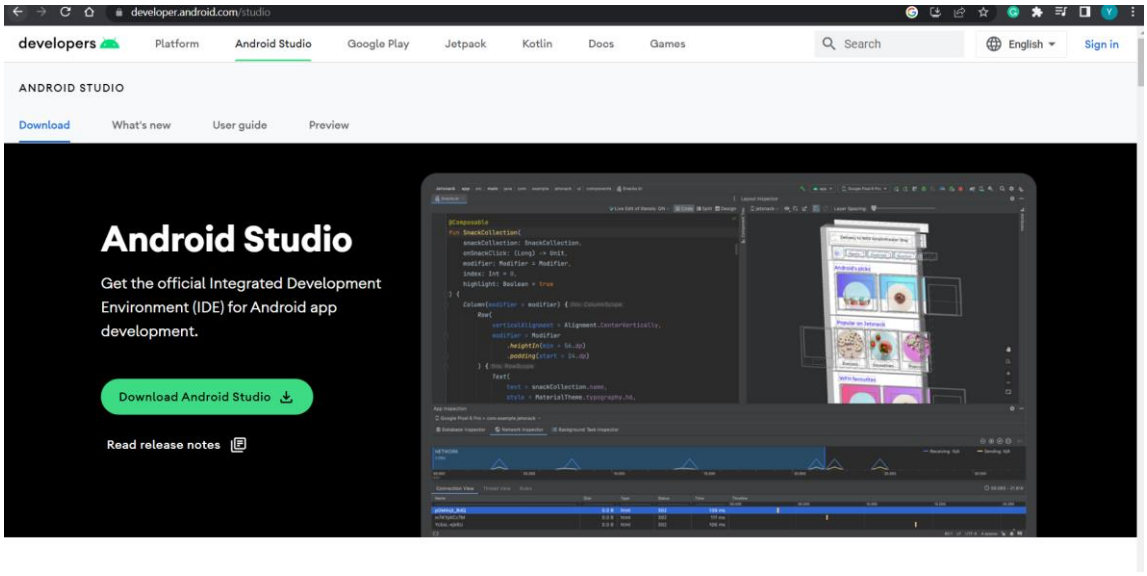


Figure 4.1: Official Website of Android Studio

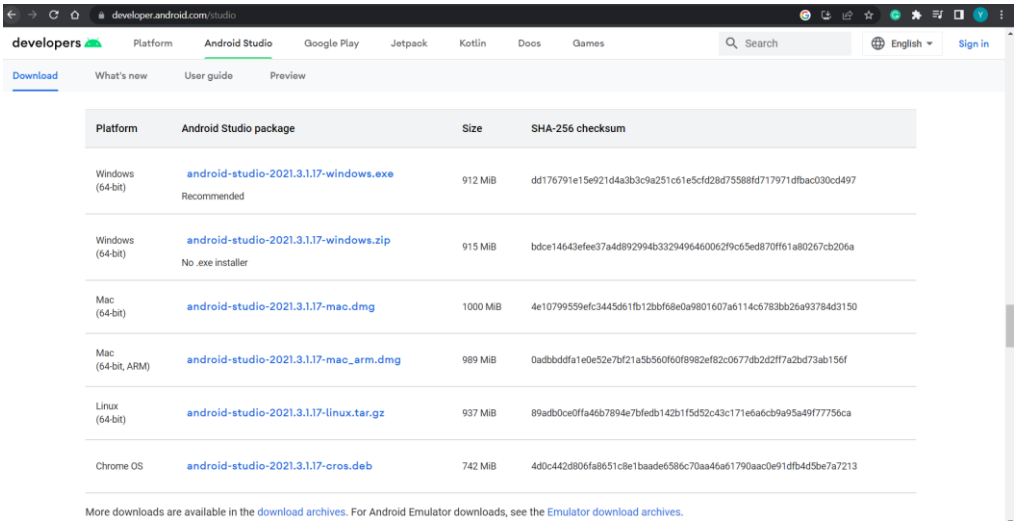


Figure 4.2: Android Studio Download Platform

4.3 Implementation

This subchapter will discuss the user interface of ElderCare that has been develop. The user will be distributed into two types which is elderly and family members and both users is using the same screen.

4.3.1 Splash Screen

When the user opens the ElderCare application, the system will display the splash screen. The animation of the icon will display in this screen. Figure 4.3 below shows the icon and splash screen of ElderCare.

Figure 4.3: Splash Screen of ElderCare

4.3.2 Select User Screen

The user need to select the user type before go to the login screen. Next, the application will pop out the alert message to the user to ensure the application can run smoothy in the user's phone. Figure 4.4 below shows the select user screen of ElderCare. Figure 4.5 shows the alert message after the user select the user type of ElderCare.

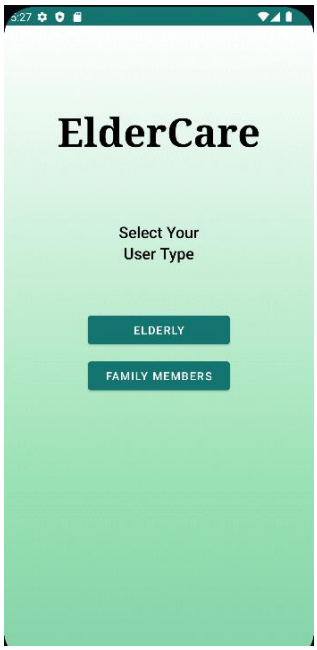


Figure 4.4: Select User Screen of ElderCare

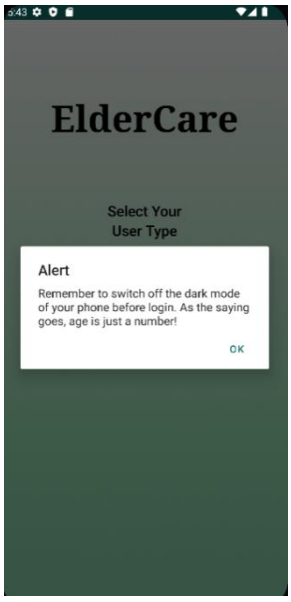


Figure 4.5: Alert Message After Select User of ElderCare

4.3.3 Login Screen

Before the user can access the ElderCare features, the user can choose whether they want to login or to register screen. The user needs to enter the email and password, then click the login button. The user will navigate to the invite code screen if the email and password is valid and correct. Figure 4.6 below shows the login screen of ElderCare.

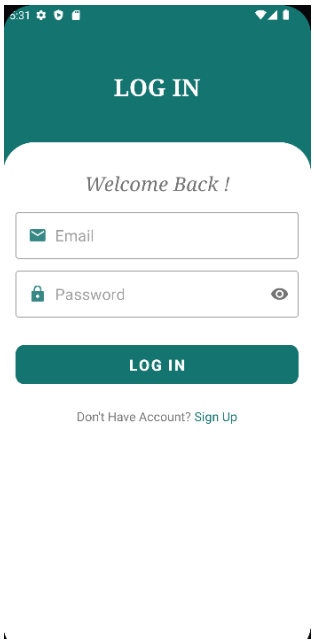


Figure 4.6: Login Screen of ElderCare

4.3.4 Sign Up Screen

The user needs to create an account to access the features of the ElderCare. The user needs to enter their first name, last name, email and also password. The information filled is cannot be edited in future. The email and password will be used for login function. If all the information filled and sign up, the user will redirect to the login screen. Figure 4.7 below shows the sign up screen of ElderCare.

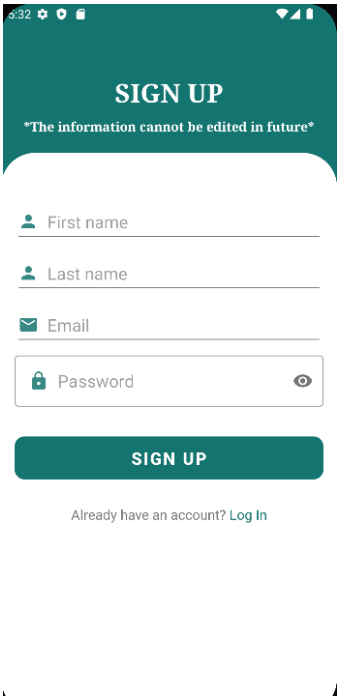


Figure 4.7: Sign Up Screen of ElderCare

4.3.5 Invite Code Screen

The user can send their invite code to the other user to let them join into their circle. The invite code is a six number code and auto-generated for each of the user then it is unique for the user. The user may share their invite code to other user or direct into the features of ElderCare by clicking Done. Figure 4.8 below shows the invite code screen of ElderCare.

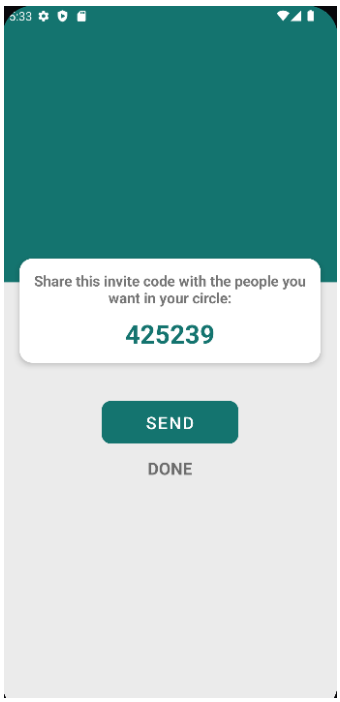


Figure 4.8: Invite Code Screen of ElderCare

4.3.6 Send Invite Code Screen

If the user needs to share their code, the invite code can be copy or share by using Gmail, Bluetooth, Message and Saved in Google Drive. The user can select the options based on their preference. Figure 4.9 below shows the send invite code screen of ElderCare.

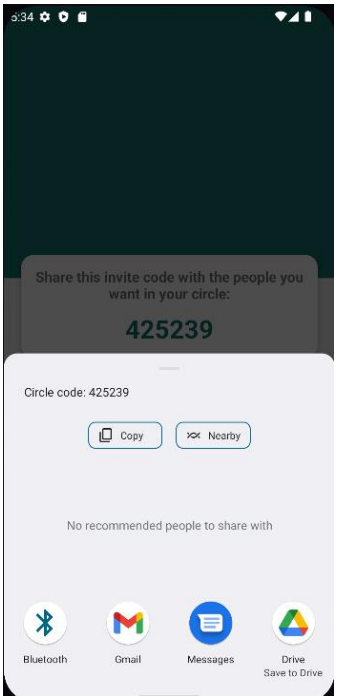


Figure 4.9: Send Invite Code Screen of ElderCare

4.3.7 Current Location Screen

After the user login to the ElderCare, the application will ask for the permission of the location and then the current location screen will display the current location of the user. The latitude and longitude will be save into the Firebase Realtime Database and display on the Google Map. The user will notice where there are according to the marker. Figure 4.10 below shows the application ask for the permission and Figure 4.11 shows the current location screen of ElderCare.

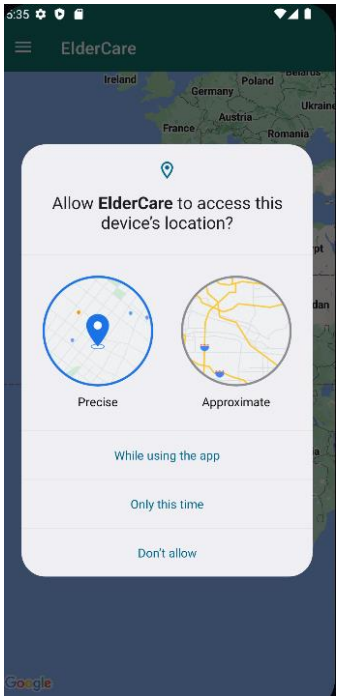


Figure 4.10: Current Location Screen of ElderCare

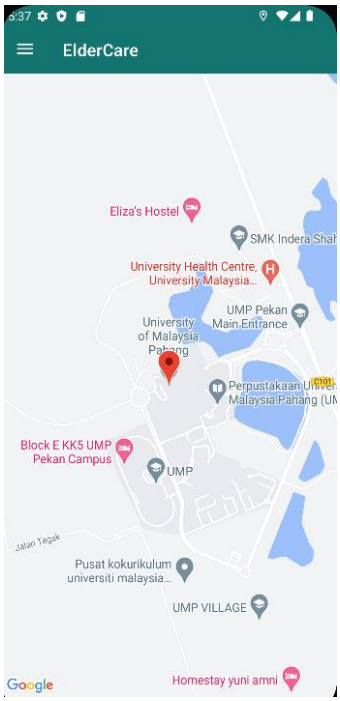


Figure 4.11: Current Location Screen of ElderCare

4.3.8 Drawer Menu Screen

The user can also go to the other screen through the drawer menu. The user first name, email and profile picture will display in the drawer menu. The features that in the drawer menu are home, location, my circle, medicine, emergency call and also logout. Figure 4.12 below shows the drawer menu screen of ElderCare.

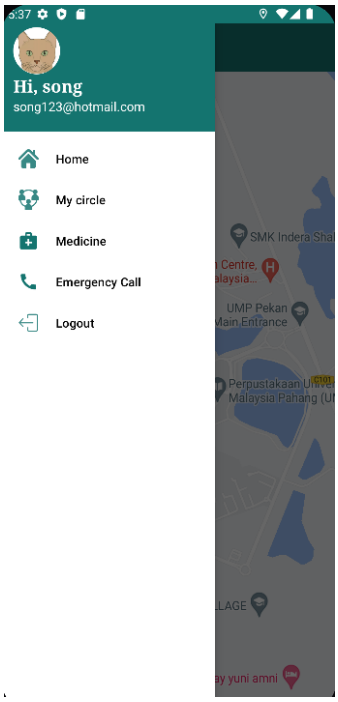


Figure 4.12: Drawer Menu Screen of ElderCare

4.3.9 Home Screen

The home screen will display the selection of the main three features of ElderCare which is location, medicine and emergency. The user can go to the specific feature by selecting the card. Figure 4.13 below shows the home screen of ElderCare.

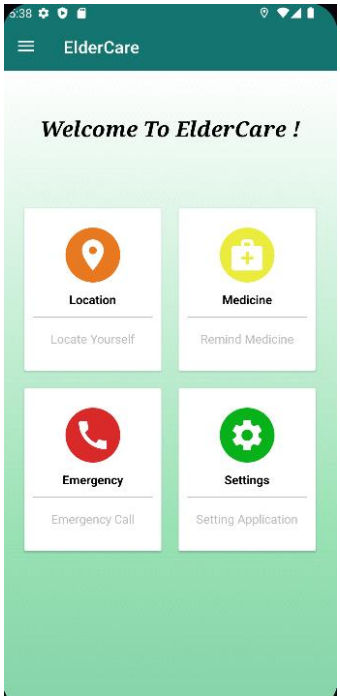


Figure 4.13: Home Screen of ElderCare

4.3.10 Settings Screen

The user can redirect to the settings screen from the home screen. The setting menu will display in the settings screen. The user can go to profile screen, join circle screen, invite code screen, help screen and about screen by clicking the arrow. Figure 4.14 below shows the settings screen of ElderCare.

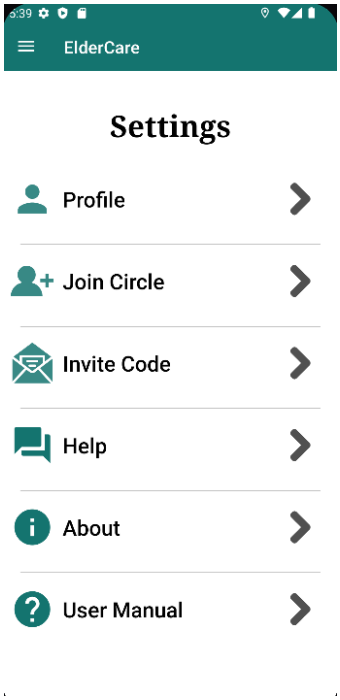


Figure 4.14: Settings Screen of ElderCare

4.3.11 Profile Screen

The information of the user will display in the profile screen. The first name, last name and email address will be displayed. The user can upload their profile picture by clicking the upload button using the circle. The user also can clicks the back arrow to go back to the settings menu. Figure 4.15 below shows the profile screen of ElderCare.

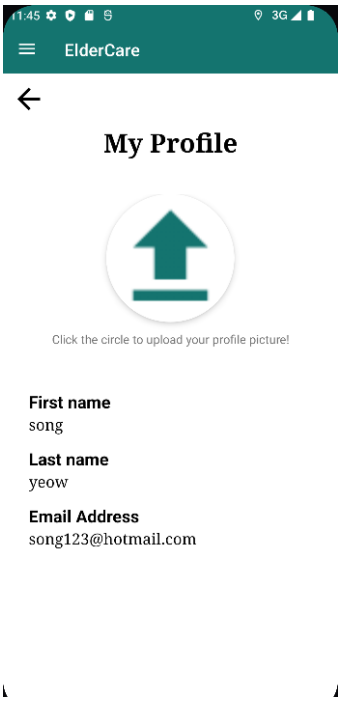


Figure 4.15: Profile Screen of ElderCare

4.3.12 Join Circle Screen

The user can enter the other user circle by entering the invite code of the other user. If the invite code is valid, then the user will join successfully. If the invite code is invalid, the user will not join any circle and the alert notification will pop out. The user also can clicks the back arrow to go back to the settings menu. Figure 4.16 below shows the join circle screen of ElderCare.

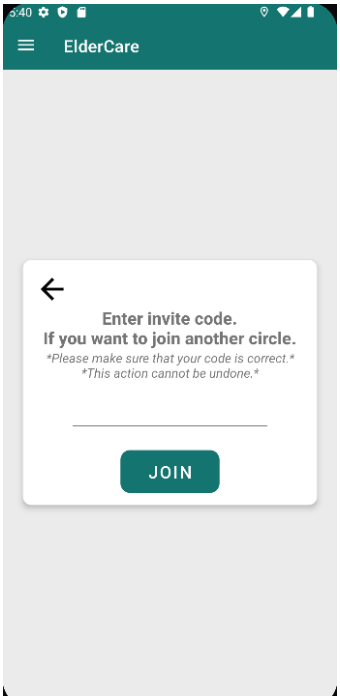


Figure 4.16: Join Circle Screen of ElderCare

4.3.13 Invite Code Screen

The user can send their invite code to the other user to let them join into their circle. The invite code is a six number code and auto-generated for each of the user then it is unique for the user. The user may share their invite code to other. The user also can clicks the back arrow to go back to the settings menu. Figure 4.17 below shows the invite code screen of ElderCare.

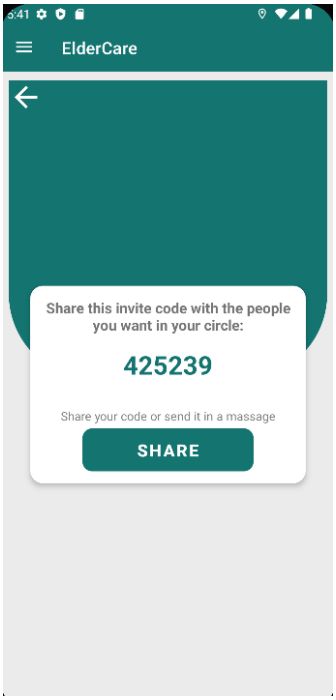


Figure 4.17: Invite Code Screen of ElderCare

4.3.14 Send Invite Code Screen

If the user needs to share their code, the invite code can be copy or share by using Gmail, Bluetooth, Message and Saved in Google Drive. The user can select the options based on their preference. Figure 4.18 below shows the send invite code screen of ElderCare.

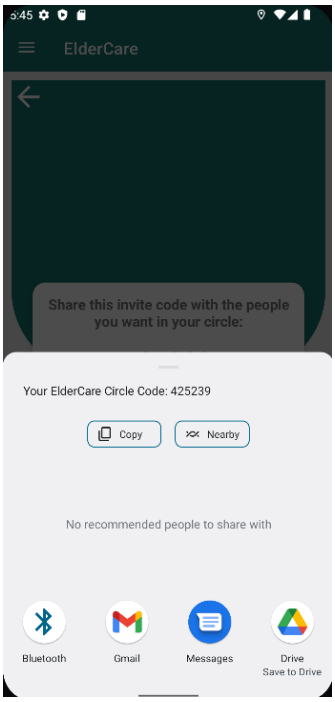


Figure 4.18: Send Invite Code Screen of ElderCare

4.3.15 Help Screen

The user can contact the customer service by using method of phone call or email. By clicking the phone call button and email button, it will navigate the user to their local function respectively. The user also can clicks the back arrow to go back to the settings menu. Figure 4.19 below shows the help screen of ElderCare. Figure 4.20 and Figure 4.21 shows the calling screen and the email screen of ElderCare in the user's phone.

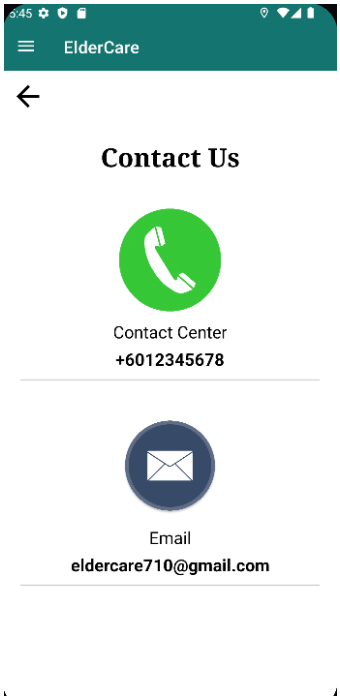


Figure 4.19: Help Screen of ElderCare

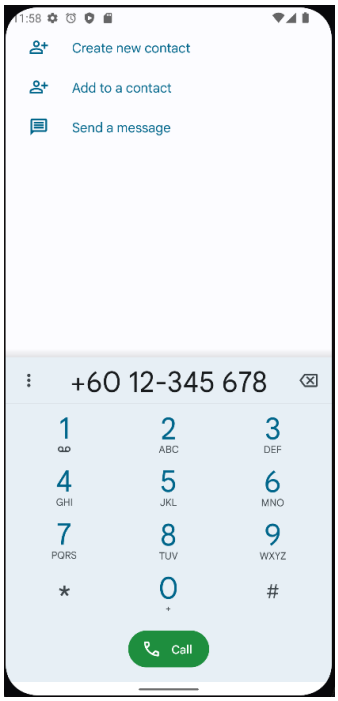


Figure 4.20: Calling Screen of ElderCare

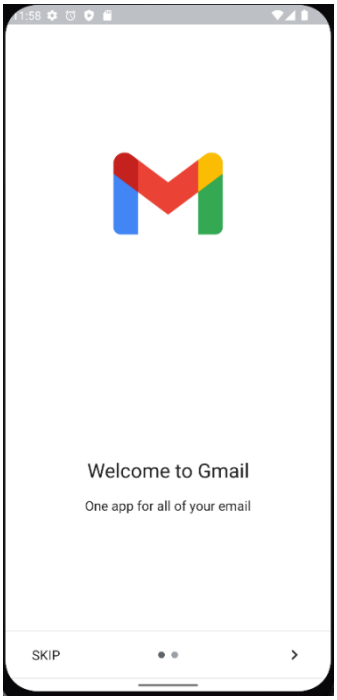


Figure 4.21: Email Screen of ElderCare

4.3.16 About Screen

The user can see the information of ElderCare in terms of version in about screen. The user also can clicks the back arrow to go back to the settings menu. Figure 4.22 below shows the about screen of ElderCare.

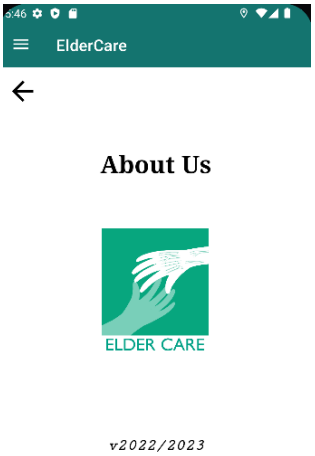


Figure 4.22: About Screen of ElderCare

4.3.17 User Manual Screen

The user can see the application instruction in terms of location, invite code, circle and medicine in user manual screen. Figure 4.23 below shows the user manual screen of ElderCare.

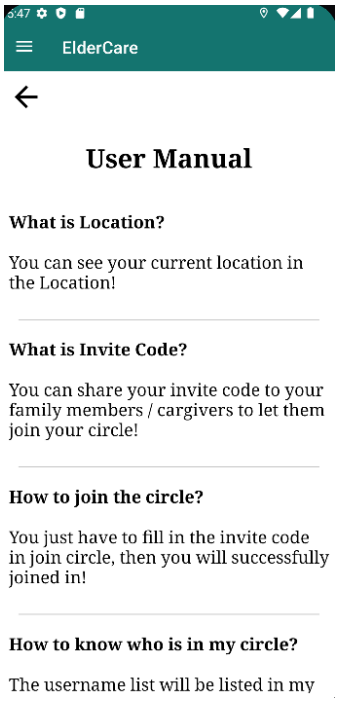


Figure 4.23 : User Manual Screen of ElderCare

4.3.18 Location Screen

The user can view the current location in the location screen. The marker will show the current location of the user in the Google Map. Figure 4.24 below shows the location screen of ElderCare.

Figure 4.24: Location Screen

4.3.19 Location Circle Screen

My circle list will display in my circle screen. There is no limit how many users can join into location circle list. The last name of the user will display in the list. After the user clicked into the name, then the location of that user is show in the Google Map and the user can clicks the red marker to reconfirm the user that joined their circle. Then, the user can clear the list by clicking the delete all button. Figure 4.25 below shows the location circle screen of ElderCare. Figure 4.26 shows the circle member location screen of ElderCare.

Figure 4.25: My Circle Screen of ElderCare

Figure 4.26: My Circle Member Location Screen of ElderCare

4.3.20 Medicine Screen

The user can add their medicine information, set alarm button and refresh button in the medicine screen. Figure 4.27 shows the empty medicine list of ElderCare. The user can add a new medicine into the medicine list by clicking the circle button in the right down corner, if not the medicine screen is shown no data. After that, the user will redirect to the add medicine screen, then the user can enter medicine information in terms of medicine name, tablets, times daily, and before or after meal, once done the user can click the button again to save the information into the database and an alert message pop out to inform the user to refresh the list which shows in Figure 4.29. Figure 4.28 shows the add medicine screen of ElderCare.

Then, the medicine information will list out in my medicine list. Figure 4.30 shows that the medicine list of ElderCare. Next, the user also can update the medicine information by clicking that specific medicine and will navigate the user to update medicine screen. All of the medicine information can be updated or delete in this screen. Figure 4.31 and Figure 4.32 shows the update and delete medicine list of ElderCare. If the user click delete button to delete the medicine information, the alert message will pop out. If the user clicks 'Yes', then the medicine information will delete and redirect the user to the medicine screen. If the user clicks 'No', then the user will back to the update medicine screen. Figure 4.33 shows an alert message of delete medicine screen of ElderCare.

Figure 4.27: Empty My Medicine List Screen of ElderCare

Figure 4.28: Add Medicine Screen of ElderCare

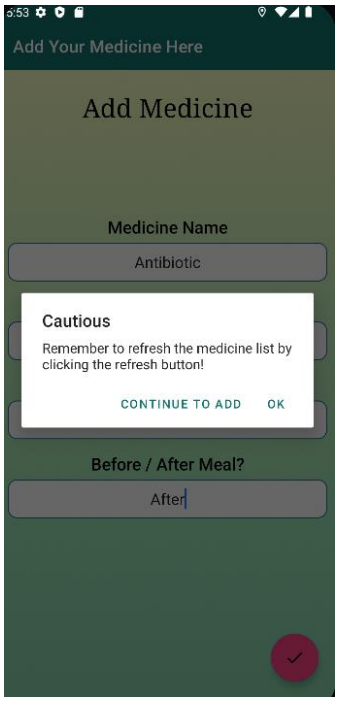


Figure 4.29: Alert Message of Add Medicine Screen of ElderCare

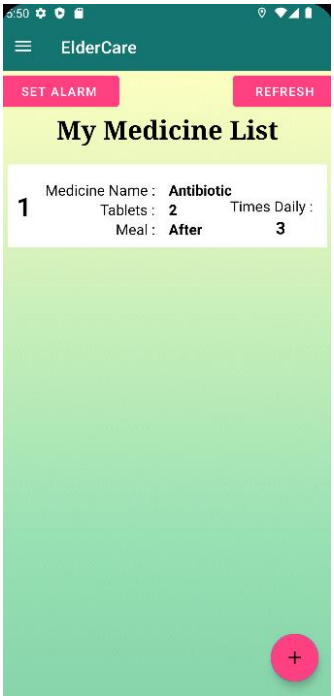


Figure 4.30: My Medicine List Screen of ElderCare

Figure 4.31: Edit Medicine Screen of ElderCare

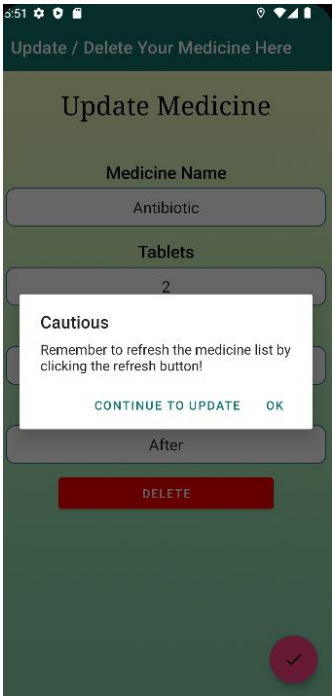


Figure 4.32: Alert Message of Update Medicine Screen of ElderCare

Figure 4.33: Alert Message of Delete Medicine Screen of ElderCare

Furthermore, the user can set an alarm reminder by clicking the ‘Set Alarm’ button. The user can click the circle button to add a new alarm in the alarm list screen. Figure 4.34 shows the alarm list screen of ElderCare. In the add alarm screen, the user can schedule time, enter label and the repeated days that user wants. Figure 4.35 shows the add alarm screen of ElderCare. Then, it will redirect the user to the alarm list screen. Figure 4.36 shows the alarm list of ElderCare. The notification will pop out while the time reached. Figure 4.37 shows the notification of ElderCare. The user also can edit the alarm information by clicking that specific alarm in the alarm list. Figure 4.38 shows the edit alarm screen of ElderCare. Then, the user will be redirected to the edit alarm screen. The user can edit the alarm information or delete the alarm in this screen. The alert message will pop out when the user wants to delete the alarm. If the user clicks ‘Yes’, then the alarm will be deleted and redirect the user back to the alarm list screen. If the user clicks ‘No’, then the user will remain in the edit alarm screen. Figure 4.39 below shows the alert message of delete alarm screen of ElderCare.

Figure 4.34: Alarm List Screen of ElderCare

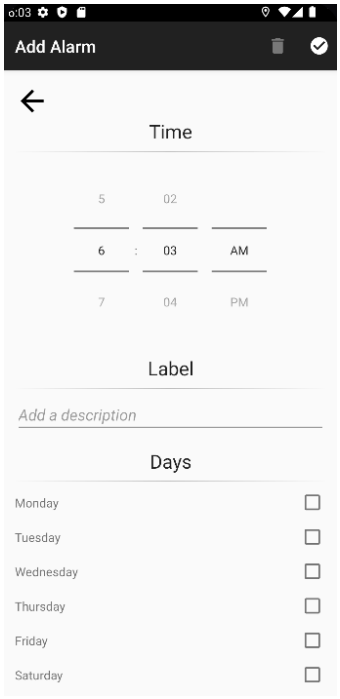


Figure 4.35: Add Alarm Screen of ElderCare

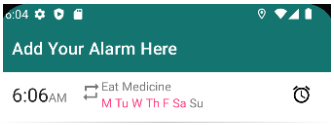


Figure 4.36: Alarm List Screen of ElderCare

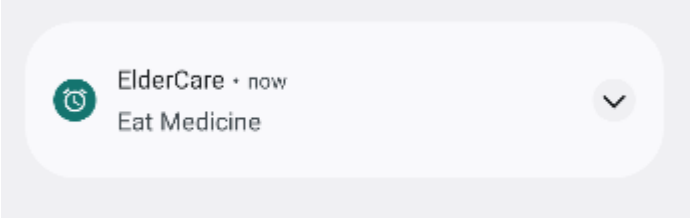


Figure 4.37: Notification of ElderCare

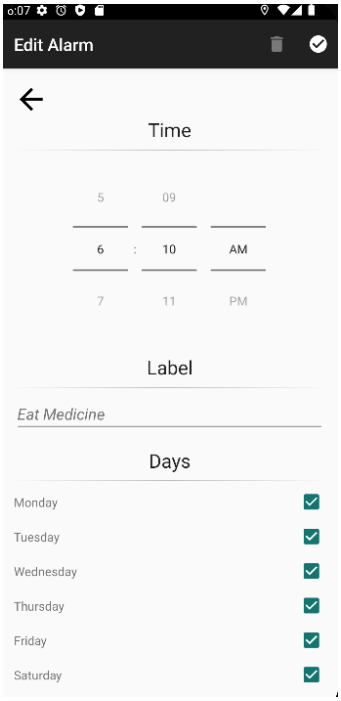


Figure 4.38: Edit Alarm Screen of ElderCare

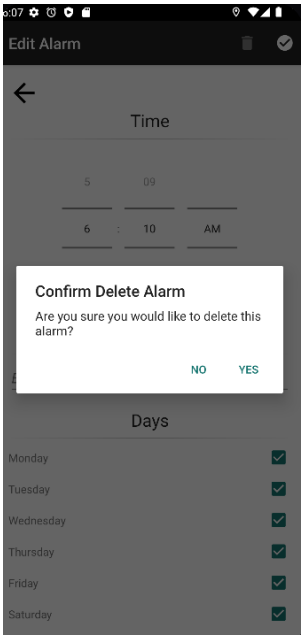


Figure 4.39: Alert Message of Delete Alarm Screen of ElderCare

4.3.21 Emergency Screen

The user can emergency call ‘911’ in the emergency screen. By clicking the red call button, the user will straight redirect to the phone call and the user can call ‘911’ immediately. Figure 4.40 and Figure 4.41 below shows the emergency screen of ElderCare.

Figure 4.40: Emergency Screen of ElderCare

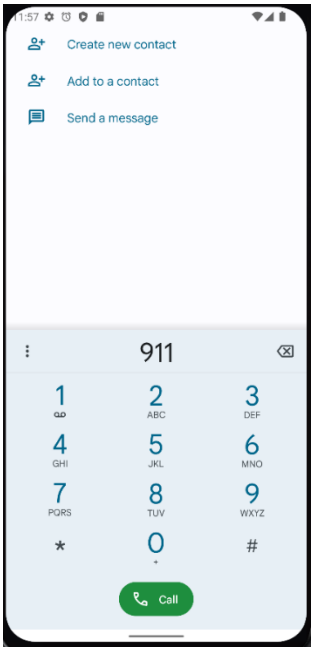


Figure 4.41: Calling Screen of ElderCare

4.3.22 Logout Screen

The logout screen shows the pop out alert message when the user clicks ‘Logout” in the drawer menu. If the user clicks ‘Yes’ then the application will redirect the user to the select user screen. If the user clicks ‘No’ then the pop out alert message will close. Figure 4.42 below shows the logout screen of ElderCare.

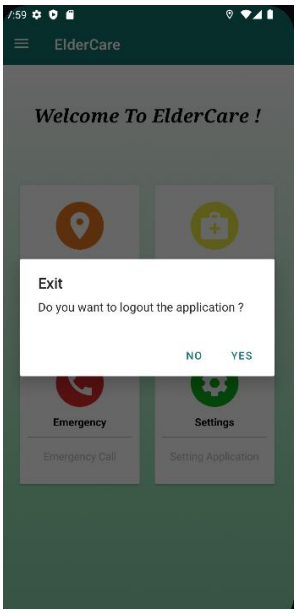


Figure 4.42: Alert Message of Logout Screen of ElderCare

4.3.23 Close Application Screen

The close application screen shows the pop out alert message when the user clicks the back button on the phone. If the user clicks ‘Yes’ then the application will close. If the user clicks ‘No’ then the pop out alert message will close. Figure 4.43 below shows the close application screen of ElderCare.

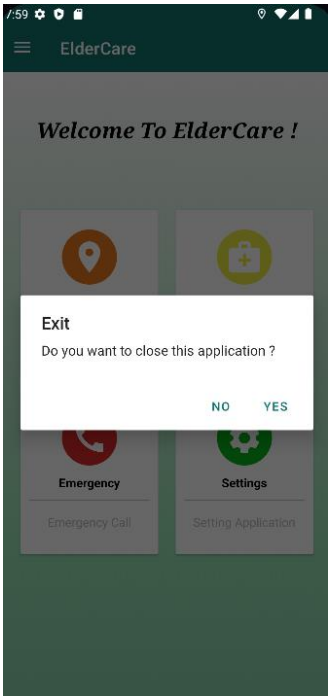


Figure 4.43: Alert Message of Close Application Screen of ElderCare

4.4 Result

Testing phase plays a crucial role once the application has done developed. The testing phase will ensure that all of the features that developed is works as expected. The user acceptance test will be conducted after ElderCare is fully developed. The User Acceptance Test (UAT) will be carried out on 20 users included of elderly and their family members. The results of UAT below shows that all of the features is functioned well. Details of the user acceptance test are explained in the Appendix D. Table 4.1 below shows one of the examples of UAT results that have been conducted on the ElderCare application.

Table 4.1: Example of the User Acceptance Test (UAT) Result for ElderCare

Event	Test Data	Expected Result	Actual Result	Pass / Fail	Comments
Sign Up	First Name: Song Last Name: Yeow Email Address: song99@gmail.com Password: sj@123	System navigate user to the login screen	Same as expected result	Pass	
Login	Email Address: song99@gmail.com Password: sj@123	System navigate user to the invite code screen	Same as expected result	Pass	
View invite code screen	Invite code: 626115	System sent the invite code to the contact person	Same as expected result	Pass	Suggest put invite code in home page
Join invite code	Invite code: 425239	System will lead the user to join the circle	Same as expected result	Pass	
View current location	N/A	System will display the marker of the user location in the map	Same as expected result	Pass	Locate my spot correctly and quickly
View location circle	Username: Song	System will display the list of the user and the	Same as expected result	Pass	The location of user is precise

		marker of the user location in the map			
Delete location circle	N/A	System will clear the list of location circle	Same as expected result	Pass	
Add medicine information	Medicine Name: Antibiotic Tablets: 1 Times Daily: 3 Before / After Meal: After	System will display the added information of medicine in the list	Same as expected result	Pass	Clear instructions
Update medicine information	N/A	System will display the updated information of medicine in the list	Same as expected result	Pass	
Delete medicine information	N/A	System will pop out an alert message and navigate the user back to the medicine list	Same as expected result	Pass	
View medicine list	N/A	System will display the medicine list	Same as expected result	Pass	System display the information correctly
Add alarm information	Time: 12.38pm Label: Remember to eat antibiotic Days: Select all weekdays	System will navigate the user back to the alarm list	Same as expected result	Pass	
Update alarm information	Time: 1pm	System will navigate the user back to the alarm list	Same as expected result	Pass	

Delete alarm information	N/A	System will navigate the user back to the alarm list	Same as expected result	Pass	
Call emergency call	N/A	System will navigate the user to the phone call screen and the number is default set	Same as expected result	Pass	
Change profile picture	N/A	System will navigate the user back to the user profile screen	Same as expected result	Pass	

4.5 Discussions

This subchapter will discuss the result of the User Acceptance Test (UAT) for ElderCare. A survey of user feedback using Google form is given to the users while the testing and evaluating usability of the mobile application. Details of the user acceptance test are explained in the Appendix D.

4.5.1 Results of User Acceptance Test (UAT)

There are 16 events has been carried out in User Acceptance Test (UAT) where the user needs to test all of the available features in the mobile application. The results of UAT shows that all of the features in this mobile application can function successfully. All of the expected result is achieved in the actual result in all of the event that mentioned in UAT script. Figure 4.44 below shows that the overview of the results of UAT. Also, the Figure 4.45 below shows that the example of the user doing the testing.

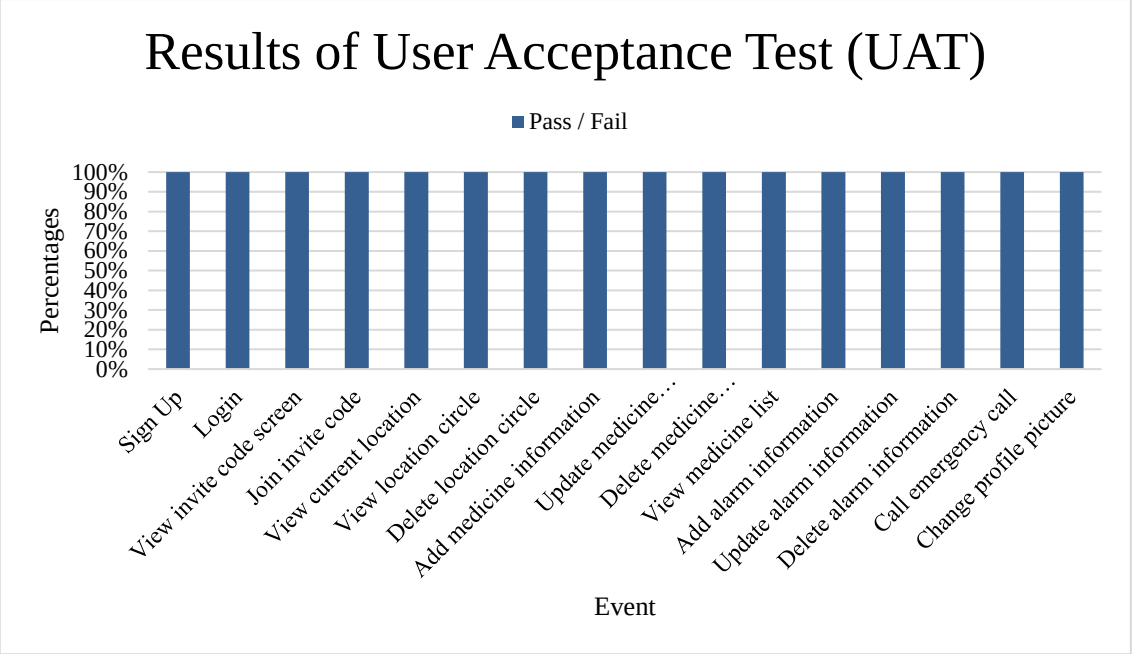


Figure 4.44: Overview of the results of User Acceptance Test (UAT)

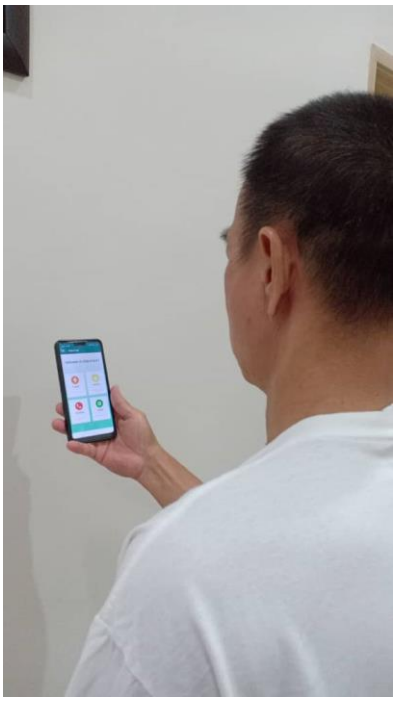


Figure 4.45: Example of user doing testing

4.5.2 Results of User Feedback

4.5.2.1 Section 1

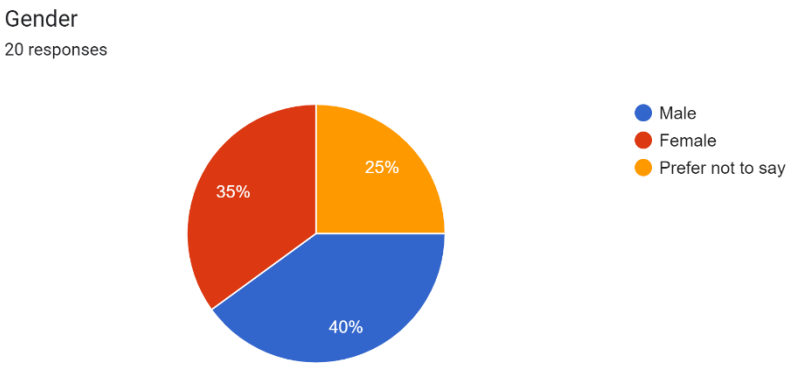


Figure 4.46: Question 1 in Section 1

8 of 20 respondents which 40% are male, outnumbering the female respondents by 7 which 35% and others prefer not to say as shown in Figure 4.46.

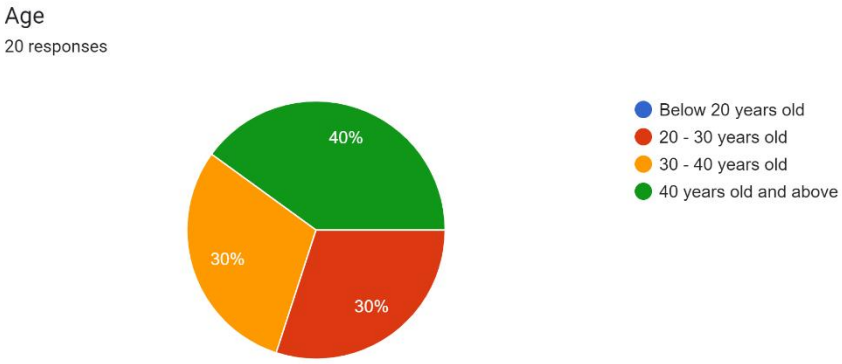


Figure 4.47: Question 2 in Section 1

There are 40% respondents of this survey are from the age group which 40 years old and above whereas 30% of respondents is from the age group which 20 – 30 years old and 30% of respondents is from the age group 30 – 40 years old as shown as Figure 4.47.

4.5.2.2 Section 2

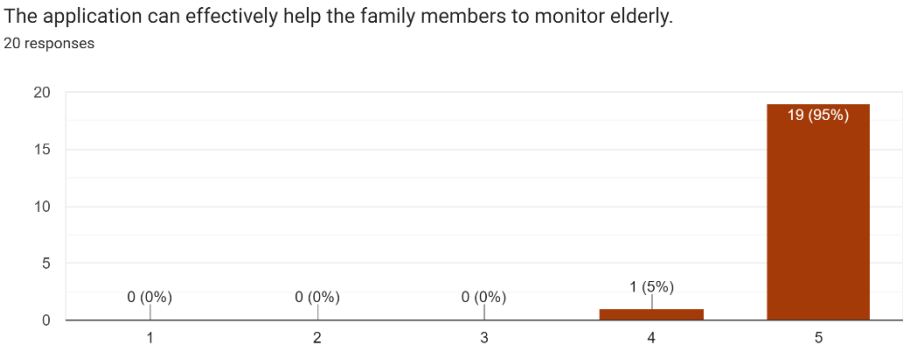


Figure 4.48: Question 1 in Section 2

There are 95% of respondents is strongly agree with the statement whereas only 5% which is 1 out of 20 respondents are agree with the statement as shown as Figure 4.48.

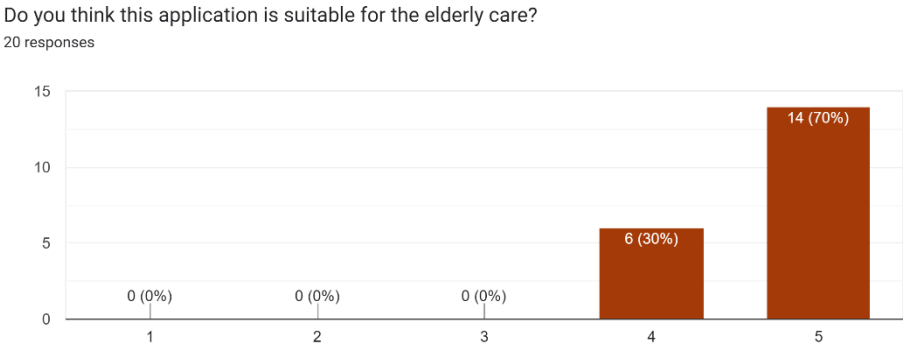


Figure 4.49: Question 2 in Section 2

14 out of 20 respondents strongly agree that the application is suitable for the elderly care whereas 30% of the respondents agree that the application is suitable for the elderly care as shown as Figure 4.49.

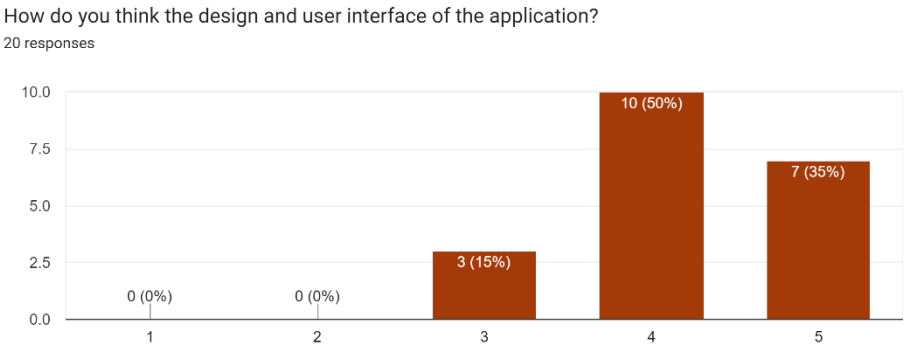


Figure 4.50: Question 3 in Section 2

There are only 35% of respondents think that the design and user interface of the application is very good whereas 10 out of 20 respondents is think that the design and user interface of the application is good and only 3 respondents is neutral for this statement as shown as Figure 4.50.

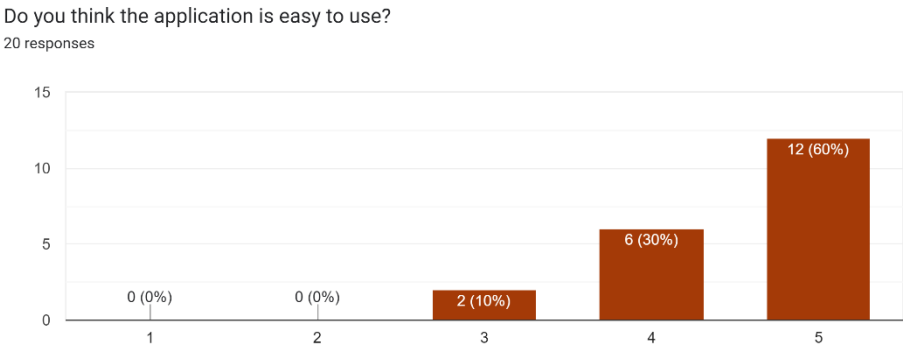


Figure 4.51: Question 4 in Section 2

12 out of 20 respondents strongly agree that the application is easy to use whereas 30% of respondents agree that the application is easy to user and 2 respondents is neutral for this statement as shown as Figure 4.51.

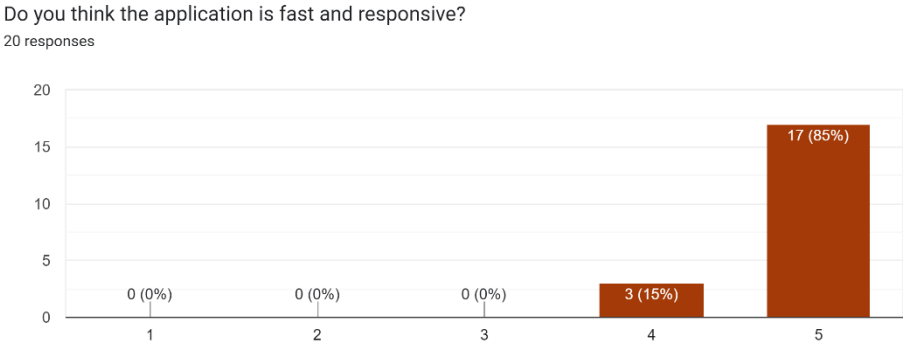


Figure 4.52: Question 5 in Section 2

There are 17 out of 20 respondents strongly agree that the application is fast and responsive and only 15% of respondents agree that the application is fast and responsive as shown as Figure 4.52.

4.6 Chapter Summary

In conclusion, this chapter discuss the implementation of ElderCare, testing result of the application and the discussion of the application. The development environment and tools are also focused in this chapter. After that, the user interface of ElderCare application that has been completely developed are discussed in this chapter with the description of each user interface. In a nutshell, the testing results and discussion of ElderCare also has been focused in this chapter which the User Acceptance Test (UAT) is included.

CHAPTER 5

CONCLUSION

5.1 Introduction

In this chapter will discuss the summarization of finding of developing a mobile application to achieve the objectives as mentioned in Chapter 1. There are 5 limitations occurred in this application and the limitations will be discussed. Next, the future works of the mobile application also will be discussed in this chapter.

5.2 Objective Revisited

All of the objectives in this project have been met. To recapitulate the objectives, they are:

1. To collect the functional and non-functional requirements for developing the ElderCare mobile application.
2. To develop ElderCare, a mobile application for elderly care.
3. To evaluate the functionality of the developed ElderCare mobile application for elderly care.

When developing the ElderCare mobile application, three objectives are focused on. The first objective is to collect the functional and non-functional requirements for developing the ElderCare mobile application. This objective has been accomplished, where the requirements are collected from three existing systems and the user which using the Google form method.

The second objective is to develop ElderCare for elderly care. This objective has been successfully achieved, as mentioned in Chapter 4. The ElderCare mobile application has been successfully developed based on the requirements and design mentioned in Chapter 3. Next, the concept of usability has been completely implemented for a better user experience.

Last but not least, the last objective is to evaluate the functionality of the developed ElderCare mobile application for elderly care using the User Acceptance Test (UAT). ElderCare has passed the user acceptance test. This mobile application can run smoothly, and the function is usable based on the test results. The results of the test can refer from Chapter 4 and Appendix D.

5.3 Limitation

ElderCare has 5 limitations, which are:

1. The mobile application does not save the location history of the user.
2. The mobile application does not provide the joined circle username to the user.
3. The mobile application does not provide the user to change the username and password.
4. The mobile application can only be accessed when the users are connected to the internet.
5. The mobile application does not provide the contact feature for the user to contact the user that joined their circle.

5.4 Future Works

This project has a numerous potentials that can be expanded and enhanced. In the future version of the application, the application will be able to save the user location history into the cloud database and display it to the user. The user can see the time and last user location in the location history. Next, the user can view or delete the circle joined manually and this can help the user to identify they are in the right circle. After that, the user can upload their medicine picture into the list and this will help the user easily differentiate the medicine. Last but not least, the application can provide some mini games for the users, elderly to release their stress and overcome their loneliness. The application will upload to the online application store such as Google Play Store and Huawei AppGallery.

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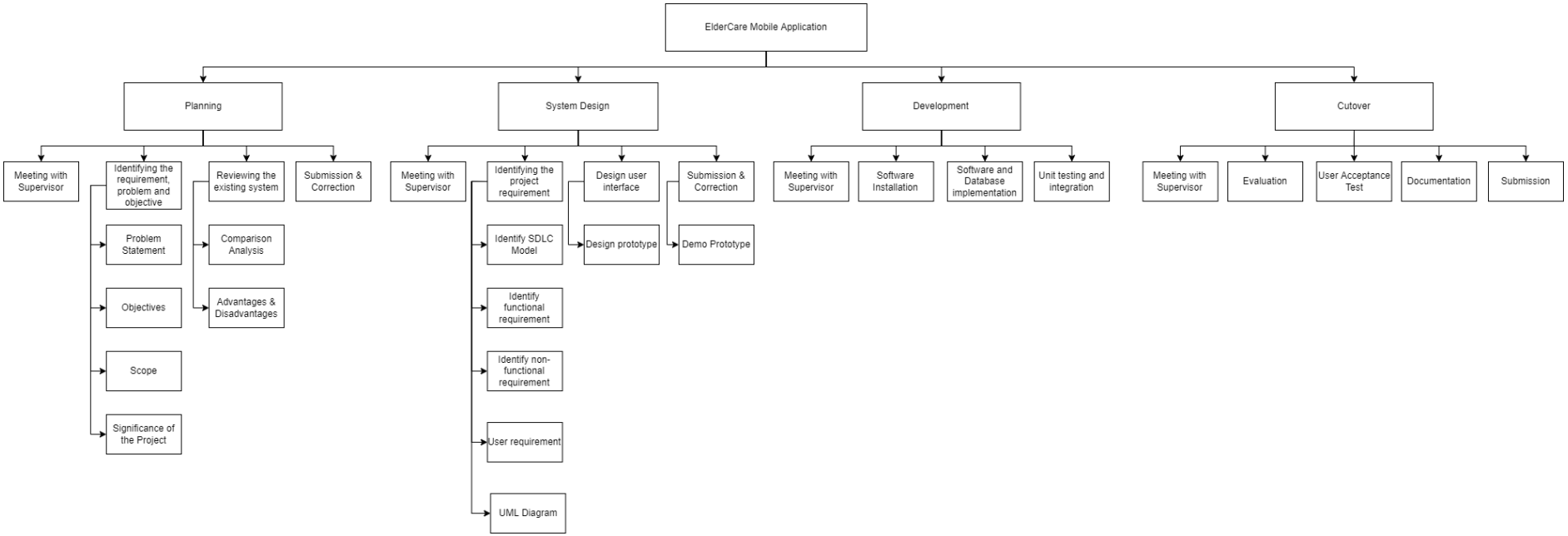
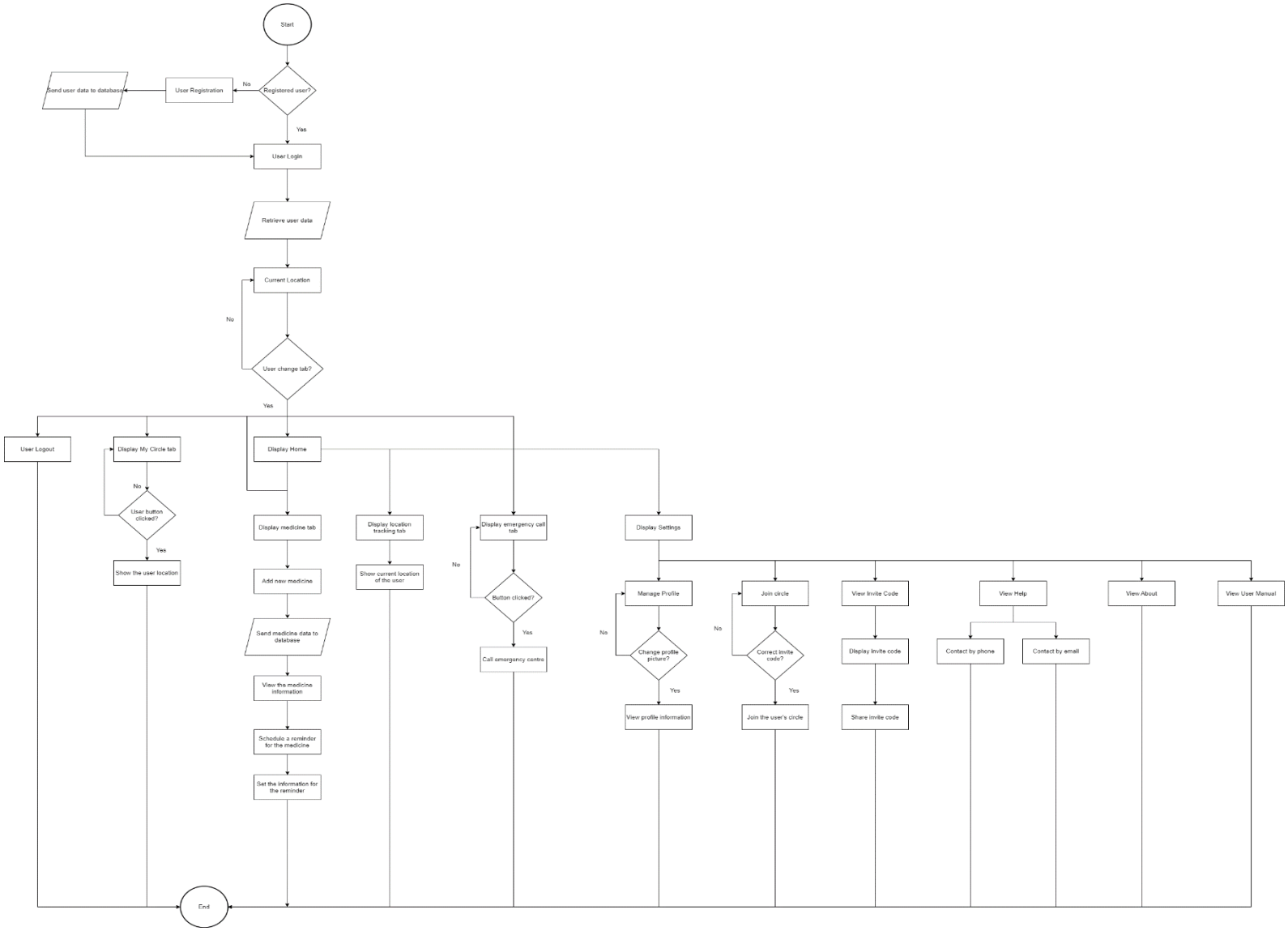
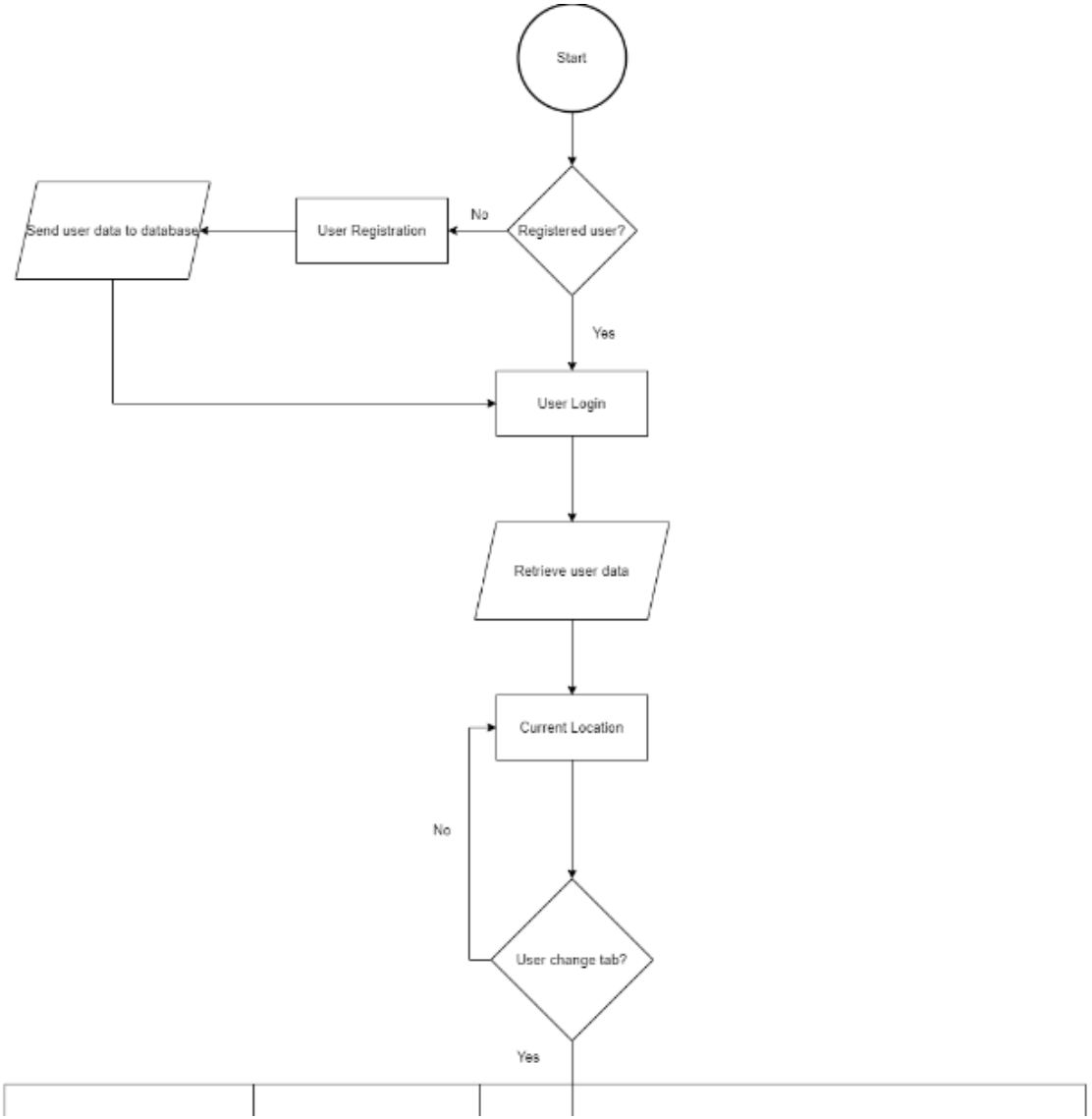
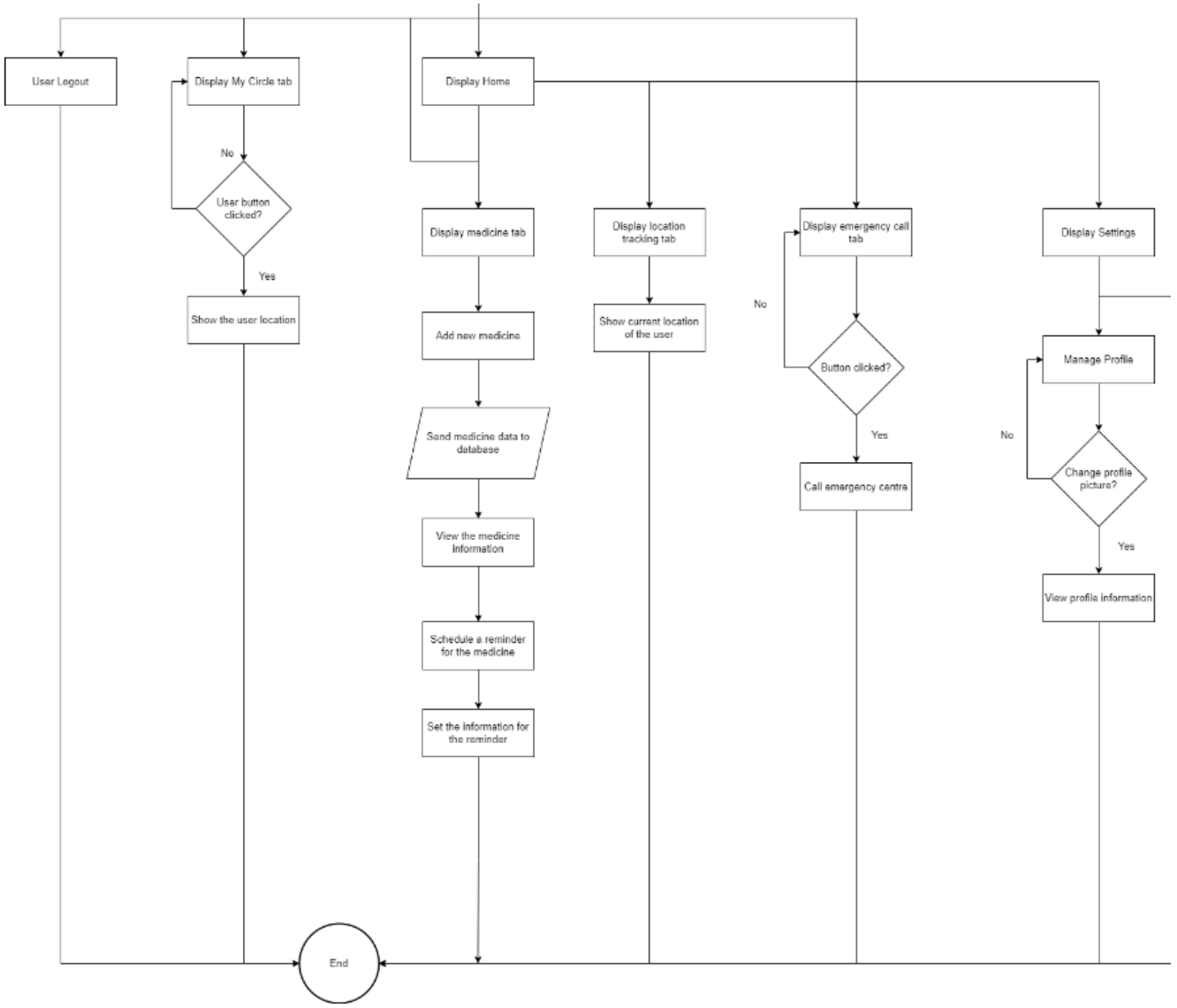
APPENDIX A
WORK BREAK STRUCTURE (WBS)

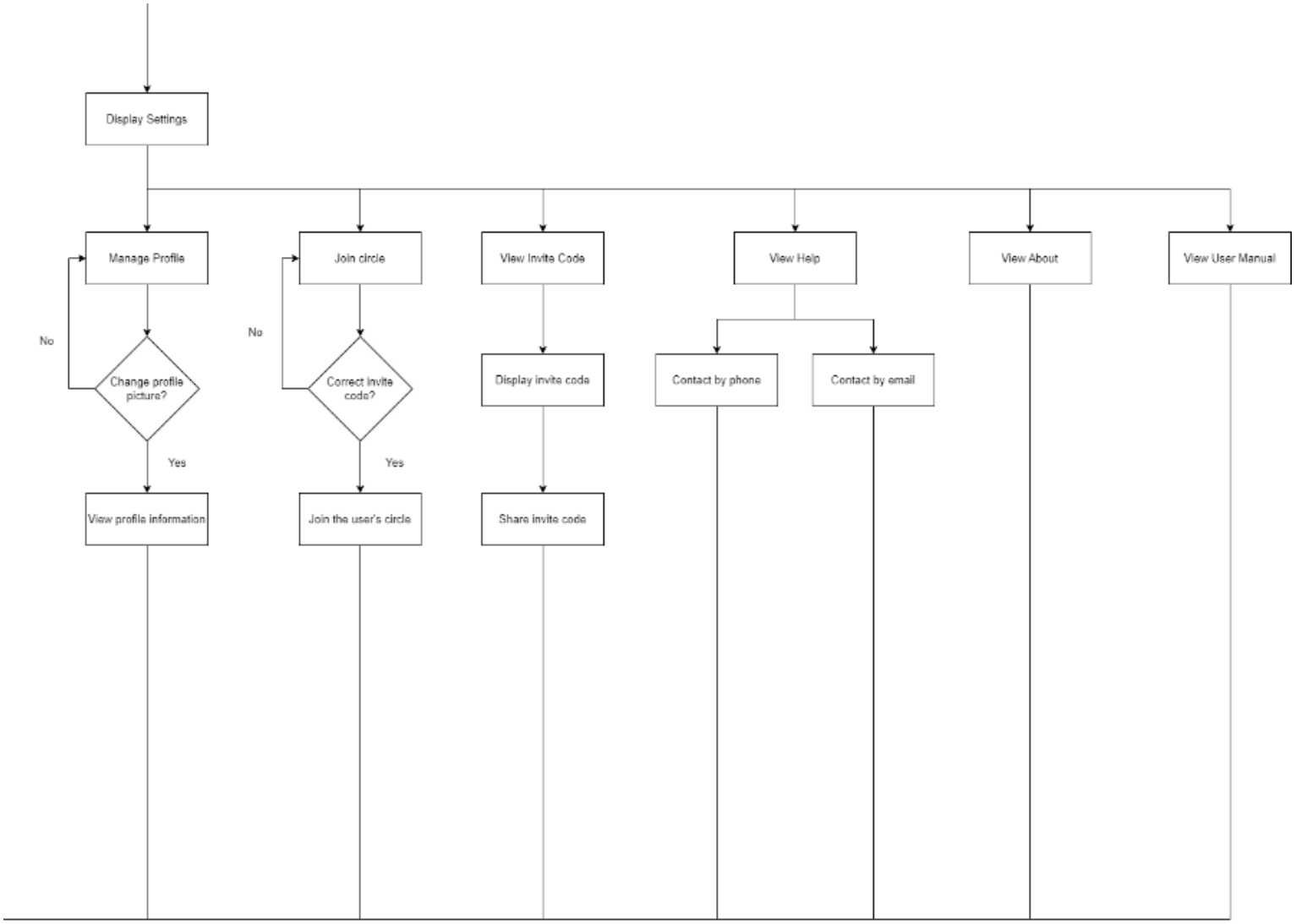


APPENDIX B
FLOWCHART

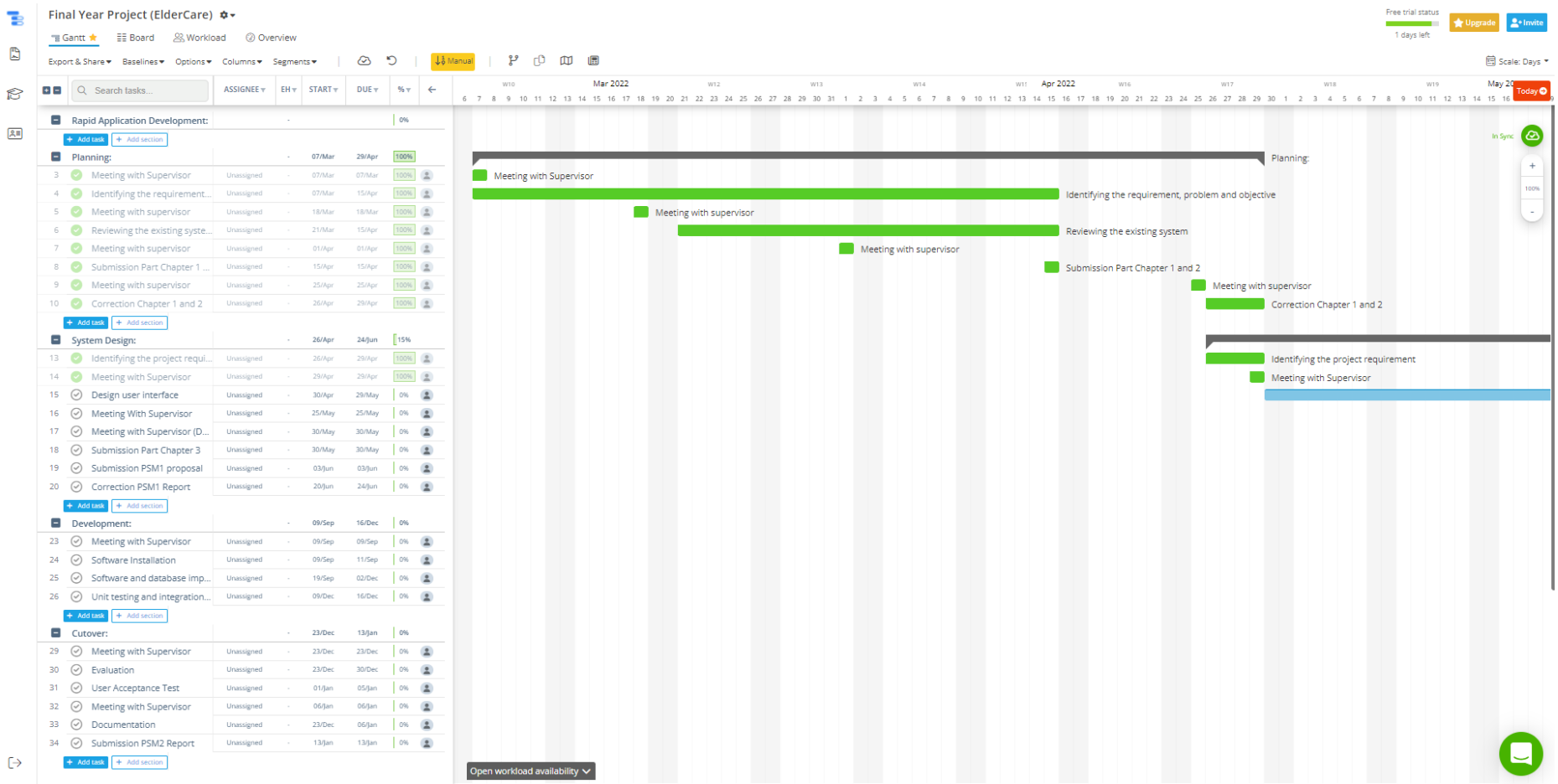

Start
Registered user?
No
User Registration
Send user data to database
Yes
User Login
Retrieve user data
Current Location
No
User change tab?
Yes
User Logout
Display My Circle tab
No
User button clicked?
Yes
Show the user location
Display Home
Display medicine tab
Add new medicine
Send medicine data to database
View the medicine information
Schedule a reminder for the medicine
Set the information for the reminder
Display location tracking tab
Show current location of the user
Display emergency call tab
No
Button clicked?
Yes
Call emergency centre
Display Settings
Manage Profile
No
Change profile picture?
Yes
View profile information
Join circle
No
Correct invite code?
Yes
Join the user's circle
View Invite Code
Display invite code
Share invite code
View Help
Contact by phone
Contact by email
View About
View User Manual
End

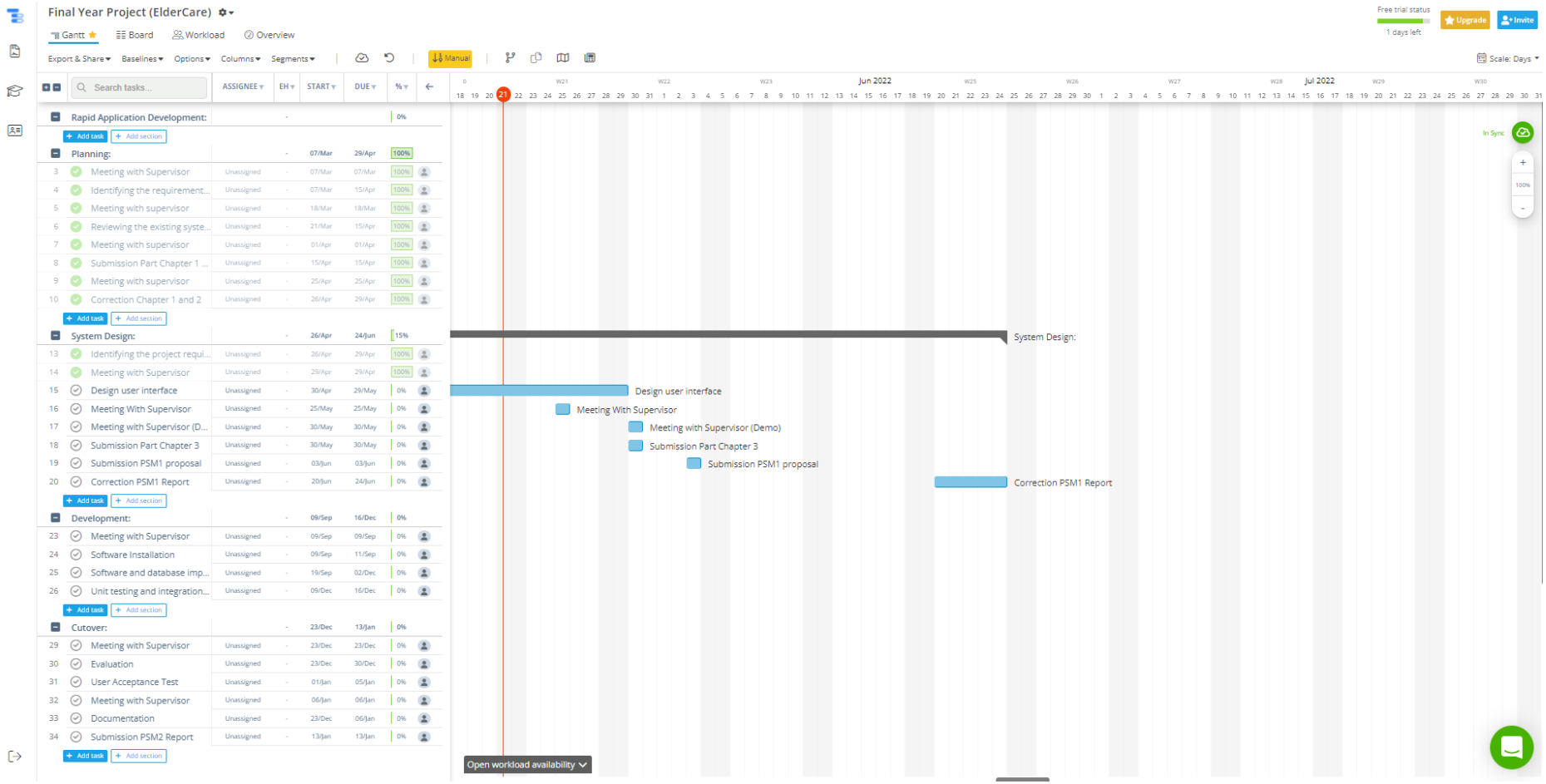

Start
Registered user?
No
User Registration
Send user data to database
Yes
User Login
Retrieve user data
Current Location
No
User change tab?
Yes

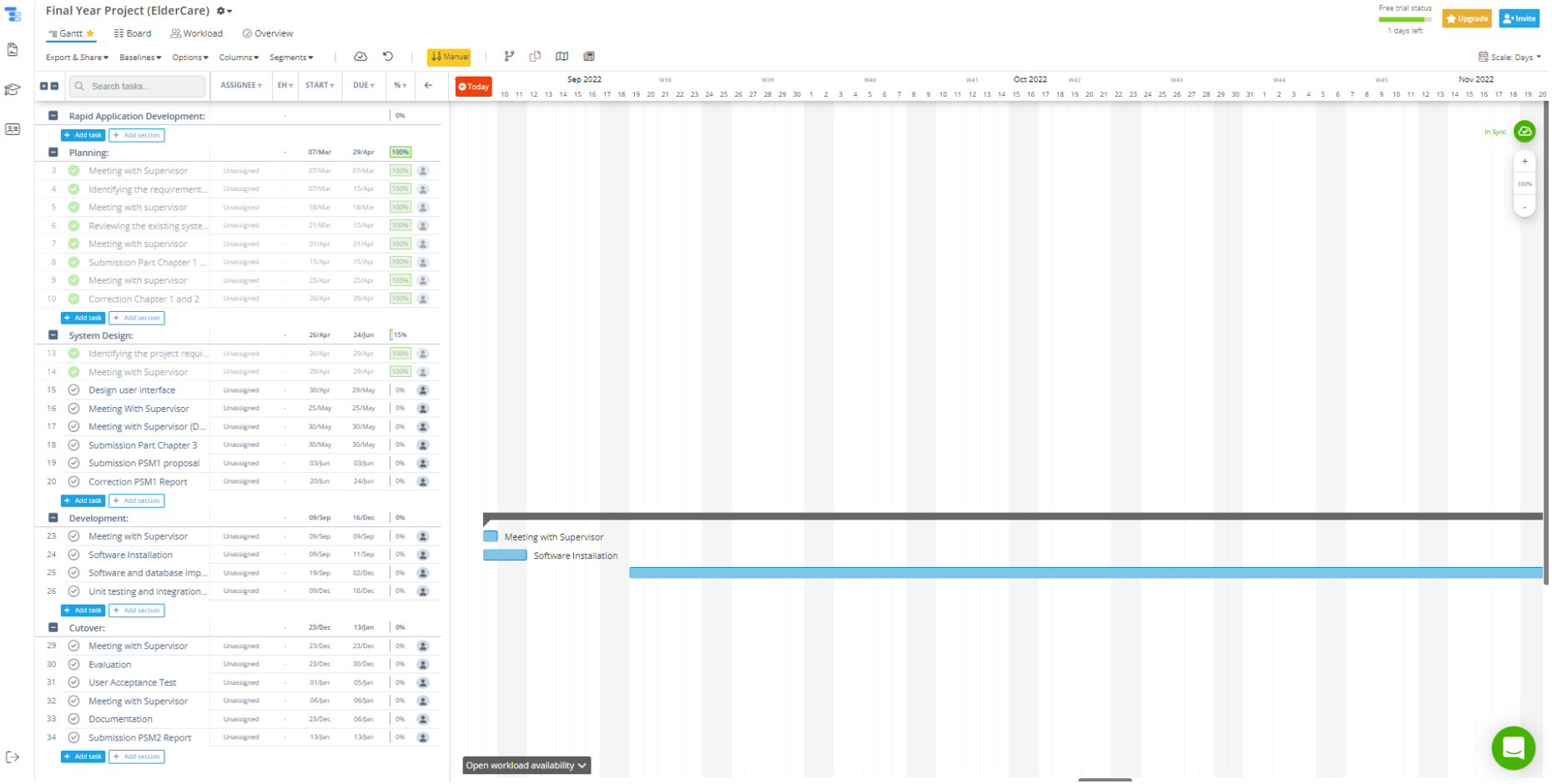

User Logout
Display My Circle tab
No
User button clicked?
Yes
Show the user location
Display Home
Display medicine tab
Add new medicine
Send medicine data to database
View the medicine information
Schedule a reminder for the medicine
Set the information for the reminder
Display location tracking tab
Show current location of the user
Display emergency call tab
No
Button clicked?
Yes
Call emergency centre
Display Settings
Manage Profile
No
Change profile picture?
Yes
View profile information
End

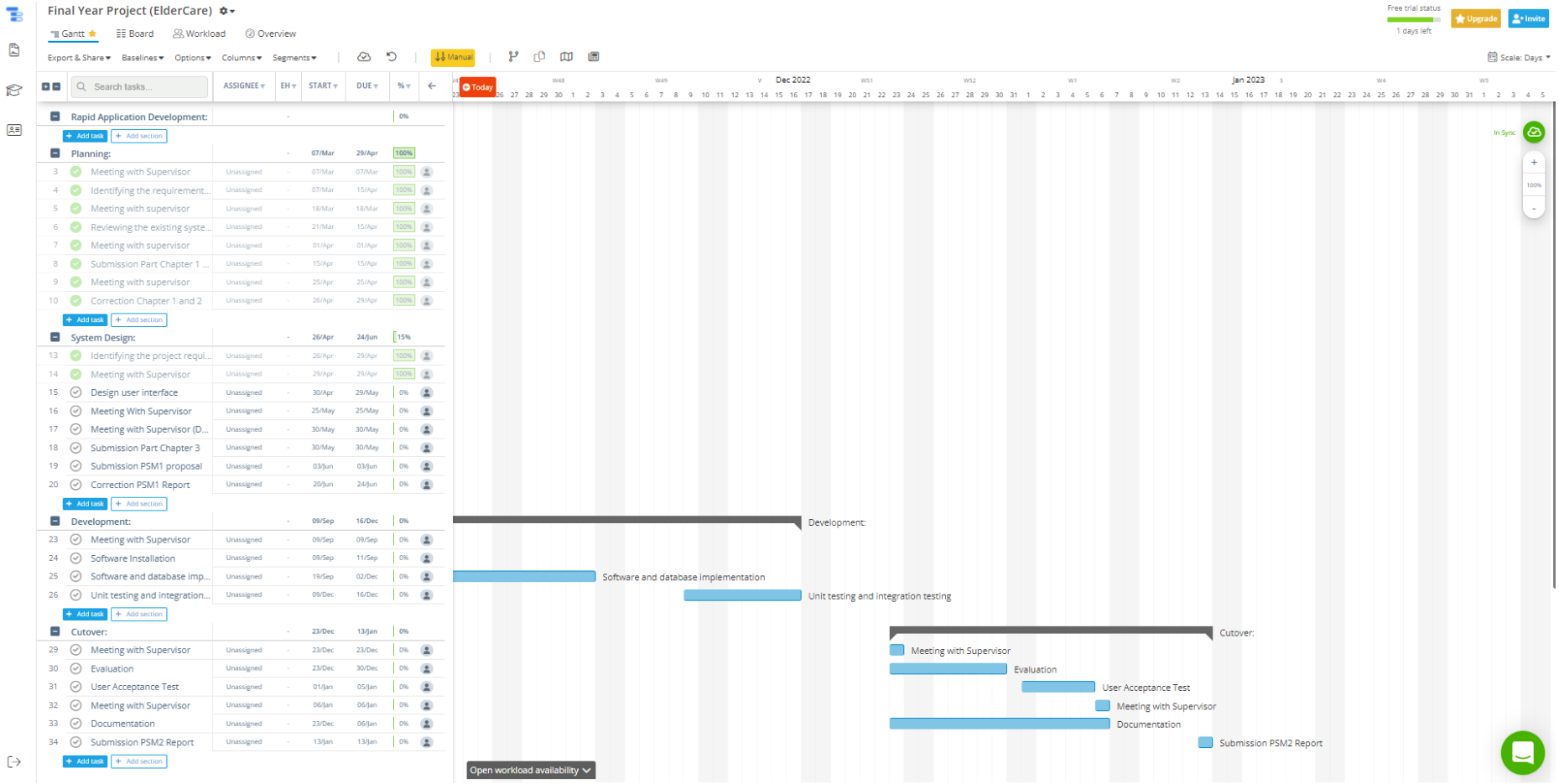

Display Settings
Manage Profile
Join circle
View Invite Code
View Help
View About
View User Manual
No
Change profile picture?
Yes
View profile information
No
Correct invite code?
Yes
Join the user's circle
Display invite code
Share invite code
Contact by phone
Contact by email

APPENDIX C
GANTT CHART




Final Year Project (ElderCare)
Gantt
Board
Workload
Overview
Free trial status
1 days left
Upgrade
Invite
Export & Share
Baselines
Options
Columns
Segments
Manual
Scale: Days
Search tasks...
ASSIGNEE
EH
START
DUE
%
Jun 2022
Jul 2022
In Sync
Rapid Application Development:
Add task
Add section
Planning:
07/Mar
29/Apr
100%
Meeting with Supervisor
Identifying the requirement...
Meeting with supervisor
Reviewing the existing syste...
Meeting with supervisor
Submission Part Chapter 1 ...
Meeting with supervisor
Correction Chapter 1 and 2
System Design:
26/Apr
24/Jun
15%
Identifying the project requi...
Meeting with Supervisor
Design user interface
Meeting With Supervisor
Meeting with Supervisor (D...
Submission Part Chapter 3
Submission PSM1 proposal
Correction PSM1 Report
Development:
09/Sep
16/Dec
Meeting with Supervisor
Software Installation
Software and database imp...
Unit testing and integration...
Cutover:
23/Dec
13/Jan
Meeting with Supervisor
Evaluation
User Acceptance Test
Meeting with Supervisor
Documentation
Submission PSM2 Report
Design user interface
Meeting With Supervisor
Meeting with Supervisor (Demo)
Submission Part Chapter 3
Submission PSM1 proposal
Correction PSM1 Report
Open workload availability


Final Year Project (ElderCare)
Gantt
Board
Workload
Overview
Export & Share
Baselines
Options
Columns
Segments
Manual
Scale: Days
Free trial status
1 days left
Upgrade
Invite
Search tasks...
ASSIGNEE
EH
START
DUE
%
Today
Sep 2022
Oct 2022
Nov 2022
In Sync
Rapid Application Development:
Add task
Add section
Planning:
07/Mar
29/Apr
Meeting with Supervisor
Identifying the requirement...
Meeting with supervisor
Reviewing the existing syste...
Meeting with supervisor
Submission Part Chapter 1 ...
Meeting with supervisor
Correction Chapter 1 and 2
System Design:
26/Apr
24/Jun
Identifying the project requi...
Meeting with Supervisor
Design user interface
Meeting With Supervisor
Meeting with Supervisor (D...
Submission Part Chapter 3
Submission PSM1 proposal
Correction PSM1 Report
Development:
09/Sep
16/Dec
Meeting with Supervisor
Software Installation
Software and database imp...
Unit testing and integration...
Cutover:
23/Dec
13/Jan
Meeting with Supervisor
Evaluation
User Acceptance Test
Meeting with Supervisor
Documentation
Submission PSM2 Report
Meeting with Supervisor
Software Installation
Open workload availability


Final Year Project (ElderCare)
Gantt
Board
Workload
Overview
Export & Share
Baselines
Options
Columns
Segments
Manual
Scale: Days
Free trial status
1 days left
Upgrade
Invite
Search tasks...
ASSIGNEE
EH
START
DUE
%
Today
Dec 2022
Jan 2023
In Sync
Rapid Application Development:
Planning:
Meeting with Supervisor
Identifying the requirement...
Meeting with supervisor
Reviewing the existing syste...
Meeting with supervisor
Submission Part Chapter 1 ...
Meeting with supervisor
Correction Chapter 1 and 2
System Design:
Identifying the project requi...
Meeting with Supervisor
Design user interface
Meeting With Supervisor
Meeting with Supervisor (D...
Submission Part Chapter 3
Submission PSM1 proposal
Correction PSM1 Report
Development:
Meeting with Supervisor
Software Installation
Software and database imp...
Unit testing and integration...
Cutover:
Meeting with Supervisor
Evaluation
User Acceptance Test
Meeting with Supervisor
Documentation
Submission PSM2 Report
Add task
Add section
Development:
Software and database implementation
Unit testing and integration testing
Cutover:
Meeting with Supervisor
Evaluation
User Acceptance Test
Meeting with Supervisor
Documentation
Submission PSM2 Report
Open workload availability

APPENDIX D
USER ACCEPTANCE TEST FORM

Test Case ID: TC-EDC-01				**Test Designed By:** Yeow Song Jie		
Test Priority (Low/Medium/High): High				**Test Designed Date:** 17/12/2022		
Module Name: Manage Authentication				**Test Executed By:** Wong Sien Jie		
Test Title: Register user account				**Test Execution Date:** 20/12/2022		
Description: Register new user account by entering first name, last name, email address and password.						
Precondition: Select the user type.						
Dependencies: None						
Steps	**Test Steps**	**Test Data**	**Expected Result**	**Actual Result**	**Status (Pass / Fail)**	**Comments**
1.	Navigate to sign up interface		System display register screen	Same as expected result	Pass	
2.	Enter the first name, last name, email address and password.	First Name: Sien Jie Last Name: Wong Email Address: sienjie1@gmail.com Password: wongsienjie5683			Pass	

3.	Click the signup button		System navigate user to the login screen	Same as expected result	Pass	

Test Case ID: TC-EDC-02	**Test Designed By:** Yeow Song Jie
Test Priority (Low/Medium/High): High	**Test Designed Date:** 17/12/2022
Module Name: Manage Authentication	**Test Executed By:** Wong Sien Jie
Test Title: Login account	**Test Execution Date:** 20/12/2022
Description: Login the application by inserting email address and password.	
Precondition: The email address and password must be registered in the application.	
Dependencies: None	

Steps	**Test Steps**	**Test Data**	**Expected Result**	**Actual Result**	**Status (Pass / Fail)**	**Comments**
1.	Navigate to login interface		System display login screen	Same as expected result	Pass	
2.	Enter the email address and password	Email Address: sienjie1@gmail.com Password: wongsienjie5683			Pass	
3.	Click the login button		System navigate user to the invite code screen	Same as expected result	Pass	

Test Case ID: TC-EDC-03	**Test Designed By:** Yeow Song Jie
Test Priority (Low/Medium/High): High	**Test Designed Date:** 17/12/2022
Module Name: Manage Invite Code	**Test Executed By:** Wong Sien Jie
Test Title: Send Invite Code	**Test Execution Date:** 20/12/2022
Description: Send the invite code to others.	
Precondition: The user already login to the application.	
Dependencies: None	

Steps	**Test Steps**	**Test Data**	**Expected Result**	**Actual Result**	**Status (Pass / Fail)**	**Comments**
1.	Navigate user to send invite code screen		System display invite code screen	Same as expected result	Pass	Suggest put invite code in home page
2.	Click the send button	Invite Code: 845897 Share by using WhatsApp's	System navigate user to the 3rd party application	Same as expected result	Pass	
3.	Share the code to the contact person		System sent the invite code to the contact person	Same as expected result	Pass	

Test Case ID: TC-EDC-04	**Test Designed By:** Yeow Song Jie
Test Priority (Low/Medium/High): High	**Test Designed Date:** 17/12/2022
Module Name: Manage Invite Code	**Test Executed By:** Wong Sien Jie
Test Title: Join Invite Code	**Test Execution Date:** 20/12/2022
Description: Join the other user circle by using the invite code.	
Precondition: The user already login to the application.	
Dependencies: None	

Steps	Test Steps	Test Data	Expected Result	Actual Result	Status (Pass / Fail)	Comments
1.	Navigate user to send join code screen		System display join code screen	Same as expected result	Pass	
2.	Click the join button	Invite Code: 425239	System will lead the user to join the circle	Same as expected result	Pass	

Test Case ID: TC-EDC-05	**Test Designed By:** Yeow Song Jie
Test Priority (Low/Medium/High): High	**Test Designed Date:** 17/12/2022
Module Name: Manage Location	**Test Executed By:** Wong Sien Jie
Test Title: Locate current location	**Test Execution Date:** 20/12/2022
Description: Locate the current location of the user in Google Maps.	
Precondition: The user already login to the application.	
Dependencies: None	

Steps	Test Steps	Test Data	Expected Result	Actual Result	Status (Pass / Fail)	Comments
1.	Navigate user to my location screen		System display my location screen	Same as expected result	Pass	Locate my spot correctly and quickly
2.	View the current location		System will display the marker of the user location in the map	Same as expected result	Pass	View my current location correctly
3.	Click the location button to back to your current location after drag the map to another place		System will display the marker of the user	Same as expected result	Pass	Well designed, Location will back to my current location quickly

			location in the map			

Test Case ID: TC-EDC-06	**Test Designed By:** Yeow Song Jie
Test Priority (Low/Medium/High): High	**Test Designed Date:** 17/12/2022
Module Name: Manage Location	**Test Executed By:** Wong Sien Jie
Test Title: View Location Circle	**Test Execution Date:** 20/12/2022
Description: View the location of the user that has joined in the circle.	
Precondition: The user already login to the application.	
Dependencies: None	

Steps	Test Steps	Test Data	Expected Result	Actual Result	Status (Pass / Fail)	Comments
1.	Navigate user to location circle screen		System display location circle screen	Same as expected result	Pass	
2.	Click the username	Username: Song	System will display the marker of the user location in the map	Same as expected result	Pass	The location of user is precise

Test Case ID: TC-EDC-07				**Test Designed By:** Yeow Song Jie		
Test Priority (Low/Medium/High): High				**Test Designed Date:** 17/12/2022		
Module Name: Manage Location				**Test Executed By:** Wong Sien Jie		
Test Title: Delete Location Circle				**Test Execution Date:** 20/12/2022		
Description: Clear the list of user circle by clicking the button.						
Precondition: The user already login to the application.						
Dependencies: None						
Steps	**Test Steps**	**Test Data**	**Expected Result**	**Actual Result**	**Status (Pass / Fail)**	**Comments**
1.	Navigate user location circle screen		System display location circle screen	Same as expected result	Pass	
2.	Click the delete all button		System will clear the list of location circle	Same as expected result	Pass	

Test Case ID: TC-EDC-08	**Test Designed By:** Yeow Song Jie
Test Priority (Low/Medium/High): High	**Test Designed Date:** 17/12/2022
Module Name: Manage Medicine	**Test Executed By:** Wong Sien Jie
Test Title: Add Medicine	**Test Execution Date:** 20/12/2022
Description: Add the new information of medicine.	
Precondition: The user already login to the application.	
Dependencies: None	

Steps	Test Steps	Test Data	Expected Result	Actual Result	Status (Pass / Fail)	Comments
1.	Navigate user to add medicine screen		System display add medicine screen	Same as expected result	Pass	Clear instructions
2.	Enter the medicine information	Medicine Name: panadol Tablets: 1 Times Daily: 2 Before / After Meal: After			Pass	

3.	Click the tick button		System will pop out an alert message and navigate the user back to the medicine list	Same as expected result	Pass	
4.	Click the refresh button		System will display the added information of medicine in the list	Same as expected result	Pass	Fast and clear

Test Case ID: TC-EDC-09	**Test Designed By:** Yeow Song Jie
Test Priority (Low/Medium/High): High	**Test Designed Date:** 17/12/2022
Module Name: Manage Medicine	**Test Executed By:** Wong Sien Jie
Test Title: Update Medicine	**Test Execution Date:** 20/12/2022
Description: Update the information of medicine.	
Precondition: The user already login to the application.	
Dependencies: None	

Steps	**Test Steps**	**Test Data**	**Expected Result**	**Actual Result**	**Status (Pass / Fail)**	**Comments**
1.	Navigate user to update medicine screen		System display update medicine screen	Same as expected result	Pass	
2.	Update the medicine information	Tablets: 2			Pass	
3.	Click the tick button		System will pop out an alert message and navigate the user	Same as expected result	Pass	

			back to the medicine list			
4.	Click the refresh button		System will display the updated information of medicine in the list	Same as expected result	Pass	

Test Case ID: TC-EDC-10	**Test Designed By:** Yeow Song Jie
Test Priority (Low/Medium/High): High	**Test Designed Date:** 17/12/2022
Module Name: Manage Medicine	**Test Executed By:** Wong Sien Jie
Test Title: Delete Medicine	**Test Execution Date:** 20/12/2022
Description: Update the information of medicine.	
Precondition: The user already login to the application.	
Dependencies: None	

Steps	Test Steps	Test Data	Expected Result	Actual Result	Status (Pass / Fail)	Comments
1.	Navigate user to update medicine screen		System display update medicine screen	Same as expected result	Pass	
2.	Delete the medicine information	Medicine Name: panadol Tablets: 2 Times Daily: 2 Before / After Meal: After			Pass	

3.	Click the delete button		System will pop out an alert message and navigate the user back to the medicine list	Same as expected result	Pass	
4.	Click the refresh button		System will display the other information of medicine in the list	Same as expected result	Pass	

Test Case ID: TC-EDC-11				**Test Designed By:** Yeow Song Jie		
Test Priority (Low/Medium/High): High				**Test Designed Date:** 17/12/2022		
Module Name: Manage Medicine				**Test Executed By:** Wong Sien Jie		
Test Title: View Medicine List				**Test Execution Date:** 20/12/2022		
Description: Display the information of medicine.						
Precondition: The user already login to the application.						
Dependencies: None						
Steps	**Test Steps**	**Test Data**	**Expected Result**	**Actual Result**	**Status (Pass / Fail)**	**Comments**
1.	Navigate user to my medicine list screen		System will display the medicine list screen	Same as expected result	Pass	
2.	View the medicine information list		System will display the medicine list	Same as expected result	Pass	System display the information correctly

Test Case ID: TC-EDC-12	**Test Designed By:** Yeow Song Jie
Test Priority (Low/Medium/High): High	**Test Designed Date:** 17/12/2022
Module Name: Manage Medicine	**Test Executed By:** Wong Sien Jie
Test Title: Add Alarm	**Test Execution Date:** 20/12/2022
Description: Add an alarm for the medicine.	
Precondition: The user already login to the application.	
Dependencies: None	

Steps	**Test Steps**	**Test Data**	**Expected Result**	**Actual Result**	**Status (Pass / Fail)**	**Comments**
1.	Navigate user to add alarm screen		System will display the add alarm screen	Same as expected result	Pass	
2.	Enter Time, Label and Repeat Days	Time: 8am Label: Eat panadol Days: Select all weekdays			Pass	
3.	Click the confirm button		System will navigate the user	Same as expected result	Pass	

			back to the alarm list			

Test Case ID: TC-EDC-13	**Test Designed By:** Yeow Song Jie
Test Priority (Low/Medium/High): High	**Test Designed Date:** 17/12/2022
Module Name: Manage Medicine	**Test Executed By:** Wong Sien Jie
Test Title: Update Alarm	**Test Execution Date:** 20/12/2022
Description: Update an alarm for the medicine.	
Precondition: The user already login to the application.	
Dependencies: None	

Steps	Test Steps	Test Data	Expected Result	Actual Result	Status (Pass / Fail)	Comments
1.	Navigate user to update alarm screen		System will display the update alarm screen	Same as expected result	Pass	
2.	Enter Time, Label and Repeat Days	Time: 8.30am			Pass	
3.	Click the confirm button		System will navigate the user back to the alarm list	Same as expected result	Pass	

Test Case ID: TC-EDC-14	**Test Designed By:** Yeow Song Jie
Test Priority (Low/Medium/High): High	**Test Designed Date:** 17/12/2022
Module Name: Manage Medicine	**Test Executed By:** Wong Sien Jie
Test Title: Delete Alarm	**Test Execution Date:** 20/12/2022
Description: Delete an alarm for the medicine.	
Precondition: The user already login to the application.	
Dependencies: None	

Steps	**Test Steps**	**Test Data**	**Expected Result**	**Actual Result**	**Status (Pass / Fail)**	**Comments**
1.	Navigate user to update alarm screen		System will display the update alarm screen	Same as expected result	Pass	
2.	Click the delete button		System will navigate the user back to the alarm list	Same as expected result	Pass	

Test Case ID: TC-EDC-15	**Test Designed By:** Yeow Song Jie
Test Priority (Low/Medium/High): High	**Test Designed Date:** 17/12/2022
Module Name: Manage Emergency Call	**Test Executed By:** Wong Sien Jie
Test Title: Emergency call	**Test Execution Date:** 20/12/2022
Description: Emergency call to the emergency department.	
Precondition: The user already login to the application.	
Dependencies: None	

Steps	Test Steps	Test Data	Expected Result	Actual Result	Status (Pass / Fail)	Comments
1.	Navigate user to emergency call screen		System will display emergency call screen	Same as expected result	Pass	
2.	Click the red call button	Call Number: 911	System will navigate the user to the phone call screen and the number is default set.	Same as expected result	Pass	

3.	Click the call button		System will call to ‘911’	Same as expected result	Pass	

Test Case ID: TC-EDC-16	**Test Designed By:** Yeow Song Jie
Test Priority (Low/Medium/High): High	**Test Designed Date:** 17/12/2022
Module Name: Manage User	**Test Executed By:** Wong Sien Jie
Test Title: Change profile picture	**Test Execution Date:** 20/12/2022
Description: Change the profile picture by uploading the picture from gallery.	
Precondition: The user already login to the application.	
Dependencies: None	

Steps	Test Steps	Test Data	Expected Result	Actual Result	Status (Pass / Fail)	Comments
1.	Navigate user to profile screen		System will display user profile screen	Same as expected result	Pass	
2.	Click the circle button	Picture from gallery	System will navigate the user to the phone gallery.	Same as expected result	Pass	
3.	Select the picture		System will navigate the user back to the user profile screen	Same as expected result	Pass	