HEALTHCARE INFORMATION SYSTEM FOR AUDIOLOGY DEPARTMENT

(IIUM Hearing & Speech Clinic System)

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Bachelor Of Computer Science (Software Engineering) With Honors

UNIVERSITI MALAYSIA PAHANG

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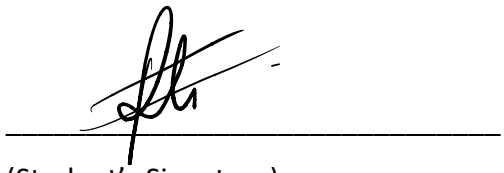

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Thesis submitted in fulfillment of the requirements
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ABSTRAK

Banyak industri kesihatan dalam bidang audiologi masih menggunakan cara manual apabila melakukan sesuatu kerja yang berkaitan dengan kesihatan seperti menyimpan data pesakit dan lain-lain. Oleh itu, IIUM Hearing & Speech Clinic Sistem telah disediakan untuk memudahkan pengguna dalam bidang kesihatan tidak kira staf, doctor atau pesakit untuk menggunakannya. Sistem ini dapat membantu pengguna apabila pesakit ingin berjumpa doctor, mereka boleh membuat temujanji dalam sistem tersebut secara online. Staf klinik juga boleh mengakses web sistem tersebut untuk memudahkan kerja dengan mengawal informasi pesakit. Sistem ini juga memudahkan doctor untuk mencari data pesakit kerana sistem akan menyediakan data dari pangkalan data. Selain itu, pesakit jugak boleh mengisi maklumat di dalam sistem untuk disimpan di dalam pangkalan data. Bagi staf, mereka boleh melihat statistik daripada sistem. Doktor boleh membuat report menggunakan sistem tersebut secara online mengikut data pesakit di dalam pangkalan data yang telah tersedia. Hal ini, memudahkan kerja para pengguna dan menjimat masa dan tenaga.

ABSTRACT

Health industries in the field of audiology are still using manual methods when it come to health-related work such as managing patient data and others. Therefore, the IIUM Hearing & Speech Clinic System has been provided to facilitate users in the field of health regardless of staff, doctors or patients to use it. This system helps users when patients want to see a doctor, they can make an appointment in the system online. Clinic staff can also access the system's web to facilitate work by controlling patient information. The system also makes it easier for doctors to find patient data because the system will provide data from a database. In addition, patients can also fill in the information in the system to be stored in the database. For staff, they can view statistics from the system. Doctors can make reports using the system online according to patient data in the database that is already available. This, simplifies the work of users and saves time and energy.

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CHAPTER 1

INTRODUCTION

1.1 Introduction

The word audiology is made up of two roots: Audio and Logy where 'Audio' means 'Hear' and 'logy' means 'the study of'. In medical terms, it is the branch of science dedicated to the study of hearing, balance and their associated disorders (Cashmere Lashkari, 2019). There are several treatments that can be done by audiologist that performs audiology by detecting hearing disorders. Audiologists aim to determine whether someone has normal sensitivity to sounds. Apart from that, there are also several diagnostic tests that can be perform to anyone that are having hearing disorders. Type of diagnosis will be depend on the symptoms that patients is complaining about. Basically, patients have to go through a diagnosis process before proceed to specific treatments with specialists. This is to ensure the symptoms that patients are having is suitable to continue with treatments.

Generally, The history of audiology began somewhere in 4th century BC, The famous Greek doctor believed that hearing loss was related to the direction of the wind, change in weather and tinnitus. Following World War II, a number of servicemen returned home with noise-induced hearing loss, giving a boost to the field of audiology in the late 1940s. Their rehabilitation programmes were crucial in advancing science. In reality, the term "audiology" was originally published in 1946 in the Journal of Speech Disorders and the Volta Review.

Audiological services were introduced in Malaysia by the American Peace Corps and the British Voluntary Service Overseas organization in the 1960s (Malaysian Association of SpeechLanguage and Hearing [MASH], 2016) and have grown rapidly in Malaysia since the introduction of the first audiology training program in 1995 (Faculty of Health Sciences, 2016).

The field of audiology has always been reliant on the available technologies. Technology based gadgets are required for measuring hearing loss, assessing the impact of the

loss on the patient's capacity to communicate, and rehabilitating with hearing aids. The aim is to provide hearing and speech.

1.2 Problem Statements

The healthcare sector in Malaysia today has a department dedicated to audiology that might be considered one of importance. The number of persons who struggle with their speech and hearing grows yearly. This encompasses all ages. Due to the fact that there are more patients than there are staff members or doctors to service them, these issues produce queueing and scheduling issues in clinics and hospitals. The majority of clinics and hospitals address these issues inefficiently, which causes extra issues. The way of they manage the patient's record is mostly by recorded in paper chart which were stored in office filing. Patient's record must be appropriately stored, secured and maintained. After a period of time, they patient's record must be destroy. This can be improve by utilize a system or specifically health information system to manage everything regarding patient's data. Studies show that patient safety improve with the existence of electronic health record system or we can say health information system.

Hearing and Speech issues can appear at any time and without warning. Staff and doctor are the one that responsible for treating those patients. It is hard to get the patient's details at the first place, the only way they have is by having the patient to come to the clinics or hospitals face-to-face to diagnose the issue. This way will slow the process and making the time to diagnose even longer. By having the system, staff, doctor and patient can literally access the system anywhere and anytime.

There are still several audiology departments in clinics or hospitals that still provide a manual works of the management. In the world of emerging technologies, hospitals and clinics should have initiative to change their manual works to automated system. Technology advancement has changed the traditional methods of doing work and hence has increased productivity. Based on the statistics in Malaysia, there are 21.57% or one fifth of the population that are having hearing loss and ear diseases and the number keep increasing according to the ages. This depicts that number of patients for audiology department increase. Thus, appointments, treatments and diagnosis will increase as well. Audiology department will keep a tight schedule and the works will be overload. This matter can be cope by monitoring patients

through online and if they had symptoms that will lead to something worst, audiologist can make an appointment for the patients through the system. This will save a lot of time, energy and cost for the patients and the healthcare professionals.

1.3 Objectives

Based on problem statements, the objectives of the project are:

I. To study the features that can be implement in developing a Healthcare Information System for Audiology Industry and automated the traditional methods of work.

II. To develop a web-based application called Health Information System to manage patient's appointment and diagnose the patient's issue through the system.

III. To test the application whether it satisfies and fulfils the project requirements.

1.4 Scope

Among the scopes of this project are:

3.1.3 User Scope :

I. Audiologist in Audiology Department
II. Patients
III. Clinic Staff

3.1.4 System Scope :

I. Health Information System will be used as a patient management by the staff and doctor.

II. Health Information System will be used by the patient to make appointment booking and keep track of their health.

3.1.5 Development Scope :

I. Using Laravel, Visual Studio Code and Digital Ocean.

1.5 Significant of projects

A. Patients

- Patients can save their time and energy by using the system without actually going to the clinic physically to get monitored by the healthcare professionals.
- Patients can also save some cost such as transportations, appointments and etc.

B. Audiologist

- The workloads will be ease as audiologist can make an appointment only when the patient is really needed to have a treatments.

1.6 Report organization

This report consists of five chapter. Chapter 1 discussing on the introduction audiology, the problem statement, the objective, the scope, and the significance of the project. Chapter 2 discussing the literature review of three existing system and the comparison analysis of these existing system.

Chapter 3 discussing the methodology that being applied for the project development which the design & interface proposed, and hardware & software specification will be mentioned.

Chapter 4 discussing about the implementations, the results, and discussion that being obtained through the developed prototype.

Chapter 5 discussing about the limitation of the proposed project and suggestions for improvement in the future work.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

This chapter contains the study of literature review. It covers the meaning of healthcare and why is it should be digitize into new method of doing works. It also explains about feature that need to be implement in the project. It explain about the process and procedures of audiology in a traditional method to have a wide knowledge how the process can be turn digitalization.

2.2 Digitalization in healthcare

In the present day, healthcare has come to mean every aspect, service and device for taking care of your health. It has an impact on our ability to achieve life goals, lowers pain and suffering, aids in the prevention of premature loss of life, and gives information for life planning.

Almost no other sector in healthcare has as much potential for enhancing process efficiency, medical quality, and patient safety, and lastly, attaining long-term economic success as digitalization. Many industries have transform into digitalization efficiently except for healthcare industry. Knowing the availability of technologies, healthcare industry should be able to change and transform into digitalization to increase the productivity and efficiency. One of the first areas of focus for Industry 4.0 applications is operations related to healthcare services(Karatas et al., 2022). There are many traditional ways of doing works that can be digitize to ease it efficiently such as traditional services can be digitize into digitalized services. This services includes monitoring services, Dental care, Hearing care etc. Digital healthcare applications (such as acoustic reminder functions for taking medication at the right time) can contribute to raising therapy reliability as well as enhancing a prevention oriented lifestyle (e.g. through glucose monitoring, or movement control)(Healthcare, n.d.).

Health should be seen as a social and economic investment. The benefits of digitalization in healthcare is undeniable. Digital innovation allow patient to learn how to manage themselves. Digitization in healthcare gives us more freedom and security as compared to manual or paper based work. Digitalization in healthcare benefits the community and health industry in so many ways that allow both party to work efficiently.

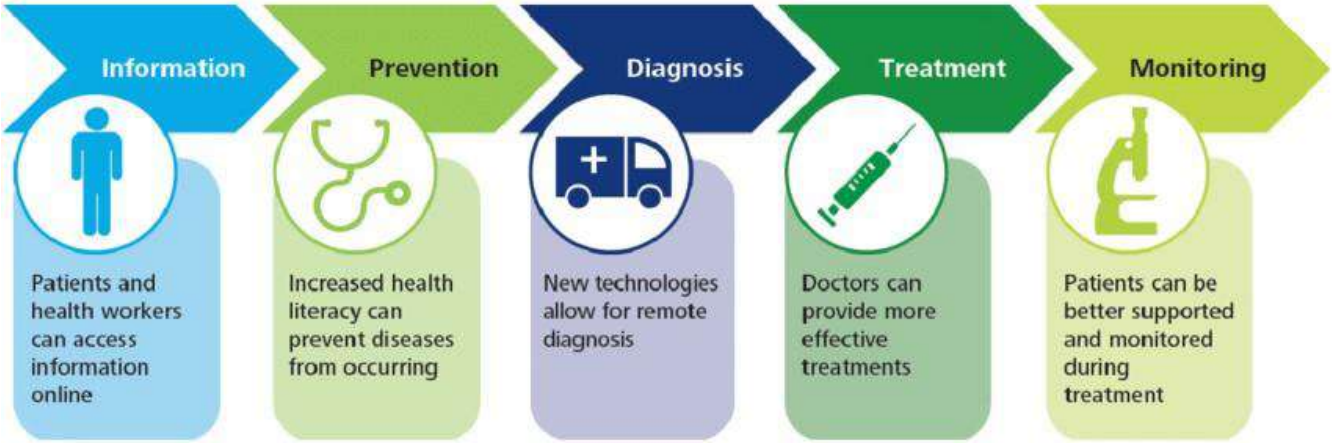


Figure 1 Digitalization

Source : https://www.researchgate.net/figure/Digitalization-improves-healthcare-through-manysteps-Williams-Strusani-2014_fig1_327138521/actions#reference

2.2.2 Electronic health records (EHRs)

Electronic Health Records (EHRs) are computerized medical information systems that collect, store and display patient's health and clinical information electronically. Access to patient data has the potential to improve clinical quality, patient safety, and efficiency. EHRs is the most commonly used database in healthcare. EHRs have provided numerous benefits for managing modern healthcare data. Researchers have examined the benefits of EHRs by considering clinical, organizational, and societal outcomes (Menachemi & Collum, 2011). EHRs is able to give a positive impact over the healthcare industry. EHRs can have a wide range of potential capabilities, but three in particular hold great promise for improving care quality and lowering costs at the health-care system level. Another benefits that can include in EHRs is to improve the ability to conduct research. Having patients data stored in system increase the availability of the data. Public health researchers are actively using electronic clinical data that are aggregated across populations to produce research that is beneficial to

society(Menachemi & Collum, 2011). However, EHRs are collected for patient care and not research but EHR data require a substantial amount of preprocessing in order to be transformed into research-ready datasets that can be statistically analyzed (Denaxas et al., 2017).

2.2.3 Audiology department in healthcare industry

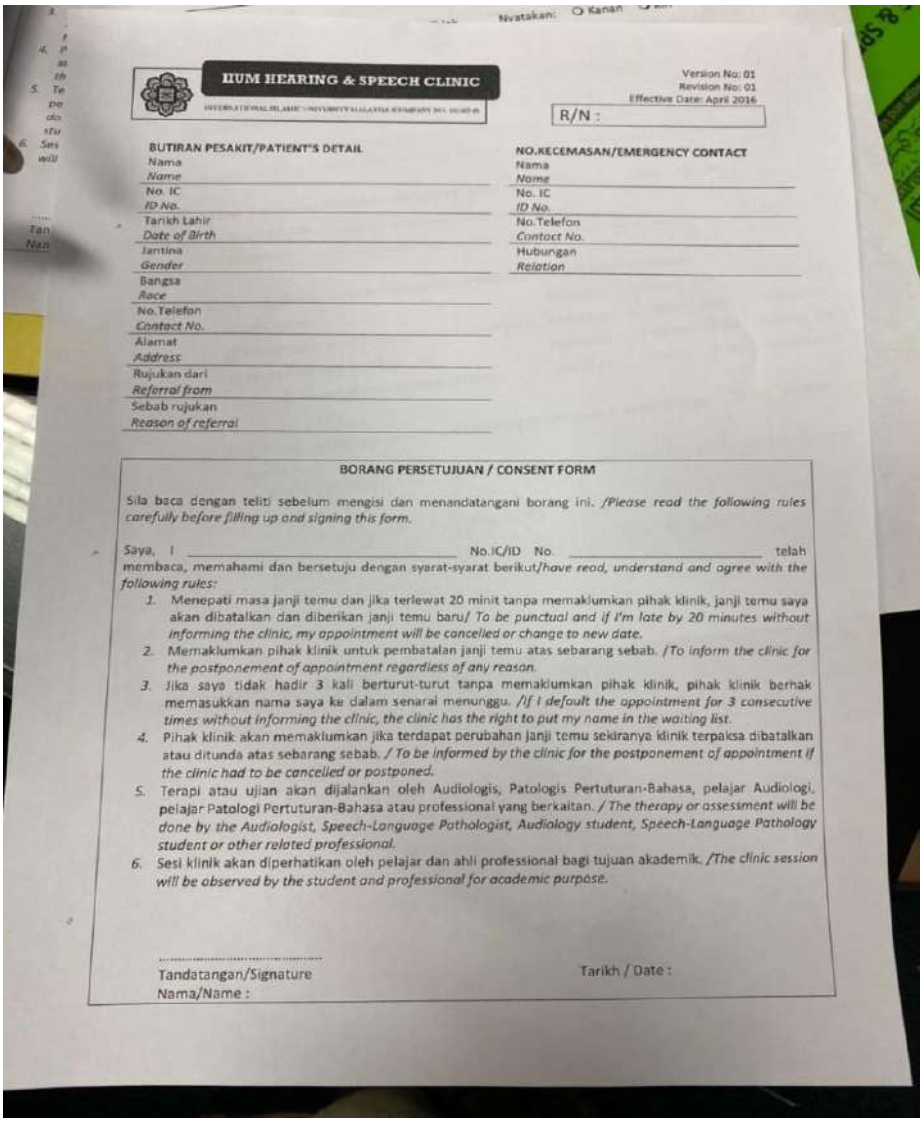
Audiology is one of the departments in healthcare industry that provides service for hearing loss and concentrates in hearing, balance and related communicative disorders. A person that performs audiology services are called audiologist. Audiologists are the one who responsible to identify, assess and manage disorders of hearing and communication. Hearing disorder is disturbance of the function of hearing while communication disorder is an impairment resulting from a speech, language or hearing disorder. Patients have to go through diagnosis at the first stage before audiologist decides the treatments needed to be done or not. All of this requires testing data from the patients. Audiologists play a crucial role in early identifications of disorders. Audiology diagnostic services is suitable to be done for people of all ages including infants. Usually, different locations such as clinics or hospitals that provide audiology services have different test and procedures. The main appointment types for adult patients include an assessment, hearing aid fittings and review appointments(Gahan & Kane, 2018). For children, they gonna have a different type of appointments.

According to Department of Audiology in International Islamic University Malaysia, Different techniques will be conducted differently for children and adult. There are many type of testing that can be execute to identify the problem having by the patients. For an example, Air-conduction and boneconduction testing, hearing sensitivity and etc. Typically testing will be conducted using frequency. For an example, extended high-frequency(EHF) range from 8-16kHz. All results of testing will be recorded in audiogram. Audiogram is used by hearing specialist to record and interpret the data received from the testing. Only audiologists can have accurate interpretation of the data. People that are having hearing disorder can go through the diagnosis and treatments before they get to use a hearing aid if necessary, depends on the disorder that they are having.

Since audiology is one of the department in health industry, which mean most of them are still using traditional methods or we call it manual method. As aforementioned, traditional

method should digitize to increase the productivity and efficiency for both party in the long run. Patients can control their own electronic health record. This will also ease the overload works for audiologists. There are many benefits of digitalization in audiology departments, patients able to communicate with audiologist or clinic staff without actually going to the clinic physically. Patient is also able to set their appointment with the specialists.

Figure 2, Figure 3 and Figure 4 below show the documents of manual or traditional method that is still use by Department of Audiology in International Islamic University Malaysia.



IIUM HEARING & SPEECH CLINIC

Version No: 01
Revision No: 01
Effective Date: April 2016

R/N :

BUTIRAN PESAKIT/PATIENT'S DETAIL

Nama
Name
No. IC
ID No.
Tarikh Lahir
Date of Birth
Jantina
Gender
Bangsa
Race
No.Telefon
Contact No.
Alamat
Address
Rujukan dari
Referral from
Sebab rujukan
Reason of referral

NO.KECEMASAN/EMERGENCY CONTACT

Nama
Name
No. IC
ID No.
No.Telefon
Contact No.
Hubungan
Relation

BORANG PERSETUJUAN / CONSENT FORM

Sila baca dengan teliti sebelum mengisi dan menandatangani borang ini. */Please read the following rules carefully before filling up and signing this form.*

Saya, I _____ No.IC/ID No. _____ telah membaca, memahami dan bersetuju dengan syarat-syarat berikut/*have read, understand and agree with the following rules:*

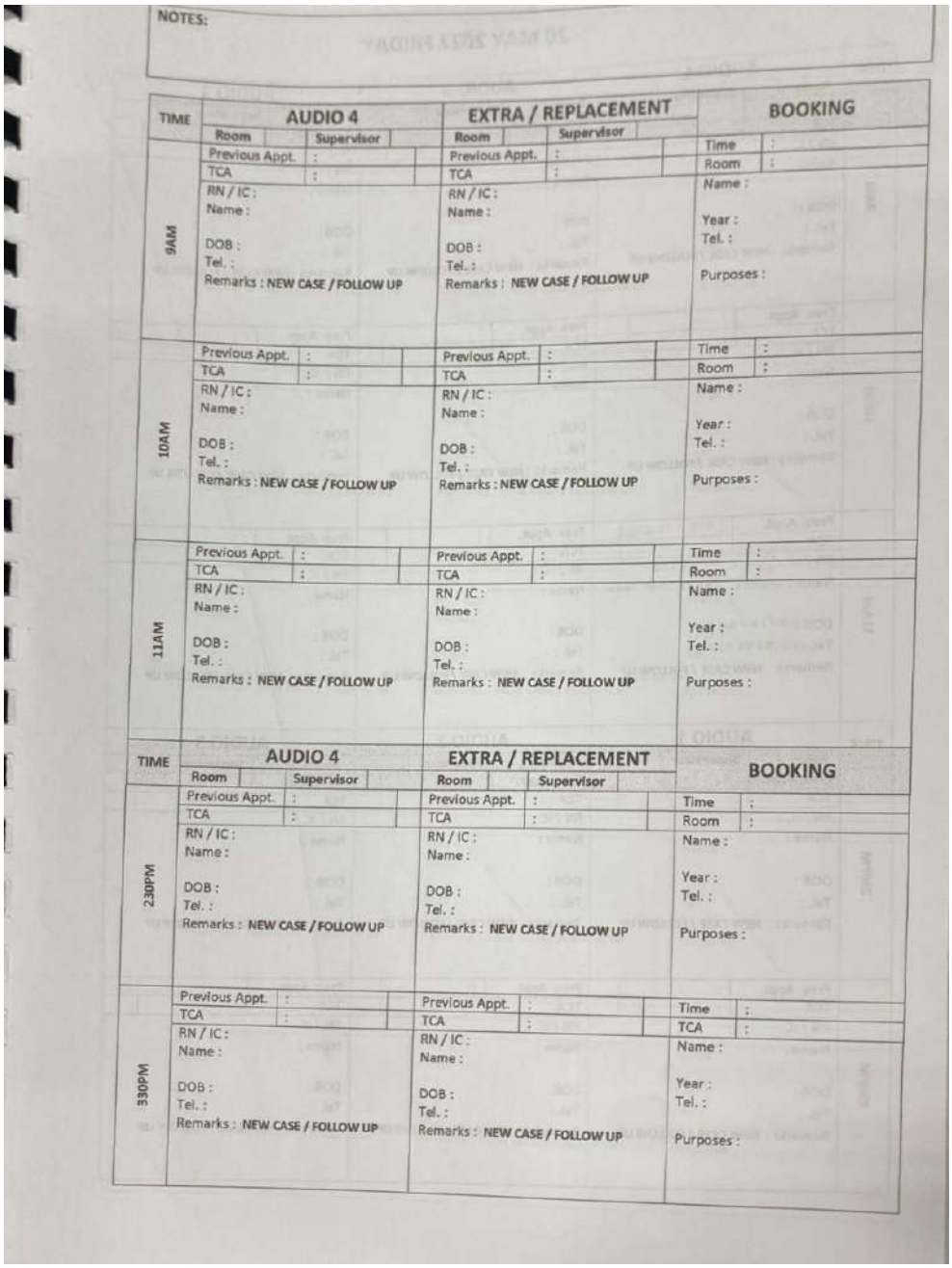
1. Menepati masa janji temu dan jika terlewat 20 minit tanpa memaklumkan pihak klinik, janji temu saya akan dibatalkan dan diberikan janji temu baru/ *To be punctual and if I'm late by 20 minutes without informing the clinic, my appointment will be cancelled or change to new date.*
2. Memaklumkan pihak klinik untuk pembatalan janji temu atas sebarang sebab. */To inform the clinic for the postponement of appointment regardless of any reason.*
3. Jika saya tidak hadir 3 kali berturut-turut tanpa memaklumkan pihak klinik, pihak klinik berhak memasukkan nama saya ke dalam senarai menunggu. */If I default the appointment for 3 consecutive times without informing the clinic, the clinic has the right to put my name in the waiting list.*
4. Pihak klinik akan memaklumkan jika terdapat perubahan janji temu sekiranya klinik terpaksa dibatalkan atau ditunda atas sebarang sebab. */ To be informed by the clinic for the postponement of appointment if the clinic had to be cancelled or postponed.*
5. Terapi atau ujian akan dijalankan oleh Audiologis, Patologis Pertuturan-Bahasa, pelajar Audiologi, pelajar Patologi Pertuturan-Bahasa atau professional yang berkaitan. */ The therapy or assessment will be done by the Audiologist, Speech-Language Pathologist, Audiology student, Speech-Language Pathology student or other related professional.*
6. Sesi klinik akan diperhatikan oleh pelajar dan ahli professional bagi tujuan akademik. */The clinic session will be observed by the student and professional for academic purpose.*

.....
Tandatangan/Signature
Nama/Name :

Tarikh / Date :

Figure 2 Patient's Detail Document

Source : https://www.iium.edu.my/kulliyyah/kahs/department-of-audiology-and-speechlanguage-pathology



NOTES:

TIME	AUDIO 4	EXTRA / REPLACEMENT	BOOKING
9AM	Room / Supervisor Previous Appt. : TCA : RN / IC : Name : DOB : Tel. : Remarks : NEW CASE / FOLLOW UP	Room / Supervisor Previous Appt. : TCA : RN / IC : Name : DOB : Tel. : Remarks : NEW CASE / FOLLOW UP	Time : Room : Name : Year : Tel. : Purposes :
10AM	Previous Appt. : TCA : RN / IC : Name : DOB : Tel. : Remarks : NEW CASE / FOLLOW UP	Previous Appt. : TCA : RN / IC : Name : DOB : Tel. : Remarks : NEW CASE / FOLLOW UP	Time : Room : Name : Year : Tel. : Purposes :
11AM	Previous Appt. : TCA : RN / IC : Name : DOB : Tel. : Remarks : NEW CASE / FOLLOW UP	Previous Appt. : TCA : RN / IC : Name : DOB : Tel. : Remarks : NEW CASE / FOLLOW UP	Time : Room : Name : Year : Tel. : Purposes :
TIME	AUDIO 4	EXTRA / REPLACEMENT	BOOKING
230PM	Room / Supervisor Previous Appt. : TCA : RN / IC : Name : DOB : Tel. : Remarks : NEW CASE / FOLLOW UP	Room / Supervisor Previous Appt. : TCA : RN / IC : Name : DOB : Tel. : Remarks : NEW CASE / FOLLOW UP	Time : Room : Name : Year : Tel. : Purposes :
330PM	Previous Appt. : TCA : RN / IC : Name : DOB : Tel. : Remarks : NEW CASE / FOLLOW UP	Previous Appt. : TCA : RN / IC : Name : DOB : Tel. : Remarks : NEW CASE / FOLLOW UP	Time : TCA : Name : Year : Tel. : Purposes :

Figure 3 Patient's Appointment Document

Source : https://www.iium.edu.my/kulliyyah/kahs/department-of-audiology-and-speechlanguage-pathology

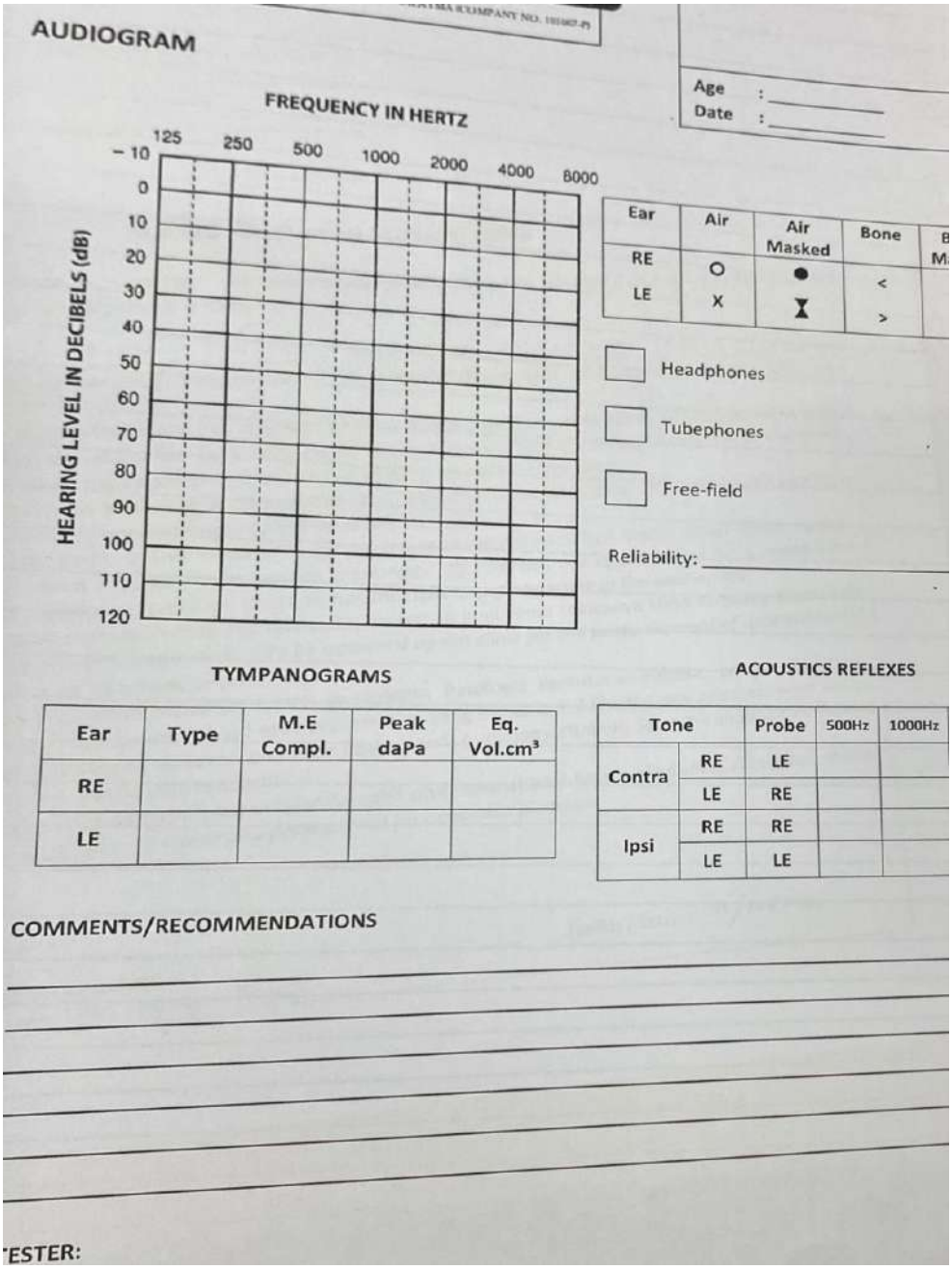


Figure 4 Audiogram testing document

Source : https://www.iium.edu.my/kulliyyah/kahs/department-of-audiology-and-speechlanguage-pathology

2.3 Similar system

This study will assess four similar system with related features to the proposed web-based application.

2.3.1 HearForm

HearForm is develop to track critical patients data. It can also organize the appointments made by the patients or the healthcare specialists. The feature is it shows audiogram report in the main page to allow patients and audiologists monitor and interpret the data.

Figure 5 Hearform

2.3.2 Amplify OMS

The system provides a clear dashboard that allow user to easily navigate. It also allow patients to communicate with audiologists. Apart from that, Patients can book their own appointments.

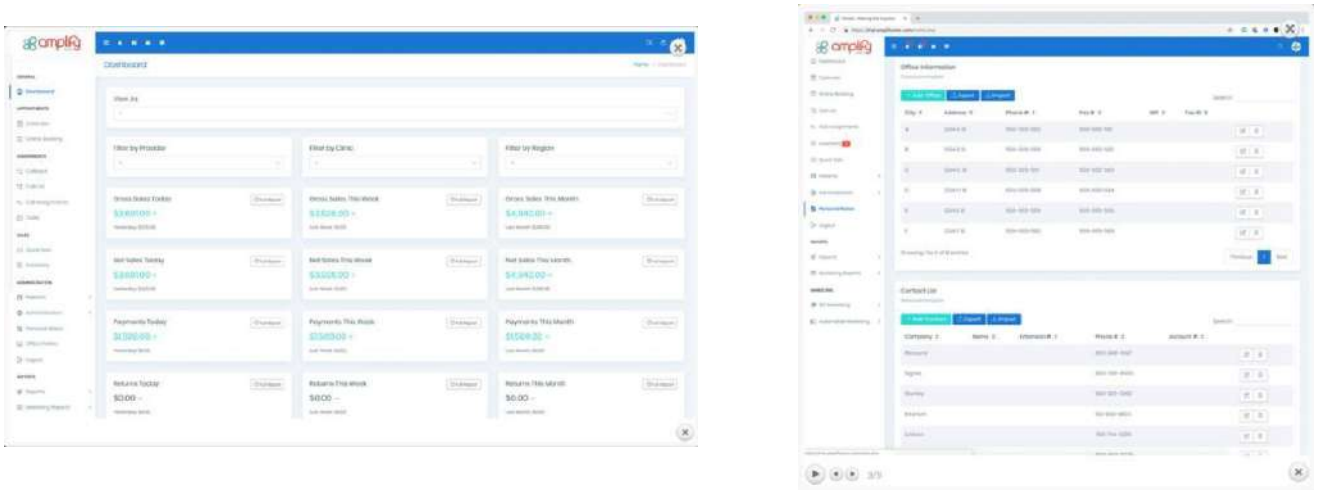


Figure 6 Amplify OMS

2.3.3 Sycle

Sycle allows patients to have online appointments and provide convenience for the patients and practice efficiency. It allows patients to upload any existing forms that map to the sycle data and easily to access from multiple locations. Last but not least, it provide patients portal that will change how patients can be connected with the audiologists.

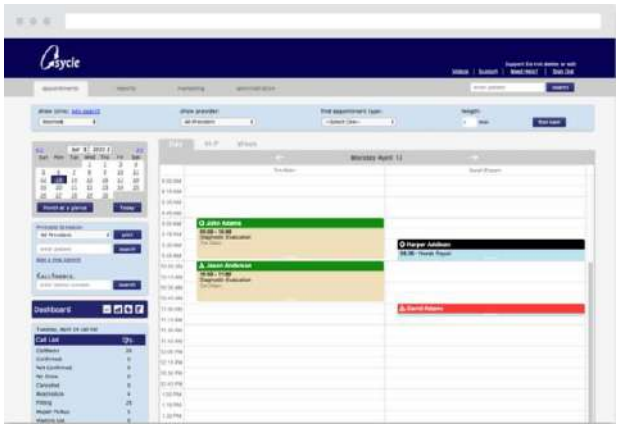


Figure 7 Sycle

2.3.4 Coreplus

Coreplus makes it possible for clients to book appointments via your website and Facebook page. Provide waitlists for the patients to queue until their turn. Coreplus also able to generate report of patient's data. Able to Communicate with patients instantly using the built-in SMS feature.

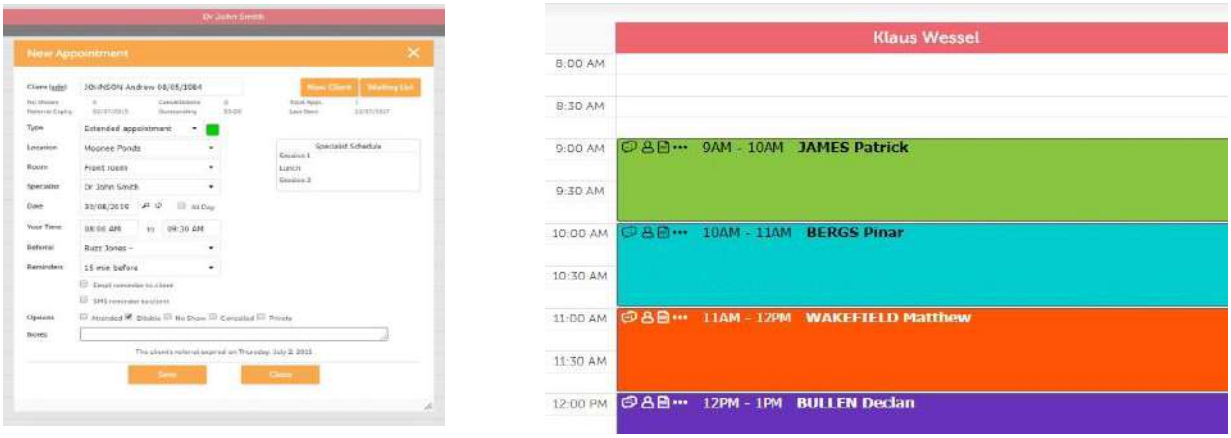


Figure 8 Coreplus

2.4 Comparing similar system

Table below depicts the comparing of 4 similar system with feature such as Appointment Booking Availability, Provide Communication with specialists, Generating Reports, Integrated with mobile device, Provide Audiogram charts.

Existing System	Appointment Booking Availability	Provide communication with specialists	Generating Reports	Integrated with mobile device	Provide Audiogram charts
HearForm	YES	YES	YES	NO	YES
AmplifyOMS	YES	YES	YES	NO	NO
SYCLE	YES	NO	YES	NO	NO
Coreplus	YES	YES	YES	YES	NO

Table 1 Comparison

2.5 Advantages and disadvantages of similar system

Existing System	Advantages	Disadvantages
HearForm	HearForm provide details information regarding patients information and also Audiologists Information. It also provide audiogram chart to allow audiologists to record and interpret the data.	Interface provides by HearForm is not efficient and hard to use because it is fiber and patients and audiologists will take time to learn to use the system.
Amplify OMS	Provide a user dashboard and ease the navigation that users make. Patients and audiologist can have a different dashboard to access the information. It also allow user to multitasking	Amplify OMS do not provide audiogram charts
SYCLE	Sycle allow user custom the form, especially for audiologists.	Has no feature that allow patients and audiologist to communicate to each other.

Coreplus	Coreplus system has a feature where it reminds user through email and mobile device because it is integrated with mobile devices.	Coreplus doesn't provide information regarding audiologist. So it is hard for patients to see their informations.

Table 2 Advantages and disadvantages

2.6 Conclusion

The literature review provides broad knowledge about the important information of the topic. The literature review was undertaken articles, journals, websites, book and other academic resources to acquire deep learning information regarding the projects. Acceptance among frontline employees is the key to service innovation success (Luengen et al., 2020). The electronic health records (EHRs) are the core informatics tool for providers (Braunstein, 2019). Electronic Health Records (EHRs) should be implemented in the project to able patients to access their own medical record and help audiologists to interpret the information of the availability data. Database is important to ensure data of patients and audiologist is stored securely. Many capabilities are achieved for similar systems, yet the systems can still be improved. This research is a result of designing a healthcare information system for audiology departments.

CHAPTER 3

METHODOLOGY

This chapter discuss the methodology of SDLC and how security can be implement in the SDLC.

It also discuss about model in SDLC that is suitable to be use in the development.

3.1 Project management framework

With the matter of time and technology, the numbers of end users have increased the expectations from the software, which users use (INDIACom 10. 2016 Delhi et al., n.d.). Secure Software Development Lifecycle (SSDLC) is a process that produce software with the highest quality and lowest cost in the shortest time with focus the implementation of security into the phase. Every software that can give the user with a platform to access it with ease must priorities security so that no other malicious bug can disrupt its operation. CIA Triad which is Confidentiality, Integrity and Availability should involve in the methodology.

Rapid Application Development (RAD) rapidly develops software via the use of prototypes, dummy GUIs, back-end databases, and more (Conrad et al., 2012). Rapid Application Development (RAD) was initially defined by James Martin in the early 1990s, who believed in creating a model that is more flexible and responsive to changing client requirements and generated quality assured systems at a low cost. Rapidly fulfilling the system's business requirements is the aim of RAD. At every stage of the development process, it is built to be adaptable to modifications and to take new inputs, such as features and functions. The RAD Methodology will make it easier and faster to design software web applications. In contrast to software produced using conventional software engineering methodologies, this method is used in the fast application development cycle and produces high-quality software.

Figure 9 below show 4 stages in Rapid Application Development Model.

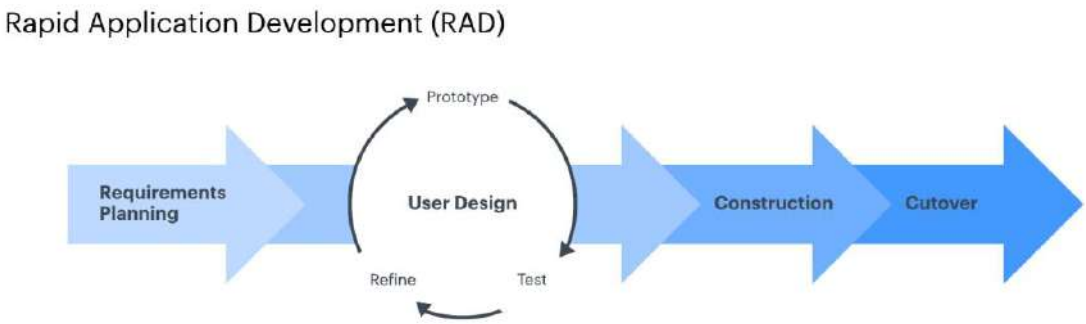


Figure 9 Rapid Application Development Model

3.1.1. Requirement Planning

This was the first stage of the system's development. At this step, information on the problem identification and data collecting was gathered directly from users or final result-oriented users in the form of primary data. All user requirements related to the design of Health information System for Audiology Department were obtained.

All requirements have been obtained using interview method with Department of Audiology in International Islamic University Malaysia. Meetings were conducted to identify goals of the system and information requirements uprising from those objectives. The primary data is obtained from the Audiologist, PSM Supervisor and Clinic Staff.

3.1.2 User Design

Once the project has been scoped, it's time to get started on development, fleshing out the user design through several prototype iterations. Clients and developers collaborate closely throughout this stage to make sure that their needs are satisfied at every stage of the design process. The detailed system is designed based on the client’s requirements.

The user interface for the system have been designed according to the client's needs.

Every design prototype that is developed will be show to the client to ensure the design is agreed upon by the client and received feedbacks for the improvement of the system prototype design.

3.1.3 Construction

This step translates the prototypes and beta systems from the design phase into the working model. Basically, this is where coding for the system take place. In this scenario, the product was a website that had been developed in accordance with user requirements. Because the majority of the problems and adjustments were handled during the extensive iterative design process, developers may build the final working model faster. However, throughout the process in this stage, the client is still able to give new inputs.

The development of Health Information System for Audiology Department is done by using PHP framework called Laravel and MySQL as the database and also Google Maps API as external feature to provide maps in the interface.

3.1.4 Cutover

The cutover stage is the implementation phase where the finish product goes to launch. This phase also includes testing and user training for the system.

Health Information System for Audiology Department will be tested by feeding every inputs to the web application platform, process the data and analyze the error or bugs exist out of the testing process. Furthermore, testing was carried out to ensure that the create, read, update, and delete (CRUD) procedure ran smoothly.

The deployment for the system to go live is by using web hosting service by Digital Ocean. The user training will be provided in this stage for all the users included in user scope;Audiology, Staff and Patient.

3.2 Project requirement

3.2.1 Functional requirements

Table 3 below show functional requirement for each module in the proposed system.

Module Name	Functional Requirements
Manage Login	• The system should allow the user to login into the system. • The system should display successful login message • The system should display 'forgot password' option.
Manage Appointment	• The system must display the available appointment date. • The system should allow user to save information. • The system should allow admin to set an appointment date. • The system should be able to send email to the user.
Manage User	• The system should allow user to create new user for the system • The system should allow user to edit the existing user. • The system should allow user to delete existing user. • The system should display list of the system users. • The system should display warning message if required fill is not filled by the user.
Manage Profile	• The system should allow user to create user information. • The system should allow user to edit the user information. • The system should allow user to delete user account.

	• The system should allow user to view the user information.
Manage Report	• The system should allow user to view the report • The system should generate report after complete the appointment.

Table 3 Functional requirements

3.2.2 Non-functional requirements

Table 4 show non-functional requirements for the proposed system.

Non-Functional Requirements	**Descriptions**
Usability	• The system should allow user to easily navigate to other page.
Performance	• The system's load time shouldn't exceed 3 seconds.
Security	• The system should log user out of the system after 10 minutes no response. • The system must encrypt sensitive data of the user.
Maintainability	• The system can be easily maintain towards any changes or update.

Table 4 Non-functional requirements

3.2.3 Constraints

The development of the IIUM Hearing & Speech Clinic System system surely has constraints that limit the behaviours of the user when using the system. Table 5 below show that list of constraints when developing IIUM Hearing & Speech Clinic System.

Constraints	Descriptions
Usability	• The system's response time cannot exceeds 5 seconds
Security	• The system should restriced unauthorized user from login.
Reliability	• The system should allow user to undo their action.
Scalability	• The system must be adapted with internet connection.

Table 5 Constraints

3.2.4 Limitations

When developing IIUM Hearing & Speech Clinic System, there are certain limitations that exist that caused user couldn't reach their goals of the system. Table 6 below show the list of limitations.

Limitations	Descriptions
Internet connections	• The system may face connection issue with the internet and it is hard for user to access the system.
Browser support	• Certain browser may not support the system.

Table 6 Limitations

3.3 Proposed Design

3.3.1 Dialogue Diagram

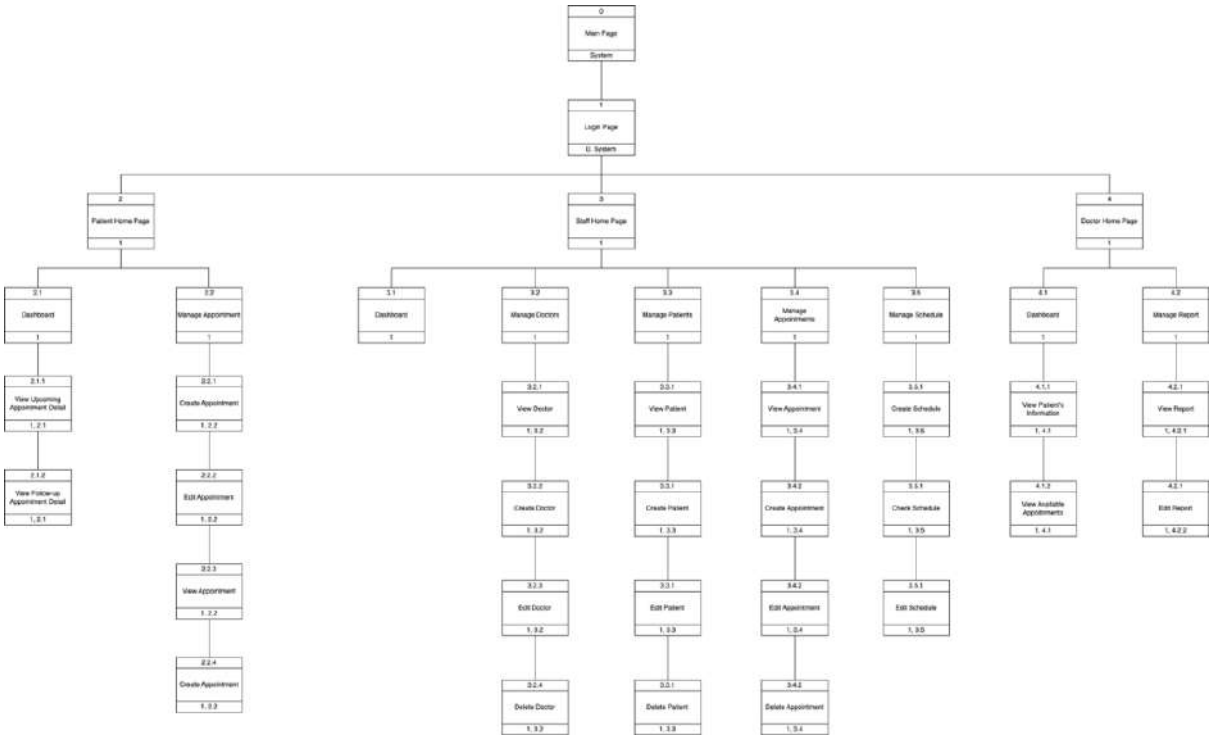


Figure 10 Dialogue diagram

Figure 10 above show the dialogue diagram of the IIUM Hearing & Speech Clinic System. The diagram shows the user interface for different user role.

3.3.2 Context diagram

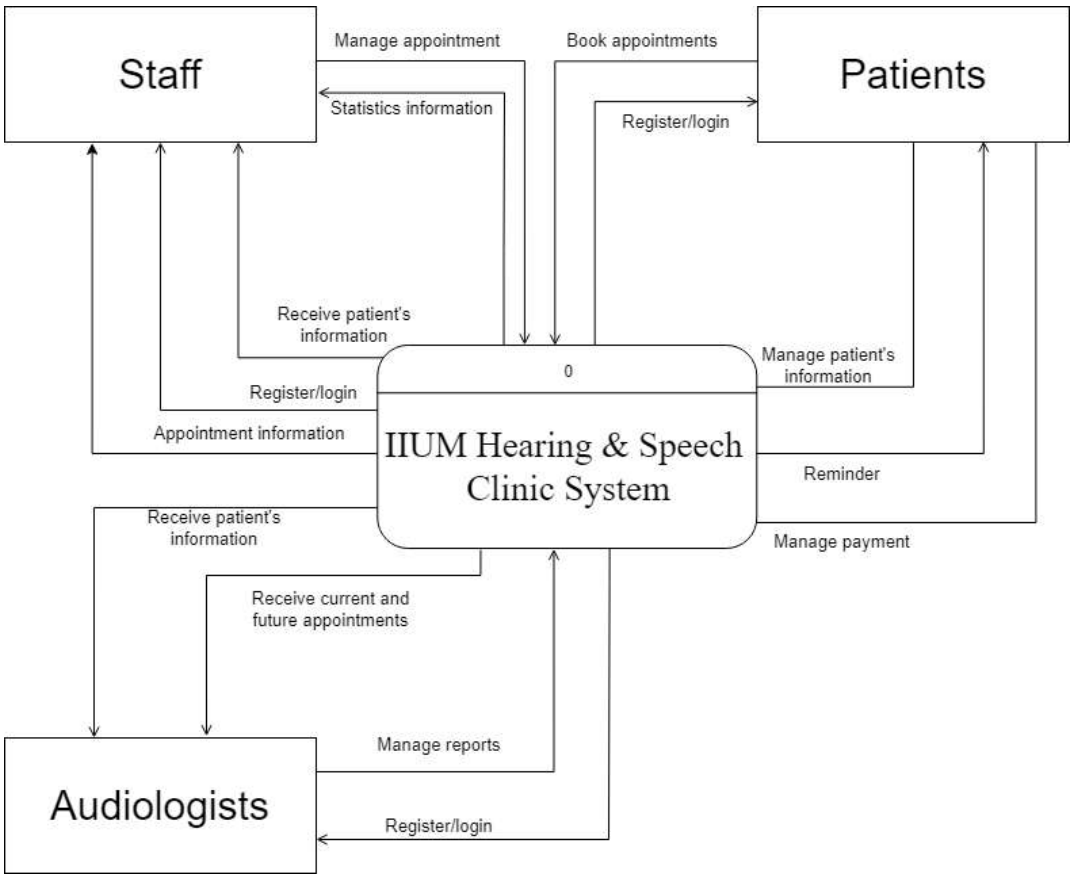


Figure 11 Context Diagram

Figure 11 above depicts context diagram for IIUM Hearing & Speech Clinic System. It explains the relationship between the system and external entities which are Patients, Staff and Audiologists.

3.3.3 Use case diagram

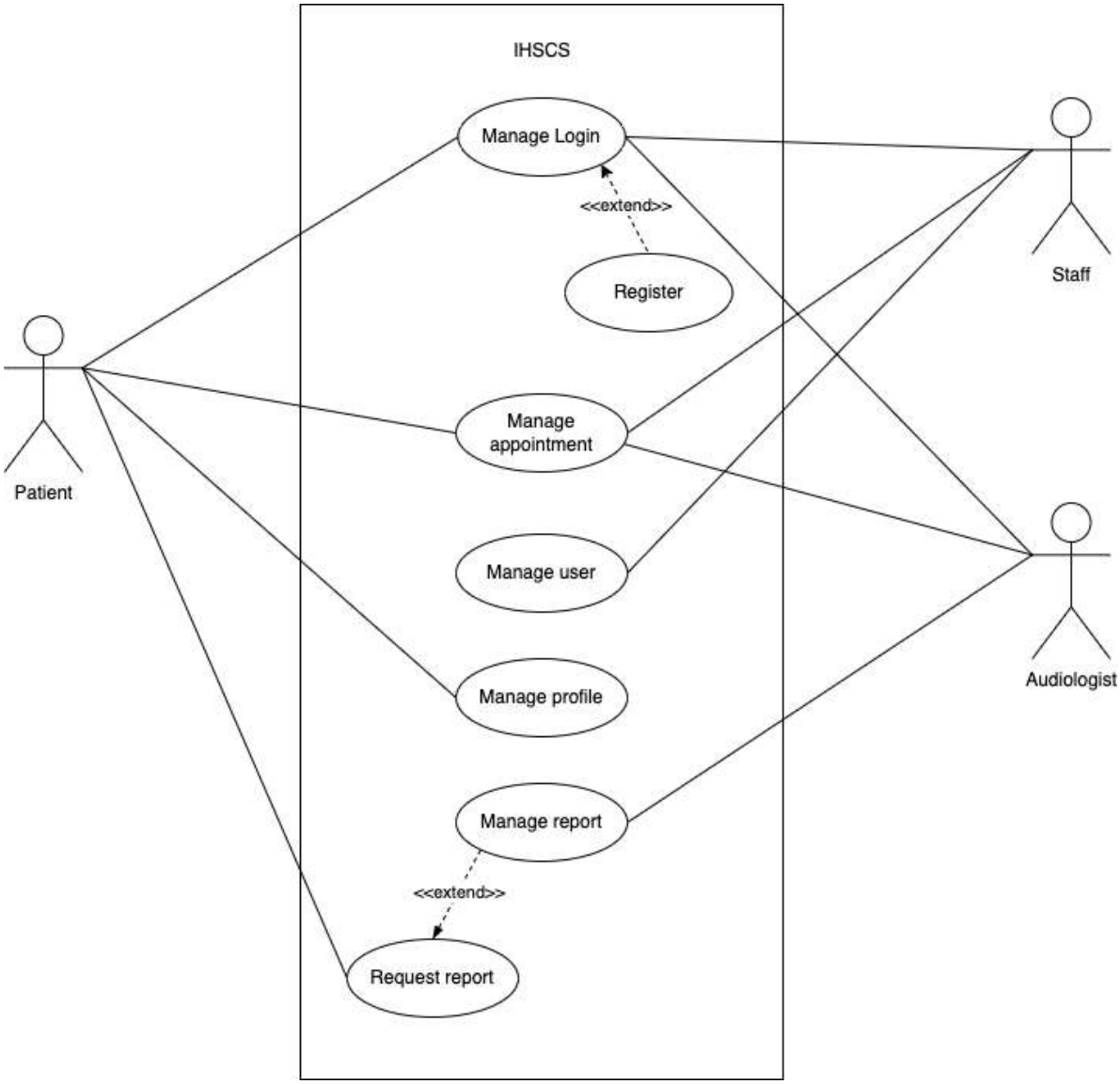
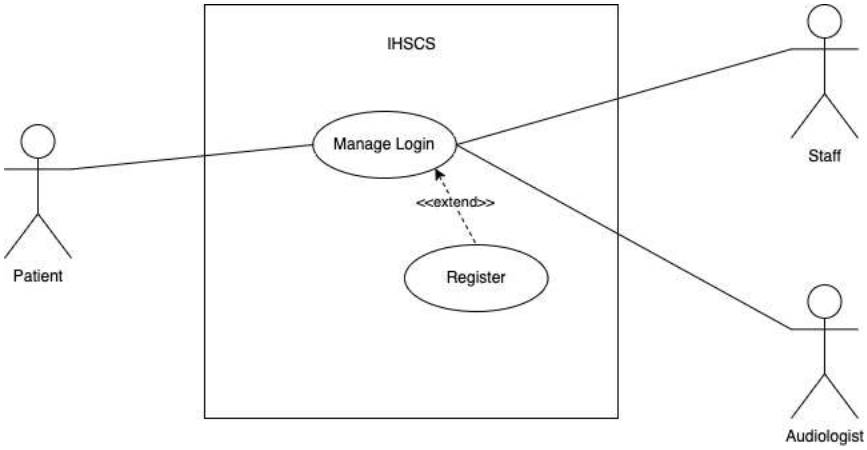


Figure 12 Use Case Diagram

Figure 12 above shows the use case diagram with 3 actors which are Patients, Staffs and Audiologists. There are 5 main activities, Manage Login, Manage appointment, Manage user, Manage profile, Manage reports.

3.3.4 Use Case Descriptions

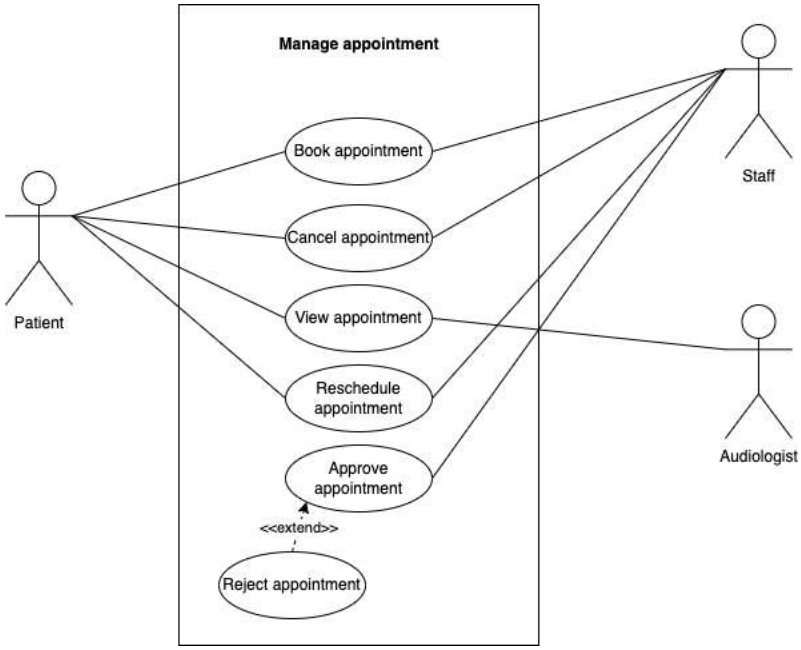
3.3.4.1 Manage Login



Use Case ID	UC01	Title	Manage Login
Actor	Patients, Staff and Audiologist		
Description	This use case specifies that user can login into the system.		
Pre-Condition	Must have an account		
Basic Flow	1. Use case starts when user navigate to the system. 2. The user click “login” button. 3. The user can click “create one” button. [A1: Register account] 4. The system will request that the user to enter their email and password. 5. The user enter their email and password. 6. The user can click “forgot password” button. [A2: Forgot password] 7. The system validate the credentials. [E1: Email or password is wrong] 8. The system navigate user to the dashboard. 9. Use case end.		
Alternative Flow	A1 : Register account 1. The user click “create one” button. 2. The system will request the user to enter their email, password and user type. 3. The system will display successful registered message. 4. The system will verify the credentials and save it into the database. 5. Use case continue to step 4 in basic flow.		

	A2 : Forgot Password 1. User click “Forgot password” button. 2. The system will request the user to enter their email 3. The user enter their email and click “Send reset password link”. 4. The system will send the information to their email. 5. The user enter new password through their email. 6. The system validate the password. 7. Use case continue on step 5 in basic flow.
Exception Flow	E1 : Email or password is wrong 1. The user enter email and password. 2. The system fail to validate the credential. 3. The system display email or password is wrong message. 4. Use case end.
Post-Condition	All users are able to register account and login into system
Rules	N/A
Constraints	N/A

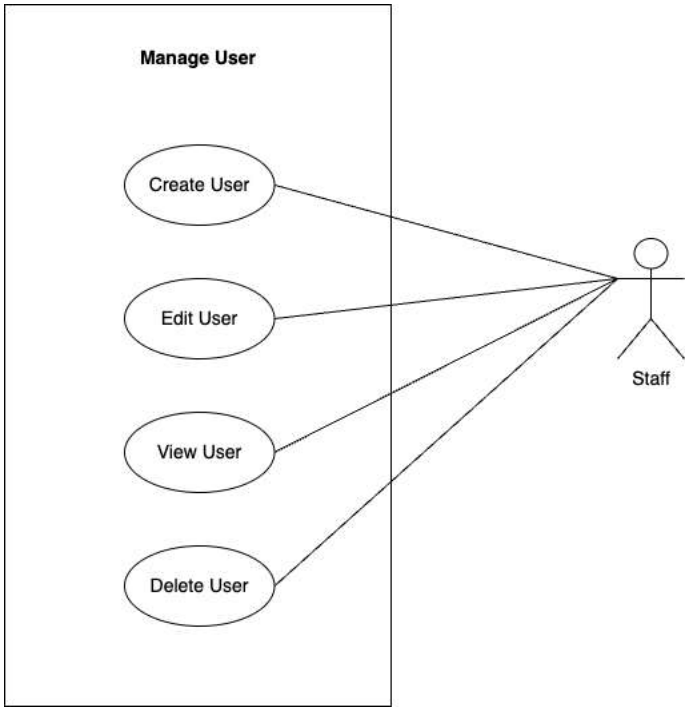
3.3.4.2 Manage Appointments



Use Case ID	UC02	**Title**	Manage appointment
Actor	1. Patient 2. Staff 3. Audiologist		
Description	This use case specifies that user can manage appointment but audiologist can only view the appointment.		
Pre-Condition	The user must log in into the system		
Basic Flow	1. Use case starts when the user is log in into the system. 2. The system will display the list of appointments. 3. User click “Set an appointment” button. [A1: Create appointment] 4. User can click “Details” button. [A2: Details] 5. User can click “Rechedule” button. [A3: Reschedule] 6. User can click “Approve” button. [A4: Approve appointment] 7. User can click “Cancel” button. [A5: Cancel appointment] 8. Use case end.		
Alterntive Flow	**A1: Create appointment** 1. The user click “Set an appointment” button. 2. The system will request user to fill in the details. 3. The user fill in the details and click “Submit” button.		

	4. The system will display successful message. 5. Use case continue to step 4 in basic flow. **A2: Details** 1. The user click “Details” button. 2. The system will display appointment information in details. 3. Use case continue to step 5 in basic flow. **A3: Reschedule** 1. The user click “Reschedule” button. 2. The system will display appointment form. 3. The user enter new appointment time. 4. The system display successful message. 5. Use case continue to step 6 in basic flow. **A4: Approve appointment** 1. The user click “Approve” button. 2. The system will verify the confirmation. 3. The system will display appointment has been approved. 4. Use case continue to step 7 in basic flow. **A5: Cancel appointment** 1. The user click “Cancel” button. 2. The system will verify the appointment id. 3. The system will ask the user for cancel appointment confirmation. 4. The user click “Yes” button. 5. The system will remove the appointment from the page and fromt the database. 6. Use case continue to step 8 in basic flow.
Exception Flow	None.
Post-Condition	Patient manage to book appointment
Rules	Booking can only be done one at a time.
Constraints	N/A

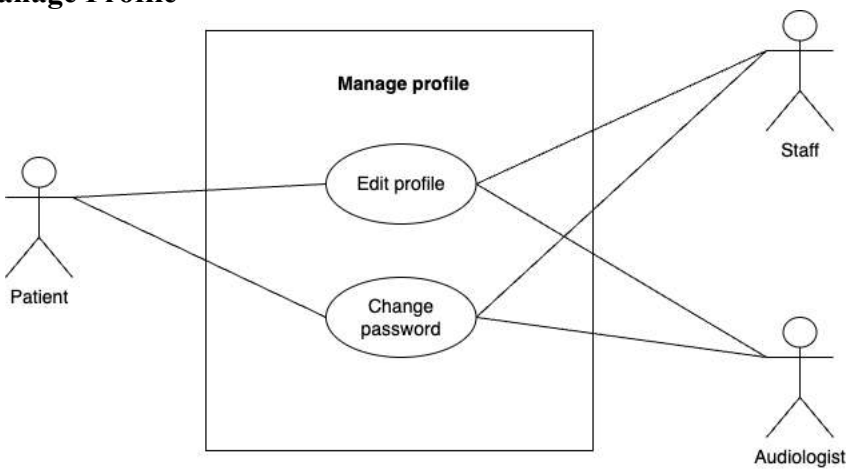
3.3.4.3 Manage User



Use Case ID	UC03	Title	Manage user
Actor	Staff		
Description	This use case specifies that staff is able to manage user of the system.		
Pre-Condition	Staff must login into the system.		
Basic Flow	1. Use case starts when staff click manage user. 2. The system will display list of users. 3. Staff clicks '+ User button. [A1: Create user] 4. Staff clicks 'More Details' button [A2: View user] 5. Staff clicks 'Edit Profile' button. [A3: Edit user] 6. Staff clicks 'Remove button. [A4: Delete user] 7. Use case end.		
Alterntive Flow	**A1: Create user** 1. Staff clicks '+ User' button. 2. The system display form. 3. Staff enter details in the form. 4. Staff clicks 'Save' button. 5. The system validate the credentials. 6. The system navigate back to index page. 7. Use case continue to step 3 in basic flow. **A2: View user** 1. Staff clicks 'More Details' button.		

	2. The system display user details. 3. Staff click 'Back' button. 4. Use case continue to step 5 in basic flow. **A3: Edit user** 1. Staff clicks 'Edit Profile' button. 2. The system display edit form. 3. Staff enter details to edit. 4. Staff enter 'Update' button. 5. The system validate the details. 6. The system display successful message. 7. Use case continue to step 6 in basic flow. **A4: Delete user** 1. Staff clicks 'Remove' button. 2. The system remove the user. **3.** Use continue to step 7 in basic flow.
Exception Flow	N/A
Post-Condition	Staff manage to add new user.
Rules	N/A
Constraints	N/A

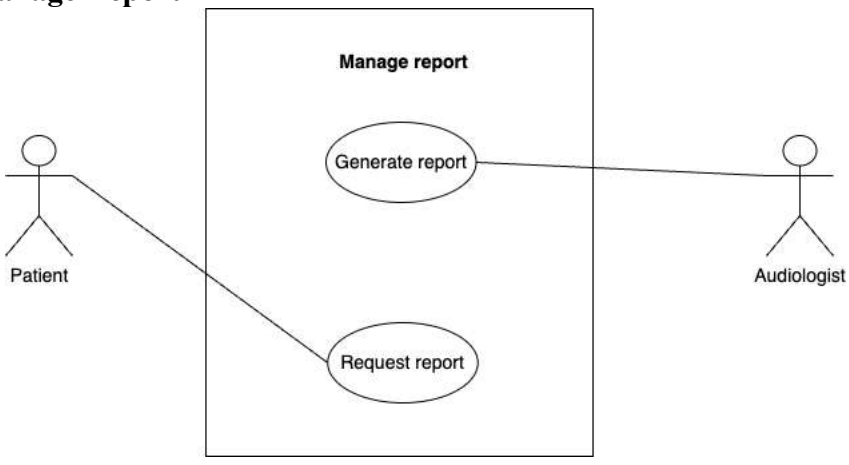
3.3.4.4 Manage Profile



Use Case ID	UC04	Title	Manage profile
Actor	Staff, Patient and Audiologist		
Description	This use case allow users to handle their own profile such as edit and change password.		
Pre-Condition	1. All users must have an account.		

Basic Flow	1. Use case starts when user click button at the side bar. 2. User clicks “Edit profile” button. [A1: Edit profile] 3. User clicks “Change password’ button. [A2: Change password] 4. Use case end.
Alterntive Flow	**A1: Edit profile** 1. User clicks “Edit profile” button. 2. The system display edit form. 3. User insert input to edit profile. 4. User clicks “Save” button. 5. Use case continue to step 3 in basic flow. **A2: Change password** 1. User clicks “Change password’ button. 2. The system display change password form. 3. User enter old password follow by new password. 4. Use click “Change” button. 5. Use case continue to step 4 in basic flow.
Exception Flow	N/A
Post-Condition	1. User must log in into the system.
Rules	N/A
Constraints	Patient can change password once.

3.3.4.5 Manage Report



Use Case ID	UC05	**Title**	Manage reports
Actor	Audiologist and Patient		

Description	This use case specifies that audiologist can manage or make reports based on the patient's appointment and patient can request for their report.
Pre-Condition	Must have appointment first.
Basic Flow	**Audiologist** 1. Use case starts when audiologist log in into the system. 2. The system display list of appointments. 3. Audiologist clicks generate report for selected appointment. 4. The system generate the report. 5. Use case end. **Patient** 1. Use case starts when patient log in into the system. 2. The system display list of previous appointments. 3. Patient clicks 'Request report' button. **4.** Use case end.
Alterntive Flow	N/A
Exception Flow	N/A
Post-Condition	N/A
Rules	Audiologist can make one report for one test to the patient
Constraints	N/A

3.4.1 Activity diagram

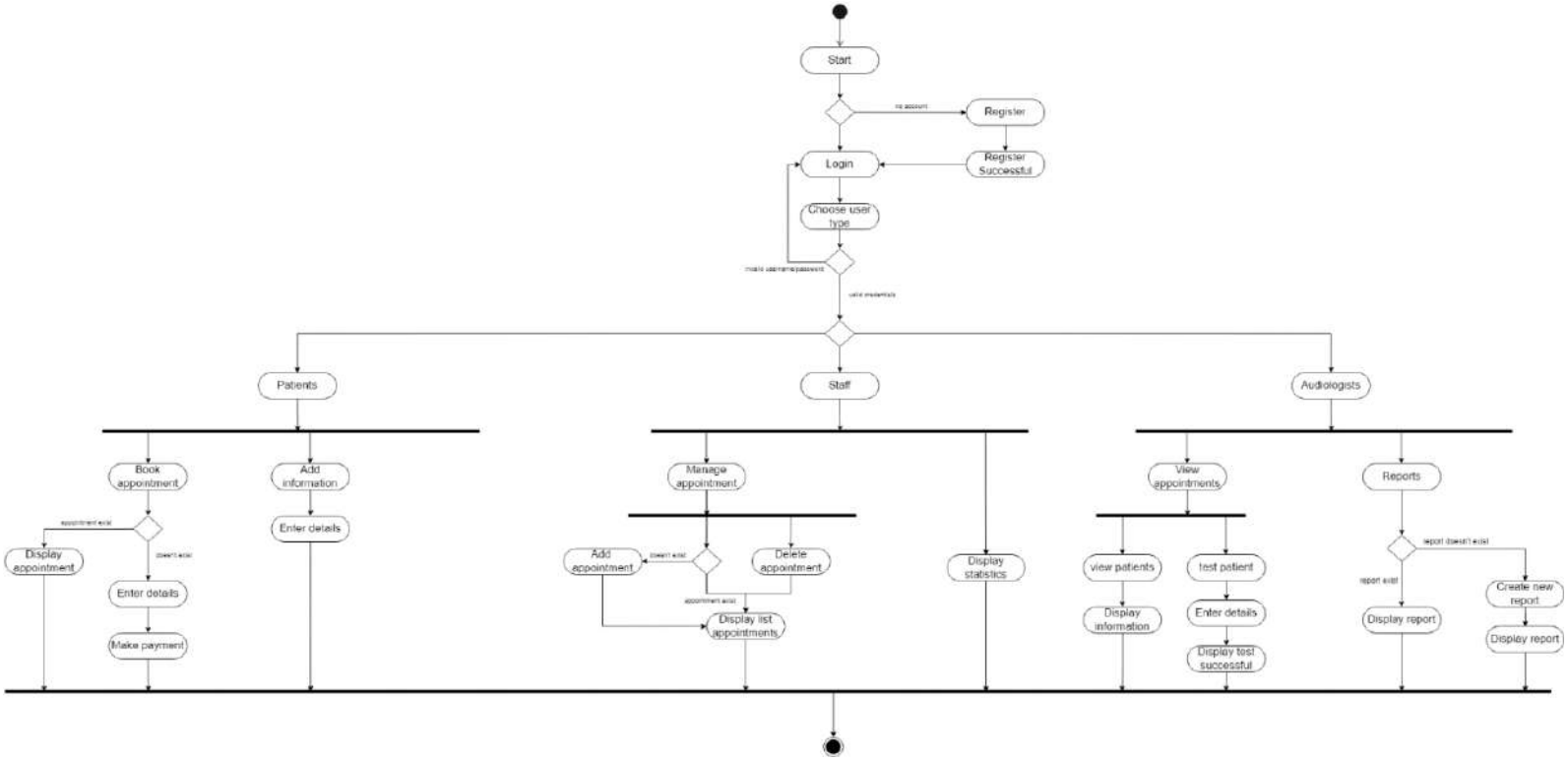
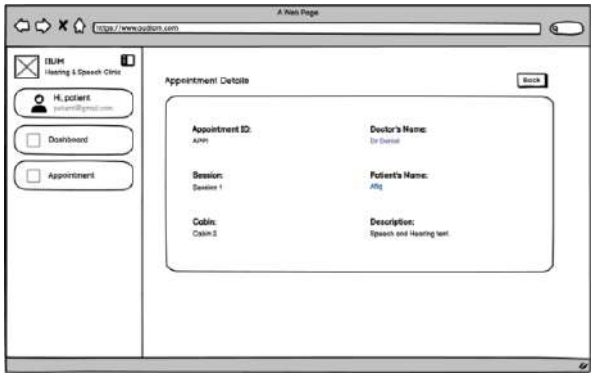
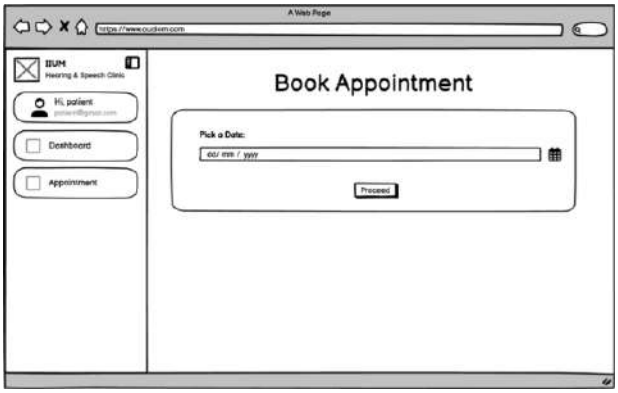
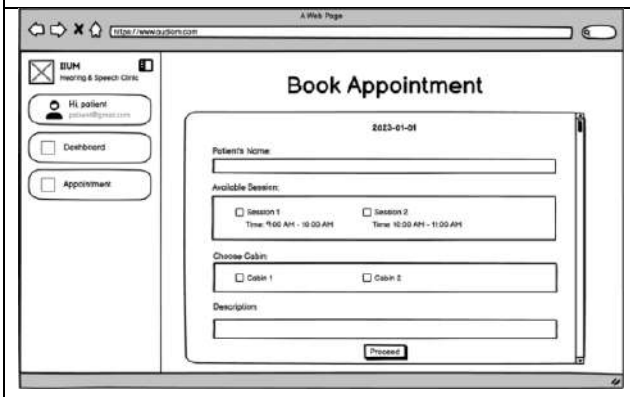
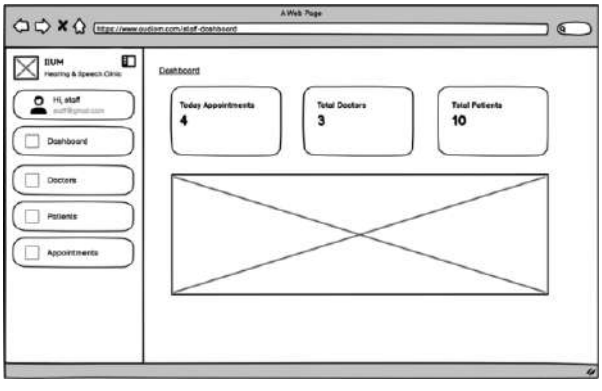


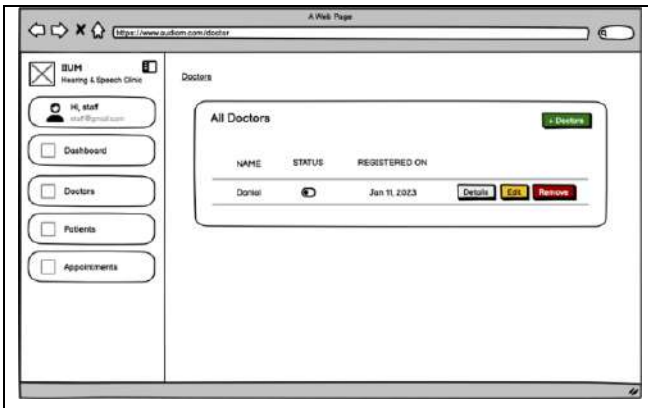
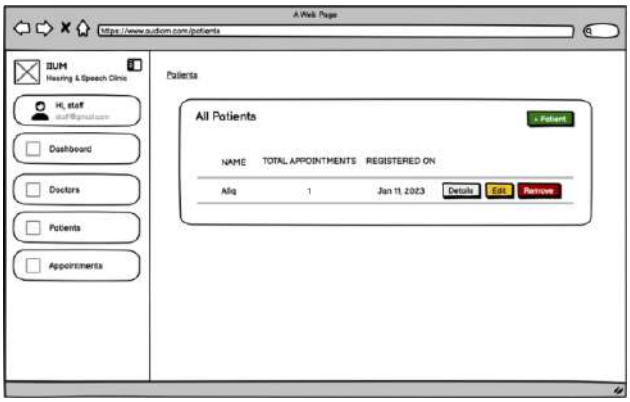
Figure 13 Activity Diagram

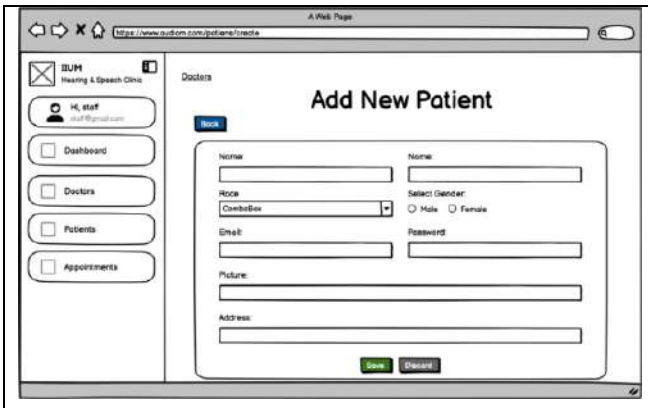
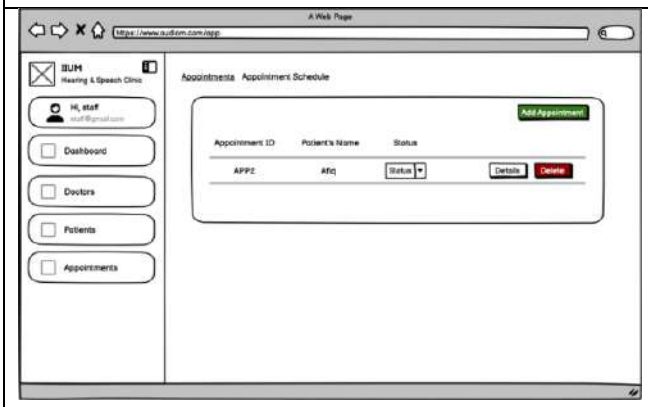
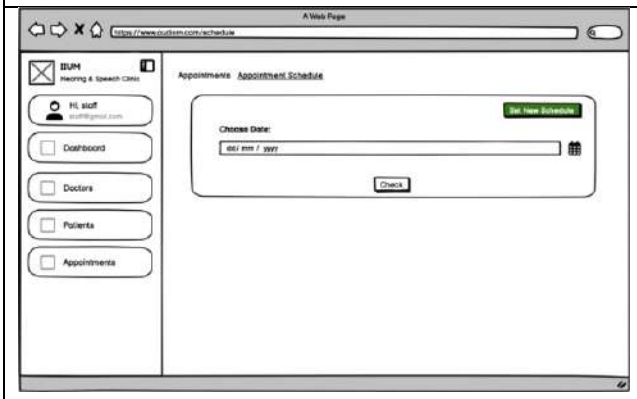
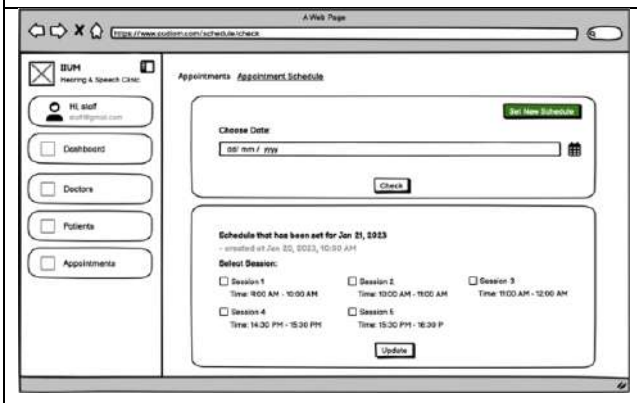
3.4.2 Storyboard

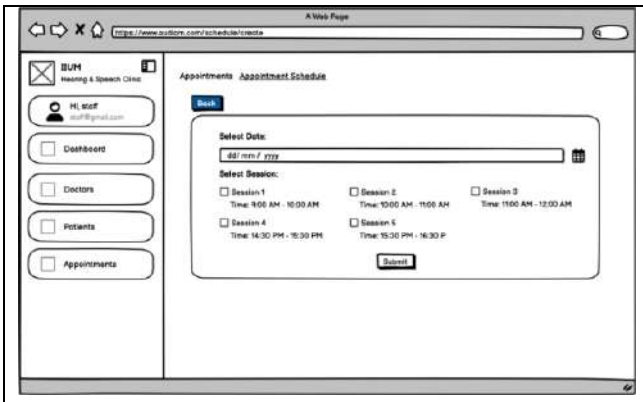
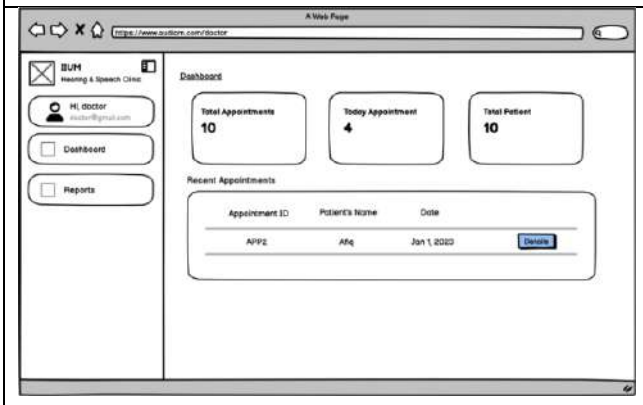
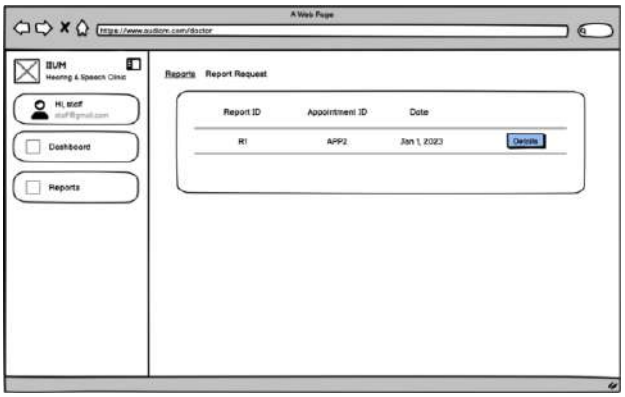
	Home Page whenever user visit the website.
	Click register button for new user
	System will navigate to register page and user can register based on the user type and click register.

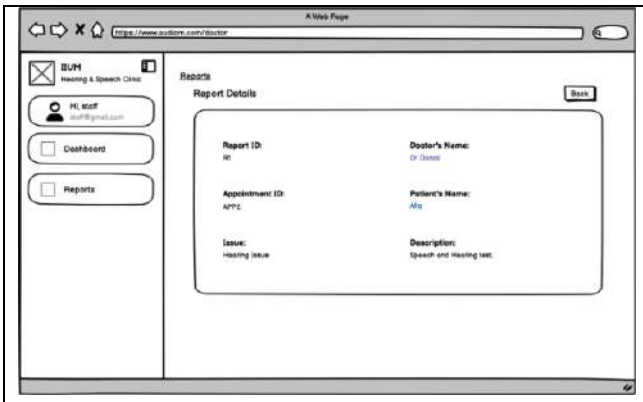
	Patient can login with their username and password and select the user type, then they can click login button
	Patient's homepage after login
	Patient clicks Details at the dashboard.

	Patient clicks Appointment button at the sidebar, the system will navigate the user to Book Appointment Page.
	Patient will choose a date and the system will display form and prompt user to insert name, Session, Cabin and Description.
	Staff's homepage after login

	Then, staff click Doctors button at the sidebar and the system will navigate the staff to Doctor page where the system will display list of doctors available.
	The staff click '+ Doctor' Button to add new doctor and the system will display add doctor form where the staff have to insert all the information and click save button. The system will automatically create an account for the doctor.
	The staff clicks Patients button at the sidebar and the system will navigate the staff to Patient page where the system will display list of patients available.

	The staff click '+ Patient Button to add new patient and the system will display add patient form where the staff have to insert all the information and click save button. The system will automatically create an account for the patient.
	The staff clicks Appointments button at the sidebar and the system will navigate the staff to Appointment page where the system will display list of appointments available.
	Then, the staff clicks Appointment Schedule button at the top bar and the system will display date form for the staff to choose.
	Then, the system will display schedule that have been set for the date chosen. If the date chose is not set, the system will display error message.

	If the staff clicks set new schedule button, the system will prompt the staff to enter details such as date and sessions to open on the date chosen.
	Doctor's homepage after login
	Doctor click Reports button at the sidebar and system will display list of appointment to be generate the report.

	Doctor click details button and system will display information report in details**.**
	Report request by the patient will display in the report request interface.

3.4 Data Design

3.4.1 Entity Relationship Diagram (ERD)

Figure 14 Entity Relation Diagram

3.4.2 Data Dictionary

3.4.2.1 Users Data Dictionary

Attribute	Data Type	Description	Constraint
id	INT	User identification	PK
email	VARCHAR(255)	User's email	
role	VARCHAR(255)	User's role	
name	VARCHAR(255)	User's name	
password	VARCHAR(255)	User's password	

Table 7 Users Data Dictionary

Table 7 shows attributes that belongs to Users table In the database. It consist of id as a primary key, email, role, name and password.

3.4.2.2 Staff Data Dictionary

Attribute	Data Type	Description	Constraint
id	INT	Staff identification	PK
user_id	INT	User identification	FK
name	VARCHAR(255)	Staff's name	
age	VARCHAR(255)	Staff's age	
dob	DATE	Staff's date of birth	
gender	VARCHAR(255)	Staff's gender	
race	VARCHAR(255)	Staff's race	
contact	VARCHAR(255)	Staff's contact number	
image	IMAGE	Staff's profile image	
address	VARCHAR(255)	Staff's address	

Table 8 Staff Data Dictionary

Table 8 shows that attributes that belongs to Staff table in the database. It consist of id as a primary key follow by user_id as a foreign key, name, age, date of birth, gender, race, contact, image and address.

3.4.2.3 Patient Data Dictionary

Attribute	Data Type	Description	Constraint
id	INT	Patient identification	PK
user_id	INT	User identification	FK
name	VARCHAR(255)	Patient name	
age	VARCHAR(255)	Patient age	
dob	DATE	Patient date of birth	
gender	VARCHAR(255)	Patient gender	
race	VARCHAR(255)	Patient race	
contact	VARCHAR(255)	Patient contact number	
image	IMAGE	Patient profile image	
address	VARCHAR(255)	Patient address	

Table 9 Patient Data Dictionary

Table 9 shows the attributes that belongs to Patient table in the database. It consist of id as a primary key follow by user_id as a foreign key, name, age, date of birth, gender, race, contact, image and address.

3.4.2.4 Doctor Data Dictionary

Attribute	Data Type	Description	Constraint
id	INT	Doctor identification	PK
user_id	INT	User identification	FK
name	VARCHAR(255)	Doctor's name	
gender	VARCHAR(255)	Doctor's gender	
race	VARCHAR(255)	Doctor's race	
contact	VARCHAR(255)	Doctor's contact number	
image	IMAGE	Doctor's profile image	

Table 10 Doctor Data Dictionary

Table 10 shows that attributes that belongs to Doctor table in the database. It consist of id as primary key follow by user_id as a foreign key, name, gender, race, contact and image.

3.4.2.5 Schedule Data Dictionary

Attribute	Data Type	Description	Constraint
id	INT	Schedule identification	PK
date	DATE	Schedule's date	

Table 11 Schedule Data Dictionary

Table 11 shows that attributes that belongs to Schedule table in the database. It consist of id as primary key follow by date.

3.4.2.6 Session Data Dictionary

Attribute	Data Type	Description	Constraint
id	INT	Session identification	PK
starttime	TIME	Session's start time	
endtime	TIME	Session's end time	

Table 12 Session Data Dictionary

Table 12 shows the attributes that belongs to Session table in the database. It consist of id as primary key follow by startime and endtime.

3.4.2.7 Appointment Data Dictionary

Attribute	Data Type	Description	Constraint
App_ID	VARCHAR(255)	Appointment identification	PK
Patient_id	INT	Patient identification	FK1
Session_id	INT	Session identification	FK2
Schedule_id	INT	Schedule identification	FK3
Patient_name	VARCHAR(255)	Patient's name	
cabin	INT	Cabin's number	
description	VARCHAR(255)	Appointment's description	

Table 13 Appointment Data Dictionary

Table 13 shows the attributes that belongs to Appointment table in the database. It consist of App_ID as a primary key follow by Patient_id, Session_id, Schedule_id as a foreign key, Patient_name, cabin and description of the appointment.

3.4.2.8 Report Data Dictionary

Attribute	Data Type	Description	Constraint
id	VARCHAR(255)	Report identification	PK
patient_id	VARCHAR(255)	Patient identification	FK1
doctor_id	VARCHAR(255)	Doctor identification	FK2
result	VARCHAR(255)	Result of the appointment	
comment	VARCHAR(255)	Comment for the report	
description	VARCHAR(255)	Report's description	

Table 14 Report Data Dictionary

Table 14 shows the attributes that belongs to Report table in the database. It consist of id as primary key follow by patient_id and doctor_id as a foreign key, result, comment and description of the report.

3.5 Design Prototype

Figures 15 are the design of the project prototype which provide a user-friendly interface that will ease the user to use it. These prototypes are also an early version of the system for the user to collect feedbacks. Therefore, the final design of the real system might be different from the current design.

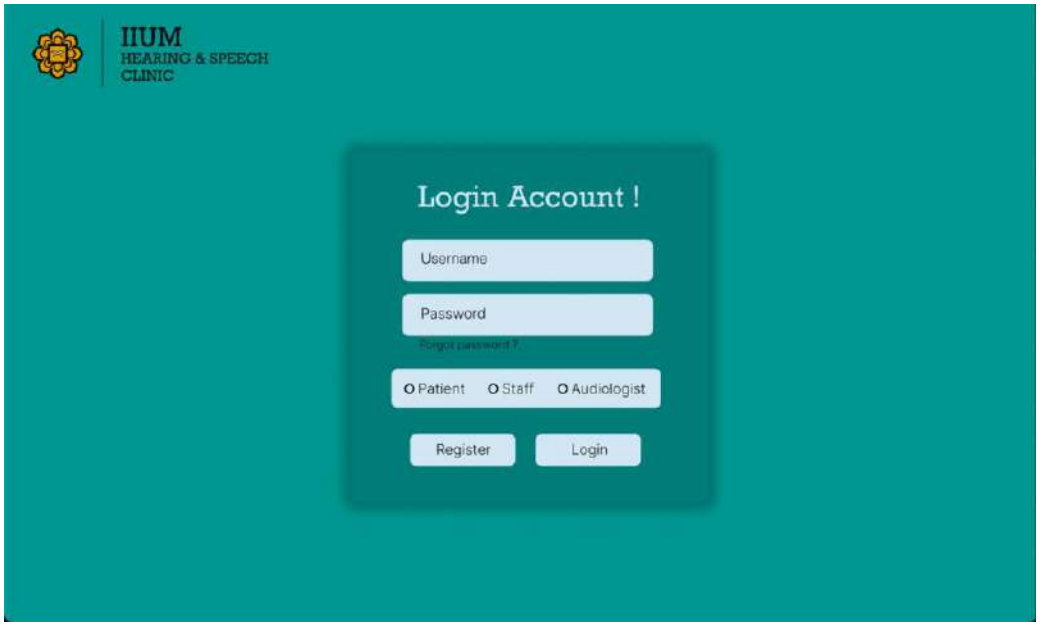


Figure 15 Login Page

Figure 15 above is the web homepage of the IIUM Hearing & Speech Clinic System when the user opens the system. There are 3 users that will use the system which is Patient, Staff and Audiologist. Basically, they can register and login into the system according to their user type.

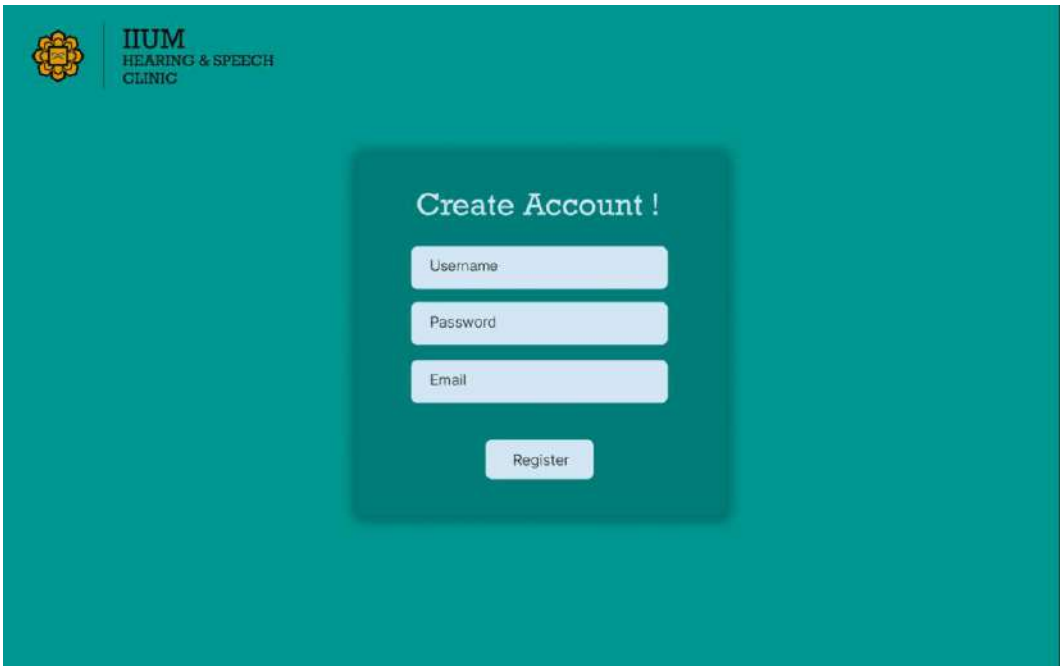


Figure 16 Register page

Figure 16 shows that interface for user to create an account. User needs to input Username, password and email.

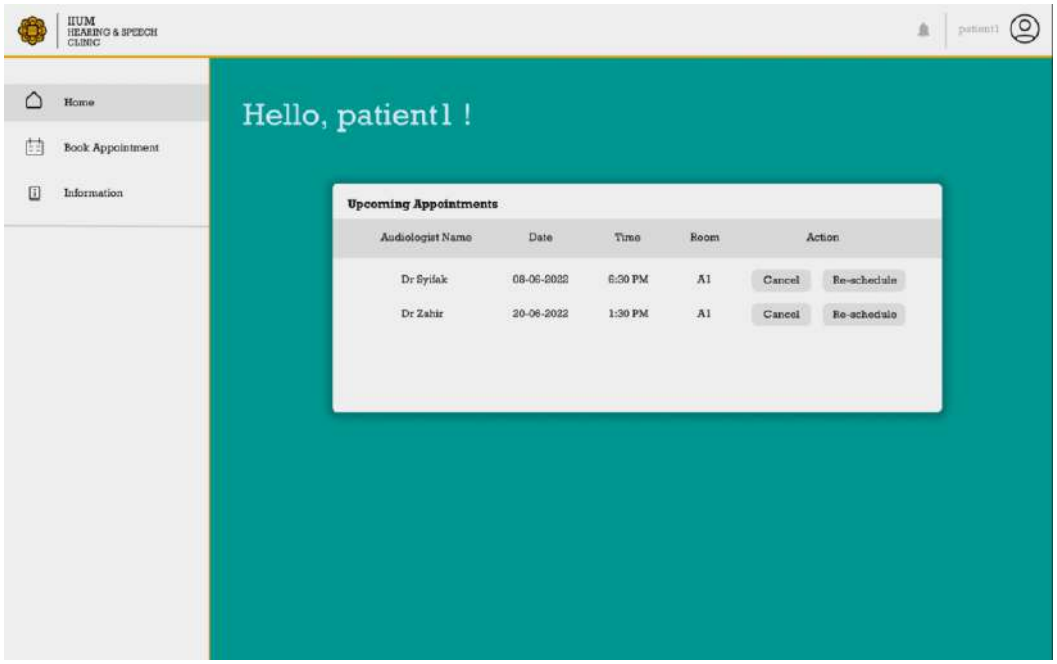


Figure 17 Patient's homepage

Figure 17 shows the patient's homepage whenever patient login into the system. The system will display list of upcoming appointments that is set for the patient. Patient is able to cancel or reschedule the appointment.

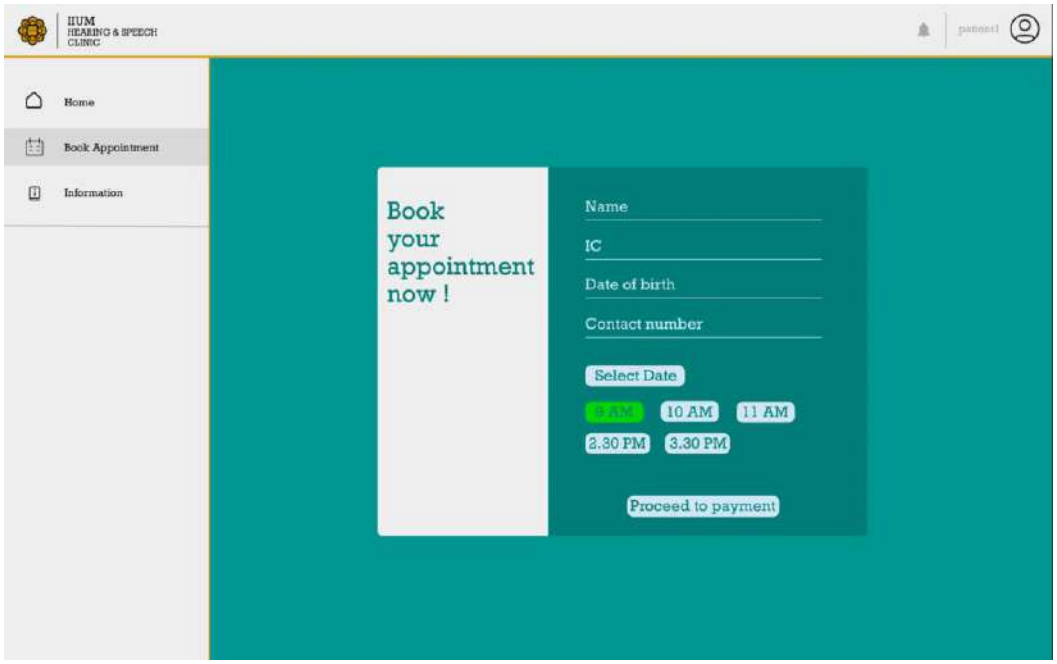


Figure 18 Book Appointment page

Figure 18 shows the book appointment interface for the patient to book an appointment. Patient is able to enter his/her name, identification number, date of birth, contact number and date that they wish to book.

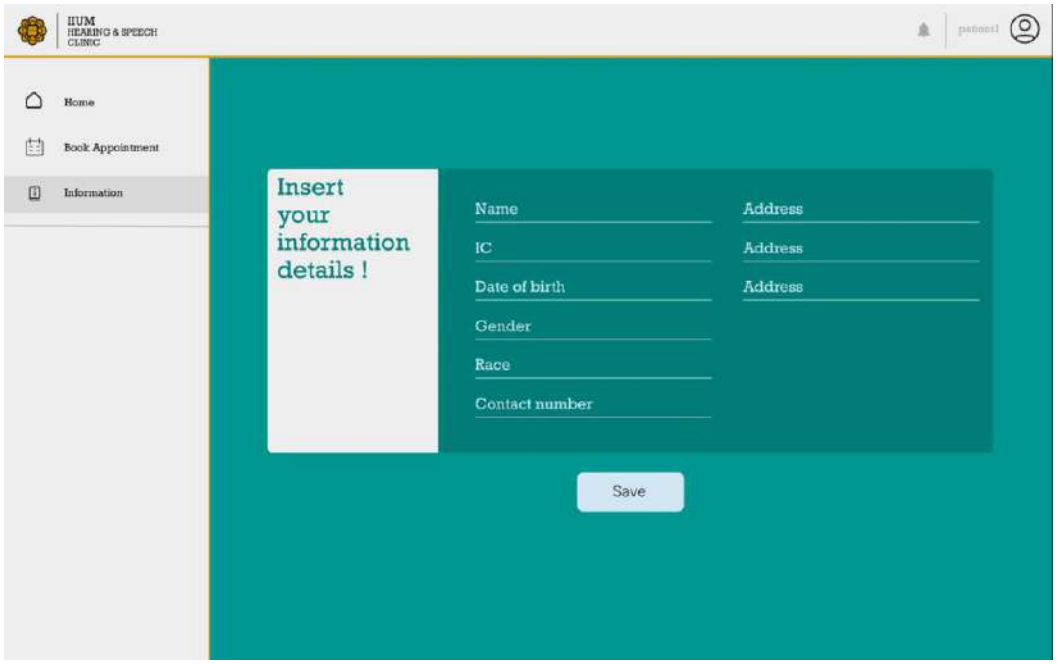


Figure 19 Information page

Figure 17, Figure 18 and Figure 19 above are the design prototypes for patient module where the first figure is the homepage for patient and the system will display upcoming appointments for patient. So user can stay alert by looking at the lists. The second figure is the booking appointment page for patient to book appointment online. The third figure is the Information page for patient to insert their details of informations. So, the system can be record in the database to let authorized user such asnstaff and audiologist to view their information.

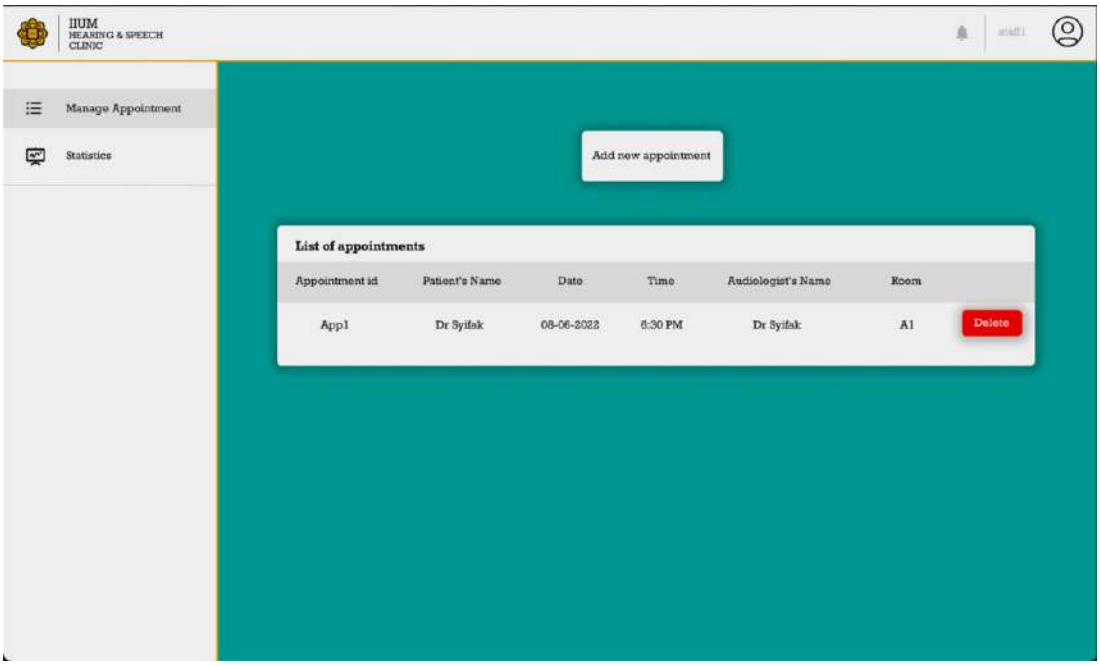


Figure 20 Manage appointment page

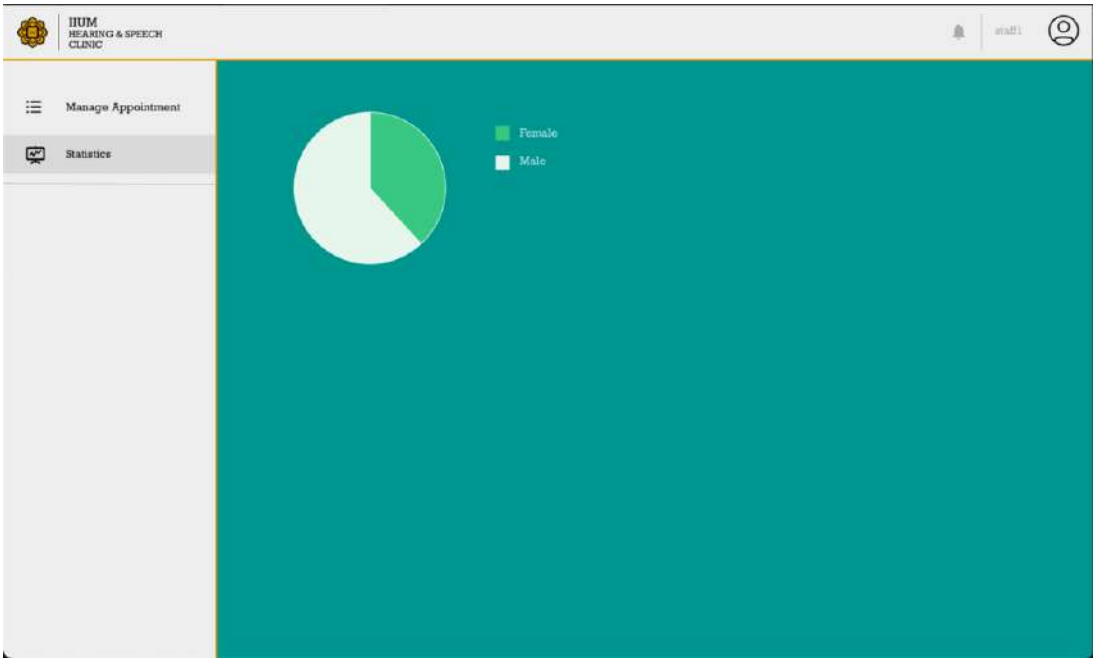


Figure 21 Statistics page

Figure 20 and Figure 21 above are the design prototypes for staff module where the first module is the manage appointment page. Staff can manage appointment for the patient whether to add or delete appointments. The second figure is the statistics page where staff can view the statistics monthly such patient statistic, payment statistic and etc.

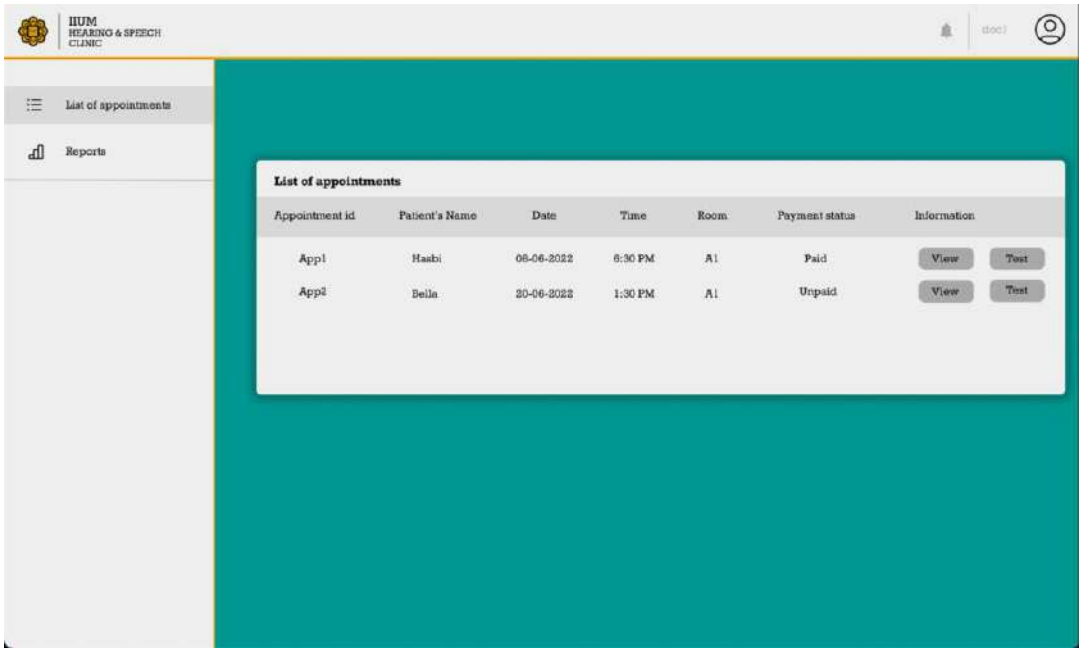


Figure 22 List of appointment page

Figure 23 Reports page

Figure 22 and Figure 23 above are the design prototypes for audiologist module where the first module is the list of appointment page. Audiologist can view patient's information or start to test them by clicking test button. The second figure is the report page where audiologist is able to create report for the patients to give comment or recommendation regarding the test.

3.6 Testing plan

A test case is generated as the testing plan to test the functionality of the IIUM Hearing & Speech Clinic System. This is to ensure that the operation of the system works as desired result. The following table is a guideline for launching the IIUM Hearing & Speech Clinic System to evaluate the functionality.

No	Module	Process	Result	Comments
1	Login/Register	User register	Pass/Fail	
2		User login	Pass/Fail	
3		User logout	Pass/Fail	
4	Manage appointment	Click book appointment	Pass/Fail	
5		Insert details	Pass/Fail	
6		Open payment interface	Pass/Fail	
7		Insert payment details	Pass/Fail	
8		Display appointments	Pass/Fail	
9	Manage User	Click manage user	Pass/Fail	
10		Display list of users	Pass/Fail	
11		Add new user	Pass/Fail	
12	Manage Profile	Click Manage Profile	Pass/Fail	
		Update information		
13		Change password	Pass/Fail	
14	Manage Report	Click reports	Pass/Fail	
15		Display report	Pass/Fail	

This test has been performed by:

Name :

Signature :

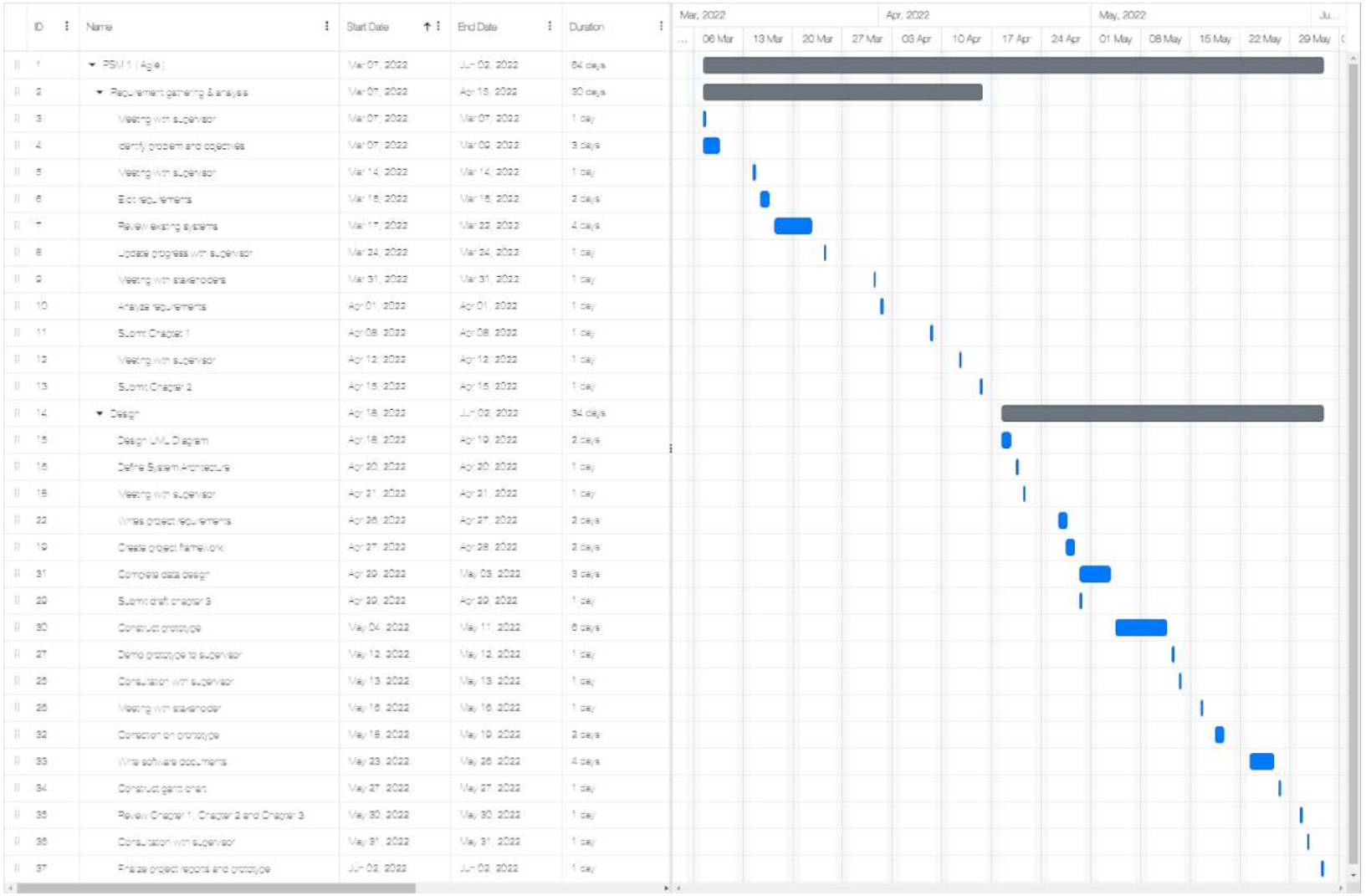
Date :

3.7 Potential use of proposed solution

It becomes hard for most health department in Malaysia these days to work using traditional method because there a lot of patients nowadays that are aware of the important of their health. So staff or doctor doesn't have enough hands to take report for every patients manually. It is still reliable but the productivity of a particular hospitals/clinics will be drop as there are too many data to be stored. Plus, all confidential data of patients are placed in the shelf only makes the data can be easily exposed. And also patient needs to come to the hospitals/clinics to book an appointment or just to see doctor. This is time, cost and energy consuming for the patients.

Therefore, IIUM Hearing & Speech Clinic System are created to help patient, staff and audiologist by digitize all the traditional method into digitalization. It helps patient by providing an online booking for appointment. This will save a lot of time and energy of the patient. Furthermore, it also helps staff to handle data and information in a very secured and effiecient way. This system helps audiologist to work more effiecient as they can view of they have appointment anywhere as long as there is internet connection available. Audiologist can just use the system to test hearing for the patient because the system provides audiogram graph to ease audiologist to mark all the test information.

3.8 Gantt chart



CHAPTER 4

IMPLEMENTATION, RESULTS AND DISCUSSION

4.1 INTORDUCTION

IIUM Hearing & Speech Clinic System has been developed for Patient, Staff and Audiologists(Doctor) who used to done the process manually. Software and services that are used to develop this system are Visual Studio Code, Dbeaver for the database management, Hostinger for hosting the system and Laravel (PHP Framework) is a framework that use to develop the system and handle functions that exist in the system.

4.2 DEVELOPMENT TOOLS

No	Tools	Purpose
1	Visual Studio Code	This platform is used to develop the overall system.
2	Dbeaver	This tool acts as a database management for the system.
3	Hostinger	Allow to host the system and deploy it on the web.
4	Laravel	A framework that is used to handle the architecture of the system.

4.3 IMPLEMENTATION

This process is to record all the steps in developing the IIUM Health & Speech Clinic System.

4.3.1 SETTING UP THE INITIAL PROCESS

Before the development starts, the project must be set up to have all the features and dependencies for the system to have later. Basically Laravel framework will provides the packages that is going to be use in the system. The methodology used by this framework is Model-View-Controller (MVC).

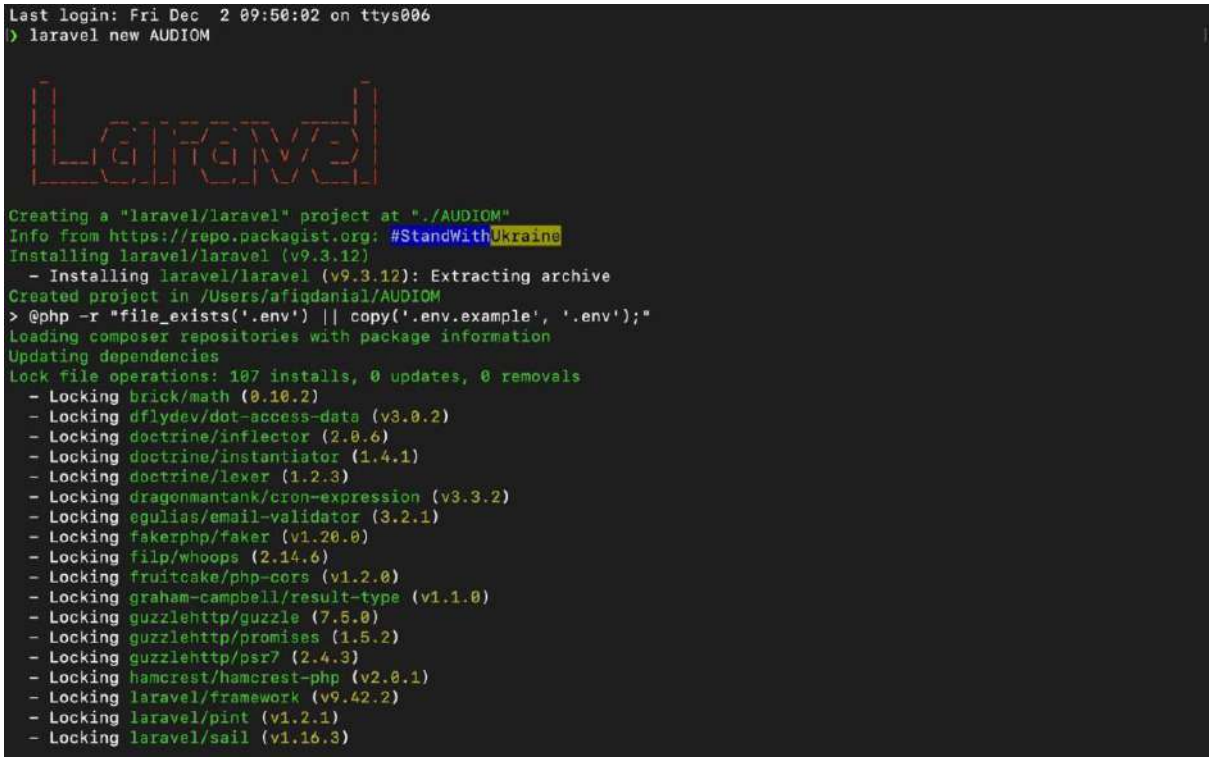


Figure 24 Project setup

This is very important part because without the setup, the development process could never be done. Here, Figure 24 show the way to setup the project by typing “Laravel new AUDIOM” and the framework will handle all the processes.

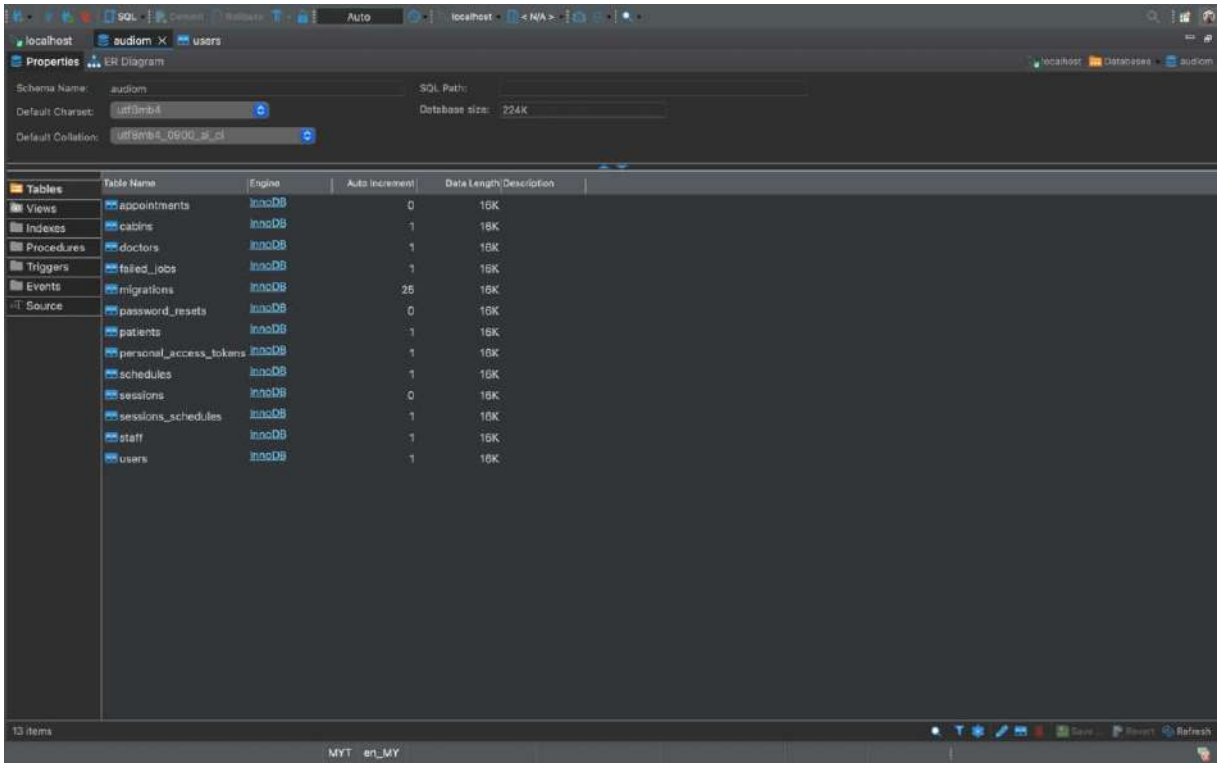


Figure 25 Database Setup

Figure 25 shows the set up for the database connection using dBeaver. The connection is made with MySQL connection. These columns are auto-generate by Laravel Framework, I only wrote a simple command and add particular attributes on each column.

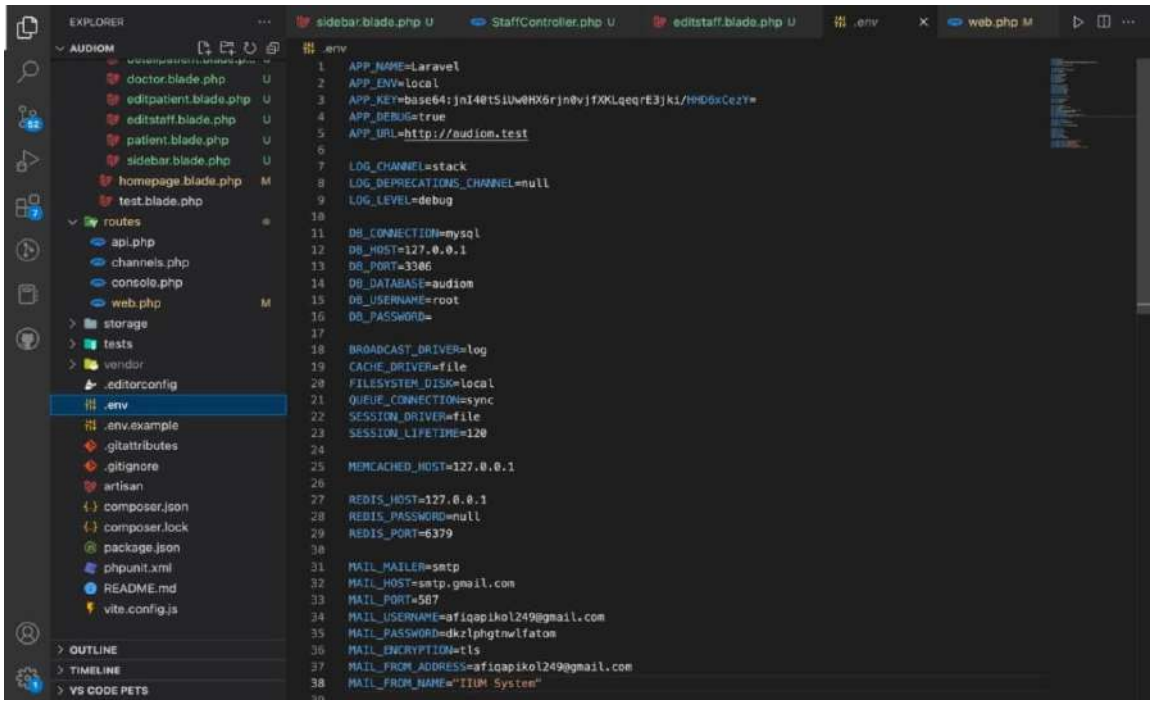


Figure 26 Environment file in Laravel

Figure 26 shows the environment file of the project to make the connection to the database. Basically, the connection will be set up by specify the connection name, host and port to connect and also the name of the database. After that, in order to migrate the database, "**php artisan migrate**" need to be run in the terminal.

4.3.2 DEVELOPMENT OF THE SYSTEM

After finished setting up the initial process, it is now prepared to start with the code of the development and display the interfaces to the web browser by type the local domain name of the system which is **http://.test/.** This domain only for local environment currently because it haven't be deploy to the hosting service.

Figure 26 Local domain to access the system

Figure 27 show the local domain name for displaying or testing the system interfaces and functions. In order to set up this domain, there are some code that need to be type in the terminal as shown in Figure 28.

Figure 27 Command to set the URL

Valet is one of the feature that Laravel provide to specifiy the domain name without actually copy the ip address of the development.

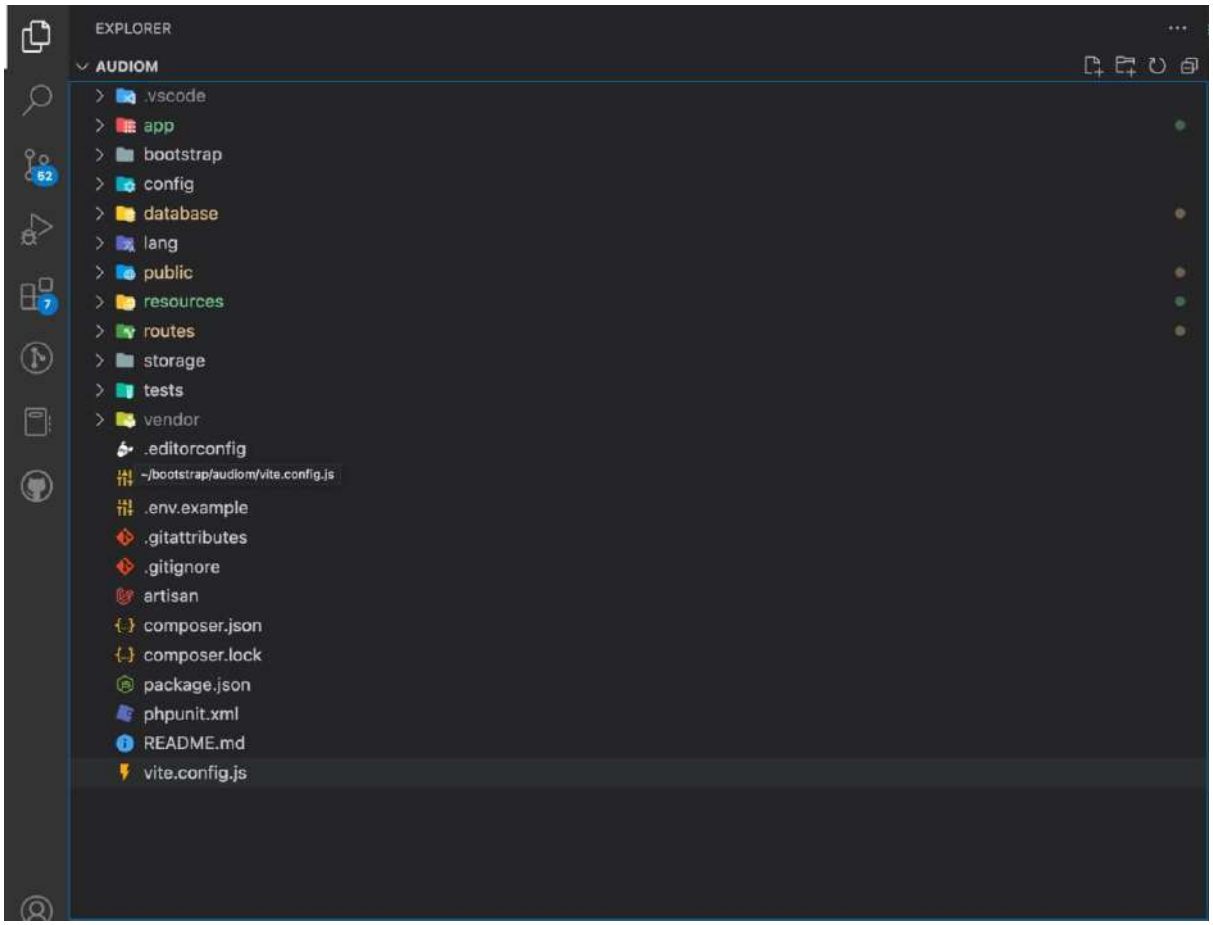


Figure 28 Laravel Folder

Figure 29 shows the list of files available in the project. There are certain files that will be use a lot during the development of the system which are resources, routes and app.

4.4 HOSTING WEBSITE INTO LIVE SERVER (HOSTINGER)

IIUM Hearing & Speech Clinic System is deployed into live server using service provided by Hostinger. Hostinger provides a user-friendly interface to manage different websites easily. Apart of providing web hosting service, Hostinger also provides a domain name for the developer to choose. Hostinger is very secured to be using as a web hosting service because it has a SSL provided as well.

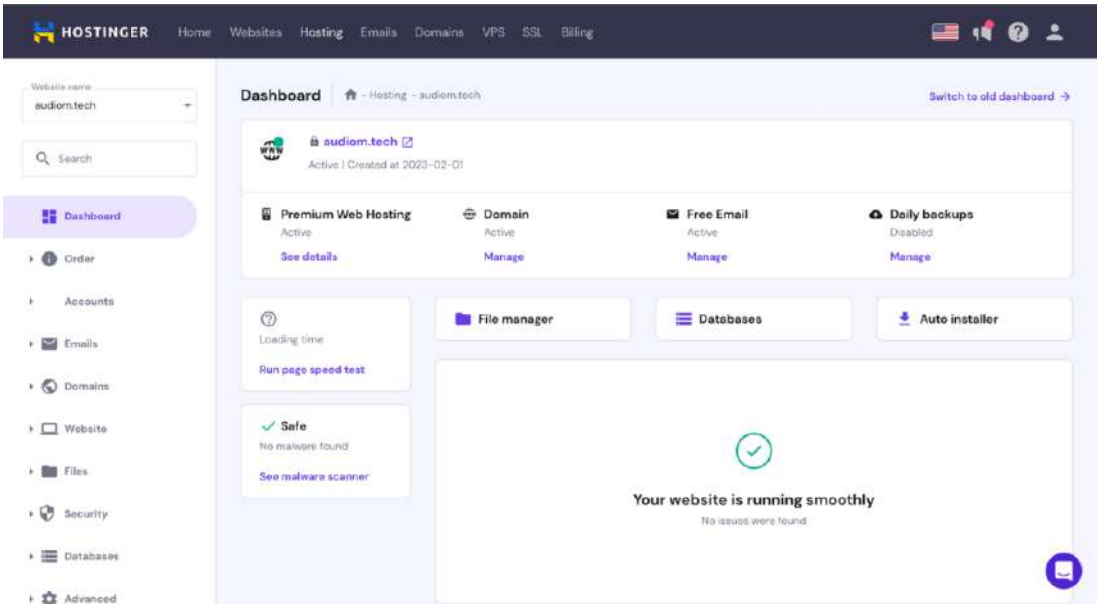


Figure 29 Hosting Server Dashboard

Figure 30 shows the dashboard of the Hostinger when you log in. It shows some functions that are available. As you can see the file manage is the location where we can upload our system files and let hostinger do the other job for you.

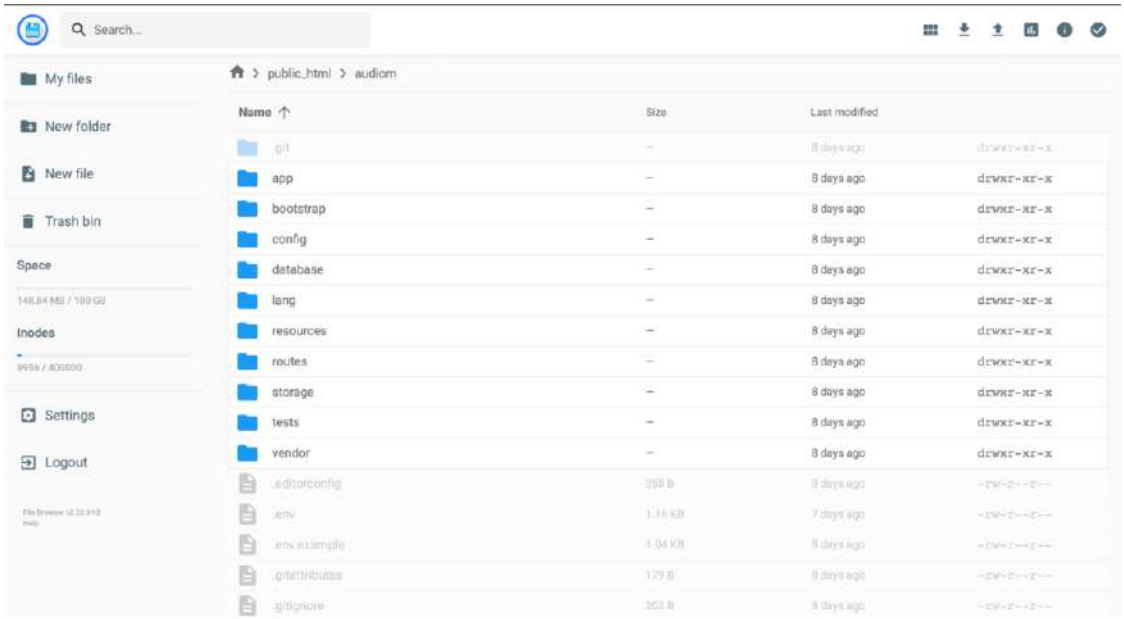


Figure 30 File available in public_html

Figure 31 shows that files that are already extract to public_html folder in the hostinger's file manager.

4.5 IIUM HEALH & SPEECH SYSTEM INTERFACES

When the development of the system is successfully finished, the system can be display in the web browser by search for the local domain name. A homepage of the system will the first interface that will be display once the you search the system.

4.5.1 HOMEPAGE INTERFACE

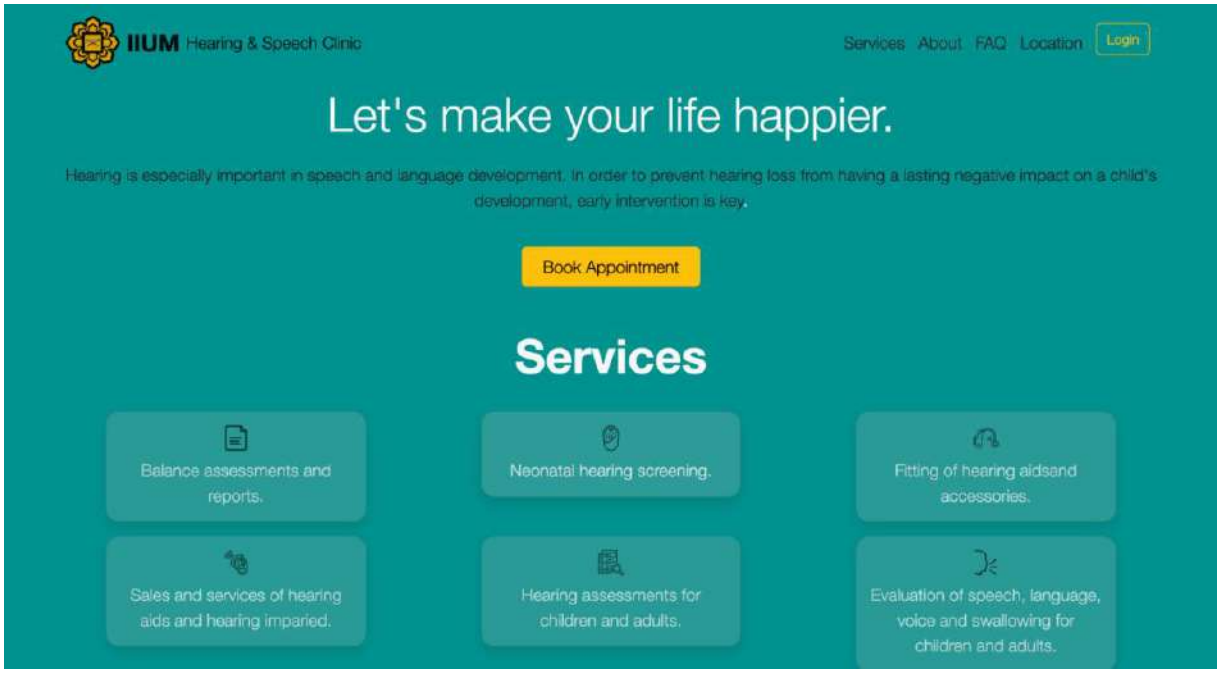


Figure 31 Homepage Interface

Figure 32 shows the homepage of the IIUM Health & Speech System which will be the first interface the user will see when they are in the system. The homepage interface shows some information regarding services that IIUM provide.

4.5.2 LOGIN INTERFACE

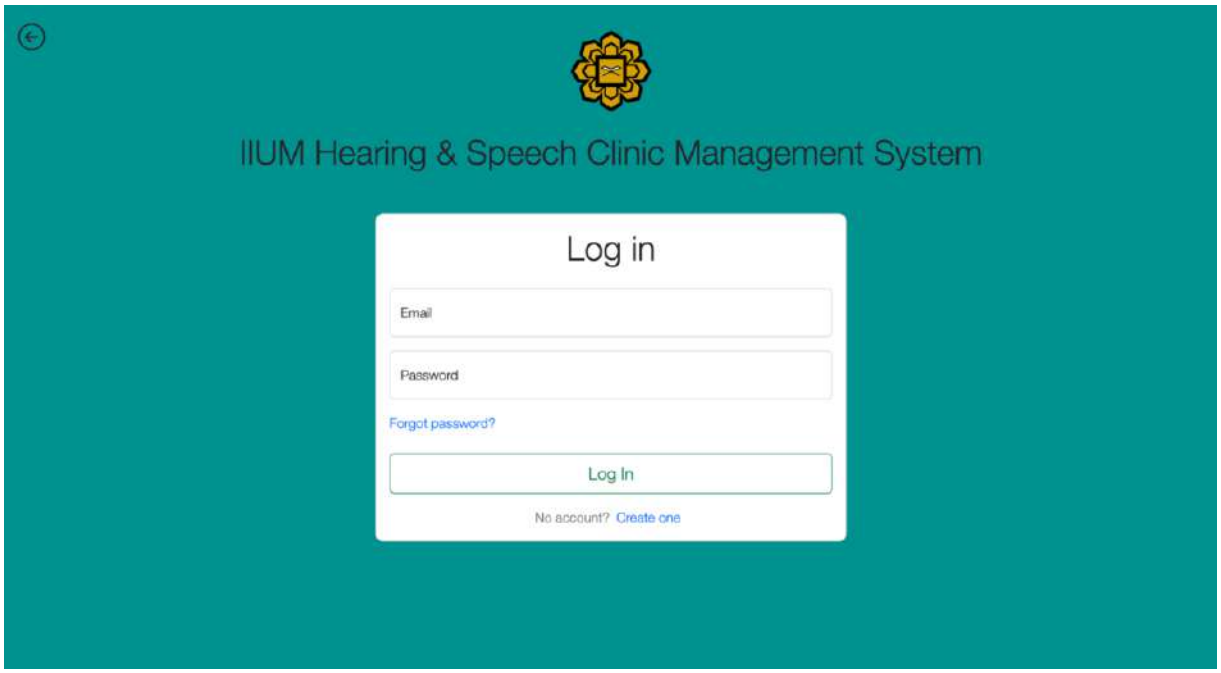


Figure 32 Login Interface

Figure 33 shows the login interface. Whenever user click login button, the system will navigate the user to this page. User able to login into the system by entering their email and password. If they don't have any account, they need to register first.

4.5.3 REGISTER INTERFACE

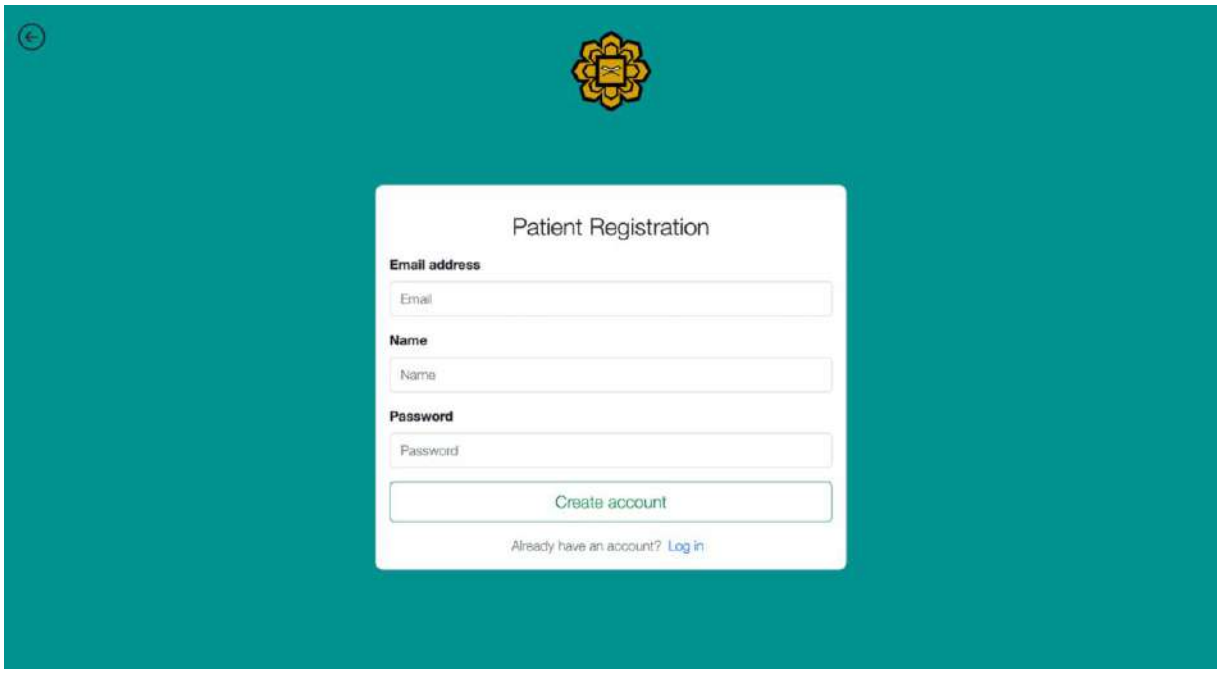


Figure 33 Register Interface

Figure 34 shows the register account interface. Only Patient need to register an account. Other role will be handle by admin of the system. So basically, Patient only need to enter email, name and password.

4.5.4 STAFF DASHBOARD INTERFACE

Figure 34 Staff Dashboard Interface

Figure 35 shows the staff homepage interface. This is the interface that staff/admin will see when they are log in into system. The staff is able to view number of appointment, doctors and patients that is available in the database.

4.5.5 MANAGE PATIENT INTERFACE

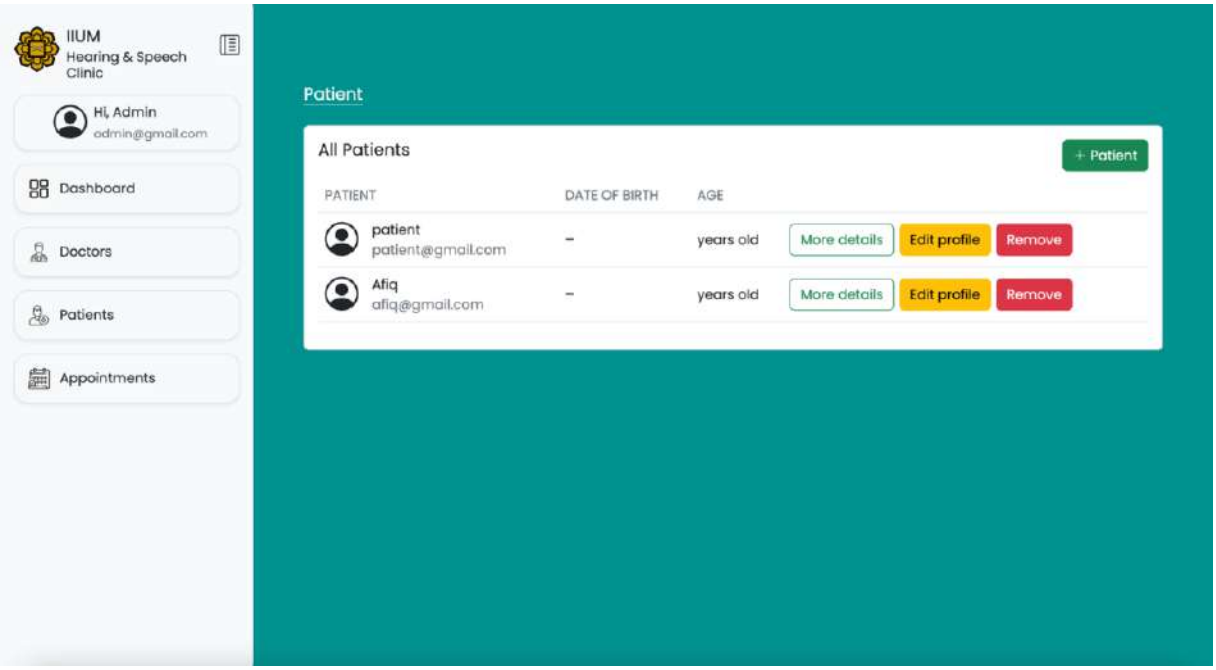


Figure 35 Manage Patient Interface

Figure 36 shows the patient interface for the staff/admin to manage the patient such as add new patient, delete current patient, edit their profile and view the details of the patient. Doctor interface is just the same as patient interface with different attributes.

4.5.5.1 ADD PATIENT INTERFACE

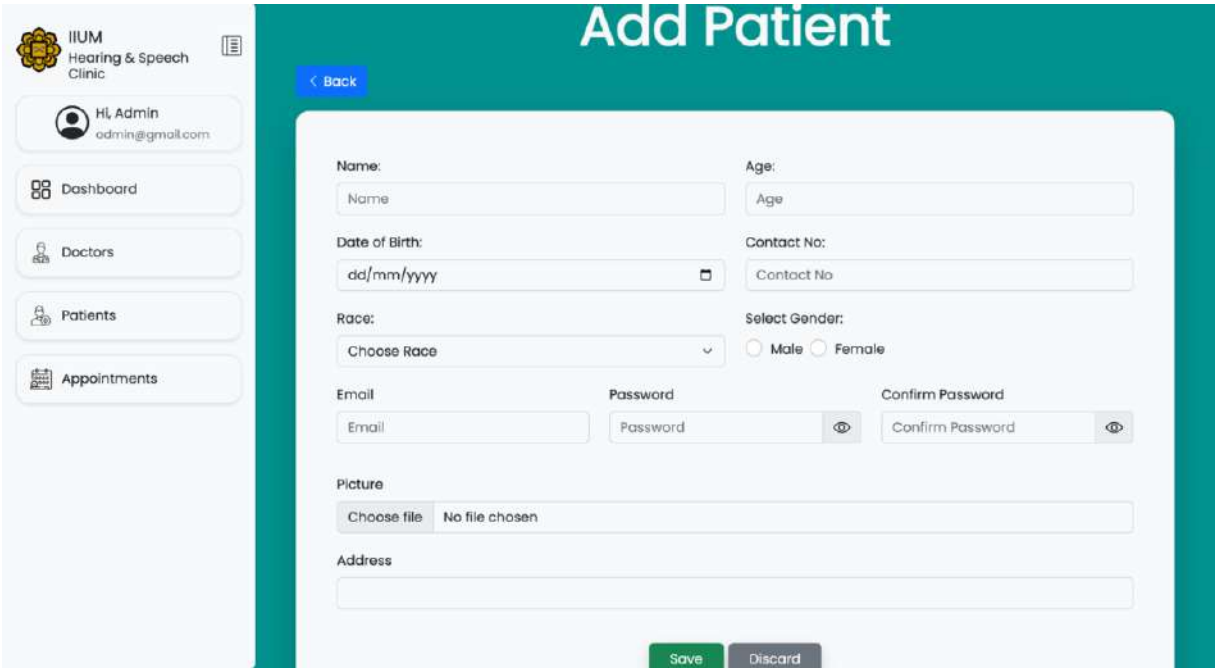


Figure 36 Add Patient Interface

Figure 37 shows the Add Patient Interface where staff/admin is able to add new patient by filling in the form and the system will create an account for the patient based on the email and password created by the staff/admin. Admin should be able to enter patient's name, age, date of birth, contact number, race, gender, email, password, picture and address. The picture is exceptional, it can be null and the system will still display default image.

4.5.5.2 EDIT PATIENT INTERFACE

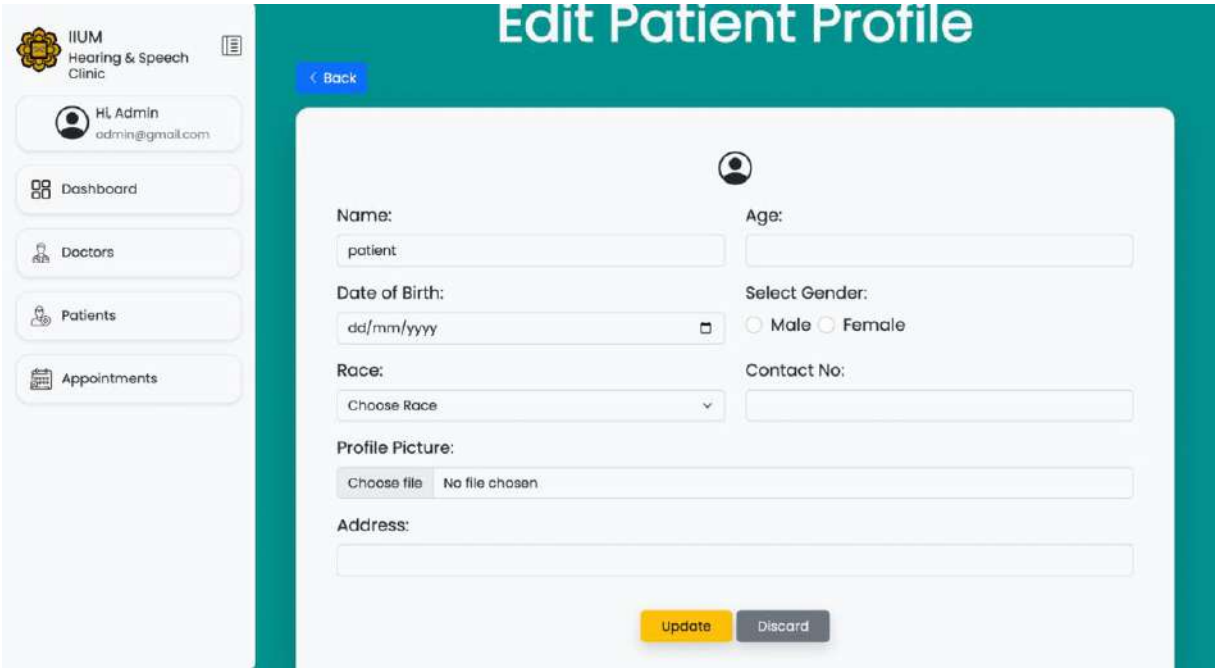


Figure 37 Edit Patient Interface

Figure 38 shows Edit Patient Interface. Staff/Admin is able to edit patient details in this interface but admin only allow to edit patient's name, age, date of birth, gender, race, contact number, profile picture and address.

4.5.6 MANAGE DOCTOR INTERFACE

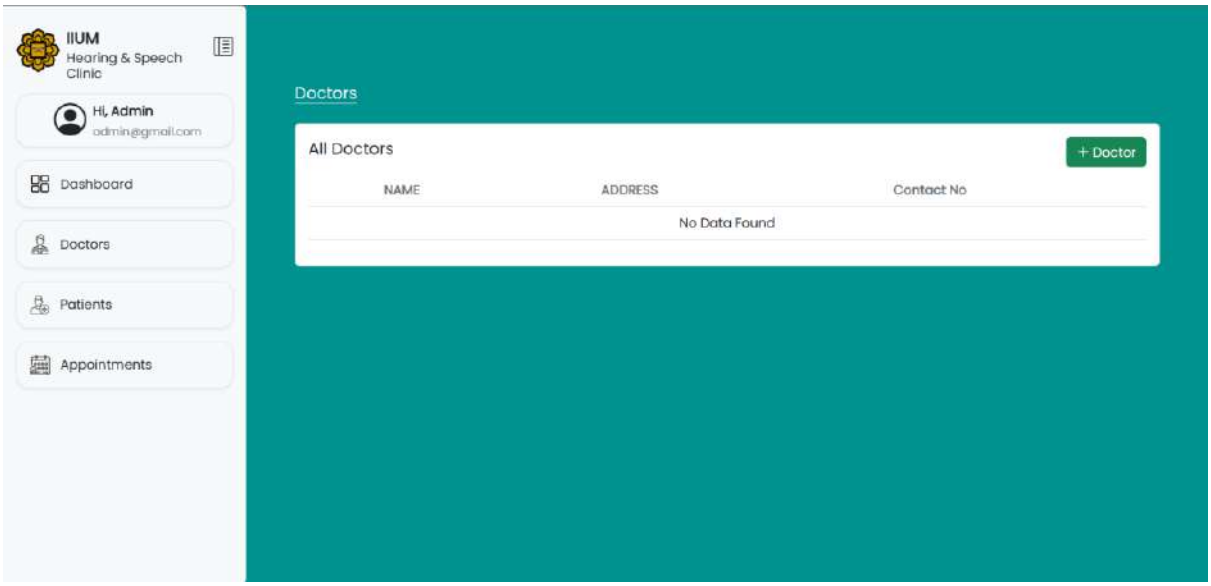


Figure 38 Mange Doctor Interface

Figure 39 shows the manage doctor interface, only admin is allow to access this interface. The system will display list of existing doctors. If there's no doctor available, the system will display "No Data Found". Admin can register new doctor by clicking the "+ Doctor" button.

4.5.6.1 ADD DOCTOR INTERFACE

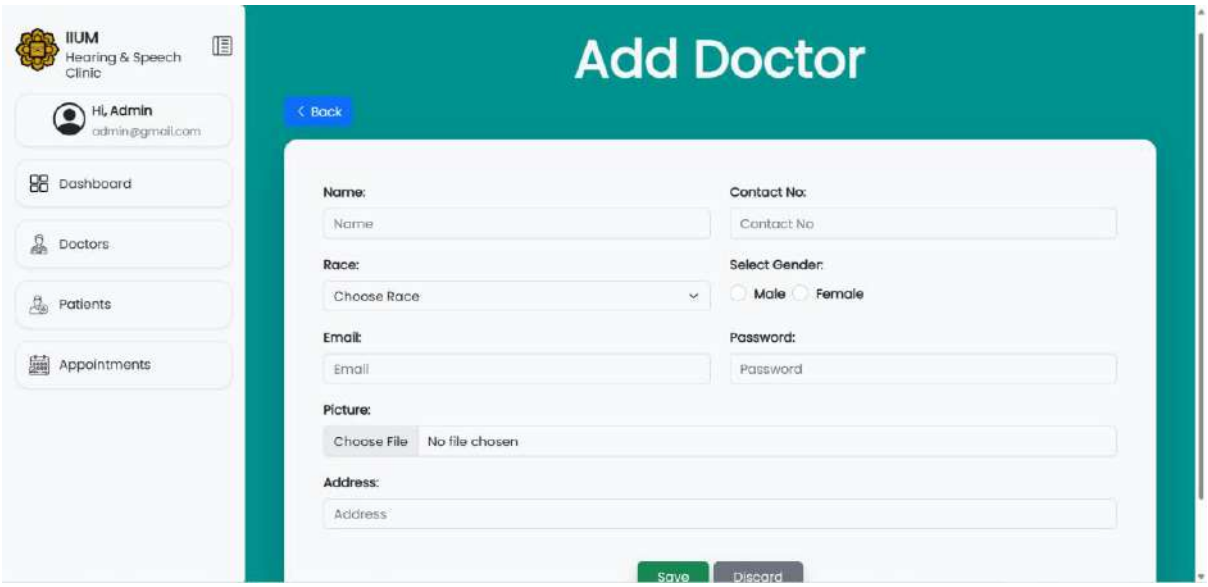


Figure 39 Add Doctor Interface

Figure 40 shows the add doctor interface which allows admin to enter information details of the new doctor in the system.

4.5.6.2 EDIT DOCTOR INTERFACE

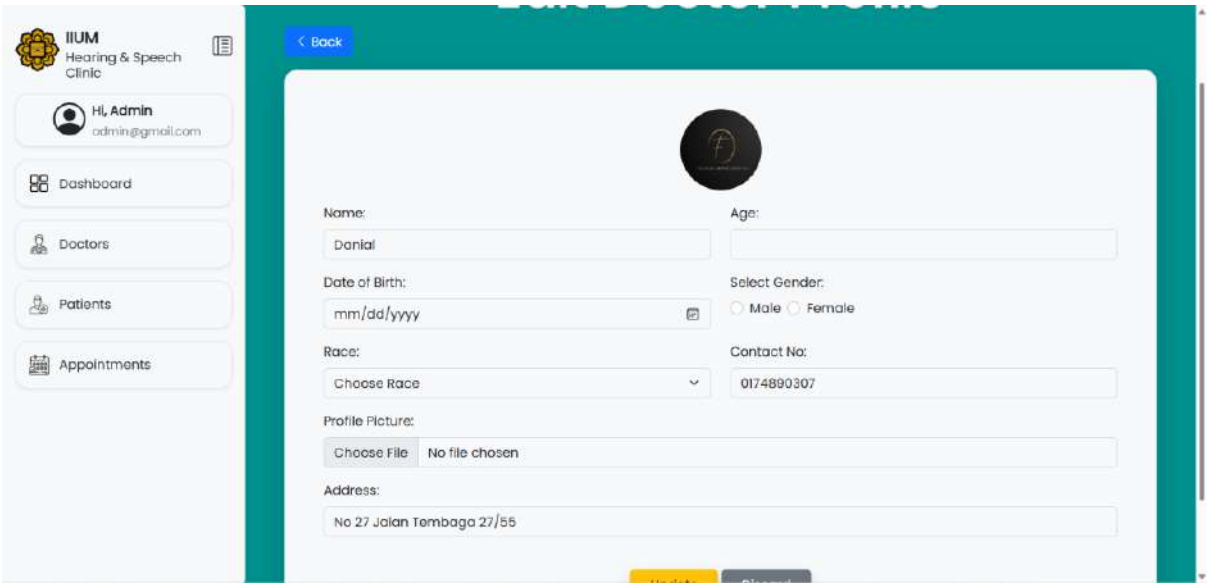


Figure 40 Edit Doctor Interface

Figure 41 shows the edit doctor interface which allow admin to edit doctor's information.

4.5.7 MANAGE APPOINTMENTS

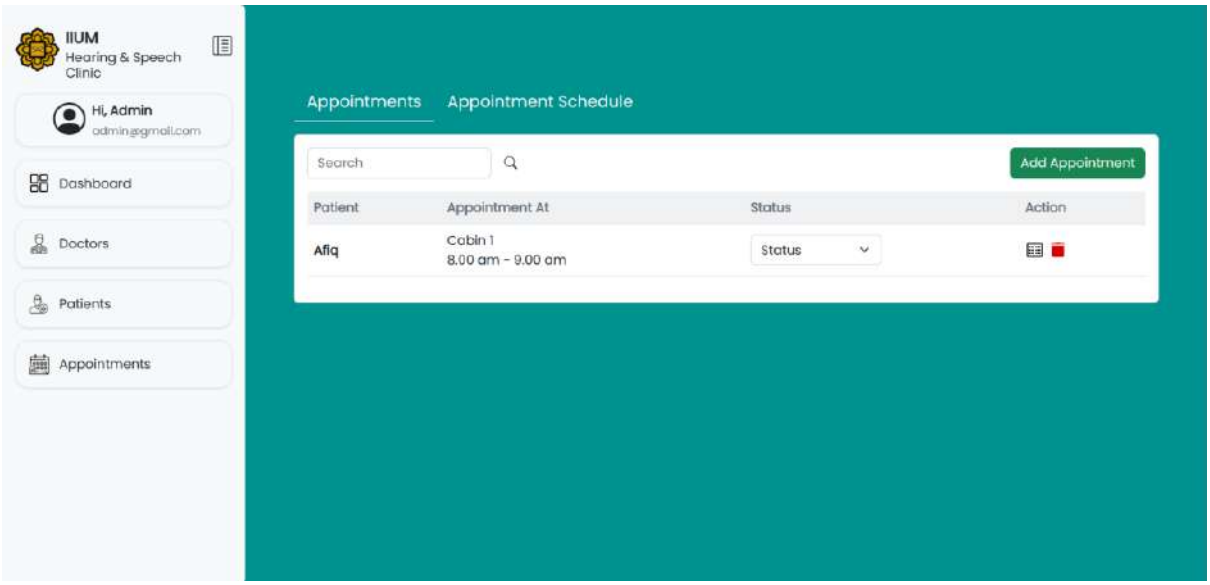


Figure 41 Manage Appointment Interface

Figure 42 shows the manage appointment interface. This interface only allow admin to access. Basically, the system will let admin choose to book appointment or to set an appointment time.

4.5.7.1 CREATE APPOINTMENT INTERFACE

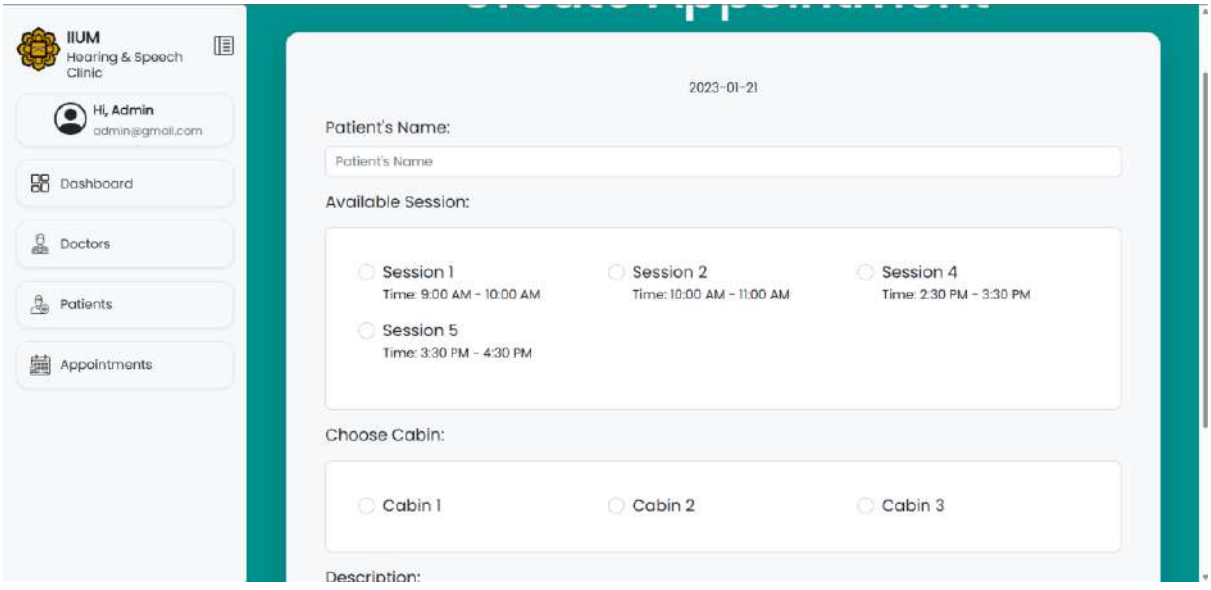


Figure 42 Create Appointment Interface

Figure 43 shows the create appointment interface where admin can book appointment for the patient by insert patient's name, pick a session available and cabin.

4.5.7.2 APPOINTMENT SCHEDULE INTERFACE

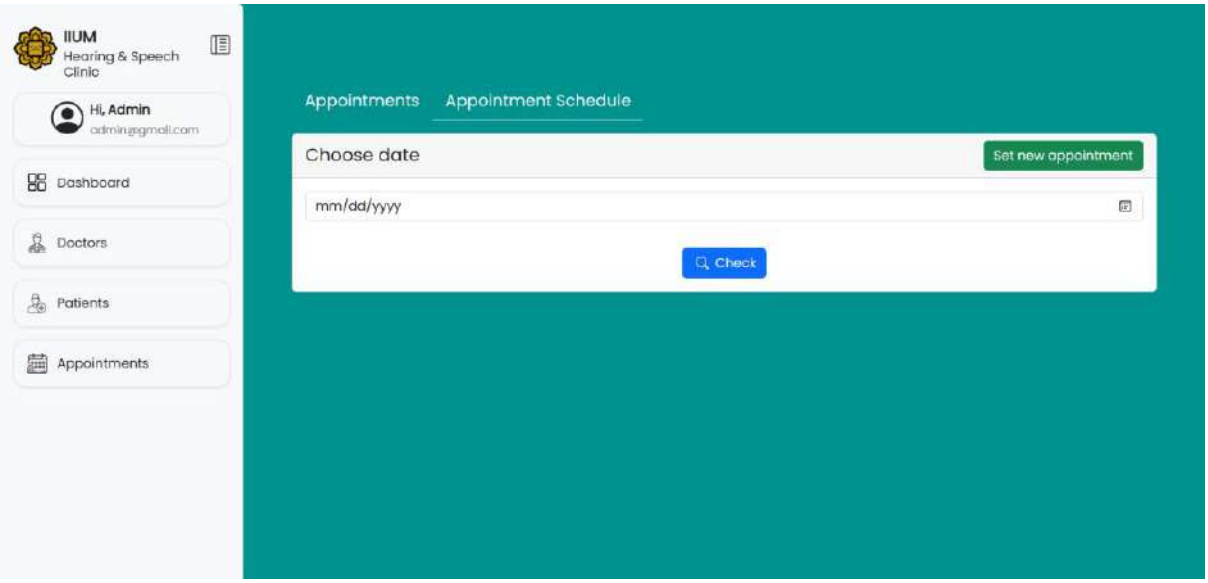


Figure 43 Appointment Schedule Interface

Figure 44 shows the appointment schedule interface which allow admin to check whether appointment has been set for the selected date.

4.5.7.3 SET NEW SCHEDUE INTERFACE

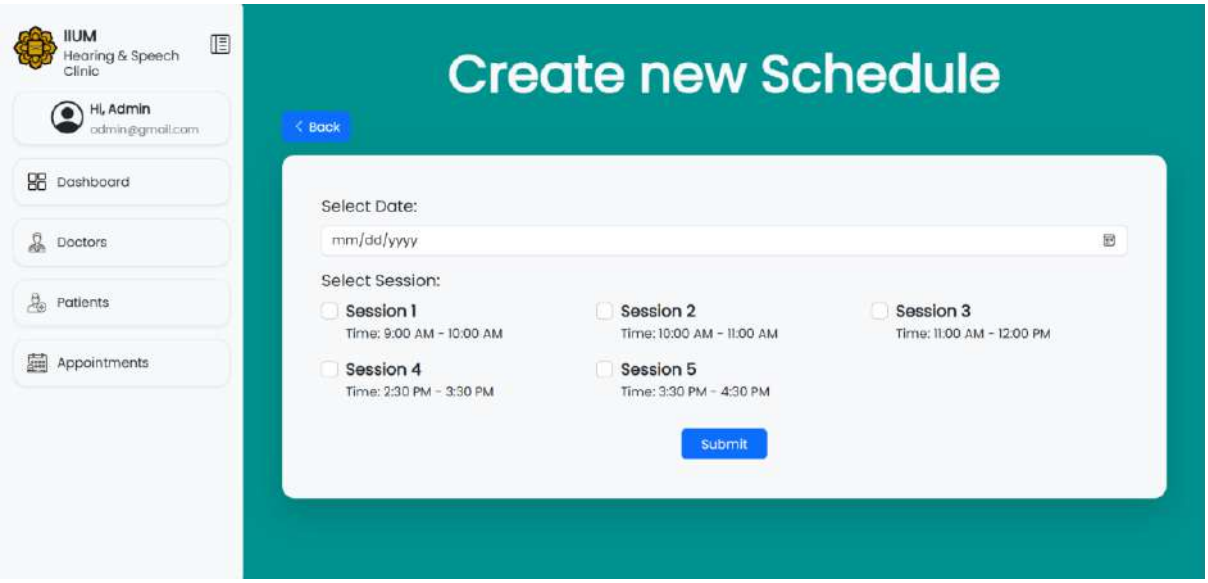


Figure 44 Create New Schedule Interface

Figure 45 shows the interface that allow admin to set a new schedule for a particular date by choosing date and sessions to open for that date.

4.5.8 PATIENT DASHBOARD

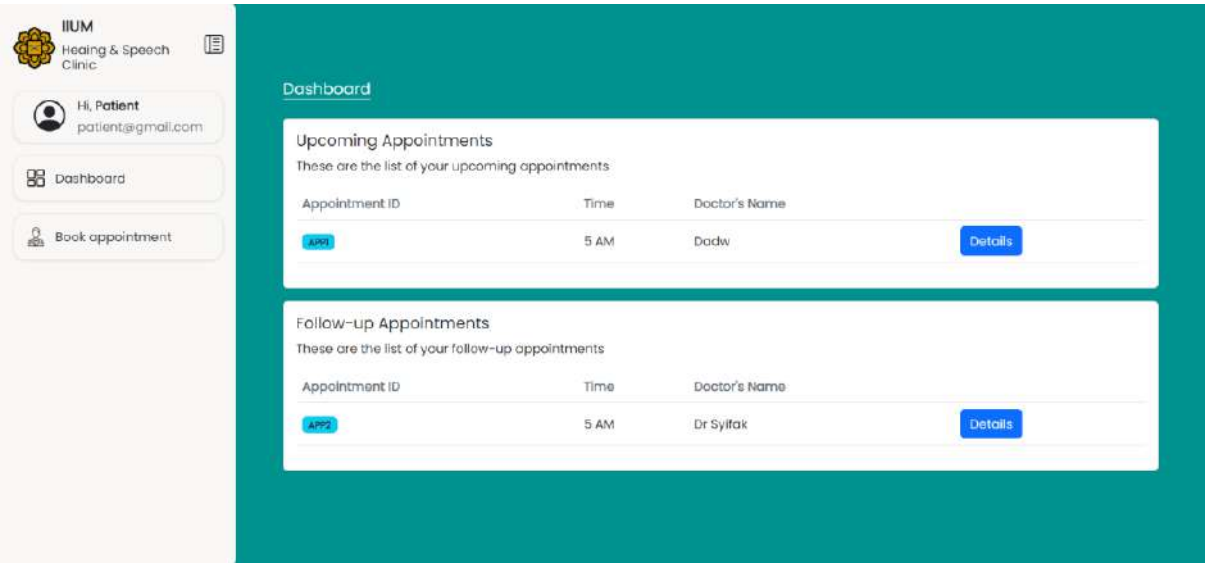


Figure 45 Patient Dashboard Interface

Figure 46 shows the Patient Dashboard whenever a patient login into the system. The system will display upcoming appointments and also follow-up appointments if and only if they are available. Patient can also book appointment by click the button at the sidebar.

4.5.8.1 APPOINTMENT DETAIL INTERFACE

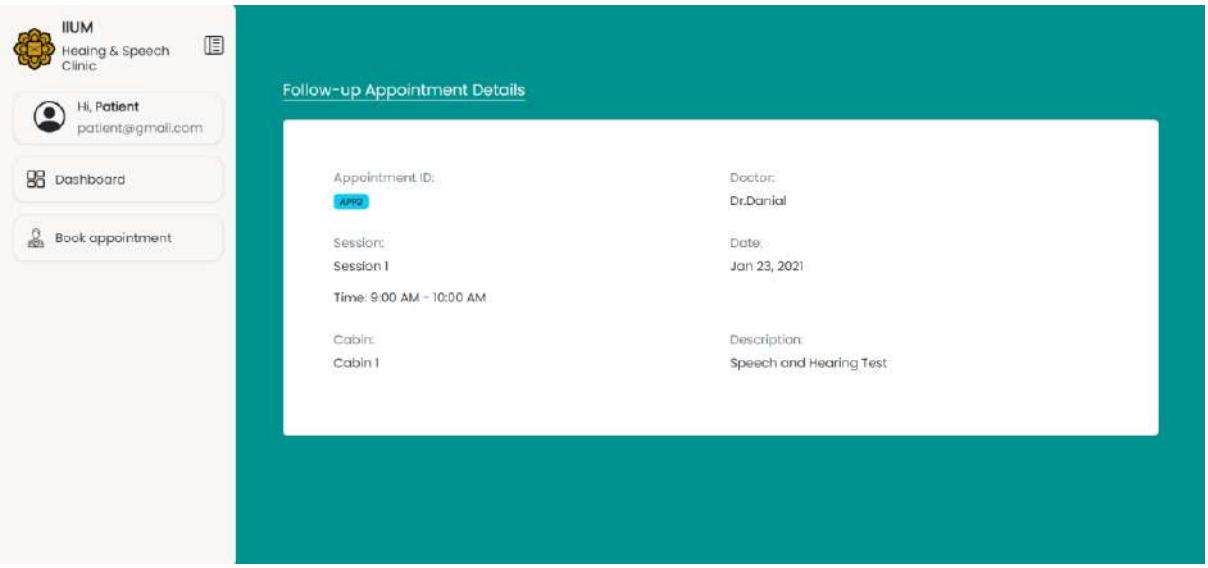


Figure 46 Appointment Detail Interface

Figure 47 shows the appointment details for the appointment that has been approved. The system will disaply information such as Appointment ID, Doctor's name, Session, Date, Cabin and Description of the appointment. This interface will be shown when patient clicks "Details" button.

4.5.8.2 ADD APPOINTMENT INTERFACE FOR PATIENT

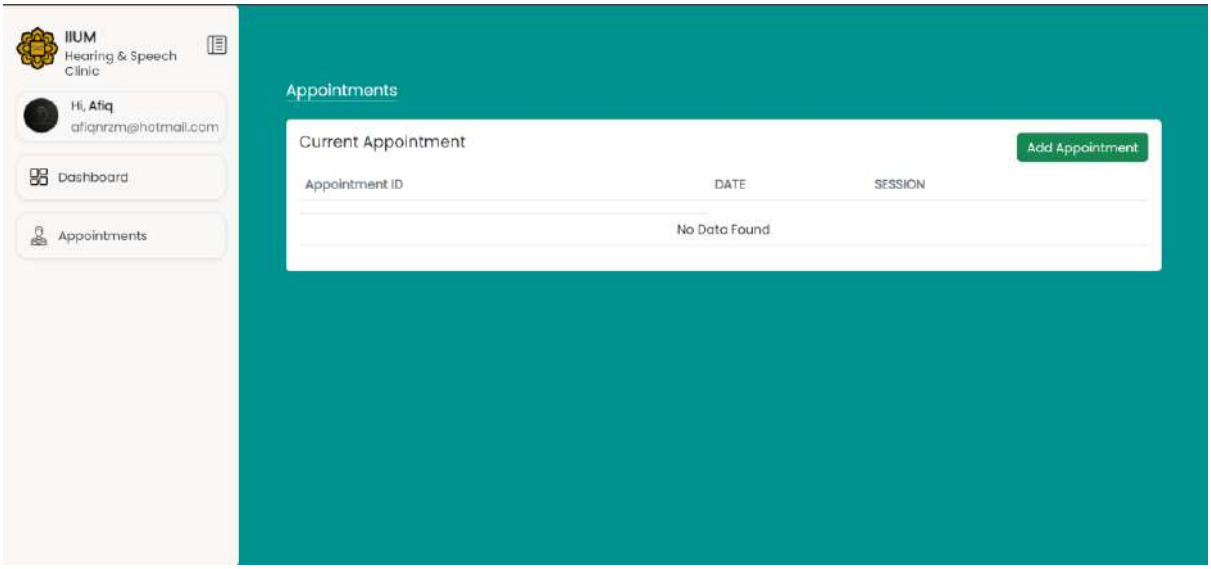


Figure 47 Add Appointment Interface

Figure 48 shows the add appointment interface which allow patient to book an appointment. The system will display list of appointment available.

4.5.8.3 EDIT PROFILE INTERFACE

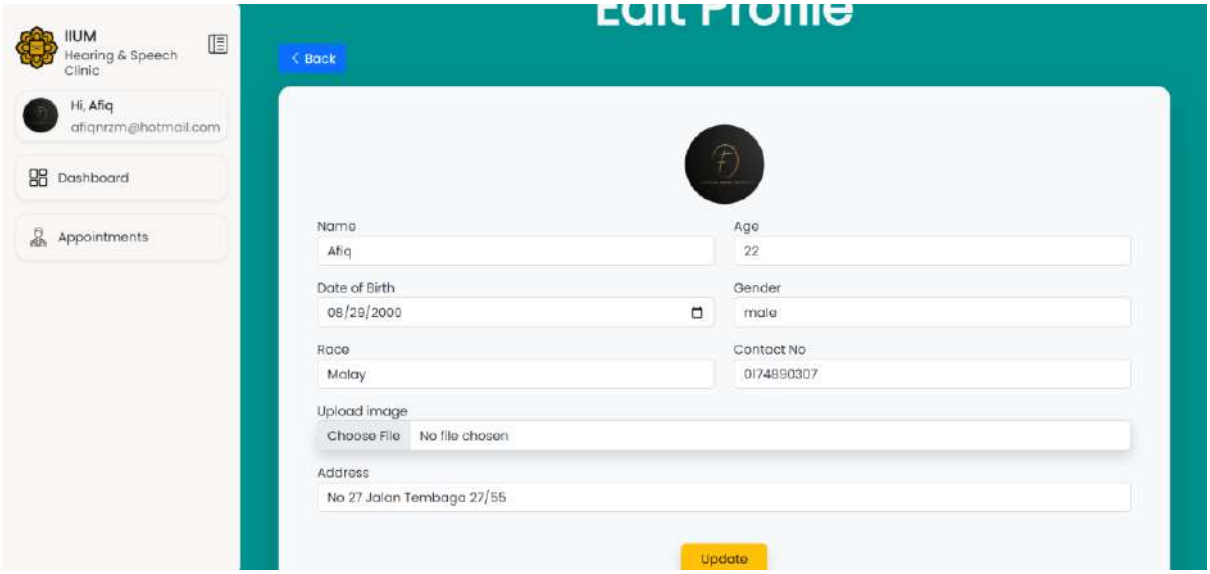


Figure 48 Edit Profile Interface

Figure 49 shows Edit Profile Interface for patient that wish to edit their information in the system.

4.5.9 DOCTOR DASHBORD

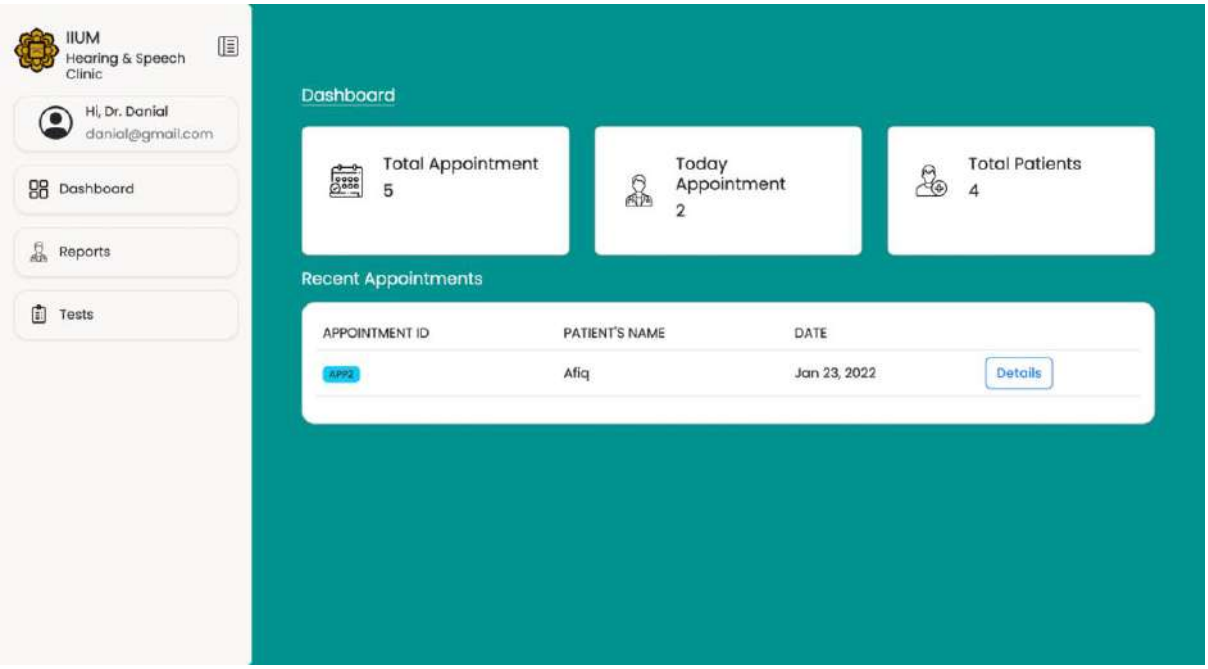


Figure 49 Doctor Dashboard Interface

All figures shown above are the results of the implementation developed. There are three dashboards in total for different user role. All user have similar interface design but with different functions.

4.6 CODING

4.6.1 PATIENT CONTROLLER

app > Http > Controllers > PatientController.php > ...

```
16      * Display a listing of the resource.
17      *
18      * @return \Illuminate\Http\Response
19      */
20     public function index()
21     {
22         $patients = Patient::with('users')->get();
23
24         if (auth()->user()->role === "staff") {
25             return view('staff.managepatient.patient', compact('patients'));
26         } else if (auth()->user()->role === "patient") {
27             return view('patient.homepage', compact('patients'));
28         }
29     }
30
31     /**
32      * Show the form for creating a new resource.
33      *
34      * @return \Illuminate\Http\Response
35      */
36     public function create()
37     {
38         return view('staff.managepatient.addpatient');
39     }
40
41     /**
42      * Store a newly created resource in storage.
43      *
44      * @param  \Illuminate\Http\Request  $request
45      * @return \Illuminate\Http\Response
46      */
47     public function store(Request $request)
48     {
49         $request->validate([
50             'name' => 'required',
51             'age' => 'required',
52             'dob' => 'required',
```

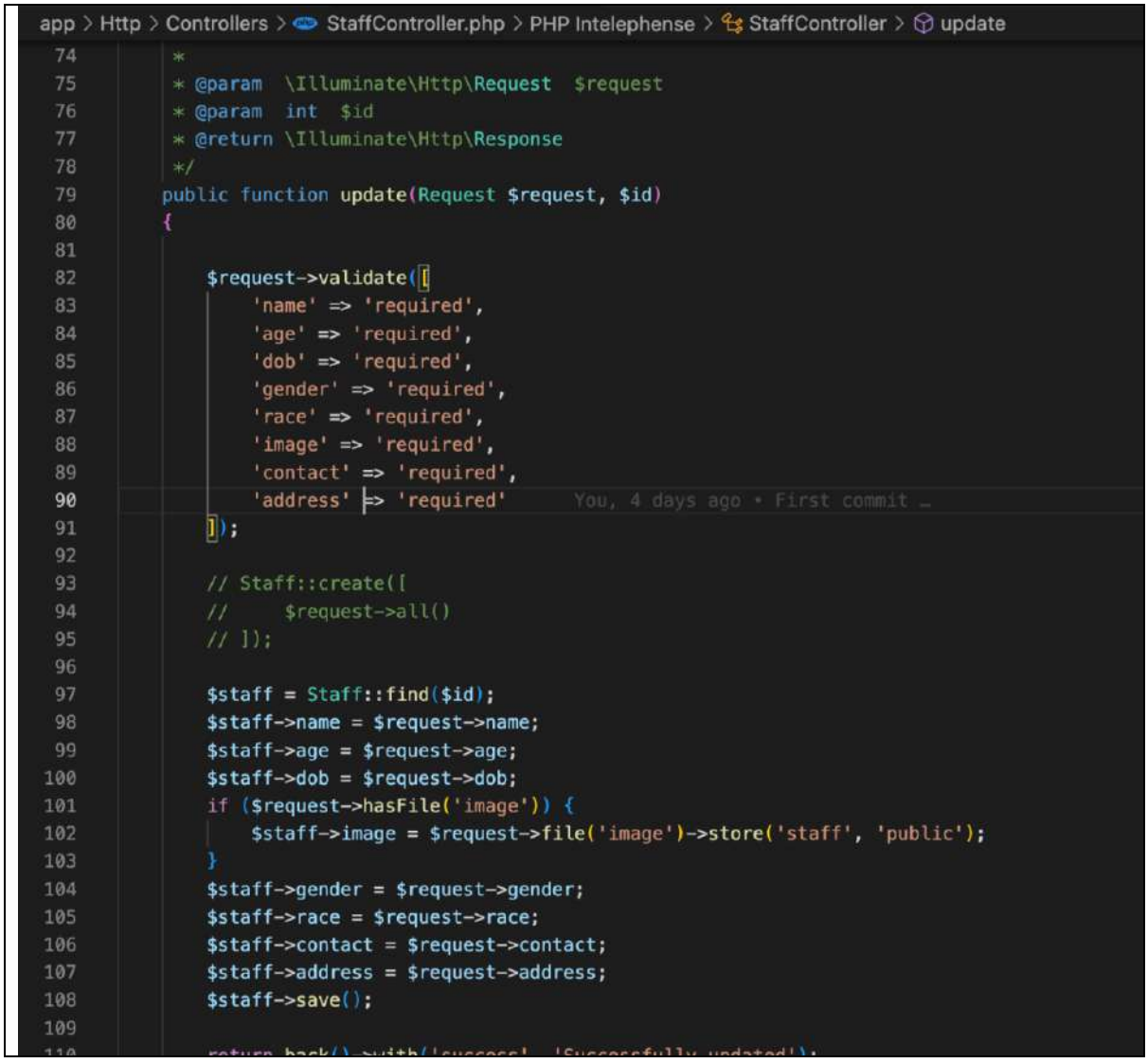
The coding above shows the amount of functions for patient controller. Basically, every functions are important to ensure all the requirements are fulfilled.

4.6.2 STAFF CONTROLLER

app > Http > Controllers > StaffController.php > PHP Intelephense > StaffController > update

```
You, 4 days ago | 1 author (You)
<?php

namespace App\Http\Controllers;

use Illuminate\Http\Request;
use App\Models\User;
use App\Models\Doctor;
use App\Models\Staff;
use App\Models\Patient;
// use App\Http\Controllers\UserController;
use Illuminate\Support\Facades\Hash;

You, 4 days ago | 1 author (You)
class StaffController extends Controller
{
    /**
     * Display a listing of the resource.
     *
     * @return \Illuminate\Http\Response
     */
    public function index()
    {
        $staff = Staff::all()->count();
        $doctor = Doctor::all()->count();
        $patient = Patient::all()->count();
        return view('staff.dashboard', compact('staff', 'doctor', 'patient'));
    }

    /**
     * Show the form for creating a new resource.
     *
     * @return \Illuminate\Http\Response
     */
    public function create()
    {
        //
```

4.6.3 DOCTOR CONTROLLER



All figures above show the main controller that handle all the function that will be execute. Controller will act as a middleman between view and model where controller will fetch the data from the model. Basically, It will control all the logic.

4.6.4 USER ACCESS MIDDLEWARE

app > Http > Middleware > UserAccess.php > PHP Intelephense > UserAccess

```
Afiq Danial, 3 months ago | 1 author (Afiq Danial)
<?php

namespace App\Http\Middleware;

use Closure;
use Illuminate\Http\Request;
use Illuminate\Support\Facades\Auth;

Afiq Danial, 3 months ago | 1 author (Afiq Danial)
class UserAccess
{       Afiq Danial, 3 months ago • first commit
    /**
     * Handle an incoming request.
     *
     * @param  \Illuminate\Http\Request  $request
     * @param  \Closure(\Illuminate\Http\Request): (\Illuminate\Http\Response|\Illuminate\Http\RedirectResponse)  $next
     * @return \Illuminate\Http\Response|\Illuminate\Http\RedirectResponse
     */
    public function handle(Request $request, Closure $next, $role)
    {
        if (auth()->user()->role == $role) {
            return $next($request);
        }

        return redirect('login')->with('error', 'Please insert your credential');
    }
}

```

What the coding above will do is basically it will control the access of certain interface or function according the user role. Let's say the user is staff/admin, then the system will detect the roles from the database and will navigate the staff to requested view. In easy speak, staff cannot access patient's interfaces and patient cannot access staff's interfaces.

4.6.5 ROUTES

```php
Route::post('create', [UserController::class, ('createUser')])->name('register.custom');
Route::post('login-user', [UserController::class, ('customLogin')])->name('login.custom');
Route::get('logout-user', [UserController::class, ('logout')])->name('logout.user');
Route::post('resetpassword', [UserController::class, ('sendResetLink')])->name('forgot-password');

// Route::get('patient-page', [UserController::class, ('patient')])->middleware(['useraccess:patient']);



Route::group(['middleware' => ['auth', 'user:patient']], function () {

    Route::controller(PatientController::class)->group(function(){
        Route::get('/patient-dashboard', 'index')->name('patient.page');
        Route::get('/change-patient-password', 'changePatientPassword')->name('change.patient.password');
        Route::post('/change-patient-pass', 'updatePatientPassword')->name('update.patient.password');
        Route::get('/bookappointment', 'bookAppointment')->name('book.appointment');
    });

    Route::resource('patients', PatientController::class);

    Route::get('patient/detail', [PatientController::class, 'detail'])->name('patient.detail');
    Route::get('patient/appointment', [PatientController::class, 'appointment'])->name('patient.appointment');

});

Route::group(['middleware' => ['auth', 'user:staff']], function () {

    Route::controller(StaffController::class)->group(function(){
        Route::get('/staff-dashboard', 'index')->name('staff.page');
        Route::get('/change-password', 'changePassword')->name('change.password');
        Route::post('/changepass', 'updatePassword')->name('update.password');
    });

    Route::controller(AppController::class)->group(function(){
        Route::get('app', 'index')->name('app.index');
        Route::get('app/create', 'create')->name('app.create');
```

The coding above show the list of routes. Routes will call blade file or the view file available.

4.7 TESTING

After the development phase is complete, the testing phase is applied to evaluate the system's usability and efficiency and validate the functionality on the system. Testing is a crucial process since it detects errors and failures in the project before it is given to the client. This procedure ensures that the quality of the application to be supplied is satisfactory.

Testing - Staff/Admin

Modules	Test Data	Expected Result	Actual Result	Pass/Fail	Comments
Manage Login	Enter correct credentials.	Successfully login	Successfully login	Pass	Able to perform as expected.
	Enter incorrect credentials.	Login fail	Login fail	Pass	Able to perform as expected.
	Able to click forgot password button.	Successfully navigate to forgot password interface	Same as expected result	Pass	Able to perform as expected.
Manage Profile	Able to edit profile information	Successfully update profile information	Same as expected result	~~Pass~~	The data didnot change even after we click update the details.
	Able to change password	Successfully update the password	Same as expected result	Pass	Able to perform as expected.
Manage User	Click 'Doctors' button.	Successfully display list of doctors	Same as expected result	Pass	Able to perform as expected.
	Able to add new doctor.	Successfully add new doctor	Same as expected result	Pass	Able to perform as expected.

	Able to edit existing doctor's information.	Successfully edit doctor's information	Same as expected result	Pass	Unable to perform.
	Able to remove existing doctor from the list.	Successfully deleted	Same as expected result	Pass	Able to perform as expected.
	Able to view doctor's information in details.	Successfully view the details.	Same as expected result	Pass	Able to perform as expected.
	Able to Click 'Patients' button.	Successfully display list of patients	Same as expected result	Pass	Able to perform as expected.
	Able to add new patient.	Successfully add new patient	Same as expected result	Pass	Able to perform as expected.
	Able to edit existing patient's information.	Successfully edit patient's information	Same as expected result	Pass	The data didnot change even after we click update the details.
	Able to remove existing patient from the list.	Successfully deleted	Same as expected result	Pass	Able to perform as expected.
	Able to view patient's information in details.	Successfully view the details.	Same as expected result	Pass	Able to perform as expected.
Manage Appointment	Able to click 'Appointments' button.	Successfully display list of appointments available.	Same as expected result	Pass	Able to perform as expected.

	Able to create new appointment for the patient.	Successfully created appointment.	Same as expected result	Pass	Able to perform as expected.
	Enter date that is not available	Appointment Form do not display	Same as expected result	Pass	Able to perform as expected.
	Enter date that is available	Successfully display Appointment form	Same as expected result	Pass	Able to perform as expected.
	Able to click 'Appointment Schedule' button.	Successfully navigate to page.	Same as expected result	Pass	Able to perform as expected.
	Able to check date	Successfully display session open on date selected	Same as expected result	Pass	Able to perform as expected.
	Able to edit session on selected date	Successfully updated session on selected date	Same as expected result	Pass	Able to perform as expected.
	Able to set new appointment	Successfully created new appointment	Same as expected result	Pass	Able to perform as expected.

This test has been performed by:

Name : MUHAMMAD RIZAL BIN MARSUDIN

Signature : 

Date : 13/02/2023

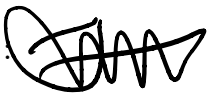
Testing - Patient

Modules	Test Data	Expected Result	Actual Result	Pass/Fail	Comments
Manage Login	Enter correct credentials.	Successfully login	Successfully login	Pass	
	Enter incorrect credentials.	Login fail	Login fail	Pass	
	Able to click forgot password button.	Successfully navigate to forgot password interface	Same as expected result	Pass	
	Able to register an account	Successfully registered an acoount	Same as expected result	Pass	
Manage Profile	Able to edit profile information	Successfully update profile information	Same as expected result	Pass	
	Able to change password	Successfully update the password	Same as expected result	Pass	
Manage Appointment	Able to click 'Appointments' button.	Successfully display list of appointments available.	Same as expected result	Pass	
	Able to create new appointment.	Successfully created appointment.	Same as expected result	Pass	

	Enter date that is not available	Appointment Form do not display	Same as expected result	Pass	
	Enter date that is available	Successfully display Appointment form	Same as expected result	Pass	

This test has been performed by:

Name : Dhiyaurrahman Bin Danial

Signature : 

Date : 10 February 2023

Testing - Doctor

Modules	Test Data	Expected Result	Actual Result	Pass/Fail	Comments
Manage Login	Enter correct credentials.	Successfully login	Successfully login	Pass	
	Enter incorrect credentials.	Login fail	Login fail	Pass	
Manage Profile	Able to edit profile information	Successfully update profile information	Same as expected result	Pass	
	Able to change password	Successfully update the password	Same as expected result	Pass	
Manage Report	Able to change password	Successfully update the password	Same as expected result	Pass	
	Able to create new record based on appointment.	Successfully created report.	Same as expected result	Pass	
	Approve report request by the patient	Report successfully approved	Same as expected result	Pass	
	Able to view report in details	Successfully view report	Same as expected result	Pass	

This test has been performed by:

Name : Muhammad Hafiz Mustaqim Bin Jefri Jamsari

Signature : 

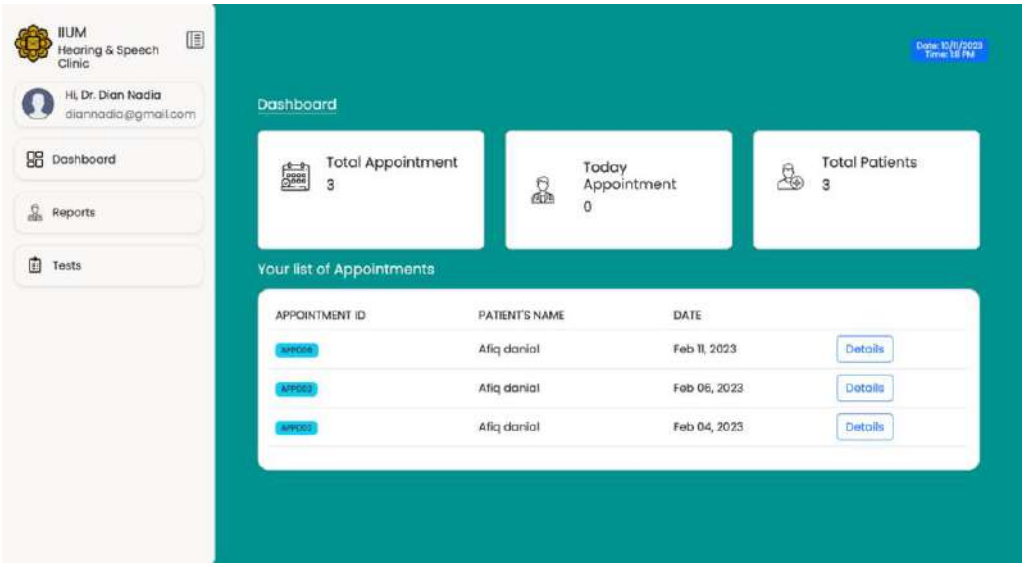
Date : 10 February 2023

4.8 Results & Discussions

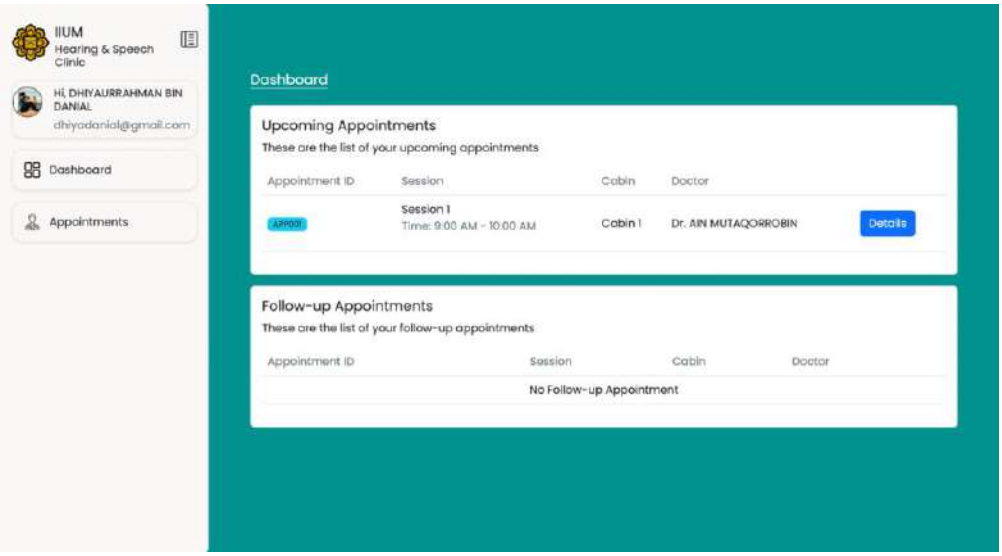
The result for the implementation is as expected or same as the proposed. The features are implemented according to the requirements that were requested by the client. IIUM Hearing & Speech Clinic System is developed for 3 main users which are Staff/Admin, Audiologist and Patient. The responsibility for each role for the system is different and it is based on the modules. Below show the results of user interface for 3 users respectively:

Staff Dashboard

Audiologist Dashboard



Patient Dashboard



CHAPTER 5

CONCLUSION

5.1 INTRODUCTION

This chapter shall discuss the overall conclusion about the proposed project in this thesis based on the objectives stated in Chapter 1. The limitation of the proposed project will be explained in detail in section 5.2. It will be followed by the explanation of future work that could be taken into consideration to improve the proposed project in section 5.3.

5.2 LIMITATION

There are few limitation on proposed project, Health Information System for Audiology Department.

I. User needs to have internet connection to use the system.
II. The testing function by the audiology is not finalized yet since lack of resources.
III. The execution time for certain function might be longer.

The limitation for the project is also include the lack of development time and also lack of knowledge on certain function. So, need to do some research on certain function to be implemented into the system.

5.3 FUTURE WORK

The aspects or feature that might be upgrade in the future is by implementing payment gateway. According to IIUM Health & Speech Clinic, every appointment that is booked by the patient need to come with payment. So payment gateway could be a useful feature that can be implement into the system. So that user can make payment through the system according to the appointment that has been set by the staff/admin. This feature is going to help patient and admin to secure any appointment that they book in the future.

The next feature that can be implemented is by adding audiogram test graph into Audiologist's module. The reason is because in a real scenario, audiologist will be testing patient by plotting an audiogram graph according to sound test but this was done manually.

So to make this system fully functional by all users, adding this feature will be ease audiologist's works.

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2022

SOFTWARE REQUIREMENT SPECIFICATION (SRS)

[IIUM Hearing & Speech Clinic System]

DOCUMENT APPROVAL

	Name	Date
Authenticated by: _____ Name		
Approved by: _____ Client		

Software :

Archiving Place :

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CHAPTER 1

1.1 PROJECT DESCRIPTION

IIUM Hearing and Speech Clinic System is a system that allow users to manage data and information. It digitize all the manual documents into digitalization. The system provides a features where audiologist is able to record test result in the system. Patient is able to book appointment online and staff able to manage appointment. This system aims to solve issue facing by IIUM Heaaring and Speech Clinic where they are still using traditional methods in managing documents and reports of the patients. So this system digitize all the documents needed such as patient's detail document, report document, book appointment document and etc. This also help patient to save their time, cost and energy by the ability to book appointment online. All data is stored in the database where it provides the availability of data when needed by the staff or audiologist at anytime.

There are 5 main functions in the system. The following table are the description for each module in the system :

Modules	Description
Manage Login	All users are able to register and login into the account.
Manage Profile	All users are able to manage their own profile.
Manage Appointment	Patient and staff are able to manage appointment.
Manage User	Staff is the one who responsible for this module.
Manage Report	Audiologist can manage reports based on the test perform.

Table 1 Main Modules Description

1.2 SYSTEM IDENTIFICATION

System Title : IIUM Hearing & Speech Clinic System

System Abbreviation : IHSCS

Version : Version 1

Year : 2022

System Identification Number : SRS- IHSCS -2022-V1

1.3 CONTEXT DIAGRAM

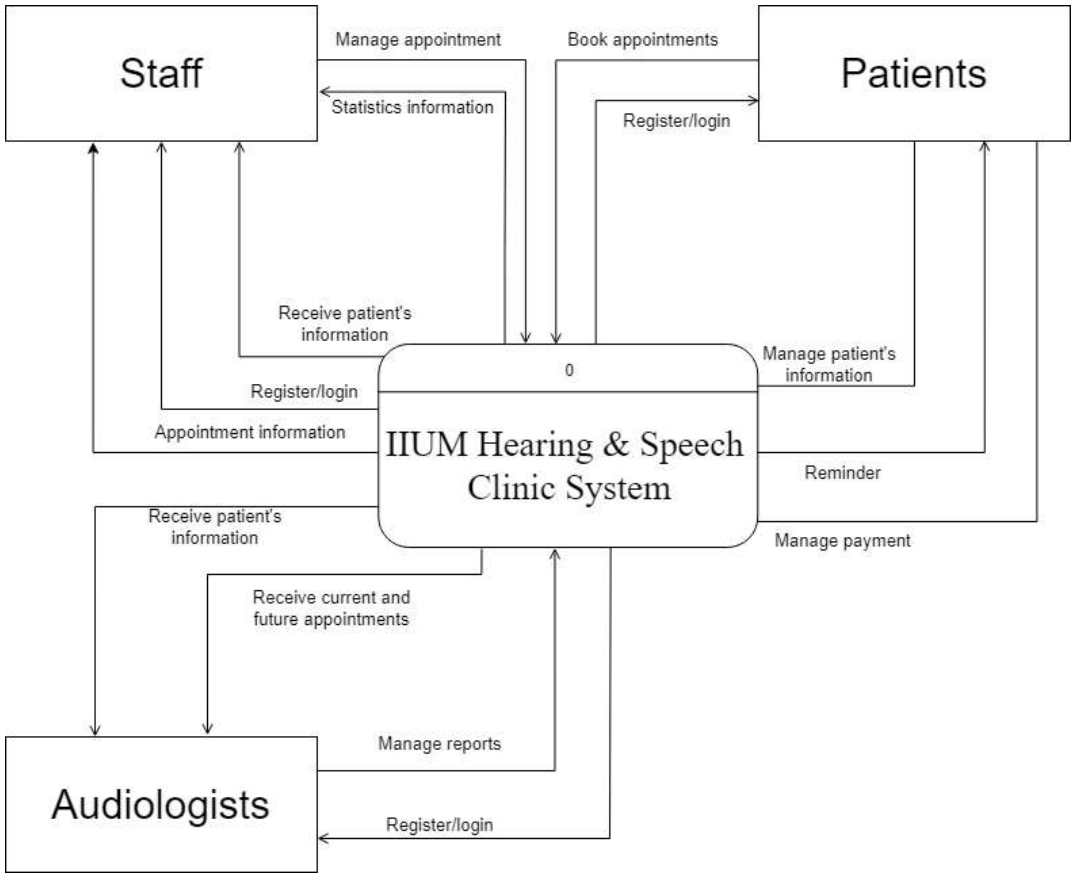


Figure 1 Context Diagram

1.4 DATA FLOW DIAGRAM

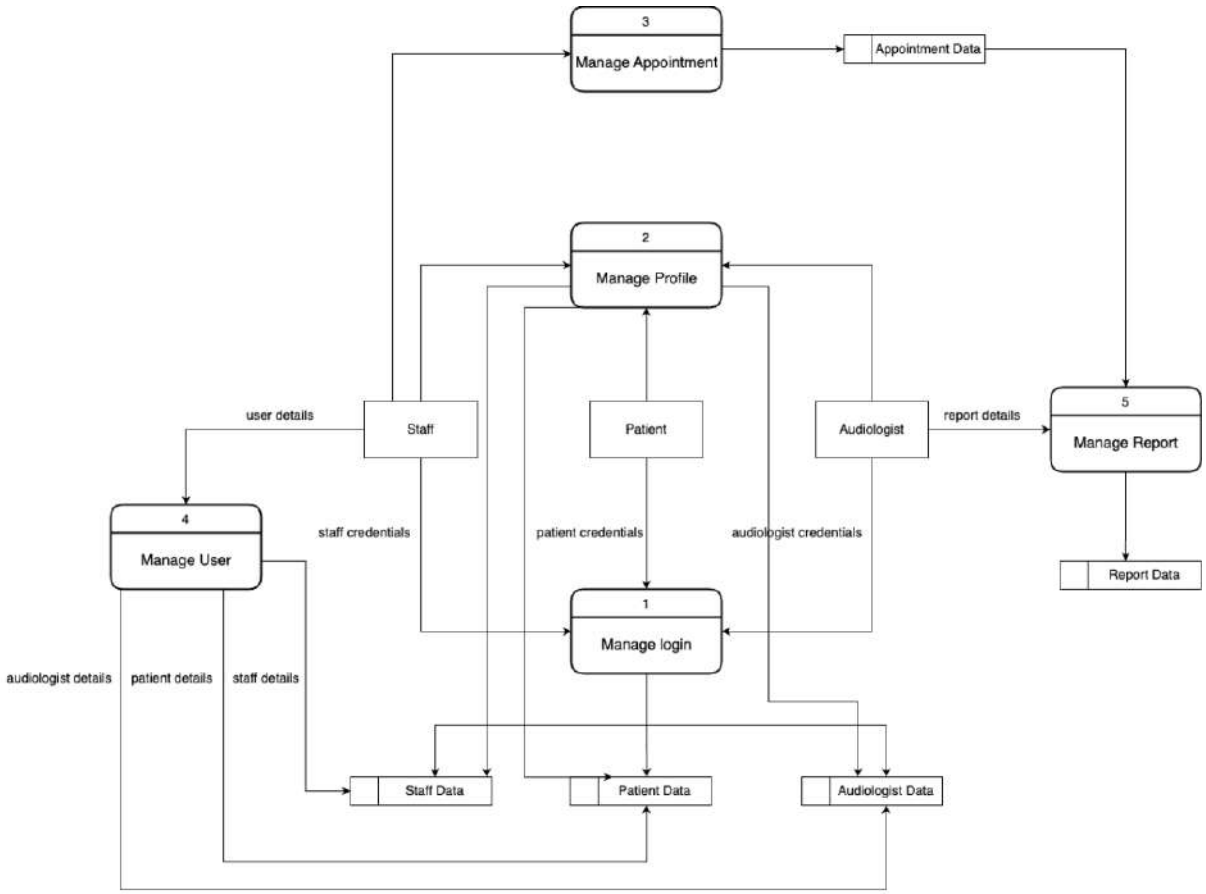


Figure 2 Data Flow Diagram

Figure 2 above show Data Flow Diagram of the system that consist of 5 processes, 3 external entities and 5 data store.

CHAPTER 2

2.1 USE CASE DIAGRAM AND DESCRIPTION

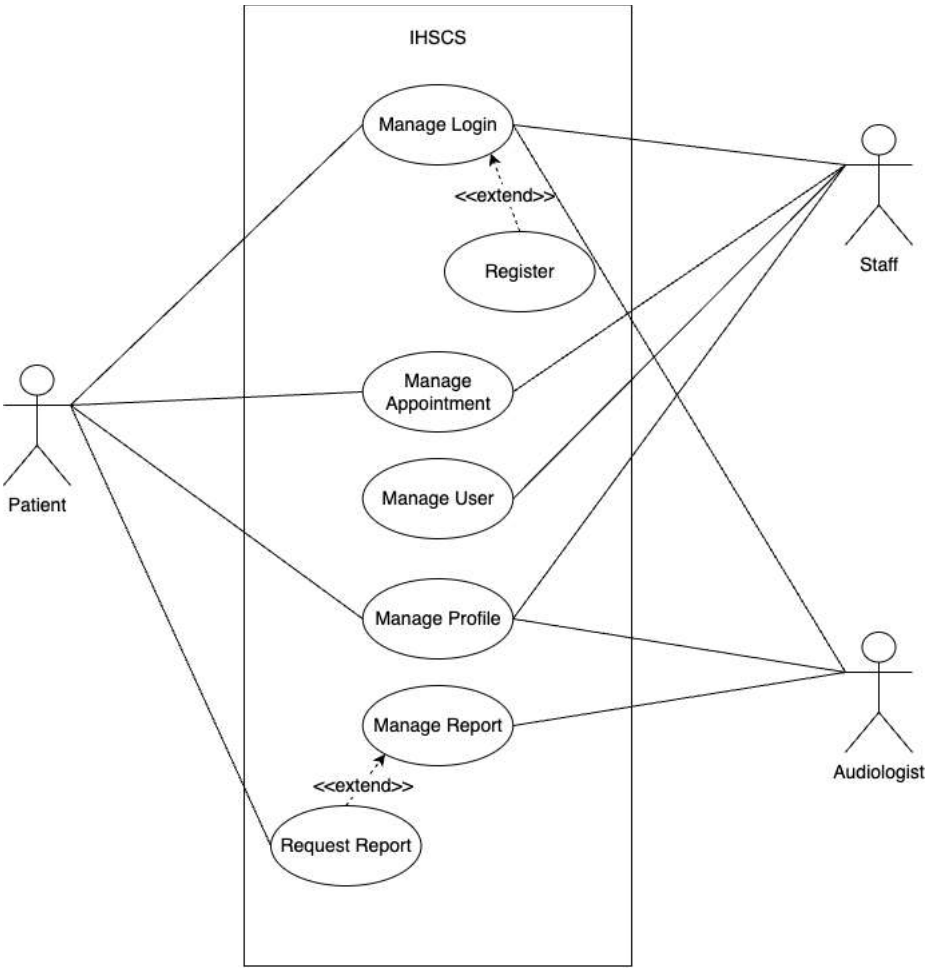
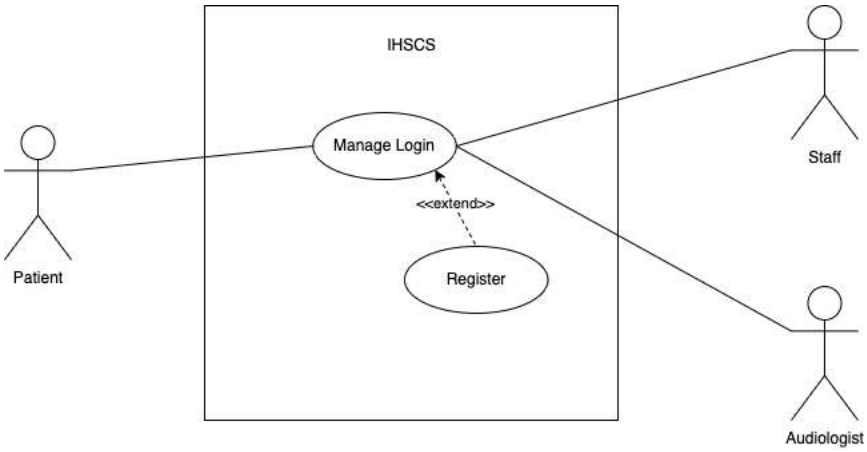


Figure 3 Use Case Diagram

2.1.1 Manage login

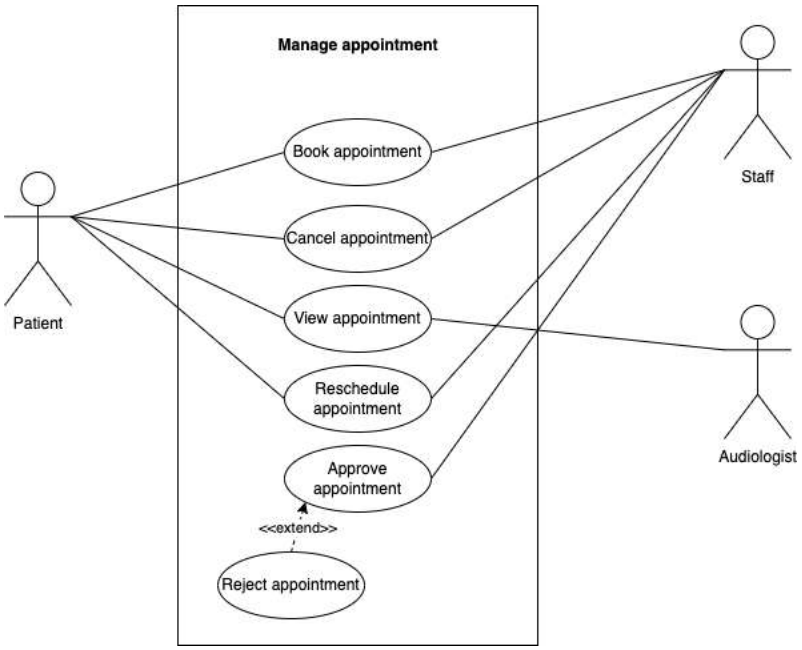


Use Case ID	UC01	Title	Manage login
Actor	Patients, Staff and Audiologist		
Description	This use case specifies that user can login into the system.		
Pre-Condition	Must have an account		
Basic Flow	1. Use case starts when user navigate to the system. 2. The user click “login” button. 3. The user can click “create one” button. [A1: Register account] 4. The system will request that the user to enter their email and password. 5. The user enter their email and password. 6. The user can click “forgot password” button. [A2: Forgot password] 7. The system validate the credentials. [E1: Email or password is wrong] 8. The system navigate user to the dashboard. 9. Use case end.		
Alternative Flow	A1 : Register account 1. The user click “create one” button. 2. The system will request the user to enter their email, password and user type. 3. The system will display successful registered message. 4. The system will verify the credentials and save it into the database. 5. Use case continue to step 4 in basic flow.		

	A2 : Forgot Password 1. User click “Forgot password” button. 2. The system will request the user to enter their email 3. The user enter their email and click “Send reset password link”. 4. The system will send the information to their email. 5. The user enter new password through their email. 6. The system validate the password. 7. Use case continue on step 5 in basic flow.
Exception Flow	E1 : Email or password is wrong 1. The user enter email and password. 2. The system fail to validate the credential. 3. The system display email or password is wrong message. 4. Use case end.
Post-Condition	All users are able to register account and login into system
Rules	N/A
Constraints	N/A

Table 2 Use Case Description Manage Login

2.1.2 Manage appointment

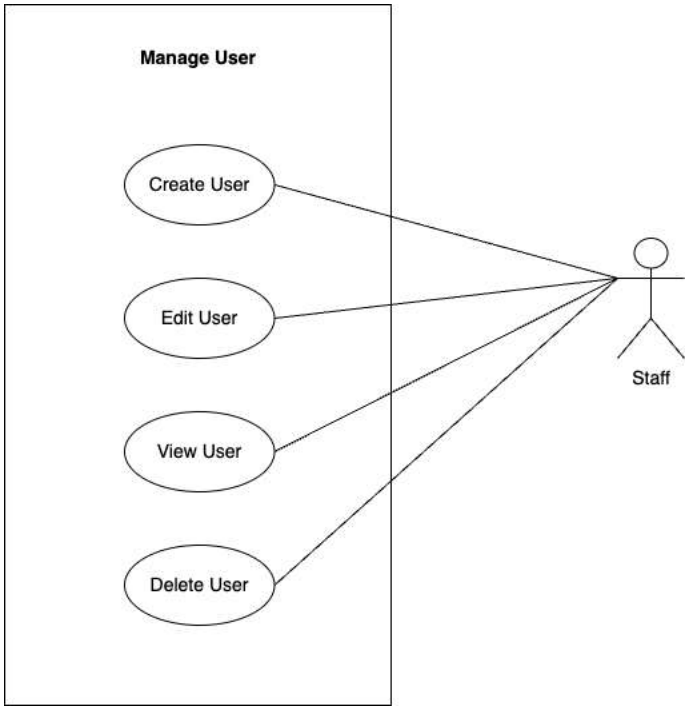


Use Case ID	UC02	Title	Manage appointment
Actor	1. Patient 2. Staff 3. Audiologist		
Description	This use case specifies that user can manage appointment but audiologist can only view the appointment.		
Pre-Condition	The user must log in into the system		
Basic Flow	1. Use case starts when the user is log in into the system. 2. The system will display the list of appointments. 3. User click “Set an appointment” button. [A1: Create appointment] 4. User can click “Details” button. [A2: Details] 5. User can click “Rechedule” button. [A3: Reschedule] 6. User can click “Approve” button. [A4: Approve appointment] 7. User can click “Cancel” button. [A5: Cancel appointment] 8. Use case end.		
Alterntive Flow	**A1: Create appointment** 1. The user click “Set an appointment” button. 2. The system will request user to fill in the details.		

	3. The user fill in the details and click “Submit” button. 4. The system will display successful message. 5. Use case continue to step 4 in basic flow. **A2: Details** 1. The user click “Details” button. 2. The system will display appointment information in details. 3. Use case continue to step 5 in basic flow. **A3: Reschedule** 1. The user click “Reschedule” button. 2. The system will display appointment form. 3. The user enter new appointment time. 4. The system display successful message. 5. Use case continue to step 6 in basic flow. **A4: Approve appointment** 1. The user click “Approve” button. 2. The system will verify the confirmation. 3. The system will display appointment has been approved. 4. Use case continue to step 7 in basic flow. **A5: Cancel appointment** 1. The user click “Cancel” button. 2. The system will verify the appointment id. 3. The system will ask the user for cancel appointment confirmation. 4. The user click “Yes” button. 5. The system will remove the appointment from the page and fromt the database. 6. Use case continue to step 8 in basic flow.
Exception Flow	None.
Post-Condition	Patient manage to book appointment
Rules	Booking can only be done one at a time.
Constraints	N/A

Table 3 Use Case Description Manage Appointment

2.1.3 Manage user

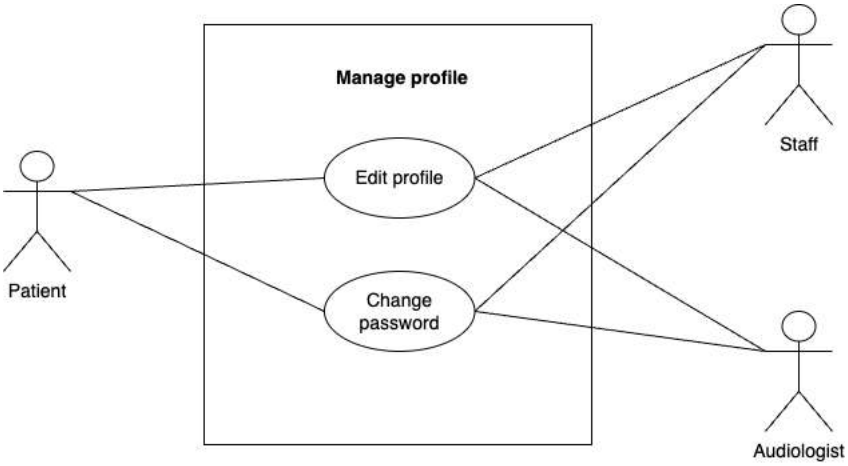


Use Case ID	UC03	Title	Manage user
Actor	Staff		
Description	This use case specifies that staff is able to manage user of the system.		
Pre-Condition	Staff must login into the system.		
Basic Flow	1. Use case starts when staff click manage user. 2. The system will display list of users. 3. Staff clicks '+ User button. [A1: Create user] 4. Staff clicks 'More Details' button [A2: View user] 5. Staff clicks 'Edit Profile' button. [A3: Edit user] 6. Staff clicks 'Remove button. [A4: Delete user] 7. Use case end.		
Alterntive Flow	**A1: Create user** 1. Staff clicks '+ User' button. 2. The system display form. 3. Staff enter details in the form. 4. Staff clicks 'Save' button.		

	5. The system validate the credentials. 6. The system navigate back to index page. 7. Use case continue to step 3 in basic flow. **A2: View user** 1. Staff clicks 'More Details' button. 2. The system display user details. 3. Staff click 'Back' button. 4. Use case continue to step 5 in basic flow. **A3: Edit user** 1. Staff clicks 'Edit Profile' button. 2. The system display edit form. 3. Staff enter details to edit. 4. Staff enter 'Update' button. 5. The system validate the details. 6. The system display successful message. 7. Use case continue to step 6 in basic flow. **A4: Delete user** 1. Staff clicks 'Remove' button. 2. The system remove the user. **3.** Use continue to step 7 in basic flow.
Exception Flow	N/A
Post-Condition	Staff manage to add new user.
Rules	N/A
Constraints	N/A

Table 4 Use Case DEscription Manage User

2.1.4 Manage profile

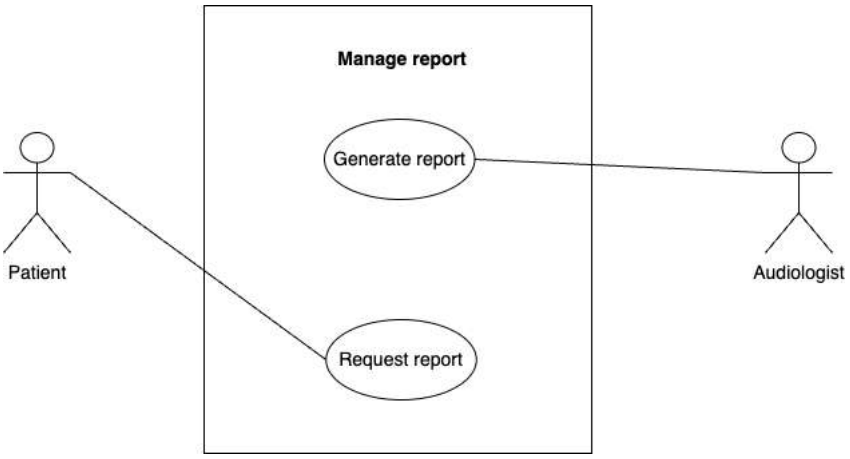


Use Case ID	UC04	Title	Manage profile
Actor	Staff, Patient and Audiologist		
Description	This use case allow users to handle their own profile such as edit and change password.		
Pre-Condition	1. All users must have an account.		
Basic Flow	1. Use case starts when user click button at the side bar. 2. User clicks “Edit profile” button. [A1: Edit profile] 3. User clicks “Change password’ button. [A2: Change password] 4. Use case end.		
Alterntive Flow	**A1: Edit profile** 1. User clicks “Edit profile” button. 2. The system display edit form. 3. User insert input to edit profile. 4. User clicks “Save” button. 5. Use case continue to step 3 in basic flow. **A2: Change password** 1. User clicks “Change password’ button. 2. The system display change password form. 3. User enter old password follow by new password. 4. Use click “Change” button. 5. Use case continue to step 4 in basic flow.		
Exception Flow	N/A		

Post-Condition	1. User must log in into the system.
Rules	N/A
Constraints	Patient can change password once.

Table 5 Use Case Description Manage Profile

2.1.5 Manage reports



Use Case ID	UC05	Title	Manage reports
Actor	Audiologist and Patient		
Description	This use case specifies that audiologist can manage or make reports based on the patient's appointment and patient can request for their report.		
Pre-Condition	Must have appointment first.		
Basic Flow	**Audiologist** 1. Use case starts when audiologist log in into the system. 2. The system display list of appointments. 3. Audiologist clicks generate report for selected appointment. 4. The system generate the report. 5. Use case end. **Patient** 1. Use case starts when patient log in into the system. 2. The system display list of previous appointments. 3. Patient clicks 'Request report' button. **4.** Use case end.		
Alterntive Flow	N/A		
Exception Flow	N/A		
Post-Condition	N/A		

Rules	Audiologist can make one report for one test to the patient
Constraints	N/A

Table 6 Use Case Description Manage Report

2.2 SEQUENCE DIAGRAM

2.2.1 Manage Login

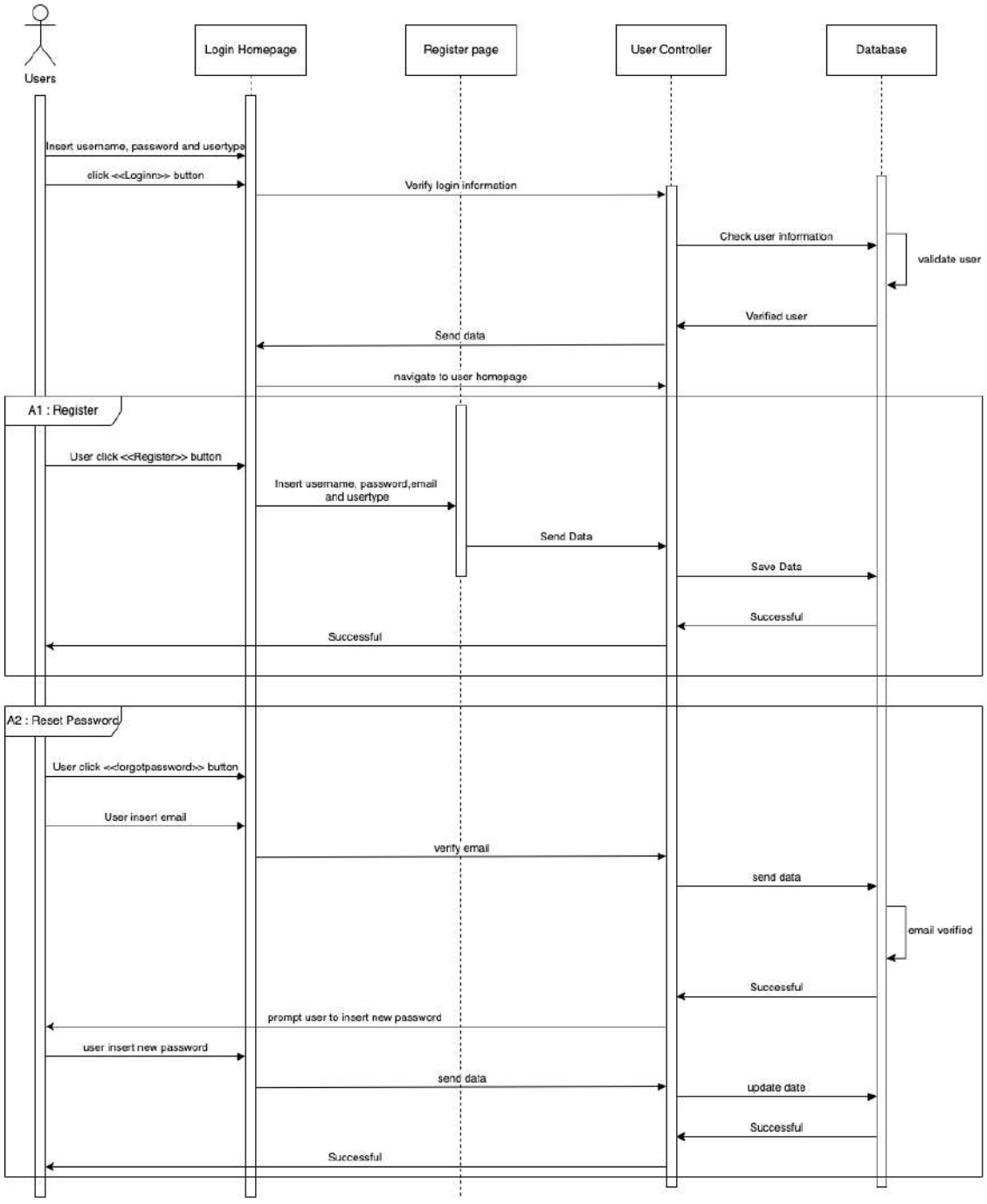


Figure 4 Sequence Diagram Manage Login

2.2.2 Manage appointment

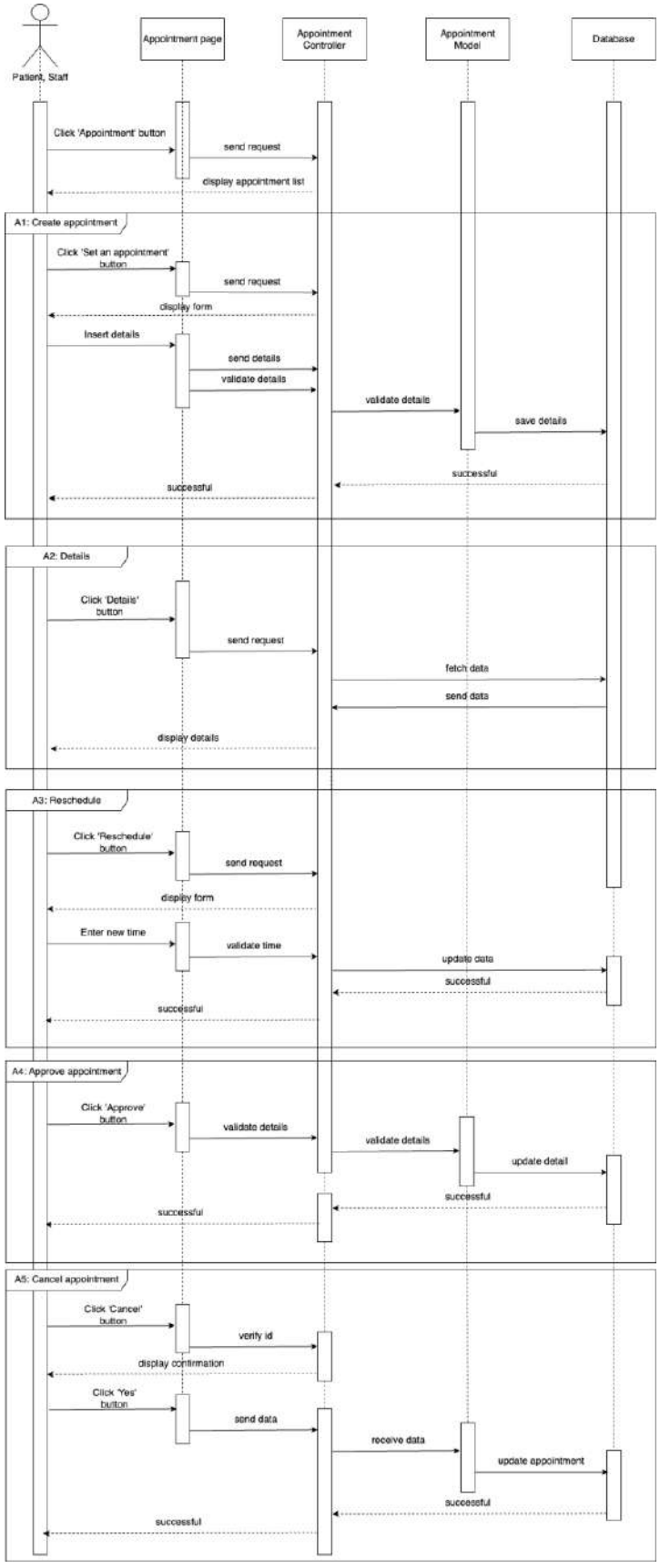


Figure 5 Sequence Diagram Manage appointment

2.2.3 Manage user

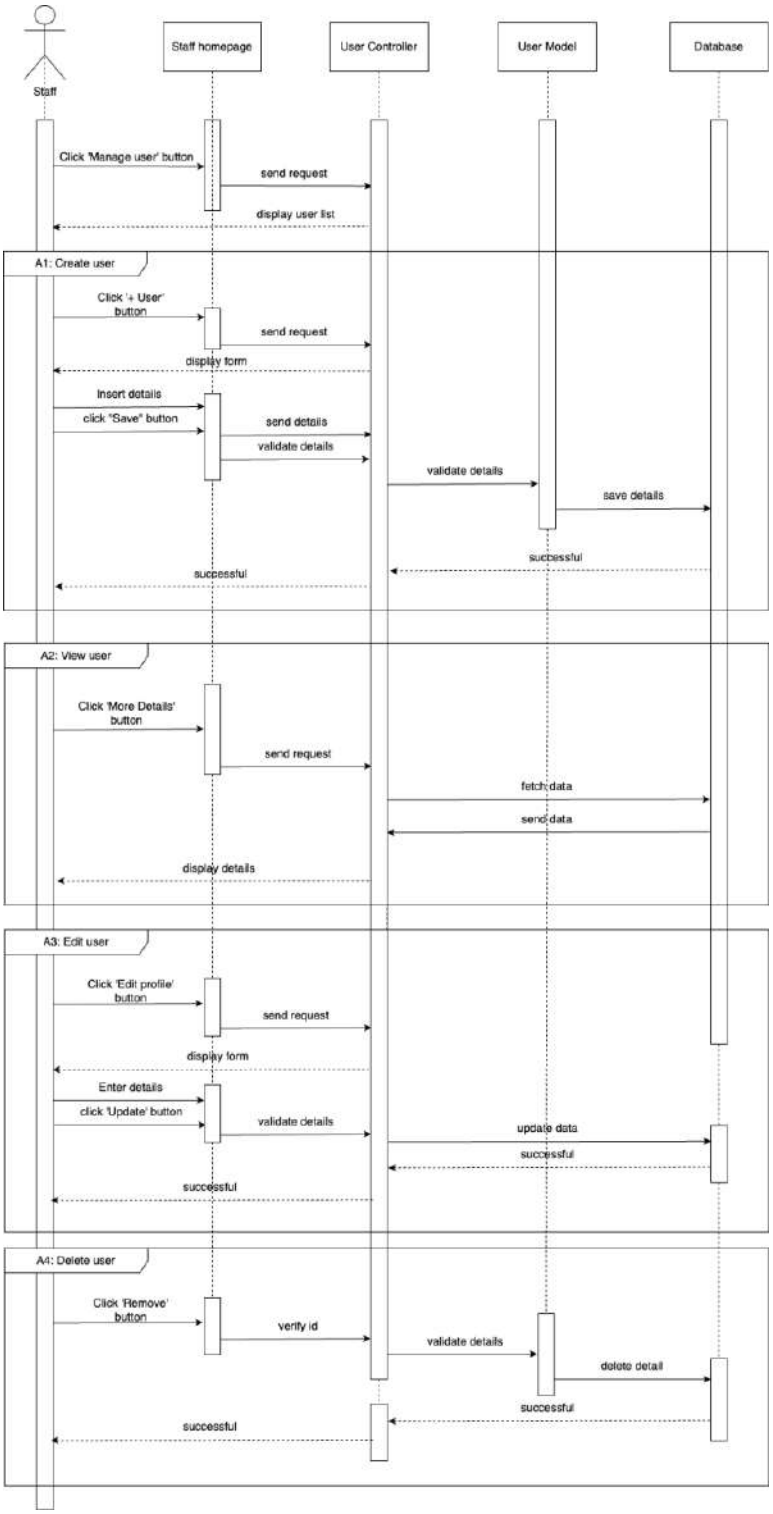


Figure 6 Sequence Diagram Manage User

2.2.4 Manage profile

Staff

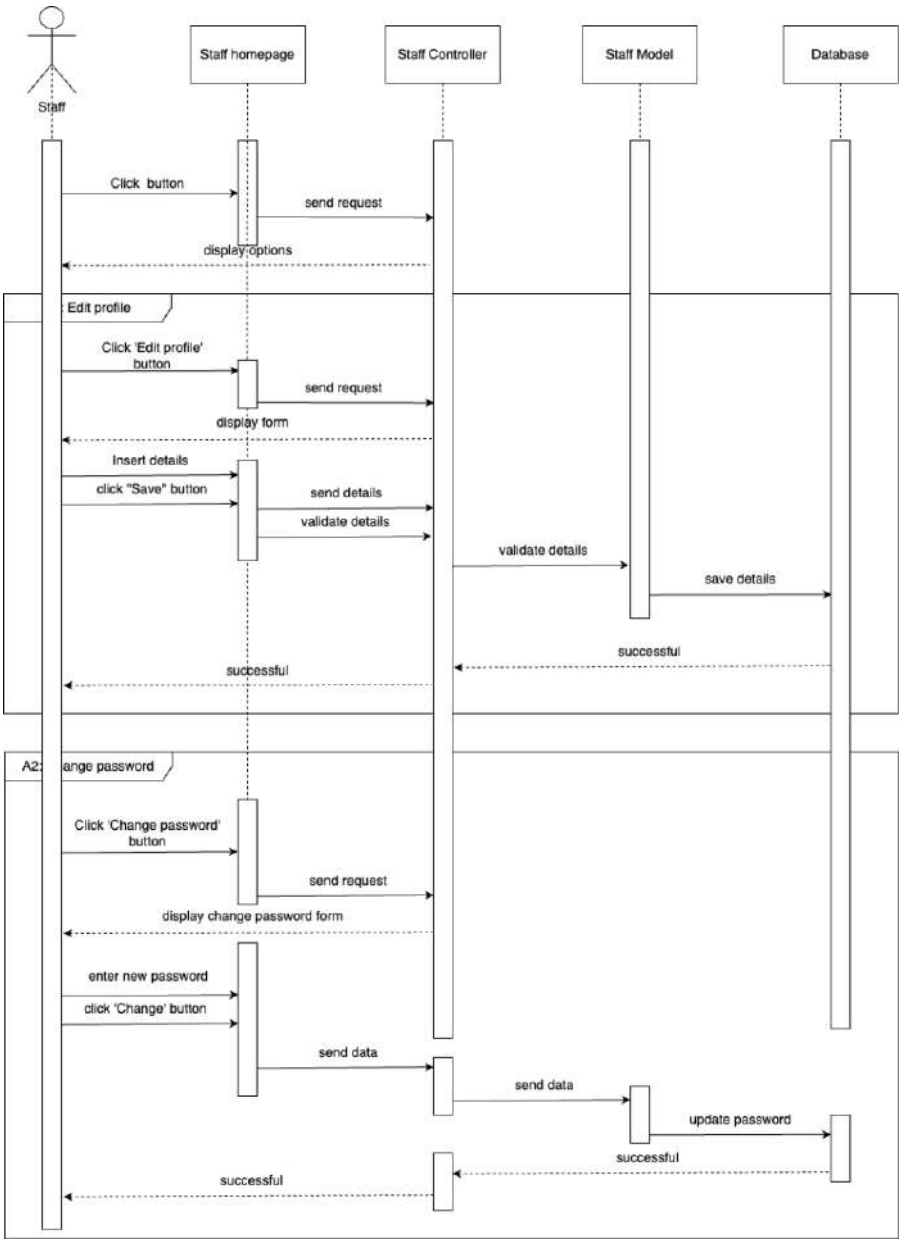
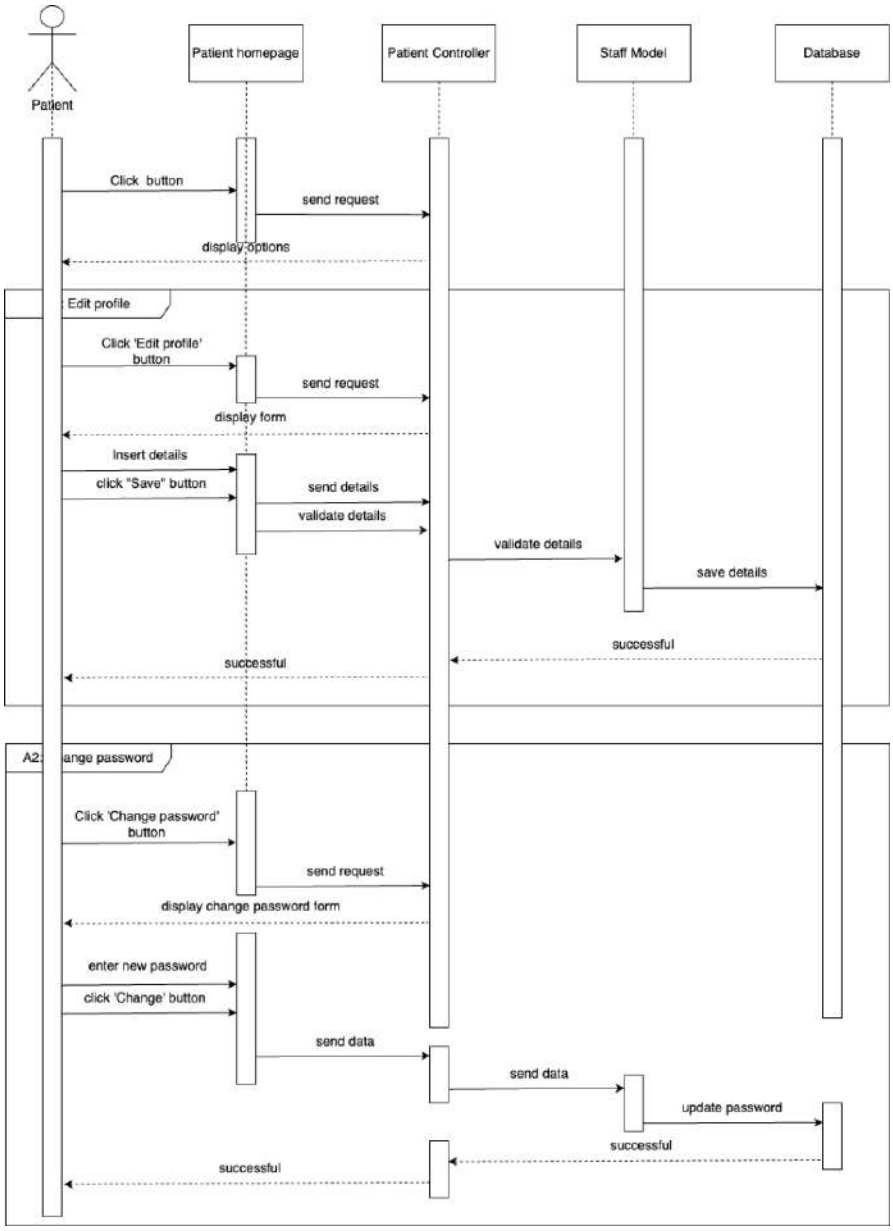
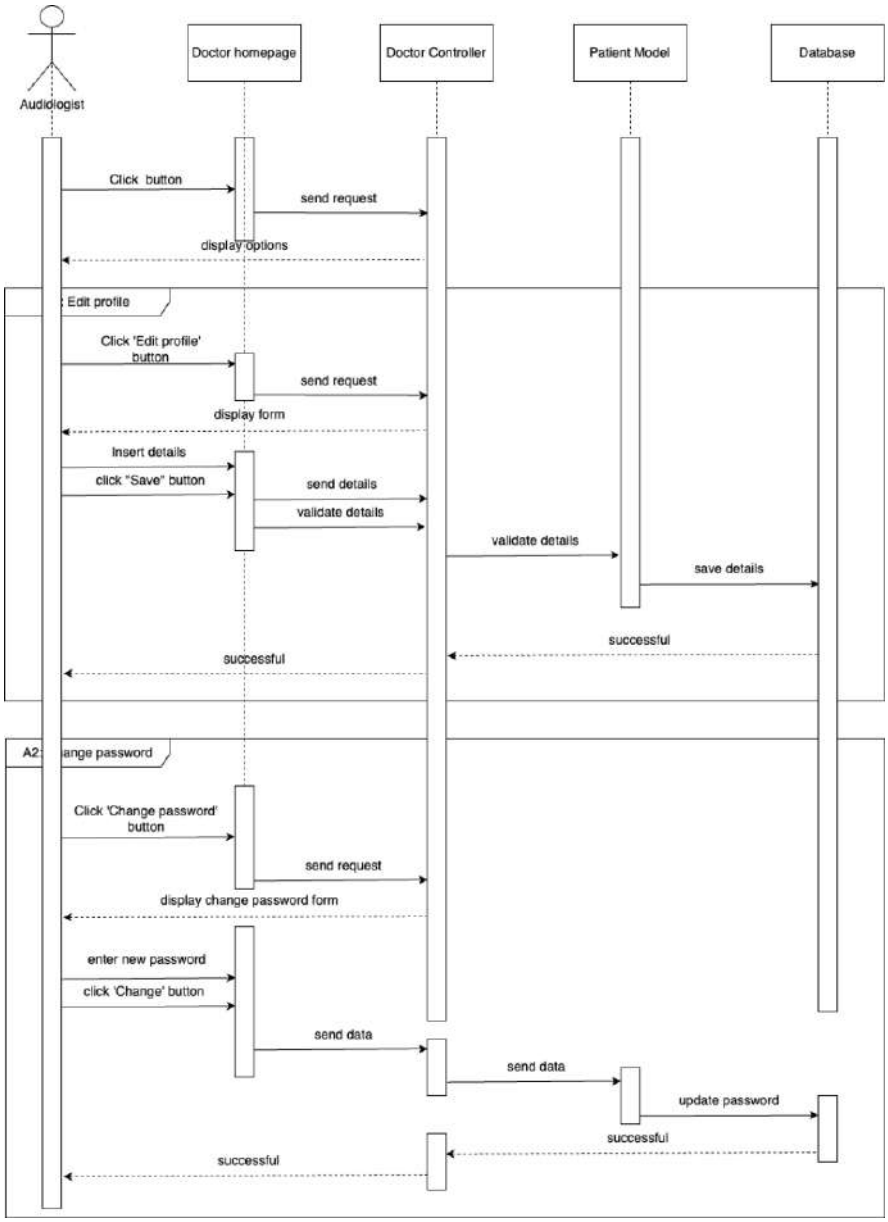


Figure 7 Sequence Diagram Manage Profile

Patient


Patient
Patient homepage
Patient Controller
Staff Model
Database
Click button
send request
display options
Edit profile
Click 'Edit profile' button
send request
display form
Insert details
click "Save" button
send details
validate details
validate details
save details
successful
successful
A2.
ange password
Click 'Change password' button
send request
display change password form
enter new password
click 'Change' button
send data
send data
update password
successful
successful

Audiologist



2.2.5 Manage reports

Audiologist

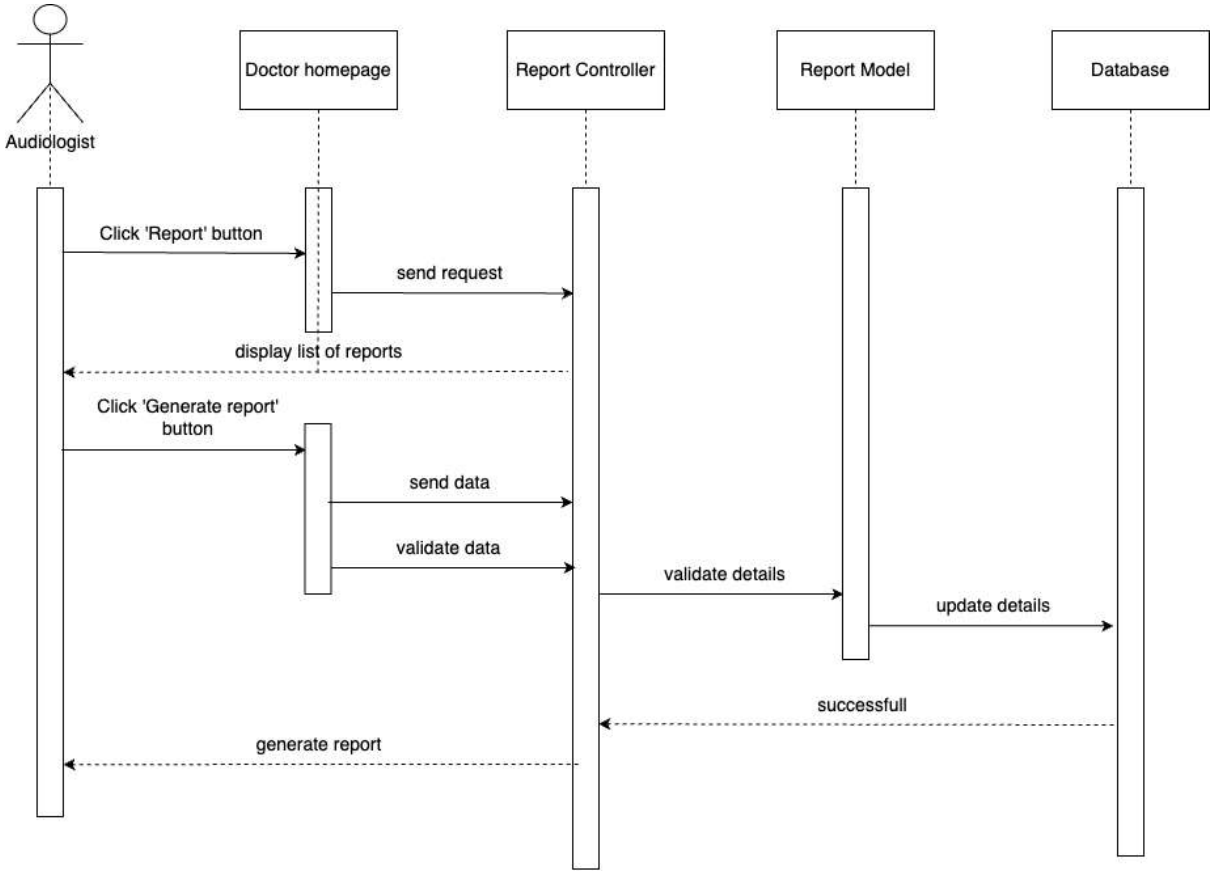
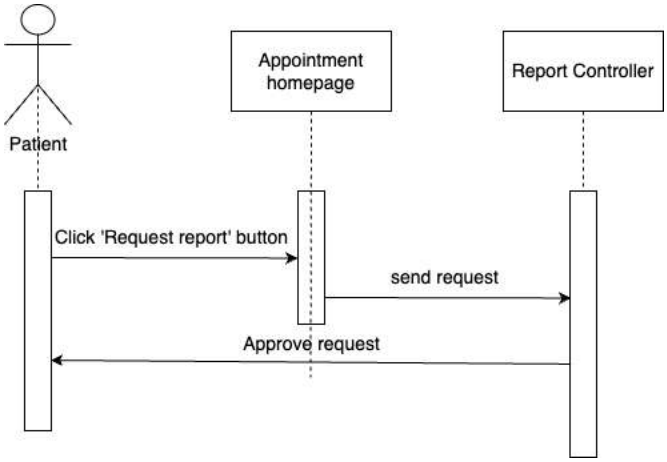


Figure 8 Sequence Diagram Manage Report

Patient



CHAPTER 3

3.1 INTERFACE DESIGN

Figure 9 Home Page

Figure 11 Login Page

Figure 12 Register page

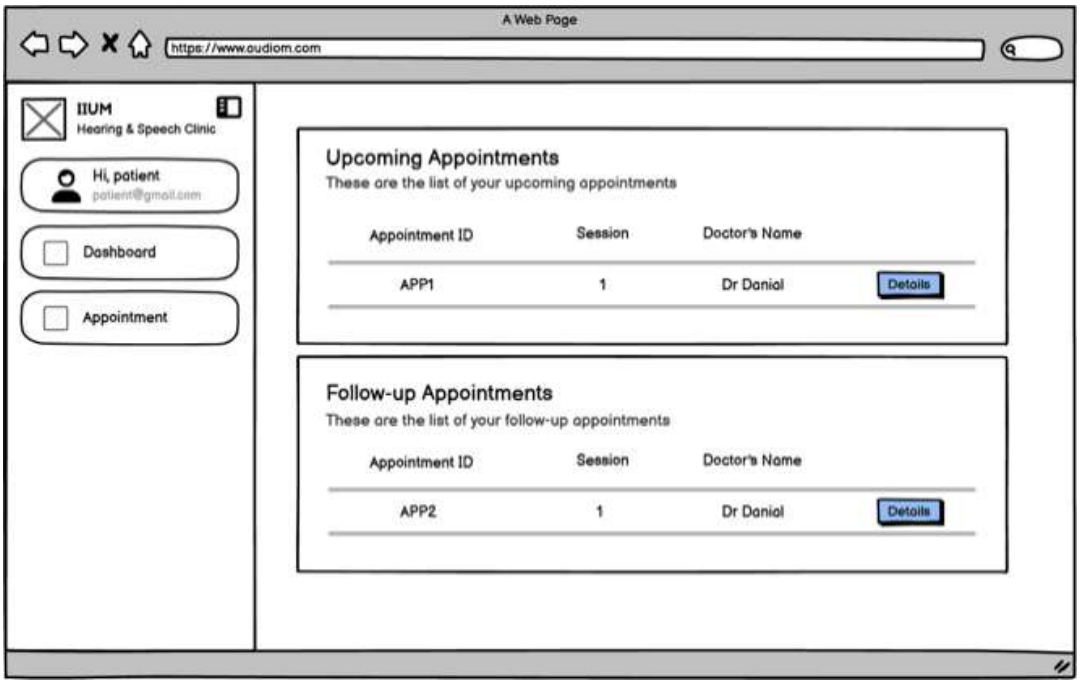


Figure 13 Patient's Dashboard

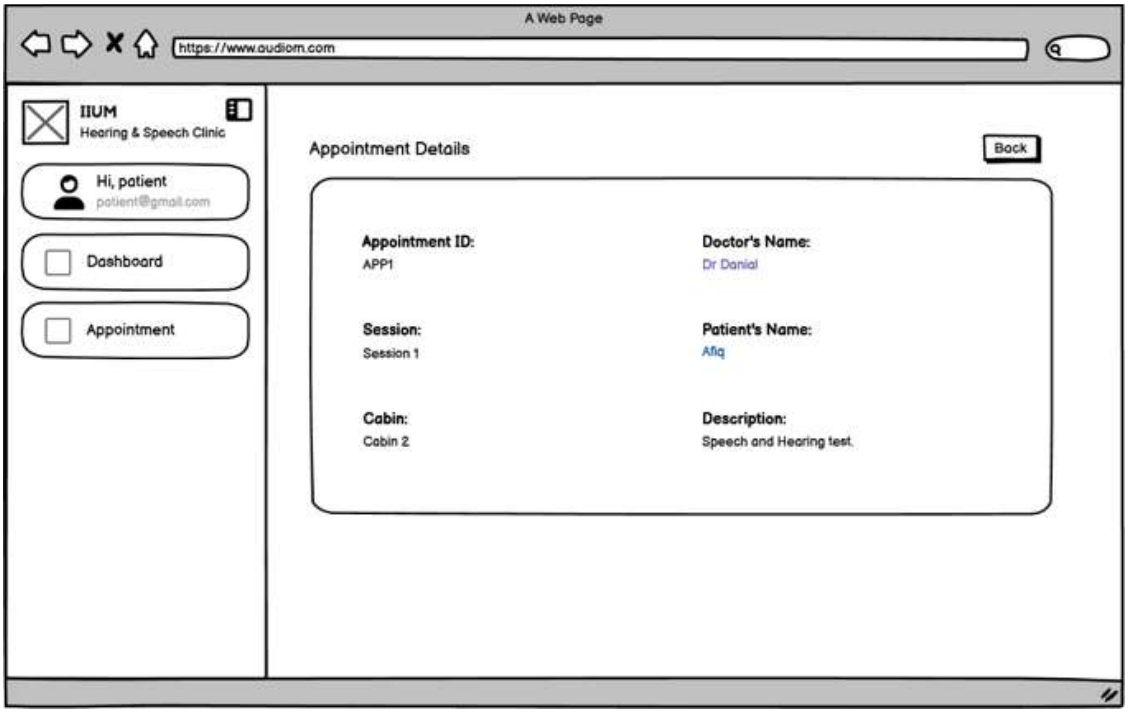


Figure 14 Appointment Detail Page

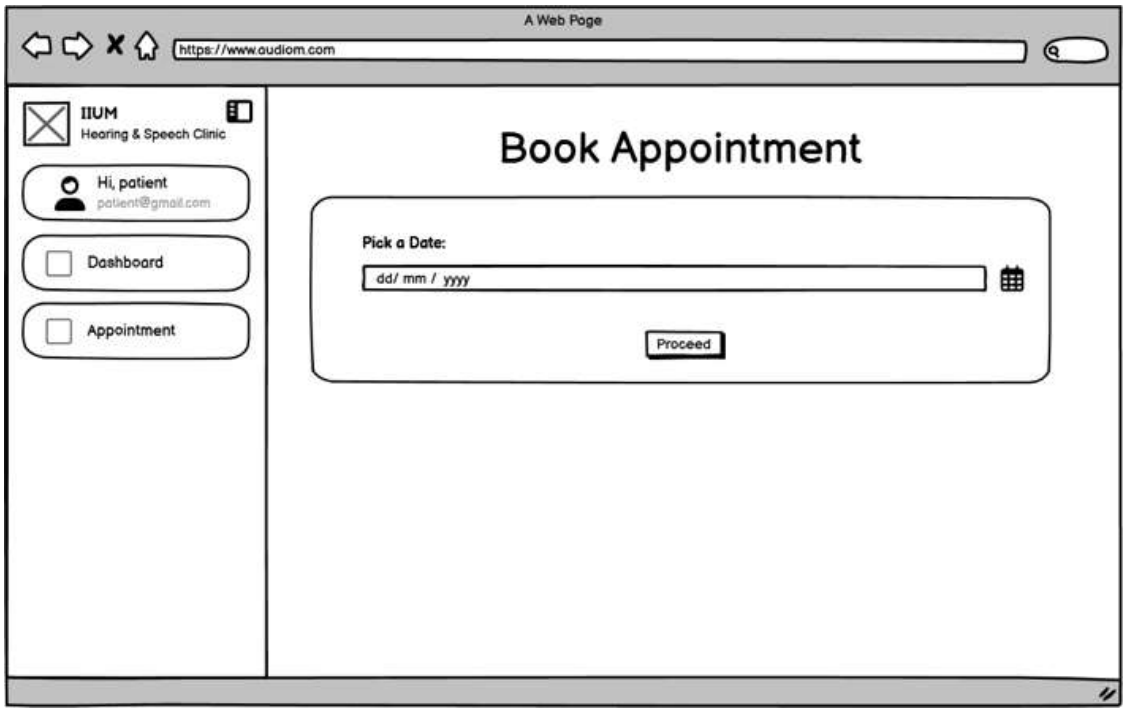


Figure 15 Main Appointment Page

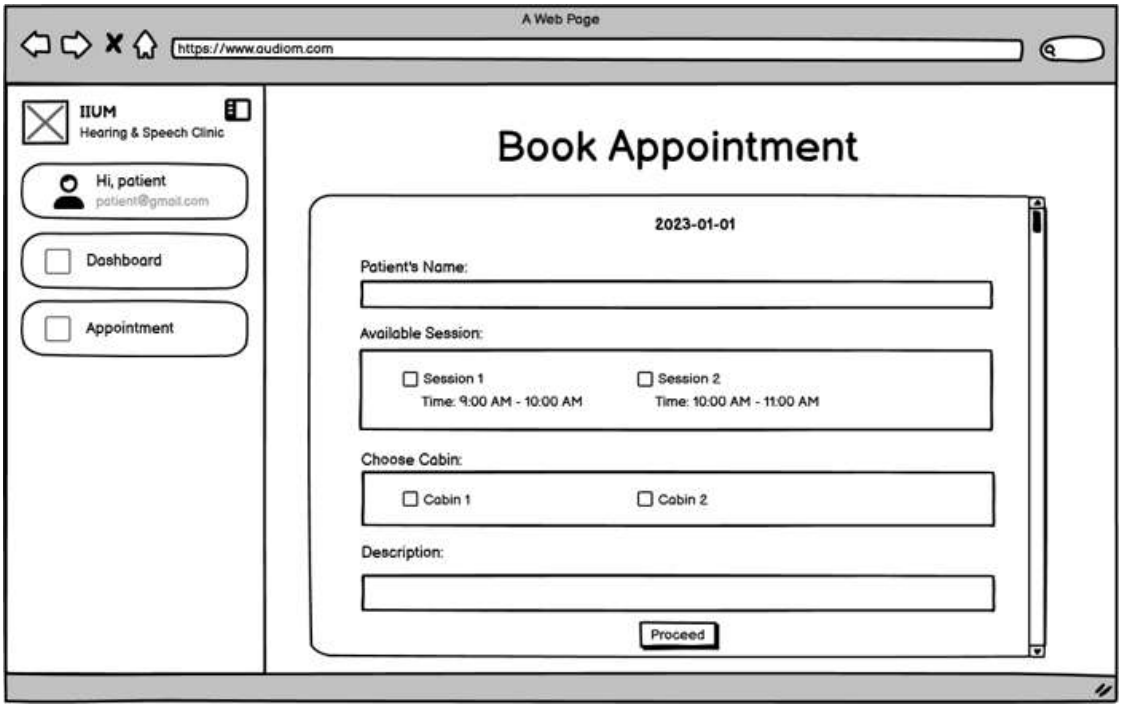


Figure 16 Book Appointment Page

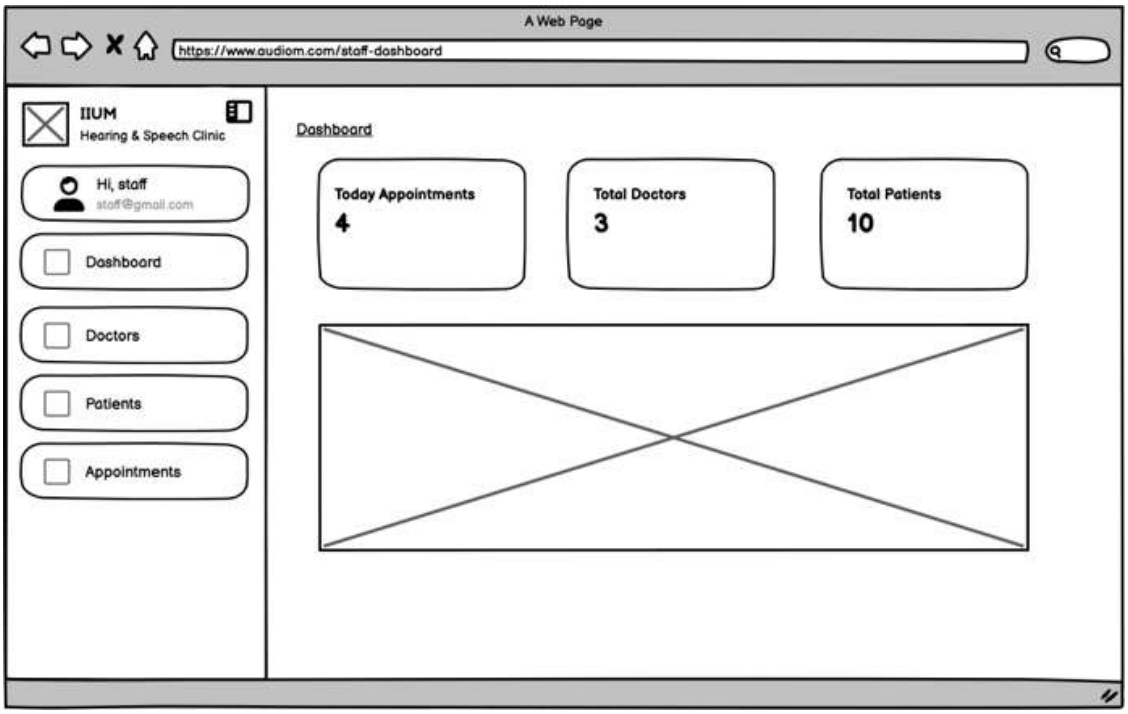


Figure 17 Staff's Dashboard Page

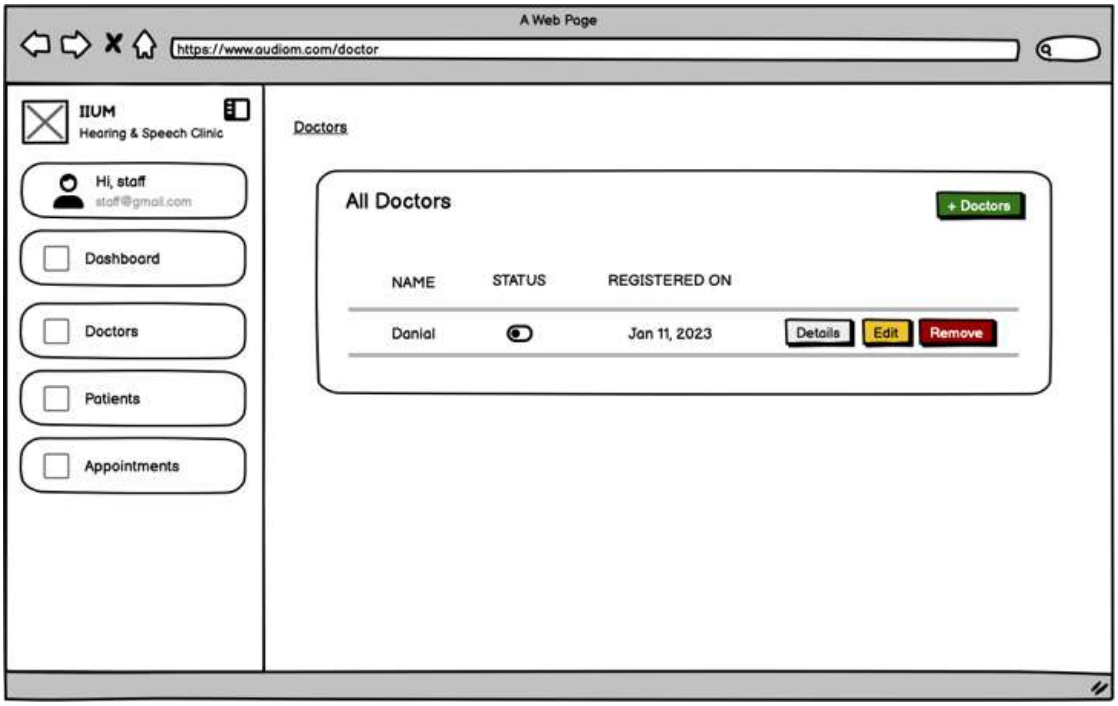


Figure 18 Manage Doctor Page

Figure 19 Add Doctor Page

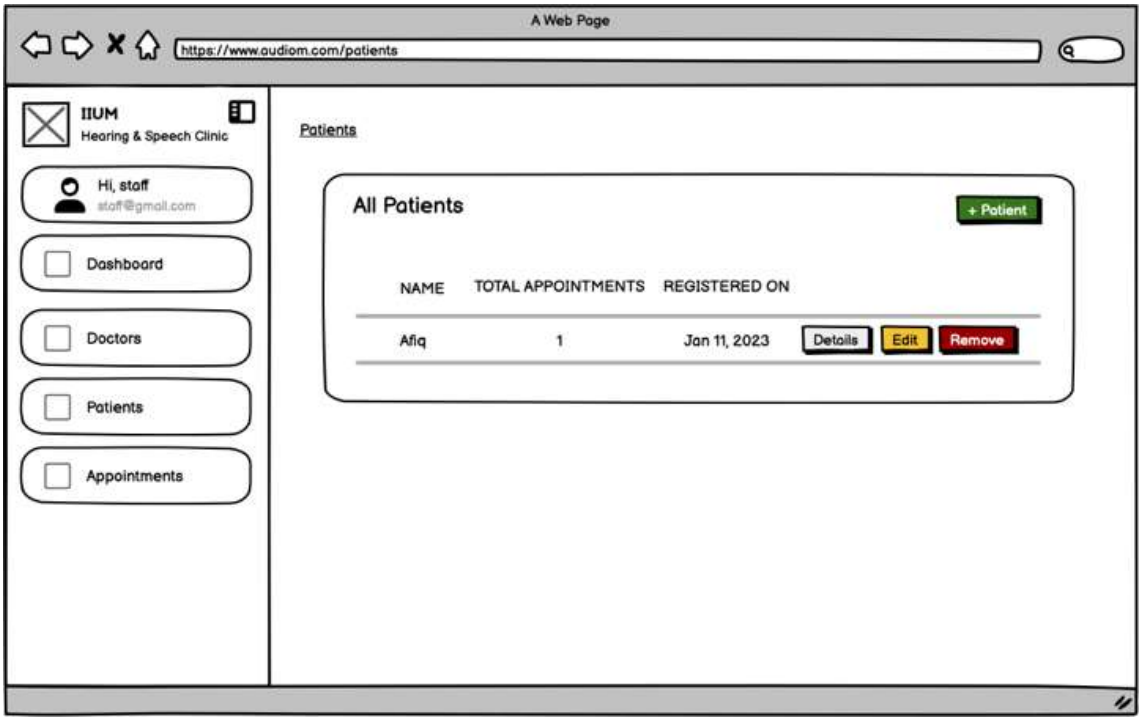


Figure 20 Manage Patient page

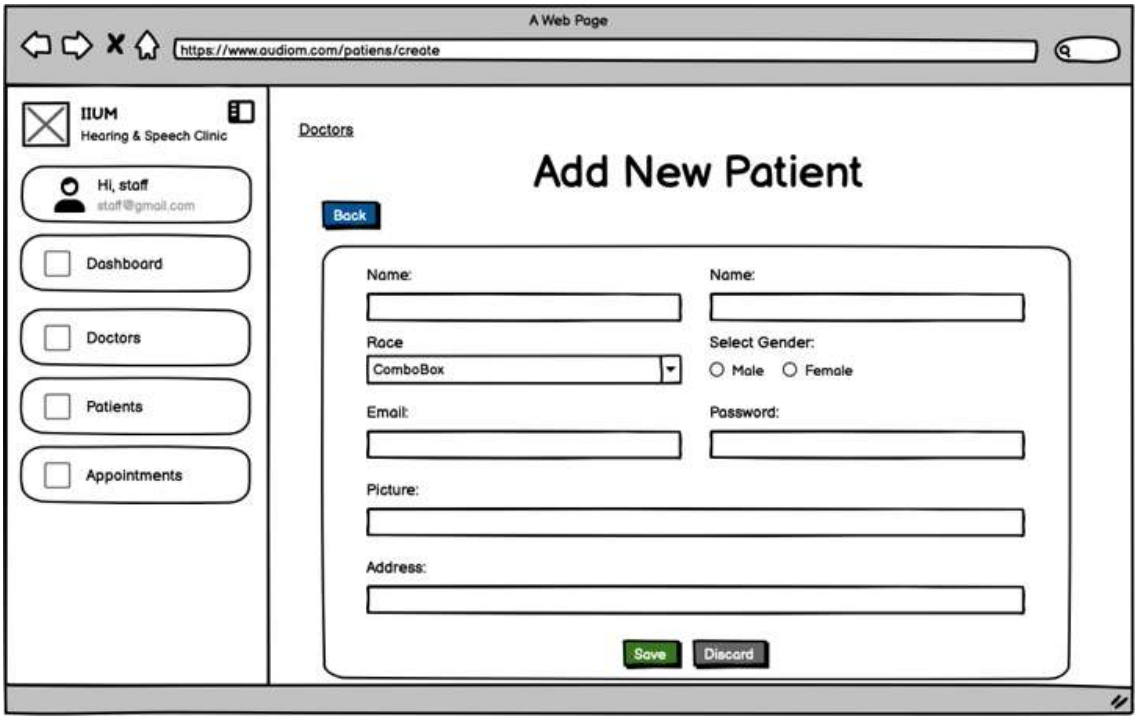


Figure 21 Add Patient page

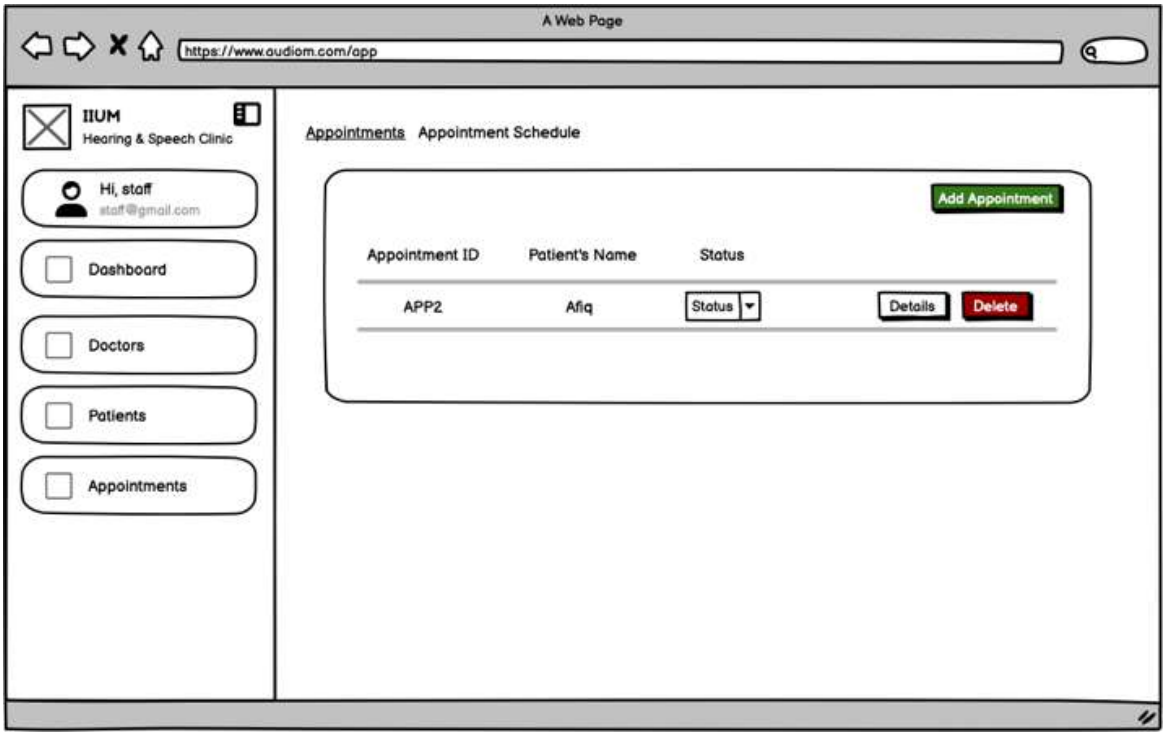


Figure 22 Manage Appointment page

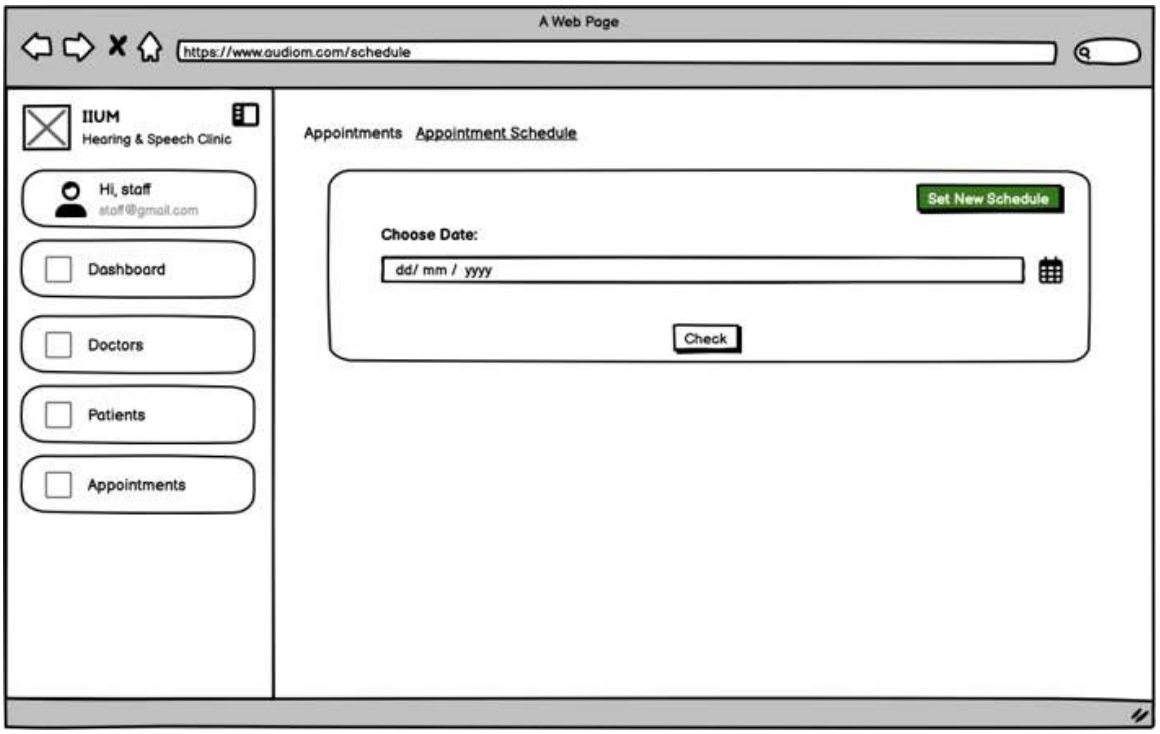


Figure 23 Manage Schedule Page

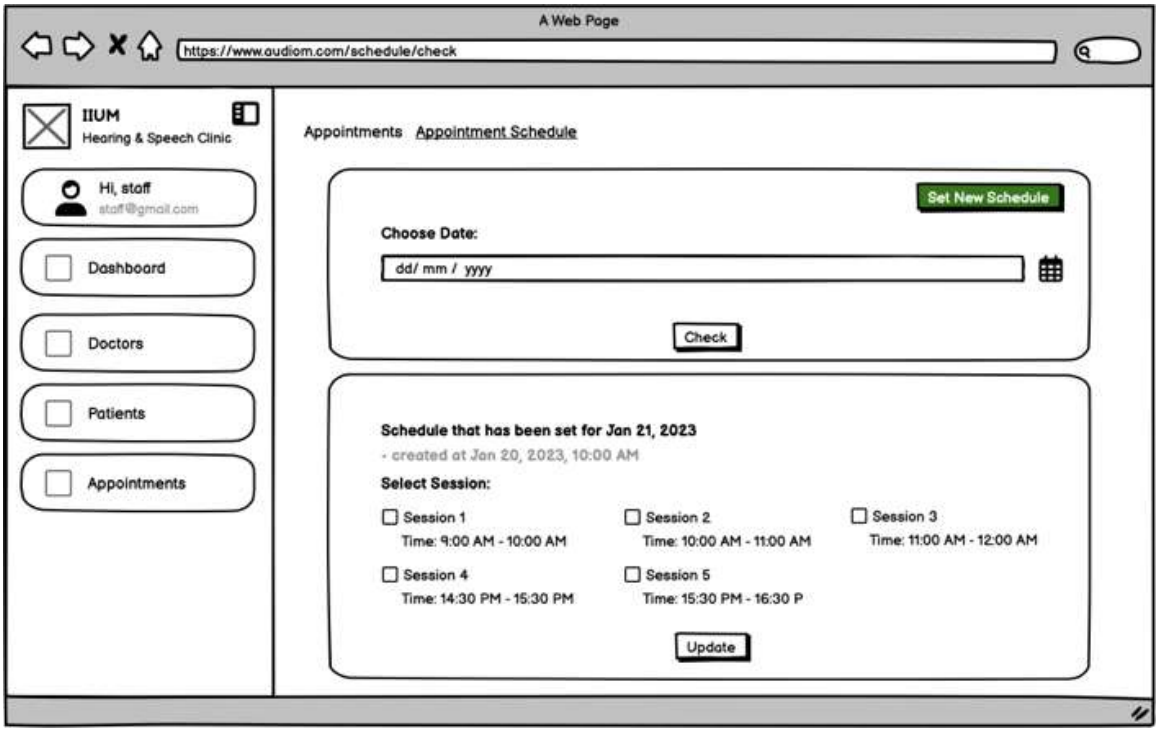


Figure 24 Check Schedule page

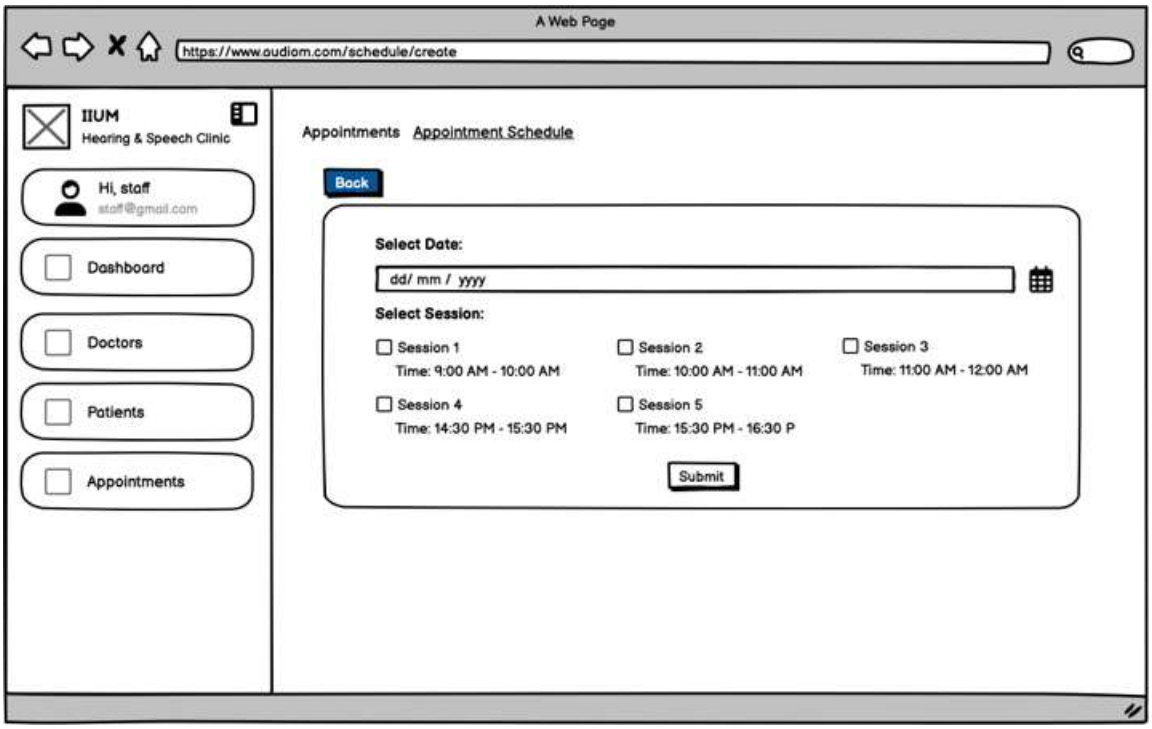


Figure 25 Set New Schedule page

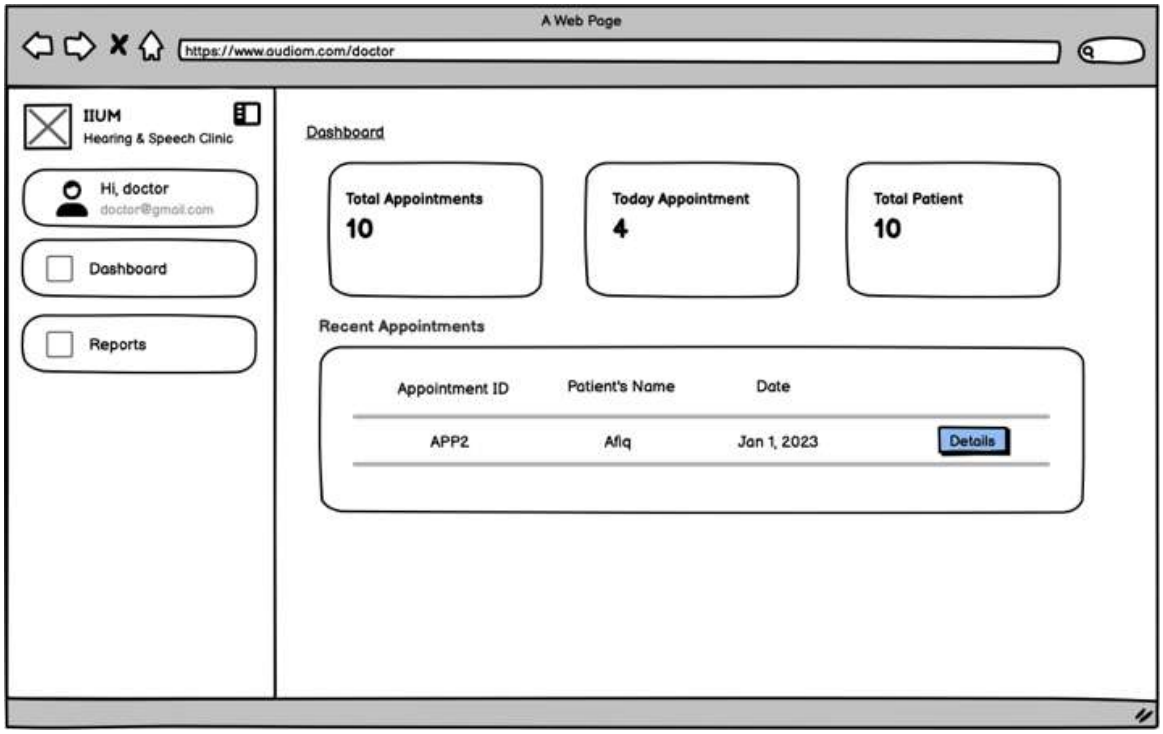


Figure 26 Doctor's Dashboard page

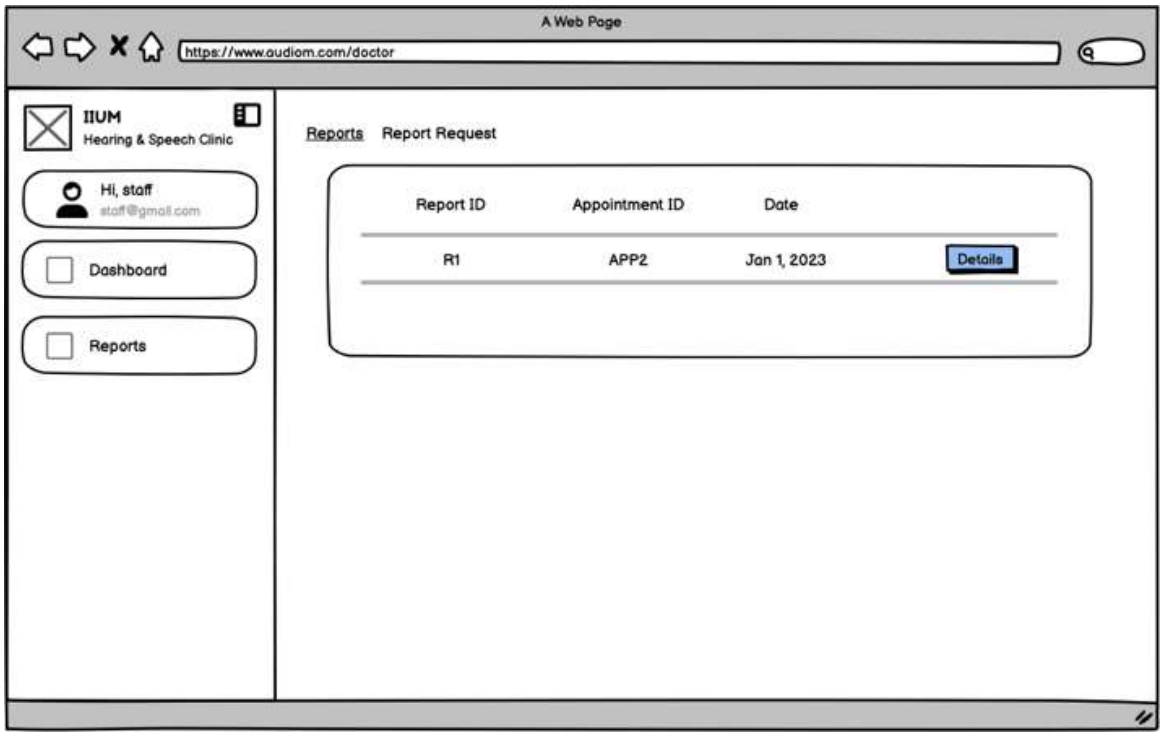


Figure 27 Manage Report page

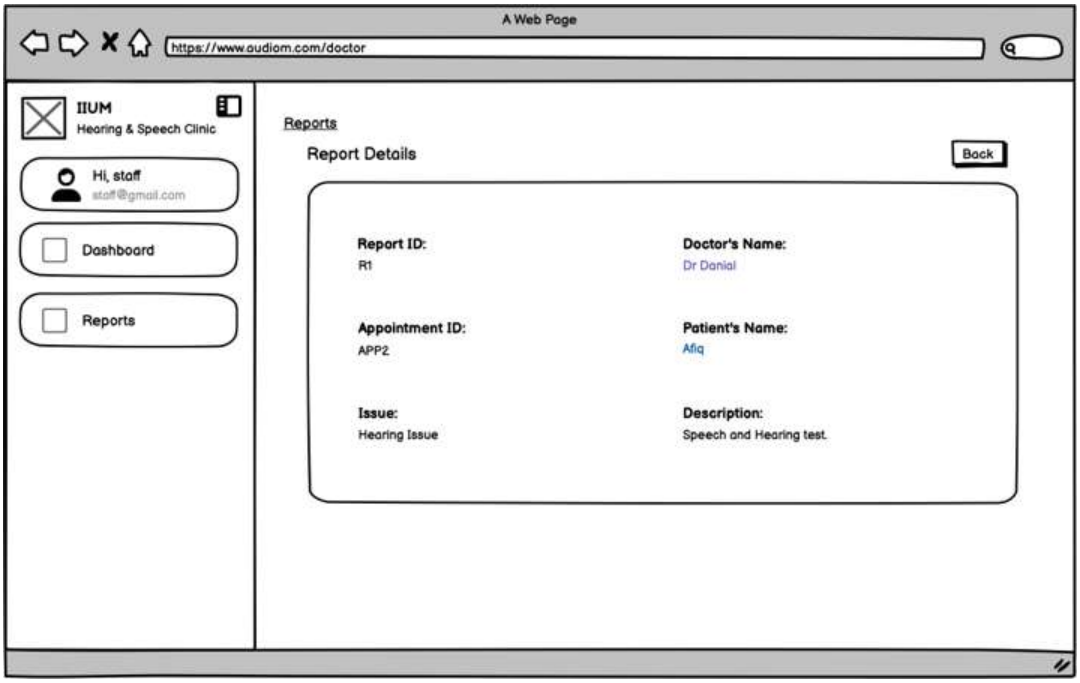


Figure 28 Report Detail page

Figure 29 Report Request Page

3.2 HARDWARE AND SOFTWARE SPECIFICATION

3.2.1 HARDWARE SPECIFICATION

Hardware	Specification	Description
Laptop	Intel(R) Core(TM) i5-9300H CPU @ 2.40GHz, 2400 Mhz, 4 Core(s), 8 Logical Processor(s) 16GB RAM Memory	• Preparing the documentation • Design projects

3.2.2 SOFTWARE SPECIFICATION

Software	Description
Visual Studio Code	• To develop the system interfaces • Program logic • Debug coding
Figma	• Develop prototyping • Interaction between functions
Balsamiq wireframes	• Construct storyboard

2022

SOFTWARE DESIGN DESCRIPTION (SDD)

[IIUM Hearing & Speech Clinic System]

DOCUMENT APPROVAL

	Name	Date
Authenticated by: _____ Name		
Approved by: _____ Client		

Software :

Archiving Place :

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CHAPTER 1

1.1 PROJECT DESCRIPTION

IIUM Hearing and Speech Clinic System is a system that allow users to manage data and information. It digitize all the manual documents into digitalization. The system provides a features where audiologist is able to record test result in the system. Patient is able to book appointment online and staff able to manage appointment. This system aims to solve issue facing by IIUM Heaaring and Speech Clinic where they are still using traditional methods in managing documents and reports of the patients. So this system digitize all the documents needed such as patient's detail document, report document, book appointment document and etc. This also help patient to save their time, cost and energy by the ability to book appointment online. All data is stored in the database where it provides the availability of data when needed by the staff or audiologist at anytime.

There are 6 main functions in the system. The following table are the description for each module in the system :

Modules	Description
Manage Login	All users are able to register and login into the account.
Manage Profile	All users are able to manage their own profile.
Manage Appointment	Patient and staff are able to manage appointment.
Manage User	Staff is the one who responsible for this module.
Manage Report	Audiologist can manage reports based on the test perform.

Table 1 Main Modules Descriptions

1.2 SYSTEM IDENTIFICATION

System Title : IIUM Hearing & Speech Clinic System

System Abbreviation : IHSCS

Version : Version 1

Year : 2022

System Identification Number : SRS- IHSCS -2022-V1

1.3 ARCHITECTURE / BLUE PRINT

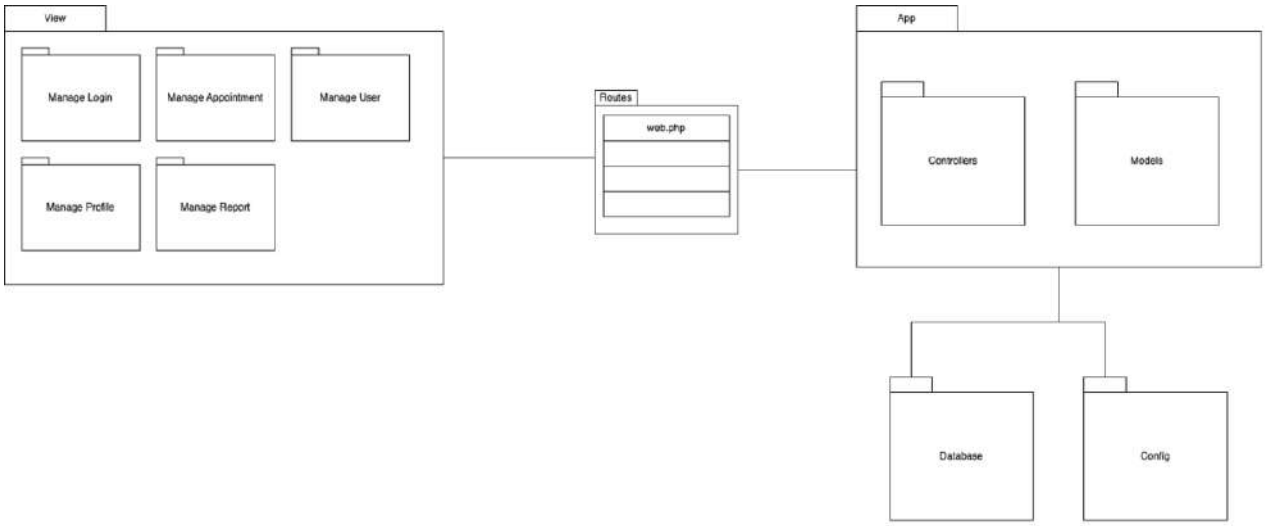

Figure 1 Architecture Design of IHSCS

Figure 1 above depicts the design architecture of IIUM Hearing & Speech Clinic System. The system uses MVC implementation in Laravel Framework. It contains 5 main modules under view which are Manage Login, Manage Appointment, Manage User, Manage Profile, and Manage Report. The route acts as a way of creating a request URL of the system. Controller handles the actions and updates the model if necessary.

1.4 ARCHITECTURE / BLUEPRINT DESCRIPTION

1.4.1 Manage Login

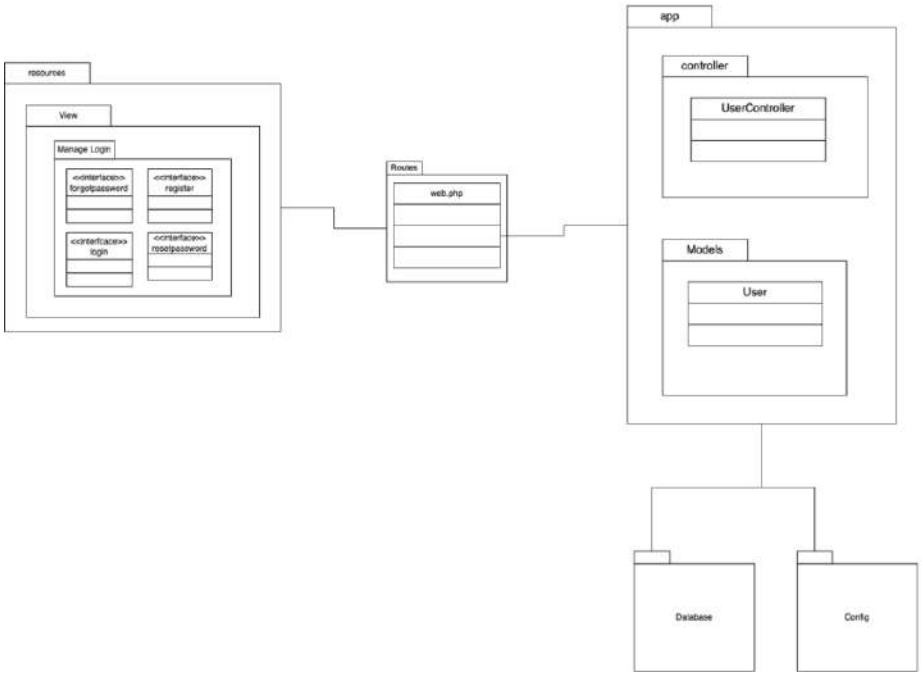

Figure 2 Manage Login

Class Name	Description
forgotpassword	An interface that allow user to enter email to reset password.
register	An interface that allow user to register an account .
login	An interface that allow user to login into the system.
resetpassword	An interface that will display to the user to reset password.
UserController	Controller that controls all the user of the system.
User	To handle data on and out from in the database.
Database	Used to store and structure all data.
Config	Used for the database migration
Web.php	Responsible for routing classes between the view and the controller.

Table 2 Manage Login

1.4.2 Manage Appointment

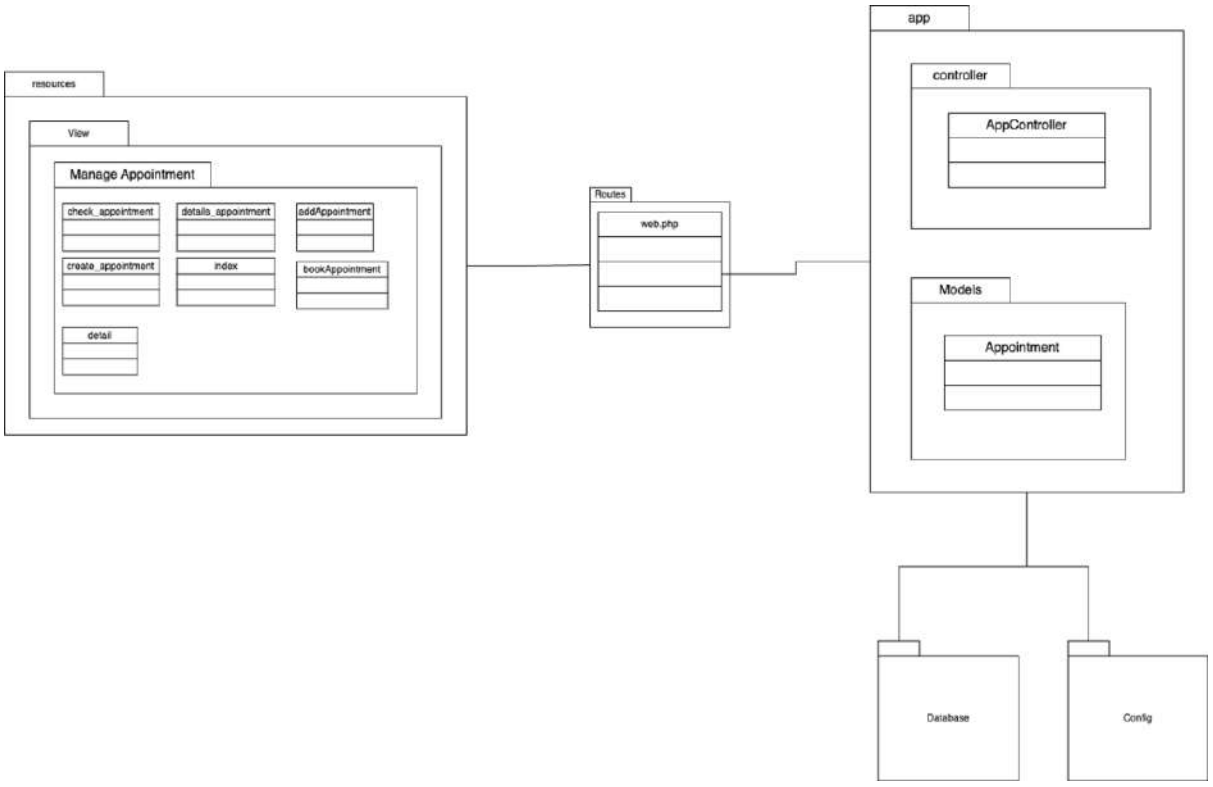

Figure 3 Manage Appointment

Class Name	Description
check_appointment	An interface that allow user to check for available appointments.
details_appointment	An interface that responsible for showing appointment in details.
Create_appointment	An interface for patient to book appointment
bookAppointment	An interface for staff to book appointment for the patient.
detail	An interface that responsible for showing appointment in details.
AppController	Controller that controls all the functions of the appointment module.
index	Main page of the appointment page.
Database	Used to store and structure all data.
Config	Used for the database migration

Web.php	Responsible for routing classes between the view and the controller.

Table 3 Manage Appointment

1.4.3 Manage User

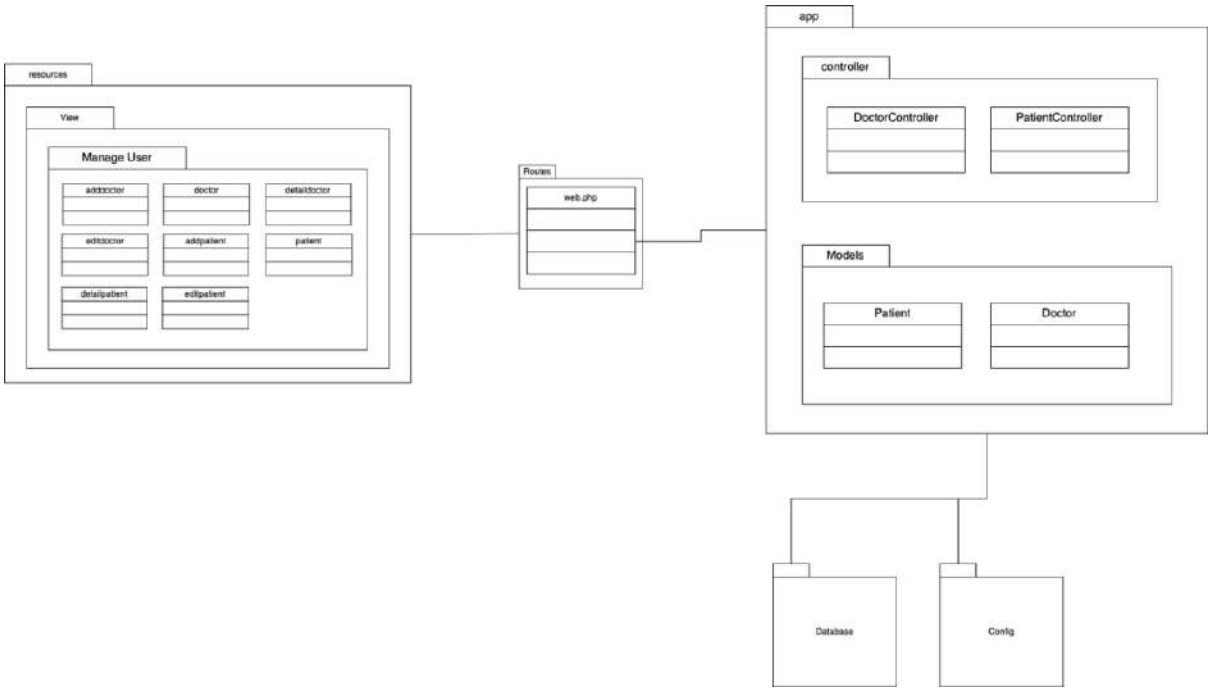

Figure 4 Manage user

Class Name	Description
addDoctor	An interface that allow staff to add new doctor into the system.
doctor	An interface that responsible to display list of doctors.
detaildoctor	An interface that allow staff to see doctor's information in details.
editdoctor	An interface that allow staff to edit doctor's information.
addpatient	An interface that allow staff to add new patient into the system.
patient	An interface that responsible to display list of patients.
detailpatient	An interface that allow staff to see patient's information in details.
editpatient	An interface that allow staff to edit patient's information.

DoctorController	Controller that controls all the functions from the view when staff manage doctors.
PatientController	Controller that controls all the functions from the view when staff manage patients.
Patient	Model that is used to handle data in and out in the database.
Doctor	Model that is used to handle data in and out in the database.
Database	Used to store and structure all data.
Config	Used for the database migration
Web.php	Responsible for routing classes between the view and the controller.

Table 4 Manage User

1.4.4 Manage Profile

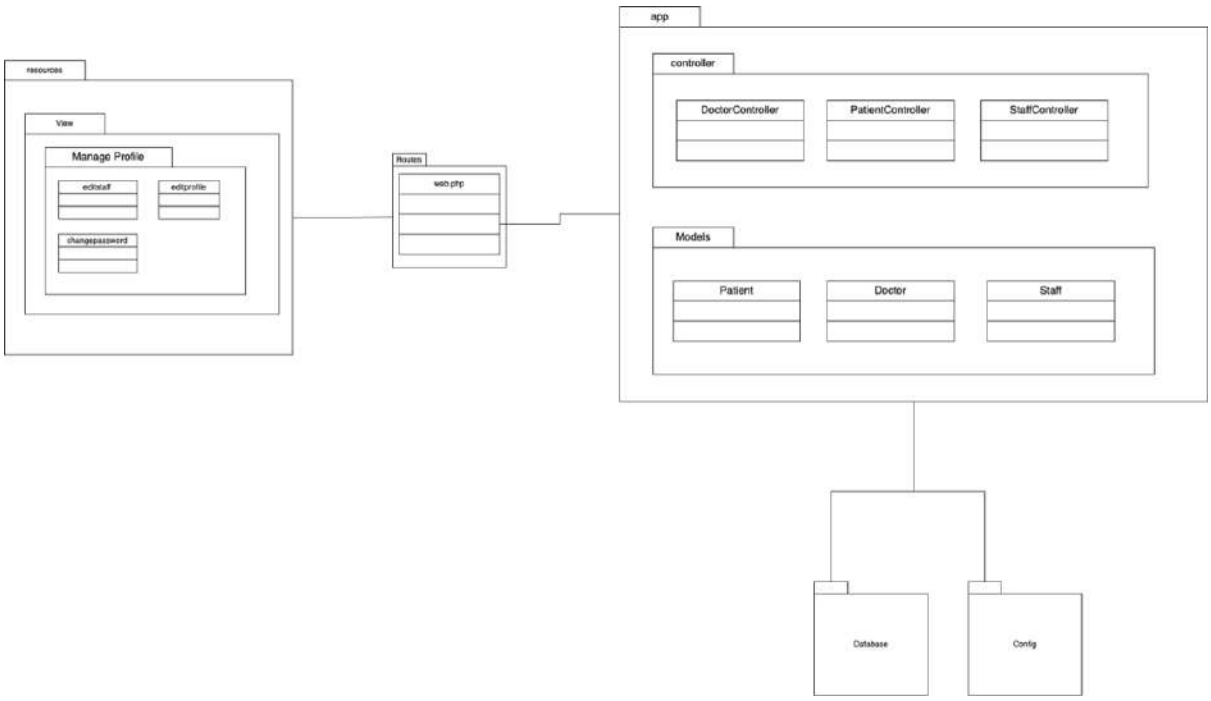

Figure 5 Manage Profile

Class Name	Description

editprofile	An interface that allow user to update their information.
changepassword	An interface that allow user to change password.
StaffController	Controller that controls all the functions.
DoctorController	Controller that controls all the functions.
PatientController	Controller that controls all the functions.
Patient	Model that is used to handle data in and out in the database.
Doctor	Model that is used to handle data in and out in the database.
Staff	Model that is used to handle data in and out in the database.
Database	Used to store and structure all data.
Config	Used for the database migration
Web.php	Responsible for routing classes between the view and the controller.

Table 5 Manage Profile

1.4.5 Manage Report

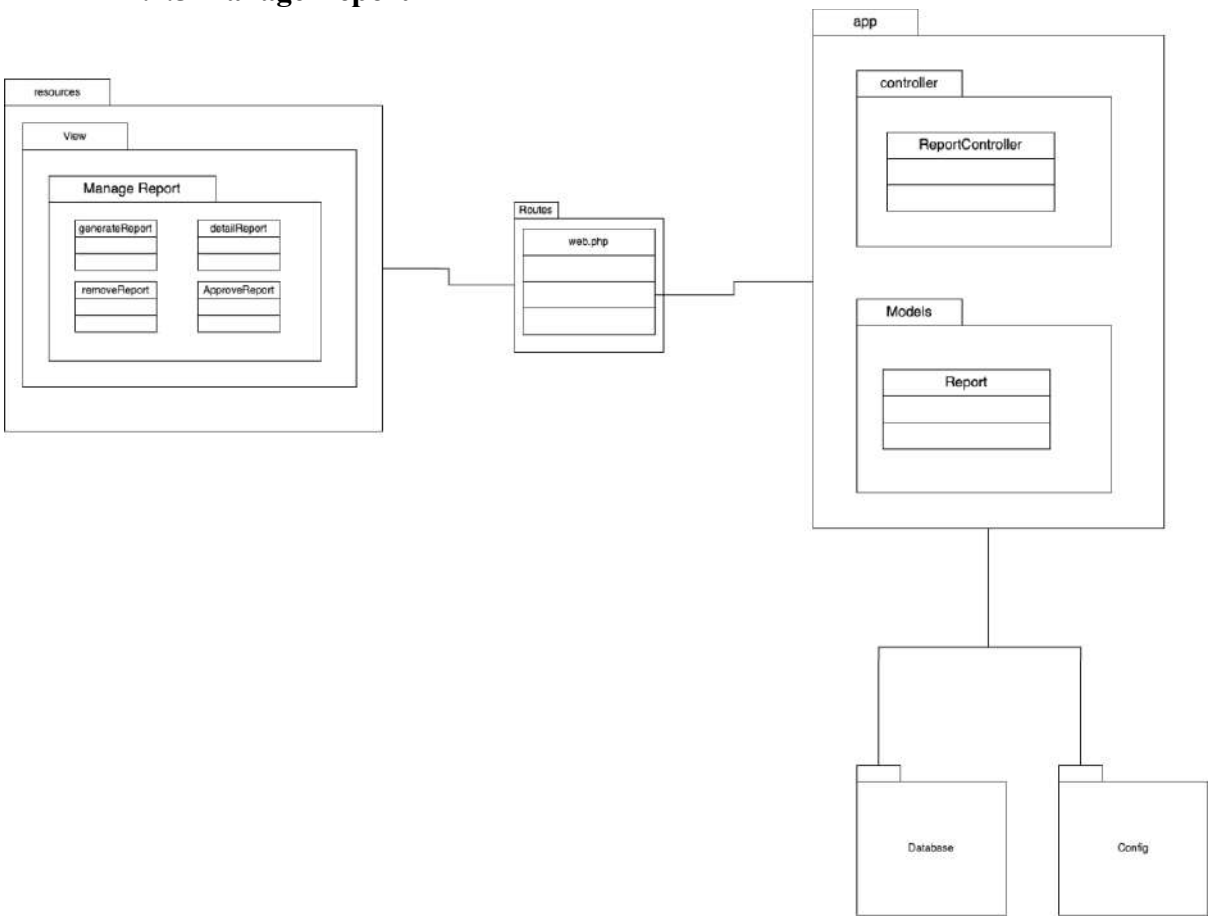

Figure 6 Manage Report

Class Name	Description
generateReport	An interface that display all appointments to generate a report.
detailReport	An interface that display report of appointment in details.
ApproveReport	An interface that allow user to approve or reject request report by the patient.
ReportController	Controller that controls all the functions.
Report	Model that is used to handle data in and out in the database.
Database	Used to store and structure all data.
Config	Used for the database migration
Web.php	Responsible for routing classes between the view and the controller.

Table 6 Manage Report

CHAPTER 2

2.1 DETAILED DESCRIPTION

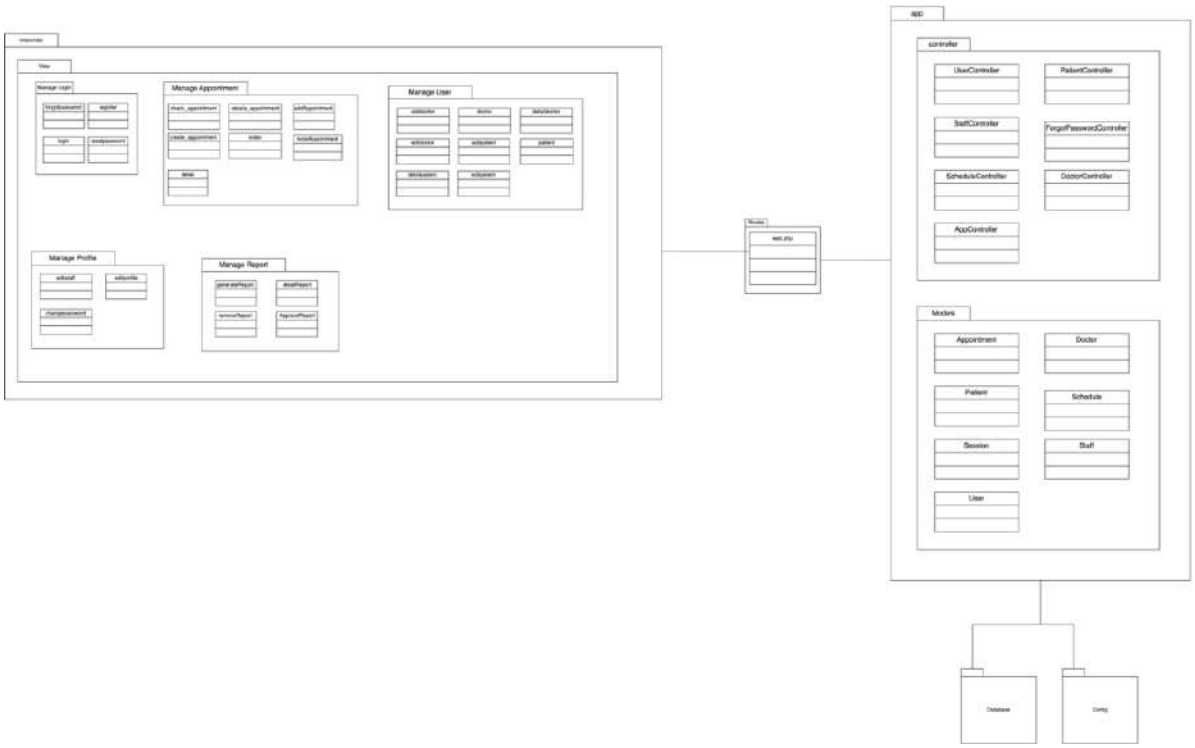

Figure 7 Package Diagram

2.1.1 Manage Login

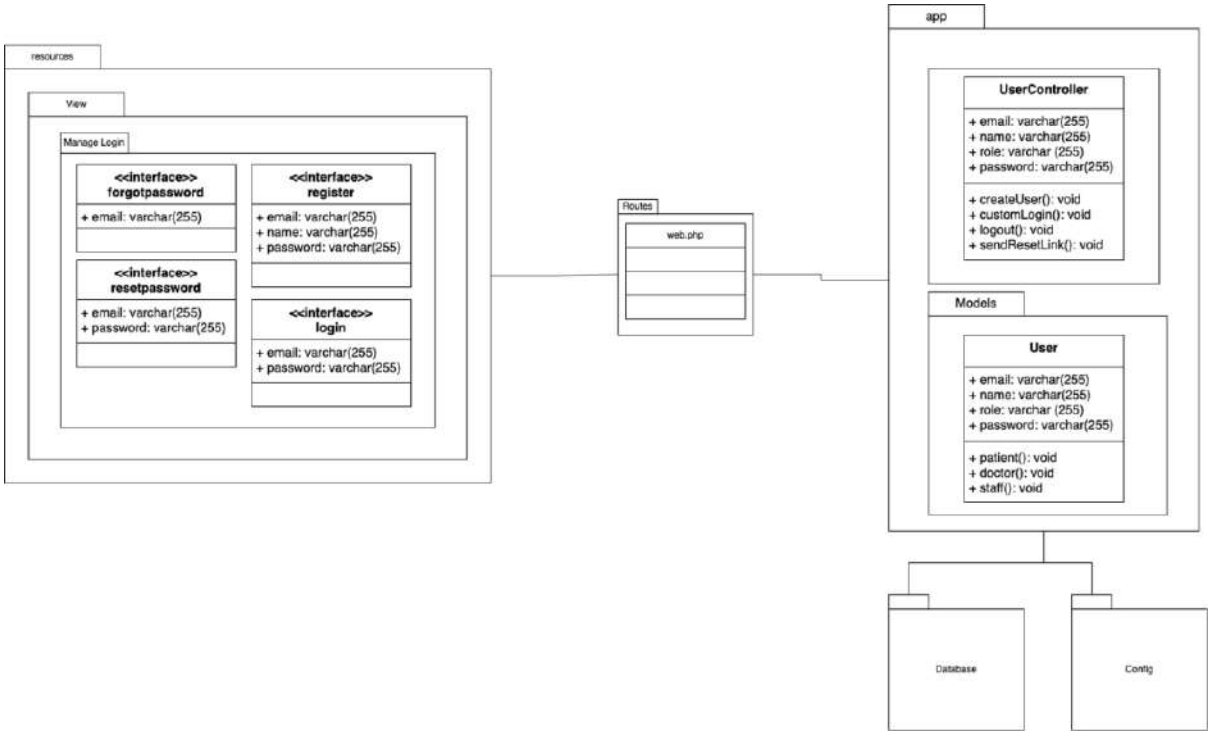

Figure 8 Detailed Design for Manage Login

Forgotpassword.blade.php

Class Type	Boundary Class	
Responsibility	An interface that allow user to enter email to reset password.	
Attributes	**Attributes Name**	**Attributes Type**
	email	VARCHAR (255)
Method	**Method Name**	**Description**
	Not Applicable	Not Applicable
Algorithm	Not Applicable	

Table 7 forgotpassword.blade.php Class Description

register.blade.php

Class Type	Boundary Class	
Responsibility	An interface that allow user to register an account .	
Attributes	**Attributes Name**	**Attributes Type**
	email name password	VARCHAR (255) VARCHAR (255) VARCHAR (255)
Method	**Method Name**	**Description**
	Not Applicable	Not Applicable
Algorithm	Not Applicable	

Table 8 register.blade.php Class Description

resetpassword.blade.php

Class Type	Boundary Class	
Responsibility	An interface that will display to the user to reset password.	
Attributes	**Attributes Name**	**Attributes Type**
	email password	VARCHAR (255) VARCHAR (255)
Method	**Method Name**	**Description**
	Not Applicable	Not Applicable
Algorithm	Not Applicable	

Table 9 resetpassword.blade.php Class Description

login.blade.php

Class Type	Boundary Class	
Responsibility	An interface that allow user to login into the system.	
Attributes	**Attributes Name**	**Attributes Type**
	email	VARCHAR (255)
	password	VARCHAR (255)
Method	**Method Name**	**Description**
	Not Applicable	Not Applicable
Algorithm	Not Applicable	

Table 10 login.blade.php Class Description

UserController

Class Type	Boundary Class	
Responsibility	Controller that controls all the user of the system.	
Attributes	**Attributes Name**	**Attributes Type**
	email	VARCHAR (255)
	password	VARCHAR (255)
	role	VARCHAR(255)
	name	VARCHAR (255)
Method	**Method Name**	**Description**
	createUser()	This function is responsible to create an account for the user .
	customLogin()	This function is responsible to allow user to login into the system.
	logout()	This function is responsible to allow user to logout from the system.

	sendResetLink()	This function is responsible to send reset password link to the user's email.

Algorithm	**createUser()**
	BEGIN
	INSERT email, password, role, name INTO users
	IF role == Patient
	RETURN route patient page
	ELSE IF role == Staff
	RETURN route staff page
	ELSE
	RETURN route doctor page
	END
	
	customLogin()
	BEGIN
	SELECT email, password FROM users
	VALIDATE credentials
	IF role == Patient
	RETURN route patient page
	ELSE IF role == Staff
	RETURN route staff page
	ELSE
	RETURN route doctor page
	END
	
	logout()
	BEGIN
	RETURN to homepage
	END	

Table 11 UserController Class Descriptions

User

Class Type	Boundary Class	
Responsibility	To handle data on and out from in the database.	
Attributes	**Attributes Name**	**Attributes Type**
	email password role name	VARCHAR (255) VARCHAR (255) VARCHAR(255) VARCHAR (255)
Method	**Method Name**	**Description**
	patient()	This function is responsible to link to patient model
	doctor()	This function is responsible to link to doctor model
	staff()	This function is responsible to link to staff model
Algorithm	**patient()** BEGIN IF role == patient INSERT name INTO patients END **doctor()** BEGIN IF role == patient INSERT name INTO patients END **staff()** BEGIN IF role == patient INSERT name INTO patients END	

Table 12 User model Class Descriptions

2.1.2 Manage Appointment

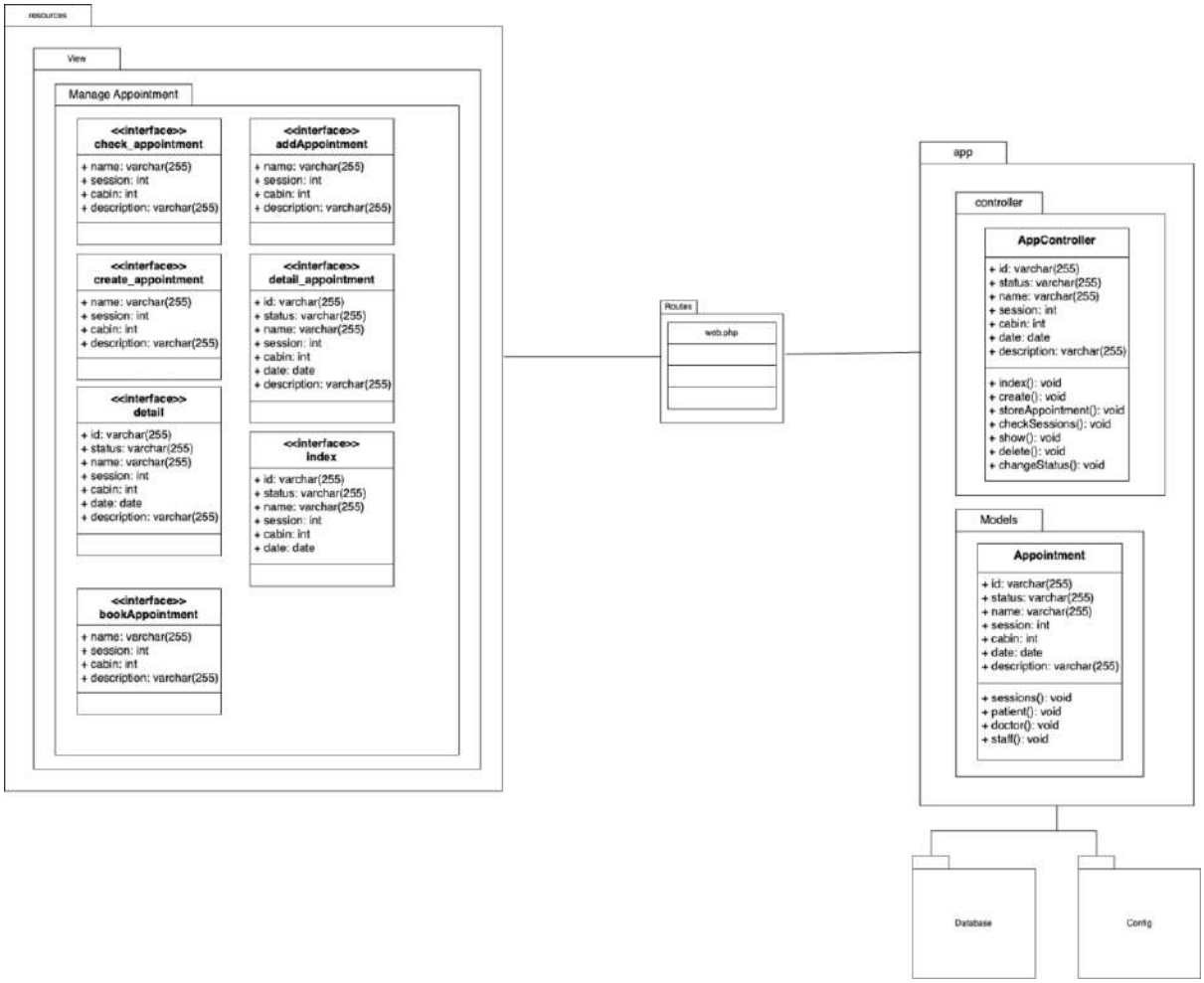

Figure 9 Manage Appointment Detailed Design

check_appointment.blade.php

Class Type	Boundary Class	
Responsibility	An interface that allow user to check for available appointments.	
Attributes	**Attributes Name**	**Attributes Type**
	name	VARCHAR (255)
	session	INT
	cabin	INT
	description	VARCHAR(255)
Method	**Method Name**	**Description**
	Not Applicable	Not Applicable
Algorithm	Not Applicable	

Table 13 check_appointment.blade.php Class Descriptions

create_appointment.blade.php

Class Type	Boundary Class	
Responsibility	An interface for patient to book appointment	
Attributes	**Attributes Name**	**Attributes Type**
	name	VARCHAR (255)
	session	INT
	cabin	INT
	description	VARCHAR(255)
Method	**Method Name**	**Description**
	Not Applicable	Not Applicable
Algorithm	Not Applicable	

Table 14 create_appointment.blade.php Class Descriptions

detail_appointment.blade.php

Class Type	Boundary Class	
Responsibility	An interface for patient to book appointment	
Attributes	**Attributes Name**	**Attributes Type**
	id	VARCHAR(255)
	status	VARCHAR(255)
	name	VARCHAR (255)
	session	INT
	cabin	INT
	date	DATE
	description	VARCHAR(255)
Method	**Method Name**	**Description**
	Not Applicable	Not Applicable
Algorithm	Not Applicable	

Table 15 detail_appointment.blade.php Class Description

Index.blade.php

Class Type	Boundary Class	
Responsibility	An interface for patient to book appointment	
Attributes	**Attributes Name**	**Attributes Type**
	id	VARCHAR(255)
	status	VARCHAR(255)
	name	VARCHAR (255)
	session	INT
	cabin	INT
	date	DATE
Method	**Method Name**	**Description**
	Not Applicable	Not Applicable
Algorithm	Not Applicable	

Table 16 index.blade.php Class Descriptions

bookAppointment.blade.php

Class Type	Boundary Class	
Responsibility	An interface for staff to book appointment for the patient.	
Attributes	**Attributes Name**	**Attributes Type**
	name	VARCHAR (255)
	session	INT
	cabin	INT
	description	VARCHAR(255)
Method	**Method Name**	**Description**
	Not Applicable	Not Applicable
Algorithm	Not Applicable	

Table 17 bookAppointment.blade.php Class Descriptions

SOFTWARE DESIGN DESCRIPTION (SDD) FKOM

AppController

Class Type	Boundary Class	
Responsibility	Controller that controls all the functions of the appointment module.	
Attributes	**Attributes Name**	**Attributes Type**
	id	VARCHAR(255)
	status	VARCHAR(255)
	name	VARCHAR (255)
	session	INT
	cabin	INT
	date	DATE
	description	VARCHAR(255)
Method	**Method Name**	**Description**
	Index()	Responsible to return index view file.
	Create()	Responsible to return create appointment view file.
	storeAppointment()	This class is use to store all the appointment details.
	checkSessions()	This class is responsible to check for sessions available for particular date.
	Show()	This class is responsible to display appointment in details.
	Delete()	This class is use to delete appointment.

	changeStatus()	Responsible to change the status of the appointment.
Algorithm	**Index()** BEGIN SELECT * FROM appointments RETURN staff.appointment.index view file END **Create()** BEGIN RETURN create appointment view file END **storeAppointment()** BEGIN CREATE new object for Appointment model INSERT id, patient_id, doctor_id, cabin, description, session_id, schedule_id INTO appointments VALIDATE the data RETURN success message END **checkSessions()** BEGIN VALIDATE input FETCH data from the database RETURN data END **Show()** BEGIN QUERY id FROM appointments RETURN id END **Delete()** BEGIN QUERY id FROM appointments DELETE id in appointments RETURN success	

	END **changeStatus()** BEGIN QUERY id FROM appointments CHANGE status id SAVE changes RETURN success END

Table 18 AppController Class Descriptions

Appointment

Class Type	Boundary Class	
Responsibility	Handle data in and out in the database.	
Attributes	**Attributes Name**	**Attributes Type**
	id	VARCHAR(255)
	status	VARCHAR(255)
	name	VARCHAR (255)
	session	INT
	cabin	INT
	date	DATE
	description	VARCHAR(255)
Method	**Method Name**	**Description**
	sessions()	This function is responsible to link to session model

	patient()	This function is responsible to link to patient model
	doctor()	This function is responsible to link to doctor model
	staff()	This function is responsible to link to staff model
Algorithm		

Table 19 Appointment model Class Descriptions

2.1.3 Manage User

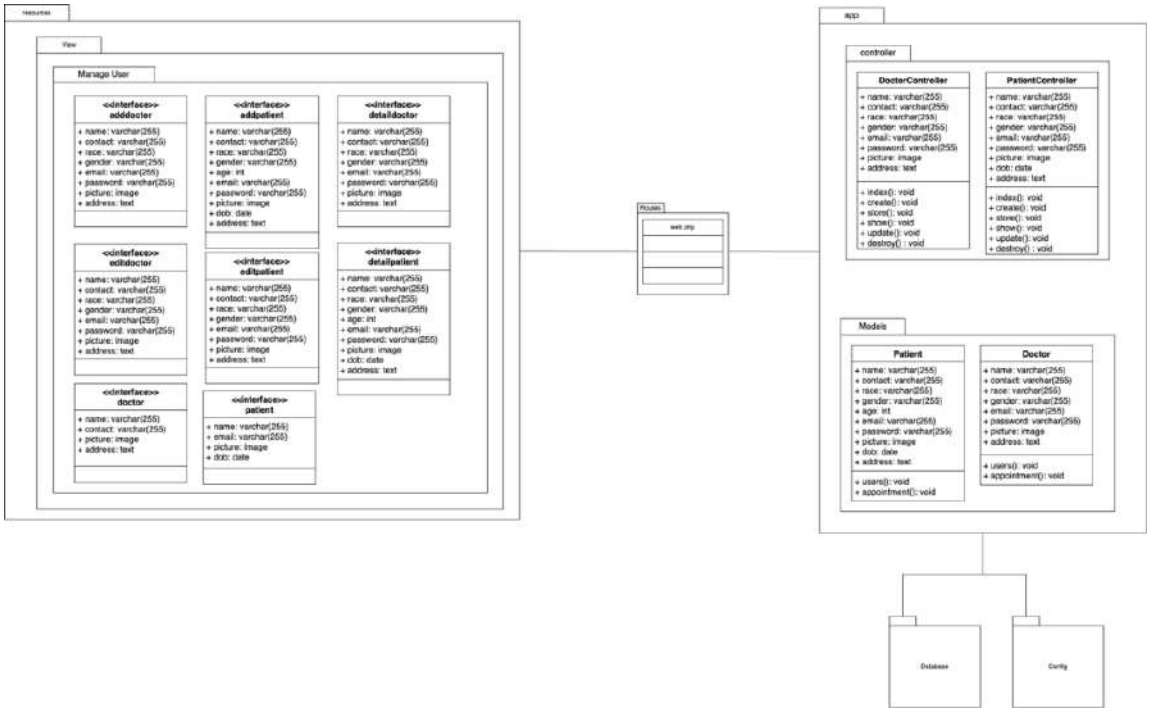

Figure 10 Manage User Detailed Design

Adddoctor.blade.php

Class Type	Boundary Class	
Responsibility	An interface that allow staff to add new doctor into the system.	
Attributes	**Attributes Name**	**Attributes Type**
	name	VARCHAR(255)
	contact	VARCHAR(255)
	race	VARCHAR (255)
	gender	VARCHAR (255)
	email	VARCHAR (255)
	password	VARCHAR (255)
	picture	Image
	address	Text
Method	**Method Name**	**Description**
	Not Applicable	Not Applicable
Algorithm	Not Applicable	

Table 20 Adddoctor.blade.php Class Descriptions

editdoctor.blade.php

Class Type	Boundary Class	
Responsibility	An interface that allow staff to edit doctor's information.	
Attributes	**Attributes Name**	**Attributes Type**
	name	VARCHAR(255)
	contact	VARCHAR(255)
	race	VARCHAR (255)
	gender	VARCHAR (255)
	email	VARCHAR (255)
	password	VARCHAR (255)
	picture	Image
	address	Text
Method	**Method Name**	**Description**
	Not Applicable	Not Applicable
Algorithm	Not Applicable	

Table 21 editdoctor.blade.php Class Descriptions

Doctor.blade.php

Class Type	Boundary Class	
Responsibility	An interface that responsible to display list of doctors.	
Attributes	**Attributes Name**	**Attributes Type**
	name	VARCHAR(255)
	contact	VARCHAR(255)
	picture	Image
	address	Text
Method	**Method Name**	**Description**
	Not Applicable	Not Applicable
Algorithm	Not Applicable	

Table 22 doctor.blade.php Class Description

Addpatient.blade.php

Class Type	Boundary Class	
Responsibility	An interface that allow staff to add new patient into the system.	
Attributes	**Attributes Name**	**Attributes Type**
	name	VARCHAR(255)
	contact	VARCHAR(255)
	race	VARCHAR(255)
	gender	VARCHAR(255)

	age	VARCHAR(255)
	email	VARCHAR(255)
	password	VARCHAR(255)
	dob	Date
	picture	Image
	address	Text
Method	**Method Name**	**Description**
	Not Applicable	Not Applicable
Algorithm	Not Applicable	

Table 23 addpatient.blade.php Class Descriptions

Editpatient.blade.php

Class Type	Boundary Class	
Responsibility	An interface that allow staff to edit patient's information.	
Attributes	**Attributes Name**	**Attributes Type**
	name	VARCHAR(255)
	contact	VARCHAR(255)
	race	VARCHAR(255)
	gender	VARCHAR(255)
	age	VARCHAR(255)
	email	VARCHAR(255)

	password	VARCHAR(255)
	dob	Date
	picture	Image
	address	Text
Method	**Method Name**	**Description**
	Not Applicable	Not Applicable
Algorithm	Not Applicable	

Table 24 editpatient.blade.php Class Descriptions

Patient.blade.php

Class Type	Boundary Class	
Responsibility	An interface that display list of patients.	
Attributes	**Attributes Name**	**Attributes Type**
	name	VARCHAR(255)
	email	VARCHAR(255)
	dob	Date
	picture	Image
Method	**Method Name**	**Description**
	Not Applicable	Not Applicable
Algorithm	Not Applicable	

Table 25 patient.blade.php Class Descriptions

Detaildoctor.blade.php

Class Type	Boundary Class	
Responsibility	An interface that display doctor's information in details.	
Attributes	**Attributes Name**	**Attributes Type**
	name	VARCHAR(255)
	contact	VARCHAR(255)
	race	VARCHAR (255)
	gender	VARCHAR (255)
	email	VARCHAR (255)
	password	VARCHAR (255)
	picture	Image
	address	Text
Method	**Method Name**	**Description**
	Not Applicable	Not Applicable
Algorithm	Not Applicable	

Table 26 detaildoctor.blade.php Class Descriptions

Detailpatient.blade.php

Class Type	Boundary Class	
Responsibility	An interface that display patient's information in details.	
Attributes	**Attributes Name**	**Attributes Type**

	name	VARCHAR(255)
	contact	VARCHAR(255)
	race	VARCHAR(255)
	gender	VARCHAR(255)
	age	VARCHAR(255)
	email	VARCHAR(255)
	password	VARCHAR(255)
	dob	Date
	picture	Image
	address	Text
Method	**Method Name**	**Description**
	Not Applicable	Not Applicable
Algorithm	Not Applicable	

Table 27 detailpatient.blade.php Class Descriptions

DoctorController

Class Type	Boundary Class	
Responsibility	Controller that controls all the functions of the doctor module.	
Attributes	**Attributes Name**	**Attributes Type**

	name	VARCHAR(255)
	contact	VARCHAR(255)
	race	VARCHAR (255)
	gender	VARCHAR (255)
	email	VARCHAR (255)
	password	VARCHAR (255)
	picture	Image
	address	Text
Method	**Method Name**	**Description**
	Index()	Function that return view blade file.
	Create()	Function that return view blade file.
	Store()	Function that receive data from the view and send to the model.
	Show()	Function that return view blade file in details.
	Update()	Function that receive data from the view and update to the model.
	Destroy()	Function that delete the information in the database.
Algorithm	**Index()** BEGIN CREATE Doctor object to connect to the doctor model. RETURN to view blade with doctor's data END **Create()** BEGIN RETURN view blade	

	END **Store()** BEGIN CREATE new doctor object to connect to doctor model INSERT name, email, password, role INTO doctor RETURN success END **Show()** BEGIN RETURN view blade END **Update()** BEGIN RECEIVE id CREATE object to connect to doctor model by id UPDATE data SAVE RETURN success END **Destroy()** BEGIN RECEIVE id CREATE object to connect to doctor model by id DELETE data END

Table 28 DoctorController Class Descriptions

PatientController

Class Type	Boundary Class	
Responsibility	Controller that controls all the functions of the patient module.	
Attributes	**Attributes Name**	**Attributes Type**
	name	VARCHAR(255)
	contact	VARCHAR(255)
	race	VARCHAR(255)
	gender	VARCHAR(255)
	age	VARCHAR(255)
	email	VARCHAR(255)
	password	VARCHAR(255)
	dob	Date
	picture	Image
	address	Text
Method	**Method Name**	**Description**
	Index()	Function that return view blade file.
	Create()	Function that return view blade file.
	Store()	Function that receive data from the view and send to the model.
	Show()	Function that return view blade file in details.
	Update()	Function that receive data from the view and update to the model.

	Destroy()	Function that delete the information in the database.
Algorithm	**Index()** BEGIN CREATE Patient object to connect to the patient model. RETURN to view blade with patient data END **Create()** BEGIN RETURN view blade END **Store()** BEGIN CREATE new doctor object to connect to doctor model INSERT name, age, dob, gender, race, contact, address, email, password, role INTO patient RETURN success END **Show()** BEGIN RETURN view blade END **Update()** BEGIN RECEIVE id CREATE object to connect to patient model by id UPDATE data SAVE RETURN success END **Destroy()** BEGIN RECEIVE id	

	CREATE object to connect to patient model by id DELETE data END

Table 29 PatientController Class Descriptions

Doctor

Class Type	Boundary Class	
Responsibility	Handle data in and out in the database.	
Attributes	**Attributes Name**	**Attributes Type**
	name	VARCHAR(255)
	contact	VARCHAR(255)
	race	VARCHAR(255)
	gender	VARCHAR(255)
	age	VARCHAR(255)
	email	VARCHAR(255)
	password	VARCHAR(255)
	dob	Date
	picture	Image
	address	Text
Method	**Method Name**	**Description**
	users()	This function is responsible to link to user model.
	Appointment()	This function is responsible to link to appointment model.
Algorithm		

Table 30 Doctor model Class Description

Patient

Class Type	Boundary Class	
Responsibility	Handle data in and out in the database.	
Attributes	**Attributes Name**	**Attributes Type**
	name	VARCHAR(255)
	contact	VARCHAR(255)
	race	VARCHAR(255)
	gender	VARCHAR(255)
	age	VARCHAR(255)
	email	VARCHAR(255)
	password	VARCHAR(255)
	dob	Date
	picture	Image
	address	Text
Method	**Method Name**	**Description**
	users()	This function is responsible to link to user model.
	Appointment()	This function is responsible to link to appointment model.
Algorithm		

Table 31 Patient model Class Descriptions

2.1.4 Manage Profile

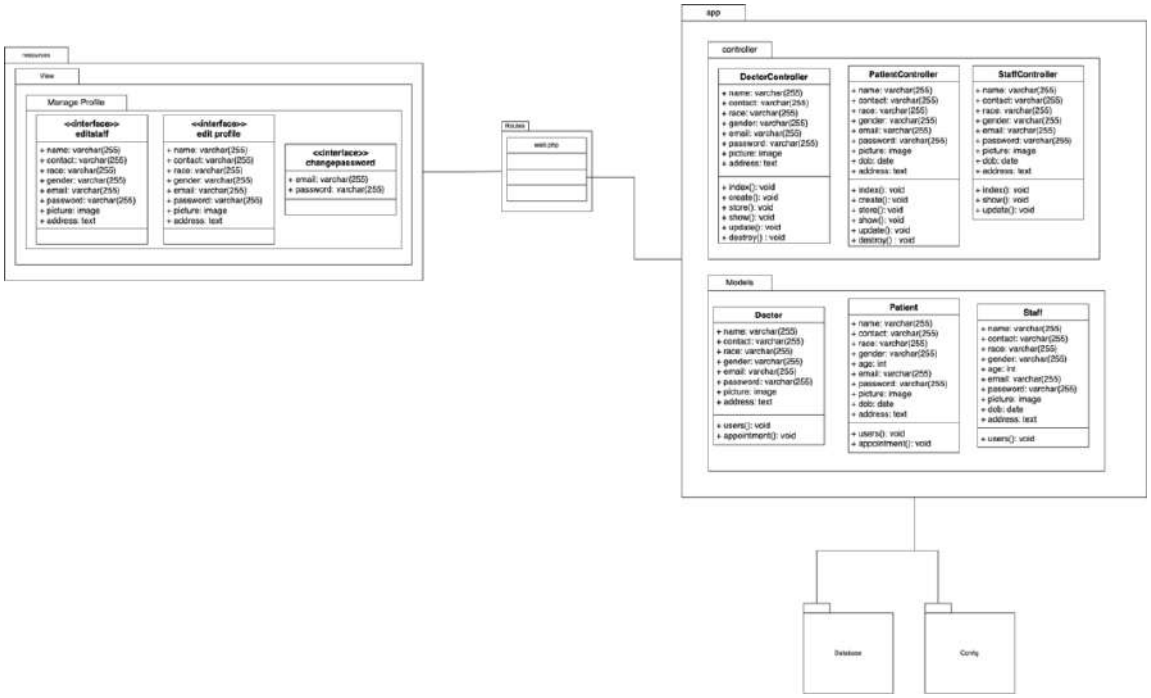

Figure 11 Manage Profile Detailed Design

Editstaff.blade.php

Class Type	Boundary Class	
Responsibility	An interface that allow staff to edit staff's information.	
Attributes	**Attributes Name**	**Attributes Type**
	name	VARCHAR(255)
	contact	VARCHAR(255)
	race	VARCHAR(255)
	gender	VARCHAR(255)
	age	VARCHAR(255)

	email	VARCHAR(255)
	password	VARCHAR(255)
	dob	Date
	picture	Image
	address	Text
Method	**Method Name**	**Description**
	Not Applicable	Not Applicable
Algorithm	Not Applicable	

Table 32 editpatient.blade.php Class Descriptions

Changepassword.blade.php

Class Type	Boundary Class	
Responsibility	An interface that allow staff to edit staff's information.	
Attributes	**Attributes Name**	**Attributes Type**
	email	VARCHAR(255)
	password	VARCHAR(255)
Method	**Method Name**	**Description**
	Not Applicable	Not Applicable
Algorithm	Not Applicable	

Table 33 changepassword.blade.php Class Descriptions

DoctorController

Refer to table 28.

PatientController

Refer to table 29.

StaffController

Class Type	Boundary Class	
Responsibility	Controller that controls all the functions of the staff module.	
Attributes	**Attributes Name**	**Attributes Type**
	name	VARCHAR(255)
	contact	VARCHAR(255)
	race	VARCHAR(255)
	gender	VARCHAR(255)
	age	VARCHAR(255)
	email	VARCHAR(255)
	password	VARCHAR(255)
	dob	Date
	picture	Image
	address	Text
Method	**Method Name**	**Description**
	Index()	Function that return view blade file.
	Show()	Function that return view blade file in details.
	Update()	Function that receive data from the view and update to the model.

Algorithm	**Index()** BEGIN CREATE Staff object to connect to the patient model. RETURN to view blade with staff data END **Show()** BEGIN RETURN view blade END **Update()** BEGIN RECEIVE id CREATE object to connect to staff model by id UPDATE data SAVE RETURN success END

Table 34 StaffController Class Descriptions

Doctor

Refer to table 30

Patient

Refer to table 31

Staff

Class Type	Boundary Class	
Responsibility	Handle data in and out in the database.	
Attributes	**Attributes Name**	**Attributes Type**
	name	VARCHAR(255)
	contact	VARCHAR(255)

	race	VARCHAR(255)
	gender	VARCHAR(255)
	age	VARCHAR(255)
	email	VARCHAR(255)
	password	VARCHAR(255)
	dob	Date
	picture	Image
	address	Text
Method	**Method Name**	**Description**
	users()	This function is responsible to link to user model.
Algorithm	Not Applicable	

2.1.5 Manage Report

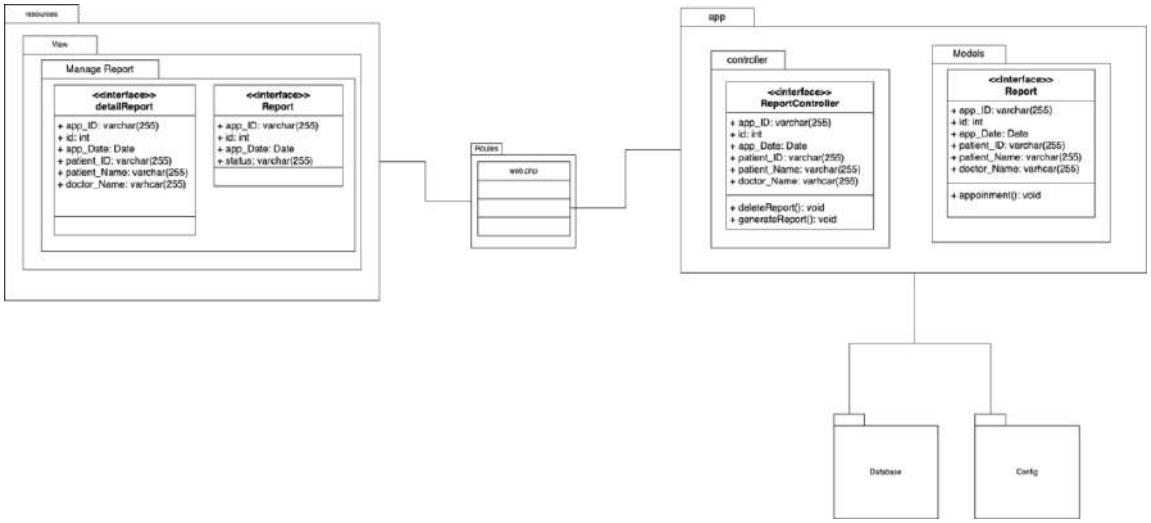

Figure 12 Manage Report Detailed Design

detailReport.blade.php

Class Type	Boundary Class	
Responsibility	An interface that display report of an appointment in details.	
Attributes	**Attributes Name**	**Attributes Type**
	App_ID	VARCHAR(255)
	id	Int
	App_Date	Date
	Patient_ID	VARCHAR(255)
	Patient_Name	VARCHAR(255)
	Doctor_Name	VARCHAR(255)
Method	**Method Name**	**Description**

	Not Applicable	Not Applicable
Algorithm	Not Applicable	

Table 35 detailReport.blade.php Class Descriptions

Report.blade.php

Class Type	Boundary Class	
Responsibility	An interface that display list of reports.	
Attributes	**Attributes Name**	**Attributes Type**
	App_ID	VARCHAR(255)
	id	Int
	App_Date	Date
	Patient_ID	VARCHAR(255)
	status	VARCHAR(255)
Method	**Method Name**	**Description**
	Not Applicable	Not Applicable
Algorithm	Not Applicable	

Table 36 Report.blade.php Class Descriptions

ReportController

Class Type	Boundary Class	
Responsibility	Controller that controls all the functions of the report module.	
Attributes	**Attributes Name**	**Attributes Type**
	App_ID	VARCHAR(255)
	id	Int
	App_Date	Date
	Patient_ID	VARCHAR(255)
	Patient_Name	VARCHAR(255)
	Doctor_Name	VARCHAR(255)
Method	**Method Name**	**Description**
	deleteReport()	Function that delete report
	generateReport()	Function to generate report
Algorithm	**deleteReport()** BEGIN RECEIVE id CREATE object to connect to report model by id DELETE data RETURN success END generateReport() BEGIN RECEIVE id CREATE object to connect to report model by id SAVE data	

	RETURN success END

Table 37 ReportController Class Descriptions

Report

Class Type	Boundary Class	
Responsibility	Handle data in and out in the database.	
Attributes	**Attributes Name**	**Attributes Type**
	App_ID	VARCHAR(255)
	id	Int
	App_Date	Date
	Patient_ID	VARCHAR(255)
	Patient_Name	VARCHAR(255)
	Doctor_Name	VARCHAR(255)
Method	**Method Name**	**Description**
	appointment()	This function is responsible to link to user model.
Algorithm	**Not Applicable**	

Table 38 Report model Class Descriptions

2.2 DATA DICTIONARY

2.2.1 Manage Login

Attribute	Data Type	Description	Constraint
id	INT	User's id	PK
email	VARCHAR(255)	User's email	
name	VARCHAR(255)	User's name	
password	VARCHAR(255)	User's password	
role	VARCHAR(255)	User's role	

Table 39 Manage Login Data Dictionary

2.2.2 Manage Appointment

Attribute	Data Type	Description	Constraint
App_id	VARCHAR(255)	Appointment identification	PK
status	VARCHAR(255)	Appointment status	
Patient_id	INT	Patient's idetification	FK1
Doctor_id	varchar(10)	Doctor's idetification	FK2
cabin	varchar(20)	Cabin number	
description	VARCHAR(255)	Appointment description	
Session_id	INT	Session idetification	FK3
Schedule_id	INT	Schedule identification	FK4

Table 40 Manage Appointment Data Dictionary

2.2.3 Manage User

Attribute	Data Type	Description	Constraint
id	INT	Staff idetification	PK
patient_id	INT	Patient identification	FK1
doctor_id	INT	Doctor identification	FK2
name	VARCAHR(255)	User's name	
gender	VARCAHR(255)	User's gender	
age	INT	User's age	
email	VARCAHR(255)	User's email	
password	VARCAHR(255)	User's passowrd	

Table 41 Manage User Data Dictionary

2.2.4 Manage Profile

Attribute	Data Type	Description	Constraint
id	INT	User identification	PK
name	VARCHAR(255)	User's name	
age	INT	User's age	
gender	VARCHAR(255)	User's gender	
password	VARCHAR(255)	User's password	
contact	VARCHAR(255)	User's contact	
image	IMAGE	User's image	
race	varchar(255)	User's Race	

Table 42 Manage Profile Data Dictionary

2.2.5 Manage Report

Attribute	Data Type	Description	Constraint
id	INT	Report identification	PK
App_id	VARCHAR(255)	Appointment identification	FK1
Patient_Id	INT	Patient idetification	FK2
Patient_Name	VARCHAR(255)	Patient's name	
Doctor_Name	VARCHAR(255)	Doctor's name	
status	VARCHAR(255)	Report status	

Table 43 Manage Report Data Dictionary