

Clinic Management System

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Abstract: Clinic Management System is a web-based system that facilitates the management of business-related information at Teck Hoe Clinic. At the moment, the clinic's proprietor has to manually record all of the clinic's information. As a result, data redundancy, data inconsistency, data loss, and even time waste are all encountered. Consequently, the aim of this project is to develop, design, and test the management system for the clinic. To develop the system, Hypertext Markup Language (HTML) and Cascading Style Sheets (CSS) are used as front-end languages. Furthermore, Hypertext Preprocessor (PHP) is used as the main back-end language. Microsoft Azure is used as the web server for hosting the system and Filess.io is used as database hosting. A waterfall model was chosen with five phases including planning, analysis, design, implementation, and testing. With the system, clinic data will be managed effectively that cannot be handled via manual recording methods. The workload in managing the clinic's data can be reduced. Finally, it assists the clinic in managing and organizing data to ensure smooth business operations.

Keywords: Clinic Management System, Clinic, Web-based, Administrator, Staff, Doctor, Analysis, Design

1. Introduction

In this project, Teck Hoe Clinic is chosen as the real-world model. It is established since year 2002. The clinic is owned by Mr. Tan Teck Hoe, at the same time, Mr. Tan is also the doctor of the clinic. Currently, the workflow is implemented in manually including record patients' information, staffs' information, doctors' information, medical records as well as the medicine inventory. It is undeniable that manual management system will lead numerous problems such as data redundancy and inconsistency, data loss, and even time wasting. For data loss, paper documents are incredibly vulnerable to manage. They may sustain damage from insects and water leaks while being stored. The most important long-term effect of a data loss which can be seen as the clinic's management lack of efficiency certainly the loss of patient trust.

Additionally, data redundancy and data inconsistency are two significant problems that come from the use of current manual document filing methods. As there are repeating and recurring data being recorded, this will lead to resource waste. Data inconsistency, which reveals that the data clashes with other data, will occur when all the data is manually stored in bulk [1]. Moreover, paper documents take a lot of space in the clinic and the amount of paper produced daily will increase. It is indeed possible

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that access to the data will reduce the clinic's productivity. Since all the data are implemented in a manual management system, it will lead to the not systematic in data management. The data will be duplicate many times and are not very secured for the clinic especially the data breaches. Data breaches triggered by human error are more likely to happen in companies that use manual data management system. Personal information is usually compromised in data breaches [2]. The risk associated with the data leakage are considerably decreased with the systematic data management. Lastly, the management of the clinic need to spend more times for checking the medicine inventory since it done in manually. Resource waste will result from the absence of a specific stocking plan [3] due to the miscalculated and unsystematic workflow.

To address the issues stated above, the Clinic Management System is designed and developed. Several objectives can be outlined to achieve the aim:

- i. To design a database Clinic Management System for Teck Hoe Clinic.
- ii. To develop a web-based information management system for Teck Hoe Clinic.
- iii. To test the Clinic Management System functionality and usability.

Meanwhile, there are three users involved in the system, including administrator, staff, and doctor. This system includes several functional modules such as login/logout, profile management, staff management, doctor management, patient management, appointment management, medicine stock count management, Medical Certificate (MC) generation, invoice generation and profit generation.

Lastly, this paper can be summarized as follows: Section 2 focuses on a literature review of related work, as well as existing applications related to the topic. Next, Section 3 describes the methodology used to develop the system with the system analysis and design. Then, Section 4 elaborates on the results and discussion regarding the output of the system. Finally, Section 5 concludes the discussion in this paper with the future recommendations.

2. Related Works

2.1 Manual Management System for Teck Hoe Clinic

In this project, the clinic chosen is Teck Hoe Clinic. Clinic's current management system involves keeping and storing all the clinic's information, including patient's information, appointment times, and medicine stocks in a file. Paper documents must be kept inside the file and arranged on the bookshelf by the clinic's owner or staff. Besides that, the appointment details will be written on a piece of schedule paper and stored in a file. The staffs will have to repair any errors in the schedule paper, which will make the details on the paper messy.

Moreover, in a desktop folder, staff, doctors, and even medicine inventories will be recorded. As there is no database that automatically creates a backup for these data, the manual management approach is unsafe, increasing the risk of data loss and file retrieval. Lastly, a logbook must be kept for the daily income of Teck Hoe Clinic. Clinic owners must use the calculator to calculate the total income for daily, weekly, monthly, and annually. This could result in miscalculation due to human factors.

As a result of manual management of the clinic, the entire process is extremely time-consuming and contains uncertainties, such as miscalculations, data redundancy and data loss. Therefore, data storing, retrieval, and analysis can be enhanced with a computerized system.

2.2 Study of Existing Related Systems

In studying the existing related systems and the developed system, the Clinic Management System will be compared to the three similar existing system namely OpenClinic GA, My Dental Clinic, and Elixir Aid Hospital Management Software [4][5][6]. As shown in Table 1, the comparison between three similar existing systems and the developed system is made based on the specific features.

Table 1: Comparison between Existing Systems and Developed System

Features / System	OpenClinic GA [4]	My Dental Clinic [5]	Elixir Aid Hospital Management Software [6]	Developed System
Web-based	✓	✗	✓	✓
Mobile-based	✗	✓	✗	✗
Easy to use	✗	✓	✓	✓
Easy to learn	✗	✓	✓	✓
Attractive user interface	✗	✓	✓	✓
Search engine	✓	✓	✗	✓
Edit user's profile	✓	✗	✗	✓
Create, view and edit patients' details	✓	✓	✓	✓
Create, view and edit staffs' details	✗	✗	✓	✓
Create, view and edit doctors' details	✗	✗	✓	✓
Help patient to make an appointment	✓	✓		✓
Manage the medicine inventory	✓	✗	✓	✓
Generate Medical Certificate (MC)		✗		
Generate invoice	✓	✗	✓	✓
Generate profit	✗	✓	✓	✓

3. Methodology/Framework

3.1 Waterfall Model

For the development of Clinic Management System, a waterfall model will be used. A waterfall model follows a linear and sequential approach to Software Development Life Cycle (SDLC) in system development. Generally, this model is used for managing complex, multifaceted projects. From the results of research, there are few successful systems developed by using waterfall model including Web-based Job Training Management Information System, Medical Record Management Information System and Work Training Acceptance System [7][8][9]. Through testing and valid results, they can create useful information systems. A waterfall model is chosen for its ability to help the author define the end goal early. In contrast to Scrum, which breaks projects into sprints, waterfall keeps the focus on the end goal throughout the project. There are five phases in this waterfall model: planning, analysis, design, implementation, and testing. In waterfall model, each phase must be completed before moving on to the next without overlapping but restarting at the first stage is the only way to return a phase [10].

Planning phase begins with a kick-off meeting with the supervisor to discuss and understand the undergraduate project. A title should be assigned to the project, along with a problem statement, objectives, and scope. Besides that, a Gantt Chart is created by using Microsoft Project 2019 to highlight the timeline and task activities of each phase. The Gantt Chart can be referred in Appendix A.

In the analysis phase, data gathering is used to investigate all the information related to the clinic. As a first step, the author interviews the clinic's owner, Mr. Tan, to understand its workflow. In addition, the developed management system is studied, compared, and analysed. Lastly, software and hardware requirements should be analysed.

In the design phase, a wireframe is designed for the developed system. After that, the general system architecture, context diagram, Data Flow Diagram (DFD) and activity diagram are designed based on the functions and scope. A suitable database that is related to the developed system is researched and an Entity Relationship Diagram (ERD) is created.

During implementation, it is the project core development phase that takes the most time. For the back-end development, Hypertext Preprocessor (PHP) is the main scripting language used, with Visual Studio Code as the developer tool. Lastly, the Microsoft Azure acts as the web server to host the system and connecting to the MySQL database through Filess.io.

During the testing phase, functional testing, and User Acceptance Testing (UAT) are performed to ensure the system's quality. It will go through several rounds of improvements until it meets the user's requirements. An overview of the developed system development process is shown in Tables 2.

Table 2: Workflow for the Development of the Developed System

Phase	Task	Output
Planning	i. Research on suitable project title.	i. Project title confirmed.
	ii. Identify problem statements, objectives, the scope of the project.	ii. Project proposal
	iii. Set a work plan.	iii. Gantt chart
	iv. Study online resources and articles that are related to the title.	iv. Literature review.
	v. Study the features and functionality of existing systems.	v. Make a comparison with the existing systems.
Analysis	i. Interview with the client – owner of the clinic.	i. Gather user requirement.
	ii. Analyse hardware and software requirements.	ii. Hardware and software requirements.
	iii. Identify functional and non-functional requirements.	iii. Functional and non-functional requirements.
	iv. Generate process model flow.	iv. General System Architecture, Data Flow Diagram (DFD), Context Diagram, Activity Diagram.
Design	i. Design wireframes.	i. Wireframes.
	ii. Design the database.	ii. Entity Relationship Diagram (ERD).
Implementation	i. Develop the system module.	i. Developed system.
	ii. Integrate the system module.	ii. Fix the errors that had been found.
	iii. Connect with database.	
	iv. Perform initial testing.	
Testing	i. Conduct functional testing.	i. Test report.
	ii. Conduct User Acceptance Testing (UAT).	ii. Fix and improve the bugs.
	iii. Identify the area of improvement.	iii. Fix and ready to release the new system.

3.2 System Analysis and Design

This section discusses the analysis and design in the development of developed system. The functional and non-functional requirements of the whole developed system are specified and explained in depth. Besides that, there are some important diagrams are illustrated including Context Diagram, Data Flow Diagram (DFD) Level 0, Entity Relationship Diagram (ERD) and wireframe.

A functional requirement is a particular task that a system must be able to complete. Table 3 shows the functional requirements of Clinic Management System.

Table 3: Functional Requirements of Clinic Management System

Modules	Functionalities
Login	<ul style="list-style-type: none"> The system should allow the administrator, staff and doctor to input a valid username and password to log into the system. The system should allow the admin, staff and doctor to reset their password if they forgot their password.
Profile Management	<ul style="list-style-type: none"> The system should allow the administrator, staff and doctor to view and update their personal information.
Staff Management	<ul style="list-style-type: none"> The system should allow the administrator to register an account to the staff. The system should allow the administrator to create, read, update, or delete the information of the staff.
Doctor Management	<ul style="list-style-type: none"> The system should allow the administrator to register an account to the doctor. The system should allow the administrator to create, read, update, or delete the information of the doctor.
Patient Management	<ul style="list-style-type: none"> The system should allow the administrator and staff to register the new patient and update the information of the existing patient. The system should allow the administrator and doctor to diagnose the patient and give medication to the patient. The system should allow the administrator, staff and doctor to view the history record of the patient.
Appointment Management	<ul style="list-style-type: none"> The system should allow the administrator, staff and doctor to view the schedule of the doctor before helping the patient to make an appointment. The system should allow the administrator, staff and doctor to edit the patient's appointment. The system should allow the administrator, staff and doctor to help the patient to make an appointment. The system should allow the administrator and staff to view the appointment list.
Medicine Stock Management	<ul style="list-style-type: none"> The system should allow the administrator and staff to create and update the medicines' information including medicines' name, description, manufacture, expired date, quantity and price. The system should allow the administrator, staff and doctor to view the medicine stock count.
Medical Certificate (MC) Generation	<ul style="list-style-type: none"> The system should allow the administrator, staff and doctor to generate the Medical Certificate (MC) for the patient.
Invoice Generation	<ul style="list-style-type: none"> The system should allow the administrator and staff to generate the invoice for the patient.
Profit Generation	<ul style="list-style-type: none"> The system should allow the administrator to view the total profit for daily, weekly, monthly, and yearly.
Logout	<ul style="list-style-type: none"> The system should allow the administrator, staff and doctor to log out from the system after using it.

Moreover, non-functional requirements describe a system's behaviour in terms of how it should work rather than what it should accomplished. Table 4 depicts the non-functional of Clinic Management System.

Table 4: Non-functional Requirements of Clinic Management System

Modules	Functionalities
Operational	<ul style="list-style-type: none"> The system only available when there is an internet connection. The system should be able to function on any web browser.
Performance	<ul style="list-style-type: none"> The system should be able to use anytime with an internet connection. The system should execute not more than 10 seconds.
Security	<ul style="list-style-type: none"> The password should be encrypted in the database. The system should be accessed by the registered staff and doctor with only a valid username or email address and password.
Usability	<ul style="list-style-type: none"> The system should have an attractive user interface and easy to use.

Additionally, context diagram is an illustration of the context in which a system works. It provides a comprehensive perspective of the system, showcasing both the system’s interactions with the external entities. Figure 1 shows the context diagram of Clinic Management System.

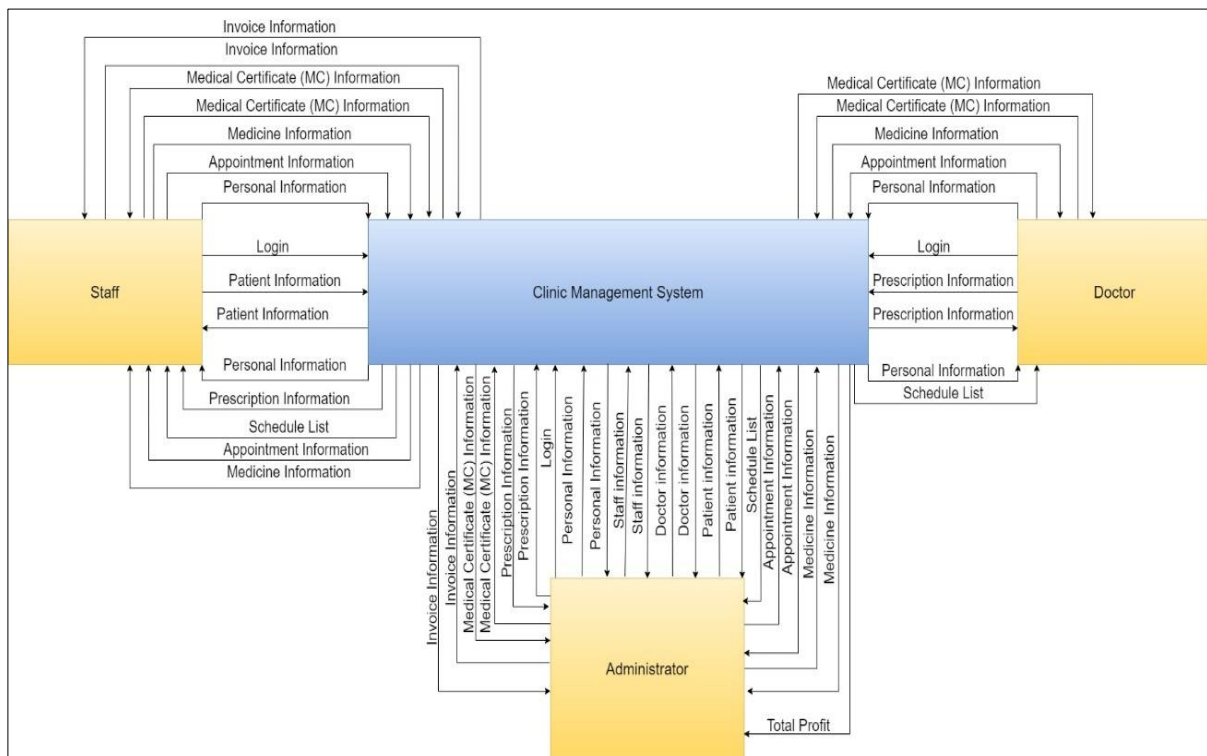


Figure 1: Context Diagram of Clinic Management System

Next, DFD level 0 is explained which it gives a high-level perspective of the whole system to highlight its boundaries and the main processes that transform data as it moves through it. There are total of three users involved in the system which are administrator, staff and doctor. Besides that, there are total of 11 processes in the DFD level 0 including login, patient management, staff management, doctor management, patient management, appointment management, medicine stock management, Medical Certificate (MC) generation, invoice generation, profit generation and logout. The DFD level 0 of Clinic Management System is created as shown in Figure 2.

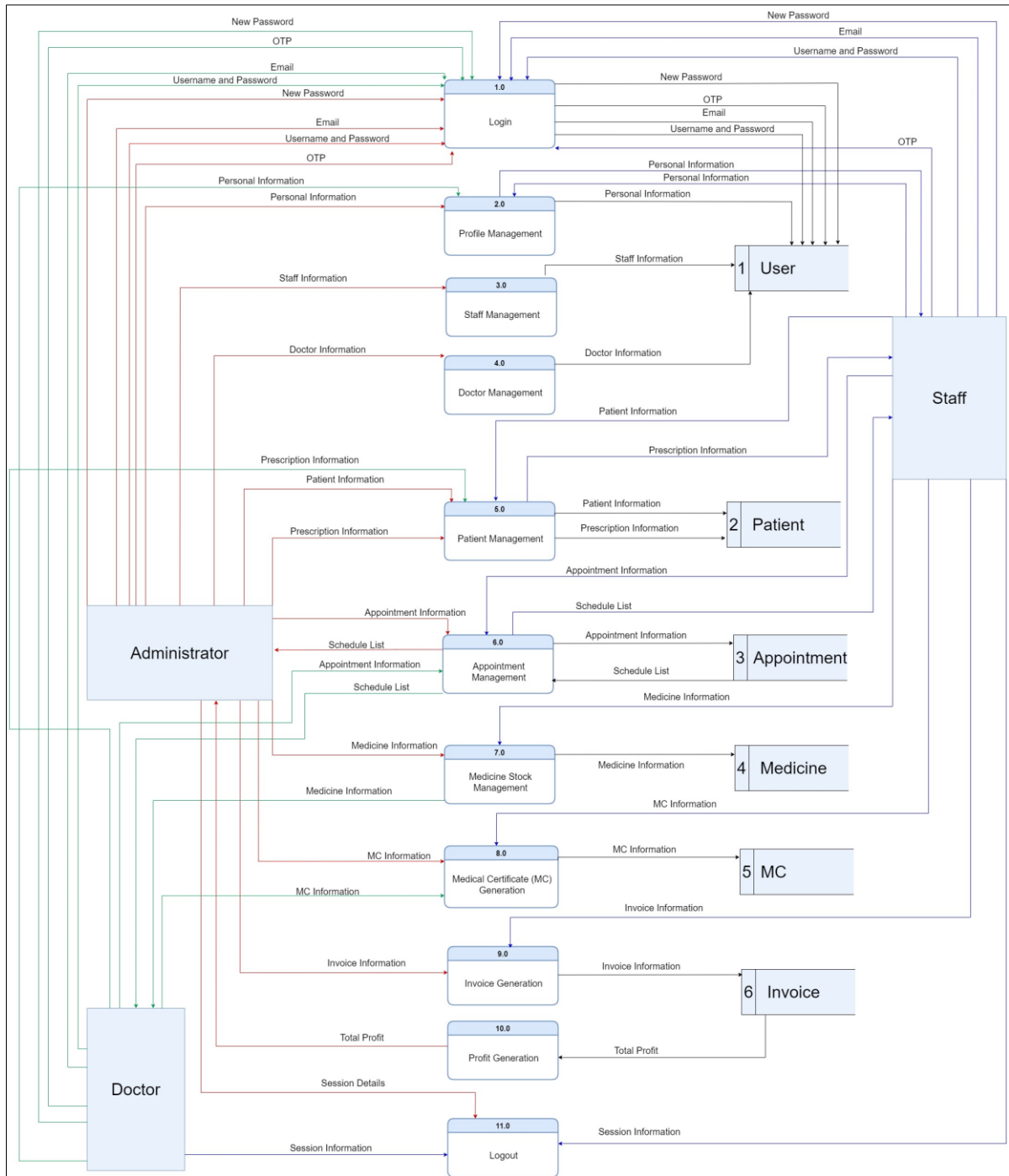


Figure 2: DFD Level 0 of Clinic Management System

Apart from that, an Entity Relationship Diagram (ERD) illustrates the relationship between entities in a database graphically. The ERD of Clinic Management System is created as shown in Figure 3.

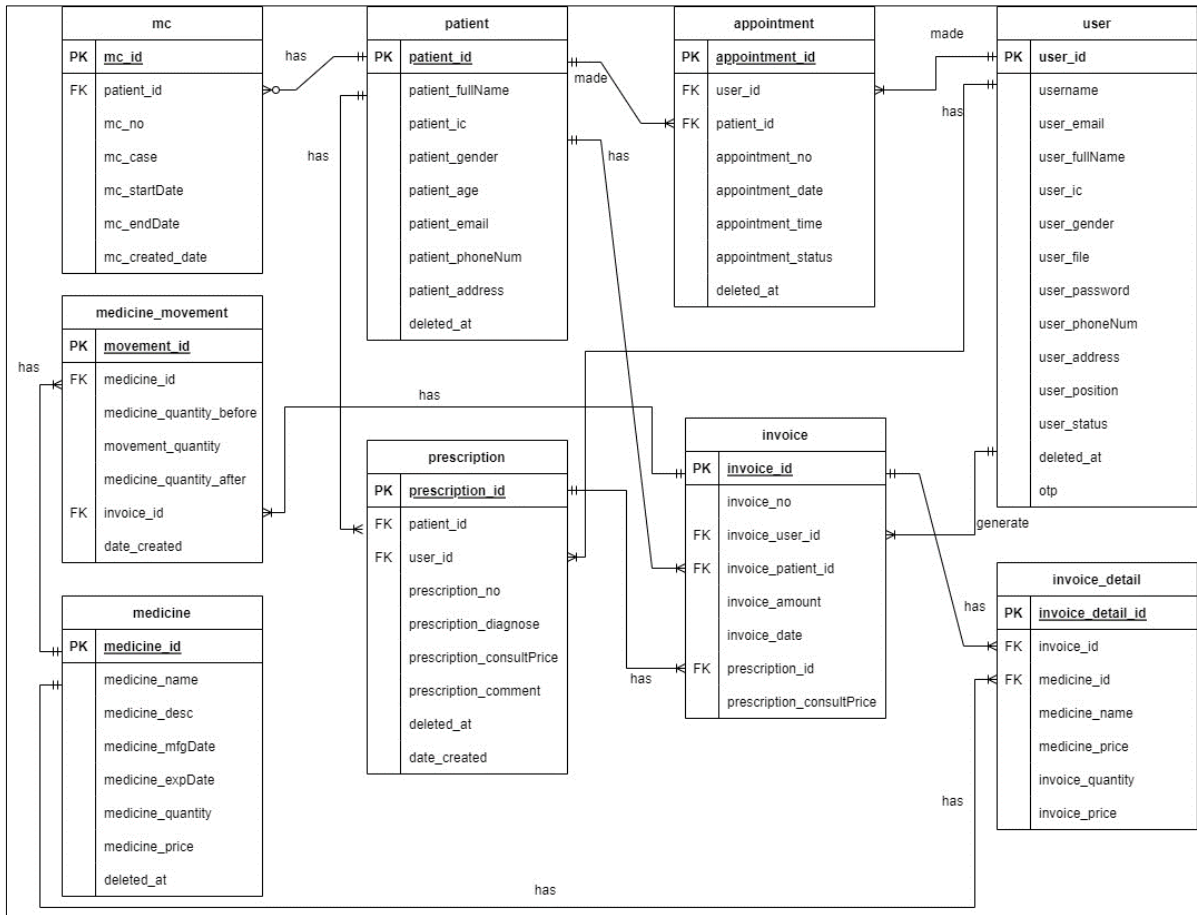


Figure 3: ERD of Clinic Management System

Lastly, user interface (UI) design is the process of creating the visual components that make up the interface of product or service. In this project, the wireframe of the user interface design is designed by using Figma. Figure 4 shows the dashboard on administrator site. For the dashboard on staff and doctor site, there are slightly different since they perform the tasks which less than administrator as stated in functional requirements.

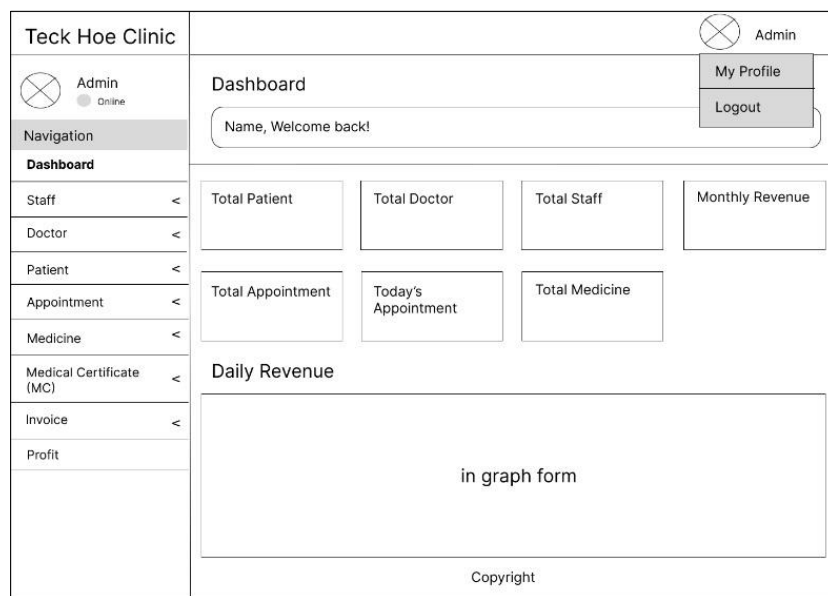


Figure 4: Dashboard on Administrator Site

4. Results and Discussion

In the developed system, the front-end is built using HTML, CSS, JavaScript, and the Bootstrap framework, while the back end is built using server-side scripting languages, PHP. In the meantime, Filess.io is used to setup the MySQL connection and Microsoft Azure is act as the web server which used to host the system. The system implementation and system testing are discussed in this section.

4.1 System Implementation

Figure 5 shows the login interface of the system. The users need to log into the system by using the correct username and password.

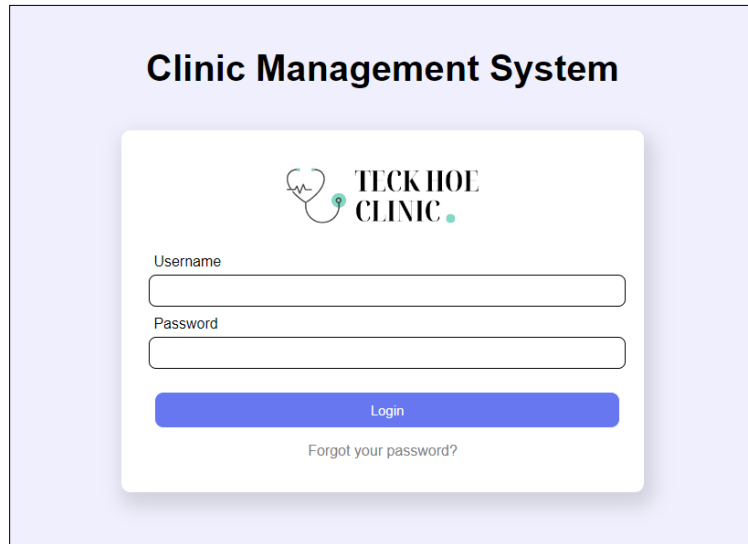


Figure 5: Login Interface of the System

As shown in Figure 6, the users can update the account's profile including profile picture, full name, identity card number, gender, email address, phone number, password and current address.

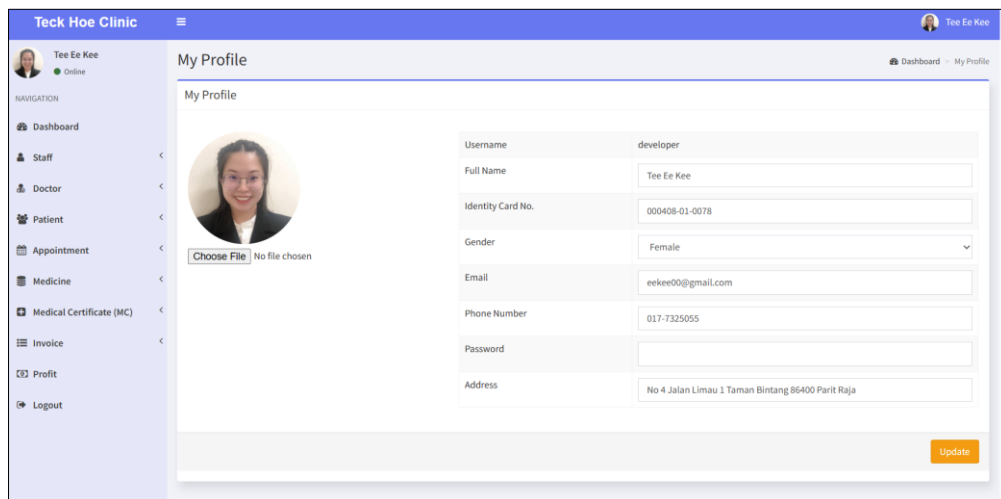


Figure 6: Interface of Updating Profile Form

Figure 7 illustrates the interface of add new staff page. Only the administrator can create the new staff. At the same time, the account for the staff to log into the system is activated once a new staff is created successfully. For creating new doctor function, it is same as creating new staff which only the administrator can create the new doctor and the account for the doctor is activated once new doctor is created successfully.

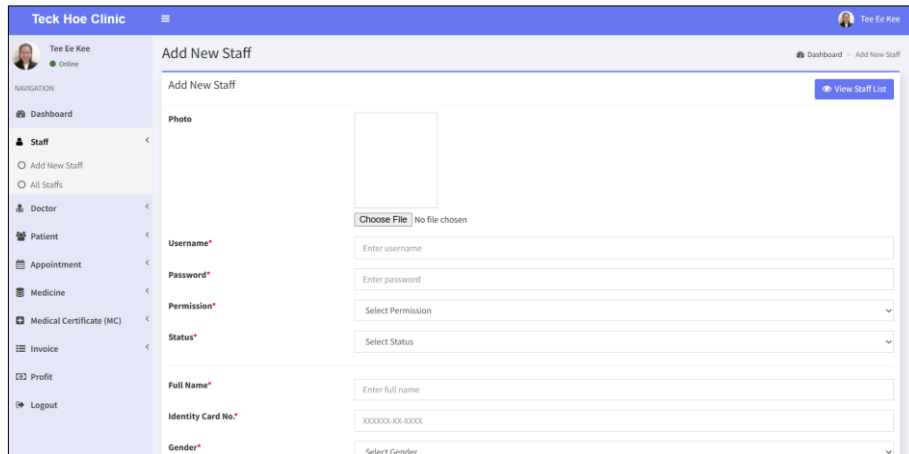


Figure 7: Interface of Add New Staff Page

The interface of all patients list is shown in Figure 8. In this page, all the users can view the lists, only the administrator and staff can edit the patient details as well as only the administrator can delete the staff. Each patient details also can be viewed by clicking “View Details” button as shown in Figure 9. In each patient page, the administrator and staff can view the details, edit the details and view medical records as well as invoice history while the doctor only can view the details and the medical records.

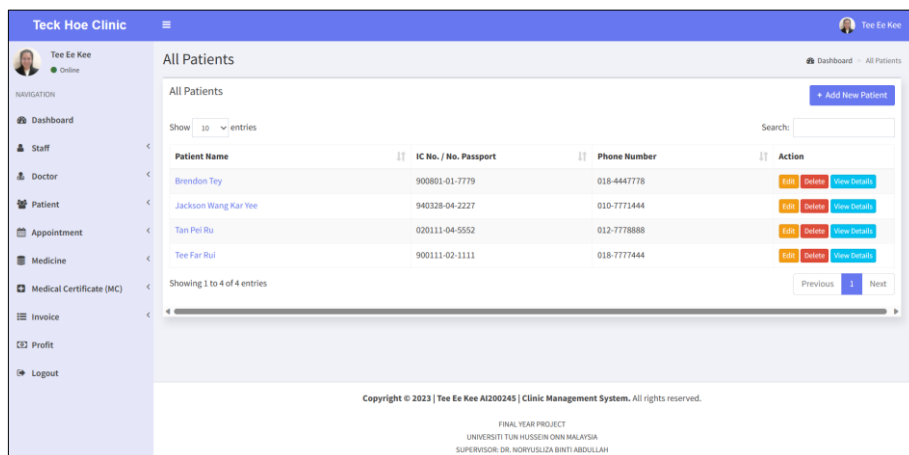


Figure 8: Interface of All Patients List

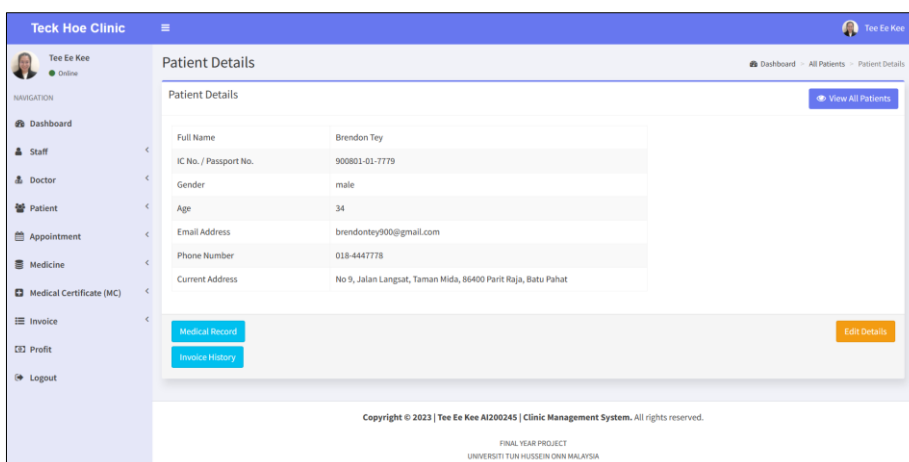


Figure 9: Interface of Each Patient Details

Moreover, only the administrator and doctor can diagnose and give medication to the patient as shown in Figure 10. Once the prescription is created successfully, the invoice for that prescription is also generated in PDF format.

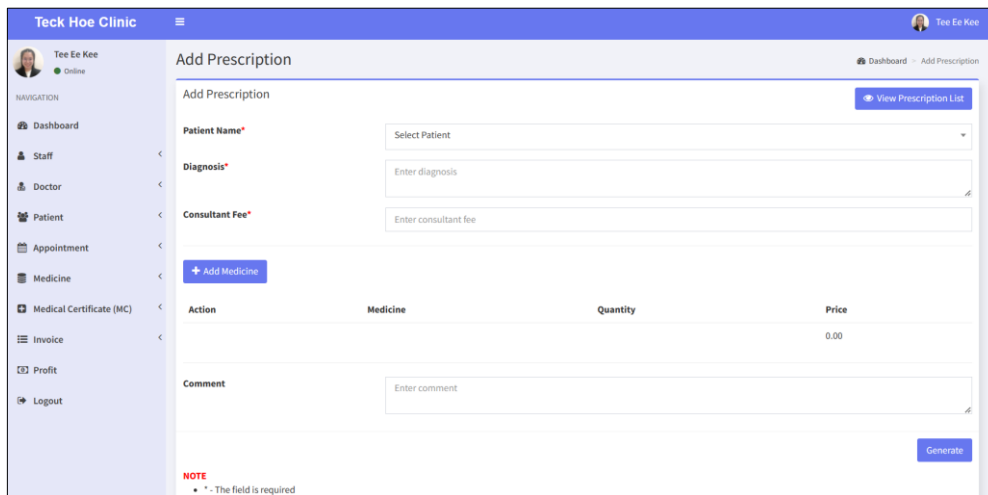


Figure 10: Interface of Add Prescription Page

In appointment management module, the users can help the patient to make an appointment by selecting patient’s name, doctor’s name, time and date. The appointment booked successfully is displayed in all appointments page as shown in Figure 11. Once the users click the “Complete” button, the status is changed from “in scheduled” into “completed”. The users also can edit appointment details and delete appointments.

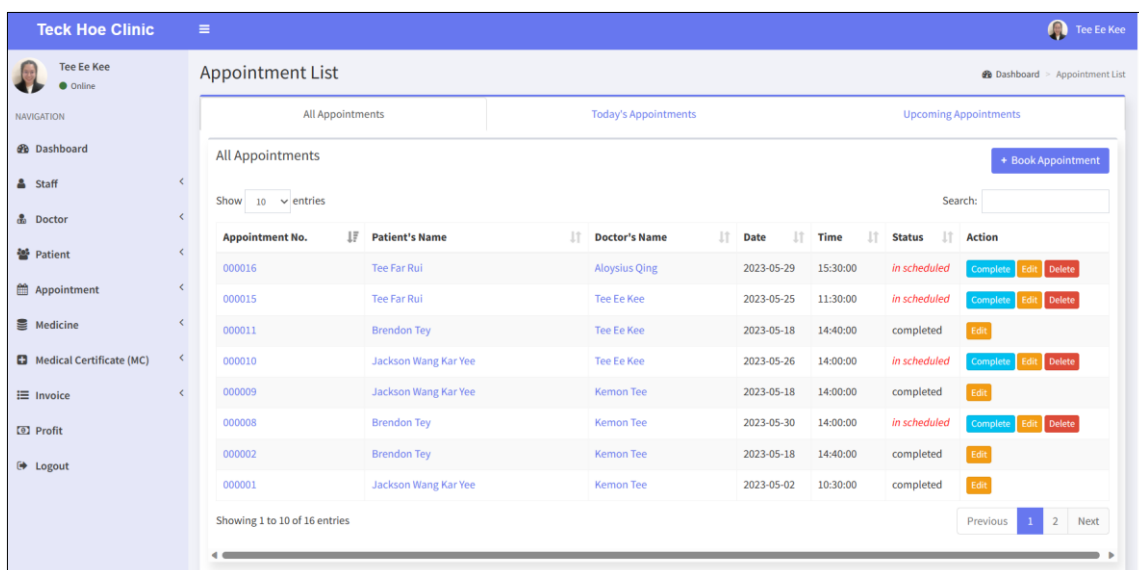


Figure 11: Interface of Appointments List Page

In medicine management module, the administrator and staff can create the new medicine by inserting medicines’ name, description, manufacture date, expired date, quantity and price. Then, the medicine created is displayed in all medicines list page which can be viewed by all users. The medicines with low quantities which less than 10 are highlighted in light red as shown in Figure 12.

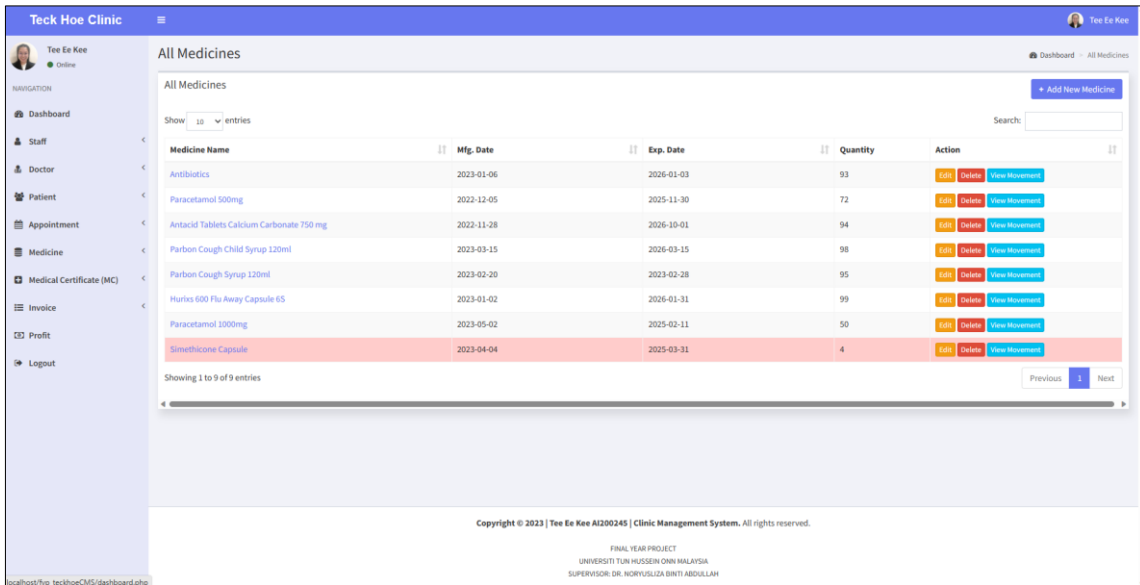


Figure 12: Interface of All Medicines Page with Low Quantities

In MC generation module, the users can generate the MC to the patient by selecting patient’s name, medical case, start date and end date. Then, the MC generated can be viewed in PDF format as shown in Figure 13.



Figure 13: Interface of MC in PDF Format

In invoice generation module, the administrator and staff can generate the invoice for the patient by selecting the patient and medicines needed. Then, the invoice generated can be viewed in PDF format as shown in Figure 14. If the invoice is generated through creating prescription, the invoice is slightly different which will add one more consultant fee in the table.

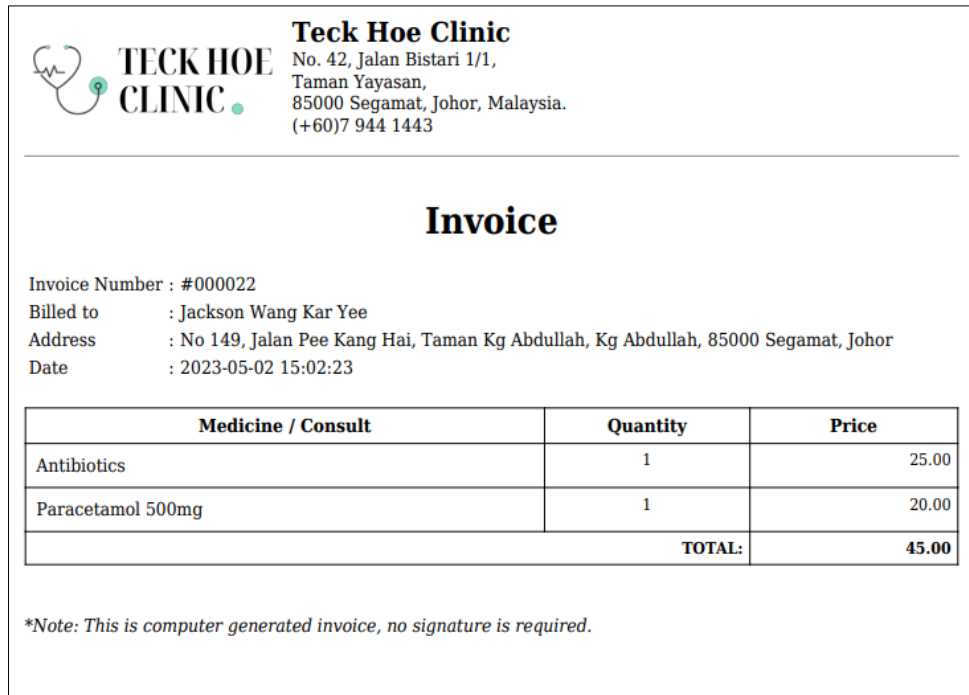


Figure 14: Interface of Invoice in PDF Format

Finally, the interface of daily profit generation page in graph form is shown in Figure 15. Other than that, the administrator also can view the total profit for yearly, monthly and weekly.

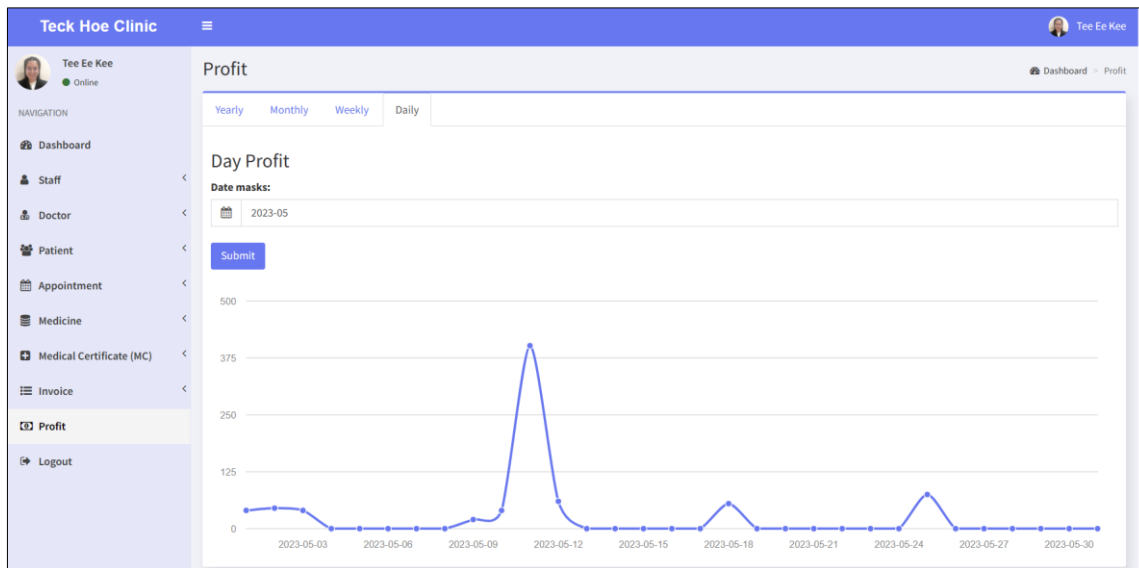


Figure 15: Interface of Total Daily Profit in May 2023

4.2 System Testing

The testing phase is to be carried out using the test plan and the user acceptance test once the system has been fully built and ready for use, to make sure that it has satisfied all of the functional and non-functional requirements.

4.2.1 Test Plan

The test plan is executed as part of the functional testing for the system. Table 5 shows the results of functional test plan to make sure each module performs as intended and delivers the desired results.

Table 5: Results of Functional Test Plan

Functions	Roles	Test Cases	Expected Result	Actual Result
Login	Administrator, Staff, Doctor,	Incomplete data input	A pop-up window with message "Error! Invalid Username or Incorrect Password".	Pass
		Complete input with invalid username or password	A pop-up window with message "Error! Invalid Username or Incorrect Password".	Pass
		Complete form with correct username and password	Login successfully and redirected to the homepage.	Pass
Forgot Password	Administrator, Staff, Doctor,	Invalid email input	An alert message appear will display and then the password reset request is rejected.	Pass
		Valid email input	Receive an OTP code in email.	Pass
		Invalid code	A pop-up window with message "Error! Invalid code".	Pass
		Valid code input	Will be redirected to create new password.	Pass
Profile Management	Administrator, Staff, Doctor,	Display the profile data as in database	The profile page will show the picture, username, full name, email, IC no., gender, phone number and address.	Pass
		Update profile data with valid input	Able to update the profile picture, full name, email, IC no., gender, phone number, address and password.	Pass
Staff Management	Administrator	Create a new staff	Able to create a new staff by inserting the staff's picture, full name, IC No., gender, email address, phone number and current address into the database. The administrator can help the staff to register an account by inserting the username, password, set permission and staff status into the database.	Pass
		View the staff lists	The staff lists are displayed in all staffs page.	Pass
		View the staff details	A pop-up window will be displayed with the staff details in table form.	Pass
		Update the staff details	Able to update the staff details by clicking the edit button at all staffs page including username, permission, status, full name, IC No., gender, email address, phone No. and address.	Pass
		Delete the staff	Confirm dialogue will be displayed. If yes button is clicked, the staff will be deleted.	Pass
		Search the staff by using name.	Able to find the specific staff.	Pass
		Search the staff by using IC No.	Able to find the specific staff.	Pass

Table 5: (cont)

Functions	Roles	Test Cases	Expected Result	Actual Result
Doctor Management	Administrator	Create a new doctor	Able to create a new doctor by inserting the doctor's picture, full name, IC No., gender, email address, phone number and current address into the database. The administrator can help the doctor to register an account by inserting the username, password, set permission and staff status into the database.	Pass
		View the doctor lists	The doctor lists will be displayed in all doctors page.	Pass
		View the doctor details	A pop-up window will be displayed with the doctor details in table form.	Pass
		Update the doctor details	Able to update the doctor details by clicking the edit button at all doctors page including username, permission, status, full name, IC No., gender, email address, phone No. and address.	Pass
		Delete the doctor	Confirm dialogue will be displayed. If yes button is clicked, the doctor will be deleted.	Pass
		Search the doctor by using name.	Able to find the specific doctor.	Pass
		Search the doctor by using IC No.	Able to find the specific doctor.	Pass
		Patient Management	Administrator, Staff, Doctor	View the patient lists
View each of the patient details	Each of the patient details will be displayed in patient details and able to view the medical record and invoice history. For doctor, doctor only can view patient details and medical record.			Pass
View all the prescription	The prescription list will be displayed in all prescriptions page.			Pass
Search the patient by using name	Able to find the specific patient.			Pass
Administrator, Staff	Search the prescription by using patient's name		Able to find the specific patient's prescriptions.	Pass
	Create a new patient		Able to create a new patient by inserting full name, IC No. / No. Passport, gender, age, email address, phone number and current address.	Pass
	Update the patient details		Able to update all the patient details.	Pass

Table 5: (cont)

Functions	Roles	Test Cases	Expected Result	Actual Result
Patient Management	Administrator, Doctor	Create a new prescription	Able to create a new prescription for the patient with the details of diagnosis, consultant fee, medicines chosen, and comment.	Pass
	Administrator	Delete the patient	Confirm dialogue will be displayed. If yes button is clicked, the patient will be deleted.	Pass
Appointment Management	Administrator, Staff, Doctor	Make an appointment	Able to help the patient to make an appointment with the details of patient name, doctor name, available date and available time.	Pass
		Update the appointment details	Able to update the appointment details.	Pass
		Search the patient's appointment by using name	Able to find the specific patient's appointment	Pass
	Administrator, Staff	View the appointment list	The appointment list will be listed in a table and can distribute into three categories which are all appointment, today's appointment and upcoming appointment.	Pass
		View the schedule lists of each doctor	Each of the doctor's schedule will be listed in a table with the details of patient name, date, time and status.	Pass
	Administrator	Delete the appointment	Confirm dialogue will be displayed. If yes button is clicked, the appointment will be deleted.	Pass
	Doctor	View the schedule lists of	Schedule will be listed in a table with the details of patient name, date, time and status.	Pass
Medicine Stock Management	Administrator, Staff, Doctor	View the medicine lists	The medicine lists will be displayed in table form.	Pass
		View the medicine details	A pop-up window will be displayed with the medicine details.	Pass
		Search the medicine by name	Able to search the specific medicine.	Pass
	Administrator, Staff	Create a new medicine	Able to create a new medicine with the details of name, description, manufacture date, expired date, quantity and price.	Pass
		View the medicine movement	A pop-up window will be displayed with the medicine movement details.	Pass
		Update the medicine details	Able to update the medicine details.	Pass
	Administrator	Delete the medicine	Confirm dialogue is displayed. If click "Yes" button, the medicine is deleted.	Pass

Table 5: (cont)

Functions	Roles	Test Cases	Expected Result	Actual Result
Medical Certificate (MC) Generation	Administrator, Staff, Doctor	Generate a MC	Able to create the MC with the details of patient name, medical case, start date and end date.	Pass
		View MC lists	The MC lists will be displayed in table form.	Pass
		View MC in PDF	MC can be view in PDF form in a new tab.	Pass
		Search the MC by patient name	Able to search the specific patient's MC	Pass
Invoice Generation	Administrator, Staff	Generate an invoice	Able to generate an invoice with the selected patient and medicine.	Pass
		View invoice lists	The invoice lists will be displayed in table form.	Pass
		View invoice in PDF	Invoice can be view in PDF form in a new tab.	Pass
		Search the invoice by patient name	Able to search the specific patient's invoice	Pass
Profit Generation	Administrator	View the profit for daily	A graph of daily profit will be displayed in profit page with the selected month.	Pass
		View the profit for weekly	A graph of weekly profit will be displayed in profit page with the selected week.	Pass
		View the profit for monthly	A graph of monthly profit will be displayed in profit page with the selected year.	Pass
		View the profit for yearly	A graph of yearly will be displayed in profit page with the selected year.	Pass

4.2.2 User Acceptance Test

The User Acceptance Test (UAT) is conducted to ensure the system's usability, functionality and accordance to the requirements. In this testing, only three users have involved which are one owner of the clinic and two staffs. The owner of the clinic has tested the system as administrator and doctor roles. In this case, there are total of four users involved in the results of UAT. Ranking 1 is highly unsatisfied whereas ranking 5 is very satisfied. Table 6 shows the result of user interface evaluation. From the result, all the users felt very satisfied with the easy to use and user-friendly interface, attractive interface, suitable background colour, suitable text used and easy to read as well as system with clear navigation. In addition, Table 7, Table 8, and Table 9 show the results of overall system functions evaluations for administrator, staff and doctor respectively. From the results of overall system functions evaluations, all the users are very satisfied with all the functions of the system.

Table 6: Result of User Interface Evaluation

No.	Features	Ranking					Total
		1	2	3	4	5	
i.	The interface of the system is easy to use and user-friendly.	0	0	0	0	4	4
ii.	The system has an attractive interface.	0	0	0	0	4	4

Table 6: (cont)

No.	Features	Ranking					Total
		1	2	3	4	5	
iii.	The background colour used is suitable for the theme of the system.	0	0	0	0	4	4
iv.	The text used is suitable and easy to read	0	0	0	0	4	4
v.	The system with clear navigation.	0	0	0	0	4	4

Table 7: Result of Overall System Functions Evaluation for Administrator

No.	Features	Ranking					Total
		1	2	3	4	5	
i.	Login function	0	0	0	0	1	1
ii.	User profile management function	0	0	0	0	1	1
iii.	Staff management function	0	0	0	0	1	1
iv.	Doctor management function	0	0	0	0	1	1
v.	Patient management function	0	0	0	0	1	1
vi.	Appointment management function	0	0	0	0	1	1
vii.	Medicine stock management function	0	0	0	0	1	1
viii.	Medical Certificate (MC) generation function	0	0	0	0	1	1
ix.	Invoice generation function	0	0	0	0	1	1
x.	Profit generation function	0	0	0	0	1	1

Table 8: Result of Overall System Functions Evaluation for Staff

No.	Features	Ranking					Total
		1	2	3	4	5	
i.	Login function	0	0	0	0	2	2
ii.	User profile management function	0	0	0	0	2	2
iii.	Patient management function	0	0	0	0	2	2
iv.	Appointment management function	0	0	0	0	2	2
v.	Medicine stock management function	0	0	0	0	2	2
vi.	Medical Certificate (MC) generation function	0	0	0	0	2	2
vii.	Invoice generation function	0	0	0	0	2	2

Table 9: Result of Overall System Functions Evaluation for Doctor

No.	Features	Ranking					Total
		1	2	3	4	5	
i.	Login function	0	0	0	0	1	1
ii.	User profile management function	0	0	0	0	1	1
iii.	Patient management function	0	0	0	0	1	1
iv.	Appointment management function	0	0	0	0	1	1
v.	Medicine stock management function	0	0	0	0	1	1
vi.	Medical Certificate (MC) generation function	0	0	0	0	1	1

5. Conclusion

Clinic Management System is a fully functioning management system that intended to reduce the workload on the clinic's owner, staff, and doctor by assuring that the huge amount of data can be managed more effectively to facilitate the business operations with the properly organized data.

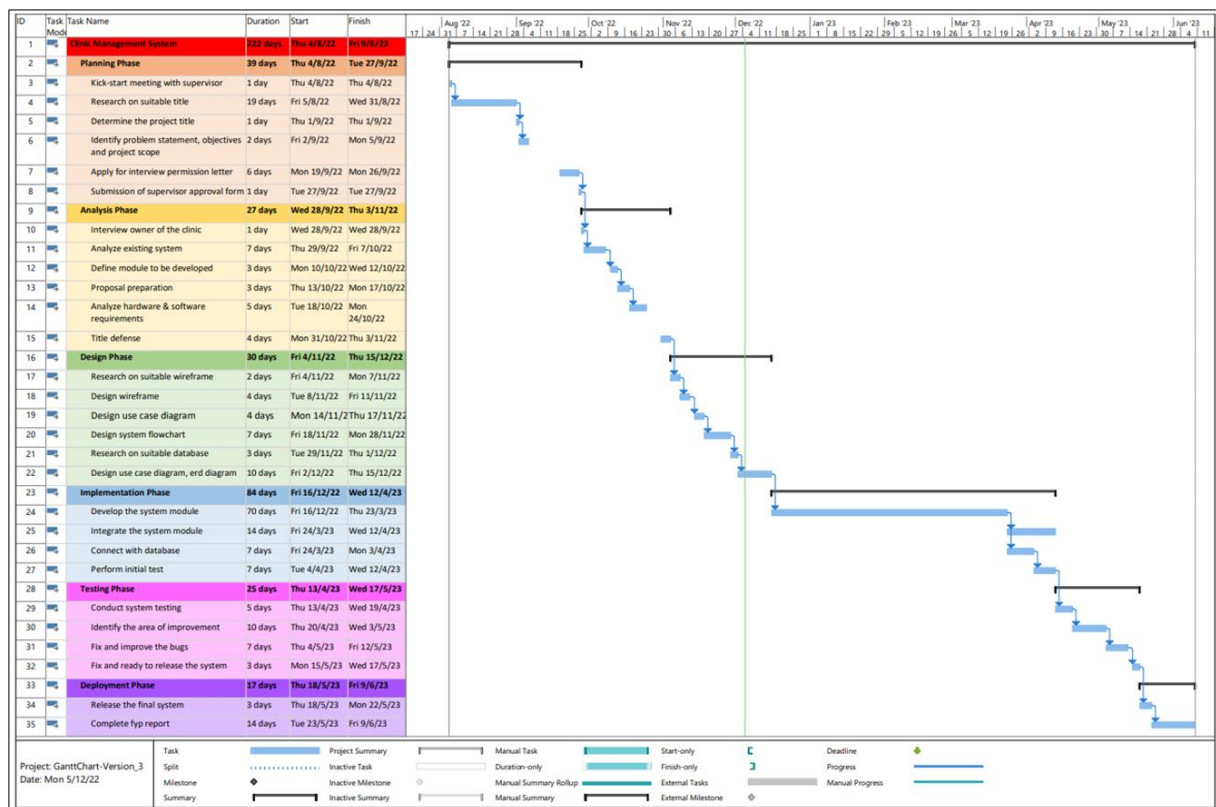
Although the objectives of this project are fully achieved where this system can ease the management process of the owner of the clinic, it also has some flaws due to some limitations. The first limitation is there is no reminder to the patient by phone SMS automatically one day before the appointment date. The staff only can remind the patient by manual phone call. Moreover, the self-registration cannot be made by the new patient to skip for the long registration queues. The appointment also cannot be booked by the patient on their own. The last limitation is there is no mobile-based clinic application for the users. The system only compatible with the browsers.

Therefore, there are few enhancements that can be made for the system in the future. The first recommendation is adding a reminder function to the patient by phone SMS or email automatically one day before the appointment date. This can reduce the workload of the staff to call the patient by phone manually. Next, the author can improve the system to allow the patient to self-register rather than the staff helping the new patients to execute their registration. The self-registration brings much convenient to the patients as well as helps them skipping the long registration process. Then, the system also can allow patients to schedule their own appointments while simultaneously allowing them to access the doctors' schedules via a website or mobile application. So that patients will not have to rely on the clinic staff to respond to their phones when they call because of the crowded clinic, they may view the availability of the desired doctor and schedule appointments accordingly without having to wait on hold. Finally, the system can create a mobile application for users. As mentioned above, there are actions required to be performed by the patients. As a result, the creation of a mobile user site application will undoubtedly improve the patients' overall user experience because it is more convenient and user friendly for them.

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Appendix A



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