MEDICAL APPOINTMENT APPLICATION

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A project report submitted in partial fulfillment of the requirements for the award of Bachelor of Science (Honours) Software Engineering

Lee Kong Chian Faculty of Engineering and Science Universiti Tunku Abdul Rahman

September 2023

DECLARATION

I hereby declare that this project report is based on my original work except for citations and quotations which have been duly acknowledged. I also declare that it has not been previously and concurrently submitted for any other degree or award at UTAR or other institutions.

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ABSTRACT

The rapid global spread of COVID-19 has prompted swift and stringent measures to contain the spread, impacting every aspect of the global healthcare system. In response, Malaysia instituted strategies such as travel restrictions, lockdown, and the conversion of hospitals into COVID-19 facilities. This creates challenges for traditional medical appointment scheduling and requires innovative solutions. The project envisions a transformation medical appointment application to improve patient experience and healthcare efficiency. By leveraging modern technology, the app is designed to enable patients to seamlessly schedule appointments, access medical records, and receive appointment reminders through an intuitive mobile platform. It addresses the shortcoming of the current process, in which patients struggle with lengthy wait times and administrative constraints while trying to get an appointment. At the same time, healthcare providers benefit from simplified schedule management, improved patient interaction, and optimized quality of care. Also, the app goes beyond just making appointments and provides valuable information about organ transplants to help patients make decisions. The overall goal is to leverage technology to foster a patient-centric ecosystem that promotes better outcomes, lower costs, and timely delivery of care while complying with regulatory data management protocols and seamlessly integrating with existing healthcare systems to deliver a comprehensive health care experience. In addition, a literature review was also conducted by analyzing existing similar applications that are currently available to identify the essential features to implement in the developed application. This project will use the evolutionary prototype methodology as the software development methodology. At the end of the development, the application was involved in user acceptance testing, where a score of 80.2 with a grade of A- and a good rating was obtained. This concludes that the developed medical appointment application is well developed, consistent, user-friendly, and easy to use.

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CHAPTER 1

INTRODUCTION

1.1 General Introduction

The main purpose of this project is to develop a mobile application which lets the patients make the appointment with the hospital and let the medical provider manage the schedule and system. The chapter 1 of this project provides an overview of the project's background, problem statement, objectives, scope, project solution, and project approach. This chapter establishes the foundation for the rest of the report, providing the reader with an understanding of the project's purpose and its intended outcomes.

1.2 Project Background

COVID-19, a highly infectious respiratory disease caused by the SARS-CoV-2 virus, was first identified in Wuhan, China in December 2019. The virus quickly spread to other parts of the world, leading to a global pandemic. Malaysia reported its first COVID-19 cases in January 2020, with the first cases involving three Chinese nationals. The Malaysian government quickly implemented various measures to contain the spread of the virus, including imposing travel restrictions, closing schools and businesses, and implementing a nationwide Movement Control Order (Hashim, 2021). These actions resulted in many hospitals being converted into emergency facilities for COVID-19 patients, necessitating the need for patients to schedule appointments before visiting the hospital. However, this process of making physical appointments has become increasingly difficult. The need for social distancing and limiting physical contact has also made it challenging for patients to seek medical attention when needed. As a result, there is a growing need for a more convenient and

efficient way to make medical appointments. This is where the development of a medical appointment application can play a crucial role in improving the healthcare experience for patients.

The current process of making medical appointments involves patients physically visiting or calling the healthcare facility to check on doctor or service availability and schedule appointments. This process is often frustrating for patients due to long wait times and the need to rely on administrative staff to book an appointment slot. Moreover, it puts a lot of strain on the administrative staff as they need to manage multiple patients and ensure that the appointments are scheduled correctly.

With the advancements in technology, it is now possible to create a mobile application that can simplify the appointment booking process for patients. Our project aims to develop a medical appointment application that allows patients to easily view the availability of doctors and services and book appointments at their preferred time and date, eliminating the need for unnecessary travel to the hospital or clinic.

The proposed application will provide patients with an easy-to-use platform to book appointments with healthcare providers, view their medical records, and receive reminders for upcoming appointments. Patients can log in to the application, search for available doctors, and schedule appointments at their preferred time and date. They will also be able to receive real-time notifications about the status of their appointments and any changes made to the schedule. This will allow patients to take control of their healthcare and manage their appointments more efficiently.

The medical appointment application will also benefit healthcare providers by providing them with a unified platform to manage their schedules, patient information, and communication with patients. The healthcare providers can view their schedules, manage appointment bookings, and communicate with patients through the application. This will enable healthcare providers to reduce wait times, increase patient satisfaction, and improve the quality of care provided to patients. In addition to facilitating consultation appointments, the application will also provide organ transplant information to patients to inform them about the possibility of undergoing an organ transplant. This information will be made available to patients who need it and can help patients make informed decisions about their healthcare.

The goal is to improve the patient experience by leveraging technology to create a more efficient and streamlined appointment booking process. this project believe that this application will improve patient outcomes, reduce healthcare costs, and help patients receive the care they need in a timely and convenient manner. The application will be designed to handle a large number of users and comply with regulatory requirements for storing and managing patient data. It will also integrate with other healthcare systems, such as electronic health records and billing systems, to provide a seamless patient experience.

1.3 Problem Statement

1.3.1 Time-consuming

The current medical appointment booking process is time-consuming and often results in long wait times for patients. This can lead to a poor patient experience, missed appointments, and delays in treatment. There is a need for a medical appointment application that provides patients with a fast and easy way to book appointments and access healthcare services.

1.3.2 Management operations and making appointment process are chaotic and inconvenient

Hospital providers often struggle with managing their appointment schedules and patient information, which can lead to inefficiencies and errors in the healthcare system. Beside that, the current medical appointment booking process can be confusing and inconvenient for patients, especially those with complex medical needs or multiple appointments with different providers. There is a need for a medical appointment application that provides healthcare providers with an easy-to-use platform for managing their schedules, patient information, and communication with patients. Beside that, can provide patients with a unified platform for managing their appointments, medical records, and communication with hospital providers.

1.3.3 Emergency of rescheduling or canceling appointments

Patients often experience long wait times or delays in getting appointments due to scheduling conflicts or cancellations. This can lead to frustration and a poor patient experience. There is a need for a medical appointment system that provides patients with real-time updates on appointment availability and enables them to reschedule or cancel appointments easily.

1.4 **Project Objectives**

- 1. To analyse the problem or the challenges in the current practice.
- 2. To develop an efficient mobile-based application for enhancing patient's appointment management.
- 3. To evaluate the development application through unit testing, integration testing and user acceptance test.

1.5 Scope

1.5.1 Target User

The target users of this medical appointment application are the patients and medical providers who want to make appointments or manage the schedule of the appointment.

1. Patient

The user's primary focus is to view and book appointments with medical providers and be able to search/filter providers by name, date, etc. Additionally, patients can also leave reviews for medical providers. Patients can also chat with the chatbot to ask some related appointment questions.

2. Medical Provider

These medical providers can use medical appointment applications to manage their schedules, appointments and patient information. They can use the application to view and manage their appointments, share medical records with patients, and more.

1.5.2 Module covered

1.5.2.1 Login module

The scope of the login module in a medical appointment application is to provide a secure and convenient way for both patients and medical providers to access their accounts and utilize the features of the application. Security and privacy are paramount, the module will incorporate strong authentication and authorization mechanisms and features to protect patient information from unauthorized access.

The login module for the patients target user in a medical appointment application is responsible for providing a secure and personalized way for patients to access their account and utilize the various features of the application. It will include a clear and easy-to-use login interface, alternative authentication methods, and password recovery features. Once logged in, patients will be able to view their appointments, access their medical records, and communicate with their healthcare providers, while maintaining the security and privacy of their personal and medical information. Overall, the login module will provide a seamless and secure experience for patients, enabling them to easily manage their healthcare information and receive high-quality care.

The login module for the medical provider target user in a medical appointment application allows healthcare providers to securely access and manage patient information and appointments. It provides a secure login interface, access to appointment schedules, patient medical records, and communication with patients. The module will also allow healthcare providers to update patient information, manage workflows, and ensure the security and privacy of patient information through strong authentication and authorization mechanisms, encryption of sensitive data, and secure data storage. The scope of the login module for the medical provider target user covers all the features and functionality necessary to provide healthcare providers with a secure and efficient way to manage patient information and appointments, while ensuring the confidentiality and privacy of patient information.

1.5.2.2 Medical appointment module

The scope of the Medical Appointment module is to provide a streamlined and efficient way for both patients and healthcare providers to manage medical appointments, while ensuring the confidentiality and privacy of patient information. The module will incorporate features to enhance the patient experience, such as the ability to view healthcare provider availability and receive appointment reminders, and features to enhance the workflow for healthcare providers, such as the ability to manage appointment schedules and communicate with patients.

The scope of the Medical Appointment module for the patient target user is to provide an easy-to-use and efficient way for patients to schedule and manage medical appointments with healthcare providers. The module will allow patients to view healthcare provider/doctor availability, schedule appointments, manage personal information and medical records, communicate with healthcare providers/doctor, and provide feedback on their appointment experience. The goal of the module is to improve patient engagement and satisfaction, while also ensuring confidentiality and privacy of patient information. Features will enhance the patient experience, streamline appointment scheduling and management, and manage workflows such as appointment scheduling, reminders, and wait times.

The Medical Appointment module for the medical provider target user is designed to provide an easy-to-use and efficient platform for healthcare providers/doctors to manage their appointments and patient information. The module aims to improve workflow efficiency, reduce cancellations and no-shows, and enhance patient care by providing access to patient information and communication tools. Features will allow for the management of appointment workflows, scheduling, wait times, reminders, and integration with other healthcare systems. The module will provide a secure and user-friendly interface for healthcare providers to manage appointments and patient information, improving the overall experience for both providers and patients.

1.5.2.3 Searching module

The Searching module in a medical appointment application allows users to search for healthcare providers, facilities, and services that meet their specific needs. The module provides comprehensive and up-to-date information on healthcare providers, including their credentials, experience, and areas of expertise, and provides filters to help users narrow down their search results. The goal of the Searching module is to provide users with a convenient and efficient way to find the healthcare providers and services they need, improving the overall user experience by providing accurate and relevant search results and making it easy for users to access the information they need to make informed decisions about their healthcare options.

The scope of the module is to improve the patient experience by providing accurate and relevant search results and making it easy for patients to make informed decisions about their healthcare options. The Searching module for the patient target user in a medical appointment application allows patients to search for healthcare providers and services based on their needs and preferences. The module provides comprehensive and up-to-date information on healthcare providers and facilities, including their credentials, experience, and areas of expertise. Patients can filter their search results to find the most relevant providers and services, and access the module easily from the main menu of the application.

The scope of the module is to improve the medical provider experience by providing accurate and relevant search results and making it easy for providers to make informed decisions about referring their patients to other healthcare providers and facilities. The Searching module for the medical provider target user in a medical appointment application allows healthcare providers to search for other healthcare providers and facilities based on their needs and preferences. The module provides comprehensive and up-to-date information on healthcare providers and facilities, including their credentials, experience, and areas of expertise. Healthcare providers can filter their search results to find the most relevant providers and services, and access the module easily from the main menu of the application.

1.5.2.4 Organ transplant Information module

The Organ Transplant Information module in a medical appointment application provides patients with detailed and relevant information about organ transplantation procedures, eligibility criteria, risks, and benefits. The module enables patients to search for transplant centers based on location and type of transplantation required, view information on available centers, and manage their transplantation appointments. The module aims to assist patients in finding suitable transplant centers and provide a convenient way to manage their appointments.

The Organ Transplant Information module aims to assist patients in finding suitable transplant centers and provide a convenient way to manage their appointments. The scope of this module for the patient target user includes easy access to information on organ transplantation, search functionality to find suitable transplant centers, detailed information on each centre, and the ability to manage transplantation appointments. The scope of the Organ Transplant Information module in a medical appointment application for the medical provider target user includes access to comprehensive information on organ transplantation procedures, patient eligibility criteria, and post-transplantation care. It provides medical providers with the ability to search for transplant centers based on patient needs, view information on available centers, and manage patient transplantation appointments. The module aims to assist medical providers in finding suitable transplant centers for their patients and provide a convenient way to manage their appointments. Additionally, the module enables medical providers to access and update patient medical records related to transplantation procedures.

1.5.2.5 Notification module

The scope of the Notification module is to provide timely and relevant updates to both the patient and the medical provider about the medical appointments and other important information related to their healthcare. The module aims to improve communication and reduce the likelihood of missed appointments or delays in care.

The scope of the Notification module for patient target users is to provide a notification system that can inform them about their upcoming appointments, prescription refills, and other important information related to their medical care. This module aims to improve patient engagement and adherence to their treatment plans, as well as reduce the likelihood of missed appointments and medication errors. The notification system is customization to allow patients to select their preferred method of receiving notifications, such as email, or push notifications within the medical appointment application.

The scope of the Notification module for medical provider target users is to provide a way for them to receive real-time updates and notifications related to their patients and appointments. This may include notifications about changes to appointments, test results, medication reminders, and other important information related to patient care. The module will be designed to ensure that medical providers are able to easily view and manage notifications in a secure and convenient manner. It may also include the ability to customize notification settings and preferences to better suit the individual needs and workflows of each medical provider.

1.5.3 Out of Scope

The Emergency Call Button module is a component of the medical appointment application, which allows patients to quickly call for emergency medical assistance if needed. The module will be accessible from the main dashboard of the application, and will be designed to be highly visible and easy to use. When activated, the module will provide a one-click call to emergency medical services, along with the patient's location information. The module will also include a confirmation step to ensure that the call is not accidentally activated. Overall, the Emergency Call Button module aims to improve patient safety and provide peace of mind to both patients and medical staff.

1.6 Project Solution

Referring to the problems identified, It is focus on the development of mobile applications. Management systems are primarily geared towards healthcare providers, while medical appointment applications extend their services to all patients. Broadly speaking, the system will include standard functionality found in existing systems. Additionally, innovative and unique features will be incorporated into the system, enhancing its appeal and user-friendliness.

As mentioned above, the management system for medical providers is an essential tool in organizing and streamlining business operations. Its importance is not only limited to the healthcare industry but also extends to various other industries. The system is designed to include various features that are necessary for the smooth running of appointments. The system ensures that all customer appointments are

efficiently tracked and monitored. This feature is critical in ensuring that the medical provider can easily manage the patient's appointments and ensure that all patients receive timely and quality healthcare services. In addition, the management system is equipped with tools for appointment scheduling, rescheduling, and cancellation, which ensures that patients can easily manage their appointments and avoid any potential delays or missed appointments. The system is also designed to provide real-time updates on appointment availability, ensuring that patients are always informed of any changes in their appointments. Overall, the management system for medical providers is an essential tool that ensures efficient and effective healthcare service delivery, streamlining operations, and improving the overall patient experience.

Similarly, the medical appointment application developed for patients aims to provide them with an easy and convenient way to browse and schedule medical appointments. Patients can simply log in to the application and browse through the available medical appointment schedules to find the most suitable appointment time and date for their needs. The application will also allow patients to create their medical appointment and receive a confirmation of the appointment. This feature will help patients save time and avoid the hassle of physically visiting or calling the hospital to book appointments. Moreover, patients can view their medical appointment history and receive real-time updates on their upcoming appointments through the notification module.

In this project will use the Reach Native and Firebase to develop the application. React Native will be used to develop a mobile application for medical appointment scheduling. React Native is an open-source framework that allows developers to build native mobile applications for iOS and Android platforms using JavaScript and React. React Native provides several advantages, including faster development, cross-platform support, and a modular architecture, making it a suitable choice for developing the medical appointment application (React native, 2023; Winch, 2020).



Figure 1. 1 React Native (Winch, 2020)

Firebase will be used as the database for the medical appointment application. Firebase is a mobile and web application development platform developed by Google that offers a suite of tools and services for developing high-quality applications quickly. Firebase provides several features, including real-time database, authentication, storage, hosting, and analytic, making it an ideal choice for developing the medical appointment application. With Firebase's real-time database, patient appointments can be easily managed and updated in real-time, providing patients with up-to-date information on their appointments. Overall, using React Native and Firebase provides a robust, scalable, and efficient solution for developing the medical appointment application (Wikipedia contributors, 2023;Stevenson, 2018).



Figure 1. 2 Firebase (Stevenson, 2018)

1.7 Project Approach



Figure 1. 3 Prototype Model (Martin, 2020)

The prototype model in software development is an iterative methodology that involves creating an initial version of the software application, testing it, and refining the design until an acceptable prototype is achieved (Pressman & Maxim, 2015, Chapter 2). It is useful when project requirements are unclear or when there is a need to quickly develop and test a software application. This model allows developers to gain insight into the user's needs and expectations by creating a prototype and using feedback to refine the design. Moreover, the prototype model is effective when changes to the requirements or design are expected, as the prototype can be quickly modified and tested to ensure that the changes are implemented correctly. The Prototyping Model, which is based on trial and error, works best in scenarios where project requirements are not known in detail and takes place between the developer and client (Guru99, 2023). The type of prototyping model this project selected is the Evolutionary prototype model.



Figure 1. 4 Evolutionary Prototype Model (Teach-ict, 2023)

The evolutionary prototyping model is a software development approach that involves creating an initial version of the software application, testing it, and then gradually improving and expanding upon it through a series of iterations. This model is useful when requirements are not completely clear, and when there is a need to quickly develop and test a software application while incorporating changes and feedback. (Teach-ICT, n.d.)

The process of the evolutionary prototyping model typically begins with an initial prototype that contains basic functionality and features. The prototype is then tested to identify any issues or areas for improvement, and feedback is obtained from users, stakeholders, and other relevant parties. Based on this feedback, changes and enhancements are made to the prototype to improve its functionality and features.

The process of creating and testing the prototype, obtaining feedback, and making improvements is repeated through a series of iterations. Each iteration builds upon the previous one, gradually adding more functionality and features to the software application. One of the key benefits of the evolutionary prototyping model is that it allows for a more flexible and adaptable approach to software development. Because the software application is developed through a series of iterations, changes and improvements can be made as needed based on feedback and evolving requirements. This helps to ensure that the final product is more closely aligned with the needs of users and stakeholders. (Mockitt, n.d.)

However, one potential drawback of the evolutionary prototyping model is that it can be more time-consuming and costly than other software development models. This is because the process of creating and testing multiple prototypes can be resource-intensive. Additionally, the iterative nature of the process can make it more difficult to estimate the total cost and timeline of the project.

In summary, the reason that this project selected the evolutionary prototyping model is because this model is a useful approach to software development, especially when requirements are not completely clear, and there is a need for quick development and testing of a software application. The model allows for a flexible and adaptable approach, incorporating feedback and changes throughout the development process, resulting in a product that is closely aligned with the needs of users and stakeholders. However, the iterative nature of the process can be time-consuming and costly, and estimating the total cost and timeline of the project can be challenging. (Teach-ICT, n.d.; Mockitt, n.d.)

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

This chapter will delve into various topics related to the project title to better understand the research and implementation process. This chapter will discuss three different topics. First, the project reviewed different software development life cycle (SDLC) models to gain insight into the different approaches used to implement software and ultimately select the perfect model to implement into the project. Second, explore the mobile application frameworks that can use in the project. Finally, this chapter will conduct research comparing existing similar applications to understand their features and functionality, which will improve our implementation process.

2.2 Software Development Methodology

A software development methodology is a systematic approach that outlines the steps to be followed when developing a software project. It includes using design methods and practices employed in the history of computing. The main goal is to simplify the software development process by providing a structured approach. There are a variety of models available, and their unique characteristics make it difficult to determine the best model. In this context, this project will discuss three models to determine the best SDLC model for medical appointment applications.

2.2.1 Evolutionary Prototyping Methodology

The evolutionary prototype model is a software development model that first develops a basic prototype, and then gradually refines and refines it through multiple iterations. When using this method, an initially developed prototype is refined based on the feedback of the customer until the final result is accepted. This model is to develop a working prototype that can be tested and evaluated by users or stakeholders to verify the usability of the project under development. This model allows early detection of problems or issues that can be resolved before the final product is developed. In addition, it is used in complex projects where every step needs to be checked regularly.



Figure 2. 1 System life cycle in prototype model

The model has a high accuracy, whereby the prototypes are helpful in the presentation of the crucial features of the product. Evolutionary prototyping model is an iterative software development process that allows developers to create a prototype of a system or design, rather than fully showing it to users to get their feedback (Chandra, 2015). Developers improve the prototype by performing analysis, design, and implementation phases concurrently to obtain an improved prototype of the system that users will have and provide additional feedback. The developers keep going through this process until there are no more changes to make, and the system can proceed to implementation and deployment (Asri et al., 2020).

There are several advantages to using the evolutionary prototyping model in the development of a medical appointment application. First, it's easy to implement, and second, it's flexible and easy to track development progress. Third, it provides a better user experience because users are able to provide feedback at an early stage of development, allowing developers to make necessary changes to meet users' needs (Asri et al., 2020). In addition, the model has high accuracy, so the prototype helps to demonstrate the key features of the product.

However, this model is not time-efficient and costly, and requires more programming effort due to the complexity of development. Furthermore, this model has some weaknesses, including the complexity of development and the need for more programming effort (Terho et al., 2017).

In conclusion, using an evolutionary prototyping model in the development of a medical appointment application is essential to ensure that the application meets the needs of users. The iterative nature of the model allows improvements to the application until it meets the desired requirements. Although this model has some limitations such as time-consuming and costly, the benefits of improved user experience and earlier customer feedback outweigh the cost (Chandra, 2015).

Advantage	Disadvantage
Early prototypes help identify and resolve	Can be more time-consuming and costly
issues before final product delivery	than other models
Users are more involved in the	Can lead to scope creep or changing
development process	requirements
Facilitate ongoing communication and	Can be difficult to manage iterative
feedback among stakeholders	changes
Produce a more accurate final product	Requires significant expertise to
that meets user requirements	effectively manage the iterative process

Table 2. 1 Advantage and Disadvantage of Evolutionary Prototype
2.2.2 Waterfall Development Methodology

The waterfall model is the oldest method in the history of software development. It was invented by Dr. Winston Royce. This approach is a linear approach to software development that involves sequential steps in multiple phases, including requirements analysis, design, coding, testing, and maintenance. This approach is well suited for projects that emphasize quality control because of the strong emphasis on documentation and planning (Alshamrani and Bahattab, 2015).



Figure 2. 2 Waterfall Development Methodology

The waterfall methodology can be used as a software development model when building a medical appointment application. The process will start by collecting and documenting all necessary requirements from stakeholders such as physicians, clinic administrators, and patients (Alshamrani and Bahattab, 2015). Once the requirements are defined, the next step is the design phase, where the team draws out the system architecture and designs the user interface of the application. Once the design is complete, the coding and development of the application will begin. After coding, the application goes through a rigorous testing phase, including functional, integration, and system testing, to ensure that it meets the initial requirements (Chaudhary et al., 2021). Finally, the application is deployed and maintained as needed. The waterfall approach is well suited for projects with clear and unchanging requirements, such as building a medical appointment application. With clear requirements and design documents, stakeholders will be able to better envision the end product. The methodical approach of the model ensures that each stage is completed before moving on to the next, allowing for better planning and easier tracking of milestones (Alshamrani and Bahattab, 2015). However, the inflexibility of this approach and the difficulty of making changes once the coding phase begins are some of its significant disadvantages.

In summary, the waterfall model can be an effective approach to use when developing a medical appointment application. By following the sequential phases of planning, design, coding, testing, and maintenance, the project team can ensure that the application meets the initial requirements of the stakeholders.

Advantage	Disadvantage	
A structured approach that provides a	Limited user involvement during	
clear understanding of project	development	
requirements and scope		
Easy to understand and implement	No flexibility or room for changes after a	
	stage is complete	
Each phase must be completed before	Problem identification too late can lead to	
proceeding, ensuring project progress is	is costly changes to the project	
measurable and controllable		
Testing at the end of the development	Testing is done only after the	
phase helps ensure product stability.	development phase, which increases the	
	risk of finding bugs or defects.	

Table 2. 2 Advantage and Disadvantage of Waterfall Methodology

2.2.3 Agile Development Methodology

Agile methodologies are gaining popularity in software development due to their flexibility, adaptability, and customer-centrist approach (Musa, Abdullahi, & Baffa, 2015). The hospital is no exception as it too can benefit from using agile methods to develop software applications that can improve patient care and services. In fact, several studies have explored the challenges and solutions of using agile methods in healthcare software development.



Figure 2. 3 Agile Development Methodology

One such study by Al-Jaroodi, Al-Nuaimi, and Al-Riyami (2015) examines the challenges of using agile software development in healthcare and proposes solutions to address these challenges. One of the main challenges, the study found, is a lack of documentation and regulation in the healthcare industry. However, they propose that agile methods can help overcome these challenges by providing a customer-centrist approach that leads to better communication, collaboration, and flexibility in software development.

Another study by Kabir et al. (2021) developed a medical appointment application using agile methods. The study found that using agile methods helped them meet the changing needs of the healthcare industry and improve the quality of applications by incorporating user feedback throughout the development process. The research also highlights the importance of involving end users and stakeholders in the development process, a key tenet of agile methods.

Furthermore, Musa, Abdullahi, and Baffa (2015) emphasise the importance of agile methods in software development by comprehensively reviewing their advantages over traditional software development methods such as the waterfall model. The research highlights how agile methods can improve customer satisfaction, improve software quality, and increase software development productivity.

Overall, these studies suggest that agile methods have the potential to transform medical software development by providing a more collaborative, flexible, and customer-centrist approach. Agile methods can help healthcare organisations develop software applications that improve patient care, streamline processes, and enhance services.

Advantage	Disadvantage	
Flexibility and adaptability to changing	May require experienced and skilled tear	
needs	members to implement properly	
Achieve customer satisfaction through	Lack of documentation and formal	
continuous delivery and feedback	processes can lead to confusion or	
	miscommunication	
Detect and resolve issues early with	Inability to accurately estimate project	
frequent testing	timelines can lead to delays or missed	
	deadlines	
Increase collaboration and	Continuous changes to requirements can	
communication among team members	lead to scope creep or feature bloat	
and stakeholders		
Continuous Integration and Testing Lead	d In some cases, agile methods may not be	
to Higher Quality Software	suitable for projects with strict regulatory	
	requirements.	

Table 2. 3 Advantage and Disadvantage of Agile Methodology

2.2.4 Comparisons Between Software Development Methodologies

Model	Evolutionary Prototyping Model	Waterfall Model	Agile Model
Description	A model to create basic prototypes and use to gather stakeholder feedback early in the SDLC process. Based on the feedback, the prototype is refined and improved until it meets the client's requirements. After the prototype is approved, the software is developed using different SDLC methodologies.	A linear and sequential model where each stage of the SDLC is completed before moving on to the next. These phases include requirements gathering, design, development, testing, deployment and maintenance.	An iterative approach that focuses on collaboration, continuous feedback, and flexibility
Development Cost	Moderate	High	Low
Simplicity	Simple	Complex	Moderate
Requirement Gathering	Requirements are discovered and refined through the iterative development of prototypes	Requires extensive documentation and planning before development begins	Ongoing collaboration and communication between developers and customers
User Involvement	High	Low	High
Control of Change	Changes are incorporated through iterations of the prototype	Changes are difficult to implement once development has progressed to a later stage	Embraces change and welcomes feedback throughout development
Iterative of Change	Continuous	Limited	Continuous
Need Expertise	Low to Moderate	High	Moderate
User Feedback	Ongoing feedback from users throughout development	Limited feedback from users until after the product is complete	Ongoing and frequent feedback from users
Flexibility	Highly flexible and adaptable to changes	Inflexible and difficult to adapt to changes	Highly flexible and adaptable to changes
Time Frame	Medium	Long	Short to medium

Table 2. 4 Comparisons Between Different Software Development Methodologies

2.2.5 Conclusion

Software development involves completing a software project using properly defined phases. Currently, multiple development models exist, making it even more challenging to choose the best model to use. The agile model is suitable for large enterprises to quickly respond to customer change requests. However, the process of using it is complicated and may not be suitable for beginners. Waterfall model, on the other hand, is easier to implement but can be time consuming. Evolutionary models offer flexibility and are easy to implement, but they can be expensive and time-consuming.

After evaluating all three software approaches above, the evolutionary prototyping approach was found to be the most suitable for this project. A teamoriented approach, such as Agile, may not be suitable for individual projects. Therefore, the chosen approach is flexible and can be easily implemented by a single developer.

2.3 Mobile Application Framework

Mobile Application Framework (MAF) is a software development framework that helps developers build mobile applications for various platforms. When developing mobile applications, This project needs to decide which application framework is needed. In this section, this project will need to compare two different frameworks which are Reach Native and Flutter to find out which of the frameworks will be faster development time, more reduced development cost, and more convenient to use.

2.3.1 React Native

According to reactnative.dev(2023), React Native is an open source mobile application framework. It was created by Facebook and was released in 2015. This framework is written in JavaScript and provides a native UI look to the developed mobile applications. Furthermore, React Native allows developers to create applications using a single code base, and it allows developers to build cross-platform mobile applications for both iOS and Android platforms.



Figure 2. 4 React Native (Workiy, 2023)

One of the advantages of using React Native is the fast refresh feature. This feature eliminates the need to repeat native builds and allows developers to see changes immediately on the emulator after making changes to source code by simply saving the code. Fast Refresh combines Live Reload and Hot Reload into one feature. With hot reloading, the state of the application is preserved during code changes,

enabling developers to quickly iterate and test their code changes. This feature drastically reduces the time required during development (reactnative.dev, 2023).

Another advantage of using React Native is that it uses JavaScript. JavaScript is a popular language that is widely known to developers, especially those who are already familiar with React. React Native has been relatively stable since its release five years ago and has been continuously maintained by the community. In fact, it was ranked as the second most contributed project in the GitHub repository in 2018 (reactnative.dev, 2023).

One of the disadvantages of using React Native is limited access to native modules and libraries (Callahan, 2019), which can lead to reduced functionality and performance for complex or specialized tasks. Additionally, React Native may not provide the same level of device hardware and OS integration as a fully native app, resulting in longer development times, more debugging and testing, and potential compatibility issues with future updates (Callahan, 2019). React Native may also not support all the latest features and API of each platform, limiting the flexibility and customization of some applications. However, these shortcomings can often be mitigated through careful planning, optimization, and use of third-party libraries and tools (Callahan, 2019).

Advantages	Disadvantages
Flexible, modular architecture for easy expansion and customization	Limited UI design capabilities compared to Flutter and native development
Large community and strong ecosystem offering a wide range of libraries and tools	Debugging can be challenging due to the need to interact with JavaScript and native code
Easy to learn and use, suitable for web developers already familiar with JavaScript and React	Development can be slowed down due to the constant need to bridge JavaScript and native code
Supports both iOS and Android platforms, as well as other platforms through third- party tools	Smaller collection of built-in widgets than Flutter, some functionality requires more third- party libraries

Table 2. 5 Advantage and Disadvantage of React Native

2.3.2 Flutter

According to flutter.dev (2023), Flutter is also an open-source mobile application development framework, created by Google and released in 2017. Flutter is similar to React Native and also supports cross-platform development. It allows developers to create high-performance, visually appealing mobile applications for both Android and iOS platforms using a single code base. In addition, Flutter focuses on expressive UI design, which can provide end users with a native UI experience, and can also customise the UI to increase design flexibility. Flutter uses the Dart programming language, which is an object-oriented language that compiles to native code for the Android and iOS platforms.



Figure 2. 5 Flutter Logo (flutter.dev, 2023)

One of the advantages of using Flutter is its fast development cycle that is the Hot Reload feature which is similar to React Native. Flutter's Hot Reload feature allows developers to see code changes immediately on an emulator or physical device without restarting the app. This capability enables developers to quickly iterate and test new ideas, making the development process faster and more efficient (Kiran Beladiya, Feb 2023).

Another advantage of using Flutter is its customization widgets. These widgets are used to create a great application interface and its appearance (Kiran Beladiya, Feb 2023). Flutter provides a wide range of customization widgets, making it easier for developers to create beautiful and responsive user interfaces. These

widgets are built from the ground up for Flutter, and they are designed to work flawlessly on iOS and Android platforms.

The main disadvantages of using Flutter is its steep learning curve. Flutter's unique architecture and syntax can take developers some time to learn, especially if they are new to the Dart programming language. Dart is not as well-known as JavaScript, so the community is smaller and developers have less experience. Furthermore, Flutter has a growing community and extensive documentation available, it may not have as many resources and libraries available as some other mobile development frameworks. However, Flutter has proven to be a powerful tool for creating high-quality mobile apps, and its popularity continues to grow (flutter.dev, 2023).

Advantages	Disadvantages
Customization and flexible UI design	A steeper learning curve for developers unfamiliar
with extensive built-in widgets and	with the Dart language and the reactive
components	programming paradigm
Hot reload feature allowing rapid development and iteration	Smaller community compared to React Native, although the community is growing rapidly
Comes with a powerful set of tools and	Lack of support for some native features and APIs,
features for performance tuning and	need to use platform channels to interact with
optimization	native code

Table 2. 6 Advantage and Disadvantage of Flutter

2.3.3 Comparisons Between Mobile Application Framework

Mobile Application Framework	React Native	Flutter
Language	JavaScript	Dart
Performance	Good	Excellent
Development Time	Slower	Faster (Hot Reload)
Release Time	Faster (shorter app store review times for iOS)	Slower (longer app store review times for iOS)
UI Design	Limited	Customizable
Community Support	Larger	Growing
Learning Curve	Lower	Steeper
Integration with Native Code	Better	Evolving
Development Environment	Various options, including Visual Studio Code and Atom	Requires Android Studio, IntelliJ IDEA, or Visual Studio Code with Flutter extension
Debugging	Debugging tools are available for JavaScript and native code	Comes with a built-in debugger, as well as support for Android Studio and IntelliJ IDEA debuggers
Performance Tuning	Can be optimised using third-party tools	Comes with built-in tools for performance profiling and optimization
Platform Support	Supports both iOS and Android, as well as web and other platforms via third- party tools	Supports both iOS and Android

 Table 2. 7 Comparisons Between Different Mobile Application Framework

2.3.4 Conclusion

For the development of this project, although the two frameworks have their own advantages and disadvantages, this project chose React Native as the mobile application framework to be implemented. The reason for choosing React Native was because of the experience in the JavaScript programming language and the greater stability of the available React Native community. The community is more experienced and it is easier to search for information online. Additionally, React Native offers cross-platform compatibility, a powerful component library, and faster development time. These advantages make React Native ideal for developing mobile applications efficiently and effectively.

2.4 Existing Similar Application

This section is about existing similar applications. The main purpose of this section is to find out the important characteristics of a medical appointment application by comparing it with three different similar medical appointment applications. In this section, this project will compare 3 different applications which are Healthengine, Practo, and BookDoc to figure out what important or new features that need to be implemented into this project.

2.4.1 Healthengine

HealthEngine is a healthcare platform that allows patients to find and book medical appointments online. It was founded in 2006 in Australia and has since become one of the largest healthcare platforms in the country (healthengine.dev, 2023). HealthEngine provides patients with access to a wide range of healthcare providers, including general practitioners, dentists, physiotherapists and specialists. The app helps users quickly and easily find available doctors, dentists, physiotherapists and other medical providers and helps them book appointments online anytime, anywhere in Australia. HealthEngine has two platforms which are website platform and mobile application platform.

The Healthengine medical appointment application consists of several modules such as registration module, user login module, online appointment module, search module, and payment module. The Registration and User Login module allows users to create accounts and access their medical records. The online appointment module enables patients to easily check the availability of doctors and services and make an appointment at their preferred time and date. The search module allows patients to search for healthcare providers based on their location, specialty and other criteria. The payment module allows patients to pay for appointments online, eliminating the need for cash transactions. These modules help streamline the appointment process and improve the overall patient experience.



Figure 2. 6 Main Page of the Healthengine



Figure 2. 7 Healthengin's Search Module



Figure 2. 8 the Search Module Result

Figure 2.7 shows the HealthEngine's search module. This module is a feature that allows users to find and make appointments with healthcare providers such as doctors, dentists and other allied health professionals. Users can search for practitioners by location, specialty, name or health concern. The search module also allows users to filter their search results based on various factors such as distance, availability and ratings.



Figure 2. 9 Medical Centre Information



Figure 2. 10 The Available Doctor List



Figure 2. 11 Doctor Information Page

HealthEngine's online appointment module allows users to schedule appointments with healthcare providers at their convenience. Users can select specific dates and time periods based on healthcare provider availability. The figure 2.9 and 2.10 shows the information of the hospital and the variable date and time of all the doctors at the hospital. The figure 2.11 shows the information and the available appointment date and time of the doctor after clicking the doctor at figure 2.10.



Figure 2. 12 TeleHealth Module

Figure 2.12 shows HealthEngine's Telehealth module. This module allows patients to connect virtually with healthcare providers from the comfort of their home by using their phone or other electronic device. This feature enables users to search for doctors offering telehealth consultations and to book virtual visits. Telemedicine capabilities are especially useful for patients who live in remote locations, have limited mobility, or prefer not to travel to a healthcare provider's office for safety or other reasons. Additionally, telemedicine capabilities help reduce wait times, increase access to healthcare, and improve patient outcomes through timely intervention.



Figure 2. 13 Login Module



Figure 2. 14 Register Module

Figure 2.13 and figure 2.14 show the Login and Register module. The Login and Register Account module in HealthEngine allows users to create an account using their email or Facebook account. Users can also log in with their Google account. After signing up, users can view their past appointments, receive appointment reminders, and save their personal and medical information for future appointments. Users can also manage their account settings, such as email notifications and communication preferences.

Table 2. 8 Advantage and Disadvantage of Healthengine

Advantages

HealthEngine provides a user-friendly platform for patients to book medical appointments, making the process more convenient and efficient.

The online appointment system allows patients to check the real-time availability of doctors and book appointments at their convenience.

HealthEngine provides a range of medical services, including telemedicine consultations, to make healthcare more accessible to patients, especially those in remote or rural areas.

HealthEngine provides a platform for patients to review and rate healthcare providers, enabling other patients to make more informed decisions when choosing a doctor.

Disadvantage

HealthEngine has been criticised for allowing private health insurers access to patient data, which could compromise patient privacy.

2.4.2 Practo

Practo is an online medical appointment application. It is the fastest growing telehealth app in India (Practo Consult - Doctor Online, n.d.). Practo allows users to find and book doctors, hospitals and diagnostic centres. In addition, it also provides online consultation and medicine delivery services for patients living in remote areas or with limited mobility. Practo also provides a platform for patients to search for healthcare providers based on their location, specialty and availability. Practo was

Launched in March 2013 and now available in several countries including India, Indonesia, Singapore and Brazil.

The Practo medical appointment application consists of several modules such as registration module, user login module, online appointment module, search module, and payment module. The registration module allows users to register and create accounts on the application, while the user login module allows users to log in and access their accounts. An online appointment module lets users book appointments with doctors and healthcare providers directly through the app, and a search module helps users search for healthcare providers and filter results based on location, specialty, and other criteria. The payment module allows users to pay for appointments and other services within the application.



Figure 2. 15 Main Page of the Practo

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← chia		
Personal	Medical Lifestyle	
Name chia	add photo	
Contact Number	+60-123965122	
Email Id	Add email	
Gender	Add gender	
Date of Birth	yyyy mm dd	
Blood Group	add blood group	
Marital Status	add marital status	
Height	add height	
Weight	add weight	
Emergency Contact	add emergency details	
Complete profile 9% completed		
\equiv		

Figure 2. 16 RegisterModule



Figure 2. 17 Login Module

Figure 2.17 and figure 2.16 is the login and register module. The Login and Register Account module in Practo allows users to create accounts and log in using their email id or mobile number. After registering, users can access their profile, view their dating history, and manage their personal information. Practo also provides users with the ability to authenticate their accounts using the Aadhaar card, the only ID card issued by the Indian government. This feature enables users to access additional services such as electronic prescriptions and electronic medical records.



Figure 2. 18 Search Module

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← Find Your He	alth Concern	LOCATION Bangalore ~
Q General phy	rsician	
Now or Later	Video Cons	PLUS
Koramangala 1 Bloc	Dr. Ravishank Reddy C. R. General Physician 30 years experienc 1 88% 242 k • Marvel Multispe	ar 📀
Hospital ~₹1000 Consultation NEXT AVAILABLE AT 11:30 AM, tomorr	on Fees ow Book C	linic Visit
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Sarjapur Road • Apo ~₹450 Consultation	ollo Clinic 1 Fees	
		1

Figure 2. 19 Seach Result

The figure 2.18 is the search module which can let the patient find what they need. The figure 2.19 is the searching result which also can let the user to filter their searching result. The search module of the Practo Medical Appointment App allows users to search for doctors, clinics, hospitals and diagnostic centers based on multiple criteria such as location, specialty, availability and cost. Users can filter their search results based on preferred criteria and view detailed information about healthcare providers, including their qualifications, experience, ratings, reviews and consultation fees. Users also can book an appointment with their preferred healthcare provider directly from the search results page, based on their availability. The search module in Practo is designed to make it easier for users to find and book an appointment with the right healthcare provider based on their specific needs and preferences.

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- THE STATE	Dr. Ravishankar Reddy C. R. Neurologist MBBS, MD - General Medicine <u>30 years experience overall</u> In 88% F 242 Patient Stories
Marvel Multis Koramangala 60 mins or less	EAppointment ₹ 1000 Fees speciality Hospital 1 Block s wait time
Today No slo	ots Tomorrow 9 slots 1
No in-Clin View all S	ic appointment slots available

Patient Stories

These stories represent patient opinions and experiences. They do not reflect the doctor's medical capabilities.





Figure 2. 21 Customer Review



Figure 2. 22 Notification Module

The figure 2.20 is the doctor information and online appointment module after selecting the doctor figure 2.19. The online appointment module in Practo allows patients to book appointments with doctors, diagnostic centers and hospitals. Patients can view a doctor's profile, read reviews from other patients, and choose a convenient time slot to make an appointment. The figure 2.22 shows the booking reminder feature. This feature allows patients to view the upcoming appointment. Beside that, Patients also can reschedule or cancel their appointments through this feature.



Figure 2. 23 Practo Pharmacy Module

Figure 2,23 shows the medicine delivery module. Practo offers a medicine delivery module called Practo Pharmacy. With this feature, users can upload their prescriptions and order medicines online. Medicines will be delivered to the user's doorstep at the given address. This function allows users to order medicines anytime and anywhere, which is convenient for them.



Figure 2. 24 HealthCash Module

Figure 2.24 shows the Practo HealthCash feature. This feature allows users to deposit money into their Practo wallet and use it to pay for various healthcare services offered on the platform, such as doctor consultations, lab tests and medicine delivery. The HealthCash page provides users with a summary of their wallet balance, transaction history, and discounts available for cashback and healthcare services.

Table 2. 9 Advantage and Disadvantage of Practo

Advantage		
The platform offers a wide range of healthcare services and products, including doctor appointments, online consultations, laboratory tests and drug delivery		
User-friendly interface for searching and booking doctors		
Provide user reviews and ratings to help patients choose the right doctor or healthcare provider		
Allow patients to make appointments at any time of the day		
Provide reminders for upcoming appointments		
Disadvantages		
Limited availability of healthcare providers in some areas		
Inconsistent quality of services provided by healthcare providers listed on the platform		
Patients may not be able to see the doctor in person, limiting the scope of diagnosis and treatment		

2.4.3 BookDoc

BookDoc is a medical appointment app that allows users to find and book appointments with healthcare providers such as doctors, dentists, and physiotherapists. It was launched in August 2015 and is available in various countries including Malaysia, Singapore, Thailand and Hong Kong. BookDoc provides users with a series of functions such as appointments, telemedicine services, drug delivery, health tracking, and health information. Users can also view healthcare provider profiles and ratings to help them make informed decisions when it comes to appointments.

BookDoc is a medical appointment application that provides users with various modules. The registration module allows users to register for a new account, while the user login module allows them to log in and access their accounts. An online appointment module enables users to schedule appointments with healthcare providers, and a search module helps them find healthcare providers based on their location and specialty. The telemedicine consultation module allows users to consult doctors and healthcare providers remotely via video calls, chat or voice calls through the app. Overall, BookDoc aims to simplify healthcare visits for users and provide a seamless experience for making appointments and managing their health.



Figure 2. 25 Main Page of BookDoc

4G 1:42 ≌		WA 3.20 46 85)
	BookDoc	
Welcome! Sign in to your Acc	count	
Email		
Password	Ø	Forgot?
s	ign In	
Do not have account? <u>Sign Up</u> or		
f Sign in with Facebook		
		1

Figure 2. 26 Login Module

Mi 1:43 🗃	in 1.30 49 (85)
\leftarrow Create Account	
Email*	
Password*	0
Confirm Password	0
Password should be	
At least 8 characters long	
Minimum one lowercase	
Minimum one uppercase	
Minimum one number	
Password match	
First Name*	
Last Name	
Date of Birth*	
Gender Male	~
₩ +60 Phone Number*	
	1

Figure 2. 27 Register Account Module

The figure 2.26 is the Login module of the BookDoc and the figure 2.27 is the account registration module. The login and registration module in BookDoc allows users to create an account using their email address, or Facebook account. Users can also log in to their existing accounts using these options.





Figure 2. 28 Profile Module



Figure 2. 29 Notification Module

Once the account is created, users can add their personal details and medical history to complete their profile. The module also includes a feature for resetting passwords if necessary. The figure 2.28 shows the Profile module. The figure 2.29 is the notification module. This module will provide users with reminders of upcoming appointments, as well as notifications of any changes or updates to their appointments. Beside that, users also can receive health reminders and reminders of regular health checks through the notification module.

4월 1:44 프 · · · · · · · · · · · · · · · · · ·	Ð
← Q. Specialty, Service, Doctor, Clinic, etc.	
O Current Location Apr 16, 2023	
Begin Search	
Common Searches	
C General Practitioner (GP Doctor)	
🕔 Dentist (General)	
24 Hours Clinic	
C PERKESO Health Screening Programme (HS	
C Aesthetic	
O Bone Specialist	
Cardiology	
Chiropractic	
O Dermatology	
Gastroenterology & Hepatology	
C General Paediatrics	
0 Obstatrics and Gunaecology (0.8.6)	

Figure 2. 30 Search Module



Figure 2. 31 Search Result

BookDoc's search module allows users to search for healthcare providers based on location, specialty, and availability. Search results display information about the provider's profile, location, cost, and time slots available for appointments.

🏭 1:45 🖬		Via 0.00 40 (85)				
\leftarrow	Professional Profile MAP					
Dr. Mohammad Wafiy Bin Mohammad Dzaki General Practitioner (GP Doctor)						
Klinik Warisan No. 62-G, Jalan Warisan Sentral 2, Kota Warisan, 43900 Sepang, Selangor, Malaysia Book Online Appointment						
	<u>Sun, A</u>	<u>Api 10</u>				
2:00 рм	2:15 рм	2:30 рм	2:45 рм			
6:00 рм	6:15 рм					
Profile	Services	Hours	Photos			
CALL	GO	TRAVEL	EMAIL			

Figure 2. 32 Appointment Module

After selecting the doctor, This online appointment module will display all the variable time slots to the user. Beside that, they also will provide service information of the provider. The online appointment module also will provide the GPS feature to go to the hospital or clinic after clicking the Go button.



Figure 2. 33 Teleconsult

The Teleconsultation module in the BookDoc app allows users to have a virtual consultation with a healthcare professional via video call or message. Users can search for doctors by specialty and availability, and book an appointment with them through the app. This feature enables patients to receive medical advice and prescriptions remotely to make healthcare more accessible and convenient.

Table 2. 10	Advantage and	Disadvantage	of BookDoc
	• • •		

Advantage				
User-friendly interface and easy-to-use platform for booking appointments.				
Enables users to search for healthcare providers based on location, specialty, and availability.				
Allows users to view doctor availability, costs, and patient reviews, which can help them make an informed decision.				
Having a teleconsultation feature that allows users to consult a healthcare provider remotely.				
Provides electronic wallet function for convenient payment and cashless transactions.				
Disadvantage				
Certain areas have limited availability of healthcare providers.				

2.4.4 Comparisons Between Exiting Similar Application

	Healthengine	Practo	BookDoc
Region	Australia	India	Malaysia
Registration Account	Available	Available	Available
Login	Available	Available	Available
Online Appointment	Available	Available	Available
Searching feature	Available	Available	Available
Filtering feature	Available	Available	Available
In-built payment	Available	Available	Available
Telehealth	Available	Available	Available
Medicine Delivery	Not available	Available	Available
E-Wallet	Not available	Available	Not available
Health information Notification	Available	Available	Available
Door-to-door service	Not available	Available	Not available
Medication Reminders	Not available	Available	Available
In-built chat	Available	Available	Available
Customer feedback and rating	Available	Available	Available
App Store Rating	4.1 / 5 (2023)	4.4 / 5 (2023)	4.8 / 5 (2023)

Table 2. 12 Comparisons Between Different Similar Application

2.4.5 Conclusion

There's a lot of medical appointment platforms out there accessible for the public. Each of the platforms has its strengths and weaknesses. In the end, the goal of the people who use the appointment application is to save time on waiting at the hospital. The above-mentioned existing application is further summarized in the table 2.11.

From the table 2.11 comparison table, this project can conclude that a good medical appointment app needs a user-friendly interface so that users know what they are doing and how the process works without any complexity, but functional features are also required. These three different applications share many of the same modules. Such as account registration, login and logout, online reservation, search query, notification, etc. this project will use all these modules and implement them into the project.

CHAPTER 3

METHODOLOGY AND WORK PLAN

3.1 Introduction

Chapter 3 of this report outlines the methodology, used development tool, and work plan that will be used to carry out the study. section 3.2 will provide all the detail flow on the selected software development methodology which is the evolutionary prototype methodology that was selected at chapter 2. section 3.3 will provide the detail of using the development tool. Lastly, section 3.4 will provide the work plan which will have the WBS and the Gantt Chart.

3.2 Application of Evolutionary Prototyping

This project will use the evolutionary prototyping methodology as the system development methodology. The evolutionary prototyping methodology consists of the following phases: requirements gathering phase, design phase, iteration phase (design, build prototype, customer evaluation and refining prototype), and final implementation phase.

3.2.1 Requirements Gathering Phase

In this requirements gathering phase consists of two sub-phases which are Quantitative Methodology and Literature Review. all system requirements are first gathered from stakeholders such as patients and medical providers. This includes identifying the features and functionality the application must have to meet the needs of users, as well as any technical requirements. Next, literature review is also performed to collect and analyse information on the identified system requirements.
3.2.1.1 Quantitative Methodology

A questionnaire was then developed and distributed to a sample size of at least 26 respondents to gather information or opinions about the online medical appointment application. The questionnaire will be prepared and designed using Google Forms. This can be distributed easily to the respondents via the Internet. The questionnaire will contain 20 questions divided into 3 sections, Section A General Background Information, Section B Unused Medical Appointment, and Section B: Medical Appointments. The structure of the questionnaire consists of closed questions only. There are two sections B inside the questionnaire. Section B Unused Medical Appointment only consists of one question to ask the reason for the person who has not made a medical appointment before.

3.2.1.2 Literature Review

A literature review will be conducted to gain insight and understanding of the field of medical appointment. 3 Existing similar medical appointment applications will be studied to identify the concept of medical appointment and its functional differences to better understand user needs. The existing similar applications selected include Healthengine, Practo, and BookDoc. Evaluating and comparing the functionality of these applications allows the identification of possible functionality that can be implemented in the project.

Moreover, software development methodologies are studied and analyses to determine the best development methodologies that are most suitable for the development of this project. The 3 methods selected for evaluation in the literature review are evolutionary prototyping, waterfall and agile development.

Finally, two web application development frameworks, React Native and Flutter, are also examined. This is to determine the pros and cons between the two development frameworks and to decide which one is best for me to use for my development projects.

3.2.2 Design Phase

After gathering all the system requirements of the application, the functional and nonfunctional requirements of the application can be identified. Then, develop a quick design of the application to visualise and test the application's features and functionality.Generate use case diagrams to illustrate clear interactions between users and the system, while including a use case description to further detail the use case diagram. The app's workflow will be demonstrated with a simple low-fidelity prototype showing the user interface. However, after the built prototype is presented to the stakeholders for evaluation, if stakeholders are not satisfied with the prototype, this phase will be iterated and the prototype redesigned. Therefore, it is included in the iteration phase.

3.2.3 Iteration Process

The iteration process is a key aspect of the evolutionary prototyping approach. It involves creating a working prototype of an application based on an initial design, building a prototype, customer evaluation, and improving the prototype. In this project, three iterations will be performed. Each iteration is based on features to be developed, after which new features and functionality are added into the application.

3.2.3.1 First Iteration

The first iteration of developing a medical appointment application would typically involve gathering system requirements and developing a quick design of the prototype to show and improve the process of navigating medical appointment applications. In the first iteration, all front-end user interfaces of the system will be developed and implemented in the prototype. Stakeholders should be able to browse the application. This will help stakeholders understand the process of navigating medical appointment applications.

3.2.3.1.1 Design

All front-end user interfaces of the online medical appointment application will be designed using the Axure prototyping tool.

3.2.3.1.2 Building Prototype

The designed front-end UI will be prototyped by using the React Native mobile application development framework, which will allow stakeholders to navigate from one page to another across all UI's in the system.

3.2.3.1.3 Customer Evaluation

After building a prototype according to the design, the prototype will be sent to 5 stakeholders for evaluation. Stakeholders will evaluate the application UI and will be asked to fill out a short questionnaire to provide feedback on the prototype. Feedback and input from stakeholders will be collected and brought to the next stage for improvement.

3.2.3.1.4 Refining Prototype

After gathering feedback and input from stakeholders, a thorough analysis will be performed to identify areas for improvement in the prototype. The identified areas of revision and enhancement will be incorporated into the next iteration of the prototype to further refine it.

3.2.3.2 Second Iteration

The second iteration of the medical appointment application involved reviewing and refining an updated prototype based on stakeholder feedback. In the second iteration, the medical appointment application will incorporate fundamental CRUD (Create, Read, Update, Delete) operations. It will establish a logical connection between the front-end user interface and the centralized back-end web service provider (i.e. Firebase) to provide the necessary functionality backed by the database. An application programming language (API) will be used to manage calls between frontend and back-end web service providers.

3.2.3.2.1 Design

The initial step in app development involves designing the fundamental features that are essential for the application's functionality. The application's interfaces will be user-friendly and intuitive to navigate, ensuring maximum usability. To provide additional insight into the application's workflow, UML diagrams, such as data flow diagrams, will be created.

3.2.3.2.2 Building Prototype

Use UML and data flow diagrams (DFDs) to implement CRUD back-end functionality into prototypes. A Firebase database needs to be created and implemented into the prototype. Then, use the API to link the CRUD back-end functionality with the database.

3.2.3.2.3 Customer Evaluation

After developing a prototype that according to the design, the prototype will be sent again to 5 stakeholders for evaluation. Stakeholders will evaluate the implemented CRUD functionality of the application and will be asked to fill out a short questionnaire to provide feedback on the prototype. In addition to this, the behaviour of the stakeholders and the use of the prototype were observed and recorded.

3.2.3.2.4 Refining Prototype

Feedback and input received from stakeholders will be analyses again and improvements will be made to the areas of the prototype that needed improvement. Afterwards, the prototype is refined for the next iteration of the prototype.

In the third iteration, the prototype will more focus on implementing more advanced features, such as appointment reminders and notifications, patient medical history, searching feature, and chatbot.

3.2.3.3.1 Design

The rest of the functionality of the medical appointment application will be outlined. This sketch will outline the data flow and data calls to execute the logical process of each function.

3.2.3.3.2 Building Prototype

All the other functionality will be implemented into the prototype based on the data flow diagram that is created at the design part.

3.2.3.3.3 Customer Evaluation

Lastly, the fully functional constructed prototype will be presented to stakeholders for final evaluation. The prototype will be sent again to 5 stakeholders for evaluation and will be asked to fill out a short questionnaire to provide feedback on the prototype. Any feedback and comments on the latest prototype will then be collected.

3.2.3.3.4 Refining Prototype

Comments and feedback gathered from stakeholders will be analysed and then the prototype will be refined before being put into final implementation.

3.2.4 Final Implementation Phase

The final phase of the prototype model involves developing the application's final version based on the feedback gathered during the iterative process. This includes finalizing the design, implementing necessary features and functionality, and conducting final testing to ensure that the application meets all requirements and works as intended. Once stakeholders are satisfied with the refined prototype, the application will be implemented as a final application. Comprehensive testing, such as unit testing, integration testing, system testing, and user acceptance testing, will be conducted to ensure the application's quality. Furthermore, documentation of the system will be developed, serving as a reference for system maintenance after deployment.

3.2.4.1 Testing

Testing is one of the most critical parts of the entire software development life cycle including prototyping models. Various tests are performed to ensure that the developed medical appointment application works as expected and meets all requirements. The testing process will include unit testing, integration testing, system testing and user acceptance testing. Testing of the application will be performed on an Android emulator. After all testing has been completed and any bugs or issues resolved, system documentation is developed to serve as a reference for system maintenance after application deployment.

3.2.4.1.1 Unit Testing

Unit testing involves testing each individual feature or component of the application in isolation to ensure that they function correctly. For example, the chatbot module, view patient or medical provider information module, and more will be tested individually.

3.2.4.1.2 Integration Testing

Integration testing is a key phase of software testing in which multiple components or functions are combined and tested to ensure proper interaction and seamless integration. After the individual modules have been thoroughly tested through unit tests, they are integrated to verify their seamless functionality as a unit. Integration testing also involves evaluating the data flow between modules to detect any errors or inconsistencies in the data. It ensures the smooth functioning of the application and improves the quality of the final product.

3.2.4.1.3 Usability Testing

Usability testing is a critical stage of software development and a touchstone of a product's user-friendliness and efficiency. During usability testing, representative users use the software to perform tasks while their interactions are carefully observed and analyzed. This critical process ensures that the software meets user expectations, allowing developers to identify and correct any design flaws. Usability testing is the cornerstone of creating user-centered software experiences that increase user satisfaction and productivity.

3.2.4.1.4 User acceptance Testing

The final stage of testing in the software development cycle is user acceptance testing, which involves testing an application under real-world conditions to assess its ability to meet requirements. During this phase, a group of ten selected users will be responsible for testing the final product. While using the mobile application, they will be given a checklist of tasks to perform and expected results to observe. A short survey will be conducted to gather feedback and opinions on user experience. Analysis of test results will uncover any issues that were not detected during unit or integration testing. Furthermore, a system's success in meeting user needs will determine its deployment.

3.3.1 Visual Studio Code



Figure 3. 1 Visual Studio Code Logo

This project uses Visual Studio Code (VS Code) because it is a popular open source code editor developed by Microsoft. It provides a lightweight but powerful environment for writing, debugging and testing code. One of its main features is its extensive plugin ecosystem, enabling developers to extend the editor's functionality to suit their specific needs. Visual Studio Code also supports several programming languages, including JavaScript and Python, making it a versatile choice for developers working on a variety of projects.

3.3.2 React Native



Figure 3. 2 React Native Logo

React Native is a popular framework for developing mobile applications for the Android platform. React Native is developed and maintained by Facebook and is based on the popular ReactJS library. It allows developers to build mobile applications using the same principles and components as they use for web development with React. Developers can use React Native to write a single code-base for both platforms, saving time and effort. It also provides a hot reload feature that helps developers see changes in real-time without rebuilding the entire application. In addition, React Native also provides a huge community support, there are many open source libraries and packages available to make it easier for developers to develop and customize their applications. Furthermore, React runs independently of the main UI row. As a result, the app can remain performance without losing functionality Overall, React Native offers a powerful and efficient way to build mobile apps, making it the first choice of many developers and companies.



3.3.3 Android Studio Android Emulator

Figure 3. 3 Android Emulator Logo

Android Studio is a widely used integrated development environment (IDE) for developing Android applications. It provides various functions such as code editing, debugging and testing. On the other hand, Android Emulator is a tool provided by Android Studio for testing and debugging Android applications on a virtual device. In this project, this project uses Android Studio Android Emulator to run, test and debug the application on a virtual device. Android emulators allow developers to test their applications on different virtual devices with different screen sizes, resolutions and Android versions. This helps them ensure their apps work well across all devices and platforms. Overall, Android Emulator is an essential tool for Android applications.



Figure 3. 4 Firebase Logo

Firebase is a popular mobile and web development platform that offers developers a range of services and features. It is owned and maintained by Google and is designed to simplify the process of building and managing applications. Firebase provides real-time databases, cloud storage, authentication, hosting, and more. One of Firebase's main strengths is its ease of use. Developers can quickly integrate Firebase into their applications without extensive setup or configuration. Additionally, Firebase provides a scalable and secure infrastructure, ensuring applications can handle large amounts of data and traffic. The platform also provides analytic and monitoring tools, making it easier for developers to track user behaviour and application performance. Overall, Firebase is a powerful and versatile platform that offers many benefits to developers, making it a popular choice for mobile and web development.

3.3.5 Draw.io



Figure 3. 5 Draw.io Logo

Draw.io is a free online diagramming tool for creating various diagrams such as flowcharts, network diagrams, UML diagrams, etc. It is a popular choice for creating diagrams because it is easy to use, customization, and has a large library of shapes and symbols. In this project, this project uses this software to create diagrams like Use Case Diagram, Data flow Diagram, and more.

3.4 Work Plan

3.4.1 Work Breakdown Structure

WBS stands for Work Breakdown Structure, which is the hierarchical breakdown of a project into smaller, more manageable work packages. By breaking projects down into smaller, more manageable parts, a WBS helps simplify project management, improve communication, and ensure that all aspects of a project are considered. A Work Breakdown diagram is attached in Appendix B. Thus, the WBS overview for this project is as below.

0.0 Medical Appointment System

1.0 Project Planning

- 1.1 Confirmation of Project Title
- 1.2 Study Project Background
- 1.3 Identify Problem Statement
- 1.4 Identify Project Objectives
- 1.5 Identify Project Scopes
 - 1.5.1 Identify Target User
 - 1.5.2 Identify Modules covered
 - 1.5.3 Identify Out of scope
- 1.6 Propose Project Solution
- 1.7 Propose Project Approach
- 2.0 Requirement Gathering and Analysis
 - 2.1 Requirement Analysis
 - 2.1.1 Design Closed-End Questions
 - 2.1.2 Distribute Questionnaire
 - 2.1.3 Data Collection and Analysis
 - 2.2 Literature Review
 - 2.2.1 Literature Review on Software Development Methodologies
 - 2.2.1.1 Review on Evolutionary Prototype Methodology
 - 2.2.1.2 Review on Waterfall Development Methodology
 - 2.2.1.3 Review on Agile Development Methodology

- 2.2.2 Literature Review on Mobile Application Framework2.2.2.1 Review on React Native
 - 2.2.2.2 Review on Flutter
- 2.2.3 Literature Review on Similar Existing Application
 - 2.2.3.1 Review on Healthengine Application

2.2.3.2 Review on Practo Application

2.2.3.3 Review on BookDoc Application

2.3 Project scheduling

2.3.1 Work breakdown structure

2.3.1.1 Breakdown activities into subunits

- 2.3.2 Gantt chart
 - 2.3.2.1 Identify task duration

2.3.2.2 Draft and examine the Gantt Chart

3.0 Design

- 3.1 Requirement specification
- 3.2 Develop UML
 - 3.2.1 Construct Use Case Diagram
 - 3.2.2 Generate Use Case Description
- 3.3 Low Fidelity Prototype

4.0 Iteration

- 4.1 First Iteration
 - 4.1.1 Design 1
 - 4.1.2 Build Prototype 1
 - 4.1.3 User Evaluation 1
 - 4.1.4 Refining Prototype 1

4.2 Second Iteration

- 4.2.1 Design 2
- 4.2.2 Build Prototype 2
- 4.2.3 User Evaluation 2
- 4.2.4 Refining Prototype 2

4.3 Third Iteration

- 4.3.1 Design 3
- 4.3.2 Build Prototype 3

- 4.3.3 User Evaluation 3
- 4.3.4 Refining Prototype 3

5.0 Final Implementation

- 5.1 Testing
 - 5.1.1 Unit Testing
 - 5.1.2 Integration Testing
 - 5.1.3 User Acceptance Testing

3.4.2 Gantt Chart

3.4.2.1 Gantt chart for FYP 1

Based on the activities identified in the WBS in the previous section 3.3.1, a Gantt chart was developed for the project development timeline for project 1 in the final year. A Gantt chart for final year Project 1 is attached in Appendix C. Phases and their activities included in the Final Year Project 1 Gantt chart include only the project planning, requirements gathering, and design phases.

3.4.2.2 Gantt chart for FYP 2

Based on the activities identified in the WBS in the previous section 3.3.1, a Gantt chart was developed for the project development timeline for project 2 in the final year. A Gantt chart for final year project 2 is attached in Appendix D. Phases and their activities included in the Final Year Project 2 Gantt chart will include iteration phases and final implementation phases.

CHAPTER 4

PROJECT SPECIFICATION

4.1 Introduction

This chapter initiates the critical phase of the project, focusing on the fact-finding efforts and data analysis from the questionnaire survey. It further outlines the both functional and non-functional requirements that are critical to the success of the project.

In Section 4.4, the project delve into comprehensive use case diagrams and use case descriptions, providing insights into key functionalities and user interactions within the system. This chapter marks a key moment in the development of the project, outlining research insights and setting the stage for an in-depth exploration of the system's architecture and functionalities.

4.2 Fact Finding

A questionnaire was prepared and distributed. A total of 26 respondents participated in the survey. This section analyses the survey results. Appendix A contains a sample questionnaire and Appendix B contains the collected responses.

4.2.1 Demography



Figure 4. 1 Age of Respondents

According to the pie chart, 50% (13) of the respondents are between 18 to 24 years old. 15.4% (4) of the respondents are between 25 to 39 years old and 40 to 59 years old. 11.5% (3) of the respondents are between 18 years old and below. Lastly, 7.7% (2) of the respondents are 60 years old and above.



Figure 4. 2 Gender of the respondents

Based on the pie chart shown above, 57.7% of the respondents (15 people) are females and the other 42.3% of the respondents (11 people) are males.

4. What is your current occupation? 26 responses



Figure 4. 3 Occupation of the Respondents

Based on the pie chart, 46.2% of the respondents (12 people) are students and are full-time employed. 7.7% of the respondents (2 people) are retired people.



Figure 4. 4 Make Appointment before question

According to the pie chart, 88.5% of the respondents(23 people) have made medical appointments before and the other 11.5% of the respondents(3 people) have not made medical appointments before. Therefore, it can be said that a lot of people start to make appointments before going to the hospital.



The reason you no use medical appointment? (Multiple Answers Question) ³ responses

Figure 4. 5 Reason Unused Appointment Question

There are 3 respondents who have not made any of the medical appointments in their life as shown in Figure 4.4. The Perception of good health and no need for medical attention is the major reason that causes the respondents not to make the appointment.

1. How many times have you made medical appointments before? 23 responses



Figure 4. 6 Frequency of make Appointment

This question asks about the number of appointments in their life. The data gathered shows that the majority of the respondents make more than 10 appointments, which consists of 11 respondents(47.8%). After that, 10 of the respondents(43.5%)

who have made between 1 to 5 appointments before. Lastly, 2 of the respondents(8.7%) make between 6 to 10 appointments in their life. Therefore, it can be said that people have started to make appointments before going to the hospital.

2. What method of the appointment have you made before?



Figure 4. 7 Method of make Appointment

This question asks about the method of making appointments before. The data gathered shows that the main method that most of the respondents use is the Physical to hospital. Which consists 9 of the respondents(39.1%), the following is the phone calling and using appointment applications. Both of these methods are 5 people(21.7%). Lastly is the method of using the Website appointment method. There are 4 people(17.4%) who select this method to make appointments.

3. Do you think that making appointments with the doctor physically at the hospital or through phone calls is difficult?
23 responses



Figure 4.8 Opinion Question

This question is aimed to determine that the respondents are having the difficulty in making the medical appointment by using phone calling or physically to the hospital. The data collected shows that 82.6% of the respondents felt that it is difficult.





Figure 4. 9 Reason of not make appointment

Among the 19 of the respondents who are having the difficulty in making appointments by using the phone call or physically booking the appointment at hospital. Refer to Figure 4.9, the inconvenience and time-consuming is the majority of the reason. Additionally, Most of the respondents only have the free time to make the medical service on weekends. This will cause a lot of the people to make the reservation on the weekend and leave the busy phone line. Besides that, this will also cause traffic jams on the way to the hospital.



5. Have you heard of medical appointment applications before? ^{23 responses}

Figure 4. 10 number of Know the application

This question is to determine how many of the respondents know the medical appointment application as the figure 4.10. The data gathered that 69.6% of the respondents have not known about the medical appointment application before.

7. Do you think the medical appointment application will be more convenient to make the appointment with the hospital or doctor? 23 responses



Figure 4. 11 Ask the Opinion Answer

This question is to determine how the respondent thinks about the medical appointment application. Based on Figure 4.11, the data gathered show that 95.7% of the respondents feel the medical appointment application will be more convenient on making the appointment with the medical providers.



Figure 4. 12 Organ Transplant Question

This question is used to determine how many of the respondents know the information about the organ transplant. Referring to the figure 4.12, the data gathered show that 82.6% of the respondents know the organ transplant.



10. Where do you get the organ transplant information? (Multiple Answers Question) ^{23 responses}

Figure 4. 13 Sources for Finding

Among 19 of the respondents who know the information about the organ transplant as shown in Figure 4.12 Referring to the figure 4.13, the data gathered shows that 19 of the respondents get the organ transplant information from online. The following 11 respondents get the information from the doctor. Lastly, the data show that 1 person get the information from the hospital advertisement.

11. Do you have any suggestion features for the medical appointment application? Except to make the doctor appointment. (Multiple Answers Question)23 responses



Figure 4. 14 External function question.

This question is used to determine what feature that the respondents need in the medical appointment application. Referred to figure 4.14, the most of the feature that the respondent needed is the Follow-up visit appointment for Clean up the wound feature. Which have 19 of the respondents select to add this feature into the application. The following feature is the X-ray and body check detail information appointment, there 18 of respondents select this feature.



12. Do you think the hospital should provide door-to-door service? ^{23 responses}

Figure 4. 15 Implement new Feature Question

This question is used to determine if the medical appointment application needs to add the door-to-door service feature. Based on the figure 4.15, the data gathered show that 69.6% of the respondents think to add the booking door-to-door service feature into the application.



13. If yes, what will be the reason? (Multiple Answers Question) ¹⁶ responses

Figure 4. 16 Reason of selection

Among 16 of respondents who have selected to add the book door-to-door service feature into the medical appointment application as shown in figure 4.15 Based on the figure 4.1.2.13, the data gathered shows that 14 of the respondents reason is door-to-door service can let them feel flexibility and adaptability. The following reason is that door-to-door service can save a lot of time on waiting at the hospital, which has 11 of respondents. Next, 9 of the respondents think that the door-to-door service can let them feel more safe. The reason is that there have a pandemic in 2020. Going to the hospital will increase the risk of getting Covid-19.



Figure 4. 17 Rating of respondents 1



Figure 4. 18 Rating of respondents 2

This question seeks to identify features or functionality to include in an online medical appointment application based on the importance of those features to the respondents. Table 4.16 summarizes the data collected and correlates with the number of respondents.

Feature / functionality	Not Important	Slightly Important	Moderately Important	derately Important	
Login	0	2	5	12	4
Forgot Password	0	4	11	5	3
Profile	0	1	10	8	4
Doctor Information	0	0	6	12	5
Doctor Schedule appointment	0	0	3	15	5
Medical appointment (for X- ray / Follow-up Visit)	0	0	7	12	4
Door-to-door Service	2	3	9	8	1
Organ Transplant Information	1	2	11	9	0
Notification (e.g. Blood Donation info, Body Check Promotion)	0	1	5	14	3

Table 4. 1 rating of respondents table

4.3 Requirement Specification

4.3.1 Functional Requirements

The functional requirements for this mobile application are:

- 1. The application shall allow the new user to register for an account.
- 2. The application shall allow users to log in and log out for the application.
- 3. The application shall allow the user to manage their account and profile.
- 4. The application shall allow the user to manage their appointment which can let them modify or cancel the appointment.

- 5. The application shall allow the user to get the notification of the organ transplant info, up-coming appointments notification, appointment update information.
- 6. The application shall allow the Patient to search and filter the appointment though the Doctor name or date.
- 7. The application shall allow the Patient to make the appointment with the specific doctor or medical provider.
- 8. The application shall allow the Patient to view medical provider information.
- 9. The application shall allow the Patient to give the feedback and rating to the medical appointment.
- 10. The application shall allow the Patient to register the organ transplant.
- 11. The application shall allow the medical provider to manage the patient information which can let them to view and update the medical record
- 12. The application shall allow the medical provider to manage their personal appointment schedule which can let them view and modify their available schedule.
- 13. The application shall allow the medical provider to manage the organ transplant information

4.3.2 Non-functional Requirements

The non-functional requirements for this mobile application are:

- 1. Accessibility
 - a) Timeliness is a priority, as customers should have access to updated application versions within 24 hours of release.
 - b) The application must maintain uninterrupted availability, operating 24/7 with dependable uptime.
- 2. Performance
 - a) The application needs to gracefully accommodate a substantial number of concurrent users while ensuring a seamless user experience.
 - Responsiveness is key, with the mobile interface promptly reacting to user interactions within a swift 5-second window.

- c) The database should adhere to standardized practices to reduce data redundancy and promote data consistency.
- 3. Development
 - a) The choice of the Android platform for development forms a foundation for the project.
 - b) Development tools encompass Visual Studio Code and the Android Studio Android Emulator.
 - c) The Evolutionary Prototyping methodology will guide the development process.
 - React Native and JavaScript are the designated programming languages for the project.
 - e) Firebase serves as the repository for all data records.
- 4. Security
 - a) Robust security measures must be integrated into the application to safeguard user data and uphold privacy.
 - b) Passwords should never be visible during entry or at any other point in the user journey.
- 5. Usability
 - a) The application's user interface should prioritize user-friendliness, ensuring ease of navigation for users with varying technical proficiency.
 - b) Tasks within the application should be achievable without errors, contributing to a seamless and frustration-free user experience.

4.3.3 Use Cases

4.3.3.1 Use Case diagram



Figure 4. 19 Use case Diagram

4.3.3.2 Use Case Description

Table 4	2 Use	Case	Descrit	ntion of	f Register	· Account
1 4010 1.	2 0 50	Cube	Deseri	pulon 0	I ICESIBICI	riccount

Use Case Name: Register Account	Use Case Name: Register AccountUse Case ID: 01Prior				
Actor: Patient	Type: Detailed, Essential				
Stakeholder and Interests:					
Patient - the person who have not an account to this application and want to register.					
Brief Description:					
This use case describes what a patient needs to do to create an account using a mobile					
medical appointment application.					
Trigger:					

The patient who have not an account but want to use the application.

Relationship:

Association : Customer

Include : Login

Extends : N/A

Generalization : N/A

Normal Flow of Event:

- 1. The user opens the medical appointment application on their device.
- 2. The application displays the login page.
- 3. The user clicks on the "Register Now" button.
- 4. The application displays the registration form.
- 5. The user fills in the required details such as email, password, confirmation password, name, phone number, IC No and other relevant information respectively in the fields given.
- 6. The user clicks on the "Register Now" button to submit the form.
- 7. The system verifies the registration information.

Perform exceptional flow E-1

8. Upon successful account creation, the mobile application displays a success message to notify user and user will proceed to login.

Sub-Flow: {optional section}

Alternate / Exceptional Flow:

E-1:

- 1. If the user enters password and conformation password not same, invalid information or misses a required field, the system will displays an error message and prompts the user to correct the information.
- 2. If the email or phone number is already registered, the system will displays an error message and prompts the user to use a different email or phone number.

Table 4. 3 Use Case Description of Login / Logout

	Table 4. 5 Ose Case Des	cription of Login / Lo	goui			
Use Case Name:	Login / Logout	Use Case ID: 02	Priority: High			
Actor: Patient, Medical Provider Type: Detailed, Essential						
Stakeholder and	Interests:					
Patient - patient w	ant to log into applicatio	on by using email and	password.			
Medical Provider	- provider want to	log into application	by using email and			
password.						
Brief Description	1:					
This use case de	scribes how user allow	to log into the appli	cation before using a			
mobile medical ap	pointment application.					
Trigger:						
The user want to l	og into the application to	o use the function of th	ne user			
Relationship:						
Association	: Patient, Medical Pro	vider				
Include	: N/A					
Extends	: N/A					
Generalization : N/A						
Normal Flow of Event:						
1. User enters the email and password to Login.						
2. The system	n will verifies the Log in	information.				
]	Perform exceptional flow E-1					
3. If the user forgets his/her account password (S-1:sub-flow is performed).						

4. Upon success login, the application will display the home page.

Sub-Flow:

S-1: Forget Password

1. The user click the "forget password" button.

2. The system will send a password reset email to the customer' registered mailbox

Alternate / Exceptional Flow:

E-1:

1. The email or password entered by the user is not found or Incorrect. The system will displays an error message and prompts the user to reenter again.

Table 4. 4 Use Case Description of Manage User's Account
--

Use Case Name: Manage User's Account	Use Case ID: 03	Priority: High			
Actor: Patient, Medical Provider	Type: Detailed, Esse	ential			
Stakeholder and Interests:					
Patient - patient who want to view and mo	dify their profile.				
Medical provider - Medical provider who	want to view and mod	ify their profile.			
Brief Description:					
This use case describes the action needed	d to be performed by	the user to view and			
modify the Profile's details.					
Trigger:					
The user who want to view or change their	r information on their j	profile.			
Relationship:					
Association : Patient, Medical Pro	vider				
Include : N/A					
Extends : N/A					
Normal Flow of Event:					
1. The user clicks on the account icon	that located inside the	e side menu.			
2. The system will display all the prof	ile information of the	user account.			
3. The user clicks on the edit icon la	abeled "Edit" that is l	ocated right below of			
the application					
4. The user enters the new information	on of his/her account i	n the respective fields			
given.					
5. The customer clicks the update but	ton.				
6. The system validates the update information.					
Perform exceptional flow	Perform exceptional flow E-1				
7. Upon successful update, the mobile application will display a success message					
to notify the user.					
Sub-Flow:					
Alternate / Exceptional Flow:					
E-1.					

1. If the user misses any required input fields, or if there are blank fields, the update profile process will be canceled and an error message will be displayed.

Table 4. 5 Use Case Description of Register Organ Transplant

Use Case	Name:	Register	Organ	Use Case ID: 04	Priority: High
Transplant					
Actor: Patient				Type: Detailed, Esse	ntial
Stakeholder a	nd Inte	erests:		1	
Patient - patien	t who v	vant to regis	ster and v	view the organ transplan	nt information
Brief Descript	ion:				
This use case	describ	es the action	n needed	to be performed by the	he patient to view or
register for the	organ	ransplant.			
Trigger:					
The patient wa	nt to re	gister or vie	w the org	gan transplant.	
Relationship:					
Association	:	Patient			
Include	:	Notification			
Extends	:	N/A			
Generalization	Generalization : N/A				
Normal Flow of Event:					
1. Patient select the "Organ Transplant" button on the side menu.					
2. The system will show some information of the organ transplant.					
3. If patient select the "Register" button (S-1:sub-flow is performed).					
Sub-Flow: {optional section}					
S-1:					
1. System will provide a form for the patient.					
2. The patient click the "Submit" button					
Perform exceptional flow E-1					
3. The system will display a successful message to the patient.					
Alternate / Ex	Alternate / Exceptional Flow:				
E-1:					

 If the user misses any required input fields, or if there are blank fields, the update profile process will be canceled and an error message will be displayed. Then, the customer is required to fill in the empty field.

Table 4. 6 Use Case Description of Manage Organ Transplant

140	10 11			lanspiane	
Use Case Name: Manage Organ Transplant			Use Case ID: 05	Priority: High	
Actor: Medical	Prov	rider	Type: Detailed, Es	ssential	
Stakeholder an	d In	terests:			
Medical Provid	ler -	provider who want to	view and update	the organ transplant	
information.					
Brief Descripti	on:				
This use case de	escril	bes the action needed to 1	be performed by the	e medical provider to	
insert or view th	ie org	gan transplant.			
Trigger:					
When the new of	orgar	i is coming. The medical	provider want to v	view, update or insert	
the organ transp	lant	information.			
Relationship:					
Association	:	Medical Provider			
Include	:	Notification			
Extends	:	N/A			
Normal Flow of Event:					
1. Medical pr	ovide	er select the "Organ Trans	splant" button on th	e side menu.	
2. The system will provide a list of the patient who are register the organ transplant					
with the name, organ need, date register, age, gender and more.					
3. The medica	al pro	ovider click the "Add Org	gan" button		
4. The system	ı will	provide a form to medic	al provider.		
5. The medical provider need to fill in the form and click "Submit" button.					

6. System will verify the input data

Perform exceptional flow E-1

7. Upon success, the system will automatic to select the suitable patient and save into the database.

Sub-Flow: {optional section}

Alternate / Exceptional Flow:

E-1:

 If the user misses any required input fields, or if there are blank fields, the update profile process will be canceled and an error message will be displayed. Then, the customer is required to fill in the empty field.

Table 4. 7 Use Case Description of Search Doctor
--

Use Case Name: Search Doctor	Use Case ID: 06	Priority: High			
Actor: Patient	Type: Detailed, Essential				
Stakeholder and Interests:					
Patient - patient who want to search the D	octor.				
Brief Description:					
This use case describes the action needed	to be performed by th	e patient to search the			
doctor information.					
Trigger:					
The patient who want to look for a specifi	c doctor.				
Relationship:					
Association : Patient					
Include : N/A					
Extends : Book Appointment,	View Doctor Information	tion			
Generalization : N/A					
Normal Flow of Event:					
1. Patient select the search tab.					
2. Patient input the keyword to be search.					
3. The system will search the database for matching keyword.					
Perform exceptional flow	Perform exceptional flow E-1				
4. The system will display the found results. If patient want select filter by date o					
name (S-1:sub-flow is performed).	name (S-1:sub-flow is performed).				
5. Patient select the doctor.					
Perform View Doctor Information Use Case					
Sub-Flow: {optional section}					
S-1:					
1. The patient select the date and sys	stem will display the	result list by available			

date.

Alternate / Exceptional Flow:

E-1:

1. If no result found, The system will displays a "No result found" message to patient.

Table 4.	8 Use	Case 1	Descriptio	on of	View]	Doctor	Information
1 auto 4.	0 0 30	Case	Descriptic	mor	V IC VV I	DOCIOI	mormation

Use Case Name: View Doctor	Use Case ID: 07 Priority: High				
Information					
Actor: Patient	Type: Detailed, Essential				
Stakeholder and Interests:					
Patient - patient who want to view the Doct	or information.				
Brief Description:					
This use case describes the action needed	to be performed by the patient to view the				
doctor information.					
Trigger:					
The patient who want to check the doctor in	nformation				
Relationship:					
Association : Patient					
Include : N/A					
Extends : Book appointment					
Generalization : N/A					
Normal Flow of Event:					
1. Patient clicks on the medical provider profile that he/she interested form the					
search list that is displayed.					
2. The system displays the information of the medical provider such as the basic					
personal information, working experience, rate and review, etc.					
3. If the customer clicks on the "Book Now" button,					
Perform Book Appointment Use Case					
Sub-Flow: {optional section}					
Alternate / Exceptional Flow:					

Use Case Name: Book Appointment	Use Case ID: 08	Priority: High
Actor: Patient	Type: Detailed, Essential	
Stakeholder and Interests:		
Patient – The patient who want to make a appointment with the doctor.		
Brief Description:		
This use case describes the action needed to be performed by the patient to make the		
appointment with the doctor.		
Trigger:		
The customer want to book the appointment with the doctor.		
Relationship:		
Association : Patient		
Include : Notification		
Extends : N/A		
Generalization : N/A		
Normal Flow of Event:		
1. The system will show all the medical service to the patient.		
2. Patient will need to select the medical service type.		
3. The system will diaplay the available doctor to the patient.		
4. Patient need to select the doctor that he / she interested.		
5. System will show the information of the doctor with the rating and review and		
doctor available date and time.		
6. Patient click the button of the available time.		
7. The system will display a confirmation info to customer.		
8. If patient click "Confirm Book" button (S-1:Confirm book sub-flow is		
performed)		
9. If patient click "Cancel" button (S-2:Cancel sub-flow is performed)		
Sub-Flow: {optional section}		
S-1: Confirm book		
1. The system will submit the appointment and save into the database.		

Table 4. 9 Use Case Description of Book Appointment

S-2: Cancel

1. The system will cancel the appointment and back to the Doctor Info Page.
Alternate / Exceptional Flow:

Table 4. 10 Use Case Description of Notification

Use Case Name: Notification	Use Case ID: 09	Priority: High		
Actor: Patient, Medical Provider	Type: Detailed, Essential			
Stakeholder and Interests:				
Patient - The patient who receives the push	notification from the a	application.		
Medical Provider - The provider who	receives the push ne	otification from the		
application.				
Brief Description:				
This use case describes how the user receiv	ve the push notificatio	n as the reminder on		
the application.				
Trigger:				
When a patient make appointment, or p	patient and medical p	provider manage the		
appointment, up-coming appointment, orga	n transplant, or door-to	o-door service.		
Relationship:				
Association : Patient, Medical Prov	vider			
Include : N/A				
Extends : N/A				
Generalization : N/A				
Normal Flow of Event:				
1. Patient select the notification feature	e at the side menu of a	pplication.		
2. the system will show all the notifica	2. the system will show all the notification.			
3. If have any action like the Trigger.	The system will sends	s a notification to the		
the user.				
4. The system will also show a push	4. The system will also show a push notification, email notification, and the			
whatsapp notification to the user.	whatsapp notification to the user.			
Sub-Flow: {optional section}				
Alternate / Exceptional Flow:				
Table 4. 11 Use Case Descrip	otion of Manage Appoi	ntment		

Use Case Name: Manage Appointment	Use Case ID: 11	Priority: High
• • • • •		• •

Actor: Patient, Medical Provider	Type: Detailed, Essential
Stakeholder and Interests:	
Patient - who want to manage the appointm	nent.
Medical Provider - who want to manage the	e appointment.
Brief Description:	
This use case describes the action needed	to be performed by the user to manage the
appointment. Beside that, patient can updat	te and cancel the appointment. The medical
appointment only can cancel the appointme	ent.
Trigger:	
When the user want to modify the appointr	nent.
Relationship:	
Association : Patient, Medical App	pointment
Include : Notification	
Extends : N/A	
Generalization : N/A	
Normal Flow of Event:	
Patient	Medical Provider
1. Patient click the "Manage	1. Medical provider click the "Manage
Appointment" button on the side	Appointment" button on the side
menu.	menu.
2. The system will display all the	2. The system will display all the
upcoming appointment and filter it	upcoming appointment and filter it
by the date and time.	by the date and time.
3. Patient click the appointment on the	3. The medical provider click the
list.	"Cancel" button on the side of the
4. The system will show the	appointment. (S-2: Cancel sub-flows
appointment information such as	was performed)
date, time, medical service type, and	
name of the medical appointment.	
5. Patient click the "Update" button (S-	
1: Update sub-flow was performed).	
6. Patient click the "Cancel" button (S-	
2: Cancel sub-flows was performed)	

Sub-Flow: {optional section}

S-1: Update

- 1. System will show the available date and time slot to patient.
- 2. Patient select the available date and time slot and click "Update" button
- 3. The system will update the database.

S-2: Cancel

- 1. The system will show a confirmation to the patient.
- 2. If user click "Confirm" button
- 3. The system will delete the appointment from the database.

Alternate / Exceptional Flow:

Table 4. 12 Use Case Description of Rating and Feedback

Use Case Name: Ra	ating and Feedback	Use Case ID: 13	Priority: High	
Actor: Patient		Type: Detailed, Esse	ential	
Stakeholder and In	iterests:			
Patient - who want t	to submit the rating and	I feedback after the ser	vice.	
Brief Description:				
This use case descri	ibes the action needed	to be performed by th	ne patient to submit a	
review and feedback	x to the related medical	provider after the serv	vice.	
Trigger:				
After the service, pa	tient want to give the f	eedback to the medica	l provider.	
Relationship:				
Association :	Patient			
Include :	N/A			
Extends :	N/A			
Generalization :	N/A			
Normal Flow of Event:				
1. After service,	patient clicks on the '	History Appointment	t" button on the side	
menu.				

2. The system lists out the previous reservations filter by the date.

3. Patient chooses and clicks on the past reservation.

4. The system displays the previous reservation information.

5. If the selected past reservation has not been rated (S-1: sub-flows was performed)

Sub-Flow: {optional section}

S-1:

- 1. Patient gives a rate and feedback to the chosen medical provider.
- 2. Patient clicks on the "Submit" button to create and update the rate and review record to the database.
- 3. The system uploads the rate and reviews on the medical provider's profile.

Alternate / Exceptional Flow:

Table 4. 13 Use Case Description of Manage Schedule

Use Case Name: Manage schedule	Use Case ID: 14	Priority: High	
Actor: Medical provider	Type: Detailed, Esse	ential	
Stakeholder and Interests:			
Medical provider - who want to manage	e their schedule.		
Brief Description:			
This use case describes the action need	ed to be performed by th	e medical provider to	
view and manage their schedule.			
Trigger:			
When the medical provider want to cha	nge the available date and	l time.	
Relationship:			
Association : Medical provider			
Include : N/A			
Extends : N/A			
Generalization : N/A			
Normal Flow of Event:			
1. Medical provider select the "M	Ianage Schedule" button	on the side menu.	
2. Medical provider set up the we	orking start time, end time	e, break time, and the	
off Day.			
3. Medical provider click the "Save" button.			
4. The system will validate the da	ata.		

Perform exceptional flow E-1

5. Upon success, the system will update the database.

Sub-Flow: {optional section}

Alternate / Exceptional Flow:

E-1:

1. If the user misses a required field, the system will displays an error message and prompts the user to correct the information.

Table 4. 14 Use Case Description of Manage Patient

Use Case Name: Manage Patient	Use Case ID: 15	Priority: High		
Actor: Medical Provider	Type: Detailed, Essential			
Stakeholder and Interests:				
Medical Provider - who want to view and n	nanage the Patient.			
Brief Description:				
This use case describes the action needed t	to be performed by th	e medical provider to		
view and update the patient medical record.				
Trigger:				
The medical provider want to view patient	medical record durin	g the service or want		
to update the medical record after the service	ce or conversation.			
Relationship:				
Association : Medical provider				
Include : N/A				
Extends : N/A				
Generalization : N/A				
Normal Flow of Event:				
1. The medical provider click the "M	lanage Patient" button	on the side menu.		
2. The system will show all the list of patient who was make appointment with				
him / her but haven't give the feedback for the medical record.				
3. Medical provider select click the p	patient.			
4. The system will provide the medic	cal form for the medic	al provider.		
5. Medical provider enter the "Submit" button.				

6. The system will submit the form and save into the patient database.

Sub-Flow: {optional section}

Alternate / Exceptional Flow:

4.4 Low-Fidelity Prototypes

The low-fidelity prototype in Appendix F was a fundamental milestone in the design and development process of this project. The prototype serves as an early-stage visual representation of the application's interface and functionality. Although the design is intentionally simple, it provides a valuable starting point for visualizing key elements and user interactions within the system. Examining the low-fidelity prototype in Appendix F will gain a basic understanding of the application's layout and flow, facilitating discussion and improvements that will ultimately result in a more polished and user-friendly final project.

CHAPTER 5

SYSTEM DESIGN

5.1 Introduction

This chapter encompasses System Architecture Design, System Design Models, and User Interface Design, collectively forming the blueprint for a robust and user-centric healthcare solution. Through these elements, the objective is to create an efficient and visually appealing system that meets the needs of both healthcare providers and patients while ensuring smooth data flow and interaction pathways.

5.2 System Architecture Design

The project's system architecture, depicted in Figure 5.1 below, is designed as a threelayered structure. It primarily comprises three layers: the Presentation Layer, the Application Layer, and the Data Layer. This architectural choice was made to enhance the development process and enhance overall system performance. Significantly, the three-tier architecture enhances security by preventing direct communication between the presentation layer and the data layer, thus mitigating potential malicious exploits.



Figure 5. 1 Architecture Design of the system

The Presentation Layer, positioned at the topmost tier, serves as the gateway for user interaction. It represents the user interface through which patients and medical providers interact with the system. Two different characters symbolize these user roles, interacting with the system via mobile phones. Mobile apps built with React Native and integrated with Firebase Authentication facilitate this interaction.

The application layer is located in the middle layer and serves as the logic and processing center of the system. For this project, it was fortified by TypeScript and Node.js, supplemented by the power of Firebase Cloud Functions. This layer plays a key role in processing user input, orchestrating business logic, and managing data exchange between the presentation and data layers.

The foundation of the architecture is the Data Layer, which is responsible for the secure storage and management of system data. Leveraging Firestore and Firebase Cloud Storage, it handles data storage needs efficiently. The two-way data flow between the Application Layer and the Data Layer is indicated by arrows, illustrating the symbiotic relationship that ensures data is securely stored and easily accessible to satisfy application functionality.

This three-tier architecture facilitates the development of a highly efficient, scalable, reliable, and secure medical appointment application. By dividing functionality into different layers, independent development and updates can be enabled, resulting in a more powerful and user-friendly healthcare solution. This architectural design not only speeds up development but also enhances the overall user experience, making it a critical component to the success of the project.

5.3 System Design Models

This section includes pivotal system design models that form the backbone of the medical appointment application. These models include the Conceptual Data Model, providing an organized view of database concepts and their relationships, Data Flow Diagrams (including the Context Diagram, DFD Level 0, and DFD Level 1) illustrating information flow within the system, and Page Navigation Flow detailing the user interface's navigational pathways. These visual representations are instrumental in shaping the structure, data flow, and user experience of the application.

5.3.1 Conceptual Data Modelling

Conceptual data models provide a high-level view of database concepts and their complex interconnections. It functions as the foundational plan for structuring and handling data within the applications, guaranteeing data integrity, simplified storage, and easy retrieval. The conceptual data model presented below provides a structured representation of the database design and the necessary data elements necessary to facilitate the appointment process. It does this by defining entities, their associated properties, and the relationships that tie them together.



Figure 5. 2 Conceptual Data Modelling

5.3.1.1 Data Dictionary

Column Name	Data Type	Key	Description
Email	String	-	The email of the user
Password	String	-	The password of the account
Uid	String	Primary	The id of the account

Table 5. 1 Data dictionary for Users table

Table 5. 2 Data dictionary for Patients table

Column Name	Data	Key	Description
	Туре		
Uid	String	Primary	The uid is the Users table uid
role	String	-	This role only will either Doctor or Patient
firstName	String	-	The first name of the patient
lastName	String	-	The last name of the patient
icNo	String	-	The ic Number of the Patient
phone	String	-	The phone number of the patient

gender	String	-	The patient gender either Male or Female
brithDate	String	-	The date of brith
img	String	-	The http link of the profile picture store in
			firestore
BloodType	String	-	The patient blood type
organTransplant	Boolean	-	To store the patient is he/she is organ
			transplant patient
Address.	String	-	The patient address 1
address1			
Address.	String	-	The patient address 2
address1			
Address.	String	-	The patient address postal code
postalCode			
Address.city	String	-	The patient address city
Address.state	String	-	The patient address state
Address.country	String	-	The patient address country

Table 5. 3 Data dictionary for Doctors table

Column Name	Data	Key	Description
	Туре		
Uid	String	Primary	The uid is the Users table uid
role	String	-	This role only will either Doctor or Patient
firstName	String	-	The first name of the doctor
lastName	String	-	The last name of the doctor
icNo	String	-	The ic Number of the doctor
phone	String	-	The phone number of the doctor
gender	String	-	The doctorgender either Male or Female
brithDate	String	-	The date of brith
img	String	-	The http link of the profile picture store in
			firestore

summary	String	-	The summary of the doctor
position	String	-	The position of the doctor
educations	String[]	-	The school name of the doctor study
Credential.	String	-	The doctor's qualification
qualification			
Credential.medical	String	-	The doctor medical registration no
_registration_no			
languages	String[]	-	The languages of doctor know
services	String[]	-	The service that doctor provide to patient

Column Name Data Type Key Description id String Primary The id of this Appointments table Patient id Foreige The patient id is the Patients table uid String Foreige Doctor id String The doctor id is the Doctors table uid date String _ The appointment date String _ The appointment time slot time firstTime Boolean For the first time to visit the doctor _ String reason -The appointment service type other String To let the patient enter some other notice _ Medical record String The medical comment given by doctor rate Number The rate given by patient _ feedback The feedback of the patient String -String The appointment status status -(Pending, Accepted, Completed, Canceled) logbook TimeStamp To store the date and time of the modify -

Table 5. 4 Data dictionary for Appointments table

Column Name	Data	Key	Description
	Туре		
id	String	Primary	The id of the OrganLists table
Patient_id	String		The patient_id is the Patients table uid
neededOrgan	String	-	The type of organ
Registration_date	String	-	The date of register as the organ transplant patient
status	String	-	The status (Pending, Accepted, Completed, Canceled)
Provider_name	String	-	The name of the donator

Table 5. 5 Data dictionary for OrganLists table

Table 5. 6 Data dictionary for Schedules table

Column	Data	Key	Description
Name	Туре		
id	String	Primary	The id of the Schedules table
Doctor_id	String	Foreige	The doctor_id is the Doctors table uid
date	String	-	The canceled date
time	String[]	-	The canceled time lists

5.3.2 Data Flow Diagram (DFD)

A data flow diagram is a powerful visual tool that describes the flow of information or data through the processes and systems of the applications. It acts as a roadmap that guides how data moves between components and processes. In this section, the project will present three DFD diagram, which are Context Diagram, DFD Level 0 and DFD Level 1. These diagrams provide increasingly fine-grained views of data flow within the system, revealing interactions between users, appointments, data stores, and more. These visual representations provide insight into the inner workings of application data flows, facilitating efficient data processing and decision-making.



Figure 5. 3 Contect Diagram



5.3.2.2 Level 0 Data Flow Diagram

Figure 5. 4 Level 0 Data Flow Diagram



Figure 5. 5 SignUp Level 1 DFD



Figure 5. 6 Login Level 1 DFD



Figure 5. 7 Manage Account Level 1 DFD



Figure 5. 8 Search Level 1 DFD



Figure 5. 9 Make Appointment Level 1 DFD



Figure 5. 10 Manage Appointment Level 1 DFD



Figure 5. 11 Notification Level 1 DFD



Figure 5. 12 Manage Organ Transplant Level 1 DFD



Figure 5. 13 Manage Schedule Level 1 DFD



Figure 5. 14 Manage Patient Record Level 1 DFD



Figure 5. 15 Manage Rate & Feedback Level 1 DFD

5.3.3 Page Navigation Flow

5.3.3.1 Patient Module Application

The diagram below show the patient module application's page navigation flow. This flow will display all the available navigation page for the patient user.



Figure 5. 16 Page Navigation Flow for Patient

5.3.3.2 Doctor Module Application

The diagram below show the doctor module application's page navigation flow. This flow will display all the available navigation page for the doctor user.



Figure 5. 17 Page Navigation Flow for Doctor

5.4 User Interface Design

This section provides a visual tour of the well-designed user interface for both the patient and medical provider sides of the application. Intuitive design is designed to enhance the user experience, ensuring seamless navigation and clear interaction points. From booking appointments to medical record management, every element has been carefully designed to prioritize accessibility and efficiency. Explore interfaces that help patients and medical providers fulfill their roles in the healthcare ecosystem. Enter a user-centric experience that redefines healthcare accessibility and convenience.

5.4.1 General Module

Welcom page is the screen where the user will direct to when the user lunch the application. In this page, there will have two option to let the user select. Two option will be the Login and Register new patient account.



Figure 5. 18 Welcome Page UI

Figure below is login screen. Login screen will able to let the user to log into the application. There will need to user to enter the valid email and password to log into the application.



Figure 5. 19 Login UI

Figure below is the home page. All the user will direct to this screen after login to the application. The doctor side and the patient side home page is same. The only difference thing is the 2 button. The patient side home page is make booking button and search button. The other hand, doctor side home page is manage appointment button and manage schedule button.



Figure 5. 20 HomePage UI

Figure below is register page the register will only can register as the patient. All the input data field are compulsory. There will have error massage if there have the error input data.

Sign Up			← Sign Up	
irst Name			First Name	
			First Name is required	
ast Name			Last Name	
			Last Name is required	
No			IC No	
			Ic No is invalid! e.g. 000000-00-0000	
none Number			Phone Number	
			Phone Number is invalid! e.g. 0123456789	
nail			Email	
assword	\$		Password	_
			Password needed 8 character	
infirm Password	8		Confirm Password	
	-		Password Incorrect!! Please Enter again.	
Register			Register)
			Register Fail!!! Please fill in all required fi provide valid information.	ields and
		_		

Figure 5. 21 Register Page UI

5.4.2 Patient Module

All the page of Patient Module will show at this section.



Figure 5. 22 Dawer, Edit Profile Page UI

· · · · · · · · · · · · · · · · · · ·	•
■ Search Doctor	■ Department Doctor
	General Practitioner
Lee Zhi Jia General Practitioner	Dentist
Chia Ali Dentist	General Surgery
	Pediatrics (Children)
	Obstetrics and Gynecology(women and pregnancy)
	Cardiology (Heart)
	Orthopedics (Bone or Musculoskeletal)
	Oncology (Cancer)
	Dermatology (Skin-related)

Figure 5. 23 Search and Department List Page UI

← Department List	⊙ ← Doctor	or Profile		
Lee Zhi Jia General Practitioner			Dr. Lee Zhi J General Practi	ia tionor
	 Available Slot	s		
Zhong Jia Hua General Practitioner		- Date	023 🖬	
0.6	 8:00	8:30	9:00	9:30
	10:00	10:30	11:00	11:30
Today Available Time	 13:00	13:30	14:00	14:30
	 15:00	15:30	16:00	16:30
	17:30	19:00	19:30	20:00
	 20:30	21:00	21:30	
	Profile	Se	ervice Ra	nte & Review
	Summa	iry		

Figure 5. 24 Doctor List and Doctor Profile Page UI

•	•
- Booking Page	Manage Appointment
Dr. Lee Zhi Jia General Practitionor	Upcoming Pending History
Date Time When: 31 / 8 / 2023 17:30	Dr. Lee Zhi Jia General Practitioner Type: Date : 13 / 9 / 2023 Time : 10:00
Fist Time to Visit?	Cancel Appointment
What is the Reason come to Visit? Select an option	Dr. Lee Zhi Jia General Practitioner Type: Date : 14 / 9 / 2023 Time : 15:00
Other Noted?	Cancel Appointment

Figure 5. 25 Booking and Pending Appointment Page UI



Figure 5. 26 Upcoming and History Page UI



Figure 5. 27 History Details and Feedback Page UI



Figure 5. 28 Feedback input and Organ Transplant Info Page UI



Figure 5. 29 Register Organ Transplant and Organ Profile page UI

5.4.3 Doctor Module

All the page of Doctor Module will show at this section.



Figure 5. 30 Drawer and View Profile Page Ui

• <u> </u>		6	
← Edit Profile	- F	÷	Edit Profile
Upload Image			Medical Registration No
			Chinese
O First Name Last Name Zhi Jia			English
Date of Bith 3 / 3 / 2023	-	۰.	Service 1 consultation
Select your gender			Service 2 follow back
Phone Number 0123456789			Remove
General Practitioner			Update

Figure 5. 31 Edit Profile Page UI

•		•
Notification	=	E Doctor Schedule
Jpcomming	ть	This is Manage Schedule Page e grey color Time Slot is Delete or Canceled
Accepted Chia Wei Qiang Ture:		Selected Date 15 / 9 / 2023
Date : 13 / 9 / 2023 Time : 10:00		7:00 7:30 8:00
		8:30 9:00 9:30
12 / 0 / 2022		10:00 10:30 11:00
12/9/2023		11:30 13:00 13:30
		14:00 14:30 15:00
No appointment found.		15:30 16:00 16:30
		17:00 17:30 19:00
11 / 9 / 2023		19:30 20:00 20:30
		21:00 21:30
No appointment found.		Update
10 / 9 / 2023		

Figure 5. 32 Notification and Manage Schedule Page UI



Figure 5. 33 Manage Appointment Page UI



Figure 5. 34 History Appointment Page UI



Figure 5. 35 Manage Organ Transplant Page UI



Figure 5. 36 Updata Patient Page UI



Figure 5. 37 Updata Comment Page UI

CHAPTER 6

SYSTEM IMPLEMENTATION

6.1 Introduction

The purpose of this chapter is to explore in depth the code implementation of each module integrated into the application. Section 6.2 will provide a detailed description of these modules, including their functional and non-functional requirements, and identify their user base. Then, in the next section will dissect and clarify the key code sections that are critical to the functionality of each module. This chapter serves as a practical guide to understanding the technical foundations of system implementation.

6.2 System Modules

Taking into account the different user types and their different needs, the implementation of the system is organized into discrete system modules. The following table provides a comprehensive view of these integrated system modules that support application development. Each module is designed to meet specific user needs, creating a cohesive and user-centered healthcare management system. View on this table to gain insight into how the system effectively serves patients and healthcare providers.

Table 6. 1 Page Navigation Flow for

Modules	Associated requirement(s)	Associated user(s)
Login	The application shall allow users to login	Patient / Doctor
	for the application.	
Register	The application shall allow the new user to	Patient
	register for an account.	
Logout	The application shall allow users to logout	Patient / Doctor
	for the application.	
Update	The application shall allow the user to view	Patient / Doctor

account	and manage their account and profile	
Search	The application shall allow the Patient to	Patient
	search and filter the doctor list though the	
	Doctor name.	
Make	The application shall allow the Patient to	Patient
appointment	make the appointment with the specific	
	doctor or medical provider.	
Update	The application shall allow Doctor or	Doctor
appointment	medical providers to manage their	
	appointment which can let them accept the	
	appointment.	
Cancel	The application shall allow the user to	Patient / Doctor
appointment	manage their appointment which can let	
	them cancel the appointment.	
Register organ	The application shall allow the Patient to	Patient
transplant	register the organ transplant	
Update organ	The application shall allow Doctor or	Doctor
transplant	medical providers to manage organ	
status	transplant patient which can let them accept	
	or reject the patient.	
Notification	The application shall allow the user to get	Patient / Doctor
	the notification of the organ transplant info,	
	upcoming appointments notification,	
	appointment update information.	
Rating &	The application shall allow the Patient to	Patient
Feedback	give the feedback and rating to the medical	
	appointment.	
Medical	The application shall allow the medical	Doctor
comment	provider to update the medical record	

6.3 Patient and Medical Provider/Doctor Module

6.3.1 Login Module

The login module will able to let the user which are patient and medical providers login to the application. The Login Module having a function named 'handleSignIn' responsible for user authentication using Firebase Authentication in the application. It initially validates whether the email and password fields are filled and, if not sets a flag 'showSnackbar' for displaying a error massage to inform the user. Upon both fields being provided, the functio will attempts firebase authentication via signInWithEmailAndPassword, logging in if successful and invoking a function called check. Error handling is in place, with a specific check for an invalid email address error ('auth/invalid-email'). Regardless of the outcome, it triggers showSnackbar to show the error massage and clear the email and password field.



Figure 6. 1 handleSignIn function

The check function is to verify the user's role authentication by using Firebase Authentication to obtain the current user. If the user is authenticated, it queries a Firestore collection called "Users" based on their unique ID (UID) to get additional user data. Based on the retrieved user data of the "role" field to check the role of the user. If the user is 'Doctor' will navigate to the Doctor Homepage by using the React Navigate. If not will navigate to the Patient Homepage. This function plays a vital role in routing users to the appropriate part of the mobile application based on their role in the system.



Figure 6. 2 check function

6.3.2 Logout Module

The logout module will able to let the user to logged out to the application. The Logout Module having a function call 'handleSignOut' by using Firebase Authentication's signOut method to perform the sign-out operation asynchronously. Upon successful sign-out, it utilizes React Navigation to reset the navigation stack, ensuring that the user is redirected to the 'Welcome' screen. A brief delay of 1.5 seconds (1500 milliseconds) is added before the navigation reset to allow let the user feel smooth transition. This function effectively manages the user's sign-out process, enhancing the application's user experience.



Figure 6. 3 handkeSignOut function

6.3.3 Update Profile Module

Update Profile Module will able to let the user to modify their personal information. There have few function to get the data from the database and update to the database. Those function are getData, updateUser, handleImageUpload, handleArrayChange, handleAddArray, handleRemoveArray.

The getData function is designed to fetch user profile data from Firestore. It utilizes the useEffect hook to ensure the code runs when the component is mounted. First, it checks if a user is currently authenticated. If so, it accesses the Firestore database to retrieve the user's document using their unique ID. If the document exists, it extracts various user profile data. These data are then set in corresponding state variables, allowing them to be rendered within the component.



Figure 6. 4 Profiel getData function

The updateUser function is responsible for updating a user's profile information in Firestore. It takes a user ID as a parameter and uses it to locate the specific user document in the Firestore collection 'Users'. The function will performs an update operation on this document, replacing the existing values with the newly provided values for attributes getted from the user input field. Once the update is successful, the function will navigates the user to the 'DoctorProfile' screen. This function essentially facilitates the process of allowing users to modify and save their profile information within the application.



Figure 6. 5 Profile updateUser function

The handleImageUpload function utilizes the React Native ImagePicker library to enable users to select an image from their device's gallery. After a user picks an image, the function retrieves the currently authenticated user's information, including their UID. It will creates a reference to a specific location call profile_images in Firebase Storage named the image as the user's UID, where the selected image will be stored. The chosen image is uploaded to this storage reference. Upon successful upload, the function retrieves the image's download URL from Firebase Storage, and sets it as the selected image for the user's profile. This process allows users to update their profile picture by choosing an image from their device's gallery.
```
const handleImageUpload = async () => {
   try {
    const image = await ImagePicker.openPicker({
      width: 300,
      height: 300,
      cropping: true,
   });
   const user = auth().currentUser;

   if (user) {
      const reference = storage().ref(`profile_images/${user.uid}`);
      await reference.putFile(image.path);
      const imageUrl = await reference.getDownloadURL();
      setSelectedImage(imageUrl);
   }
};
```

Figure 6. 6 handleImageUpload function

There have some extra function for the Doctor Update Profile Model which are the handleArrayChange, handleAddArray, handleRemoveLastItem. The handleArrayChange function is a utility function used in React to update an array state. It takes four parameters: arrayState, which represents the current array state variable; setArrayState, the state-setting function provided by React to update the array state; text, the new value you want to set at a specific index within the array; and index, which specifies the position where the update should occur. Inside the function, it creates a copy of the current state array using the spread operator to ensure that the original state remains unaltered. Then, it updates the value at the specified index in the copied array with the new text value. Finally, the updated array is passed to setArrayState to update the array state variable.



Figure 6. 7 handleArrayChange function

The handleAddArray function is a utility function in a React component designed to add a new element to an array state. It takes two parameters: arrayState and setArrayState. Inside the function, it creates a new array by spreading the elements of the current state array, and then appends an empty string to the end of this new array. By using the setArrayState function with the updated array.

Figure 6. 8 handleAddArray function

The handleRemoveLastItem function is a utility function in a React component that allows you to remove the last item from an array state. It takes two parameter: arrayState and setArrayState. Inside the function, it first checks if there's at least one item in the array, then creates a copy of the array, removes the last item, and updates the state with the modified array.



Figure 6. 9 handleRemoveLastItem function

6.3.4 Cancel Appointment Module

The handleCancel function is designed to handle the cancellation of an appointment. But the cancel function will not direct delete or remove the data from the database. It only will update the appointment status to 'Canceled'. The function utilizes the Alert.alert method to display a confirmation dialog to the user, asking for confirmation to cancel the appointment. If the user confirms, it triggers an update operation on the Firestore database to change the appointment's status to 'Canceled' and update the logbook timestamp to the current date and time. After successfully updating the appointment, it triggers a state refresh to reload the appointment data, clears the existing appointment data, and displays a success alert. This function provides a robust way to handle appointment cancellations in a React Native application while ensuring user confirmation and database updates.



Figure 6. 10 Cancel Appointment function

6.3.5 Notification Module

The notification module will able to let the user to get the notification of the upcoming and latest appointment. There will have a getAppointment function to get all the possible upcoming appointment from the database. First, the function will get the current date time of the application. Then, it queries the Firestore collection 'Appointments' to filter appointments where the patient ID matches the logged-in user's ID and the status is 'Accepted'. This function maps the resulting document, evaluates whether each appointment's date and time is greater than or equal to the current date and time, and filters out any past appointments. If valid appointments are found, it stores them in the state variable appointmentData; otherwise, it sets appointmentData to an empty array. After that, using the doctor Id to get the doctor information for display purpose.



Figure 6. 11 getAppointment function

6.4 Patient Module

6.4.1 Register Module

The register module will able to let the new patient to create a new account for the application. The module will have 2 major of the function which is authUser function and createUser function.

The authUser function is responsible for user registration in a React Native application using Firebase Authentication. The authUser function is responsible for user registration in a React Native application using Firebase Authentication. When the authUser function is executed, it utilizes Firebase's authentication method to attempt user registration using the provided email and password. Upon successful registration, it will retrieves the current user object, and triggers the createUser function, which is responsible for adding the user's details to Firestore. After successful registration and user creation, a reminder will be displayed to inform the user that the registration is successful. If a registration error occurs, such as trying to register with an email that is already in use or providing an invalid email format, an appropriate error message is displayed and a snack-bar is displayed to indicate the error to the user. After successful registration or error handling, the function ultimately navigates the user to the Welcome screen.



Figure 6. 12 AuthUser function



Figure 6. 13 Create User function

6.4.2 Search Module

The search Module will able to let the patient to search the doctor by using the name of the doctor. In this module will having 2 major function which is the loadDoctor function and handleSearch function.

The loadDoctors function uses Firebase Firestore to retrieve a list of doctors from the 'Users' collection where the 'role' field is equal to 'Doctor'. It then processes the retrieved data, creating an array of Doctor objects. These doctor objects are stored in the doctors state variable. The handleSearch function performs real-time filtering of the doctor list based on the user's search query. It updates the filteredDoctors state with only the doctors whose names contain the search query in a case-insensitive manner. So, when the user types in the search bar, the list of displayed doctors dynamically adjusts to match the search criteria. This will providing an efficient and user-friendly search feature for finding doctors by name.



Figure 6. 14 Search function

6.4.3 Make Appointment Module

This module will able to let the patient make a new appointment with the specific doctor. This module will use 2 pages to present the function, one is the doctor profile page which will able to let the patient view the doctor summary profile, patient rate & feedback and the available date and time slot; the other will be the booking page which is able to let the user make appointment with the selected date time.

In the DoctorProfile Page, the findAppointedTime function queries the 'Appointments' collection to retrieve all appointment times for the selected doctor on the specified date, excluding appointments with a 'Canceled' status. It extracts these times from the query result and stores them in the appointment state. This allowing for the display of already scheduled appointment times for the doctor on the chosen date.



Figure 6. 15 Find Appointment Time function

The handleSlots function performs dynamic filtering of available time slots for booking appointments with a doctor. It first checks if there are any previously canceled slots for the selected date in the 'Schedules' collection specific to the doctor. If canceled slots exist, they are removed from the list of available slots. Next, it filters out slots that have already been booked (appointmentTime state). Finally, it further filters the slots based on whether they meet certain time constraints, considering the current time, selected date, and ensuring that at least 10 minutes are left before booking an appointment for the same day. The resulting available slots are then stored in the availableSlots state for displaying purpose.



Figure 6. 16 handleSlots function

In the Booking page, the createDoc function retrieves the current number of documents in the 'Appointments' collection and generates a new ID by adding 1 to the collection's size, ensuring the uniqueness of the document ID for the new appointment. This ID is then returned to be used in creating the appointment document.



Figure 6. 17 CreateDoc function

The insertBooking function is responsible for creating a new appointment booking in the 'Appointments' collection in Firestore. It first calls the createDoc function, which retrieves the current number of documents in the 'Appointments' collection and generates a new unique ID by incrementing the size by one. This ID is then used to create a new document in the 'Appointments' collection with various appointment details. Once the appointment document is successfully created, the user is navigated to the 'PatientHome' screen.



Figure 6. 18 insertBooking function

6.4.4 Register Organ Transplant Module

This module will able to let the patient to register as the organ transplant patient. This module will 2 major function. There are the createDoc which is to create the new unique id for appointment; the other, is the insertBooking function which is to create a new appointment in the database.

The createOrgan function facilitates the creation of organ transplant requests for patients. It starts by checking the current user's authentication status and proceeds if a user is authenticated. It then invokes the createDoc function to generate a unique ID for the new organ transplant request by inspecting the 'OrganLists' collection's current size and incrementing it by one. Subsequently, the function uses Firestore to create a new document within the 'OrganLists' collection and storing details. After successfully creating the organ transplant request document, then the user is directed to the 'PatientHome' screen.



Figure 6. 19 CreateOrganPatient function

The updatePatient function given an authenticated user, updates the user's Firestore record by setting the 'bloodType' and 'organTransplant' fields as specified. In this context, it appears to enable the user to indicate their willingness for organ transplant and record their blood type.



Figure 6. 20 Update Orgen Patient function

The getOrganInfo function is responsible for retrieving organ transplant information associated with a specific patient and displaying it in a component. First, it sets the user using the parameters passed to the component. Then, it checks the current authentication status to ensure a user is logged in. If a user is authenticated and the user's first name is not empty, the function queries the Firestore database within the 'OrganLists' collection. It searches for documents where the 'patient_id' matches the currently logged-in user's UID. If matching documents are found, the function extracts the data from the first document in the result (assuming there's only one) and sets this organ transplant information in the component's state. This allows the user to access and display their organ transplant-related details on the screen, provided they are authenticated and have previously stored this information in Firestore.



Figure 6. 21 Get Organ Patient detail function

6.4.5 Rating and Feedback Module

This module will able to let the patient to give the rating and feedback for the appointment they make. This module will have 3 major function which will be the getAppointment, getDoctor, handleUpdate function.

The getAppointment function is implemented using the useEffect hook to automatically retrieve a list of completed appointments that have not been rated by the user. It first checks if there is a currently authenticated user. If a user is authenticated, it queries the Firestore database in the 'Appointments' collection, filtering appointments where the 'patient_id' matches the current user's UID, the 'status' is 'Completed,' and the 'rate' is 0 (indicating that the appointment has not been rated yet). The query results are mapped to extract specific appointment data. This data is then set in the component's state, allowing the user to see a list of their un-rated completed appointments. If no such appointments are found will display a massage to tell patient no appointment found.



Figure 6. 22 getUnRatedAppointment function

The getDoctor function retrieves additional information about the doctor associated with the unrated completed appointment stored in the unRateData array. It does this by mapping the unRateData array and checking for each appointment whether "doctor_id" is not empty. If not empty, it asynchronously queries the Firestore database in the "Users" collection using the doctor's ID to get their information. These details are converted into object format and collected in a series of promises.

The Promise.all function is then used to wait for all these asynchronous queries to resolve and filter the results to remove any undefined values (this will happen if the appointment's "doctor_id" is empty). The resulting array newDocData contains additional doctor information, and if it contains any valid data, it is set in the component's state. If no doctor information is found or all "doctor_id" values are empty, a default empty doctor data structure is provided to ensure a consistent rendering experience.



Figure 6. 23 Doctor Info Function

The handleUpdate function is a confirmation dialog using the Alert.alert method to confirm the submission of feedback and rating for an appointment identified by its id. When the user confirms the submission, it updates the Firestore document associated with the appointment. Specifically, it sets the 'feedback' field with the provided feedback text, the 'rate' field with the chosen rating, and updates the 'logbook' field with a timestamp of the current date and time to record the submission.

```
const handleUpdate = (id: string) => {
    Alert.alert(
        'Confirm Submission',
        'Are you sure you want to Submit this Feedback?',
                text: 'Cancel',
                style: 'cancel',
                text: 'Submit',
                onPress: () => {
                     firestore()
                         .collection('Appointments')
                         .doc(id)
                         .update({
                              feedback: feedback,
                             rate: rating,
                             logbook: FormatDataToTimeStamp(new Date()),
                          .then(() => {
                              setAllData([{
                                  id: "',
                                  date: "
                                  time: ",
                                  doctor id: '',
                                  reason: ",
                                  medical_Record: '',
                                  status: ",
                                  img: <sup>**</sup>,
name: <sup>**</sup>,
                                  position: "
                              }])
                              getAppointment();
                              setVisible(false);
                              Alert.alert('Success Submit Feedback');
                         )
                         .catch(error => {
                              console.error(error);
```

Figure 6. 24 Update Feedback Function

6.5 **Doctor Module**

6.5.1 Update Appointment Module

This module will able to let the doctor to update the status of the appointment when the doctor accept the appointment make by patient. There have 3 major function which are the getAppointment, getPatient, hendleAccept function to get the specific appointment and update the appointment.

The getAppointment function is responsible for fetching a list of appointments for a specific doctor based on their user ID and a specified appointment status. It first retrieves the current time and date, parsing them to extract the hour and minute. It then queries the Firestore collection 'Appointments' to filter and retrieve appointments that match the doctor's user ID and the provided status. It also applies additional filtering logic to include only future appointments, checking if the appointment date is greater than or equal to the current date. It constructs an array of appointment objects, filtering out undefined entries, and updates the state variable 'appointmentData' with this list.



Figure 6. 25 get appointment list function

The getPatient function is responsible for retrieving patient information related to the appointment list. It loops through the appointment data and checks if each appointment has a valid patient ID. For appointments with a valid patient ID, it queries the Firestore collection "Users" to retrieve additional information such as the patient's profile image and full name. These details are then used to build an array of patient objects, filtering out any undefined entries. Finally, the state variable "patentInfo" is updated with this list of patient information. If no valid patient information is found, it sets "patentInfo" to an empty object array.



Figure 6. 26 Get Patient Info function

The handleAccept function confirms acceptance of a specific appointment by displaying an alert dialog box to the doctor. When the Submit button in the alert dialog is pressed, this function updates the appointment status in Firestore to "Accepted" and records this action in the appointment's log. It then triggers a state refresh and clears the data in "allData", essentially resetting it. Finally, it displays an alert informing the doctor that the appointment has been successfully accepted.



Figure 6. 27 Accept Appointment function

6.5.2 Update Organ Transplant Patient Module

This module will able the let the doctor to update the status and provider name of the organLists database. There will have few major of function which are getOrganData function to get all the organ transplant patient lists; the getPatient function to get the patient information; the handleCancel function is to reject the reject the register; the handleAccepted to accept the patient register; the handleCompleted to let the patient update the provider name for the organ transplant patient.

The getOrganData function retrieves organ transplant information from the Firestore database based on status. It first verifies the authentication status of the current user. If the user is authenticated, it will query the "OrganLists" collection in Firestore and filter the data based on the specified status. After that, it maps the retrieved documents into a structured format and extracts relevant fields. This function filters out any undefined data entries, ensuring only valid records are included. If valid data is found, it sets the "organData" state variable to the retrieved information; otherwise, it initializes "organData" with the default null value. This process ensures that doctors retrieve organ transplant information.





The getPatient function retrieves patient information related to organ transplant from Firestore. It operates on the 'organData' array, which contains records of organ transplant requests, and maps over these records. For each entry, it checks if the 'patient_id' field is not empty. If it's not empty, the function queries the 'Users' collection in Firestore using the patient ID and retrieves data. The retrieved data will transformed into an object. If the data exists and is valid, it will included in the 'newDocData' array. Finally, the function sets the 'patientData' state variable to this filtered and structured patient information. If there are no valid patient records, it initializes 'patientData' with default empty values. This process ensures that patient information related to organ transplant requests is retrieved.



Figure 6. 29 Get Organ Patient Info function

The handlerCancel function is responsible for handling the cancellation of organ transplant patient requests. When called, it displays an alert dialog to confirm cancellation. If the user confirms the cancellation by pressing "Submit," this feature updates the status of the corresponding organ transplant patient request in Firestore to "Cancelled." This is achieved by locating a specific document using the "id" provided in the "OrganLists" collection and modifying its "status" field. After successfully updating the state, it triggers a refresh by setting the "refresh" state, and clears the "allData" state, which holds information about the organ transplant patient. Finally, it displays an alert confirming that the patient request was successfully canceled. This feature ensures that organ transplant patient requests can be canceled and their status updated accordingly in Firestore.





The handlerAccepted function handles the acceptance of an organ transplant patient request. When called, it displays an alert dialog box to confirm acceptance of the patient's request. If the user confirms acceptance by pressing "Confirm," this feature updates the status of the corresponding organ transplant patient request in Firestore to "Accepted." After that, the following step will similar with the handleCanceled function.



Figure 6. 31 Accept Organ function

The handlerCompleted function handles the completion of an organ transplant patient request. Before continuing, it first checks if the "provider" input field is empty and sets the "providerError" flag accordingly to indicate if there is an error. If "providerError" is false, i.e. the "provider" field is not empty, an alert dialog is displayed to confirm that the organ transplant patient's request has been completed. If the user confirms by pressing "Confirm", the function updates the status of the corresponding organ transplant patient request in Firestore to "Completed" and sets the "provider_name" field to the provided input value. After successfully updating the state, it triggers a refresh by toggling the "refresh" state, hides the mode by setting "setVisible" to false if it was previously visible, clears the "allData" state where the information about the organ transplant patient is saved, and displays an alert , confirming that the patient's request was successfully completed. If the "providerError" flag is true, indicating that the "provider" field is empty, an alert will be displayed prompting the user to enter the name of the provider before continuing to completion. This feature ensures that organ transplant patient requests are completed and updates status and provider information in Firestore when necessary conditions are met.



Figure 6. 32 Complet Organ function

6.5.3 Medical Comment Module

This module will able to let the doctor to update the status and the medical record of the appointment. This module will have 3 major function which isgetAppointment, getPatient, and handleUpdate.

The getAppointment function retrieves the appointment list for doctors who are currently logged in and have a status of "Accepted" but are missing medical records. It first checks the current time and date and filters appointments based on specific criteria. This function queries the Appointments collection in Firestore, filtering by the doctor's user ID, acceptance status, and missing medical records. It then iterates over the query results, checking whether the date and time of each appointment meets certain criteria to include it in the list of appointments without medical records. Then set the filtered appointment to "unCommentData" state for use in the component. This feature ensures that only relevant appointments that meet specified criteria are displayed for doctors to add to their records.



Figure 6. 33 Get Uncomment Appointment function

The getPatient function is responsible for retrieving patient information for a list of appointments that lack medical records. this function will similar as previous getPatient function.



Figure 6. 34 getPatient function

The handleUpdate function is responsible for updating the medical record and marking the appointment as completed. It first checks if a valid medical record exists; if not, it displays an alert to prompt the user to provide comment. If a comment is provided, an alert dialog box is displayed to confirm the submission. Upon confirmation, it updates the corresponding appointment in Firestore by setting the "medical_Record" field with the provided annotation, changing the status to "Completed", and recording the update timestamp. After successfully updating an appointment, it hides the modal and clears the component's data state. Finally, displays a success message to the user. This process ensures that appointments for medical records are marked as completed with associated feedback.



Figure 6. 35 Update Medical Record function

6.5.4 Manage Schedule Module

This module will let the doctor user to manage their available schedules. This page will show all the time slots. The available time slots will be white color and the canceled time slots will be grey color.

The getSchedule function retrieves the cancellation schedule for a specific date associated with the user UID. It first checks if the user is authenticated. If

authenticated, it accesses the Firestore collection named "Schedules" using the user's UID and the "Cancel" subcollection. It attempts to retrieve the document corresponding to the formatted date. If the document exists, it sets the "cancelSlot" state using the "times" data in the document, which represents the time period for cancellation on that date. If the document does not exist, "cancelSlot" is set to an empty array. This feature helps in fetching and displaying any canceled slots for a specific day in the user's schedule, thereby providing visibility into appointment availability.

Figure 6. 36 Get Schedule function

The handleCancel function is used to confirm and execute the cancellation of time slots, and is used for reservation scheduling. When called, it triggers an alert dialog with a confirmation message asking the user if they are sure they want to delete the slot. If the doctor selects "Confirm", the function updates the "cancelSlot" status by adding the provided "slotId" to the list of canceled slots, effectively marking it as unavailable. This feature is essential to allow users to cancel and release specific time slots in the schedule, thereby affecting appointment availability.



Figure 6. 37 Cancel slot function

The handleInsert function is designed to confirm and perform the insertion of a previously canceled time slot back into the availability state. This used in reservation scheduling systems. The function is similar with the handleCancel function. This function only filter out the time slot from the list.



Figure 6. 38 Insert Slot function

The handleUpdate function is responsible for confirming and executing updates to the user's schedule, especially the list of canceled periods. It triggers an alert dialog with a confirmation message asking the user if they want to update the slot information. If the doctor selects "Confirm," the function will proceed to update the user's schedule in the Firestore database. It builds the Firestore document path based on the user ID and formatted date, and then sets the "times" field to the current state of the "cancelSlot" array, effectively saving any changes made to the canceled time slot. This feature is essential for users to manage their availability and scheduled appointments within their schedule.



Figure 6. 39 Update Schedule function

CHAPTER 7

SYSTEM TESTING

7.1 Introduction

This chapter is dedicated to providing a broad overview of the testing phase that follows the development and implementation of an application. Throughout the process, the system was rigorously tested at three different levels, including unit testing, integration testing, and user acceptance testing (UAT). In this chapter, a comprehensive analysis of the results for each test type, providing valuable insights into the application's reliability, functionality, and user acceptance.

7.2 Unit Testing

In this project, Unit testing <u>will</u> carry out with total number 13 test case. Unit testing is a key software quality assurance technique in which individual components, or "units," of a software application are carefully reviewed in isolation to determine their proper functioning (TechTarget, n.d.). These units typically contain functions, methods, or classes that are checked to verify that each unit operates accurately according to its expected specifications. This meticulous, fine-grained inspection helps identify and correct defects or errors early in the software development process, helping to enhance software integrity and maintainability.

Table 7. 1 Test Case for Registration

Project Title:		Medical Appointment Application			Planned Date: 31 / 8 / 2023				
Module Title:		Registration			Planned By:	Chia Wei Qiang	Chia Wei Qiang		
Pre-Conditions:		-	-			Execution Date:	Execution Date: 4/9/2023		
						Executed By:	Chia Wei Qiang		
Test	Te	st	Tast Casa	Procedure	Test Data	Expected	Post-	Actual Desults	Status
Case #	Scen	ario		Trocedure	Test Data	Results	Conditions	Actual Results	Status
UT-001	To veri	fy the	Register	1. Click the	1. First Name: null	Error message	e Registration	All imput field	PASS
	registra	tion	with all	'Register' button	2. Last Name: null	will shown at	process failed	have the error	
	functio	nality	empty		3. Ic No: null	every input fie	eld and new	massage.	
			fields		4. Phone: null	bottom and th	e account will		
					5. Email: null	field change to	o not created.		
					6. Password: null	red.			
			Register	1. Enter the First	1. First Name: Chia	a An alert	Registration	The massage	PASS
			with all	name	2. Last Name: Wei	Confirmation	process	'Success	
			valid datas	2. Enter the Last	Qiang	message will	passed and	Register' have	
				name	3. Ic No: 000123-03	3- show if click	yes new account	shown.	
				3. Enter the Ic No	0101	will show aler	t is created		
				4. Enter the Phone	4. Phone:	message of	successfully		
				number	0123456789	'Success	user can		
				5. Enter the Email	5. Email:	Register'	login to this		

	6. Enter the	abc123@gmail.com		account.		
	Password	6. Password:				
	7. Enter the Confirm	password				
	Password	7. Confirm				
	8. Click the	Password:				
	'Register' button	password				
Register	1. Enter the First	1. First Name: null	An error message	Registration	The name field	PASS
with empty	name	2. Last Name: null	'Register Fail!!!	process failed	have error	
name	2. Enter the Last	3. Ic No: 000123-03-	Please fill in all	and new	massage 'name	
	name	0101	required fields	account will	is Require'	
	3. Enter the Ic No	4. Phone:	and provide valid	not created.	shown.	
	4. Enter the Phone	0123456789	information.' and			
	number	5. Email:	the name field			
	5. Enter the Email	abc123@gmail.com	will change to			
	6. Enter the	6. Password:	red and bottom			
	Password	password	will show error			
	7. Enter the Confirm	7. Confirm	massage of			
	Password	Password:	'name is			
	8. Click the	password	Require'			
	'Register' button					
Register	1. Enter the First	1. First Name: Chia	An error message	Registration	The Ic No field	PASS

	with empty	name	2. Last Name: Wei	'Register Fail!!!	process failed	have error	
	or Invalid	2. Enter the Last	Qiang	Please fill in all	and new	massage 'Ic No	
Ic No name		name	3. Ic No:	required fields	account will	is invalid! e.g.	
		3. Enter the Ic No	000123030101	and provide valid	not created.	000000-00-	
		4. Enter the Phone	4. Phone:	information.' and		0000' shown.	
		number	0123456789	the Ic No field			
		5. Enter the Email	5. Email:	will change red			
		6. Enter the	abc123@gmail.com	and bottom will			
		Password	6. Password:	show error			
		7. Enter the Confirm	password	massage of 'Ic			
		Password	7. Confirm	No is invalid!			
		8. Click the	Password:	e.g. 000000-00-			
		'Register' button	password	0000'			
	Register	1. Enter the First	1. First Name: Chia	An error rt	Registration	The phone field	PASS
	with empty	name	2. Last Name: Wei	message	process failed	have error	
	or Invalid	2. Enter the Last	Qiang	'Register Fail!!!	and new	massage 'Phone	
	Phone	name	3. Ic No: 000123-03-	Please fill in all	account will	Number is	
	Number	3. Enter the Ic No	0101	required fields	not created.	invalid! e.g.	
		4. Enter the Phone	4. Phone: 012-	and provide valid		0123456789'	
		number	3456789	information.' and		shown.	
		5. Enter the Email	5. Email:	the Phone			
	1		1	1	1	1	1

1	I.			1 100 - 11	1 (* 11 ***			1
			6. Enter the	abc123@gmail.com	number field will			
			Password	6. Password:	change red and			
			7. Enter the Confirm	password	bottom will show			
			Password	7. Confirm	error massage of			
			8. Click the	Password:	'Phone Number			
			'Register' button	password	is invalid! e.g.			
					0123456789'			
		Register	1. Enter the First	1. First Name: Chia	An error message	Registration	The email field	PASS
		with empty	name	2. Last Name: Wei	'Register Fail!!!	process failed	have error	
		or Invalid	2. Enter the Last	Qiang	Please fill in all	and new	massage 'Email	
		Email	name	3. Ic No: 000123-03-	required fields	account will	is invalid! e.g.	
			3. Enter the Ic No	0101	and provide valid	not created.	abc123@gmail.	
			4. Enter the Phone	4. Phone:	information.' and		com' shown.	
			number	0123456789	the Email field			
			5. Enter the Email	5. Email: abc123	will change red			
			6. Enter the	6. Password:	and bottom will			
			Password	password	show error			
			7. Enter the Confirm	7. Confirm	massage of			
			Password	Password:	'Email is invalid!			
			8. Click the	password	e.g.			
			'Register' button		abc123@gmail.c			
1	1	1	1	1		1	1	
			om'					
------------	----------------------	----------------------	--------------------	----------------	------------------	------		
Register	1. Enter the First	1. First Name: Chia	An error message	Registration	The email field	PASS		
with	name	2. Last Name: Wei	'Register Fail!!!	process failed	have error			
Existing	2. Enter the Last	Qiang	Please fill in all	and new	massage 'That			
Email	name	3. Ic No: 000123-03-	required fields	account will	email address is			
	3. Enter the Ic No	0101	and provide valid	not created.	already in use!'			
	4. Enter the Phone	4. Phone:	information.' and		shown.			
	number	0123456789	the Email field					
	5. Enter the Email	5. Email:	will change red					
	6. Enter the	abc123@gmail.com	and bottom will					
	Password	6. Password:	show error					
	7. Enter the Confirm	password	massage of 'That					
	Password	7. Confirm	email address is					
	8. Click the	Password:	already in use!'					
	'Register' button	password						
Register	1. Enter the First	1. First Name: Chia	An error message	Registration	The password	PASS		
with empty	name	2. Last Name: Wei	'Register Fail!!!	process failed	field have error			
or less	2. Enter the Last	Qiang	Please fill in all	and new	massage			
then 8	name	3. Ic No: 000123-03-	required fields	account will	'Password			
character	3. Enter the Ic No	0101	and provide valid	not created.	needed 8			
Password	4. Enter the Phone	4. Phone:	information.' and		character!!'			

Г		1	0100456700			1	
		number	0123456789	the Password		shown.	
		5. Enter the Email	5. Email:	field will change			
		6. Enter the	abc123@gmail.com	red and bottom			
		Password	6. Password: pass	will show error			
		7. Enter the Confirm	7. Confirm	massage of			
		Password	Password: pass	'Password			
		8. Click the		needed 8			
		'Register' button		character!'			
-	Register	1. Enter the First	1. First Name: Chia	An error message	Registration	The confirm	PASS
	with empty	name	2. Last Name: Wei	'Register Fail!!!	process failed	password field	
	or	2. Enter the Last	Qiang	Please fill in all	and new	have error	
	difference	name	3. Ic No: 000123-03-	required fields	account will	massage	
	with	3. Enter the Ic No	0101	and provide valid	not created.	'Password	
	Password	4. Enter the Phone	4. Phone:	information.' and		Incorrect!!	
	of Confirm	number	0123456789	the Confirm		Please Enter	
	Password	5. Enter the Email	5. Email:	Password field		again' shown.	
		6. Enter the	abc123@gmail.com	will change red			
		Password	6. Password:	and bottom will			
		7. Enter the Confirm	password	show error			
		Password	7. Confirm	massage of			
		8. Click the	Password: pass	'Password			
				1	1		

'Re	egister' button	Incorrect!! Please		
		Enter again.'		

Table 7. 2 Test Case for Login

Project T	itle:	Medic	cal Appointme	ent Application		Planned Date:	31 / 8 / 2023			
Module 7	litle:	Login				Planned By:	Chia Wei Qiang			
Pre-Conc	litions:	-				Execution Date: 4/9/2023				
						Executed By:				
Test	Te	st	Tost Casa	Drogoduro	Tost Data	Expected	Post-	A atual Dasults	Status	
Case #	Scena	ario	I est Case	Trocedure	Test Data	Results	Conditions	Actual Results	Status	
UT-002	To veri	fy the	Login with	1. Enter the Email	1. Email:	A massage of	Login process	Massage 'Login	PASS	
	Login		all valid	2. Enter the	abc123@gmail.co	om 'Login	passed and	Successfully'		
	function	nality	email and	Password	2. Password:	Successfully'	will navigate	shown and		
			password	3. Click the 'Login'	password	will show.	to home page.	navigate to		
				button				home page		
			Login with	1. Enter the Email	1. Email:	An error	Login process	error massage of	PASS	
			empty	2. Enter the	abc123@gmail.co	m massage of	failed	'Invalid email		
			email and	Password	2. Password:	'Invalid emai	1	or password!!'		
			password	3. Click the 'Login'	password	or password!	,	shown		
				button		will shown at				
						bottom.				

	Login with	1. Enter the Email	1. Email: abc12	An error	Login process	error massage of	PASS
	empty or	2. Enter the	2. Password:	massage of	failed	'Invalid email	
	Invalid	Password	password	'Invalid email		or password!!'	
	Email	3. Click the 'Login'		or password!!'		shown	
		button		will shown at			
				bottom.			
	Login with	1 Enter the Email	1 Fmail.	An error	Login process	error massage of	DASS
		1. Enter the Eman	1. Eman.		Login process	cifor massage of	TASS
	empty or	 2. Enter the 	abc123@gmail.com	massage of	failed	'Invalid email	TASS
	empty or Invalid	2. Enter the Password	abc123@gmail.com 2. Password: pass	massage of 'Invalid email	failed	'Invalid email or password!!'	1 A55
	empty or Invalid Password	 2. Enter the Password 3. Click the 'Login' 	abc123@gmail.com 2. Password: pass	massage of 'Invalid email or password!!'	failed	'Invalid email or password!!' shown	1 A33
	empty or Invalid Password	 2. Enter the Password 3. Click the 'Login' button 	abc123@gmail.com 2. Password: pass	massage of 'Invalid email or password!!' will shown at	failed	'Invalid email or password!!' shown	1 A35
	empty or Invalid Password	 2. Enter the Password 3. Click the 'Login' button 	abc123@gmail.com 2. Password: pass	massage of 'Invalid email or password!!' will shown at bottom.	failed	'Invalid email or password!!' shown	1 A35

Table 7. 3 Test Case for Manage Account

Project T	itle:	Media	cal Appointme	nt Application		Pla	anned Date:	31 / 8 / 2023		
Module 7	Iodule Title: Manage Account					Planned By: Chia Wei Qiang				
Pre-Conditions: The user has login to his/her account				Execution Date: 4/9/2023						
						Ex	ecuted By:	Chia Wei Qiang		
Test	Te	st	Test Case	Procedure	Test Data		Expected	Post-	Actual Results	Status
Case #	Scen	cenario		Test Data		Results	Conditions	Actual Acsuits	Status	

UT-003	To verify the	Update the	1. Enter the	1. First Name: Chia	An alert	Update	All the data are	PASS
	Manage	profile	updated data	2. Last Name: Wei	Confirmation	Account	updated.	
	Account	with valid	field	Qiang	message will	process Pass		
	functionality	data	2. Click the	3. Phone: 0123456789	show if click yes	and will		
			'Update' button	4. Address1: 31, sunagi	will show alert	navigate to		
				besar	message of 'User	Profile page.		
				5. Postal Code: 12345	Update Success!'			
				6. City: sungai besar				
				7. State: Selangor				
				8. Country: Malaysia				
		Update the	1. Enter the	1. First Name: Chia	An error message	Update	Error massage	PASS
		profile	updated data	2. Last Name: null	'Update Fail!!!	Account	'Update Fail!!!	
		with	field	3. Phone: 0123456789	Please fill in all	process failed	Please fill in all	
		Empty	2. Click the	4. Address1: 31, sunagi	required fields		required fields	
		name	'Update' button	besar	and provide valid		and provide	
				5. Postal Code: 12345	information.' and		valid	
				6. City: sungai besar	the Name field		information.'	
				7. State: Selangor	will change red		shown and	
				8. Country: Malaysia	and bottom will		name field show	
					show error		error massage	
					massage of 'First		'First and Last	
			1			1	1	1

			and Last Name is		Nome	
			and Last mame is		Iname is	
			Required!!.'		Required!!.'	
Update the	1. Enter the	1. First Name: Chia	An error message	Update	Error massage	PASS
profile	updated data	2. Last Name: Wei	'Update Fail!!!	Account	'Update Fail!!!	
with	field	Qiang	Please fill in all	process failed	Please fill in all	
Empty or	2. Click the	3. Phone: 012-3456789	required fields		required fields	
Invalid	'Update' button	4. Address: 31, sunagi	and provide valid		and provide	
Phone		besar	information.' and		valid	
Number		5. Postal Code: 12345	the Phone		information.'	
		6. City: sungai besar	Number field		shown and	
		7. State: Selangor	will change red		Phone Number	
		8. Country: Malaysia	and bottom will		field show error	
			show error		massage 'Enter	
			massage of		a Correct Phone	
			'Enter a Correct		Number!!'	
			Phone Number!!'			
Update the	1. Enter the	1. First Name: Chia	An error message	Update	Error massage	PASS
profile	updated data	2. Last Name: Wei	'Update Fail!!!	Account	'Update Fail!!!	
with	field	Qiang	Please fill in all	process failed	Please fill in all	
Empty	2. Click the	3. Phone: 0123456789	required fields		required fields	
Address1	'Update' button	4. Address1: null	and provide valid		and provide	
			1			

		5. Postal Code: 12345	information.' and	valid
		6. City: sungai besar	the Address1	information.'
		7. State: Selangor	field will change	shown and
		8. Country: Malaysia	red and bottom	Address1 field
			will show error	show error
			massage of	massage
			'Address is	'Address is
			Required!!'	Required!!'

Table 7. 4 Test Case for Search

Project T	Title:	Media	cal Appointme	ent Application		Pla	nned Date:	31 / 8 / 2023		
Module 7	Fitle:	Searc	h			Pla	nned By:	Chia Wei Qiang		
Pre-Con	ditions:	tions: The user has login to his/her account					ecution Date:	4/9/2023		
						Ex	ecuted By:	Chia Wei Qiang		
Test	Te	Test Case Procedure Test Data		Test Data		Expected	Post-	Actual Results	Status	
Case #	Scen	ario	I est Case	Troccurre	Test Data		Results	Conditions	Actual Results	Status
UT-004	To veri	fy the	Search for	1. Enter the name of	1. Name: Lee Zhi Ji	ia	All the doctors	-	1 doctor show at	PASS
	Search a doctor doctor		doctor			name is call 'lee		the below		
	functionality name				zhi jia' will be					
						show at below.				

	Search for	1. Enter the name of	1. Name: Lee	All the doctors	-	Few doctor	PASS
	part of	doctor		name have part		show in below	
	doctor			of 'lee' will be			
	name			show at below.			
	Search for	1. Enter the name of	1. Name: ulala	No doctor list	-	No data been	PASS
	doctor	doctor		will show at		shown	
	name that			bellow. Only			
	without the			show 'No data			
	database			Found'.			

Table 7. 5 Test Case for Make Appointment

Project	Fitle:	Medi	cal Appointme	nt Application		Pla	anned Date:	31 / 8 / 2023			
Module '	Title:	Make	Appointment			Pla	anned By:	Chia Wei Qiang			
Pre-Con	ditions:	The u	ser has login to	o his/her account		Ex	ecution Date:	: 4/9/2023			
						Ex	ecuted By:	Chia Wei Qiang			
Test	Tes	st	Test Case	Procedure	Test Data		Expected	Post-	Actual Results	Status	
Case #	Scena	ario	i est case	Troccurre	i est Data		Results	Conditions	Actual Acoults	Status	
UT-005	To verif	y the	View the	1. Select the	-		All the doctor	User will	Show all the	PASS	
	Make		List of	Position Named			under 'General	able to see	doctor with		
	Appoint	ment	Doctors	'General			Practitioner'	the list of	position		

functionality	according	Practitioner'.		Position will	doctor	'General	
	to the			show to the user		Practitioner'	
	Position						
	View the	1. Select the doctor	-	The Dr Lee Zhi	user can able	Show the Dr	PASS
	profile of	named 'Lee Zhi		Jia Profile and	to see the	Lee Zhi Jia	
	specific	Jia'.		available time	profile and	Profile and	
	Doctor' s			slot will show to	available	available time	
	profile with			the user	time and date	slot.	
	available				of the doctor.		
	Time slot				Beside that,		
					can see the		
					doctor		
					previous		
					patient rating		
					and feedback.		
	Selected a	1. Click on the one	-	This will	User can able	Successful	PASS
	available	of the time slot.		navigate to the	to see that the	navigate to	
	Time slot			booking page	select time	booking page	
	of the			with the selected	appointment		
	doctor			date and time.	and make the		
					appointment		
					1		

	Make a	1. Select the First	1. First Time: True	An Alert	New booking	A massage	PASS
	appointment	time field.	2. Reason:	massage of	created pass.	'Booking	
	with valid	2. Select a Reason	Consultation	'Booking		Successful'	
	data	to visit.	3. Other: null	Successful' will		show and	
		3. Click the		show. Then, will		successful	
		'Booking' button		navigate to the		navigate to	
				home page .		home page.	
	Make a	1. Select the First	1. First Time: True	An Alert	New booking	Error massage	PASS
	appointment	time field.	2. Reason: null	massage of	created fail.	'Please Select a	
	with empty	2. Select a Reason	3. Other: null	'Please Select a		Reason!!'	
	reason	to visit.		Reason!!' will		shown	
		3. Click the		show.			
		'Booking' button					

Table 7. 6 Test Case for Manage Appointment (Patient)

Project T	Title:	Medie	Medical Appointment Application				Planned Date:	31 / 8 / 2023			
Module 7	Module Title: Manage Appointment (Patient)					Planned By:	Chia Wei Qiang				
Pre-Conditions: The			ser has login to	his/her account			Execution Date:	ate: 4/9/2023			
							Executed By:	Chia Wei Qiang			
Test Case #	Te Scen	st ario	Test Case	Procedure	Test Data	I	Expected Results	Post- Conditions	Actual Results	Status	

UT-	To verify	View the	1. Click the	-	All the upcoming	The user will	Show few	PASS
P006	the manage	upcoming	Segmented Button		appointment list will	able to see the	appointment with	
	appointment	appointment	labeled		shown to the user, if	upcoming	accepted status.	
	functionality		'Upcoming'		don't have the	appointment		
					appointment will	List		
					shown massage 'No			
					Appointment Found!'			
		Cancel the	1. Click the 'Cancel'	-	A confirmation alert	The	The appointment	PASS
		upcoming	button		massage 'Confirm to	appointment	cancel successful	
		appointment			Cancel' will shown. If	status will be	and didn't shown	
					click 'Confirm' will	updated to	again	
					cancel the	"Canceled" in		
					appointment.	the firestore		
		View the	1. Click the	-	All the pending	The user will	Show 1	PASS
		pending	Segmented Button		appointment list will	able to see the	appointment with	
		appointment	labeled 'Pending'		shown to the user, if	pending	pending status.	
					don't have the	appointment		
					appointment will	List		
					shown massage 'No			
					Appointment Found!'			
		Cancel the	1. Click the 'Cancel'	-	A confirmation alert	The	The appointment	PASS

	pending	button		massage 'Confirm to	appointment	cancel successful	
	appointment			Cancel' will shown. If	status will be	and didn't shown	
				click 'Confirm' will	updated to	again	
				cancel the	"Canceled" in		
				appointment.	the firestore		
	View the	1. Click the	-	All the history	The user will	Show all	PASS
	history	Segmented Button		appointment list will	able to see the	appointment with	
	appointment	labeled 'History'		shown to the user, if	Completed and	completed and	
				don't have will show	Canceled	canceled status.	
				'No Appointment	appointment		
				Found!'	List and detail		

Table 7. 7 Test Case for Manage Appointment(Doctor)

Project T	ect Title: Medical Appointment Application						Planned Date:	31 / 8 / 2023		
Module 7	litle:	Mana	ge Appointmen	t (Doctor)			Planned By:	Chia Wei Qiang		
Pre-Conditions: The user has login to his/her account				Execution Date:	4/9/2023					
			-	Executed By:	Chia Wei Qiang					
Test	Te	st	Test Case	Procedure	Test Data	E	vnected Results	Post-	Actual Results	Status
Test Case #	Te Scena	st ario	Test Case	Procedure	Test Data	E	xpected Results	Post- Conditions	Actual Results	Status
Test Case # UT-	Te Scena To veri	st ario fy the	Test Case View the	Procedure 1. Click the	Test Data -	Ex All t	xpected Results	Post- Conditions The user will	Actual Results Show 1	Status PASS

appointment	appointment	labeled		shown to the user, if	upcoming	Accepted status.	
functionality		'Upcoming'		don't have the	appointment List		
				appointment will			
				shown massage 'No			
				Appointment Found!'			
	Cancel the	1. Click the 'Cancel'	-	A confirmation alert	The appointment	The appointment	PASS
	upcoming	button		massage 'Confirm to	status will be	cancel successful	
	appointment			Cancel' will shown. If	updated to	and didn't shown	
				click 'Confirm' will	"Canceled" in	again	
				cancel the	the firestore		
				appointment.			
	View the	1. Click the	-	All the pending	The user will	Show 2	PASS
	pending	Segmented Button		appointment list will	able to see the	appointment with	
	appointment	labeled 'Pending'		shown to the user, if	pending	Accepted status.	
				don't have	appointment List		
				appointment will			
				shown massage 'No			
				Appointment Found!'			
	Accept the	1. Click the 'Accept'	-	A confirmation alert	The appointment	The appointment	PASS
	pending	button		massage 'Confirm to	status will be	accept successful	
	appointment			Accept' will shown. If	updated to	and didn't shown	
					1		

			click 'Confirm' will	"Accepted" in	again	
			accept appointment.	the firestore		
Cancel the	1. Click the 'Cancel'	-	A confirmation alert	The	The appointment	PASS
pending	button		massage 'Confirm to	appointment	cancel successful	
appointment			Cancel' will shown. If	status will be	and didn't shown	
			click 'Confirm' will	updated to	again	
			cancel the	"Canceled" in		
			appointment.	the firestore		
View the	1. Click the	-	All the history	The user will	Show all	PASS
history	Segmented Button		appointment list will	able to see the	appointment with	
appointment	labeled 'History'		shown to the user, if	Completed and	completed and	
			don't have will show	Canceled	canceled status.	
			'No Appointment	appointment		
			Found!'	List and detail		

Table 7. 8 Test Case for Register Organ Transplant

Project T	Title:	Media	cal Appointmen	t Application		Planned Date:	31 / 8 / 2023		
Module Title:Register Organ TransplantPlanned By:					Planned By:	Chia Wei Qiang			
Pre-Conditions: The user has login to		his/her account		Execution Date:	4/9/2023				
			Executed By:	Chia Wei Qiang					
Test	Te	st	Test Case	Procedure	Test Data	Expected Result	ected Results Post- Actual R		Status

Case #	Scenario					Conditions		
UT-	To verify the	Register	1. Click the	1. Organ Needed:	An alert	Registration	A massage	PASS
P007	Register	with Valid	'Register' button	Heart	Confirmation	process	'Success	
	Organ	data	2. Select the Organ	2. Blood Type:	message will show	passed and	Register' shown	
	Transplant		Needed	A+	if click yes will	new data is	and successful	
	functionality		3. Select Blood		show alert message	created	navigate to home	
			Туре		of 'Success	successfully	page.	
			4. Click the		Register'. Then,	user can see		
			'Submit' button		navigate to home	the detail of		
					page.	the Organ		
						Transplant		
		Register	1. Click the	1. Organ Needed:	An error message	Registration	Massage	PASS
		with empty	'Register' button	null	'Register Fail!!	process fail	'Register Fail!!	
		Organ	2. Select the Organ	2. Blood Type:	Don\'t leave blank!'	and new	Don\'t leave	
		Needed	Needed	A+	and the Organ	data will not	blank!' and organ	
			3. Select Blood		Needed field	create	needed field	
			Туре		bottom will show		show 'Please	
			4. Click the		error massage of		Select a Type Of	
			'Submit' button		'Please Select a		Organ!!'	
					Type Of Organ!!'			
		Register	1. Click the	1. Organ Needed:	An error message	Registration	Massage	PASS

		with empty	'Register' button	Heart	'Register Fail!!	process fail	'Register Fail!!	
		Blood Type	2. Select the Organ	2. Blood Type:	Don\'t leave blank!'	and new	Don\'t leave	
			Needed	null	and the Organ	data will not	blank!' and blood	
			3. Select Blood		Needed field	create	type field show	
			Туре		bottom will show		'Please Select	
			4. Click the		error massage of		Blood Type!!'	
			'Submit' button		'Please Select			
					Blood Type!!'			
	-	After	1. After Register	-	The Organ	The user	All the info	PASS
		Register the	2. Click the 'Organ		Transplant Detail	will able to	shown	
		user only	Transplant'		will shown.	see the their		
		can View	button at the			organ		
		the register	Drawer.			transplant		
		data.				detail		
1					1	1		

Table 7. 9 Test Case for Manage Organ Transplant

Project Title:	Medical Appointment Application	Planned Date:	31 / 8 / 2023
Module Title:	Manage Organ Transplant	Planned By:	Chia Wei Qiang
Pre-Conditions:	The user has login to his/her account	Execution Date:	4/9/2023
		Executed By:	Chia Wei Qiang

Test	Test	Test Case	Procedure	Test Data	Expected Results	Post-Conditions	Actual Results	Status
Case #	Scenario	I est Case	Troccure	I est Data	Expected Results	i ost conditions	Actual Results	Status
UT-	To verify the	View the	1. Click the	-	All the pending organ	The user will able	Show few organ	PASS
D007	manage	pending	Segmented Button		transplant patient list	to see the pending	transplant patient	
	Organ	organ	labeled 'Pending'		will shown to the	organ transplant	with pending	
	Transplant	transplant			user, if don't have	patient List	status.	
	functionality	patient			organ transplant			
					patient will shown			
					massage 'No Patient			
					Found!'			
		Accept the	1. Click the 'Accept'	-	A confirmation alert	The Organ Lists	The organ	PASS
		pending	button		massage 'Confirm to	status will be	transplant patient	
		organ			Accept' will shown. If	updated to	accept successful	
		transplant			click 'Confirm' will	"Accepted" in the	and didn't shown	
		patient			accept organ	firestore	again	
					transplant patient.			
		Cancel the	1. Click the 'Cancel'	-	A confirmation alert	The Organ Lists	The organ	PASS
		pending	button		massage 'Confirm to	status will be	transplant patient	
		organ			Cancel' will shown. If	updated to	cancel successful	
		transplant			click 'Confirm' will	"Canceled" in	and didn't shown	
		patient			cancel the organ	the firestore	again	

			transplant patient.			
View the	1. Click the	_	All the Accepted	The user will able	Show few organ	PASS
Accepted	Segmented Button		organ transplant	to see the	transplant patient	
organ	labeled 'Accepted'		patient list will shown	accepted organ	with accepted	
transplant			to the user, if don't	transplant patient	status.	
natient			have the organ	List		
patient			transplant patient will			
			shown massage (No			
			snown massage INO			
			Patient Found!'			
Completed	1. Click the	Provider	A confirmation alert	The Organ Lists	Massage	PASS
the Accepted	'Completed'	Name: Ali	massage 'Confirm to	status will be	'Success' shown	
organ	button		Completed' will	updated to		
transplant	2. Enter the		shown. If click	"Completed" and		
patient with	Provider_name		'Confirm' will show	update the		
valid	3. Click the		an alert massage	provider_name to		
provider	'Confirm'		'Successful'.	'Ali' in the		
name				firestore		
Completed						DIGG
the Accented	4. Click the	Provider	An alert massage	The update will	Massage 'Enter	PASS
the recepted	4. Click the 'Completed'	Provider Name:	An alert massage 'Enter the Provider	The update will fail and the	Massage 'Enter the Provider	PASS
organ	4. Click the 'Completed' button	Provider Name: null	An alert massage 'Enter the Provider Name' will show to	The update will fail and the update will no	Massage 'Enter the Provider Name' shown	PASS

	patient with	Provider_name					
	empty	6. Click the					
	provider	'Confirm'					
	name						
	View the	2. Click the	-	All the history organ	The user will	Show all organ	PASS
	history	Segmented Button		transplant patient list	able to see the	transplant patient	
	organ	labeled 'History'		will shown to the	Completed and	with Completed	
	transplant			user, if don't have	Canceled organ	and Canceled	
	patient			will show 'No Patient	transplant patient	status.	
				Found!'	List and detail		

Table 7. 10 Test Case for Notification

Project T	Title:	Medie	cal Appointmen	t Application			Planned Date:	31 / 8 / 2023				
Module 7	Fitle:	Notifi	ication				Planned By:	Chia Wei Qiang	7			
Pre-Conditions: The user has login to his/her account							Execution Date:	4/9/2023	/9/2023 Chia Wei Qiang			
							Executed By:	Chia Wei Qiang	7			
Test	Te	Test Test Case Procedure Test Data Expected Pesu		xnected Results	Post-	Actual Results	Status					
Case #	Scen	ario	i est cust	Tioccuire	I Cot Dutu		Apecieu Results	Conditions		Status		
UT-008	To veri	ify the	View the	1. Click the	-	Will show the		The user will	There are showing	PASS		
	Notific	ation	Notification	'Notification'		upcoming and last 2		able to get the	the upcoming and			
	functionality button at Drawer day a		appointment	notification.	last 3 day							

		lists.	appointment.	

Project T	itle:	Medic	cal Appointmen	t Application		Pla	anned Date:	31 / 8 / 2023				
Module 7	Fitle:	Rating	g and Feedback			Pla	anned By:	Chia Wei Qiang				
Pre-Conc	ditions:	The u	ser has login to	his/her account		Ex	ecution Date:	4/9/2023	4/9/2023			
						Ex	ecuted By:	Chia Wei Qiang				
Test	Test Tes		Tost Casa	Procedure	Tost Data		Expected	Post-	Actual Desults	Status		
Case #	Scena	ario	Test Case	Trocedure	Test Data		Results	Conditions	Actual Results	Status		
UT-009	To veri	fy the	View all the	1. Click the 'Rate &	-		The system will	User will	Show 1	PASS		
	Rating and		unrated	Feedback' button			display all the	able to get	appointment			
	Feedba	ck	appointment	on Drawer			completed and	the				
	function	nality					unrated	appointment				
							appointment list	t. lists				
			Update the	1. Click the	1. Feedback: Good		A confirmation	The update	The	PASS		
			appointment	appointment	doctor		alert 'confirm to	process pass	appointment			
			with valid	2. Enter the	2. Rate: 5		Submit?' if click	k and the	update success			
			data	feedback			'Submit' will	feedback and	and didn't show			
				3. Select the rate			show alert	rate of	again.			
				4. Click the			massage	appointment				

Table 7. 11 Test Case for Rating & Feedback

	'Submit' button	'Success submit'	will updated	

Project T	Title:	Media	cal Appointmen	t Application	-	Planned Date:	31 / 8 / 2023				
Module 7	Fitle:	Mana	ge Patient Reco	rd	-	Planned By:	Chia Wei Qiang				
Pre-Conc	ditions:	The u	ser has login to	his/her account	-	Execution Date:	4/9/2023	4/9/2023			
						Executed By:	Chia Wei Qiang				
Test	Te	st	Tost Casa	Procedure	Tost Data	Expected	Post-	A atual Dasults	Status		
Case #	Scena	ario	Test Case	Tiocedure	Test Data	Results	Conditions	Actual Results	Status		
UT-010	To veri	fy the	View all the	1. Click the	-	The system will	User will	Show 1	PASS		
	Manage	e	Accepted	'Medical		display all the	able to get	appointment			
	Patient		and	Comment' button		Accepted and	the				
	Record		Uncomment	on Drawer		uncomment	appointment				
	function	nality	appointment			appointment lis	t. lists				
			Update the	1. Click the	1. Comment: Less ea	t A confirmation	The update	The	PASS		
			appointment	appointment	spicy food.	alert 'confirm to	process pass	appointment			
			with valid	2. Enter the		Submit?' if clic	k and the	update success			
			data	comment		'Submit' will	comment of	and didn't show			
				3. Click the		show alert	appointment	again.			
				'Submit' button		massage	will updated				

Table 7. 12 Test Case for Manage Patient Record

		'Success submit'		

Project T	itle:	Medic	cal Appointment A	Application		Planned Date:	31 / 8 / 2023		
Module 7	Fitle:	Mana	ge Schedule			Planned By:	Chia Wei Qian	ıg	
Pre-Conc	ditions:	The u	ser has login to hi	s/her account		Execution Date:	4/9/2023		
						Executed By:	Chia Wei Qian	ıg	
Test Test Case # Scenar		st ario	Test Case	Procedure	Test Data	Expected Results	Post- Conditions	Actual Results	Status
UT-011	To veri Manage Schedu function	fy the e le nality	View the time slot of specific date	1. Click the 'Manage Schedule' button on Drawer	-	Will display the time slot with color Grey mean Canceled time and white mean available time	User will be able to see the schedule.	Showing all time slot with white and grey color.	PASS
			Update the schedule by change the available time to canceled	 Select a date Click the time slot white button Click 'Confirm' button 	-	The selected slot will change to grey color.A confirmation alert 'confirm to update?' will show.	The database cancel schedule array will be updated	A massage 'Success Update Schedule' shown. The selected slot change color from white to grey.	PASS

Table 7. 13 Test Case for Manage Schedule

		4. Click 'Update'		If click 'Confirm'			
		button		will display alert			
				massage 'Success			
				Update Schedule'			
	Update the	1. Select a date	-	The selected slot	The database	A massage 'Success	PASS
	schedule by	2. Click the time slot		will change to white	cancel	Update Schedule'	
	change the	grey button		color.A confirmation	schedule	shown. The selected	
	canceled time	3. Click 'Confirm'		alert 'confirm to	array will be	slot change color	
	to available	button		update?' will show.	updated	from grey to white.	
		4. Click 'Update'		If click 'Confirm'			
		button		will display alert			
				massage 'Success			
				Update Schedule'			
1							

7.2.1 Unit Test Conclusion

Conclusively, the unit testing phase has proven to be critical and successful in the software development process. There were 13 tables tested meticulously, with the notable result being that all tests were successfully passed. This represents the expected performance of individual components and features within the application without critical deficiencies. The comprehensiveness of unit testing gives people firm confidence in the reliability of the entire system and lays a solid foundation for the upcoming testing phase. This accomplishment underscores the resolute dedication to deliver a robust, high-quality application to users.

7.3 Integration Testing

Integration testing is considered the second stage of the software testing process after unit testing and involves careful examination of individual components or units in a software project. The main goal is to find defects and ensure that the units work together as per their specified design (Terra, J, 2023). In a typical software project, where different modules are produced by different programmers, integration tests are the litmus test of their collective functionality. While each unit can function independently, the key question is whether they work together when integrated. Essentially, integration testing determines whether the various components of a software application work effectively together (Terra, J, 2023.). During the integration testing phase, six testing modules were executed, and all six test cases were successfully passed.

Table 7. 14 Integration 1

Module:	Patient can create new account	Module ID:	IT-001				
	and login into their account to						
	modify their profile.						
Create by:	CHIA WEI QIANG	Executed by:	CHIA WEI QIANG				
Description:	To test the patient can create a n	ew account into	the system and their				
	can login to the application and	modify their prot	file.				
Test	1. Patient click the register button to navigate to register page.						
procedure:	2. Patient enter the name,IC No,phone number,email, password						

	and confirm password.				
	3. Patient click the register button to complete register and				
	navigate to welcome page.				
	4. Patient click the login button to navigate to login page.				
	5. Patient enter the valid email and password.				
	6. Patient sign in to access the application.				
	7. Patient click the human logo picture at the Drawer to navigate to				
	profile page.				
	8. Patient click the Edit button to navigate to the Edit Profile page.				
	9. Patient can modify the profile data. Like: name, birth date,				
	gender, phone number, address, Profile Image.				
	10. Patient click the Update button and navigate to the profile page.				
	11. Patient can see the completed profile information.				
Test Data:	Patient register info				
	First Name: Chia Last Name: Wei Qiang, Ic No: 000123-11-1234,				
	Phone: 0123456789 Email: test123@gmail.com				
	Password: test1234 Confirm Password: test1234				
	Patient Login credential				
	Email: test123@gmail.com Password: test1234				
	Edit profile info				
	First Name: Chia Last Name: Wei Qiang, Ic No: 000123-11-1234,				
	Phone: 0123456789 Birth Date: 21 / 5 // 2000 Gender: Male				
	Address1: UTAR Postal Code: 12345 City: Bandar Sungai Long				
	State: Selangor Country: Malaysia				
Expected	- Patient should able to create a new account.				
Result:	- Patient should able to login into the application.				
	- Patient should able to view the profile details.				
	- Patient should able to edit and update the new profile record.				
Status	Pass				

Module:	Doctor can mange their Module ID: IT-002		IT-002			
	schedule and the patient will					
	see the new available time					
	slot and make appointment					
Create by:	CHIA WEI QIANG	Executed by:	CHIA WEI QIANG			
Description:	To test the doctor can manage t	heir schedule and	patient can make			
	appointment with the newest tir	ne slot.				
Test	1. Doctor lunch the app and	login to the appl	ication.			
procedure:	2. Doctor navigate to the ma	anage schedule fr	om the Drawer.			
	3. Doctor select a date and c	change the time s	lot of the date.			
	4. Doctor update the Schedu	ale by click the up	odate button.			
	5. Patient login to the applic	cation and naviga	te to make			
	appointment.					
	6. Selected the department a	and the specific d	octor.			
	7. Patient select available date and time slot and navigate to					
	booking.					
	8. Patient select the reason, first time and enter other(optional).					
	9. Patient click the booking button and navigate to home page.					
Test Data:	Doctor Login credential					
	Email: doctor1@gmail.com Password: doctor11					
	Patient Login credential					
	Email: test123@gmail.com Password: test1234					
	Booking info					
	Reason: Consultation First Time: Yes Other: null					
Expected	- Doctor should able to change	their schedule.				
Result:	- Patients are able to see the new	west schedule of t	he doctor.			
	- Patients are able to create a ne	w appointment a	t specific available			
	time.					
Status	Pass					

Table 7. 15 Integration 2

Module:	Doctor search doctor by nameModule ID:IT-003						
	and select a available time slot						
	to make appointment.						
Create by:	CHIA WEI QIANG	CHIA WEI QIANG Executed by: CHIA WEI QIANG					
Description:	To test the patient search the doo	ctor by name and	make the				
	appointment.						
Test	1. Patient lunch the app and	login to the appli	cation				
procedure:	2. Patient navigate to the Sea	arch page from th	ne Drawer or Search				
	button.						
	3. Enter the part of doctor na	ame.					
	4. Patient select the doctor fr	com the searching	g lists.				
	5. Patient select available date and time slot and navigate to						
	booking.						
	6. Patient select the reason, first time and enter other(optional).						
	7. Patient click the booking button and navigate to home page.						
Test Data:	Patient Login credential						
	Email: test123@gmail.com Password: test1234						
	Search Info						
	Seacrh name: Lee						
	Booking info						
	Reason: Consultation First Time: Yes Other: null						
Expected	- Patient should able find the spe	ecific doctor by e	enter the full or part of				
Result:	the doctor name.						
	- Patient should able to view the	doctor profile de	etails.				
	- Patients are able to create a new appointment at specific available						
	time.						
Status	Pass						

Table 7. 16 Integration 3

Module:	User can manage their Module ID: IT-004		IT-004			
	appointment.					
Create by:	CHIA WEI QIANG	Executed by:	CHIA WEI QIANG			
Description:	To test the user can manage th	eir appointment qu	ickly and easily			
Test	1. Patient lunch the app and	d login to the appli	cation			
procedure:	2. Patient navigate to the m	anage appointmen	t page from the			
	Drawer.					
	3. Patient click the Pending	g button at the top.				
	4. Patient can see all the ne	w pending appoint	tment lists.			
	5. Doctor lunch the app and	d login to the appli	cation			
	6. Doctor navigate to the m	anage appointmen	t page from the			
	Drawer.					
	7. Doctor click the Pending	g button at the top.				
	8. Doctor can see all the new pending appointment lists.					
	9. Doctor click Accept button at the bottom of the appointment.					
	10. Doctor click the Upcoming button at the top.					
	11. Doctor can see all the upcoming appointment lists.					
	12. Patient lunch the app and login to the application					
	13. Patient navigate to the manage appointment page from the					
	Drawer.	Drawer.				
	14. Patient click the Upcom	tient click the Upcoming button at the top. tient can see all the doctor accepted and upcoming				
	15. Patient can see all the do					
	appointment lists.					
	16. Patient click the cancel l	16. Patient click the cancel button bottom of the appointment.				
	17. Patient click the History	. Patient click the History button at the top.				
	18. Patient can see the appo	intment Lists.				
	19. Doctor lunch the app and	d login to the appli	cation			
	20. Doctor navigate to the m	avigate to the manage appointment page from the				
	Drawer.					
	21. Doctor click the Upcom	ing button at the to	p.			
	22. Appointment will disapp	bear.				
	23. Doctor click the History button at the top.					

Table 7. 17 Integration 4

	24. The appointment will show at here.			
Test Data:	Doctor Login credential			
	Email: doctor1@gmail.com Password: doctor11			
	Patient Login credential			
	Email: test123@gmail.com Password: test1234			
Expected	- Doctor should able to get the new pending appointment and can			
Result:	accept or cancel the appointment.			
	- Doctor can view all the history of make appointment at past.			
	- Patient should able to view all the appointment.			
	- Patient can able to cancel the Upcoming and Pending appointment.			
	- Patient can view all the history of make appointment at past.			
Status	Pass			

Table 7. 18 Integration 5

Module:	Doctor can update the acceptedModule ID:IT-005					
	appointment, which is over					
	current data time, medical record.					
	And the Patient can giving the					
	rate and feedback to the					
	completed appointment					
Create by:	CHIA WEI QIANG	Executed	CHIA WEI			
		by:	QIANG			
Description:	To test the doctor can update the medical record and completed or					
	cancel the appointment and patient can update the rate and feedback to					
	the appointment.					
Test	1. Doctor lunch the app and login to the application.					
procedure:	2. Doctor navigate to the Medical Comment page from Drawer.					
	3. Doctor select a specific appointment.					
	4. Doctor enter the medical comment.					
	5. Doctor click the submit button.					
	6. Patient lunch the app and login to the application.					
	7. Patient navigate to the rate & feedback page from Drawer.					

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	8. Patient select a specific appointment.					
	9. Patient enter the feedback and select the rate.					
	10. Patient click the submit button.					
Test Data:	Doctor Login credential					
	Email: doctor1@gmail.com Password: doctor11					
	Comment Info					
	Comment: Don't eat too many spicy food. Drink more water.					
	Patient Login credential					
	Email: test123@gmail.com Password: test1234					
	Feedback Info					
	Rate: 4.5 Feedback: Good Doctor and friendly					
Expected	- Doctor should able to view uncompleted and uncomment					
Result:	appointment lists.					
	- Doctor can complete the appointment and update the medical record.					
	- Patient should able to view completed and unrating appointment					
	lists.					
	- Patient can update the feedback and rating for the appointment.					
Status	Pass					

Module:	Patient can register as a	Module ID:	IT-006	
	Organ Transplant patient and			
	the doctor can manage the			
	organ transplant patient.			
Create by:	CHIA WEI QIANG	Executed by:	CHIA WEI QIANG	
Description:	To test the patient can create a new organ transplant patient and view			
	the details. The doctor can accept or cancel the patient.			
Test	1. Patient lunch the app and login to the application.			
procedure:	2. Patient navigate to the Organ transplant page from Drawer.			
	3. Patient click the Register button.			

	4. Patient select the organ needed and blood type.					
	5. Patient click the Register button and navigate to the home page.					
	6. Patient navigate to the Organ transplant page from Drawer.					
	7. Patient can view the organ transplant details.					
	8. Doctor lunch the app and login to the application.					
	9. Doctor navigate to the Manage Organ transplant page from					
	Drawer.					
	10. Doctor can view all the organ transplant patient lists.					
	11. Doctor click the Accept button at the bottom of specific patient.					
	12. Doctor click completed button at accepted patient page.					
	13. Doctor enter the Provider Name.					
	14. Docter click the Submit button.					
Test Data:	Patient Login credential					
	Email: <u>test123@gmail.com</u> Password: test1234					
	Register Info					
	Organ Needed: Heart Blood Type: A+					
	Doctor Login credential					
	Email: doctor1@gmail.com Password: doctor11					
	Manage Organ Info					
	Provider Name: Ali Chia					
Expected	- Patient should able to create only 1 organ transplant patient account.					
Result:	- Doctor should able to view all the status type of the organ transplant					
	patient list.					
	- Doctor should able to accept or reject the organ transplant patient.					
	- Doctor should able to complete the organ transplant patient and					
	update the provider name of the organ donetor.					
Status	Pass					

7.3.1 Integration Test Conclusion

To summarize, the integration testing phase of the project consisted of a total of six comprehensive tests, each designed to evaluate the seamless integration of individual system components. Otherwise, all six integration tests were successfully completed with passing results. This means that the different modules and functions of the system work harmoniously together, ensuring that the application is cohesive and reliable. The successful results of these tests highlight the project's commitment to achieving a well-integrated and robust system that provides a solid foundation for subsequent phases of development and testing.

7.4 Usability Testing

Usability testing is a key practice in software development that revolves around evaluating the user-friendliness of a design with a representative group of users. This method systematically observes user interactions to evaluate the effectiveness, efficiency, and satisfaction of the system. It is a versatile tool that applies to the entire development process from launch to product release and is consistent with Paul Maritz's emphasis on real-time customer capture and the provision of contextually relevant information (Interaction Design Foundation, n.d.). In this project, usability evaluation uses the Standardized System Usability Scale (SUS) metric to evaluate user satisfaction, effectiveness in achieving goals, and resource efficiency.

7.4.1 System Usability Scale (SUS)

For the usability test evaluation, a questionnaire was created using Google Forms with questions adapted from the System Usability Scale (SUS) (UIUX Trend, 2017). The questionnaire consists of two parts A and B. Part A contained 10 rating-type questions in which participants rated their responses on a scale from strongly disagree (1) to strongly agree (5). In part B, participants were asked to rate the application on a scale from "unlikely" (0) to "extremely unlikely" (10). This evaluation occurs after participants interact with the system but before any debriefing or discussion occurs. The figure below shows the SUS template base on UIUX Trend (2017), which is used fro the project's usability testing.

Level (1-Strongly disagree, 2-Disagree, 3-Neutral, 4-Agree, 5-Strongly Agree) *

	1	2	3	4	5
I found I would like to use this mobile application frequently	0	0	0	0	0
l found the application unnecessarily complex	0	0	0	0	0
l found the application was easy to use	0	0	0	0	0
I found I need technical support to use the application	0	0	0	0	0
I found that various functions in this mobile application were well integrated.	0	0	0	0	0
I thought there was too much inconsistency in this application	0	0	0	0	0
I image that most people would learn to use this app quickly.	0	0	0	0	0
I found application very difficult and tricky to use	0	0	0	0	0
l felt confident using this application	0	0	0	0	0
I think I need to learn before use this application	0	0	0	0	0
How likely are yo	u recomment	d this applicat	tion with othe	r? *	
0	1 2	3 <mark>4</mark> 5	6 7	8 9 10	
Not Likely	000	000	000	000	Extremely

Figure 7. 1 System Usability Scale form

7.4.2 Usability Testing Result

The System Usability Scale (SUS) evaluation involved 15 users who rated each of 10 questions on a scale of 1 to 5 indicating their level of agreement. The SUS assessment results for each participant can be found in Appendix G. The SUS score is calculated based on a specific formula. Figure 7.2 shows the formula for obtaining the SUS score. To provide some context, SUS scores range from 0 to 100, with each question weighted 10 points. While the SUS score technically ranges from 0 to 100, it does not represent a percentage in the traditional sense. For example, a SUS score of 80 out of 100 does not equate to 80% in the traditional sense, but rather indicates where the score stands relative to other assessments.

- X = Sum of the points for all odd-numbered questions 5
- Y = 25 Sum of the points for all even-numbered questions
- SUS Score = (X + Y) x 2.5





Figure 7. 3 SUS Score

Table 7. 2	20 SUS	Result
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Question No	Min Score	Max Score	Average Score	Total Score from 15 P
1	1	4	2.87	43
2	2	4	3.27	49
3	2	4	3.2	48
4	2	4	3.27	49
5	2	4	3	45

6	2	4	3.47	52
7	2	4	3.33	50
8	2	4	3.4	51
9	2	4	3.07	46
10	2	4	3.2	48
Total Score:32.08			481	
SUS Score:			80.2	

Based on the total SUS score obtained by our esteemed participants, the Medical Appointment App achieved a commendable SUS average score of 80.2 and received an outstanding B grade. This resounding result emphasizes the meticulous development, unwavering consistency and user-centered design principles embedded in the application. It is a clear proof that medical appointment apps are not only powerful, but also adept at providing users with a seamless, user-friendly, and effortless navigation experience. This victory in usability testing reinforces the confidence in the quality of the app and its potential to significantly improve the healthcare journey for all users.

7.5 User Acceptance Test (UAT)

User Acceptance Testing (UAT) is often referred to as the final frontier of software development and is a critical stage before a software application is actually deployed. UAT represents the ultimate litmus test, where end users themselves scrutinize software performance in real-world scenarios. This critical testing phase is the final validation process, ensuring that the software integrates seamlessly with the intended design and meets the organization's exact needs. UAT allows real users to evaluate whether the software is functioning as expected, verify any modifications made, and confirm compliance with the project requirements. Ultimately, the primary goal of UAT is to validate end-to-end business processes, providing final assurance before the software is deemed ready for release (Elazar. E, 2018).

7.5.1 UAT Test Cases Template

User Acceptance Testing (UAT) test case templates are the cornerstone of meticulous evaluation of a medical appointment application and are an indispensable tool to ensure its readiness for deployment. The template contains two different aspects: one is tailored to the patient's perspective, and the other is specifically targeted at medical providers (especially doctors). Each template carefully outlines a comprehensive set of test cases, carefully designed to cover every imaginable scenario, interaction, and functionality in your application. The both of the UAT test cases template can be found in Appendix H and Appendix I.

7.5.2 User Acceptance Testing Result

A total of 10 participants actively participated in the application during the comprehensive testing phase. Among these participants, six played the role of patients and executed a total of 16 patient-related test cases. At the same time, four participants played the role of doctors and participated in 19 doctor-related test cases. The table below showing that all the participants test result.

Test form ID:	Form ID: PT-001 UAT Test ID:		ID:	UAT-PF001	
Test Executed by	t Executed by: Chia Wei Qiang Participant Name:		Name:	Chia Hoon Hia	
Test Priority:		High	Testing Date:		7 / 9 / 2023
Module:		Patient	Test time:		5:00 p.m.
Test Case ID:	T	est Case:	Status:	Comment:	
UAT-001	R	egister	PASS	-	
UAT-002	L	ogin	PASS	-	
UAT-003	U	User Profile		PASS	-
UAT-004	S	Search		PASS	-
UAT-005	D	Doctor profile		PASS	-
UAT-006	C	Create appointment		PASS	-
UAT-007	V	View Pending appointment		PASS	-
UAT-008	C	Cancel pending status appointment		PASS	-
UAT-009	V	View Upcoming appointment		PASS	-
UAT-010	C	Cancel Accepted/ Upcoming appointment		PASS	-

 Table 7. 21 UAT Test Form Patient 1
UAT-011	Appointment history	PASS	-
UAT-012	Register Organ Transplant patient	PASS	-
UAT-013	View Organ Transplant details	PASS	-
UAT-014	Notification	PASS	-
UAT-015	Rating & Feedback	PASS	-
UAT-016	Logout	PASS	-

Table 7. 22 UAT Test Form Patient 2

Test form ID:	PT-002	UAT Test	ID:	UAT-PF001
Test Executed by	y: Chia Wei Qiang	Participant	Name:	Chia Xin Mei
Test Priority:	High	Testing Da	te:	7 / 9 / 2023
Module:	Patient	Test time:		7:00 p.m.
Test Case ID:	Test Case:		Status:	Comment:
UAT-001	Register		PASS	-
UAT-002	Login		PASS	-
UAT-003	User Profile		PASS	-
UAT-004	Search	PASS	-	
UAT-005	Doctor profile		PASS	-
UAT-006	Create appointment		PASS	-
UAT-007	View Pending appointment	View Pending appointment		-
UAT-008	Cancel pending status appoint	ment	PASS	-
UAT-009	View Upcoming appointment		PASS	-
UAT-010	Cancel Accepted/ Upcoming a	ppointment	PASS	-
UAT-011	Appointment history		PASS	-
UAT-012	Register Organ Transplant pat	Register Organ Transplant patient		-
UAT-013	View Organ Transplant details		PASS	-
UAT-014	Notification	Notification		-
UAT-015	Rating & Feedback		PASS	-
UAT-016	Logout		PASS	-

Table 7. 23 UAT Test Form Patient 3

Test form ID:	PT-003	UAT Test ID:	UAT-PF001
Test Executed by:	Chia Wei Qiang	Participant Name:	Chia Hui Ching
Test Priority:	High	Testing Date:	7 / 9 / 2023
Module:	Patient	Test time:	8:00 p.m.

Test Case ID:	Test Case:	Status:	Comment:
UAT-001	Register	PASS	-
UAT-002	Login	PASS	-
UAT-003	User Profile	PASS	-
UAT-004	Search	PASS	-
UAT-005	Doctor profile	PASS	-
UAT-006	Create appointment	PASS	-
UAT-007	View Pending appointment	PASS	-
UAT-008	Cancel pending status appointment	PASS	-
UAT-009	View Upcoming appointment	PASS	-
UAT-010	Cancel Accepted/ Upcoming appointment	PASS	-
UAT-011	Appointment history	PASS	-
UAT-012	Register Organ Transplant patient	PASS	-
UAT-013	View Organ Transplant details	PASS	-
UAT-014	Notification	PASS	-
UAT-015	Rating & Feedback	PASS	-
UAT-016	Logout	PASS	-

Table 7. 24 UAT Test Form Patient 4

Test form ID:		PT-004	UAT Test	ID:	UAT-PF001	
Test Executed by	y:	Chia Wei Qiang	Participant Name:		Loh Yong Wei	
Test Priority:		High	Testing Da	te:	7 / 9 / 2023	
Module:		Patient	Test time:		9:00 p.m.	
Test Case ID:	Т	est Case:		Status:	Comment:	
UAT-001	R	egister	PASS	-		
UAT-002	L	ogin	PASS	-		
UAT-003	U	User Profile		PASS	-	
UAT-004	Se	Search		PASS	-	
UAT-005	D	octor profile		PASS	-	
UAT-006	C	reate appointment		PASS	-	
UAT-007	V	View Pending appointment		PASS	-	
UAT-008	C	Cancel pending status appointment		PASS	-	
UAT-009	V	iew Upcoming appointment		PASS	-	
UAT-010	C	ancel Accepted/ Upcoming app	ointment	PASS	-	

UAT-011	Appointment history	PASS	-
UAT-012	Register Organ Transplant patient	PASS	-
UAT-013	View Organ Transplant details	PASS	-
UAT-014	Notification	PASS	-
UAT-015	Rating & Feedback	PASS	-
UAT-016	Logout	PASS	-

Table 7. 25 UAT Test Form Patient 5

Test form ID:		PT-005	UAT Test I	D:	UAT-PF001
Test Executed by	y:	Chia Wei Qiang	Participant	Name:	Lim Jia Ying
Test Priority:		High	Testing Da	te:	7 / 9 / 2023
Module:		Patient	Test time:		10:00 p.m.
Test Case ID:	T	est Case:		Status:	Comment:
UAT-001	R	egister		PASS	-
UAT-002	Lo	ogin		PASS	-
UAT-003	U	ser Profile		PASS	-
UAT-004	Se	Search			-
UAT-005	Doctor profile			PASS	-
UAT-006	Cı	Create appointment		PASS	-
UAT-007	V	View Pending appointment		PASS	-
UAT-008	C	ancel pending status appointme	ent	PASS	-
UAT-009	V	iew Upcoming appointment		PASS	-
UAT-010	C	ancel Accepted/ Upcoming app	ointment	PASS	-
UAT-011	A	ppointment history		PASS	-
UAT-012	R	Register Organ Transplant patient			-
UAT-013	V	View Organ Transplant details		PASS	-
UAT-014	N	Notification		PASS	-
UAT-015	Ra	ating & Feedback		PASS	-
UAT-016	L	ogout		PASS	-

Table 7. 26 UAT Test Form Patient 6

Test form ID:	PT-006	UAT Test ID:	UAT-PF001
Test Executed by:	Chia Wei Qiang	Participant Name:	Ong Shu Qing
Test Priority:	High	Testing Date:	8 / 9 / 2023
Module:	Patient	Test time:	7:00 p.m.

Test Case ID:	Test Case:	Status:	Comment:
UAT-001	Register	PASS	-
UAT-002	Login	PASS	-
UAT-003	User Profile	PASS	-
UAT-004	Search	PASS	-
UAT-005	Doctor profile	PASS	-
UAT-006	Create appointment	PASS	-
UAT-007	View Pending appointment	PASS	-
UAT-008	Cancel pending status appointment	PASS	-
UAT-009	View Upcoming appointment	PASS	-
UAT-010	Cancel Accepted/ Upcoming appointment	PASS	-
UAT-011	Appointment history	PASS	-
UAT-012	Register Organ Transplant patient	PASS	-
UAT-013	View Organ Transplant details	PASS	-
UAT-014	Notification	PASS	-
UAT-015	Rating & Feedback	PASS	-
UAT-016	Logout	PASS	-

Table 7. 27 UAT Test Form Doctor 1

Test form ID:		DT-001	UAT Test	ID:	UAT-DF001	
Test Executed by	y:	Chia Wei Qiang	Participant	Name:	Liew Yong Hang	
Test Priority:		High	Testing Da	te:	8 / 9 / 2023	
Module:		Doctor	Test time:		8:00 p.m.	
Test Case ID:	T	est Case:		Status:	Comment:	
UAT-001	Lo	ogin	PASS	-		
UAT-002	U	ser Profile	PASS	-		
UAT-003	V	View Pending appointment		PASS	-	
UAT-004	A	Accept pending status appointment		PASS	-	
UAT-005	Ca	ancel pending status appointment	t	PASS	-	
UAT-006	V	iew Upcoming appointment		PASS	-	
UAT-007	Ca	Cancel Accepted/Upcoming appointment		PASS	-	
UAT-008	A	Appointment history		PASS	-	
UAT-009	V	iew pending Organ Transplant pa	atient	PASS	-	
UAT-010	A	ccept pending status organ transp	olant patient	PASS	-	

UAT-011	Cancel pending status organ transplant patient	PASS	-
UAT-012	View Accepted Organ Transplant patient	PASS	-
UAT-013	Update accepted status organ transplant patient	PASS	-
UAT-014	Organ Transplant patient history	PASS	-
UAT-015	Notification	PASS	-
UAT-016	View the schedule	PASS	-
UAT-017	Update the schedule	PASS	-
UAT-018	Medical comment	PASS	-
UAT-019	Logout	PASS	-

Table 7. 28 UAT Test Form Doctor 2

Test form ID:		DT-002	UAT Test l	(D:	UAT-DF001
Test Executed by	y:	Chia Wei Qiang Participant Name:		Name:	Kham Lih Yang
Test Priority:		High	Testing Da	te:	8 / 9 / 2023
Module:		Doctor	Test time:		9:00 p.m.
Test Case ID:	T	est Case:		Status:	Comment:
UAT-001	L	ogin		PASS	-
UAT-002	U	ser Profile		PASS	-
UAT-003	V	iew Pending appointment		PASS	-
UAT-004	Accept pending status appointment		PASS	-	
UAT-005	Cancel pending status appointment		PASS	-	
UAT-006	View Upcoming appointment		PASS	-	
UAT-007	Cancel Accepted/Upcoming appointment		PASS	-	
UAT-008	Appointment history		PASS	-	
UAT-009	V	iew pending Organ Transplant pa	atient	PASS	-
UAT-010	A	ccept pending status organ transp	plant patient	PASS	-
UAT-011	C	ancel pending status organ transp	plant patient	PASS	-
UAT-012	V	iew Accepted Organ Transplant	patient	PASS	-
UAT-013	U	pdate accepted status orga	n transplant	PASS	-
	pa	atient			
UAT-014	0	rgan Transplant patient history		PASS	-
UAT-015	N	otification		PASS	-
UAT-016	V	iew the schedule		PASS	-
UAT-017	U	pdate the schedule		PASS	-

UAT-018	Medical comment	PASS	-
UAT-019	Logout	PASS	-

Table 7. 29 UAT Test Form Doctor 3

Test form ID:	est form ID: DT-003 UAT Test ID:		D:	UAT-DF001	
Test Executed by	est Executed by: Chia Wei Qiang Participant Name:		Name:	Chong Jing Yong	
Test Priority:		High	Testing Da	te:	8 / 9 / 2023
Module:		Doctor	Test time:		10:00 p.m.
Test Case ID:	Т	est Case:		Status:	Comment:
UAT-001	Lo	ogin		PASS	-
UAT-002	U	ser Profile		PASS	-
UAT-003	Vi	iew Pending appointment		PASS	-
UAT-004	A	ccept pending status appointment	t	PASS	-
UAT-005	Ca	ancel pending status appointment	t	PASS	-
UAT-006	View Upcoming appointment			PASS	-
UAT-007	Cancel Accepted/Upcoming appointment			PASS	-
UAT-008	Appointment history			PASS	-
UAT-009	View pending Organ Transplant patient		PASS	-	
UAT-010	Accept pending status organ transplant patient			PASS	-
UAT-011	Cancel pending status organ transplant patient			PASS	-
UAT-012	Vi	iew Accepted Organ Transplant j	patient	PASS	-
UAT-013	Update accepted status organ transplant		n transplant	PASS	-
	patient				
UAT-014	Organ Transplant patient history			PASS	-
UAT-015	Notification			PASS	-
UAT-016	View the schedule			PASS	-
UAT-017	U	pdate the schedule		PASS	-
UAT-018	Medical comment			PASS	-
UAT-019	Logout			PASS	-

Table 7. 30 UAT Test Form Doctor 4

Test form ID:	DT-004	UAT Test ID:	UAT-DF001
Test Executed by:	Chia Wei Qiang	Participant Name:	Tan Jun Ting
Test Priority:	High	Testing Date:	9 / 9 / 2023
Module:	Doctor	Test time:	10:00 a.m.

Test Case ID:	Test Case:	Status:	Comment:		
UAT-001	Login	PASS	-		
UAT-002	User Profile	PASS	-		
UAT-003	View Pending appointment	PASS	-		
UAT-004	Accept pending status appointment	PASS	-		
UAT-005	Cancel pending status appointment	PASS	-		
UAT-006	View Upcoming appointment	PASS	-		
UAT-007	Cancel Accepted/Upcoming appointment	PASS	-		
UAT-008	Appointment history	PASS	-		
UAT-009	View pending Organ Transplant patient	PASS	-		
UAT-010	Accept pending status organ transplant patient	PASS	-		
UAT-011	Cancel pending status organ transplant patient	PASS	-		
UAT-012	View Accepted Organ Transplant patient	PASS	-		
UAT-013	Update accepted status organ transplant patient	PASS	-		
UAT-014	Organ Transplant patient history	PASS	-		
UAT-015	Notification	PASS	-		
UAT-016	View the schedule	PASS	-		
UAT-017	Update the schedule	PASS	-		
UAT-018	Medical comment	PASS	-		
UAT-019	Logout	PASS	.SS -		

The notable outcome of this rigorous testing process is that all patient-related test cases were not only carefully executed but also successfully passed by the

patient group. It is also commendable that all three doctors performed admirably, effectively conducting and passing all doctor-related test cases. This unequivocal success highlights the robustness and deployment readiness of the application, ensuring patients and physicians receive a reliable and user-friendly healthcare experience.

CHAPTER 8

CONCLUSIONS AND RECOMMENDATIONS

8.1 Introduction

This chapter is a comprehensive summary of the entire project. It contains several key elements, starting with clear conclusions drawn from the project results. Furthermore, it highlights the various limitations encountered during project execution, revealing areas that require further consideration or improvement. In the final section, the chapter provides valuable suggestions and insights into potential future efforts that can build on the project and promote continued growth and innovation.

8.2 Conclusion

The development of the Medical Appointment Application was a resounding success, fully meeting both the specified functional and non-functional requirements. The project started in early February 2023 and ended at the end of September 2023, encompassing a span of approximately seven months. This timeline encompassed all project phases, including planning, analysis, design, coding, and testing. In the end, the project successfully realized all the objectives outlined in Chapter 1, Section 1.4.

At the starting of the planning phase, the medical appointment booking process is time-consuming and challenging for patients , often resulting in long wait times and a poor experience specialy at the COVID-19 pandemic moment. Healthcare providers also struggle with managing schedules and patient information, leading to inefficiencies. Additionally, patients frequently face issues with appointment rescheduling or cancellations, causing frustration. To address these issues, the planned medical appointment application aims to streamline the booking process, enhance healthcare providers' schedule management, and provide real-time updates for patients. This project seeks to revolutionize the healthcare experience by leveraging technology to create a more efficient and patient-centric ecosystem. After the development and implementation was completed, the critical phase of User Acceptance Testing (UAT) was conducted, in line with one of the main objective of the project. This UAT process was successfully executed and thanks to the participation of 7 students from UTAR Sg Long campus as well as 3 aspiring medical students, providing valuable insights into the usability and functionality of the application. This diverse group of testers played a key role in evaluating the app, ensuring it met the needs of both regular users and potential future medical professionals.

All in all, the developed medical appointment application is very useful for all patients where they can easily make appointments with medical providers. This app is not only beneficial for patients but also very useful for medical providers i.e. doctors as they can list their available time slots and manage their appointments more conveniently by using this app.

8.3 Limitations

Several limitations were encountered throughout the course of the project, spanning the development, testing, and implementation phases. These limitations include:

- 1. The implementation of the reset password feature encountered challenges, mainly because the project relied on Firebase's email-type authentication. Firebase provides a convenient authentication system, but its email-based password reset feature can sometimes be difficult to implement seamlessly. Issues may include ensuring that password reset links are generated correctly, handling password reset emails, and securely verifying and updating user credentials. If these challenges are not carefully addressed, it can lead to user frustration and a sub-optimal user experience.
- 2. Acquiring real, practicing doctors for testing purposes presented a significant hurdle. The ideal scenario would have been to involve experienced medical professionals, as they possess a deep understanding of the intricacies of healthcare workflows and could provide valuable insights into the application's usability and functionality. However, due to constraints in finding and engaging

practicing doctors, the testing pool was limited to last-year medical students. While these students have a solid foundation in medical knowledge, they may not fully replicate the experiences and requirements of healthcare practitioners. Consequently, the feedback collected during testing might not comprehensively cover all aspects of real-world medical practices, potentially impacting the application's ability to meet the diverse needs of medical providers.

8.4 **Recommendations and Future Work**

Below are some of the recommendations for future enhancements to the Medical Appointment Application. It is advisable to pursue ongoing improvements to enhance system usability, aiming to provide a more favorable user experience in the times ahead.

8.4.1 User Interface Improvements

Based on the feedback gained from usability testing and user acceptance tests, it became clear that enhancing the user interface was critical. Consider incorporating visually appealing elements such as animated navigation, more intuitive notifications of user actions, and sophisticated error or success message designs. These improvements can significantly enhance the overall user experience and make the application more engaging.

8.4.2 Built-in chat function

In order to facilitate user interaction and information exchange, you can consider adding a built-in chat function to the system. The feature will enable users to communicate with each other seamlessly, providing a convenient platform for discussions and queries related to appointments or medical information.

8.4.3 Payment Gateway Integration

Simplify financial transactions within the app by integrating a secure payment gateway. This new addition will enable users to pay for services or appointments directly through the system, enhancing convenience and improving the overall user experience.

8.4.4 Deeper integration with electronic health records (EHR)

Consider further integrating the app with electronic health record (EHR) systems. This integration can significantly improve the accuracy and efficiency of healthcare delivery by providing real-time access to patient information, treatment history, and medical records. It will also facilitate seamless information sharing among healthcare providers.

8.4.5 Expanding telemedicine capabilities

To meet the growing demand for telemedicine services, future work could focus on expanding telemedicine capabilities within the application. This could include enabling video consultations, remote monitoring of patients, and integration with medical devices to collect data. These enhancements will make the application more versatile in meeting the changing needs of healthcare services.

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APPENDIX

Appendix A Questionnaire Survey Form Questions

Medical Appointment Application

Dear respondents,

Thank you for agreeing to participate in this survey. I am CHIA WEI QIANG, a final year software engineering student from University Tunku abdul Rahman.

I am currently working on my final year project which is to develop a medical appointment system. The purpose of this questionnaire is to collect some relevant data that can be used to demonstrate some of the statistical methods for analyzing quantitative data.

The aim of this study is to determine whether the medical appointment application will bring more convenience to all people. The individual responses will be anonymous and the data collected will be used for my Final Year Project (fyp).

This questionnaire has a total of 18 questions.

I would really appreciate it if you could spend approximately 5 - 10 minutes of your valuable time to answer this questionnaire.

If you have any inquiries or concerns about the questionnaire or the topic, please don t hesitate to contact me via email (<u>cwq0521@1utar.my</u> or <u>cwq0521@gmail.com</u>).

Thank you for your participation.

Part A: General Background Information

The Background of	the responders
-------------------	----------------

1. What is your age? *
Under 18
18 - 24
25 - 39
40 - 59
60 and above

2. Wha	tis	your	gend	er? *
		100	guine	

- O Male
- Female
- O Other:
- 3. What is your education level?*
- O Primary school
- O Secondary school
- O Foundation / A-level
- O Diploma
- O Bachelor of degree
- O Master
- O PHD
- O Other:
- 4. What is your current occupation? *
- Student
- O Part-time employed
- O Full-time employed
- O Unemployed
- O Self-employed
- O Retired

5. Have you made medical appointments before? *

Yes
No

Part B: Unused medical application

this w	ill have one question to ask the reason not use medical appointment
The	reason you no use medical appointment? *
(Mu	Itiple Answers Question)
	Lack of time
	Inconvenience
	Long wait times
	Difficulty in scheduling an appointment
	Fear or anxiety about medical procedures
	Lack of trust in healthcare providers
	Financial concerns or limitations
	Perception of good health and no need for medical attention.
	Other:

Part B: Medical Appointment

This part question is about the medical appointment

1. How many times have you made medical appointments before? *
1 - 5
6 - 10
10 and above

2. What method of the appointment have you made before?*												
 Phone call Physical to Hospital Website 												
							O Application (APP)					
							O Other:					
3. Do you think that making appointments with the doctor physically at the hospital or through phone calls is difficult?	*											
O Yes												
O No												
4. If yes, what will be the reason? (Multiple Answers Question)												
inconvenience												
time-consuming												
miscommunication												
crowded and long queues												
No answer/Line busy												
Other:												

5. Have you heard of medical appointment applications before? *						
O Yes						
O No						
6. If yes, please list out the medical appointment application you used before.						
Your answer						
7. Do you think the medical appointment application will be more convenient to make the appointment with the hospital or doctor?	*					
O Yes						
O No						
8. When you wanted to make an appointment. What kind of information do you	*					
(Multiple Answers Question)						
Doctor information						
Doctor schedule						
Available appointment date & time						
Other:						

9. Have you heard of organ transplant before? *						
O Yes						
O No						
10. Where do you get the organ transplant information? *						
(Multiple Answers Question)						
From doctor						
Online finding						
From black market						
Other:						
11. Do you have any suggestion features for the medical appointment						
application? Except to make the doctor appointment.						
(Multiple Answers Question)						
Emergency call button						
Organ transplant information						
X-ray and body check detail information appointment						
Follow-up visit appointment for Clean up the wound						
Door-to-door service						
Blood donate information						

ChatBot

Other:

219

12. Do yo	u think the	hospital	should	provide	door-	to-door	service?*	ł
-----------	-------------	----------	--------	---------	-------	---------	-----------	---

0	Yes
\sim	

O No

13. If yes, what will be the reason? (Multiple Answers Question)

Better medication adherence
Saving time
Saving money
Flexibility and adaptability
Confidentiality
Safety
Other:

Not Slightly Moderately Very Important Important Important Important Important 0 0 0 0 0 Login Forget 0 0 0 0 0 Password Profile 0 0 0 0 0 Doctor 0 0 0 0 0 information Doctor 0 0 0 0 0 schedule appointment Medical appointment (for X-ray / 0 0 0 0 0 Follow-up visit) door-to -door 0 0 0 0 0 service Organ transplant 0 0 0 0 0 information Notification (e.g. blood donation info, 0 0 Ο 0 0 body checking promotion)

14. Based on your online reservation experience, please rate below features/functionalities on how important they are for you?

*



Appendix B Questionnaire Survey Results







6. If yes, please list out the medical appointment application you used before.

5 responses

bookdoc	
ophthalmology	
BookDoc	







14. Based on your online reservation experience, please rate below features/functionalities on how important they are for you?







Appendix C Work Breakdown Structure Diagram

Appendix D FYP-1 Gantt Chart

	Medical Appoint	nent Ap	plicatio	on																												
	PRO.	ECT START	I Jan 31	1, 2023	Week 1	Wee	ak 2	Week 3	Week 4		Week 5		Week 6	We	ek 7		Week 8		Week 9		Week 1	0	We	ek 11		Week 1	2	Wer	ek 13		Week 14	
					30/2023 31/2023 71/2023 72/2023	4/2023 (5/2023 (6/2023 (8/2023 (8/2023	10/2023 11/2023 12/2023 13/2023	14/2023 15/2023 16/2023 17/2023 18/2023	20/2023 21/2023 22/2023 23/2023 24/2023	25/2023 26/2023 27/2023 28/2023	1/2023 /2/2023 /3/2023	/4/2023 /5/2023 /6/2023	(8/2023 (8/2023 10/2023 11/2023	12/2023 13/2023 14/2023 15/2023	1 6/2023 1 7/2023 1 8/2023	19/2023 20/2023 21/2023	23/2023 23/2023 24/2023	26/2023 27/2023 28/2023	29/2023 30/2023 31/2023	/1/2023 /2/2023 /3/2023	/5/2023 /6/2023	8/2023 9/2023 10/2023	11/2023	1 4/2023 1 4/2023 1 5/2023	1 6/2023 1 7/2023 1 8/2023	20/2023	22/2023 22/2023 23/2023 24/2023	25/2023	27/2023 28/2023 29/2023	30/2023	/3/2023 /4/2023 /5/2023	102023
_	Final Year Project 1 (FYP-1)				22000	44444	22 22	55555	2222	6725	n n n		1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	3/ 3/	3/	3/	3/ 3/	3/ 3/	3/ 3/ 3/	ৰ ব ব ৰ	f 4 4 •	1 4 4 4	4	4/4/	4/4/4	4/	4/4	4/	4/4/	4 2 2	vs vs v	N N
NO	TASK	DURATION (DAYS)	START	END	M T W T F	S S M T W T	FSSM	TWTFS	MTWTF	SSMT	W T F	S S M	TWTFS	S M T W	TFS	SMT	W T F S	SMT	W T F	S S M	T W T	FSSM	тw	TFS	SMT	W T I	FSSM	TW	T F S	SMT	W T F	S S
0	Medical Appointment Application	85	31/1/2023	20/4/2023																												
1.0	Project Planning	23	31/1/2023	17/2/2023					.0 Project Plannin																							
1.1	Confirmation of Project Title	3	31/01/23	02/02/23																												
1.2	Identify Project Background	4	02/02/23	05/02/23																												
1.3	Identify Problem Statement	6	04/02/23	09/02/23																												
1.4	Identify Project Objectives	2	09/02/23	10/02/23																												
1.5	Identify Project Scope	3	11/02/23	13/02/23																												
1.5.1	Identify Target User	1	11/02/23	11/02/23																												
1.5.2	Identify Modules covered	1	12/02/23	12/02/23																												
1.5.3	Identify Out of scope	1	13/02/23	13/02/23																												
1.6	Propose Project Solution	3	14/02/23	16/02/23							TT														T							
1.7	Propose Project Approaches	2	16/02/23	17/02/23															Π													

2.0	Requirement Gathering and Analysis	49	18/02/23	07/04/23																								.0 Requir	ement G	athering	and Anal	ysis			11	III		
2.1	Requirement Analysis	18	18/02/23	07/03/23															T	III																		
2.1.1	Design Closed-End Question	3	18/02/23	20/02/23						T									T	TTT																		
2.1.2	Distribute Questionnaire	7	21/02/23	27/02/23				TT		11	ΓTΤ					TTT			TT	ΤT	TT			ΓTΤ			TT				T				11	ſſŢ		
2.1.3	Data Collection Analysis	8	28/02/23	07/03/23															TT	111										TTT	T				T			
2.2	Literature Review	26	08/03/23	02/04/23								IT																							11	ÎŤ		
2.2.1	Literature Review on Software Development Methodologies	9	08/03/23	16/03/23															TT								TT								11	IT		
2.2.1.1	Review on Evolutionary Prototype Methodology	3	08/03/23	10/03/23						11-																	111								11			
2.2.1.2	Review on Waterfall Development Methodology	3	11/03/23	13/03/23						11-	I T								ŤŤ	†††							111								11-			
2.2.1.3	Review on Agile Development Methodology	3	14/03/23	16/03/23				TT		11	ΓĦ					TT			TT	†††				TT			TT			TTT					11	TT.		
2.2.2	Literature Review on Mobile Application Framework	7	17/03/23	23/03/23	 <u> </u>			F††	111	11-				1-1-1	- -	111	11	111	11	111				t t t		-+- -	111	+							11	[]††		
2.2.2.1	Review on React Native	3	17/03/23	19/03/23				Ш		П	ΓΠ					TTT			TT	TTT	TTT						TT			TTT		ITT				ΠΤ		
2.2.2.2	Review on Flutter	4	20/03/23	23/03/23								TT	TT							11T																		
2.2.3	Literature Review on Similar Existing Application	10	24/03/23	02/04/23				Π		11									TT	†††	TTT						111								11	ΠT		
2.2.3.1	Review on Healthengine Application	4	24/03/23	27/03/23				Π		11	ΠT								TT	TTT							TT									ΠΤ		
2.2.3.2	Review on Practo Application	3	28/03/23	30/03/23						TT	ΠT								T	ITT																ΠΤ		
2.2.3.3	Review on BookDoc Application	3	31/03/23	02/04/23				Π		TT									T	ITT							Π									ITT		
2.3	Project scheduling	5	03/04/23	07/04/23		Π		Π		TT	ΓΠ					TTT			TT	TTT	TTT			Π												ΠΤ	TT	
2.3.1	Work breakdown structure	2	03/04/23	04/04/23				Π		T									TT	Π							Π								П	Π		
2.3.1.1	Breakdown activities into subunits	2	03/04/23	04/04/23				Π		TT	ΠT	Π							TT	TTT																IT		
2.3.2	Gantt chart	3	05/04/23	07/04/23				Π		11									TT	TTT																Π		
2.3.2.1	Identify task duration	2	05/04/23	06/04/23				Π		TT	ΠT								TT	TTT		TTI														ITT		
2.3.2.2	Draft and examine the Gantt Chart	1	07/04/23	07/04/23																																		
Sec. 1					 +-+			-+-+-	+-			+			 -+-+-	+-+-+	-11	+		+-+-+-	+-+-+	-111	-+		+		 +-+-+	+-+-+			+-+-+					-+-+-	++-	
3.0	Design	13	08/04/23	20/04/23			44		$\downarrow \downarrow \downarrow$	44-		1.1_1				$\downarrow \downarrow \downarrow$	<u>_</u>		4		$\downarrow \downarrow \downarrow$	444			\downarrow							3.	0 Design	4	$\downarrow \downarrow \downarrow$			
3.1	Requirement specification	2	08/04/23	09/04/23						<u></u>	_	<u> </u>				\downarrow			<u> </u>		$\downarrow \downarrow \downarrow$			_							444						╞╌┝╴┝	
3.2	Develop UML	6	10/04/23	15/04/23																															Ш			
3.2.1	Construct Use Case Diagram	2	10/04/23	11/04/23																																		
3.2.2	Construct Work Breakdown Structure (WBS)	4	12/04/23	15/04/23																																		
3.3	Low Fidelity Prototype	5	16/04/23	20/04/23																																		

Appendix E FYP-2 Gantt Chart

	Medical Appointn	nent Ap	plicatio	on																																			
	PROJ	ECT START	Jun 20	0, 2023	Week	:1	w	eek 2	Week 3	1	Weel	k 4		Week 5		Week	5		Week 7	4 0	Week	8	11	Week 9	3	1	Week 10		We	ek 11		Week 1	2		Week 1	3		Week	14
					0023	023 023 023	023	023		023	023	023	023	003	023	0023	023	023	222	2022	223	023	023	220	023	023	023	023	023	2222	023	023	023	023 023	023	023	023	023	023
					6/19/2 6/20/2 6/21/2 6/22/2	6/23/1 6/24/1 6/25/12	6/28/12	6/29/2 6/30/2 7/1/2	2/2/1 2/2/1 2/2/1 2/2/1 2/2/1 2/2/1 2/2/1 2/2/1	C/01/L	7/13/2	7/14/2 7/15/2	C/11/17	2/02/L	7/22/1 7/23/1	7/24/2 7/25/2 7/26/2 7/27/2	7/29/2	8/1/2	8/2/2 8/3/2 8/4/2	2/2/8 2/8/8 2/7/8	2/8/8 2/6/8 8/10/2	8/11/2 8/12/2 8/13/2	8/14/2 8/15/2	8/17/2 8/18/2	8/19/2	8/21/2 8/22/2	8/24/2 8/25/2	8/27/12 8/27/12 8/78/12	8/29/2	9/1/2	9/4/2	C/9/6/2	C/01/6	9/11/2	9/13/2	9/12/16	0/19/2	9/20/2	9/22/0 9/23/1
NO	Final Year Project 2 (FYP-2) TASK	DURATION	START	END	мтwт	FSS	MTW	TFS	SMTWTFS	SM	r w T	FSS	MTI	VTF	s s	мтwт	s s s	мт	WTF	s s m	тwт	FSS	мт	WTF	s s	мтт	TT	S S b	4 T W	TFS	SMT	WT	FSS	MT	W T	FSS	мт	W T	FSS
0	Medical Appointment Application	(DAYS) 87	20/6/2023	14/9/2023																																			
4.0	Iteration	77	20/6/2023	4/9/2023		┝┾┾┽	+++		++++++		++-	╆╌┽╾┾	+++	++	++-		┿╍┝╍┝			-+-+-					╋╼╋╼╋	-++		++	++++			4.01	teration		┢╍╉╼╋	++	++-		
4.1	First Iteration	23	20/6/2023	12/7/2023		┝╌┝╌┝		-+-+-			++-	┝╌┽╼┞╸		+-+-			+										+-+-					┼┼╌	-1-1-		┢╺╋╼╋	++-	++-		
411	Design 1	4	20/06/23	23/06/23		$\left \right $		+++			++	+++	+++	++	+++		+++	+	+++	++		++	$\left \cdot \right $	++	+++	++	+++	++	+++	++	┼┼┼	+++	+++-		\vdash	++	++	++-	
4.1.2	Build Prototype 1	13	24/06/23	06/07/23		┝┾┾┽		-+-+-+	┥┥┥┥	.+.+	++-	┝┥┥	+++	++	++		┿┥┥		┝╋╋	++				++	┿╼┿╼┝	++	+-+-+	+	+++		┼╌┼╌┝╴	┼┼┼	++-		┢╌┿╌┿	++-	++-		
413	User Evaluation 1	2	07/07/23	08/07/23		┝╌┝╌┝		- 	++++++		++	┼┼┼	+++	++	+++		++	+	$\left + + \right $	++	++	++		++	┼╌┼╴┼	++	+++	++	+++		┝┼┼	┼┼┼	++-	$\left \cdot \right $	┢┥┽	++	++-		
4.1.4	Refining Prototype 1	4	09/07/23	12/07/23		┝┾┾┽		-+++			++-	┼┼┼	+++	++	+++		+++		┟┼┼┼	++	┝╌┝╌┼╌┥		┝┅┿╍╍┡	++	┼╌┼─┼	++	++++	++	+++		┼╌┼╌┼╴	+++	+++-		+ + + + + + + + + + + + + + + + + + +	++	++-		
4.2	Second Iteration	27	13/07/23	08/08/23	╋	┝┾┾┽	++	┽┽┽	┿┿┿┿┿			╈		++				-	┝┼┼┼	++-		++-	┝┼┥	++	┼╌┼╌┼	++		++	+++	++-	┼┼┼	+++			┝┥┽	++	++-		$\left + + + \right $
4.2.1	Design 2	4	13/07/23	16/07/23	╋	┝┾┾┽	++	-+++	╶┼┼┼┽┽┾┾╵	-		┟╌╂╼┠╸		+-+-			+		┝╌╉╼╄╌╊	-	┝╍┝╌┥	+		++	╋╋	++		++	+++	++-	┼┼┼	+++	++-		┝┥┥	++	++	++	
4.2.2	Build Prototype 2	17	17/07/23	02/08/23	╬╬╬	┝┾┾┽	+++	┽┽┽	╅╅╅		- - - -	╈		++-					┝╅╌┾╌┾	++	┝╌┝╌┝╴┥			++	+ + +	++		++-	++-		╁╼╁╼┾╌	┼┼┼	++-		┢╍┿╸	++	++		┝╼┾╼┥
4.2.3	User Evaluation 2	2	03/08/23	04/08/23		$\left + + + \right $	++	+++	╅╅╅		++	$\uparrow \uparrow \uparrow$					╋			++	$\left \right $	++	$\left \right $	+ +	++	++		++	++	++	┝┼┼╴	\dagger	++-		Ht	++	++-		┝┼┼┥
4.2.4	Refining Prototype 2	4	05/08/23	08/08/23	++++-	┝┾┾┽	+++	-+-+-+	╶┟╾╁╴╂╶┨╌┠╌		++-	┼┼┼		+			╈╋		┝┼┼┼	-+				++	+ + +	++		+	+++		┼┼┼	┼┼┼	+++-		┢┥╋	++	++-		
4.3	Third Iteration	27	09/08/23	04/09/23		$\left + + + \right $	++	+++	+++++		++-	$\uparrow \uparrow \uparrow \uparrow$	+++	++	+++		+++		┟┽┼┼	++				++				++				+++			┝┽┽	++	++		
4.3.1	Design 3	4	09/08/23	12/08/23	+++++	┝┾┾┽		-+++			tt		ttt	++-						++													++-		H	++-	++-		
4.3.2	Build Prototype 3	17	13/08/23	29/08/23	╋	┝┾┾┽		-+++	╺┼┼┼┽┽┤╸┾┄			┼┼┼		╋╋		┝╾╿╾┞╾┾╌┿	╋╋		┟┼┼┼	++-	┝╌┝╌┝							++-			┼╾┼╾┾╴	┼┼┼	+++-		┝╍┥╾┥╸	++-	++-		
4.3.3	User Evaluation 3	2	30/08/23	31/08/23		++++	++	+++	++++++		++	\dagger	\dagger	††-	+		\dagger			$^{++}$					+			++			╏╴╏╴╏	$\uparrow \uparrow \uparrow$	+++-		htt	++	++-		
4.3.4	Refining Prototype 3	4	01/09/23	04/09/23			11		++++++		++	┟┤╌┟╴	\dagger	++-			\uparrow			\dagger				++		++		++				\uparrow	+++-		rtt	++-	++-		
3.0	Final Implementation	10	05/09/23	14/09/23							+++-	┟╌┥╼┥╸	+++	+++-			\uparrow			++-			+	++	┼╌┼─┼	-++		++					TT			5.	0 Final	Implem	nentation
3.1	Testing	10	05/09/23	14/09/23			111	+++			++	† †-†-	\dagger	11					İ	++				+	1-1-1	11		+	\dagger							++	Π	TT	ITT
3.1.1	Unit Testing	4	05/09/23	08/09/23	++++	$\left + + + \right $	++	+++	+++++		++	\dagger	\dagger	$^{++}$	+++		\dagger		$\uparrow \uparrow \uparrow \uparrow$	$^{++}$		++	$\left - \right $	++	\dagger	++	+++	++	\dagger	+	┼╌┼╌┝╸	$\uparrow \uparrow \uparrow$	++-			++	++-	++	
3.1.2	Integration Testing	3	09/09/23	11/09/23	╋	┝┾┾┽	++	+++	╋╋		++	┼┼┼		++	+		++	-	┟┼┼┼	++-				++	╈	++		++	+		┼┼┼		++-		┢╋╋	++	++-		
3.1.3	User Acceptance Testing	3	12/09/23	14/09/23		┝┼┼┤	+++		┥┽┽┽┼┼		++	┼┼┼	\dagger	++	+++		┼┼┼		┟┼┼┤	++		++-	┝┅┿╍┥	++	┼╌┼╌┼	++		+	+++		┼┼┼	┼┼┼			┢╇	++	++-	++	
							11				11	111	111		11		111	1		11				11		11	111	11		11	111				111				

Appendix F Prototype

Medico	Welcome to Use I Appointment Application
	Login
	Register Now

The Main Page before login

Lo	ogin
Email	
Password	Forget Passv

The Login Module



Forget Password Module

First Nam	e	
Last Nam	ıe	
IC No		
Phone Num	ber	
Email add	lress	
Password (1	0+ characters)	
Confirm Pas	sword	

Register Account Module
+	
	Hi, Chia Wei Qiang Edit Prifile
ප	Name Chia Wei Qiang
ᄴ	Date Of Brith 21 May 2000
ợ '	Gender Male
۵	Phone Number +60123456789
	Email Address cwq0521@1utar.my

Manage Profile module

	Name Position	0
Available Date Time	2023	
9:00 a.m.	1:00p.m.	4:00p.m.
10:00 a.m.	2:00p.m.	5:00p.m.
11:00 a.m.	3:00 p.m.	8:00p.m.
Doctor infomatio	on	

View Doctor Information module

Search	
Search	_Q I≣
Name Position	>
Daily Available time	
Position	>
Daily Available time	
A Name Position	>

Search Module



Door-to-door service module

New	Address
Name	
Contact Number	
Address 1	
Address 2	
Postcode	
State	
	Submit

the sub-flow of the door-to-door service

	Booking
8	Name Position
Date ti When: S	me at, 22/04. 10:00 a.m.
the Re	ason come to visit ?
	.
First Yes	time to see?
	Book Now

Book Appointment Module

Appendix G Usability Survey Form

Participant 1

Level (1-Strongly disa	Level (1-Strongly disagree, 2-Disagree, 3-Neutral, 4-Agree, 5-Strongly Agree) *							
	1	2	3	4	5			
I found I would like to use this mobile application frequently	0	0	0	۲	0			
l found the application unnecessarily complex	۲	0	0	0	0			
I found the application was easy to use	0	0	0	0	۲			
I found I need technical support to use the application	۲	0	0	0	0			
I found that various functions in this mobile application were well integrated.	0	0	0	۲	0			
I thought there was too much inconsistency in this application	۲	0	0	0	0			
l image that most people would learn to use this app quickly.	0	0	0	0	۲			
I found application very difficult and tricky to use	۲	0	0	0	0			
I felt confident using this application	0	0	0	0	۲			
I think I need to learn before use this application	۲	0	0	0	0			



Level (1-Strongly disagree, 2-Disagree, 3-Neutral, 4-Agree, 5-Strongly Agree) *

	1	2	3	4	5
I found I would like to use this mobile application frequently	0	0	0	0	۲
I found the application unnecessarily complex	۲	0	0	0	0
I found the application was easy to use	0	0	0	0	۲
I found I need technical support to use the application	۲	0	0	0	0
I found that various functions in this mobile application were well integrated.	0	0	0	0	۲
I thought there was too much inconsistency in this application	۲	0	0	0	0
l image that most people would learn to use this app quickly.	0	0	0	0	۲
l found application very difficult and tricky to use	۲	0	0	0	0
I felt confident using this application	0	0	0	0	۲
I think I need to learn before use this application	۲	0	0	0	0

How likely are you recommend this application with other? *

Level (1-Strongly disagree, 2-Disagree, 3-Neutral, 4-Agree, 5-Strongly Agree) *

	1	2	3	4	5
I found I would like to use this mobile application frequently	0	0	0	0	۲
I found the application unnecessarily complex	0	۲	0	0	0
I found the application was easy to use	0	0	۲	0	0
I found I need technical support to use the application	0	۲	0	0	0
I found that various functions in this mobile application were well integrated.	0	0	0	۲	0
I thought there was too much inconsistency in this application	۲	0	0	0	0
l image that most people would learn to use this app quickly.	0	0	0	۲	0
I found application very difficult and tricky to use	0	۲	0	0	0
l felt confident using this application	0	0	0	۲	0
I think I need to learn before use this application	0	0	۲	0	0

Level (1-Strongly disagree, 2-Disagree, 3-Neutral, 4-Agree, 5-Strongly Agree) *

	1	2	3	4	5
I found I would like to use this mobile application frequently	0	0	۲	0	0
I found the application unnecessarily complex	0	0	۲	0	0
I found the application was easy to use	0	0	۲	0	0
I found I need technical support to use the application	0	0	۲	0	0
I found that various functions in this mobile application were well integrated.	0	0	۲	0	0
I thought there was too much inconsistency in this application	0	0	•	0	0
l image that most people would learn to use this app quickly.	0	0	۲	0	0
I found application very difficult and tricky to use	0	0	۲	0	0
I felt confident using this application	0	0	۲	0	0
I think I need to learn before use this application	0	0	۲	0	0

How likely are you recommend this application with other? *

Level (1-Strongly disa	agree, 2-Disagi	ree, 3-Neutral, 4-A	Agree, 5-Strongly	Agree) *	
	1	2	3	4	5
I found I would like to use this mobile application frequently	0	0	۲	0	0
I found the application unnecessarily complex	0	۲	0	0	0
I found the application was easy to use	0	0	0	0	۲
I found I need technical support to use the application	۲	0	0	0	0
l found that various functions in this mobile application were well integrated.	0	0	0	۲	0
l thought there was too much inconsistency in this application	۲	0	0	0	0
l image that most people would learn to use this app quickly.	0	0	0	0	۲
l found application very difficult and tricky to use	۲	0	0	0	0
l felt confident using this application	0	0	0	۲	0
l think 1 need to learn before use this application	۲	0	0	0	0

	0	1	2	3	4	5	6	7	8	9	10	
Not Likely	0	0	0	0	0	0	0	0	۲	0	0	Extremely

Level (1-Strongly disagree, 2-Disagree, 3-Neutral, 4-Agree, 5-Strongly Agree) *

	1	2	3	4	5
I found I would like to use this mobile application frequently	0	0	0	۲	0
I found the application unnecessarily complex	0	۲	0	0	0
I found the application was easy to use	0	0	0	۲	0
I found I need technical support to use the application	0	۲	0	0	0
I found that various functions in this mobile application were well integrated.	0	0	0	۲	0
I thought there was too much inconsistency in this application	0	۲	0	0	0
l image that most people would learn to use this app quickly.	0	0	0	۲	0
l found application very difficult and tricky to use	0	۲	0	0	0
I felt confident using this application	0	0	0	۲	0
I think I need to learn before use this application	0	۲	0	0	0

	0	1	2	3	4	5	6	7	8	9	10	
Not Likely	0	0	0	0	0	0	•	0	0	0	0	Extremely

Level (1-Strongly disagree, 2-Disagree, 3-Neutral, 4-Agree, 5-Strongly Agree) *

		4	3	4	5
I found I would like to use this mobile application frequently	0	0	۲	0	0
I found the application unnecessarily complex	0	0	۲	0	0
I found the application was easy to use	0	0	0	۲	0
I found I need technical support to use the application	0	۲	0	0	0
I found that various functions in this mobile application were well integrated.	0	0	۲	0	0
I thought there was too much inconsistency in this application	0	۲	0	0	0
l image that most people would learn to use this app quickly.	0	0	0	۲	0
I found application very difficult and tricky to use	0	۲	0	0	0
l felt confident using this application	0	0	۲	0	0
I think I need to	0	۲	0	0	0

	0	1	2	з	4	5	6	7	8	9	10	
Not Likely	0	0	0	0	0	۲	0	0	0	0	0	Extremely

Level (1-Strongly disagree, 2-Disagree, 3-Neutral, 4-Agree, 5-Strongly Agree) *

	1	2	3	4	5
I found I would like to use this mobile application frequently	0	0	0	۲	0
I found the application unnecessarily complex	0	۲	0	0	0
I found the application was easy to use	0	0	0	۲	0
I found I need technical support to use the application	0	۲	0	0	0
I found that various functions in this mobile application were well integrated.	0	0	0	۲	0
I thought there was too much inconsistency in this application	0	۲	0	0	0
l image that most people would learn to use this app quickly.	0	0	0	۲	0
l found application very difficult and tricky to use	0	۲	0	0	0
I felt confident using this application	0	0	0	۲	0
I think I need to learn before use this application	0	۲	0	0	0

How likely are you recommend this application with other? *

Level (1-Strongly disagree, 2-Disagree, 3-Neutral, 4-Agree, 5-Strongly Agree) *

	1	2	3	4	5
I found I would like to use this mobile application frequently	0	0	0	۲	0
I found the application unnecessarily complex	۲	0	0	0	0
I found the application was easy to use	0	0	0	0	۲
I found I need technical support to use the application	0	۲	0	0	0
I found that various functions in this mobile application were well integrated.	0	0	0	۲	0
I thought there was too much inconsistency in this application	۲	0	0	0	0
l image that most people would learn to use this app quickly.	0	0	0	0	۲
I found application very difficult and tricky to use	۲	0	0	0	0
l felt confident using this application	0	0	0	۲	0
I think I need to learn before use this application	0	۲	0	0	0

How likely are you recommend this application with other? *

Level (1-Strongly disagree, 2-Disagree, 3-Neutral, 4-Agree, 5-Strongly Agree) *

	1	2	3	4	5
I found I would like to use this mobile application frequently	0	0	0	0	۲
I found the application unnecessarily complex	۲	0	0	0	0
l found the application was easy to use	0	0	0	0	۲
I found I need technical support to use the application	۲	0	0	0	0
I found that various functions in this mobile application were well integrated.	0	0	0	0	۲
I thought there was too much inconsistency in this application	۲	0	0	0	0
l image that most people would learn to use this app quickly.	0	0	0	0	۲
l found application very difficult and tricky to use	۲	0	0	0	0
l felt confident using this application	0	0	0	0	۲
I think I need to learn before use this application	۲	0	0	0	0

How likely are you recommend this application with other? *

Level (1-Strongly disagree, 2-Disagree, 3-Neutral, 4-Agree, 5-Strongly Agree) *

	1	2	3	4	5
I found I would like to use this mobile application frequently	0	0	۲	0	0
I found the application unnecessarily complex	0	0	۲	0	0
I found the application was easy to use	0	0	۲	0	0
I found I need technical support to use the application	0	0	۲	0	0
I found that various functions in this mobile application were well integrated.	0	0	۲	0	0
I thought there was too much inconsistency in this application	0	0	۲	0	0
l image that most people would learn to use this app quickly.	0	0	۲	0	0
I found application very difficult and tricky to use	0	0	۲	0	0
I felt confident using this application	0	0	۲	0	0
I think I need to learn before use this application	0	0	۲	0	0

	0	1	2	3	4	5	6	7	8	9	10	
Not Likely	0	0	0	0	0	۲	0	0	0	0	0	Extremely

Level (1-Strongly disagree, 2-Disagree, 3-Neutral, 4-Agree, 5-Strongly Agree) *

	1	2	3	4	5
I found I would like to use this mobile application frequently	0	0	0	0	۲
I found the application unnecessarily complex	۲	0	0	0	0
I found the application was easy to use	0	0	0	0	۲
I found I need technical support to use the application	۲	0	0	0	0
I found that various functions in this mobile application were well integrated.	0	0	0	0	۲
I thought there was too much inconsistency in this application	۲	0	0	0	0
l image that most people would learn to use this app quickly.	0	0	0	0	۲
l found application very difficult and tricky to use	۲	0	0	0	0
I felt confident using this application	0	0	0	0	۲
I think I need to learn before use this application	۲	0	0	0	0

	0	1	2	З	4	5	6	7	8	9	10	
Not Likely	0	0	0	0	0	0	0	0	0	۲	0	Extremely

Level (1-Strongly disagree, 2-Disagree, 3-Neutral, 4-Agree, 5-Strongly Agree) *

	1	2	3	4	5
I found I would like to use this mobile application frequently	0	۲	0	0	0
I found the application unnecessarily complex	0	0	0	۲	0
I found the application was easy to use	0	۲	0	0	0
I found I need technical support to use the application	0	0	0	۲	0
I found that various functions in this mobile application were well integrated.	0	۲	0	0	0
I thought there was too much inconsistency in this application	0	0	0	۲	0
l image that most people would learn to use this app quickly.	0	۲	0	0	0
l found application very difficult and tricky to use	0	0	0	۲	0
I felt confident using this application	0	۲	0	0	0
I think I need to learn before use this application	0	0	0	۲	0

How likely are you recommend this application with other? *

Level (1-Strongly disagree, 2-Disagree, 3-Neutral, 4-Agree, 5-Strongly Agree) *

	1	2	3	4	5
I found I would like to use this mobile application frequently	0	۲	0	0	0
l found the application unnecessarily complex	۲	0	0	0	0
I found the application was easy to use	0	0	0	0	۲
I found I need technical support to use the application	0	۲	0	0	0
I found that various functions in this mobile application were well integrated.	0	0	0	۲	0
I thought there was too much inconsistency in this application	۲	0	0	0	0
l image that most people would learn to use this app quickly.	0	0	0	0	۲
l found application very difficult and tricky to use	۲	0	0	0	0
l felt confident using this application	0	0	0	۲	0
I think I need to learn before use this application	0	۲	0	0	0

	0	1	2	3	4	5	6	7	8	9	10	
Not Likely	0	0	0	0	0	0	0	•	0	0	0	Extremely

Level (1-Strongly disagree, 2-Disagree, 3-Neutral, 4-Agree, 5-Strongly Agree) *

	1	2	3	4	5
I found I would like to use this mobile application frequently	0	0	0	۲	0
I found the application unnecessarily complex	۲	0	0	0	0
I found the application was easy to use	0	0	0	۲	0
I found I need technical support to use the application	۲	0	0	0	0
I found that various functions in this mobile application were well integrated.	0	0	0	۲	0
I thought there was too much inconsistency in this application	۲	0	0	0	0
l image that most people would learn to use this app quickly.	0	0	0	۲	0
l found application very difficult and tricky to use	۲	0	0	0	0
I felt confident using this application	0	0	0	۲	0
I think I need to learn before use this application	۲	0	0	0	0

	0	1	2	3	4	5	6	7	8	9	10	
Not Likely	0	0	0	0	0	0	0	0	۲	0	0	Extremely

	User Accepted Testing							
UAT Test ID: UAT-PF-001		Tester Name:	Module: Patient Date:	:				
Test Case	Test Case Type	Test Scenario (TS) and Expected Result (ER)	Prerequisites and Test Data	Status				
ID								
UAT-001	Register	TS:	Prerequisites :					
		1. Patient enter all the necessary data info	The email need unique and all data					
		2. Patient click the register button	need valid.					
		ER:						
		1. Patient successful created new account.	Test Data:					
			All need data					
UAT-002	Login	TS:	Prerequisites :					
		1. Patient enter the email and password	Patient need to have a account.					
		2. Patient click the login button						
		ER:	Test Data:					
		1. Patient will login to home page.	Email and password					
UAT-003	User Profile	TS:	Prerequisites :					
		1. Patient click the profile button	Patient must have logged into the					
		2. Patient view their personal details	application.					

Appendix H User Accepted Testing Patient Form Template

		3. Patient click edit profile button		
		4. Patient fill in all info	Test Data:	
		5. Patient click update button	Changed data	
		ER:		
		1. Patient will able to view their personal details		
		2. Patient will get the update success massage.		
UAT-004	Search	TS:	Prerequisites :	
		1. Patient click the search button.	Patient must have logged into the	
		2. Patient enter the doctor name.	application.	
		ER:		
		1. Patient will get the search result	Test Data:	
			Input the name	
UAT-005	Doctor profile	TS:	Prerequisites :	
		1. Patient click a doctor.	Patient must have logged into the	
		2. Patient view the doctor background information and	application.	
		available date and time slot.		
		ER:	Test Data:	
		1. Patient will able to view the doctor information.	N/A	

UAT-006	Create	TS:	Prerequisites :
	appointment	1. Patient click the time slot.	Patient must have logged into the
		2. Select the first time and Reason.	application.
		3. Click the booking button.	
		ER:	Test Data:
		1. Patient will successful created a new appointment	first time and reason
		with pending status.	
UAT-007	View Pending	TS:	Prerequisites :
	appointment	1. Patient click the manage appointment button.	Patient must have logged into the
		2. Patient click the pending segmented button	application.
		ER:	
		1. Patient will able to view the new pending	Test Data:
		appointment.	N/A
UAT-008	Cancel pending	TS:	Prerequisites :
	status	1. Patient click the cancel button at the bottom of	Patient must have logged into the
	appointment	appointment.	application.
		ER:	
		1. Patient will able to cancel the pending appointment	Test Data:
			N/A

UAT-009	View Upcoming	TS:	Prerequisites :
	appointment	1. Patient click the Upcoming segmented button	Patient must have logged into the
		ER:	application.
		1. Patient will able to view the accepted and upcoming	
		appointment.	Test Data:
			N/A
UAT-010	Cancel Accepted	TS:	Prerequisites :
	status/ Upcoming	1. Patient click the cancel button at the bottom of	Patient must have logged into the
	appointment	appointment.	application.
		ER:	
		1. Patient will able to cancel the accepted/upcoming	Test Data:
		appointment	N/A
UAT-011	Appointment	TS:	Prerequisites :
	history	1. Patient click the History segmented button	Patient must have logged into the
		2. Patient click one of the appointment	application.
		3. Patient can view the appointment detail	
		ER:	Test Data:
		1. Patient will able to view the completed and canceled	N/A
		appointment.	

UAT-012	Register Organ	TS:	Prerequisites :
	Transplant	1. Patient click the organ transplant button from	Patient must have logged into the
	patient	drawer.	application.
		2. Patient click the register button	
		3. Patient select the organ needed and blood type.	Test Data:
		4. Patient click the register button	Order needed and blood type
		ER:	
		1. Patient successful register as a organ transplant	
		patient.	
UAT-013	View Organ	TS:	Prerequisites :
	Transplant	1. Patient click the organ transplant button from	Patient must have logged into the
	details	drawer.	application.
		2. Patient can view the organ transplant detail and	
		status.	Test Data:
			N/A
		ER:	
		1. Patient will able to see the organ transplant detail	
		and status result.	

UAT-014	Notification	TS:	Prerequisites :
		1. Patient click the notification button	Patient must have logged into the
		2. Patient can view the appointment.	application.
		ER:	
		1. Patient able to check the appointment status and	Test Data:
		upcoming appointment.	N/A
UAT-015	Rating &	TS:	Prerequisites :
	Feedback	1. Patient click the rating & feedback button from	Patient must have logged into the
		drawer.	application.
		2. Patient can see all the unrated completed	
		appointment.	Test Data:
		3. Patient click to the appointment.	Rate and feedback
		4. Patient select rate and enter feedback	
		5. Patient click the submit button.	
		ER:	
		1. Patient will able to see all the unrated completed	
		appointment.	
		2. Patient can update the rate and feedback to the	

		appointment.		
UAT-016	Logout	TS:	Prerequisites :	
		1. Patient click the logout button	Patient must have logged into the	
		2. Patient logged out from the application.	application.	
		ER:	Test Data:	
		1. Patient will be successfully logged out from the	N/A	
		application.		

		User Accepted Testing				
UAT Test ID: UAT-DF001		Tester Name:	Module: Doctor	Date:		
Test Case	Test Case	Test Scenario (TS) and Expected Result (ER)	Prerequisites and Test Data			
ID	Туре					
UAT-001	Login	TS:	Prerequisites :			
		1. Doctor enter the email and password	Doctor need to have a	account.		
		2. Doctor click the login button				
			Test Data:			
		ER:	Email and password			
		1. Doctor will login to home page.				
UAT-002	User Profile	TS:	Prerequisites :			
		1. Doctor click the profile button	Doctor must have lo	ogged into the		
		2. Doctor view their personal details	application.			
		3. Doctor click edit profile button				
		4. Doctor fill in all info	Test Data:			
		5. Doctor click update button	Changed data			
		ER:				
		1. Doctor will able to view their personal details				
		2. Doctor will get the update success massage.				

Appendix I User Accepted Testing Doctor Form Template

UAT-003	View Pending	TS:	Prerequisites :
	appointment	1. Doctor click the manage appointment button.	Doctor must have logged into the
		2. Doctor click the pending segmented button	application.
		ER:	Test Data:
		1. Doctor will able to view the new pending appointment.	N/A
UAT-004	Accept	TS:	Prerequisites :
	pending	1. Doctor click the accept button at the bottom of	Doctor must have logged into the
	status	appointment.	application.
	appointment		
		ER:	Test Data:
		1. Doctor will able to accept the pending appointment	N/A
UAT-005	Cancel	TS:	Prerequisites :
	pending	1. Doctor click the cancel button at the bottom of	Doctor must have logged into the
	status	appointment.	application.
	appointment		
		ER:	Test Data:
		1. Doctor will able to cancel the pending appointment	N/A

UAT-006	View	TS:	Prerequisites :
	Upcoming	1. Doctor click the Upcoming segmented button	Doctor must have logged into the
	appointment		application.
		ER:	
		1. Doctor will able to view the accepted and upcoming	Test Data:
		appointment.	N/A
UAT-007	Cancel	TS:	Prerequisites :
	Accepted	1. Doctor click the cancel button at the bottom of	Doctor must have logged into the
	status/	appointment.	application.
	Upcoming	ER:	
	appointment	1. Doctor will able to cancel the accepted/upcoming	Test Data:
		appointment	N/A
UAT-008	Appointment	TS:	Prerequisites :
	history	1. Doctor click the History segmented button	Doctor must have logged into the
		2. Doctor click one of the appointment	application.
		3. Doctor can view the appointment detail	
		4. ER :	Test Data:
		2. Doctor will able to view the completed and canceled	N/A
		appointment.	

UAT-009	View pending	TS:	Prerequisites :	
	Organ	1. Doctor click the manage organ transplant button from	Doctor must have logged into the	
	Transplant	drawer.	application.	
	patient	2. Doctor click the pending segmented button		
		3. Doctor can view the pending status organ transplant	Test Data:	
		patient lists.	N/A	
		ER:		
		1. Doctor will able to see the pending status organ		
		transplant detail and status result.		
UAT-010	Accept	TS:	Prerequisites :	
	pending	1. Doctor click the accept button at the bottom of organ	Doctor must have logged into the	
	status organ	transplant patient.	application.	
	transplant	ER:		
	patient	1. Doctor will able to accept the pending organ transplant	Test Data:	
		patient	N/A	
UAT-011	Cancel	TS:	Prerequisites :	
	pending	1. Doctor click the cancel button at the bottom of organ	Doctor must have logged into the	
	status organ	transplant patient.	application.	

	transplant	ER:		
	patient	1. Doctor will able to cancel the pending organ transplant	Test Data:	
		patient	N/A	
UAT-012	View	TS:	Prerequisites :	
	Accepted	1. Doctor click the Accepted segmented button	Doctor must have logged into the	
	Organ	2. Doctor can view the Accepted status organ transplant	application.	
	Transplant	patient lists.		
	patient	ER:	Test Data:	
		1. Doctor will able to see the accepted status organ	N/A	
		transplant detail.		
UAT-013	Update the	TS:	Prerequisites :	
	accepted	1. Doctor click the completed button at the bottom of	Doctor must have logged into the	
	status organ	organ transplant patient.	application.	
	transplant	2. Doctor enter the provider name		
	patient	3. Doctor click the submit button	Test Data:	
			Provider name	
		ER:		
		1. Doctor will able to update the provider name and status		
		of the accepted status organ transplant patient.		

UAT-014	Organ	TS:	Prerequisites :
	Transplant	1. Doctor click the History segmented button	Doctor must have logged into the
	patient	2. Doctor can view the canceled and completed organ	application.
	history	transplant detail.	
		ER:	Test Data:
		1. Doctor will able to see the organ transplant detail and	N/A
		status result.	
UAT-015	Notification	TS:	Prerequisites :
		1. Doctor click the notification button	Doctor must have logged into the
		2. Doctor can view the appointment.	application.
		ER:	
		1. Doctor able to check the appointment status and	Test Data:
		upcoming appointment.	N/A
UAT-016	View the	TS:	Prerequisites :
	schedule	1. Doctor click the manage schedule button from drawer.	Doctor must have logged into the
		2. Doctor can view their available date and time slot.	application.
		ER:	
		1. Doctor will able to see their available and canceled time	Test Data:
		slot.	N/A

UAT-017	Update the	TS:	Prerequisites :
	schedule	1. Doctor select the date	Doctor must have logged into the
		2. Doctor click time slot to cancel the time.	application.
		3. Doctor click time slot to available the time.	
		4. Doctor click the update button.	Test Data:
		ER:	N/A
		1. Doctor will able to update their available and canceled	
		time slot.	
UAT-018	Medical	TS:	Prerequisites :
	comment	1. Doctor click the medical comment button from drawer.	Doctor must have logged into the
		2. Doctor can see all the uncomment accepted appointment.	application.
		3. Doctor click on the oappointment.	Test Data:
		4. Doctor enter the medical comment.	Medical comment
		5. Doctor click the submit button.	
		ER:	
		1. Doctor will able to see all the uncomment accepted appointment.	
		2. Doctor can update the medical record to the	

		appointment		
UAT-019	Logout	TS:	Prerequisites :	
		1. Doctor click the logout button	Doctor must have logged into the	
		2. Doctor logged out from the application.	application.	
		ER:	Test Data:	
		1. Doctor will be successfully logged out from the application.	N/A	

Appendix J FYP 1 Feedback

Project title:	Medical appointment application
Student Name	CHIA WEI QIANG
Supervisor	Gunavathi a/p Duraisamy
Moderator	Nawaf Hassan Mohammed Mohsen Shrifan

Key Assessment for Project Proposal	Supervisor Comments/Remarks	Moderator Comments/Remarks
Project Description	Problem need to include some citation and survey finding.	Problem statement is clear but need to be shorter without subtitling. One paragraph for
- Is the problem or need to be addressed clearly presented?		each problem.
- Is the proposed approach or solution clearly presented and justified?		
Project Scope and Objectives - Is the scope of the project clearly defined? - Are the objectives of the project clearly specified? - Are the project scope and objectives appropriate for a final year project?	Objectives need to refine.	Objectives are appropriate with minor corrections. Objective 2 need to be shorter as one sentence such as "To develop an efficient mobile-based application for enhancing patient's appointment management". Objective 3 no need to evaluate web-based management with your application. It is better to compare with other mobile applications. Project scope need to be about the segment of study such as certain area hospital or clinic, mobile platforms or web-based application, software used, testing evaluation for some criteria.
Literature Review / Fact Finding for Benchmarking / Verification of Project - Are sources for literature review / fact finding appropriate? - Is information from literature review / fact finding relevant and adequate? - Is information from literature review / fact finding clearly presented and discussed?	ok	Literature review is adequate. However, Student needs to link the Tables and Figures to their discussion. For example, Figure 2.3 shows Agile development methodology which includes several stages such as plan, design, etc. Revise and check the entire report.
Research/Development Methodology and Development Tools - Is the methodology for the project clearly described and discussed? - Are the required development tools clearly described and discussed? - Are the stated methodology and development tools appropriate?	ok	Development tools are detailed and suitable to carry out the project
 Project Plan Are the phases and tasks of the project properly defined and planned? Are the phases and tasks consistent with the methodology of the project? 	ok	Phases and tasks of the project are defined
Initial Deliverables - Are deliverables (e.g. use case diagrams and descriptions) of initial phases of	ok	
the project plan included in the report?		Initial Deliverables are appropriate

Project title:	Medical appointment application
Student Name	CHIA WEI QIANG
Supervisor	Gunavathi a/p Duraisamy
Moderator	Nawaf Hassan Mohammed Mohsen Shrifan

Key Assessment for Project Proposal	Supervisor Comments/Remarks	Moderator Comments/Remarks
Report Structure and References	Refer to marked report	
 Is the report organised in a logical structure? Are references listed in accordance to Harvard format? 		
Language and Clarity of Writing	Refer to marked report	
 Are the sentences concise and understandable? Are there spelling and grammar issues? 		