



FACULTY OF COMPUTING AND INFORMATION TECHNOLOGY

Diploma in Software Engineering

Programme: D (Group:.)

Assignment

AMCS2003 SOFTWARE REQUIREMENT AND DESIGN

Name (Block Letters)	Registration No.	Signature	Marks
1. Ang Wen Yee	22WMD08802	wenyee	
2. Chan Chee Hein	22WMD08466	Hein	
3. Aloysius Khoo	22WMD08707	KK	
4. Khoo Li Xuan	22WMD08619		
5.			

Lecturer's Name: DHAYALAN A/L GOBI

FORM 2



FACULTY OF COMPUTING AND INFORMATION TECHNOLOGY

Plagiarism Statement and Guideline for Late Submission of Coursework

Read, complete, and sign this statement to be submitted with the written report.

We confirm that the submitted work are all our own work and are in our own words.

Name (Block Letters)	Registration No.	Signature	Date
1. Ang Wen Yee	22WMD08802	wenyee	29/9/2023
2. Chan Chee Hein	22WMD08466	Hein	
3. Aloysius Khoo	22WMD08707	Khoo	29/9/2023
4. Khoo Li Xuan	22WMD08619		29/9/2023
5.			

Software Requirements Specification

for

<Hospital System>

Version<1.0>

Prepared by

Group Name: DCS2G8 Group 2

Aloysius Khoo	2208707
Ang Wen Yee	2208802
Chan Chee Hein	2208466
Khoo Li Xuan	2208619

Instructor: DHAYALAN A/L GOBI

Course: Diploma in Computer Science Year 2

Lab Section:

Date: 29/9/2023

1. Introduction.....	8
1.1 Document purpose.....	8
1.2 Product Scope.....	9
1.3 Intended Audience and document overview.....	10
1.4 Definition, acronyms and abb.....	11
1.5 Reference and acknowledgments.....	12
2. Overall Description.....	13
2.1 Product Overview.....	13
2.2 Product Functionality.....	14
2.2.1 Existing Problem.....	14
2.2.1.1 Booking method response time is slow.....	14
2.2.1.2 Tracking expiration date for medicine.....	14
2.2.1.3 Poor scheduling method.....	14
2.2.1.4 Poor staff response time.....	15
2.2.1.5 Current method for storing info is lacking.....	15
2.2.1.6 Improper documentation and inaccurate reporting.....	15
2.2.2 Proposed Solution.....	16
2.2.2.1 Online Booking.....	16
2.2.2.2 New system to track medicine expiry date.....	16
2.2.2.3 Streamline way to distribute schedule.....	16
2.2.2.4 Staff Training and Guidelines.....	17
2.2.2.5 Create central database for storing information.....	17
2.2.2.6 Auto generate report.....	17
2.2.3 Structure Diagram.....	18
2.2.4 Modules Description.....	19
2.2.4.1 Doctoral Module.....	19
2.2.4.2 Customer Relationship Management Module.....	19
2.2.4.3 Inventory Module.....	19
2.2.4.4 Finance Module.....	20
2.2.5 Requirement Analysis Approach.....	21
2.3 Design and Implementation Constraints.....	22
2.4 Assumptions and Dependencies.....	22
3. Specific Requirements.....	23
3.1 User Interface.....	24
3.1.1 Inventory.....	24
Diagram 2.1.2 UI for inventory module.....	28

3.1.2 Finance.....	31
3.1.3 Doctoral.....	36
3.1.4 CRM.....	39
3.2 User Interface Quality Attributes.....	44
3.2.1 User familiarity.....	44
3.2.2 User guidance.....	44
3.2.3 Consistency.....	44
3.2.4 Recoverability.....	45
3.2.5 User diversity.....	45
3.3 Functional Requirements.....	46
3.3.1 CRM Module.....	46
3.3.2 Inventory Module.....	47
3.3.3 Finance Module.....	47
3.3.4 Doctorial Module.....	48
3.4 Overall Use Case.....	49
3.5 Detailed Use Case.....	50
3.5.1 Doctoral.....	50
3.5.2 Inventory.....	52
3.5.3 Finance.....	54
3.5.4 CRM.....	58
4. Other Non-functional Requirements.....	60
4.1 Performance Requirements.....	60
4.2 Safety and Security Requirements.....	61
4.2.1 Security.....	61
4.2.2 Safety.....	62
4.3 Modular Non-Functional Requirements.....	63
4.3.1 Doctoral module.....	63
4.3.2 Inventory module.....	63
4.3.3 Finance Module.....	64
4.3.3.1 Payment SubModule.....	64
4.3.4 CRM Module.....	64
4.4 Quality Attributes.....	65
4.4.1 Availability.....	65
4.4.2 Reliability.....	65
4.4.3 Performance.....	65
4.4.4 Integrity.....	65
4.4.5 Interoperability.....	66
5. Other Requirements.....	67
5.1 Hardware and Software requirements.....	67
5.1.1 Hardware Requirements.....	67

5.1.2 Software Requirements.....	68
5.2 requirements managements.....	69
5.2.1 Fill in Change Request Form.....	69
5.2.2 Problem analysis and changes specification.....	69
5.2.3 Change analysis and costing.....	69
5.2.4 Change implementation.....	70
5.2.5 Revised requirements.....	70
5.3 System architecture.....	71
Client server.....	71
Model-View-Controller.....	72
Layered.....	73
Most Suitable Architecture.....	74
5.4 State Diagram.....	75
Inventory.....	75
Finance.....	76
Doctoral.....	77
CRM.....	78
5.5 Sequence Diagram.....	79
Inventory.....	79
Finance.....	81
Doctoral.....	83
CRM.....	85
5.6 communication diagram.....	87
Inventory.....	87
Finance.....	88
Doctoral.....	89
CRM.....	90
5.7 activity diagram.....	91
Inventory.....	91
Finance.....	93
Doctoral.....	95
CRM.....	97
6. Appendix.....	98
Appendix A Background Studies.....	98
Appendix B Elicitation techniques.....	99
Interview.....	99
Questionnaires.....	99
Appendix C Stakeholders Analysis.....	100
Inventory.....	100
Doctorial.....	100

Customer Relationship Management.....	100
Finance.....	101
Appendix D Interview , Questionnaire.....	102
Interview.....	102
Inventory.....	102
Finance.....	103
Doctoral.....	104
CRM.....	105
Questionnaires.....	106
Inventory.....	106
Finance.....	114
Doctoral.....	119
CRM.....	125
Appendix E All diagram.....	130
Appendix F All User Interface.....	131
Finance.....	131
Inventory.....	135
Doctoral.....	137
CRM.....	144

1. Introduction

This chapter is about introduction of the documents and also the introduction of the software products. It introduce about the goals, objectives and benefits of the software product and also the reader and brief description of the overall documents. It also contains the acronyms and references that we have used in this documents to let the reader can more easily understand our document.

1.1 Document purpose

The purpose of this document is to provide a detailed overview of the software products, its parameters and goals. This document is prepared with the detailed information that required of a software product development. The document contains the requirements and non - requirements of the software product, the problem and solution of the system, structure of the software product and so on. This documents is important to make sure the system meet all the requirements of all stakeholders. This document also used to record the product scope , goals and benefits of the software product. Providing all the software product information in a tidy form to present to our clients and developers of the software product.

1.2 Product Scope

This software product was developed for Sonway Medical Centre. Finish the daily task operation and solve the problem that faced by the Sonway Medical Centre is the purpose of the software product. The software product has related to multiple departments, there are doctoral department, inventory department, finance department and CRM department. Each department can perform their specific task in the system is the objective of this software products. The benefits of the product is increase accuracy and efficiency of the work. Furthermore, the software product can help the Sonway Medical Centre to become digitization and storing all the data into database to make the company become more systematic and advanced.

1.3 Intended Audience and document overview

There are many readers of this document. First reader is the clients, clients can know how the software product will be, know the user interface of the system and the feature that will have in the proposed system. Project manager will be one of the reader also. Project manager will explain the system to the clients using this documents and diagram such as sequence diagram or use case diagram or structure diagram to inform the functions of the system. Beside that, the developers will read the document. They can know the requirements and functions and also the structure of the overall system to help them to develop the system. Moreover, tester also one of the reader of this document. Tester need to know the requirements and functionalities of the system need to meet and write the test case to ensure the system can satisfy the clients need.

This document was distributed to 5 chapters. For the chapter 1 is introduction and there are some introduction about the documents and also the brief description about the software product. Additionally, the acronyms, references and acknowledgements that we have used in this documents. The chapter 2 is the overall description and is about the product functionality and the description of all the modules. The constraint and assumptions of this software product are also included in this chapter 2. This chapter is important and most of the reader cannot ignore this chapter.

Title of Chapter 3 is specific requirements. It contains all functional requirements and use cases that are required for the developer to develop the system. There are also ui design and ui quality attributes that can be viewed by the clients and frontend developers to develop the user interface. For the chapter 4 Non-functional requirements is about all the non-functional requirements that need to be considered in this software product. There are performance requirements, safety and security requirements requirements and others non-functional requirements in module-based for developers to reference and consider. Other requirements is the title of chapter 5 and it contains the hardware and software that required in the system implementation. How many hardware and reason of need it and what kind of software are needed in the proposed system are all recorded in this chapter. Furthermore, the system architecture that we prefer to use and diagrammatic notations such as state diagram and sequence contains in the chapter 5.

1.4 Definition, acronyms and abbreviations

Acronyms	Definition	Explanation
CRM	Customer Relation Management	CRM is a technology for managing all your company's relationships and interactions with customers and potential customers.
UI	User interface	The user interface (UI) is the point of human-computer interaction and communication in a device.

1.5 Reference and acknowledgments

1. Slow System Response Time. 06 March 2023, view on 8 september2023, Available form <<https://ehrintelligence.com/news/slow-system-response-time-hampers-clinician-e-hr-satisfaction>>
2. Causes of expired medicine. 25 July 2023 , view on 8 september 2023 , Available from <<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC10367394/>>
3. Consequence of poor Scheduling ,20 Oct 2021, view on 8 september 2023 , Available from <<https://workfeed.io/blog/the-consequences-of-poor-scheduling/>>
4. Hospitality staff shortage and turnover. 03 Jan 2023,view on 8 september 2023 , Available from <<https://www.go1.com/blog/hospitality-staff-shortage-turnover>>
5. Missing hospital information. 23 May 2011, view on 8 september 2023 , Available from <<https://bmchealthservres.biomedcentral.com/articles/10.1186/1472-6963-11-114>>
6. Consequence if there are documentation missing. 27 April 2023, view on 8 september 2023 , Available from <<https://www.gilmanbedigian.com/what-happens-if-there-are-medical-documentation-errors/>>
7. Benefits of an online appointment, 29 May 2019, view on 8 september 2023 , Available from <<https://mocdoc.in/blog/benefits-of-an-online-appointment-management-system-in-healthcare-industry#:~:text=Time%2DSaving%3A,middle%20of%20the%20boy%20schedule>>
8. Mobile health tips- Tracking medicine expired date. 30 Sep 2016, view on 8 september 2023 , Available from <<https://www.medgadget.com/2016/09/mobile-healthcare-tips-tracking-medicines-expiration-date.html>>
9. How to Streamline your Product schedule.21 Sep 2023, view on 8 september 2023 , Available from <<https://www.linkedin.com/advice/3/how-can-you-streamline-your-production-schedule>>
10. Important of staff training. 31 Aug 2023 view on 8 september 2023 , Available from <<https://www.proprofstraining.com/blog/hospitality-industry-training/>>
11. Benefits of storing information in a Central Repository. 22 Aug 2023 view on 8 september 2023 , Available from <<https://questudio.com/blog/benefits-of-storing-all-information-in-a-central-repository/>>
12. Benefits of auto generated Report. 2011, view on 8 september 2023 , Available from <<https://www.domo.com/learn/article/-benefits-of-bi-driven-automated-reporting-for-your-business>>

2. Overall Description

The purpose of this is to identify the stakeholders based on several conditions and how to interact with them. On top of that, is the usage of requirement elicitation techniques, using artefact or stakeholder driven elicitation techniques to elicit new or previously hidden information. In addition, conceptual modelling is also used to help aid in understanding current system strengths and weaknesses, depict the requirements and solutions of the new system and to aid in communicating with customers.

2.1 Product Overview

The hospitality system was created for the Sonway Medical Centre and this system will be used by the doctoral department, customer relationship management department, inventory department and also finance department. The main purpose of the new system is to make the workflow and process in the Sonway Medical Centre smoother and ensure accuracy. The system will digitalize all information and processes to make it convenient for the customers, doctors, nurses and the staff in the hospital. For instance, the system will provide an online appointment booking function, hence the customers can just choose the specialities, time and location online. By making the process online, it will streamline the appointment booking process, experience for the customer with minimal mistakes. Beside that, the new system can help to reduce the workload of the staff by automating most procedures. Benefits of automation is reducing mistakes made, especially in a medical centre, any mistake may cause a very big issue, for example giving expired medicine to the patients due to carelessness. Just one mistake, but the patients may have been in danger and even lost their life, the company will also cause a huge reputation damage. Another benefit is that the new system, following industrial trends, will be familiar for both new and old staff alike to use.

In conclusion, the goal of the new system is to solve the problems faced by the Sonway Medical Centre and improve their performance of the current process.

2.2 Product Functionality

2.2.1 Existing Problem

2.2.1.1 Booking method response time is slow

Problem that occurs in Sonway Medical's current system is when visitor booking using the current system the response time is too slow, other than response time slow it's also hard to track availability of doctors for the appointment. The current system is unable to keep up with the speed of changes made to the schedules. The slow response time that had caused many effects has been identified by Teoh Sin Di on May 01,2020 by .The article shows that the reference of the delayed ambulance reason time due to the slow system reason time. These problems make customers dissatisfied with the existing system.

2.2.1.2 Tracking expiration date for medicine

Sonway Medical's current system also faces challenges in tracking the expiration date for medicine. This can lead to potential risks of administering expired medications to patients, compromising their safety and well-being or not discovering that the stock for some medicine is about to expire, wasting the medicine when it eventually expires. This concern aligns with the guidelines by regulatory bodies such as World Health Organization(WHO) which pay attention to the importation of maintaining medication quality. These problems should be paid attention by the hospital to make sure patient health gets secure.

2.2.1.3 Poor scheduling method

Poor staff scheduling is another critical problem affecting the current system. Overlapping timetables can lead to understaffed shifts and confused staff. For example, a nurse being required to attend to 2 different postings at the same time. That is impossible for a nurse to do 2 different tasks given at the same time. This causes inefficiencies in patient care and affects the quality of service.We will know more about the consequence of poor scheduling by reading the article that was written by Vimal Navaneesan in 20 OCT 2022 Leading to overall customer dissatisfaction and staff frustration.

2.2.1.4 Poor staff response time

The existing problem in hospitals is patient families need to physically find the nurse when there is an emergency. Sometimes patients need to request anything from the nurse. They didn't get a response from the nurse immediately and didn't even get a reply. For example, a patient needs to emergency call a nurse but maybe nurses didn't get any notify and unfortunately the patient missed the best rescue time. This is a serious problem that the management needs to pay attention to. Reasons that causes staff slow response time had been listed out by Mike Jeavons on Jan 01, 2023 in this article we will know what causes staff shortage in hospitality. So that hospital can prescribe the right medicine.

2.2.1.5 Current method for storing info is lacking

Furthermore, the system's inconvenience in tracking or searching patient details can result in delays and confusion during medical consultations. This lack of streamlined access to patient information can hinder the healthcare professionals' ability to provide timely and accurate treatments as the info they have on patients may be outdated or wrong. This will cause confusion, with wrong medicine or treatment methods administered to the patients. The shortage for storing patients' information happened before in Britain in 2007, the impact of missing patient details due to the unavailability of the hospital information.

2.2.1.6 Improper documentation and inaccurate reporting

Improper documentation and inaccurate reporting for sales and finance could lead to financial discrepancies and a lack of transparency in the hospital's financial management. For the current method, all the documents and reports are produced by the staff. This method will cost a lot of time but just could get a low quality document and report only, uncorrect data and calculation, incomplete information include in the document will happen in one of the document or report without being noticed. Beside the accuracy and completeness of the report, the loyalty of the staff that produce the report also should be noticed to ensure the accounting fraud will not happen. This can have serious consequences for the hospital's financial stability and credibility.

2.2.2 Proposed Solution

2.2.2.1 Online Booking

Patients can book an appointment online. The patient can first select the doctor whose specialisation they require. There they can check the doctor's schedules, details and qualifications to ensure their validity. When they want to book an appointment with their selected doctor, they can check the doctor's schedule and availability in real time then select an empty slot on which the doctor is free to book the appointment. There are a lot of benefits of an online appointment, written by Sanjana 29 May 2023 she listed out all the benefits for online booking appointment.

2.2.2.2 New system to track medicine expiry date

Staff can use the new system to check their medicine and how long it will expire to ensure expired medicine will not accidentally be distributed to patients. If a set of medicine is sent into the hospital, the system will be key-in by the inventory management about the expiry date. And when the date is less than a month from expiry it will start giving out warning messages to alert the pharmacist about it and start acting on it. Staff can use the system to dispose of expired medicine to make sure the medicine will not be sold to any patients. This system can make sure patients can get the most quality medicine and also improve the reputation of the hospital.

2.2.2.3 Streamline way to distribute schedule

Staff can use the new scheduling system to check their schedule, which will be refreshed every 30 seconds. When entering any proposed changes, the system will automatically check for any clashing or any clashes caused by the changes in and highlight them to help avoid any overlapping timetables. Any changes made will be processed and approved before updating the schedule. This is the best way to make sure there is no overlap in the doctor's schedule so that the appointment goes smoothly without any distractions from the problems of scheduling.

Streamline ways to distribute schedules can help you reduce cost and improve the quality of the hospitality industry system. We found a website that can teach you how to streamline your product schedule written on 21 sep 2023.

2.2.2.4 Staff Training and Guidelines

Educating hospitality staff on how to effectively navigate and utilise the features of the new software platform. This includes providing training sessions that cover tasks such as handling guest requests, assigning priorities, utilising communication tools, and tracking task progress. Additionally, guidelines are established within the system to offer staff clear directions on managing different request types, adhering to response time targets, escalating urgent matters, and ensuring consistent customer service. By integrating training and guidelines directly into the software system, staff can seamlessly follow best practices, leading to improved response times, streamlined operations, and enhanced guest satisfaction. An article found the importance of staff training written by Karmy Anderson in December 2023.

2.2.2.5 Create central database for storing information

The new system will provide a comprehensive database to record down all of patient-related information, medical history, test results, prescription, diagnosis and treatment plans, and the new system provides plenty of quality life improvement on searching for specific patient info. The new system provides a quick search bar for easy access or finding of a specific patient info, the system having a friendlier user interface makes it easier to learn and sort out the information in the database. Moreover, a centralised database can lead to good decision making for doctors to cure the patient. Time and cost will also be saved a lot. A lot of benefits can prove that creating a central database for storing information is a good solution by visiting the article written by Questudio on 22 Aug 2023.

2.2.2.6 Auto generate report

The new proposed system will provide auto-generated function for the report and document. The system will take the data and records from the central database to generate the reports. The report will include all the information that have been settings previously. Since all the data is taken from the database and calculate by the system, the human error that can happen can be all avoided in the proposed system and do not waste the human resources to gather the data and produce the report. If want to change the data or format of the report, the related department manager need to get the permission from the highest management to have the right to edit the report data and format. All the changes will be recorded in the system to make sure the authenticity of the reports.

2.2.3 Structure Diagram

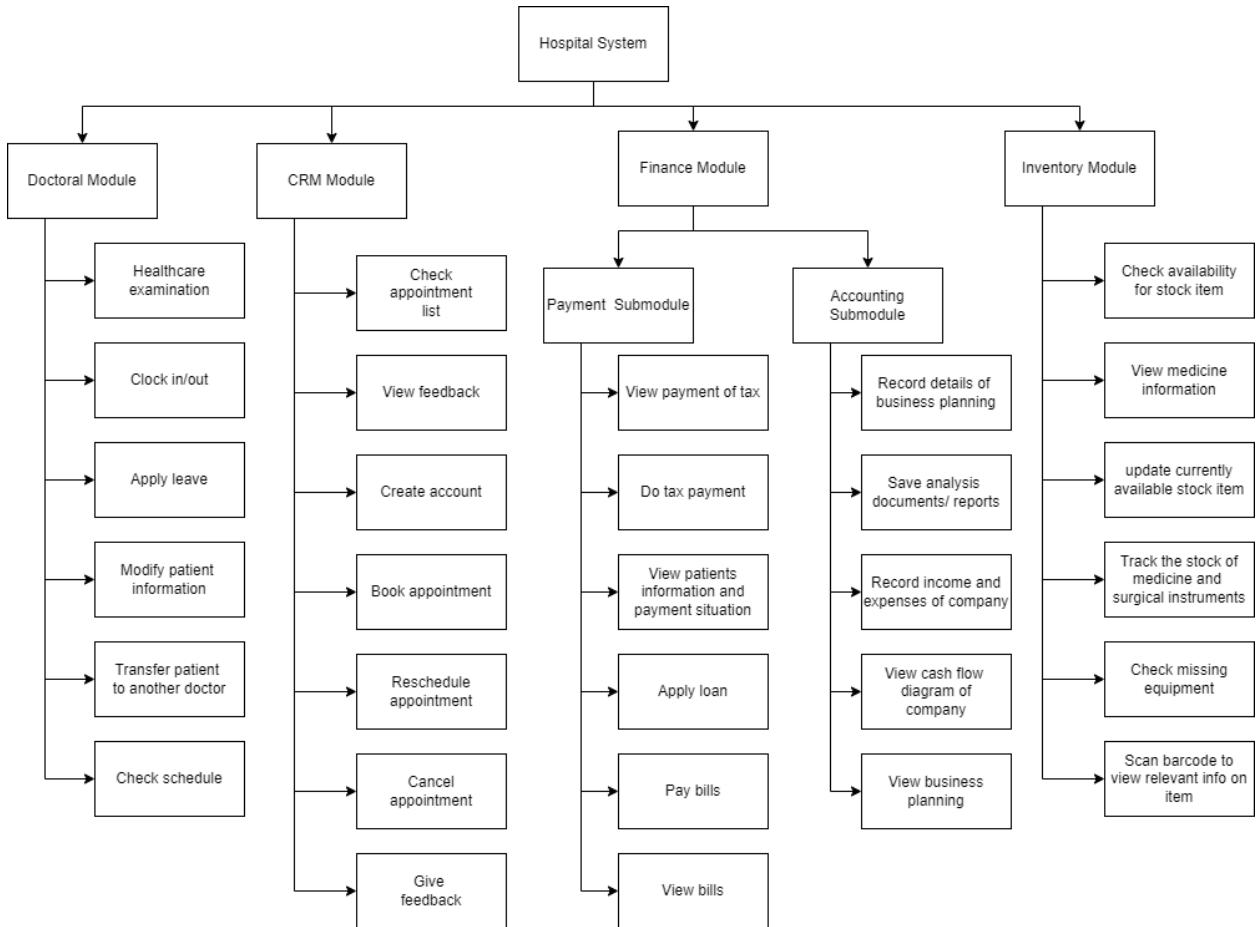


Diagram 1 structure diagram

2.2.4 Modules Description

2.2.4.1 Doctoral Module

Doctoral Module's primary use is for the doctors and nurses to do their daily task, both can use the system for clocking in and out of work, apply leave for work, doing health examination on patients to get details on their conditions, and record down the patient info, doctors are also able to transfer one patient to another doctor in different specialty that is in needed for the patient, and doctor also can check their schedule that is updated in real-time with whether they are slotted with appointments or no, and finally doctor can modify patient info and only if they got the patients consent and the higher ups authorization. And finally patients can also use this module to simply call for doctor or nurses for service, and they can also put in additional request items.

2.2.4.2 Customer Relationship Management Module

The Customer relationship management module (CRM module for short) is used mainly by both customers and CRM staff. Customers can make an online account to streamline their booking process as the account requires their personal details, thus negating the need to re-enter their details every time an appointment is made. Customers can make appointment bookings but will have to first check for the doctor's availability by viewing the doctor's schedule. Customers can also cancel the appointment if needed. Appointment rescheduling is also allowed to be done by the customer to reschedule their appointments if they found it inconvenient or if something else requires their attention. Any booking, cancellation or rescheduling requests will be processed and approved before updating the doctor's schedule to avoid scheduling conflicts. All appointments will be added to a list to allow staff to validate the customers appointment on the appointment day. Customers can also give feedback, which will be documented in a neat report with filters allowing staff to view it to help improve customer service.

2.2.4.3 Inventory Module

The Inventory management module is mainly used by staff and nurses. Inventory modules focus on the stock items arrangement and availability. Staff can update the availability of stock items to let nurses view the status. Staff can keep track of the stock items and generate reports. To let the nurses know well about the medicine information and the quantity of the stocks availability for that particular moment. Staff will be the first point of contact to know the situations of stock items, if any problems the system will send the notification to the staff on the spot. In this module, all of the stocks items will be stored in the history of stocks movement. Purpose of stored history of stock movement it's because easy for future tracking and arrangement of the stock items. The system also enables the staff to view the loss equipment report. System will also

have role-based access controls to enable the authorised personnel to access and modify inventory data.

2.2.4.4 Finance Module

The finance module is used by the finance staff, manager and patients. Finance module has two submodule, payment submodule and accounting submodule. Payment submodule is focus on the payment between patients and medical centre and also the tax that have to pay to the government. In this payment submodule, patients can view and pay their payment and generate receipt after the payment. For the big amount of treatment fees and surgery fees, the patients are also allowed to apply for a loan with the medical centre through the system online. Manager could view the tax payment and complete the tax payment via the proposed system. In the accounting submodule, the finance staff can record the income and expenditure details of the medical centre and view the cash flow diagram that generate based on these income and expenditure. The system also enable finance staff to store their analysis documents after viewing the business planning that is recorded by the manager in the system.

2.2.5 Requirement Analysis Approach

Viewpoint oriented analysis is an approach to produce a synthesis of requirements from different perspectives. Viewpoint oriented analysis can be used to classify different types of stakeholders and other sources of requirements. There are three generic types of viewpoint, interactor viewpoint, indirect viewpoint and domain viewpoint.

Interactor viewpoint is the viewpoint from people who directly use the system such as staff and this viewpoint could help us to get the detailed requirements including system features and interfaces. They will be the main users for the proposed system and they know the most about the workflow and the feature they need to finish their daily task. For example, we can figure out the proposed system need to have online feedback feature anonymously to protect patients or customer themselves, online appointment feature to convenient themselves from the customer viewpoint analysis.

Indirect viewpoints describe the stakeholders who didn't use the system themselves but they influence the requirements in some way. For example a stakeholder that didn't use the system but they are familiar with it and they may have the power to influence the system feature and interface of the system. In our hospitality system, the management of the hospital are the examples of indirect viewpoints. Their opinion and request will affect the features of the proposed system such as they request the different format and information for the reporting.

Domain viewpoints is the type of viewpoint use as way to understand the domain characteristic and constraint that will influence the system requirements. Domain is usually refer as country, global or state law, and depends on the country it will directly affect how the system is constraint if it wants to work in other countries. For example in Malaysia we can always use IC as the certified way to identify the exact patient we want to find, however in a different country it might be different. As an example Australia does not have an identity card to identify the patients and we are constrained in using various documents to identify their identity.

The reason for using viewpoint-oriented analysis is because our system will be related to different departments. Each department will provide different requirements that may have some conflict between these requirements. Using this approach it is easier to classify them and discover the conflicts. This approach can encourage us to consider not only the prime system, but also the wider system. For example, we are need to consider the experience of the customer or patients to use this system, not just consider the main person, staff who are using the system. Furthermore, we can highlight more hidden requirements missing from the original requirements because not all the stakeholders can provide all needed requirements precisely. Hence, viewpoint-oriented analysis is a useful method to discover the requirements that is not provided by the stakeholders.

2.3 Design and Implementation Constraints

Designing and implementing a hospital software system in Java involves addressing critical constraints, including regulatory compliance to safeguard patient data, ensuring interoperability with various healthcare systems, prioritising data security and privacy, integrating with legacy systems, managing budget limitations, optimising resource availability, planning for scalability and performance, facilitating user training and adoption, minimising downtime through high availability strategies, managing change effectively, providing secure mobile and remote access, and conducting rigorous testing and quality assurance, all while leveraging Java's versatility and security features to meet these challenges and ensure a seamless and compliant healthcare technology solution.

2.4 Assumptions and Dependencies

It should be assumed that the user of the system will have a basic understanding on how to use and operate a computer and internet browser and that the user has a decent and stable internet on top of a modern smart device or computer. The software should assume that the hospitality system software will have a mobile-friendly interface or a dedicated mobile app, enabling staff to access critical information and perform key tasks from smartphones or ipads. This mobile accessibility will enhance flexibility and responsiveness in providing service to customer. It should also be assumed that the company will have a decent dedicated server to host the system with enough power to support the system and over 100000 amount of user requests . The external systems that are related in the proposed system like online bank transfer systems are also expected to function properly to guarantee the experience of the users.

3. Specific Requirements

This chapter discusses the types of requirement specification, user requirements document and system requirements document and the use of diagrammatic notations to ease communication and to provide overview of system-to-be.

3.1 User Interface

3.1.1 Inventory

Medical

Expired Date | **Stocks available**



Medical

Cefuroxime (Anti-infective)



Search

FOR SEARCH
SPECIFIC MEDICINE

Out of stock products



3

Stock that's no more

Products on low stock



3

Stock that's no more

Number of products
to be arrived



12

Stock arriving

Weighted Score



75%

Stock available

Enter Increase Quantity

100

Confirm

Maximum!!!

Know more about us

Watch our video

Diagram 2.1.1 UI for inventory module

This page is staff searching the specified medicine to track the stock level, besides the search bar there has a question mark notation. This is user guidance for staff to understand what they need to do. Other than that below there is a function to let staff increase the stocks level of the medicine the bar can enter the quantity that wants to increase besides the bar the up down button is to let staff more accurately to prompt the quantity of medicine that they want to increase. This user interface show that if staff increase the quantity of the stocks level the system will validate if there over the normal stocks level system will come out errors.

Medical

Expired Date | Stocks available

Medical

FOR SEARCH
SPECIFIC MEDICINESearch

Expiry date

		Expiry date	Y/N	Actions
1.	Ce	Terbinafine (Anti-fungal)	N	<input type="button" value="This cannot be disposed !"/>
2.	Mu	Dolutegravir (HIV medi)	Y	<input type="button" value="dispose"/>
3.	Te	Lenalidimide (Anti-cancer)	Y	<input type="button" value="dispose"/>
4.		Dabigatran (Blood disorder)	N	<input type="button"/>
5.		Dolutegravir (HIV medi)	22 Jan 2030	<input type="button"/>
6.		Lenalidimide (Anti-cancer)	28 Sep 2027	<input type="button"/>
7.		Dabigatran (Blood disorder)	13 Jul 2019	<input type="button" value="dispose"/>
8.		Insulin Glargine (Anti-diabetic)	23 Jan 2033	<input type="button"/>
9.		Teneligliptin (Anti-diabetic)	22 Jun 2040	<input type="button"/>
		Declatasvir (Hep B & C)	19 May 2043	<input type="button"/>

[Know more about us](#)

[Watch our video](#)

Diagram 2.1.2 UI for inventory module

This is a part of the Inventory module User interface design, this is to let staff to track the expiration date of the medicine. At the search bar we can see that they have a user-friendly functionality that can help the staff to find the medicine name by pointing the mouse at the search bar. Next, besides the search bar there is a question mark notation. This is user guidance for staff to understand what they need to do.



Undo?

Do you want to restore the disposed data ?

Undo

Re-Enter



Disposed!

You have successfully disposed medicine.

OK



Error!

Medicine haven't expired can't disposed.

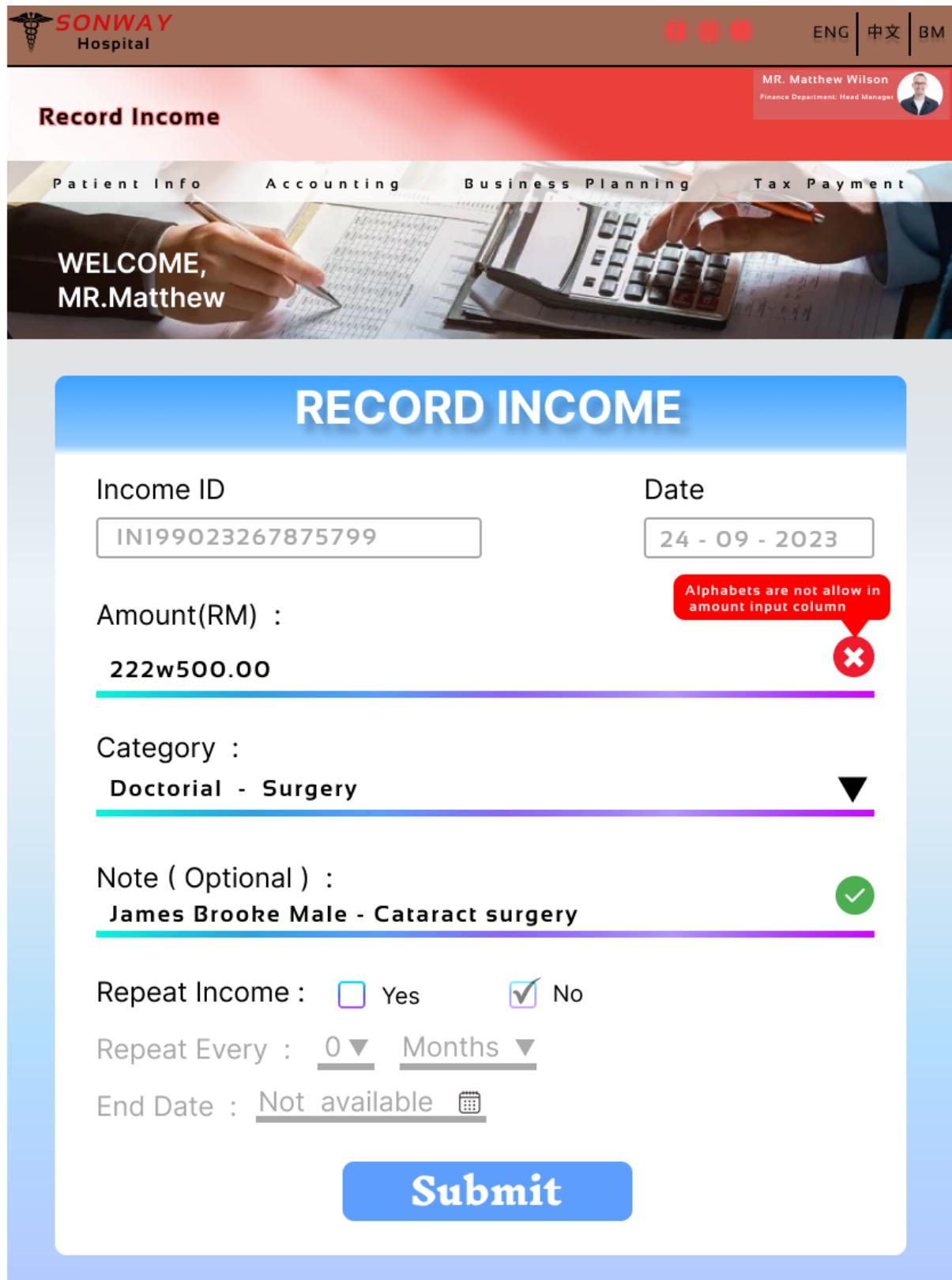
Try Again

Diagram 2.1.3 success and error message for inventory module

This is the successful message and error message for the user. Went they successfully disposed the expired medicine system will display the successfully message, if system cannot disposed medicine system will also display the errors msg to let the staff know they unsuccessfully disposed the medicine.

There is also a recoverability user interface design, “undo” this function is let user to restore the accidentally disposed data.

3.1.2 Finance



The screenshot shows a mobile application interface for Sonway Hospital's finance department. At the top, there is a header bar with the hospital logo, language options (ENG | 中文 | BM), and social media icons. A profile picture of Mr. Matthew Wilson, Head Manager of the Finance Department, is displayed. Below the header, a banner says "Record Income". The main content area features a background image of hands working with a calculator and papers. A welcome message "WELCOME, MR.Matthew" is overlaid on the left. The form itself has a blue header "RECORD INCOME". It includes fields for "Income ID" (IN199023267875799), "Date" (24 - 09 - 2023), "Amount(RM)" (222w500.00, with a red error bubble saying "Alphabets are not allow in amount input column" and a red X icon), "Category" (Doctorial - Surgery), "Note (Optional)" (James Brooke Male - Cataract surgery, with a green checkmark icon), and checkboxes for "Repeat Income" (Yes or No). The bottom right of the form has a large blue "Submit" button.

SONWAY
Hospital

ENG | 中文 | BM

MR. Matthew Wilson
Finance Department: Head Manager

Record Income

Patient Info Accounting Business Planning Tax Payment

WELCOME,
MR.Matthew

RECORD INCOME

Income ID: IN199023267875799 Date: 24 - 09 - 2023

Amount(RM) : 222w500.00

Alphabets are not allow in amount input column

Category : Doctorial - Surgery

Note (Optional) : James Brooke Male - Cataract surgery

Repeat Income : Yes No

Repeat Every : 0 Months

End Date : Not available

Submit

Diagram 2.2.1 UI for Finance module

This is webpage for record income in the finance module. The financial staff needs to enter the required information to record the income of the company into the system. There is a validation for the amount input. If the staff input the alphabet or symbols in the amount input column, there will show a invalid icon and show the message to help staff to discover the error.



Submitted!

You have successfully submitted income record

OK

Diagram 2.2.2 Success Message for finance Module

This image above shows the successful message when the staff submitted the income record successfully into the system.



Error!

You have input illegal symbols in the amount column

Try Again

Diagram 2.2.3 Error message for finance Module

This image above shows the error message when the staff submitted the income record successfully into the system. In this error message, the system will display the errors to help financial staff to discover the error and fix it.



Undo?

Are you want to undo your previous input or re-enter?

Undo

Re-Enter

Diagram 2.2.4 recoverability message for Finance module

This undo message will only display after the error message display and staff click try again.If the staff click “Re-Enter”, staff will return to the record income webpage and all the input column will be reset.If the staff click “Undo”, the staff will return to the record income webpage with remain the data that have been entered by the staff just now.

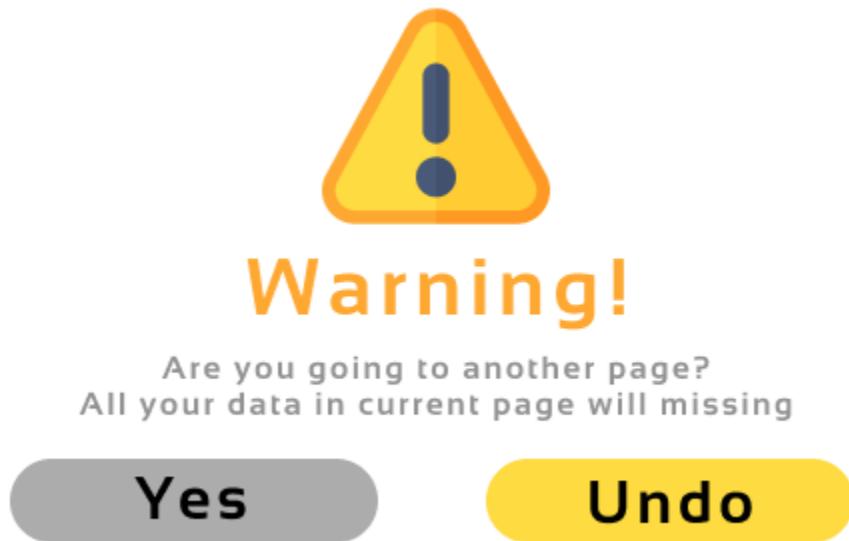


Diagram 2.2.5 warning message for Finance module

This warning message will display if the staff click to go to another webpage but the current input column is not empty.The system will display this warning message to confirm the staff action and prevent staff misclick and lose the data that the staff entered in the current page.



Updated!

You have successfully updated stock level.

OK



Error!

Unsuccessfully updated the medicine stock level.

Try Again

Diagram 2.2.6

This is the successful message and error message for the user. If they successfully update the lower stocks medicine system will display the successful message, if the system cannot increase the medicine system will also display the errors msg to let the staff know they unsuccessfully disposed of the medicine.

3.1.3 Doctoral

The screenshot shows the Sonway Hospital Patient Information System. At the top, there is a navigation bar with the hospital logo, social media icons, language options (ENG | 中文 | BM), and a doctor's profile (DR. LESLIE WITHERS, Medical specialties: Anesthesiology). Below the header, there are tabs for ANNOUNCEMENT, PATIENT INFO, SCHEDULE, and APPLY LEAVE. A banner displays a welcome message: "WELCOME, DR.LESLIE".

PATIENT INFORMATION

General **Insurance** **Family** **Copay** **Health**

Vaccination

Chicken Pox (Varicella)	: Vaccinated
Measles	: Vaccinated
Hepatitis B	: Not Vaccinated
Covid-19	: Vaccinated

Health Examination Record

Blood Pressure	: 120/80 mm Hg
Heart Rate	: 70 bpm
Temperature	: 37°C

Physical Examination Findings:

General Appearance: Well-nourished, alert

Skin: Rashes, sore

Eyes: Bloodshot

Ears/Nose/Throat: Sore throat, ears and nose appears to be normal

Cardiovascular: Regular heart rate

Respiratory: Difficulty in breathing

Abdomen: Non-tender

Musculoskeletal: Please enter patient current condition

Please enter the result of the patient's musculoskeletal check-up, joint mobility, muscle strength condition etc.

Allergies **Risk Level**

Peanuts	Low
Latex	High

+ Add more if needed

Date **Medical History**

[No medical history]

Save Record

Diagram 2.3.1 Doctoral module's patient information page

2.2.7

This page is used for doctors to check patient's more detailed information, and if doctor select the "health" category on the option above they can record their physical examination finding results obtain from doing health check-up with the patient, if doctor hover over to the question mark in each of the column, the UI will show the doctor how to insert coming with brief example. For example if a doctor hover over the musculoskeletal column's question mark icon, it will display the insert example. And pressing save record after all data has been entered.

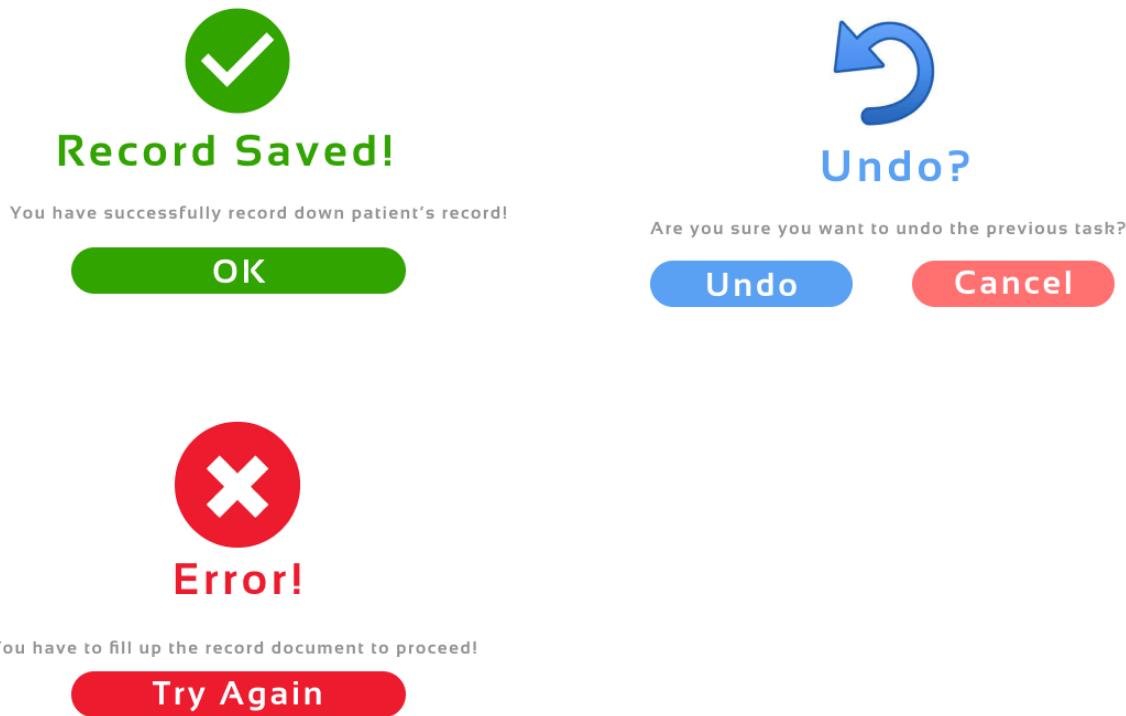


Diagram 2.3.2 Doctoral module's success, undo confirmation and Error message

2.2.8

These are the error messages in the module. If a doctor finishes filling up the record and saving it, the system will prompt a success message. If the doctor presses undo after saving the record it will prompt a confirmation button to ask them one more time whether they want to undo previous changes or not. Finally if a doctor tries to save an incomplete record it will prompt the error message.

Physical Examination Findings:

General Appearance

Well-nourished, alert



Skin

Rashes, sore



Eyes

Bloodshot



Ears/Nose/Throat

Sore throat, ears and nose appears to be normal



Cardiovascular

Regular heart rate



Respiratory

Difficulty in breathing



Abdomen

Non-tender



Musculoskeletal

Normal



Record Saved



UNDO CHANGES

Diagram 2.3.3 Doctoral module after saved patient record

2.2.9

This is after successfully saving a record, if want to undo changes presses the undo changes icon
And it will prompt the user with the undo confirmation message.

3.1.4 CRM.



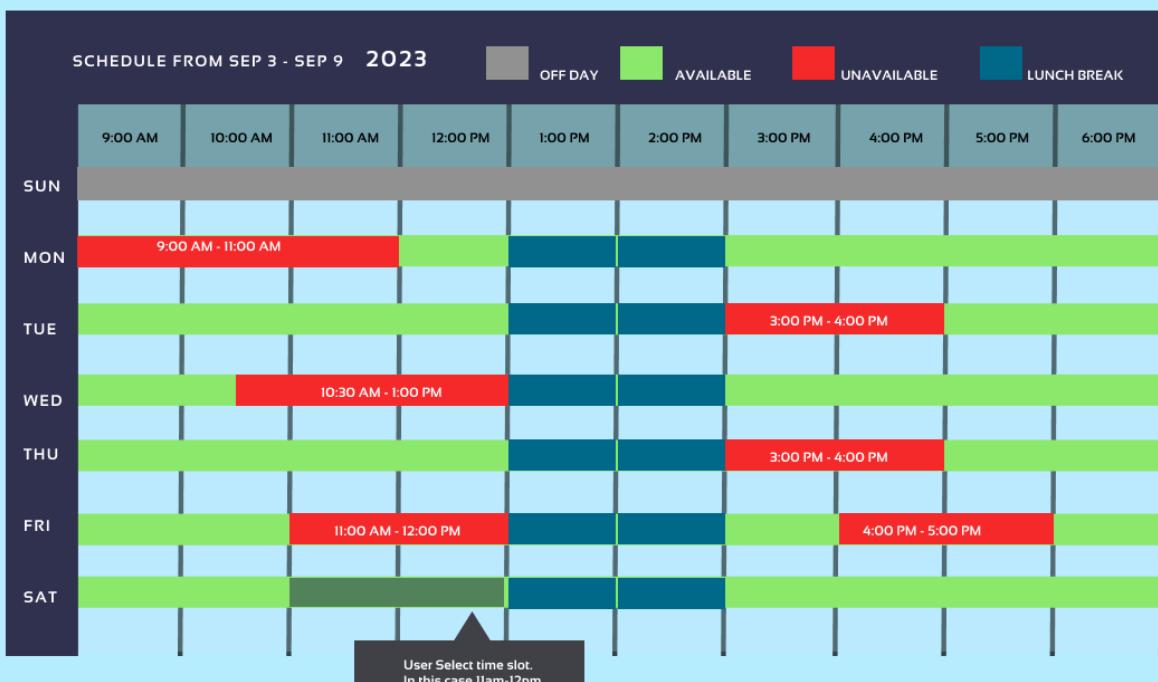
Dr Mark

Specializes in :
Urology

Contact Info:

HP : +60-12 333 4459

Email : drMark@mail.com



**Book
Appointment**

Diagram 2.4.1 Booking interface

From the UI above, the patient may select the appointment slots they wish to book and press the book appointment button to submit their request.



Confirm ?

Confirm to book appointment at said time ?

Confirm

No

Diagram 2.4.2 Confirmation message

The customer will be prompted to confirm their choice. Pressing no will return them to the booking page, while pressing confirm will display outcomes depending on success of the request.



Booked !

You have successfully booked an appointment.

OK

Diagram 2.4.3 Success Message

If the request is successful, the system will then display the above image.



Error!

Appointment booking failed !

Try Again

Diagram 2.4.4 Error Message

If the request is unsuccessful or if the user selected an unavailable time slot, the system will then display the above image.



← Dr Mark

Specializes in :
Urology

Contact Info:

HP : +60-12 333 4459

Email : drMark@mail.com



Book
Appointment

× Booking Request Submitted! [Undo?](#)

Diagram 2.4.5 Booking Request Submitted, Recoverability with undo

If the request is successful, and the customer presses ok, the customer will then be brought back to the booking screen, a pop up will then appear at the bottom right corner, informing the customer that their request has been submitted and if they wish to undo and withdraw their request.

3.2 User Interface Quality Attributes

3.2.1 User familiarity

User familiarity is the quality attributes that use the term and concepts that are drawn from the experience of the users. A interface that contains user familiarity quality attributes should be intuitive. The interface can be naturally understood by the users. The users does not need to think about how to use the system because they already can understand and expect what will be happen in the interface. For an example, a floppy disk icon will represent save function in the most of the microsoft office software. Every users can understand the function of the icon when they see it, that a good user interface that contain user familiarity. In our hospital system, there are some magnifier icon in the CRM and inventory module to represent a search function.

3.2.2 User guidance

User guidance is the user interface that provides some help feature or meaningful feedback when errors occur. The users can solve the problems via these user guidance messages. In our hospital system, there are a red colour message that display “Alphabets are not allow in the amount input column” to remind users when they input the alphabets in the income record. There are also have some help feature that help users to explore the deeper usage of a functions. For example, there are a user guidance message in the viewing cash flow diagram page show “zoom in the cash flow diagram to get the more detailed information”. If the users zoom in the cash flow diagram, the diagram will the expenses and income from monthly to monthly become day to day.

3.2.3 Consistency

Consistency is a user interface quality attribute that keep the operation being used or activated in the same way. With a consistency interface, we can make users rely on our interface design and giving them a good experience of using our system. There can also prevent chaos, ambiguity and instability information in the consistent interface. If there are a website will change the position of logout in each web page, does the users will have a good experience on it? Hence, we have the consistent header in our hospital system. We will maintain the header that contains the logo of our hospital, user profile and information, title of the webpage and bar to let users go to others webpage in the system for convenient users to become familiar and rely on our user interface design.

3.2.4 Recoverability

Recoverability is the ability to restore the state prior to unexpected system failure. When the users make some mistake, the system should enable the users to recover the errors. The most common function that can represent recoverability is undo function. If a user interface does not consider about recoverability, users are more hard to restore from their errors and it will bring some bad experience to the user of using this system. In our hospital system, we will ask the users to confirm for leaving a webpage to another webpage. If the users was misclick, this feature can help the users to maintain their data that has been made just now. In the finance module, if the users have some errors in submit the income or expenditure record, the system will ask users for restore the data input just now or start input a new record.

3.2.5 User diversity

Meaning of User diversity is that the UI designs should accommodate the needs and preferences of diverse users, including those with different abilities, cultures and languages. In others word, the user interface should provide appropriate interaction facilities for different types of system users. For the elderly, the system should provide very detailed step with images for support to help them perform a function. For the people who have colour blindness, the system should provide the changing background and text colour features to let them can see the text and use the system easily. In our hospital system, we have provide the language changing feature for three languages, english ,chinese and malay for the different race and different country to make sure all the people with different race can explore the system without any difficulties.

3.3 Functional Requirements

Functional requirement is a requirement feature for a system to have. Functions of a system come from users' requirements, and are about what the user wants in the system-to-be. We must try to include all the requirements to the system to satisfy the clients.

3.3.1 CRM Module

1. The System should allow patient to online register and login to their account
2. The System should be able to accept patient's appointment booking request
3. The System should be able to notify the patient of their upcoming appointment via notification.
4. The System should allow the receptionist to view and confirm the patient's appointment booking request.
5. The System should be able to automatically send a patient's confirmed appointment booking request to the doctoral department.
6. The System should allow the patient to cancel the appointment.
7. The System should allow the patient to reschedule the appointment.
8. The system should allow the patient to check for doctor availability.
9. The System should be able to allow for patient feedback.
10. The System should be able to record patient's personal information in a formatted document
11. The System should be able to automatically record patient feedback history and check their satisfaction
12. The System should be able to automatically mark feedback importance by patient's satisfaction.

3.3.2 Inventory Module

1. System should be able to show the information of each medicine.
2. System should able staff to track the stock of medicine and surgical instruments
3. System should enable staff to update the currently available stock items.
4. System should be able to limit the stock's output.(maximum quantity output)(limit)
5. System should have an automated reorder point mechanism that triggers alerts or notifications when stock levels reach a predefined minimum quantity.
6. System should be able to avoid the duplication in ordering stocks.
7. System should be able to avoid the overstock or understocks.
8. System should be able to check missing materials that didn't return by staff on time.
9. System should offer customizable reports and analytics to provide insights into inventory utilisation, costs, and trends, helping in strategic planning and cost management.
10. System should have barcode scanning to view relevant information on items and the updated inventory information.
11. System should store a detailed history of stock movements (receipts, issues, transfers) helps in analysing usage.
12. System should have a role-based access control that ensures that only authorised personnel can access and modify inventory data.

3.3.3 Finance Module

Accounting submodule

1. System should record the every income and expense of company
2. System should be able to save the analysis documents.
3. System should enable staff to view the cash flow of the company.
4. System should enable managers to record the cost,risk and details of the business planning.
5. System should enable staff to view the details of the business planning.

Payment submodule

1. System should able manager to view the tax that is calculated and needs to be paid.
2. System should enable the manager to pay tax and send a reminder email before the certain date that the manager had set.
3. System should record the bills and their situations for every patient.
4. System should enable patients to pay their hospital bills.
5. System should generate the financial reports automatically.
6. System should highlight the payment that was not paid on time.
7. System should enable patients to apply for a loan.
8. System should be able to generate receipts after the payment is done.

3.3.4 Doctorial Module

1. System should be able to record down doctor profiles and their details like their field of expertise.
2. System should be able to track available time of the doctors.
3. System should be able to change the booked time for a doctor into occupied to prevent booking overlap.
4. Doctors and nurses should be able to store patient information
5. System should be able to let patients call for help with additional service option like bringing Item to them via entering their input.
6. Doctors and nurses should be able to conduct healthcare examinations with the patient and obtain results of the patient's current condition.
7. System should be able to record clock in and clock out time for the doctors and nurses.
8. System should be able to let doctors modify patient details.
9. Patient should be able to request extend it's stay in the hospital
10. Doctor should be able to transfer patient detail to another doctor or specialist

3.4 Overall Use Case Case

In the below overall use case diagram, it shows all the actors interacting with each other and the system to execute various tasks using the system. The diagram helps us to visualize the interaction between actor and the system. The diagram has shown the action that can be taken by each actor in this system. Patients can call for service when they need via the system, patients can also give feedback, booking appointments, create account, apply loan and also do the payment in the system. For the doctor, most of the action that a doctor can possess is in the doctoral module, such as, check schedule for duty, modify patients information , clock-in and clock-out and so on. Staff in different department will also have their own action. For example, finance staff can record the income and expenditure of the company, CRM staff can view the feedback and the appointment list. The overall use case diagram display the whole hospitality system function and highlight the interaction between actors and the system to understand the functionalities of the proposed system easily.

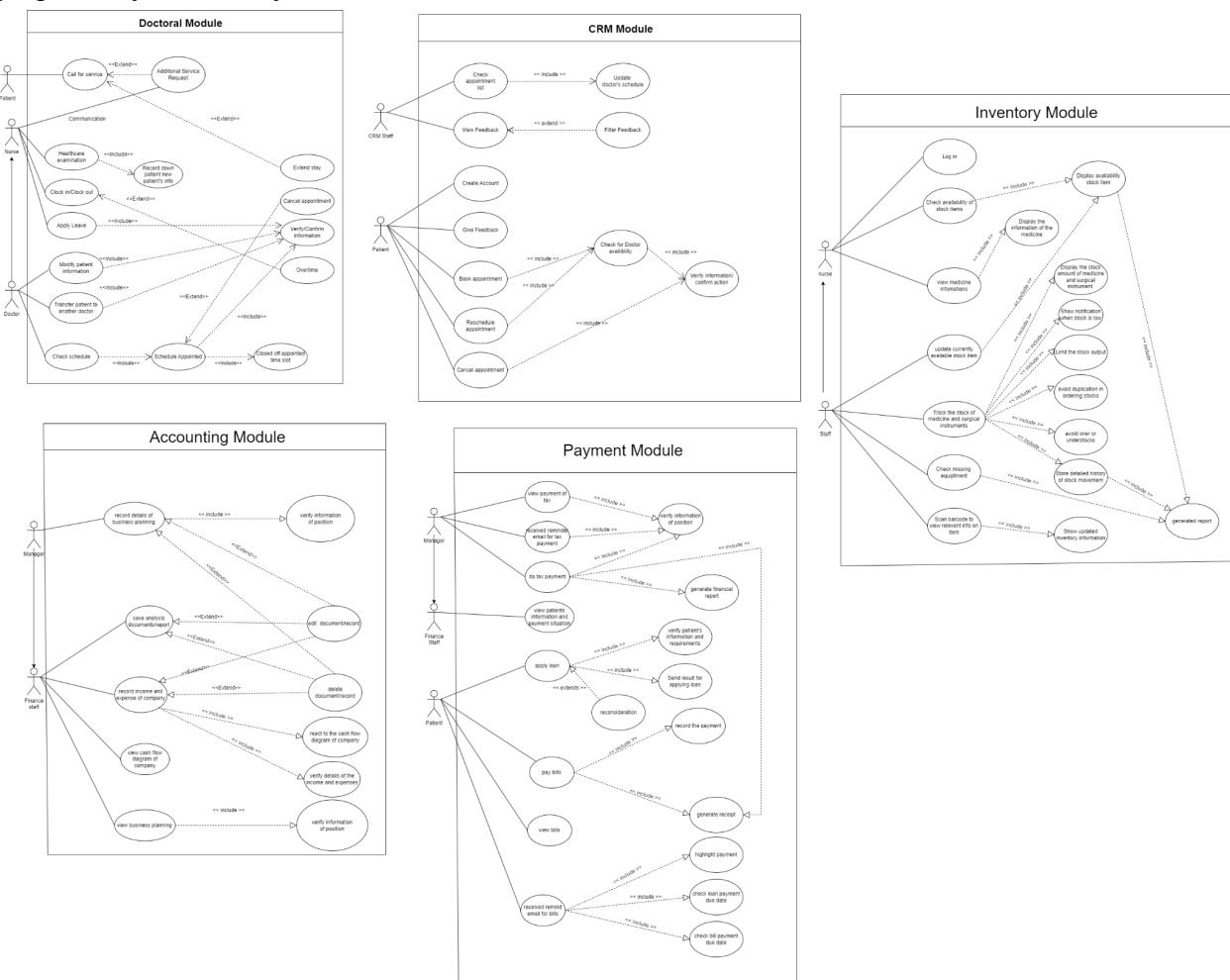


Diagram 3 overall use case diagram

3.5 Detailed Use Case

3.5.1 Doctoral

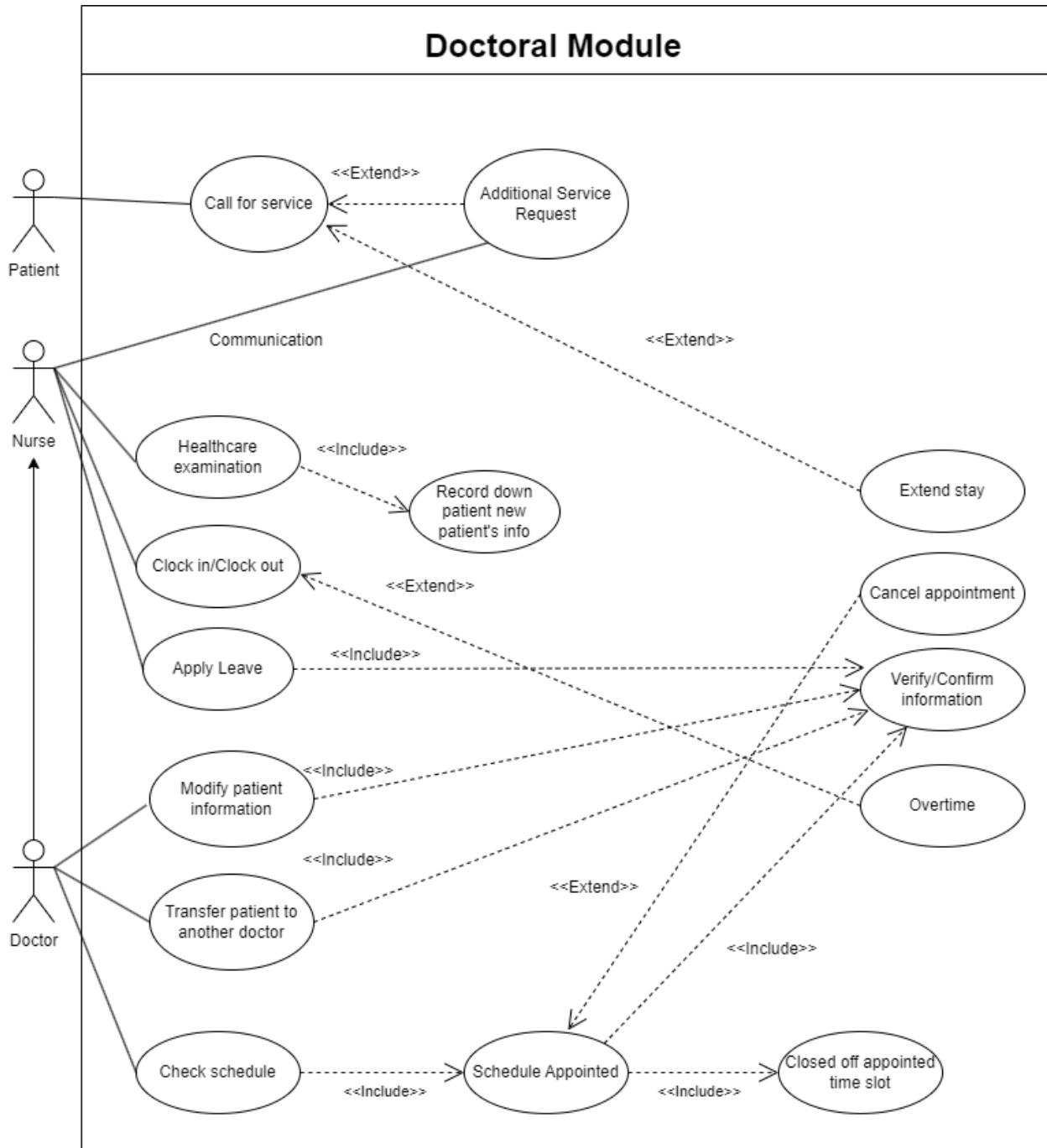


Diagram 3.1 Doctoral Module Use Case

Use case Name: Doctoral	
Actors : Patients, Nurses, Doctors	
Brief Description: Let doctors to check and track their scheduled work and to clock in and out of the system	
Main Flow of Events Actors Actions	System Response
<ol style="list-style-type: none"> 1. Update doctors on appointed schedules make by customer/patients from CRM booking detail. 3. Both doctor and nurses clock in and out from the system. 5. Doctors modify patients' details. 7. Doctors transfer one patient to another doctor. 9. Doctors or nurses apply leave 11. Patient calls for service. 13. Nurses or doctors help patients do health examination. 	<ol style="list-style-type: none"> 2. Display all of the doctors schedule for the week and further if any appointment is further than a week. 4. Display clock in and out time of doctors and nurses and track the total work hours, record down overtime if necessary. 6. Display before and after modified detail before confirmation. 8. Other doctor slots become occupied after transfer is completed. 10. Waiting for pending / validation 12. Nurses receive the call for service 14. Display obtained patient info in record.
<p>Alternative Flow:</p> <p>A1: Step 1 : Doctors can reject/cancel the appointment but needs to provide reasons, and the CRM will return back to the customer if the doctor cancels the appointment.</p> <p>A2: Step 2: If doctors and nurses didn't clock out within their work time after 3 minutes the system will count them as overtime.</p>	

3.5.2 Inventory

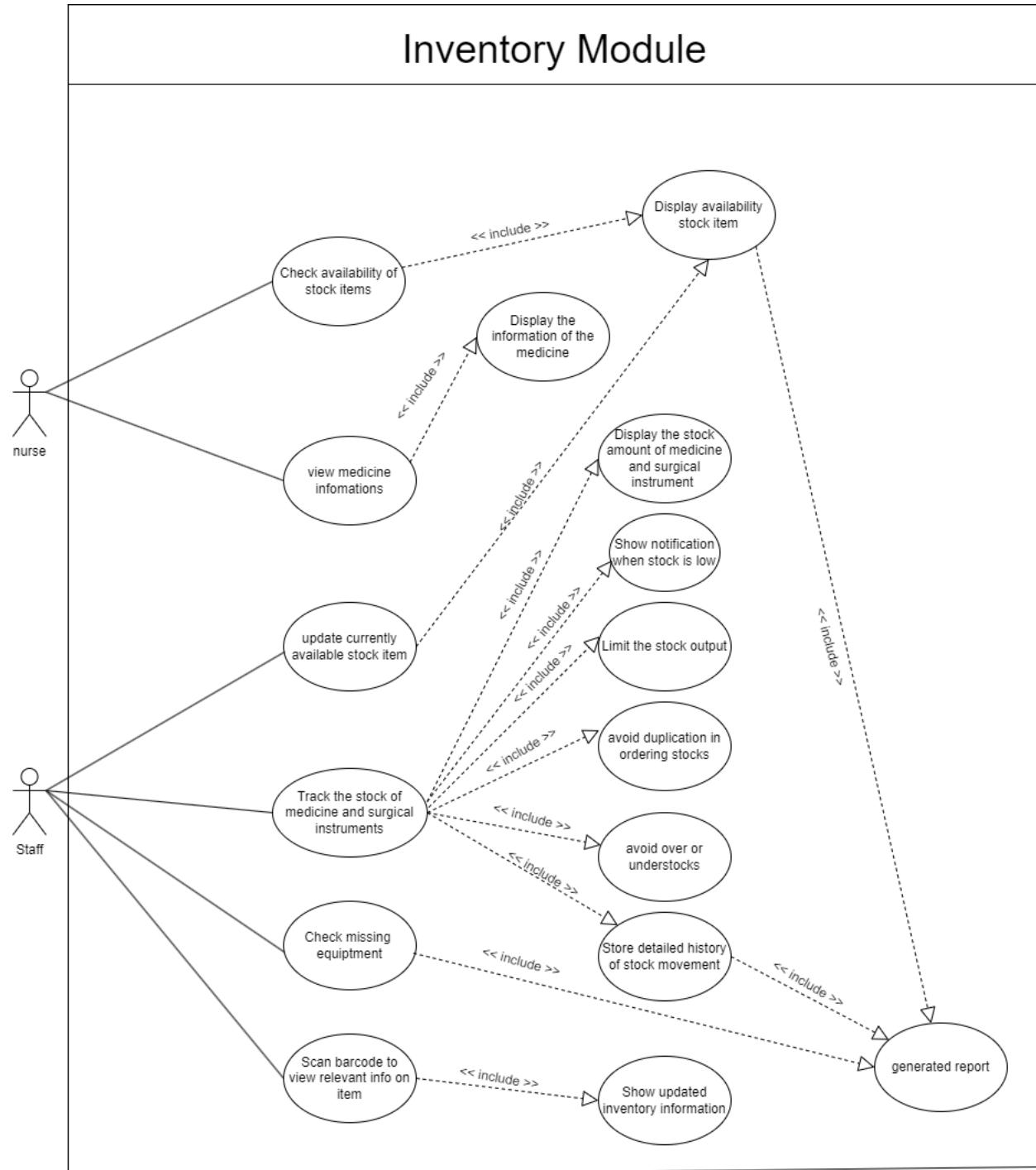


Diagram 3.2 Inventory Module Use Case

Use case Name : Inventory	
Actors : staff and Patients	
Brief Description: Let staff easily track the Inventory and update any information for the patients.	
Main Flow of Events: Actors Actions	System Response
1.Update currently availability stocks items 3.Search the stock items 4.View medicine informations 6.Track the availability stock items 7. Disposed of expired stock items 9. Check loss materials 11. Scan barcode to view relevant information on items	2.Display availability stock items 5. Display the information of the medicine. 8. Display the expired stock items. Show notification when stock is low. Limit the stock output. Avoid over or under stocks. Store detailed history of stock movement. Generate a report. 10. Generate a report for missing materials 12. Show updated inventory information
Alternative Flow: A1: Step 6: Staff click button “track” to track the stock of medicine and instrument of surgery. A2: Step 8: Click “loss materials”, the system will generate a report for missing materials that staff have forgotten to return.	

3.5.3 Finance

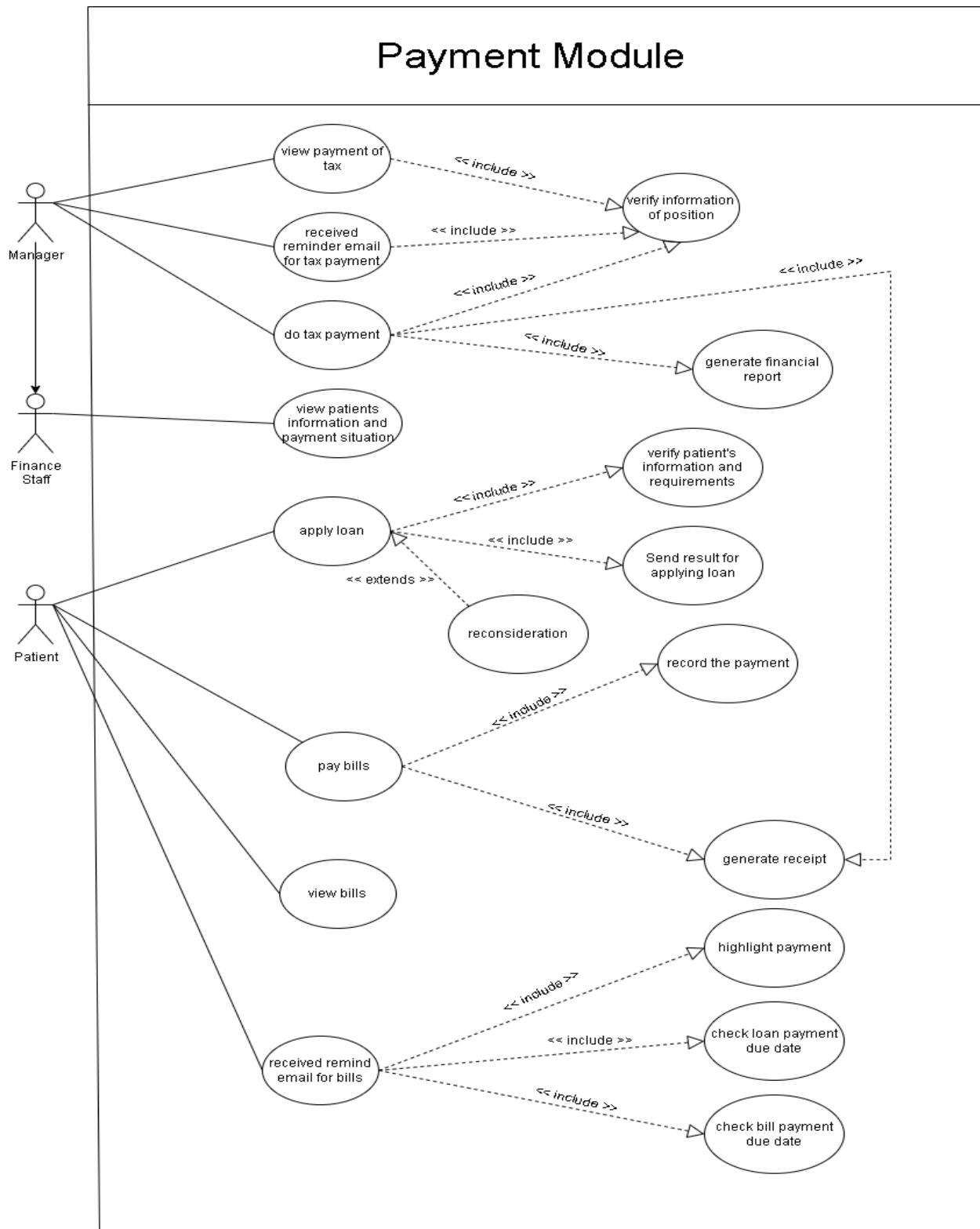


Diagram 3.3 Payment Submodule Use Case

Use case Name : Apply loan	
Actors : Patients	
Brief Description: Let patients can apply loan due to the large amount of treat payment	
Main Flow of Events: Actors Actions	System Response
<ol style="list-style-type: none"> 1. Select apply loan from the menu 2. Input the information of patients 4. Enter the loan amount 6. Input month/year to return the Loan 8. Click 'Yes' for the confirmation 	<ol style="list-style-type: none"> 3. Verify the information of patients 5. Validate the patients fulfil requirement based on the Payment. 6. Display amount of payment every month 7. Send confirmation 9. Display success message
<p>Alternative Flow:</p> <p>A1: Step 3: Display an error message if the information of patients did not exist and match with the company database.</p> <p>A2: Step5: Display an error message and show the reason for the failure loan application.</p> <p>A3: Step6: Return to step 6 if the patients click 'No' for the confirmation.</p>	



Diagram 3.4 Accounting Submodule Use Case

Use case Name : Record income and expenses of company	
Actors : Staff	
Brief Description: Let staff record the details of the income and expenses of the company.	
Main Flow of Events: Actors Actions	System Response
1. Select record income or expenses in the main page 3 . Input the details of the income 4 . Click submit button	2. Turn to the income page 5. Verify the details of the income 6. Send a successful message 7. React to the cash flow diagram
Alternative Flow: A1: Step 2: Turn to the expenses page if the staff select to record expenses of the company. A2: Step 6: Send a failure message if the verification process does not access and show the reason for the failure recording.	

3.5.4 CRM

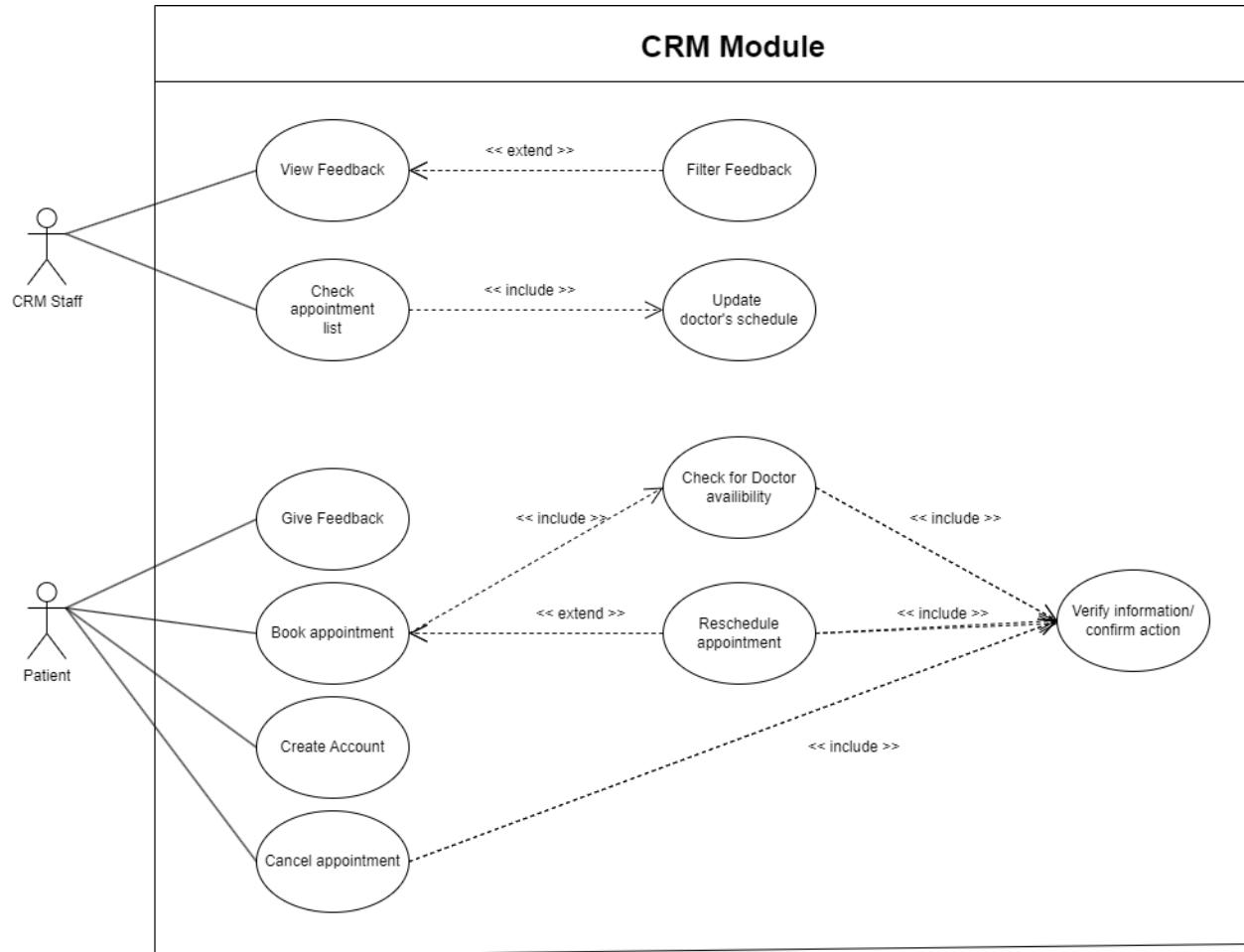


Diagram 3.5 CRM Module Use Case

Use case Name : Book appointment	
Actors : Customers	
Brief Description: Let customer book an appointment	
Main Flow of Events: Actors Actions	System Response
<ol style="list-style-type: none"> 1. Customers select the book appointment option from the menu. 3. Customers select a slot to book their appointment. 5. Click 'Yes' for confirmation 	<ol style="list-style-type: none"> 2. Shows the doctors available, and slots available for them to book. 4. Receives the request, cross checks with the doctor's schedules before approving and returning a confirmation. 6. Return a success message.
<p>Alternative Flow:</p> <p>A1: Step 3: Customer does not press yes and instead presses no, will return to the doctor schedule menu.</p>	

4. Other Non-functional Requirements

This chapter is about the non-functional requirements that shall exist in the proposed system. It includes the listing of the performance requirements, safety and security requirements and non-functional requirements based on modules. Quality attributes of the non-functional requirements are also included in this chapter.

4.1 Performance Requirements

Performance requirement is how the system should behave during the operation period. These requirements are crucial for ensuring that the system meets the needs and expectations of its users, performs efficiently, and delivers a satisfactory user experience. Performance requirements normally cover various aspects of the system's behaviour, responsiveness and resource utilisation.

Performance requirements:

1. Reliability- System should reliably measure the system performance without failure or errors over a certain period of time.
2. Response Time- Refers to the time that the system takes to complete a task. It could also include how quickly a webpage loads, how fast a function executes or how long it takes to complete a transaction.
3. Scalability- System should be able to handle data in massive scales and make sure it will not crash and cause server down time.
4. Error Handling - If System error does occur, the system should be able to restore its functionality within 5 minutes, and data that is lost maximum will be 5%.

4.2 Safety and Security Requirements

4.2.1 Security

A system quality to ensure that the system will be secure and protected from unauthorized data tampering or data leaks.

This will ensure that sensitive data such as patients or staff's personal information are automatically encrypted so that they are accessible by unauthorized personnel with insufficient security clearance or leaked to the public by hackers.

Without such an attribute, the personal information of our patients or staff are exposed and cause many dangers for them by exposing their data, it may even cause lawsuits filed for negligence of protecting customer data.

Security Requirements

1. The system shall back up all the information and data at 3am everyday.
2. The website of the Someday Medical Centre should have a ssl certificate to encrypt the user's connection with the system.
3. The system shall have a firewall to decline unauthorized access and protect from hackers.
4. The system shall enable managers to change important information or data in the database after getting permission from the highest management.
5. The system shall be able to encrypt the important information of patients such as password or ic to prevent data leakage.

4.2.2 Safety

From a dependability point of view, safety is defined to be the absence of catastrophic consequences on the environment. Safety can also be defined as the attributes to make sure the system doesn't cause any physical damage to the users. This will ensure the user safety from the human errors. For example, the nurse using a broken medical equipment that is forgotten to be thrown for the patients. When the nurse or doctor was realized, they can use the emergency shutdown function to stop the broken medical equipment though the system immediately.

Safety Requirements

1. The system shall have a backup server to be used when the current using server cannot function because of physical damage.
2. The system shall have emergency shutdown functions for some certain device.

4.3 Modular Non-Functional Requirements

4.3.1 Doctoral module

1. The system should be able to operate 24/7 even after hours for patients and late night nurses.
2. The system should respond in 1 second to retrieve appointments that are taken, delayed or cancelled and update the schedule accordingly.
3. The system should make 0 mistakes out of 10000 testing in conducting healthcare examinations. (image testing, CT, MRI scan, blood pressure testing)
4. System should have a login authorised access for data integrity purposes.
5. System interface should be more intuitive using multiple principles in designing interface (familiarity, consistency..)
6. A Patient's service request/emergency call should take less than 1 second to alert the nurses or doctors.
7. The System should be able to take in large scale of input from doctors and nurses,

4.3.2 Inventory module

1. System should be able to let users view stocks that are currently available anytime during the system operations.
2. System should be able to handle 100000 of stock input or output at the same time.
3. System should be able to display the information of medicine in 2 seconds.
4. System should be able to show the full name of stocks that users search using shortcut wording.
5. System should be able to let different mobile devices scan through the QR code.

4.3.3 Finance Module

4.3.3.1 Payment SubModule

1. System shall calculate the tax that is needed to be paid and display the results in 2 seconds.
2. System shall support different methods of payment for the patients such as bank transfer,e-wallet.
3. System shall generate receipt after patients done their payment in 1 seconds
4. System shall process 100000 payments at the same time.
5. System shall check the status of patients' payment at 12 am every day to highlight the patients that did not pay on time.
6. System should generate the financial reports automatically and accurately at the end of month.
7. System should record the bills and their situations for every patient without any mistakes and inaccuracies.

4.3.3.2 Accounting Module

1. System shall update the cash flow diagram every 30 seconds based on the latest income and expenditure record of the company.
2. System shall complete the verification of the position to record the business planning in 0.5 seconds.
3. System shall display the cash flow diagram to the staff or manager in 1 second.
4. System should record every income and expense of the company in 1 second.
5. System should be able to save the analysis documents in 2 seconds.

4.3.4 CRM Module

1. The System shall process the patient's requests in 2 seconds.
2. The System shall refresh and update the doctors schedule every 30 seconds.
3. The System should be able to automatically send a patient's confirmed appointment booking request to the doctoral department in 3 seconds.
4. The System shall notify the patient of their upcoming appointment via notification 3 days in advance, and then once again on the day before their appointment.
5. The System shall process the patient's feedback in 2 seconds.
6. The System shall document the patient's feedback in a neat format.
7. The System shall update the receptionists list of customer appointments every 30 seconds.
8. System should have authentication based login.

4.4 Quality Attributes

4.4.1 Availability

Availability is a degree to which a system can be accessible and all the functionality can function properly when it is needed. Such an attribute is more or less required so that patients can book for appointments as soon as possible.

4.4.2 Reliability

Make sure the system can function correctly. Failure rate of the system should be less than 5%. If the system always fails when functioning, the patient can't get to book an appointment with the doctor in an emergency case. Reliability of the system can affect a person's life.

4.4.3 Performance

To ensure that the system would function with speed and response time expected by a modern system.

This is so that customers, staff or general users will not feel frustrated when using the system because of the lack of performance. And as such they can have a streamlined and nice experience when using the system.

A lack of such a quality would cause users to be frustrated when using the system which would drive away potential users.

4.4.4 Integrity

A quality of a system to produce data that is consistent and free from unauthorised or manipulative data.

This will prevent important data such as patient personal detail to not be manipulated by doctors without going through to the patients, and the higher ups.

If integrity is lacking in our system design, the patient data that is on a doctors hand can be freely manipulated for the doctors personal gain or malicious intent. And this might cause law to be involved. And if doctor manipulate a patient data without proper checking, the hospital might distribute prescription that is allergic to patient unaware, or even messing up the time for their appointment / surgery / check-up

4.4.5 Interoperability

Interoperability is the ability of a system to connect and exchange information with different devices,systems or other computer products without the end-user's effort.

This quality attribute can help our system to have a good connection with other systems that are required ,such as touch and go, a bank transfer system that is developed by the bank to make the payment method more flexible. This system is related to many departments, must have some external system or platform, even devices have to connect to perform the task perfectly. Without interoperability quality attributes, this system will be limited. Let's take back the payment function for an example, we cannot using other payment system that develop and belongs to other company.Hence, our patients are only allowed to pay their hospital fee using cash, and we believe it will brought a lot of inconvenience to customer and also company to store the huge amount of cash.Besides, a system that have low interoperability is hard to have a good connection with other electronic device such as electronic punch lock.Therefore, system are unable to record the check-in and check-out time of doctors and nurses.

5. Other Requirements

This chapter is about the hardware and software that are required to implement the system. There are also show the steps of requirements management and explain the architecture of the system. After that, there are state diagram, sequence diagram, communication diagram and activity diagram for each module in the specific scenario.

5.1 Hardware and Software requirements

5.1.1 Hardware Requirements

Name of Hardware	Purpose of Hardware	Quantity of Hardware
Server	Server can store, share and manage the data that is produced by the system and software. A higher specification server can process the data faster and store more data.	4
Router / Switches	To make sure the reliable network is connecting with all the devices.	2
Computer	Company Staff can use the computer to operate the system to finish their task and work.	50
Printer	To print some reports, inventory records and financial records that are generated or stored in the system.	2
Power supply	To convert the electricity to the correct voltage to the servers and other devices to make sure they can function for a long time.	1
Punch Clock	To record the time of the	1

	doctors and nurse clock in and clock out	
Backup server and power supply	To ensure there is a back up device to replace when the current device is broken down.	1

5.1.2 Software Requirements

Name of software	Purpose of software	Quantity of software
Veeam Backup & Replication	It is a backup software to back up the data from the server to make sure the c	1
Palo Alto Network	This software can detect the known and unknown threats and protect our system data from the cyber attack.	1

5.2 requirements managements

5.2.1 Fill in Change Request Form

Change request form is a form that includes detailed information for the changing requirements and can be passed to the people who are involved in the requirements changing. Change request form will contain the requester for the change, date, the change details, reason for the change request, documents to support the change, signature fields and comments. The requester need to fill in the form to inform us about the requirements changing. For example, the clients want a AI customer service feature to answer the general problems or question that would exist from the customers and patients. Hence, the clients need to fill in the reason for adding the new feature, who is the people who want this feature and others details to request for requirements changing.

5.2.2 Problem analysis and changes specification

Problem analysis is analysing the new changes that come from new customer needs or operational problems with the system to make sure the new changes are necessary for the proposed system. If the new changes are required to have, the new changes requirements are analysed using problem information and requirements changes are proposed. For instance, our client changes a new boss and he wants the income record and expenditure record stored into the system automatically. As a developer, we have to analyse is it necessary to make the record to be stored in the system automatically? What are the changes of the workflow and process of the current accounting? After the analysis and validation for the changes, we will just change the specification of the system.

5.2.3 Change analysis and costing

At this stage, we have to identify the current requirements and system components are affected. To develop the new requirements, how much time will be used and estimate the cost of the system development again. And also we have to inform to the clients in formal way for the time delay and additional cost due to the new requirements and make sure they can accept it. For example, changing the income and expenditure record to be stored automatically may need to delay one more week to finish the whole development of the whole system. RM6000 will be costed for the new requirements changes.

5.2.4 Change implementation

Change implementation means we start to develop the new requirements in the proposed system.Hence, we have to check and design our system structure again.Check and modify the relationship between the functions and functions, module and module.After that, change the coding to develop the new feature for meet the new requirements changes.Testing and validation also have to be done again such as unit testing,integration testing and performance testing.Using the same example in the previous stage, we need to check again in the finance module to ensure the automatically store record feature can be implement with minimum design errors.After done coding about the new requirements changes,we have to create some new test case for evaluate the new feature and do the testing again.

5.2.5 Revised requirements

In this stage, we have to update all our documentation with the latest requirements.All the affected modules also have to be noticed to be modified to the latest requirements.The system structure diagram , use case diagram,state diagram and others diagram that related to the requirements all have to be changed to the latest version of diagram.After done the modification.we can send the updated documentation to the clients to let clients to know our progress and changes.After the clients approved and satisfy with the new changes,the whole requirements management are be completed.

5.3 System architecture

Software system architecture is the earliest model of the whole software system created along the software life cycle, with architecture as a set of viewpoints which defines the conventions like notations, languages and model types for constructing a certain kind of view that represents a partial aspect of a software architecture that shows specific properties of a software system. With goals to expose the system structure but hide its implementations, realise all use-case and scenarios. Try to address the requirements of various stakeholders, handle both the functional and quality requirements and improve external confidence in either the organisation or system.

Client server

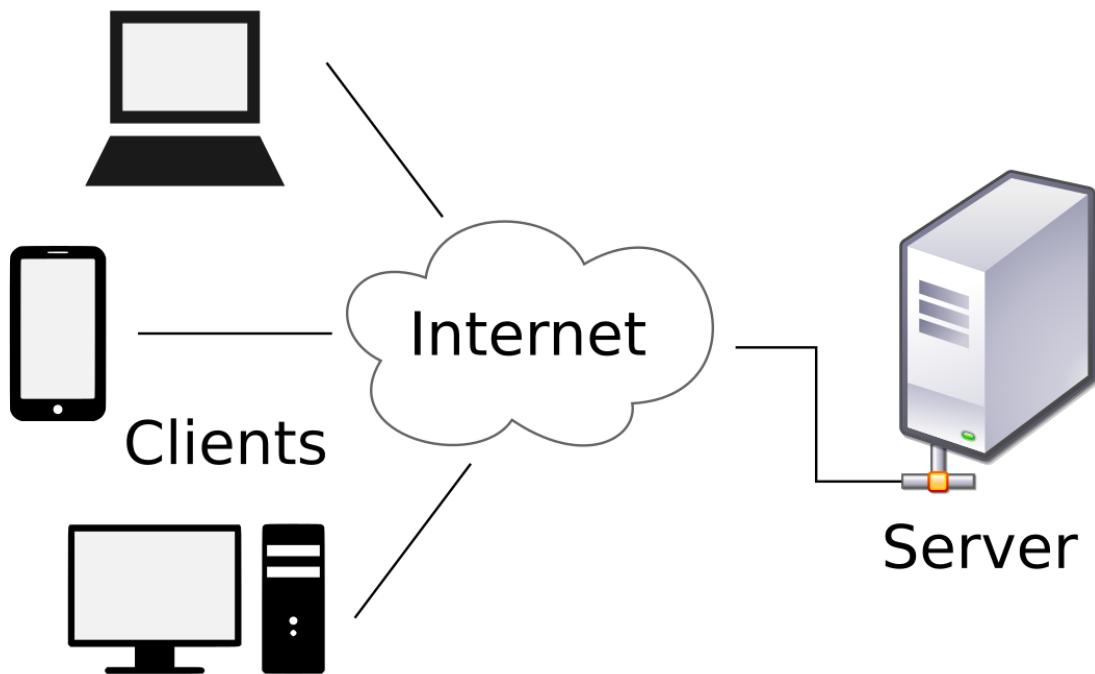


Diagram A Client Server Image

Client server Architecture contains mainly 3 components,

The 1st component, **the client** is the requester of service or information and is the main interface that initiates requests for service or resources.

The 2nd component, **server**, provides services and resources in response to client requests, it also manages data, processes requests and performs core logic. Data is centralised on the server, which is built to handle multiple clients.

The 3rd component, is **the medium of communication of client and server**, which defines the path by which client and server communicate with each other. Common mediums include internet, intranet etc.

Model-View-Controller

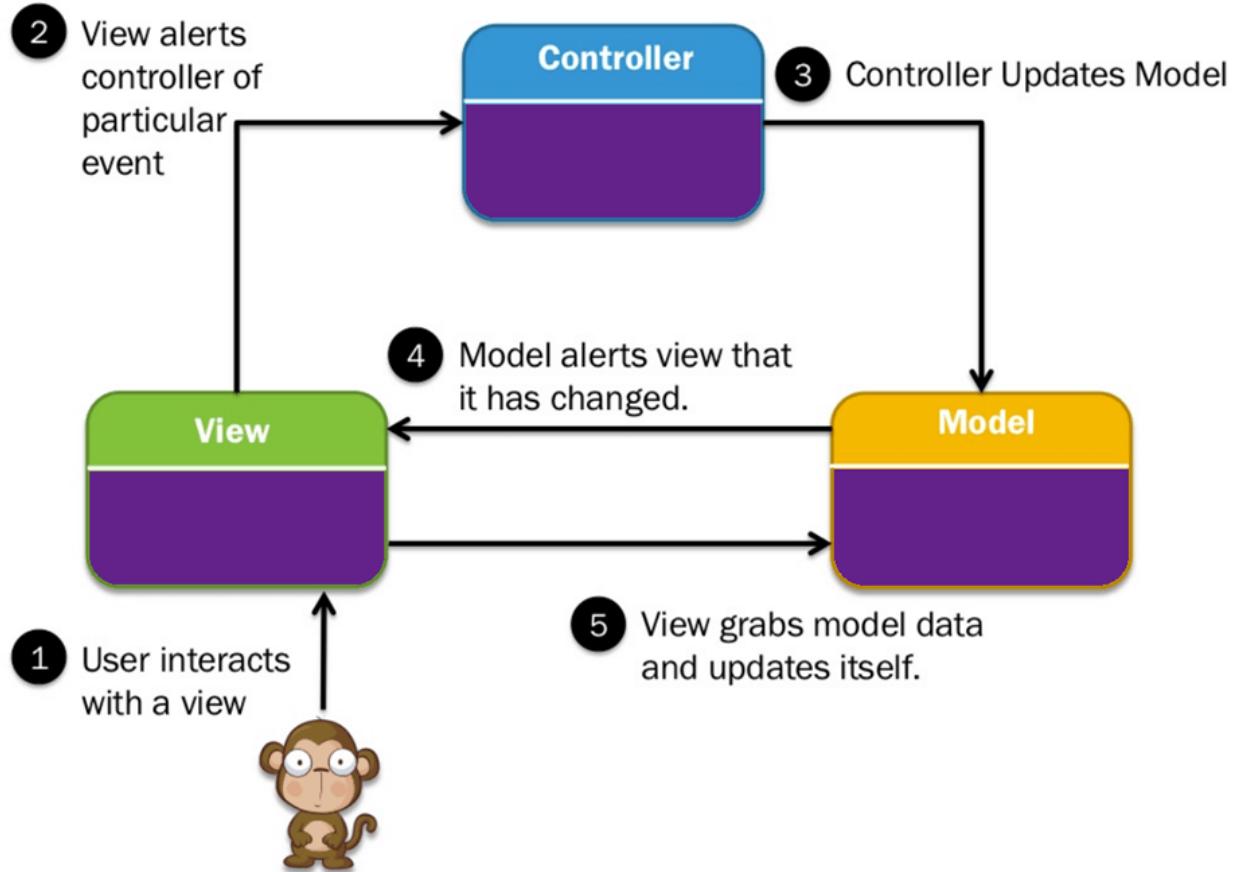


Diagram B Model-View-Controller Image

Model-View-Controller, mvc for short. Contains 3 important components.

The model, which stores data and its related logic and represents data that is being transferred between controller components or any other business logic that are related.

The view, which is the user interface part of MVC architecture, is responsible for the presentation of data to users, created by data collected from the model data. It requests the model to give information so that it can present the output presentation to the user. It also represents the data from chats, diagrams and tables.

The last part, **the controller**, handles user interactions, it interprets the mouse and keyboard inputs from the user, informing the model and the view to change as appropriate.

Layered

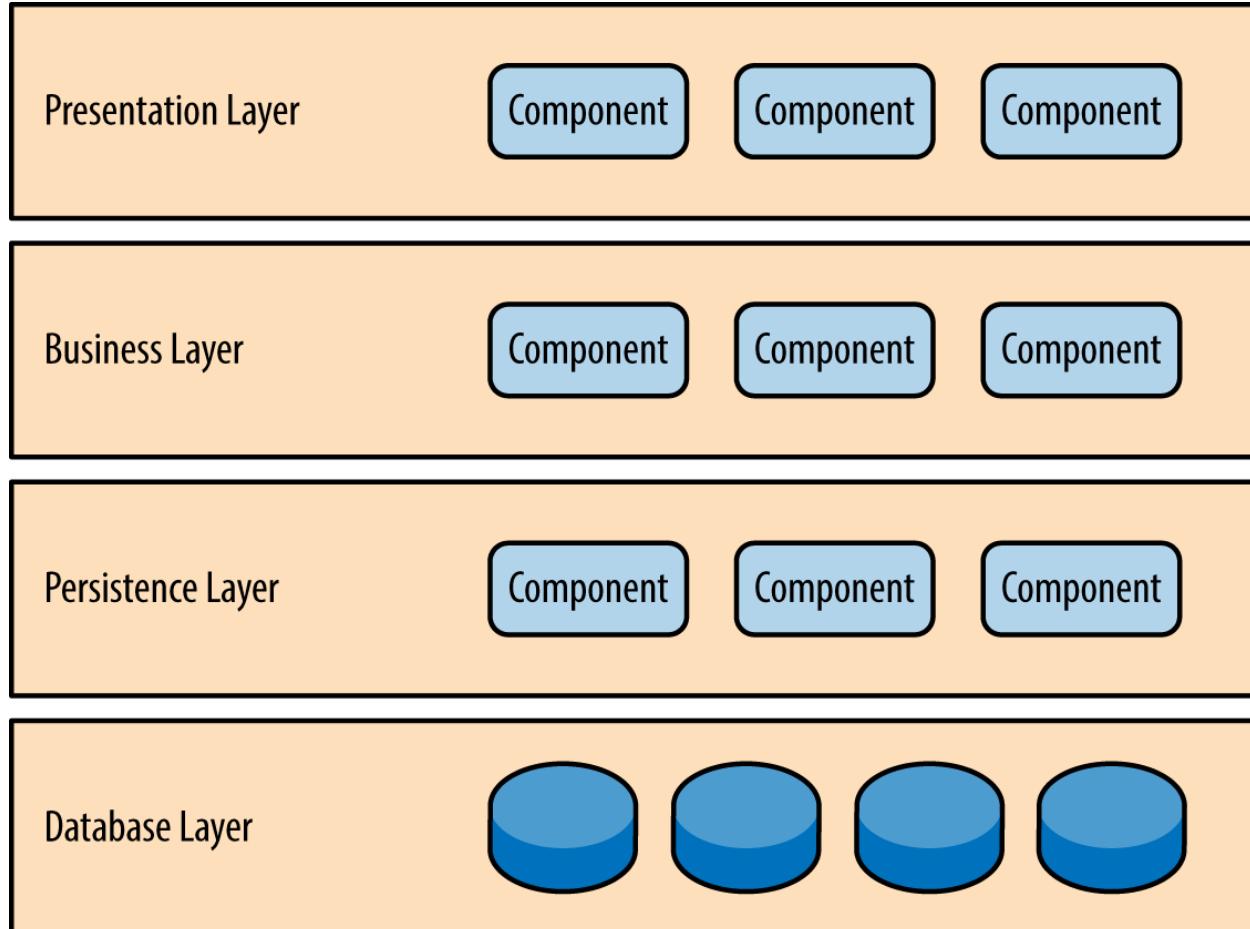


Diagram D Layered Image

The simplest form of software architecture pattern.

Contains 4 basic layers, **the presentation layer** is the topmost layer and is responsible for handling user interaction + present info to the user.

The business layer contains all business logic and rules of the system, the systems functions and the processes required from the presentation layer to pass it to the next layer.

The next layer is **the persistence layer**, also the data access layer, it handles interactions with the data storage, it retrieves and processes data and handles transaction, connection management.

The last layer, **the data layer** is the database of the architecture, it is responsible for the storing of data. Every layer is connected and communicates with each previous and subsequent layer.

Most Suitable Architecture

The most suitable system architecture would be Client-Server-Architecture as it can handle multiple servers and clients. Since this is a Hospital System, it can be assumed that the server traffic will be heavy or needed to have high scalability to sustain large amounts of user requests. It can also centralise data management, storing data in servers and is deemed to be consistent in doing so, data can also be backed up easily. To prevent loss of patient medical history / information. The use of this architecture can also allow platforms independent access. Allowing users to access the system from different platforms, whether PC or mobile, allowing them to view upcoming appointments and such so long as they have internet access.

5.4 State Diagram

Inventory

The staff that need to know the expired date of the medicine status by tracking into the Inventory module. When the medicine is “expired” it will automatically dispose of the expired medicine and there will be insufficient stocks and show “less” of the stock of medicine. If there is “no expired” it may also be “less” because it's used up, or else it will show “normal”. The staff will then restock the medicine to the “normal” level, and update the status soon. When it is successfully gone through, there will be a successful message.

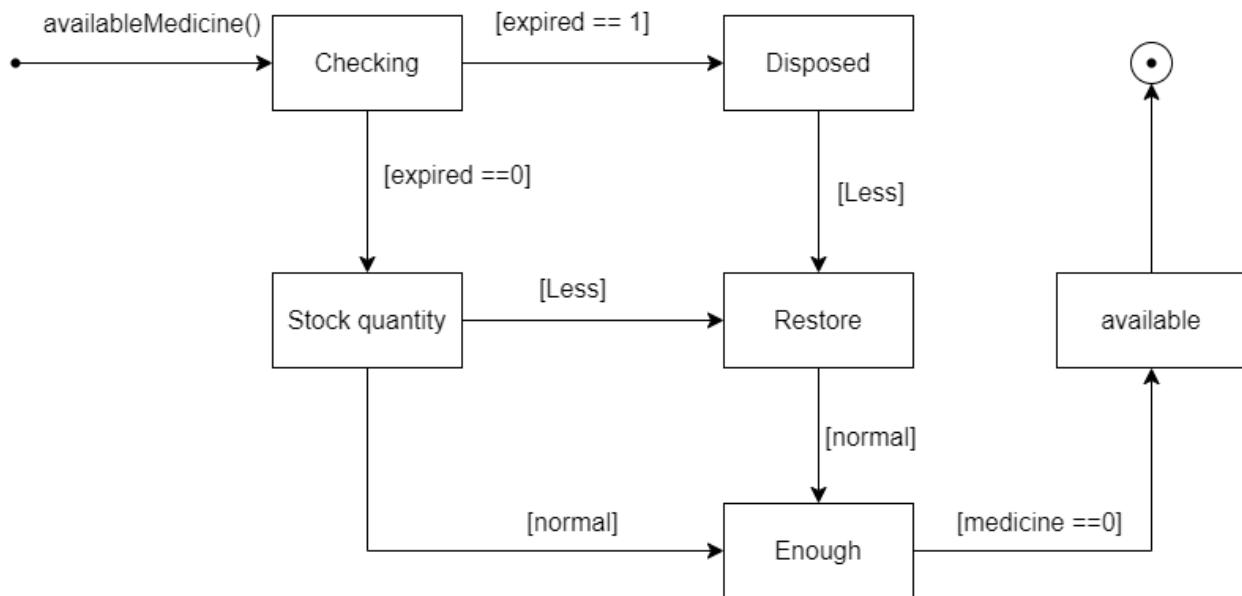


Diagram 4.1 State Diagram for Inventory Diagram

Finance

The patients can apply for a loan to return their large amount of treatment fees and the loan will change to “processing” status. If the patients enter the information correctly, the system will send a confirmation to the patients and after patients click yes, loan will change to “pending” status. If the patients enter the wrong information, loan will become “failure”. If the loan gets approved, loan will become “approved” status and send the result to the patients. Patients can also select reconsideration if the loan is getting “rejected”. The patients need to enter the more detailed information and situation about economics and family and make the loan applying reconsider by the staff again. No matter approved or rejected, the system will send the result to the patients.

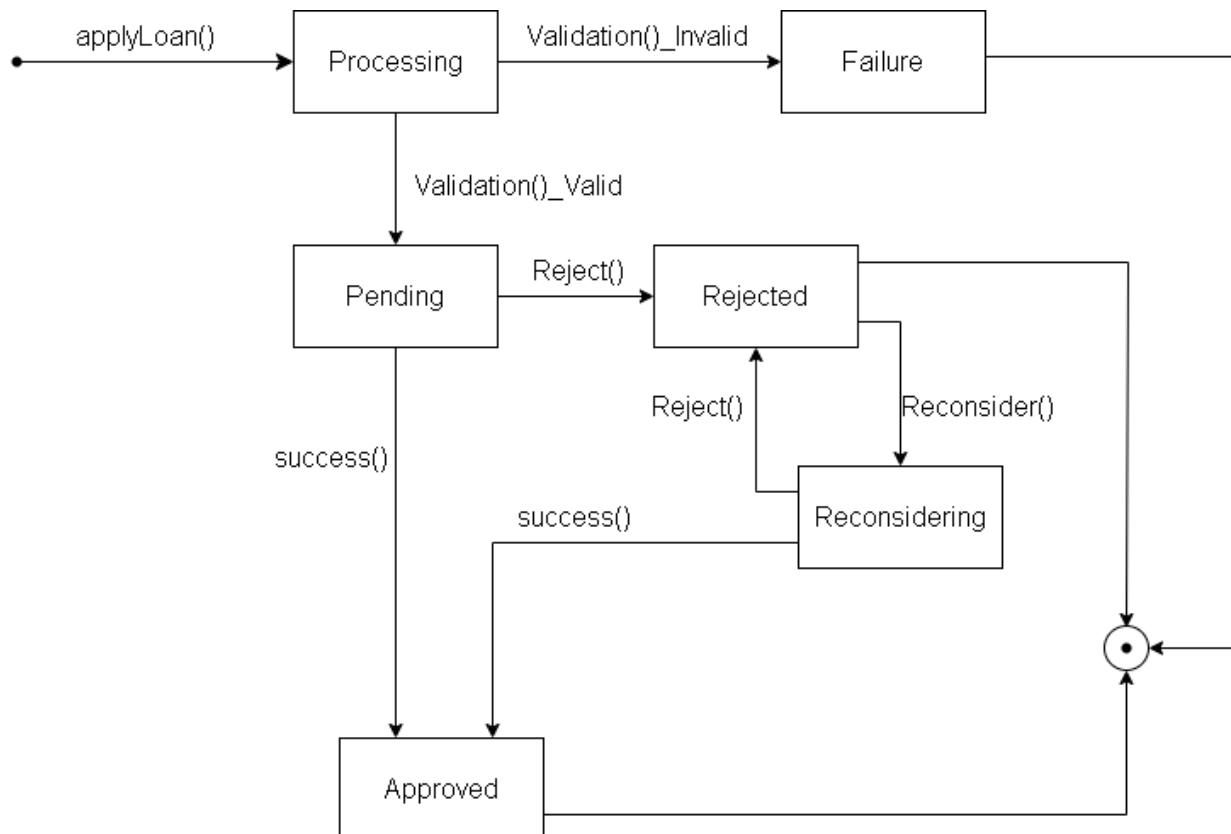


Diagram 4.2 State Diagram for Finance Module

Doctoral

Doctors will receive patient basic information after the patient has booked an appointment with said doctor, the doctor will have the choice of accepting the appointment or rejecting it. Rejecting it requires filling in the reason and set to be approved, as well as transferring the patient that got their appointment cancelled to another doctor. After accepting it the doctor will have to attend the appointment or it will count the doctor as missing and wait for replacement. If a doctor has a long term appointment scheduled and needs to transfer a patient to another due to circumstances. Doctors need to inform the other doctor and need validity from the patient's consent and the doctor that is about to take over.

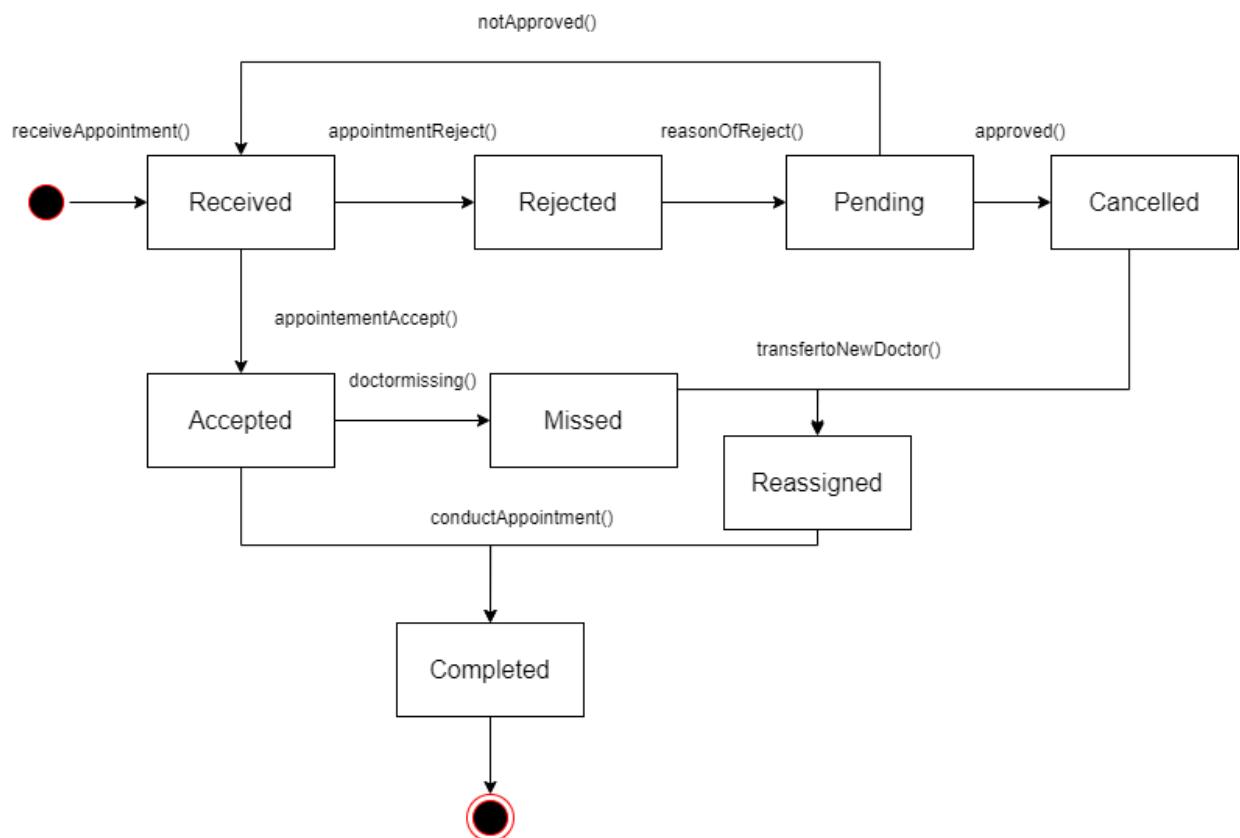


Diagram 4.3 State Diagram For Doctoral Module

CRM

Customers that wish to meet a doctor can send an appointment booking request after selecting an appointment slot from the doctor's schedule. The System will then check the availability of the doctor at that time, If the doctor is not available, the system will return an error message. If the doctor is available, the patient will be prompted to confirm their decision. If they confirm, the system will process the request and update the schedule to reflect it. If not, nothing will happen. Customers can also reschedule the appointment if they realised they booked it on a day that they are busy on or if an unexpected problem arises. They will then have to recheck the schedule for the doctor's availability, before selecting an appointment slot that is available and convenient to the customer. The system will then update the doctor's schedule to reflect the rescheduled appointment.

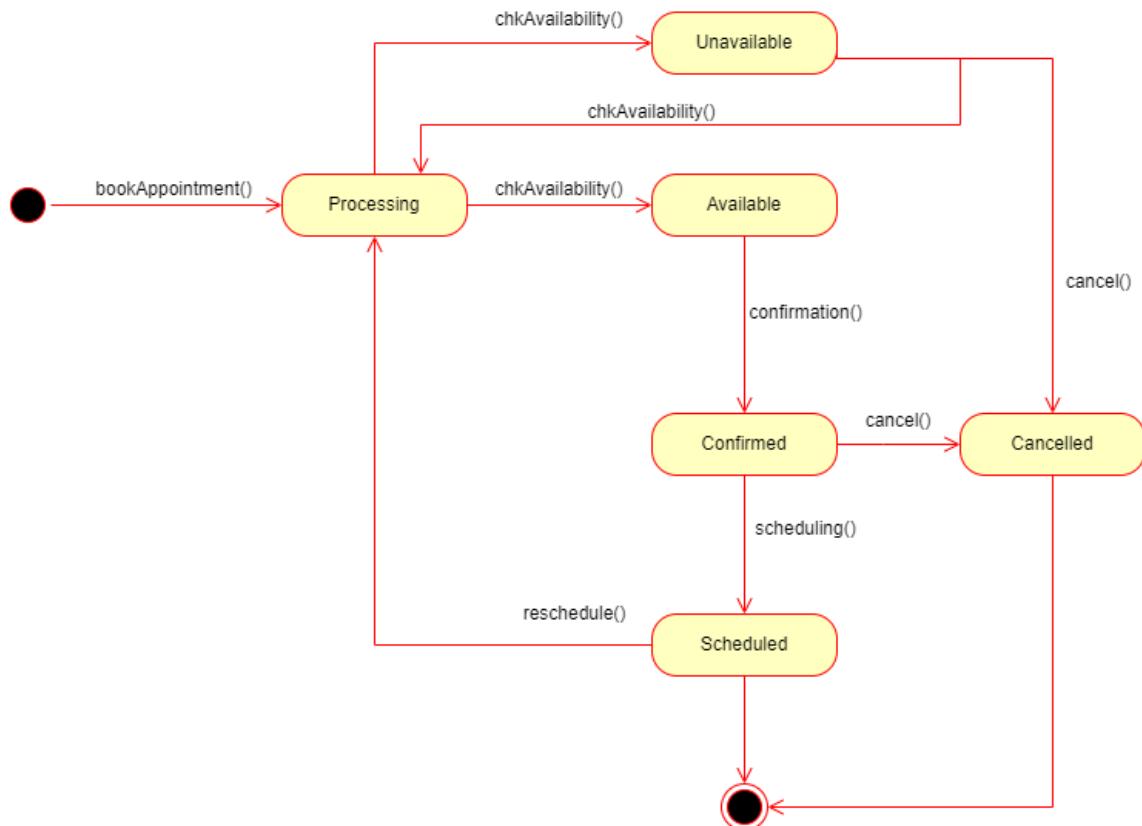


Diagram 4.4 State Diagram for CRM Module

5.5 Sequence Diagram

Inventory

The staff that need to know the expired date of the medicine status by tracking into the Inventory module. When the medicine is “expired” it will automatically dispose of the expired medicine and there will be insufficient stocks and show “less” of the stock of medicine. If there is “no expired” it may also be “less” because it's used up, or else it will show “normal”. The staff will then restock the medicine to the “normal” level, and update the status soon. When it is successfully gone through, there will be a successful message.

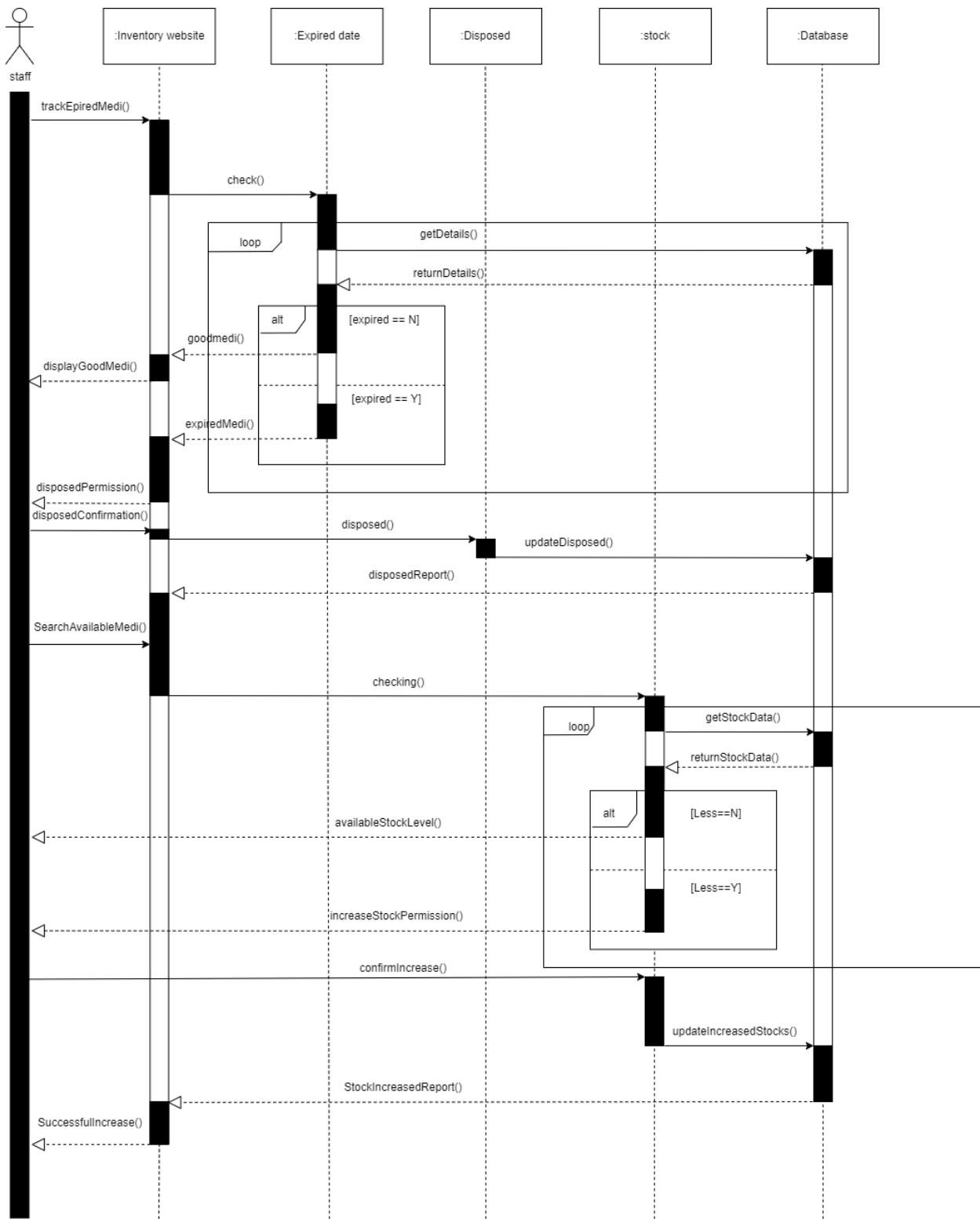


Diagram 5.1 Sequence Diagram for Inventory Diagram

Finance

The patients can apply for a loan to return their large amount of treatment fees and the loan will change to “processing” status.if the patients enter the information correctly, the system will send a confirmation to the patients and after patients click yes, loan will change to “pending” status.if the patients enter the wrong information, loan will become “failure”. If the loan get approved,loan will become “approved” status and send the result to the patients.Patients can also select reconsideration if the loan is getting “rejected”.The patients need to enter the more detailed information and situation about economics and family and make the loan applying reconsider by the staff again.No matter approved or rejected, the system will send the result to the patients.

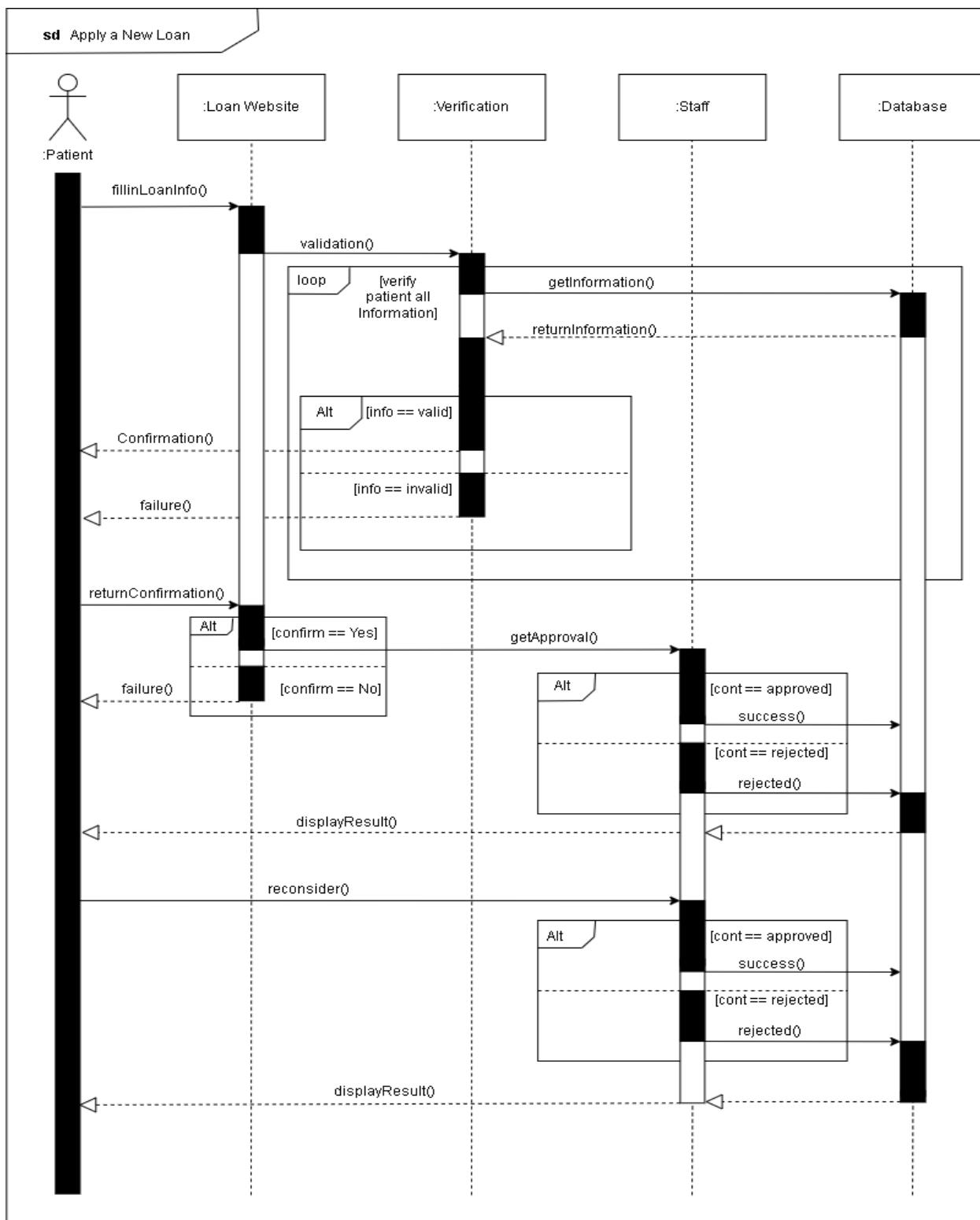


Diagram 5.2 Sequence Diagram for Finance Module

Doctoral

Doctors will receive patient basic information after the patient has booked an appointment with said doctor, the doctor will have the choice of accepting the appointment or rejecting it.

Rejecting it requires filling in the reason and set to be approved, as well as transferring the patient that got their appointment cancelled to another doctor. After accepting it the doctor will have to attend the appointment or it will count the doctor as missing and wait for replacement. If a doctor has a long term appointment scheduled and needs to transfer a patient to another due to circumstances. Doctors need to inform the other doctor and need validity from the patient's consent and the doctor that is about to take over.

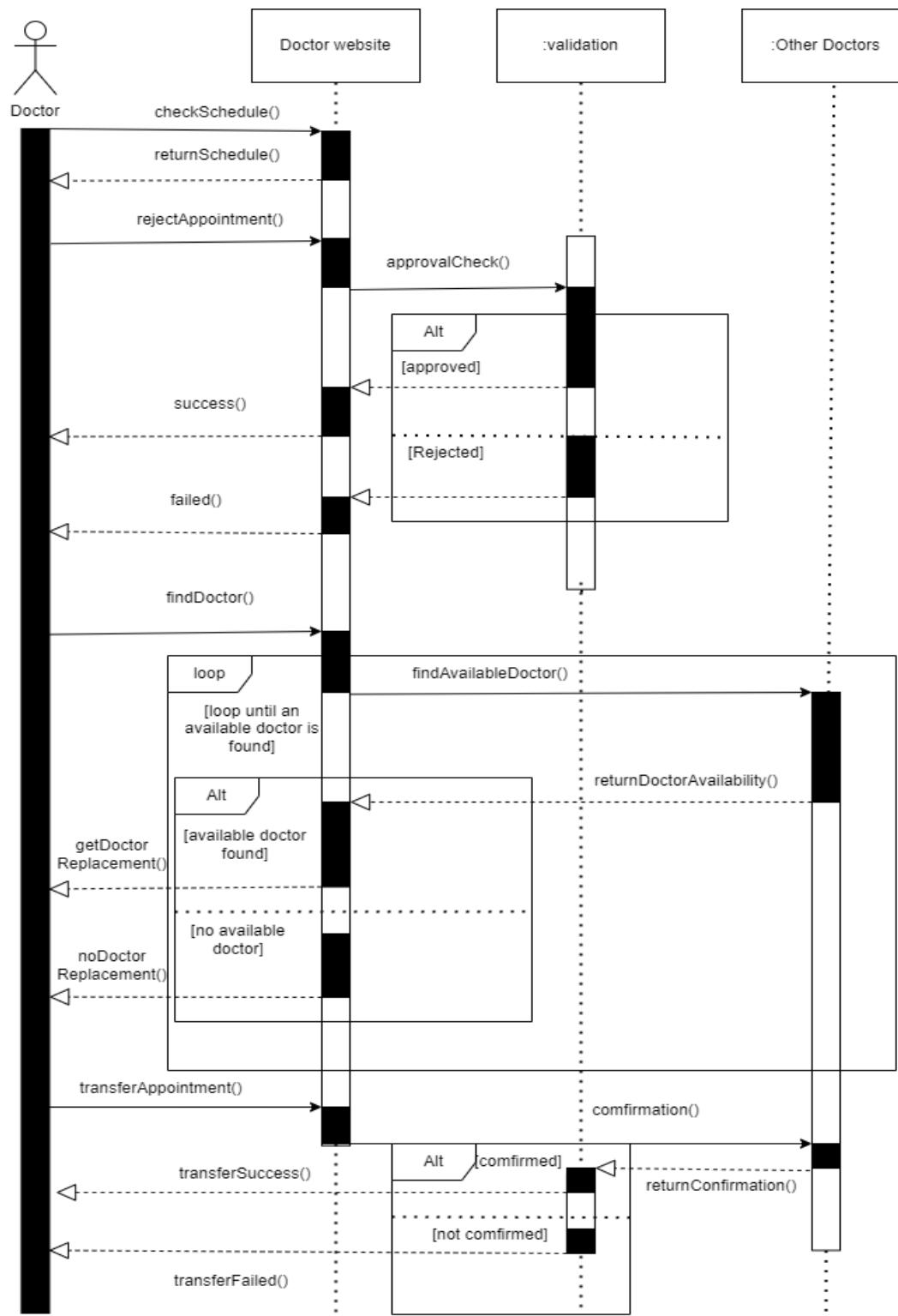


Diagram 5.3 Sequence Diagram for Doctoral Module

CRM

Customers that wish to meet a doctor can send an appointment booking request after selecting an appointment slot from the doctor's schedule. The System will then check the availability of the doctor at that time. If the doctor is not available, the system will return an error message. If the doctor is available, the patient will be prompted to confirm their decision. If they confirm, the system will process the request and update the schedule to reflect it. If not, nothing will happen. Customers can also reschedule the appointment if they realised they booked it on a day that they are busy on or if an unexpected problem arises. They will then have to recheck the schedule for the doctor's availability, before selecting an appointment slot that is available and convenient to the customer. The system will then update the doctor's schedule to reflect the rescheduled appointment.

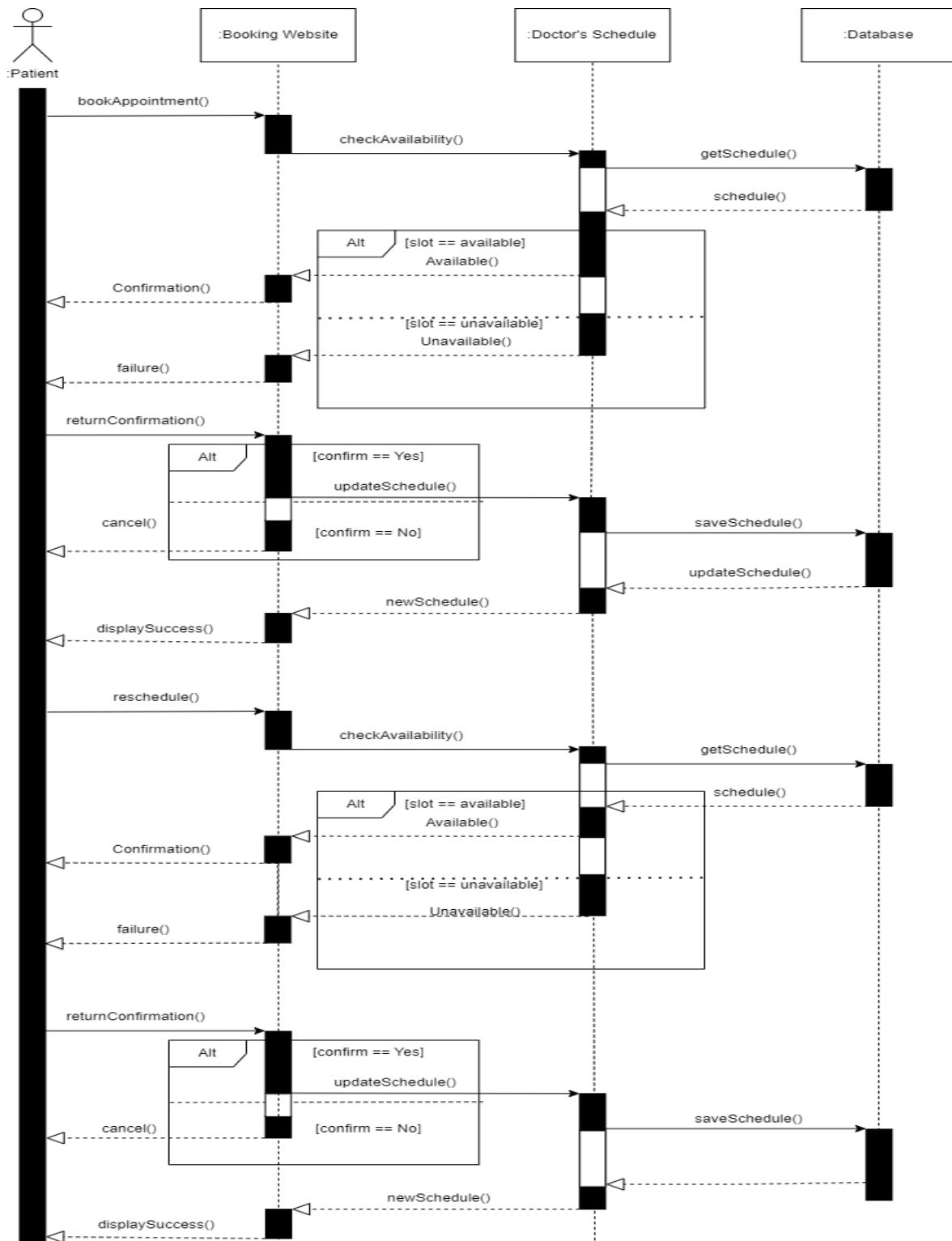


Diagram 5.4 Sequence Diagram for CRM Module

5.6 communication diagram

Inventory

The staff that need to know the expired date of the medicine status by tracking into the Inventory module. When the medicine is “expired” it will automatically dispose of the expired medicine and there will be insufficient stocks and show “less” of the stock of medicine. If there is “no expired” it may also be “less” because it's used up, or else it will show “normal”. The staff will then restock the medicine to the “normal” level, and update the status soon. When it is successfully gone through, there will be a successful message.

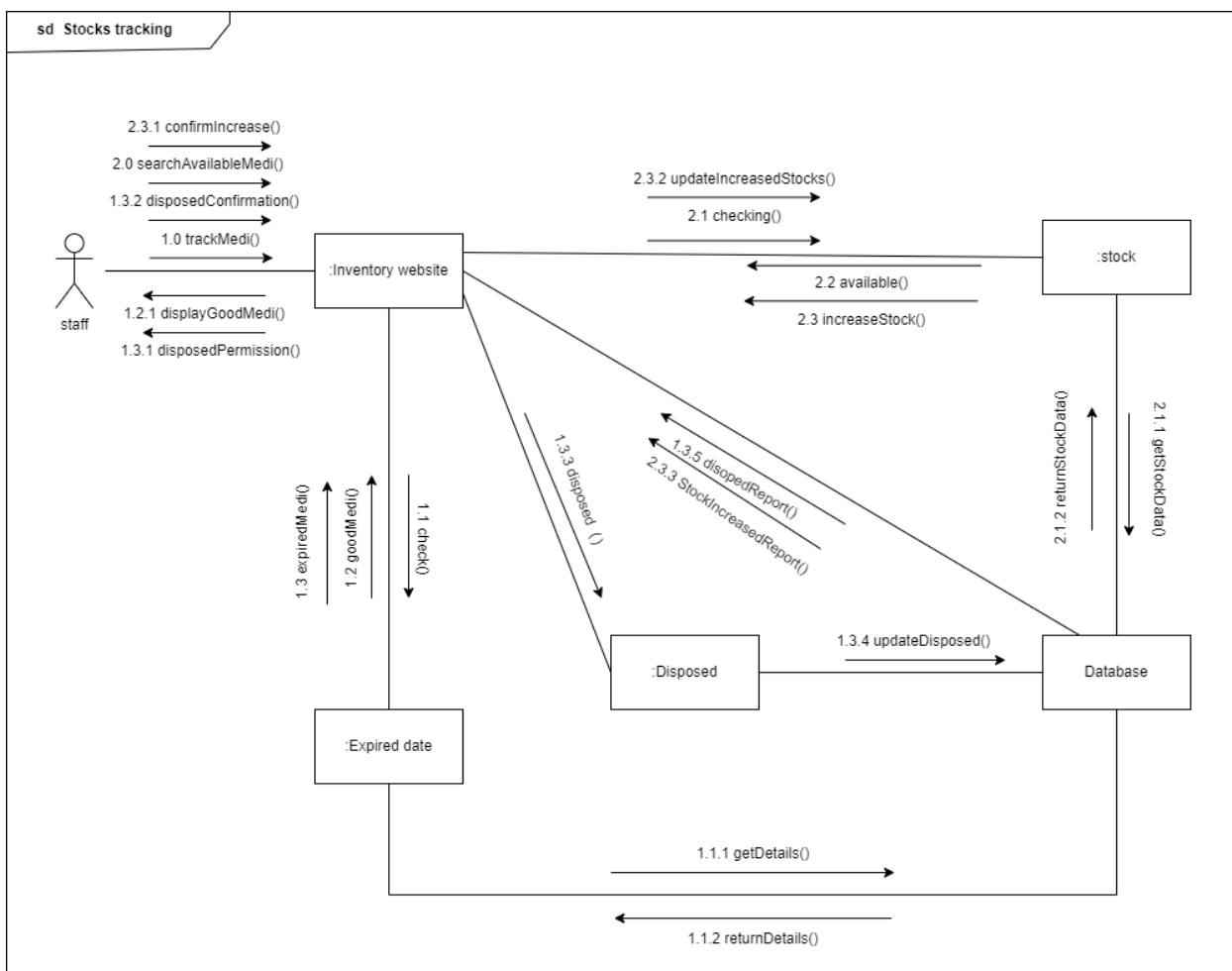


Diagram 6.1 Communication Diagram for Inventory Module

Finance

The patients can apply for a loan to return their large amount of treatment fees and the loan will change to “processing” status.if the patients enter the information correctly, the system will send a confirmation to the patients and after patients click yes, loan will change to “pending” status.if the patients enter the wrong information, loan will become “failure”. If the loan get approved,loan will become “approved” status and send the result to the patients.Else,the loan will become “rejected” status and send the result to the patients also.

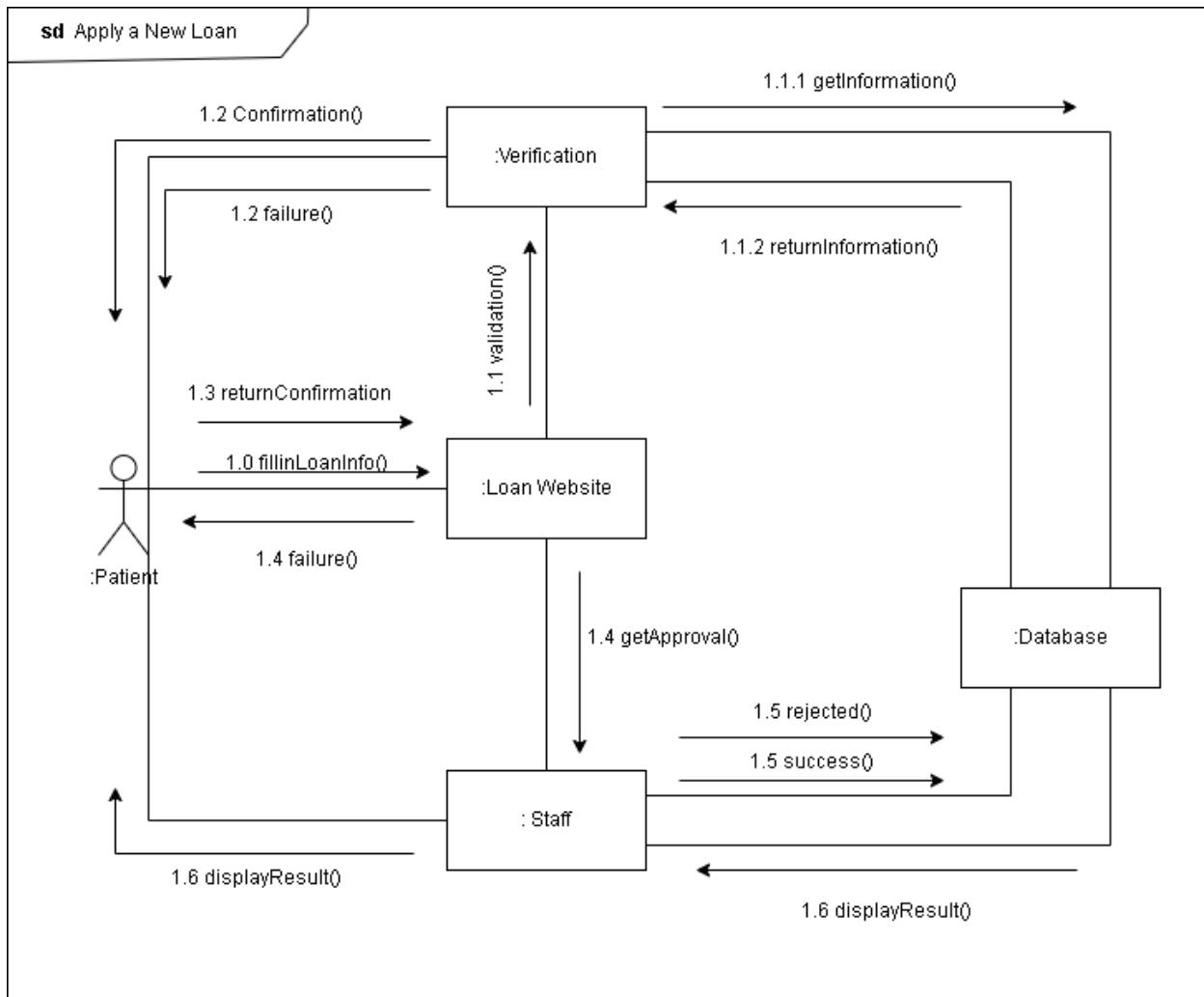


Diagram 6.2 Communication Diagram for Finance Module

Doctoral

Doctors that have successfully rejected a patient's appointment have to transfer the patient to another doctor.. Doctors need to find another available doctor to inform them about needing to transfer the appointment, after the other doctor agreed upon taking on the cancelled appointment, the doctor needs validity from the patient's consent, the doctor previously, or head doctor's approval and successfully transfers the rejected patient's appointment.

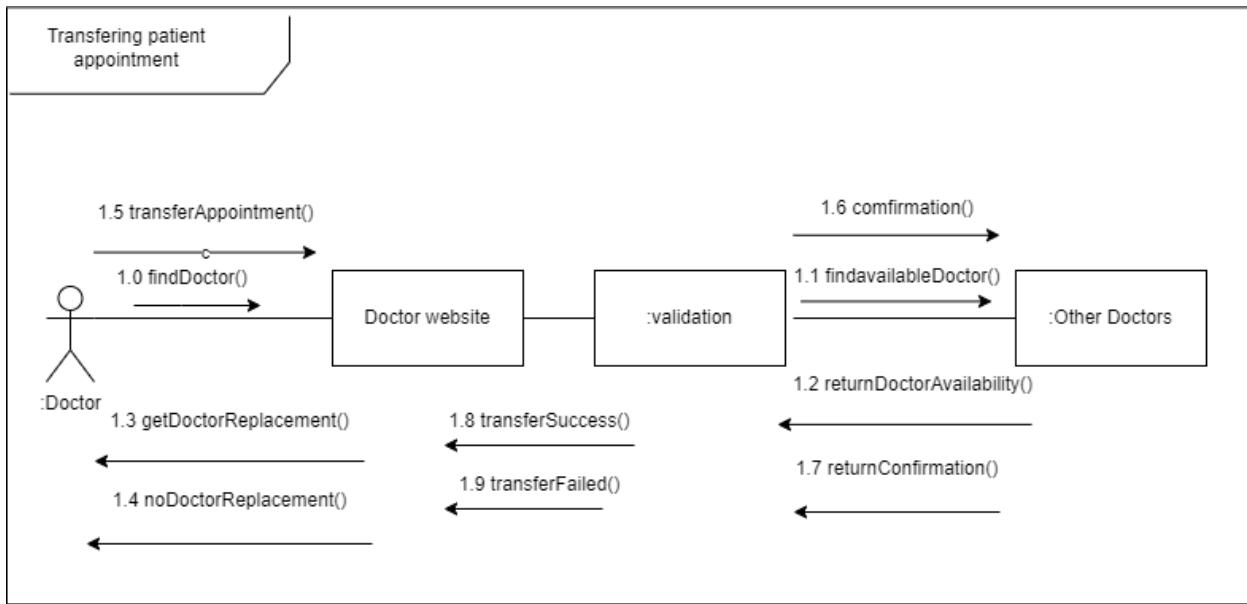


Diagram 6.3 Communication Diagram for Doctoral Module

CRM

Customers that wish to meet a doctor can send an appointment booking request after selecting an appointment slot from the doctor's schedule. The System will then check the availability of the doctor at that time. If the doctor is not available, the system will return an error message. If the doctor is available, the patient will be prompted to confirm their decision. If they confirm, the system will process the request and update the schedule to reflect it. If not, nothing will happen.

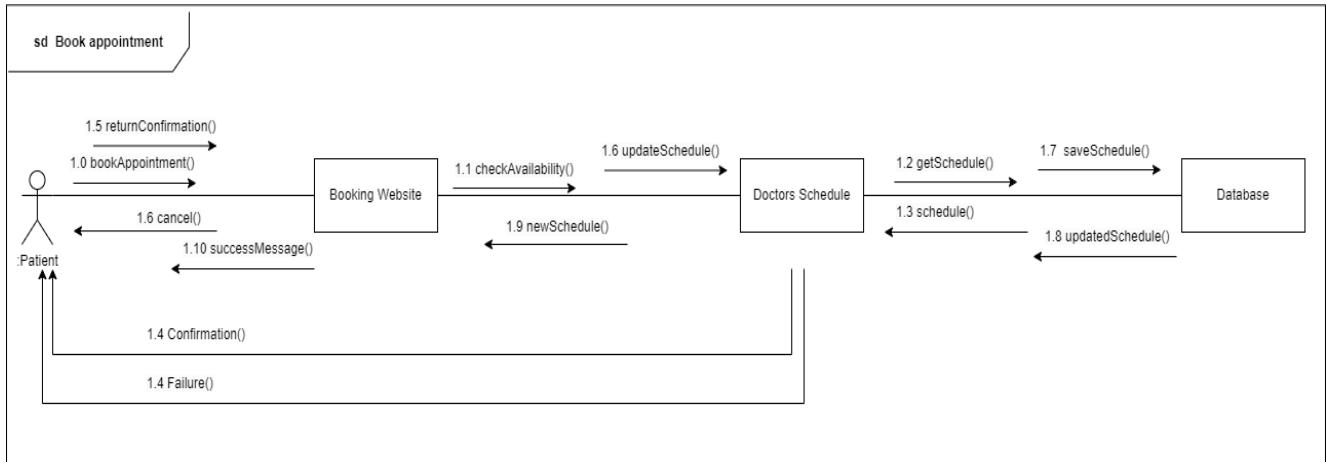
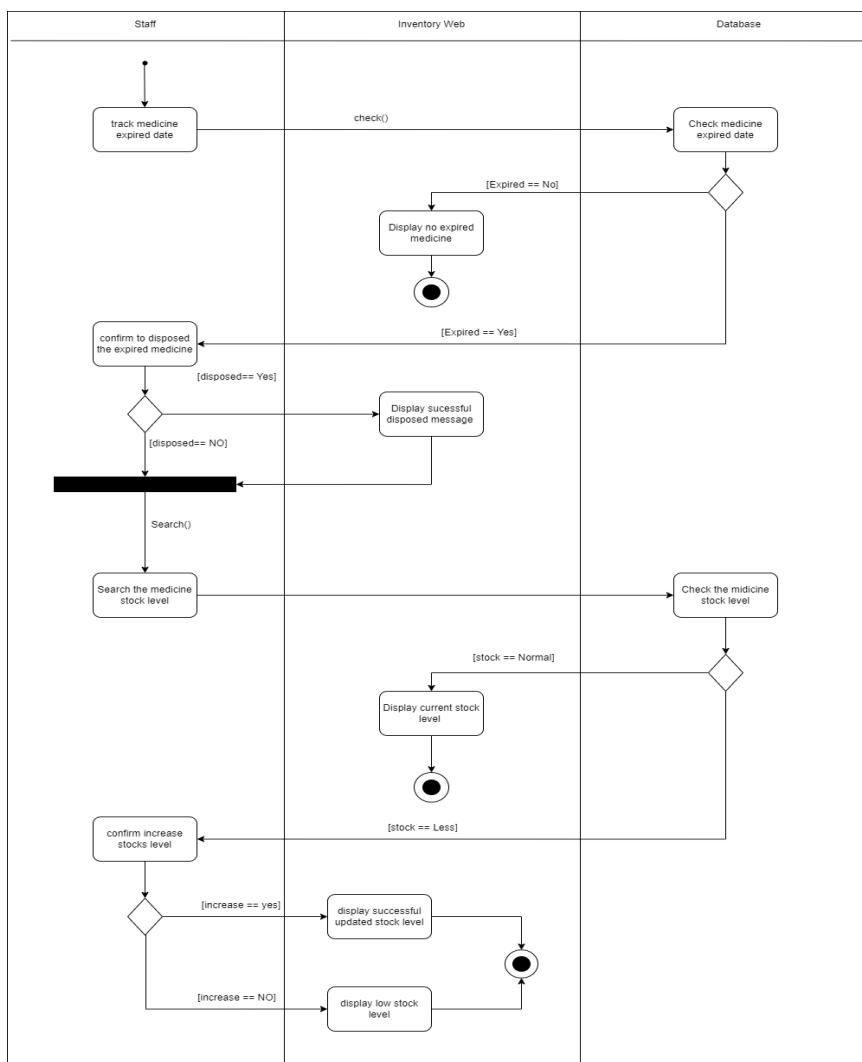


Diagram 6.4 Communication Diagram for CRM Module

5.7 activity diagram

Inventory

The staff that need to know the expired date of the medicine status by tracking into the Inventory module. When the medicine is “expired” it will automatically dispose of the expired medicine and there will be insufficient stocks and show “less” of the stock of medicine. If there is “no expired” it may also be “less” because it's used up, or else it will show “normal”. The staff will then restock the medicine to the “normal” level, and update the status soon. When it is successfully gone through, there will be a successful message.



7.1 Activity Diagram for Inventory Module

Finance

The patients can apply for a loan to return their large amount of treatment fees and the loan will change to “processing” status.if the patients enter the information correctly, the system will send a confirmation to the patients and after patients click yes, loan will change to “pending” status.if the patients enter the wrong information, loan will become “failure”. If the loan get approved,loan will become “approved” status and send the result to the patients.Patients can also select reconsideration if the loan is getting “rejected”.The patients need to enter the more detailed information and situation about economics and family and make the loan applying reconsider by the staff again.No matter approved or rejected, the system will send the result to the patients.

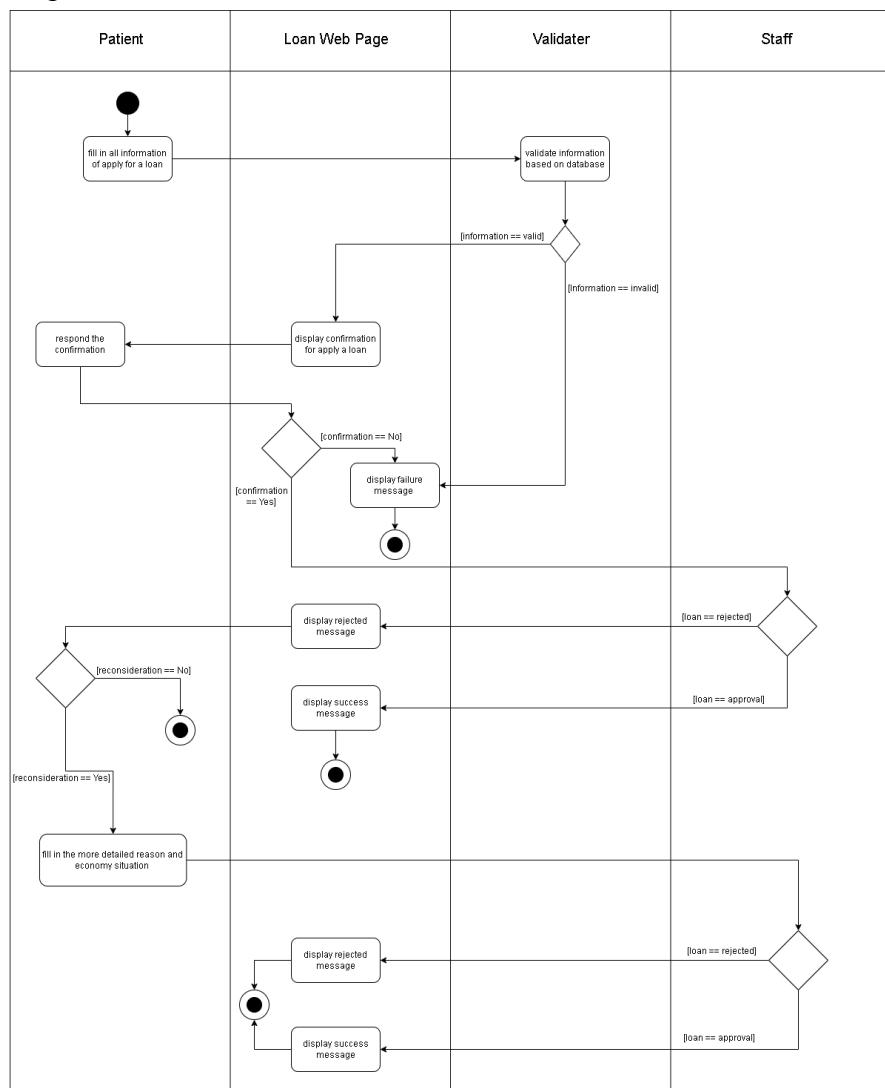


Diagram 7.2 Activity Diagram for Finance Department

Doctoral

Doctors that have successfully rejected a patient's appointment have to transfer the patient to another doctor.. Doctors need to find another available doctor to inform them about needing to transfer the appointment, after the other doctor agreed upon taking on the cancelled appointment, the doctor needs validity from the patient's consent, the doctor previously, or head doctor's approval and successfully transfer the rejected patient's appointment..

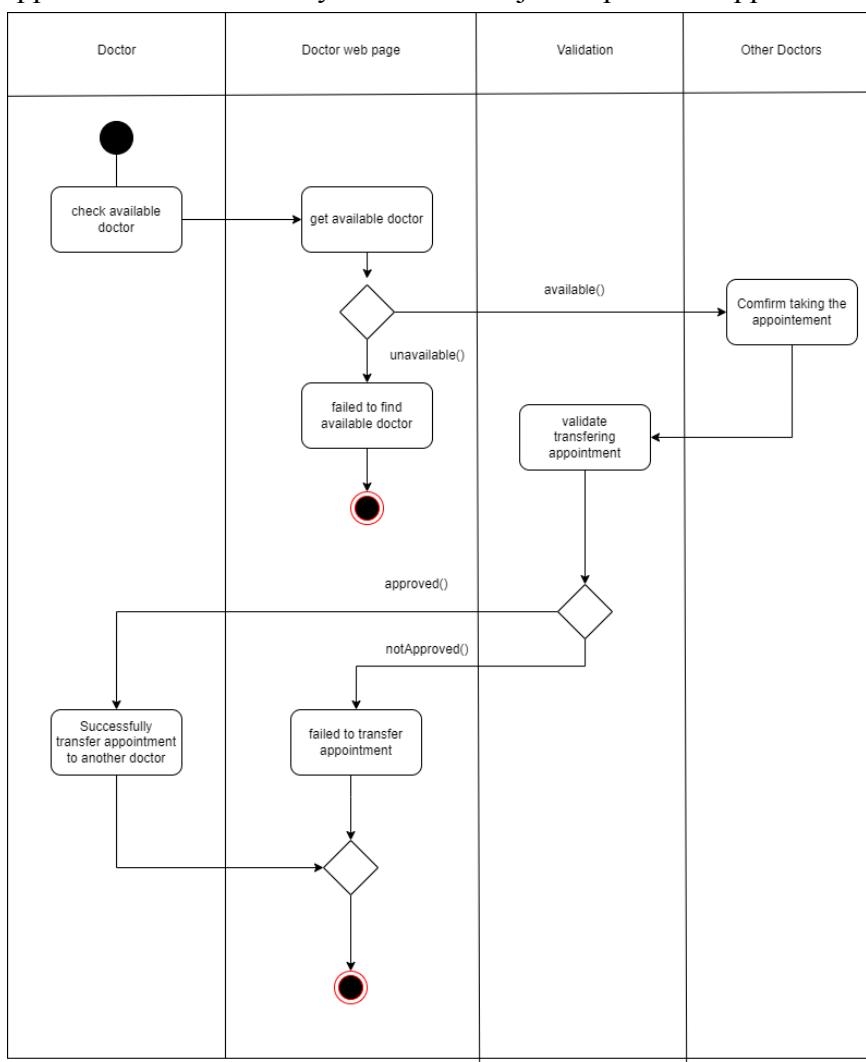


Diagram 7.3 Activity Diagram for Doctoral Module

CRM

Customers that wish to meet a doctor can send an appointment booking request after selecting an appointment slot from the doctor's schedule. The System will then check the availability of the doctor at that time. If the doctor is not available, the system will return an error message. If the doctor is available, the patient will be prompted to confirm their decision. If they confirm, the system will process the request and update the schedule to reflect it. If not, nothing will happen.

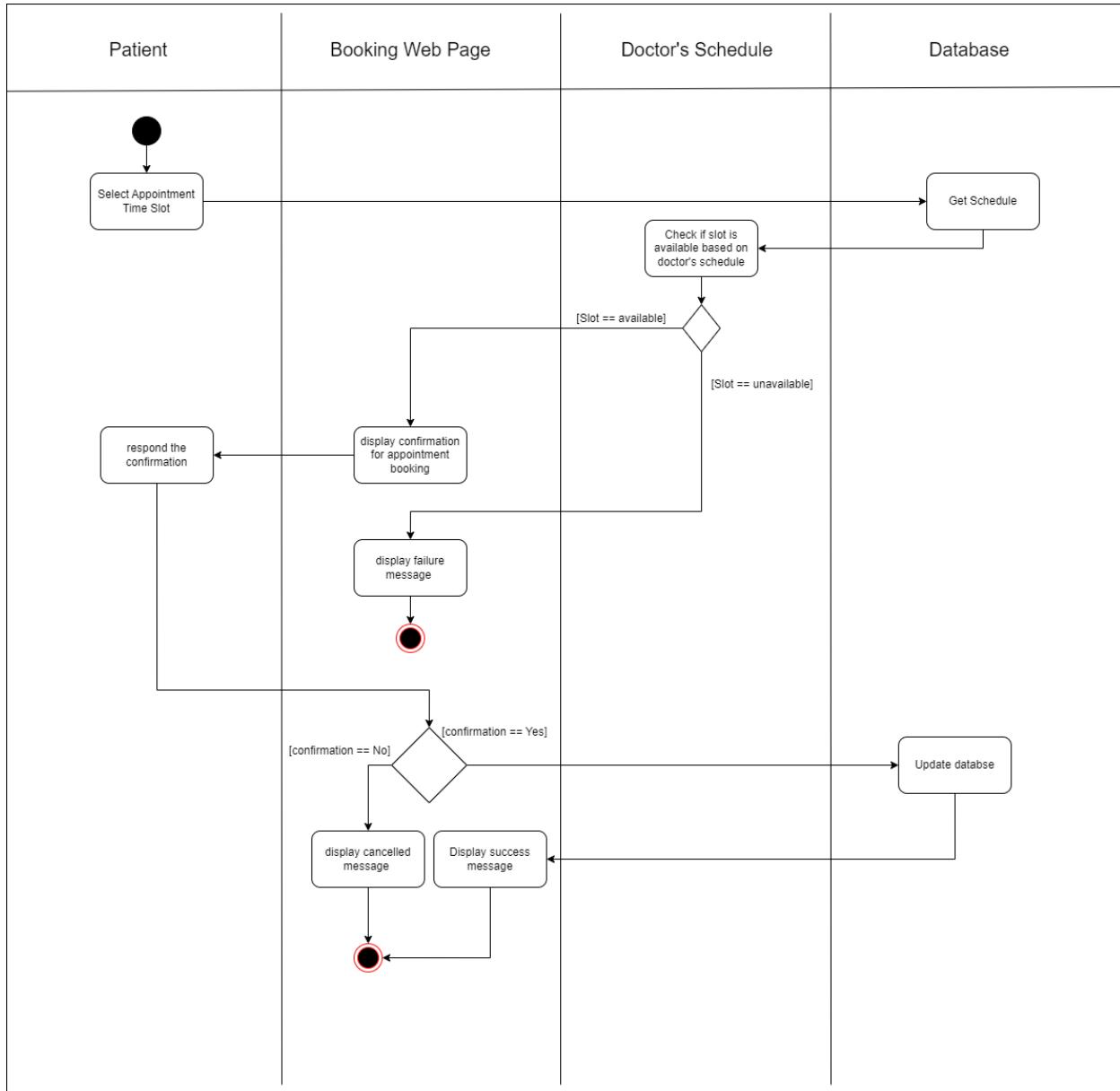


Diagram 7.4 Activity Diagram for CRM Department

6. Appendix

Appendix A Background Studies

Established in November 1999, Someway Medical Centre is an Australian Council on Healthcare Standards (ACHS) and Malaysian Society for Quality in Health (MSQH) accredited private hospital. Located in the smart sustainable Sunway City, Sunway Medical Centre is surrounded by an ecosystem that will inspire a healthy, safe and interconnected society for generations to come. Someway Medical Centre has 9 healthcare units in Malaysia and Singapore and 28 centres of excellence to provide top-notch medical care and satisfy every patient's needs. For example, diabetes care centres are in-charge to provide high quality care and service to our diabetes patients. The diabetes care centres also help the diabetes patients to maintain a good control of their diabetes so that they can live as normal life as possible. Someday medical centres also provide treatment for the patients who have an appointment to the doctors. There are over 100 specialties and doctors that are available to let patients make appointments with them.

15/7/2023, <https://www.sunwaymedical.com/en/>

Appendix B Elicitation techniques

Interview

The interview is a structured conversation where one participant asks questions, and the other provides answers. That is a one-on-one conversation between an interviewer and an interviewee. The purpose of an interview is to ask the interviewee such as employees and employers for information(problem)about the current system and the requirements for the new system. There are two types of interviews,structured interview and unstructured interview. Structured interviews is a interview that have a specific purpose. We will prepare well the specific question and have a deeper discussion about a certain topic. For the unstructured interview, we do not have pre-determined sets of questions. There will be a free discuss in the current system and proposed system to explore some overlooked questions. The best effective ways is mix both of the interviews, start with the structured interviews to get the information that we want for the development and end with the unstructured interview for understand more about the system as-is. The benefits of the interview are we can clarify the facts because we are face-to-face interview and easier to build rapport with the clients to get the more accurate information. We can also able to analyse the tone of the responses and body language which convey great deal of information.

Questionnaires

Questionnaire is a research method that consists of a list of questions and the purpose of it is to get a lot of information from the general or a large group of people. The questions in questionnaires usually include open and closed questions. An example of an open question is what is the issue that is faced by the company? Open questions can help us to get a more in-depth answer from the respondent. Closed questions are like the type of operating system used by the company and it is used to ascertain the facts. By doing questionnaires, we can get the information and analyse the answer to determine the system requirements. The benefits of questionnaires is we can get a huge amount of data by questionnaires because of the electronic questionnaire like google form. We can promote the questionnaire to the large amount of people that in the different locations to ensure the diversity of data. Furthermore,we can ask some sensitive question that we cannot ask in the interview because the responder can answer the questionnaire anonymous and get the most authentic data. Another benefits of questionnaire is does not need lot of time compare to the interview. By using the questionnaire techniques, we are able to acquire large amount of data for our system development.

Appendix C Stakeholders Analysis

Inventory

[head department]

The reason for the inventory manager to be chosen is because inventory managers are experienced and know the workflow of the inventory department. He/She can provide us with some of the requirements that are needed by them. For instance, what information needs to be recorded for a medicine? What information needs to be included in the report or document? What process needs to be conducted before store into a storehouse?

Inventory

[medicine administration manager]

The position of the staff makes him become one of the stakeholders. He/She know most of the information and knowledge for medicine that use by the Someday Medical Centre. For example, he/she can provide us the medicine that is important and need to be always in stock or the things need to be noticed to make the medicine can function properly like expiration date.

Doctorial

[Doctorial Manager]

The reason for picking the manager of the Pharmaceutical department as one of the stakeholders, she/he is the most important person in charge of operating the hospital in general, so having their knowledge on the ins and outs of their current method help us understand better on what they want and need for their new system.

Customer Relationship Management

[CRM Manager]

The selection of this staff is due to their experience in customer relationship management and with how things are run here. They are knowledgeable in formats of documents or reports used by the client company. For example, they can provide insight into which important information and or details are required for documents and reports to be submitted by patients, customers or staff members.

Finance

[Finance Manager]

The Finance Manager is chosen to become one of the stakeholders because he/she is the key person to manage the whole financial situations of the someday medical centre.Hence,he/she understands the process and inconvenience of the current process. He/She is also in-charge to manage and pay the tax of the company,so the manager can provide us with the detailed information or requirements about the tax section.

Appendix D Interview , Questionnaire

Interview

Inventory

1. What information need to get from the medicine supplier?(E.g. Expiry date, amount)
2. Do you need to categorise all the medicine by each department?
3. What actions should be taken when the medicine is out of stock?
4. What actions should be taken when an emergency doctor needs surgical instruments but there is not enough?
5. Do you need a platform to let the staff feedback what inventory they need?
6. What actions should be taken when there are not enough hospital beds in an emergency situation?
7. Do you need to generate a monthly or daily report?
8. What are the most important records that you hope to see in the report?
9. Do you need to auto group all the duplicated inventory stocks?
10. What is the process needed to take when staff need to use inventory?
11. Do you need a platform for staff to report when facing damage or lost inventory happens?
12. If patients are not satisfied with the inventory they are using, what process should they do to change their inventory? E.g hospital beds.
13. What training and support will be provided to staff during the implementation process to ensure a smooth transition and successful adoption of the new system?
14. What are the expected return on investment (ROI) and benefits that the organisation can anticipate after implementing the new inventory management system?
15. What security measures do you expect the new system to have in place to protect sensitive inventory data from unauthorised access or potential cyber threats?

Finance

1. What details and information for expenses and income need to be stored?
2. What is the common category to classify the expenses and income?
3. What data and information of a business planning needs to be recorded?
4. Is it needed to generate a report after the planning is done?
5. How many types of financial reports are required? What information needs to be included in every report? What format of every report?
6. What payment methods are required for the patients?
7. How frequently does the system need to generate a financial report?
8. If the reports have some unexpected error, what process to overwrite the reports?
9. Who has the permission to overwrite the reports?
10. What is the format/diagram/way to display the cash flow of a company?
11. If you found some conflicting data within the reports or documents, how would you go about correcting?
12. How would you remark on the patients that did not do the payment on time?
13. What is the process to apply for a loan?
14. What are the basic conditions of patients to apply for a loan?
15. What is the limit amount of a loan?
16. What if the patients did not repay the loan on time?

Doctoral

1. What format did your department use to record doctor profile details?
2. How do the department distribute schedules for the doctor and nurses?
3. How does the customer know when the doctor is free to do an appointment?
4. What is the method of storing patient profiles and details?
5. What method is used to check overtime doctors and nurses?
6. If there are expired medicines, how's the process of disposing it in a record and what is the method of recalling the inventory department for restock?
7. If a patient want service from nurses, what and how many method do they have to do so
8. If the patient needs to have some record details changed, what is the process of it.
9. After making an appointment with the customer, how does this department communicate with other departments to coordinate operations like sending customer info to the CRM department.
10. If patients want to be discharged early, how is the process of changing their document details?
11. What would happen if a doctor is fully booked and needs another doctor to replace him for the next appointment.
12. What if the customer wants to change the appointment date, how does the department rearrange available time for the customer to check?
13. What will happen if the doctor missed an appointed time?
14. What is the process if the customer wants to make an emergency appointment?
15. What is the process of a patient needing or wanting to change from a doctor to another?

CRM

1. How does the customer book for an appointment?
2. What important details are required by the customer to book an appointment ?
3. How does a customer submit a feedback form ?
4. When do you collect customer's feedback ?
5. What is the process of accepting a customer's feedback?
6. How is customer feedback filtered ?
7. What is the process of processing a customer's feedback?
8. What are the important details required by customers before submitting the feedback?
9. What is the format of the document used to store customer feedback?
10. What data is recorded and stored ?
11. When negative feedback is received, how do you coordinate with other departments to resolve it ?
12. How long do you keep customer's feedback ?
13. How do you coordinate with the Doctoral department to distribute appointment timetables ?
14. How do you coordinate with the Finance department and the Doctoral department to record or update customer's personal information ?
15. What important details from the feedback are shared with other departments ?

Questionnaires

Inventory

Staff

What are the biggest challenges you face with the current inventory management process?

- Difficult to find the expired medicine
- Inaccurate stocks level counting
- long procedure to increase stocks level
- Other: _____

How do you currently track inventory levels and reorder points?

- manually
- mentally
- other system
- Other: _____

Do you feel the current inventory system is efficient and accurate? If not, what improvements would you like to see?

Your answer

How often do you face issues with out of stocks or overstocking of items?

- often
- rarely
- Other: _____

What information do you need to have readily available when managing inventory?

- stock increase
- stock deduction
- date product
- date expired
- Other: _____

Are there any specific reports or data analytics you'd like to see in the new inventory system?

Your answer

How would you prefer to receive alerts or notifications about low stock levels or expiring items?

- email
- message
- Whatapps
- wechat
- Other: _____

Submit

[Clear form](#)

Patient

Have you ever experienced delays in receiving treatment or care due to unavailable supplies or medications?

- Yes
- No
- Other: _____

How important do you think it is for the hospital to have a well-managed inventory system to ensure timely and efficient patient care? rate 1 to 5

- 1
- 2
- 3
- 4
- 5
- Other: _____

How do you feel about the hospital potentially developing a new inventory system to improve its operations?

Your answer

Have you ever lasted very long to visit a hospital because of issues related to inventory management?

Yes

No

Maybe

Other:

Do you believe that an improved inventory system could lead to better patient safety and reduced medical errors?

- Yes
- No
- Maybe
- Other: _____

How would you prefer to receive information about any potential or complications related to inventory management during your hospital stay?

- Phone call
- Email
- Whatapps
- Other: _____

What features would you find valuable in an inventory system that could enhance your overall hospital experience?

auto generate report

reminder notification

Other: _____

Are there any specific concerns or suggestions you have regarding inventory management at the hospital?

Your answer

Submit

[Clear form](#)

Finance

1. Brief describe your computer skill level

1	2	3	4	5	
Worst	<input type="radio"/> Best				

2. Do you wish to have a new system. If yes, what would you hope to have in the new system? *

- Yes
- No
- Other: _____

3. Will work become more efficiency if having a system

1	2	3	4	5	
useless	<input type="radio"/> efficiency				

4. How many types of expenses and costs need to be recorded in the system? List them

- medicine
- treatment
- medical equipment
- Other: _____

5. What is the common category to classify the expenses and income?

treatment

medicine

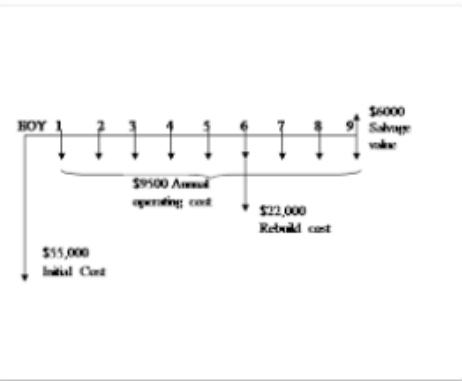
Other: _____

6. If the cash flow diagram drawn using a system/computer or auto-generated by system becomes more comfortable?

Yes

No

7. What do you hope the cash flow diagram looks like?



Option 1



Option 2

Other:



Option 3

8. What is your preferred software to write the analysis report and documents?

- microsoft excel
- ecount
- Other: _____

9. What are the common requirements for applying for a loan?

- personal financial ability
- age
- family
- Other: _____

10. What information about patients ' expenses do you think need to be recorded in the system?

- period of treatment
- medicine and using date
- total fee of treatment
- Other: _____

11. Do you hope to differentiate the normal patients and the patients with loans? If yes ,in which ways?

- Yes
- No
- Other: _____

12. What is your preferred method to highlight the patient that did not pay their fee or loan on time?

- bold
- color
- arrangement at the top
- Other: _____

13. What is the solution to handle the patients that did not pay the loan?

Your answer

14. Is there another common problem for patients besides not paying on time?

Your answer

15. Do you have any inconvenient points for the current finance process?

Your answer

Submit

Clear form

Doctoral

For Doctor

Questionnaire (For doctors)

To ask numerous question for the manager for Doctorial Department

*

1. Are you satisfied with the current method of getting an appointment schedule?

- Very Satisfied
- Satisfied
- Neutral
- Unsatisfied
- Very Unsatisfied

*

2. Is it convenient for you to want changes in your schedules with the current method?

- Yes
- No

3. Are you satisfied with the current procedure of recording down information for patients?

- Very Satisfied
- Satisfied
- Neutral
- Unsatisfied
- Very Unsatisfied

4. In your opinion, does the current method of storing patient info or searching for it in the backlog inefficient and cumbersome?

Short answer text

5. How confident are you in trusting the current method of protection or preserving patient info?

- Confident
- Neutral
- Not Confident

6. Is inaccuracy in documents regarding medical supplies or patient info happens often?

- Yes
- No

For Nurses

Questionnaire (For Nurses)

Form description

1.

What do you think of the biggest challenges you have to face when managing patients?

Short answer text

2. Does the current hospital method make it efficient for you to transfer documents from department to department?

- Yes
- No

...

3. Is searching for a patient document a hassle?

- Yes
- No

4.

What do you think is missing in the current method of receiving patient service calls?

Short answer text

5.

Is the current method effective in communication for aligning schedules?

- Very effective
- Effective
- Not sure
- Not Effective
- Terrible

For Patient

Questionnaire (For Patient)

Form description

1. Is the call for service response time slow?

- Yes
- No

2. Is the current way of the hospital handling requests for an extended hospital stay annoying for you?

- Yes
- No

3. Do you trust the doctors to protect your information with integrity?

- Yes
- No
- Unsure

4. What new feature do you want in the new system for patient service?

Short answer text

CRM

Staff

1. Have you ever received complaints about conflicting appointment schedules ?

- Yes
- No

2. Do you think that the current process of receiving customer booking appointments is time consuming ?

- Yes
- No

3. Do you think that the current process of receiving customer booking appointments is tedious ?

Yes

No

4. Do you have any suggestions that you think would be a nice addition to streamline the booking process ?

Long answer text

5. Do you think that the current process of receiving and filtering customer feedback is tedious or annoying ?

Yes

No

6. In your opinion, is the current process of receiving and filtering customer feedback time consuming ?

Yes

No

7. What changes would you make to reduce the time taken to receive and filter customer feedback time?

Long answer text

8. What filters do you think would be important to include when filtering customer feedback ?

Long answer text

9. Do you have any suggestions that you think would be a nice addition to streamline the process of receiving and filtering customer feedback ?

Long answer text

Customer

1. Have you felt confused during the booking process ?

Yes

No

2. What do you feel about the response time about the current appointment booking system?

1

2

3

4

5

Very Slow

Very Fast

3. What was the longest time you had to wait before receiving an appointment booking notification?

Short answer text

4. Are you satisfied with the current customer service provided ?

Yes

No

5. Are you clear with the details of your appointment notification ?

Yes

No

6. What improvements would you like to see ?

Long answer text

Appendix E All diagram

Appendix F All User Interface

Finance

The screenshot shows the Sonway Hospital Patient Info module interface. At the top, there is a header with the hospital logo, language options (ENG | 中文 | BM), and a user profile for MR. Matthew Wilson (Finance Department: Head Manager). Below the header, a banner displays a welcome message: "WELCOME, MR.Matthew". The main dashboard features several key statistics: 4507 PATIENTS, an 88% success rate for payments (Paid On time), 3966 Paid transactions, 540 Unpaid transactions, and a breakdown of delays: Delay 3 Days (64%), Delay 7 Days (24%), and Delay 30 Days (12%). To the left, a "FILTER LIST" panel includes fields for "FROM" (01 - 09 - 2023), "TO" (31 - 09 - 2023), "CATEGORY" (Neurology), "NAME" (search bar with placeholder "FOR SEARCH SPECIFIC PATIENTS" and a question mark icon), and a "SEARCH" button. To the right, a table lists patient details: Patient Name, Payment amount, Status, and a "MORE DETAILS" link. The table contains 10 entries, with the last entry being Emma Martinez (RM 7900.00, PAID). Navigation arrows at the bottom indicate page 1 of 12.

Patient Name	Payment	Status	Note
John Smith	RM 19000.00	PAID	MORE DETAILS
Sarah Johnson	RM 1120.00	PAID	MORE DETAILS
Emily Miller	RM 2460.00	PAID	MORE DETAILS
Michael Johnson	RM 12336.00	UNPAID	MORE DETAILS
David Williams	RM 676.00	PAID	MORE DETAILS
James Brown	RM 2364.00	PAID	MORE DETAILS
Christopher Davis	RM 7548.50	UNPAID	MORE DETAILS
Olivia Anderson	RM 6367.00	PAID	MORE DETAILS
Jessica Taylor	RM 2350.00	UNPAID	MORE DETAILS
Emma Martinez	RM 7900.00	PAID	MORE DETAILS

Diagram 8.1.1 Patient Info for Finance Module



CASH FLOW DIAGRAM

Patient Info

Accounting

Business Planning

Tax Payment

**WELCOME,
MR.Matthew**

FILTER LIST



FROM : 01 - 09 - 2023

TO : 31 - 09 - 2023

CATEGORY : INCOME & EXPENSES


 zoom in the cashflow diagram to get
 more details information

CASH FLOW DIAGRAM

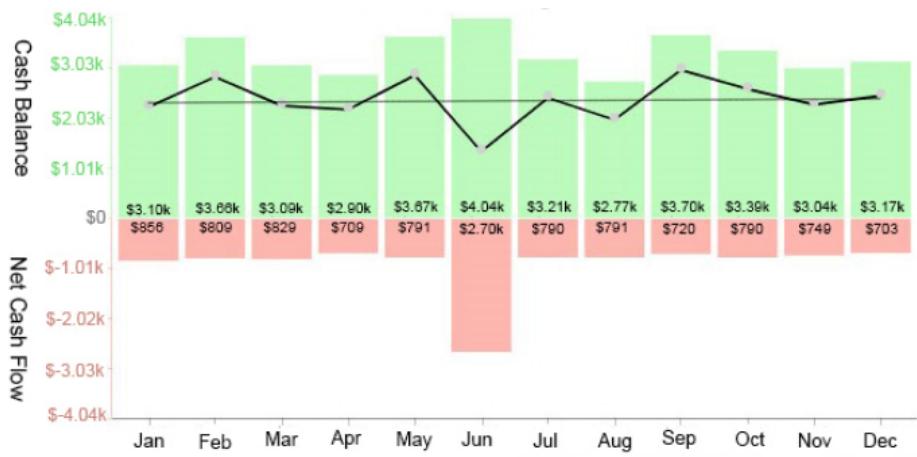


Diagram 8.1.2 cash flow diagram for Finance Module

**Record Expenditure**

Patient Info

Accounting

Business Planning

Tax Payment

WELCOME,
MR.Matthew**RECORD EXPENDITURE**

Expenditure ID

EX125397469311374

Date

01 - 09 - 2023

Amount(RM) :

11225000.00



Category :

Doctorial - Surgery Tools



Note (Optional) :

Purchase with UMMI Surgical Sdn Bhd

Repeat Income : Yes No

Repeat Every : 1 Months

End Date : 31 - 12 - 2023 **Submit**

Diagram 8.1.3 Record Expenditure for Finance Module

Inventory

The screenshot shows the inventory module of the Sonway Hospital mobile application. At the top, there is a header bar with the Sonway Hospital logo, three circular icons, and language options (ENG | 中文 | BN). Below the header is a red banner with the word "Inventory". Underneath the banner, there is a navigation bar with links: Medical | Hospital beds | Haemodialysis bays | Surgical tools. A "WELCOME" message is displayed over a background image of a medical professional's hand near medical equipment. The main content area is titled "Select an icon to track the object status" and contains four icons arranged in a 2x2 grid:

- Hospital beds: An icon of a red hospital bed with a blue plus sign above it.
- Medical: An icon of a red heart with a blue ECG line above it.
- Haemodialysis bays: An icon of a person sitting at a dialysis machine.
- Surgical tools: An icon of a pair of red surgical scissors.

At the bottom of the screen, there are two buttons: "Know more about us" and "Watch our video".

Diagram 8.2.1 Inventory Module

This is the main page of the inventory module. Staff can press the 4 icon that given to process the next operations.

Doctoral

The screenshot shows the Sonway Hospital Patient Information System. At the top, there is a header with the Sonway Hospital logo, social media icons, language selection (ENG | 中文 | BM), and a doctor's profile (DR. LESLIE WITHERS, Medical specialties: Anesthesiology). Below the header, a red banner displays "PATIENT INFO". Underneath, a navigation bar includes "ANNOUNCEMENT", "PATIENT INFO", "SCHEDULE", and "APPLY LEAVE". A large image of a doctor in a white coat is on the right.

PATIENT INFORMATION

WELCOME, DR.LESLIE

PATIENT INFORMATION

Mark Edward ID:P5024
Hospital Status : Active

Gender	Male
Age	34
Language	English/Korean
Height	1.78 m
Weight	69.5kg

Allergies Risk Level
 Peanuts Low
 Latex High
 + Add more if needed

Used Drugs

Brand name	Generic Name	Strength	Pack	Form	Manufacturer
Apo-Ciproflox	Ciprofloxacin Hydrochloride	250mg	100	Tab	Apotex Industries.
Acetaminophen	Acetaminophen	500mg	20	Pill	Perrigo Company
Amoxicillin	Amoxicillin	250mg	100	Tab	Dr. Reddy's Laboratorie..
Atorvastatin	Atorvastatin	250mg	100	Susp.	Pfizer Inc.
Cyclobenzaprine	Cyclobenzaprine Hydrochloride	250mg	100	Tab	Apotex Industries.
Lyrica	Pregabalin	250mg	100	Syrop	Pfizer Inc.

Diagram 8.3.1 Patient Information for Doctoral Module

PATIENT INFO

[ANNOUNCEMENT](#) [PATIENT INFO](#) [SCHEDULE](#) [APPLY LEAVE](#)

**WELCOME,
DR.LESLIE**



PATIENT INFORMATION


Mark Edward ID:P5024

Hospital Status : Active

Gender Male

Age 34

Language English/Korean

Height 1.78 m

Weight 69.5kg

[General](#) [Insurance](#) [Family](#) [Copay](#) **Health**

Vaccination

 Chicken Pox (Varicella) : **Vaccinated**
 Measles : **Vaccinated**
 Hepatitis B : **Not Vaccinated**
 Covid-19 : **Vaccinated**

Health Examination Record

 Blood Pressure : 120/80 mm Hg
 Heart Rate : 70 bpm
 Temperature : 37°C

Physical Examination Findings:

General Appearance

Well-nourished, alert



Skin

Rashes, sore



Eyes

Bloodshot



Ears/Nose/Throat

Sore throat, ears and nose appears to be normal



Cardiovascular

Regular heart rate



Respiratory

Difficulty in breathing



Abdomen

Non-tender



Musculoskeletal

please enter patient current condition



Please enter the result of the patient's musculoskeletal check-up, joint mobility, muscle strength condition etc.



Date	Medical History
	[No medical history]

Diagram 8.3.2 Patient Information for Doctoral Module

PATIENT INFO

[ANNOUNCEMENT](#) [PATIENT INFO](#) [SCHEDULE](#) [APPLY LEAVE](#)
**WELCOME,
DR.LESLIE**


PATIENT INFORMATION


Mark Edward ID:P5024

Hospital Status : Active

Gender Male

Age 34

Language English/Korean

Height 1.78 m

Weight 69.5kg

Allergies **Risk Level**

 Peanuts Low

 Latex High

+ Add more if needed

[General](#) [Insurance](#) [Family](#) [Copay](#) **Health**
Vaccination

 Chicken Pox (Varicella) : Vaccinated

 Measles : Vaccinated

 Hepatitis B : Not Vaccinated

 Covid-19 : Vaccinated
Health Examination Record

Blood Pressure : 120/80 mm Hg

Heart Rate : 70 bpm

Temperature : 37°C

Physical Examination Findings:
General Appearance

Well-nourished, alert


Skin

Rashes, sore


Eyes

Bloodshot


Ears/Nose/Throat

Sore throat, ears and nose appears to be normal


Cardiovascular

Regular heart rate


Respiratory

Difficulty in breathing


Abdomen

Non-tender


Musculoskeletal

Normal


 Record Saved
undo changes

Diagram 8.3.3 Patient information for Doctoral Module



Record Saved!

You have successfully record down patient's record!

OK



Undo?

Are you sure you want to undo the previous task?

Undo

Cancel



Error!

You have to fill up the record document to proceed!

Try Again

Diagram 8.3.4 Message for Doctoral Module

CRM

The screenshot shows the homepage of the Sonway Hospital website. At the top left is the Sonway Hospital logo with a caduceus symbol. At the top right are social media icons for Facebook, Instagram, and Twitter, followed by language options "ENG | 中文 | BM". Below the header is a navigation bar with links: ANNOUNCEMENT, DOCTOR'S SCHEDULE, BOOK APPOINTMENT, PAYMENT, and GIVE FEEDBACK. The main title "Compassion In Care" is prominently displayed. A blue callout box on the left contains the text: "We work hard to provide outstanding services for you and the people you care for." Below it is a search bar with the placeholder "Need anything?". To the right of the title is a group photo of five healthcare professionals (three men and two women) in white coats and scrubs, standing with their arms crossed. At the bottom left is another smaller image showing a group of healthcare workers in a meeting around a tablet device. On the right side, there is a large blue section containing the text: "Healthcare for you. Services Offered: • Acute surgical conditions • Medical emergencies • Sports injuries • Trauma/accident injuries • Other emergencies • 24-hour pharmacy services • 24-hour laboratory (blood test) services • 24-hour imaging services (X ray, CT scan etc)".

Diagram 8.4.1

Emergency Hotline : +60 11-111 1111 Ambulance: +60 22-222 2222

[ANNOUNCEMENT](#) [DOCTOR'S SCHEDULE](#) [BOOK APPOINTMENT](#) [PAYMENT](#) [GIVE FEEDBACK](#)

Looking for a specific doctor ?

Any Specialty

Dr Mark
UROLOGY[Doctor's Schedule](#)Dr Manfred
Cardiology[Doctor's Schedule](#)Dr Madeline
UROLOGY[Doctor's Schedule](#)Dr Emily
Cardiology[Doctor's Schedule](#)Dr Aloy
General Surgery[Doctor's Schedule](#)Dr Lynette
General Surgery[Doctor's Schedule](#)

Diagram 8.4.2



Dr Mark

Specializes in : Urology

Contact Info:

HP : +60-12 333 4459

Email : drMark@mail.com

Book
Appointment

Proceed to booking

Languages:

English, Malay, Mandarin, Cantonese, Hokkien

Gender:
Male

Qualifications:

MBBS (India), MS (UM), AM (UM), Fellowship in Metabolic, Bariatric & Advanced Laparoscopic Surgery (France)

Assistant:
N/A



Diagram 8.4.3



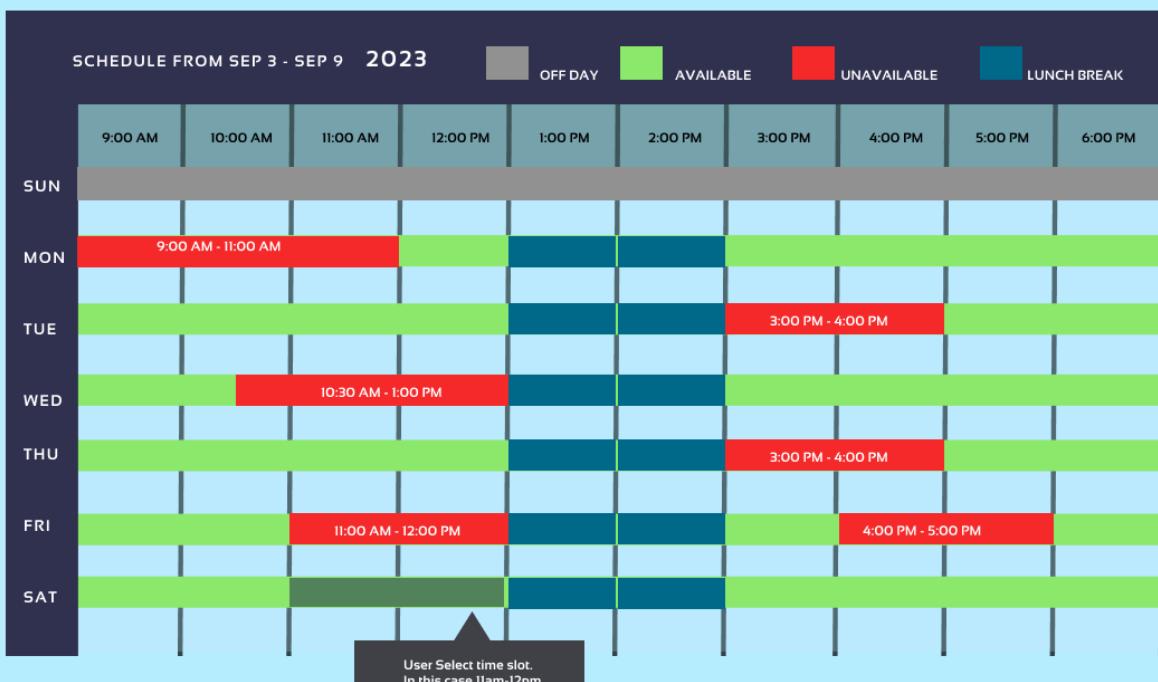
Dr Mark

Specializes in :
Urology

Contact Info:

HP : +60-12 333 4459

Email : drMark@mail.com



**Book
Appointment**

Diagram 8.4.4



Confirm ?

Confirm to book appointment at said time ?

Confirm

No

Diagram 8.4.5



Booked !

You have successfully booked an appointment.

OK



Error!

Appointment booking failed !

Try Again

Diagram 8.4.6



Dr Mark

Specializes in :
Urology

Contact Info:

HP : +60-12 333 4459

Email : drMark@mail.com



Book
Appointment



Booking Request Submitted!

[Undo?](#)

Diagram 8.4.7



WELCOME

Mark Edwards

HP : +60 19 666 8345

Address: No 09, 2/10 Taman Address, 40091, Klang, Selangor

Insurance Provider: MSIG Insurance



For user to edit profile

Your upcoming appointments

Appointment Date
(DD/MM/YYYY)

Appointment Time

Appointed Doctor

04/9/2023

9:00 AM - 11:00 AM

Dr Lesley

[Cancel
Appointment](#)

[Reschedule
Appointment](#)

Diagram 8.4.8

CRM

ANNOUNCEMENT

PATIENT INFO

SCHEDULE

APPLY LEAVE

WELCOME,
Mr Jake



Today's Appointments

150



Doctors On Duty

40



New Feedback

45



Enter Patient Name



Enter Doctor Name

Patient

Time

Doctor

John Smith	10:00 AM - 11:00 AM	Dr. Anderson
Sarah Johnson	11:15 AM - 12:15 PM	Dr. Ramirez
Michael Davis	2:30 PM - 3:30 PM	Dr. Patel
Emily Wilson	3:30 PM - 4:30 PM	Dr. Lee
David Brown	4:30 PM - 5:30 PM	Dr. Anderson
John Doe	10:00 AM - 12:00 PM	Dr. Andy
Mary Monroe	11:00 AM - 12:00 PM	Dr. Ramirez
Manfred Davis	2:30 PM - 3:30 PM	Dr. Patel
Emily Watson	3:30 PM - 4:30 PM	Dr. Lee
David Hunter	4:30 PM - 5:30 PM	Dr. Martinez

Diagram 8.4.9

CRM

[ANNOUNCEMENT](#)[PATIENT INFO](#)[SCHEDULE](#)[APPLY LEAVE](#)

WELCOME,
Mr Jake



Today's Appointments

150



Doctors On Duty

40



New Feedback

45

Negative Reviews (3)

John Smith	Extremely Dissatisfied
Emily Wilson	Dissatisfied
David Brown	Unsatisfied

Positive Reviews (42)

John Doe	Extremely	Extremely Satisfied
Emily Hunter		Extremely Satisfied
Sarah Brown		Extremely Satisfied
Manfred Smith		Satisfied
Mary Wilson		Satisfied
Lesley Ulrich		Great

Diagram 8.4.10



Error!

Patient Not Found!

Try Again



Error!

Staff Not Found!

Try Again

Diagram 8.4.11