UTM
UNIVERSITI TEKNOLOGI MALAYSIA

PHASE 1: Project Proposal & Database Requirement

SECD2523 - 08 Database

SEMESTER I, SESSION 2023/2024

Lecturer: Dr. Noor Hidayah Zakaria

Group name: 6G

Group members:

IVLYN TAY WAN ROU	A22EC0168
JOLYN LIN XIN EN	A22EC0127
TAN YUN XI	A22EC0282
YAP JUN CHENG	A22EC0294

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1.0 Introduction

A physiotherapy clinic system serves as a comprehensive online platform that allows people to access services, online medical resources and databases to know more about their health conditions and treatments from anywhere with internet connectivity. It has made our lives easier and more convenient than in the past by eliminating the need for physical presence. This includes booking appointments for consultants, treatment, and supplements.

One of the primary benefits of this system lies in its capability to facilitate various essential tasks online. Patients can seamlessly book appointments for consultations, treatments, and supplements without needing to visit the clinic physically. This convenience significantly improves the overall patient experience, especially for individuals facing challenges in traveling to the clinic due to distance or physical limitations.

However, despite the system's considerable advancements, there exist several persistent issues that hinder its optimal functionality. The current system encounters occasional slowdowns, impacting its overall efficiency. Moreover, while the system does offer online booking services, it lacks friendly reminders and digital feedback forms, essential for enhancing patient engagement and service improvement.

Understanding these deficiencies, our team has embarked on an in-depth study focused on enhancing the existing physiotherapy clinic system at PKU UTM. Our objective is to address these challenges comprehensively, aiming to revamp the clinic's operations and optimize patient experiences. We aspire to bridge the existing gaps by proposing significant enhancements across various aspects of the healthcare system at PKU UTM. These enhancements include but are not limited to, simplifying appointment booking, introducing friendly reminders, implementing digital feedback mechanisms, and addressing system slowdowns.

Our strategy prioritizes aligning the system with modern healthcare demands and using the most recent technological breakthroughs. By optimizing system functionality, automating essential processes, and placing a strong emphasis on patient-centric care, our goal is to create a more efficient, accessible, and patient-friendly healthcare environment at PKU UTM. This initiative aims to cater to the diverse needs of patients while facilitating a seamless and satisfactory healthcare experience for all.

2.0 Background Study

The proposed Physiotherapy Clinic Information Management System aims to improve healthcare services by introducing complete automation to the daily functions of a clinic in UTM. After our team interviewed Aidaliza binti Asmuni, a medical therapist in PKU UTM, we found that the current healthcare system lacks an effective way to remind patients of the appointment time. They can only remind patients of the appointment time by sending emails. This approach often leads to patients overlooking emails, resulting in missed appointments and reduced work efficiency.

Additionally, to reduce the risk of potential data loss, clinic staff currently manually record patient information into physical books as a backup, this in result leads to operational inefficiencies. Moreover, there is currently no digital feedback mechanism available to enable patients to provide valuable insights into their treatment experience. This absence limits the clinic's ability to gather crucial feedback directly from patients, hindering the establishment of a continuous improvement cycle for healthcare services.

Furthermore, the existing system suffers from occasional slowdowns, further affecting the clinic operations. Our team is confident that these challenges can be effectively addressed through the implementation of our enhanced database applications. The system aims to automate patient appointment reminders, eliminate manual data entry, reduce paperwork, introduce a digital feedback mechanism and enhance the overall efficiency of UTM healthcare services.

3.0 Problem Statement

3.1 Lack of effective ways of appointment reminder

The current physiotherapy clinic system at PKU UTM has several limitations of function that impact its functionality and efficiency. The first limitation is the system is not effective enough when it comes to appointment reminders. The appointment reminder mechanism of the system is only using email to push reminders to the patients. This often leads to overlooked messages and missed appointments by patients as email is not the main communication platform that is used by the people. Other than that, users' email may overload due to the large number of email they receive daily, promotional emails, newsletters, and other communications, appointment reminders may get buried or overlooked.

3.1 Heavy reliance on manual data entry

The heavy reliance on manual data entry to record patient information physically leads to clinic operational inefficiencies. The manual data entry led to errors that are caused by typos, misinterpretation of handwriting, or accidental keystroke mistakes. These errors can lead to inaccuracies in patient records, potentially impacting treatment plans and overall clinic operations. Manual data entry is time-consuming as it takes time for physiotherapists to input data manually, especially in a busy healthcare environment where speed and accuracy are crucial. The staff members spending excessive time on data entry may detract from other critical tasks, slowing down overall processes.

3.3 Lacking of structured feedback system

The absence of a structured feedback system limits the clinic's ability to gather insights to improve their services. This will cause the inability to identify weaknesses of the system. A structured feedback system allows patients to highlight specific aspects of their experience that might need improvement. Without this system, the clinic might be unaware of weaknesses in its processes, communication, or service delivery that could negatively impact patient satisfaction. This also will let the system miss the opportunities for improvement. A structured feedback provides actionable insights that the clinic can use to make targeted improvements. The clinic may miss opportunities to address issues and enhance the overall quality of care and patient satisfaction.

4.0 Proposed Solutions

4.1 Solutions

Appointment Reminder Module

The appointment reminder module streamlines patient communication by sending timely alerts via SMS and email. Automated reminders can be set at fixed intervals before appointments, such as 24 hours or 1 week in advance. Custom recurrence patterns ensure periodic reminders until the appointment is complete. Reminder rules can be tailored to patient preferences, with options for SMS or email notifications. Each channel can be configured with specific sender details and personalized content.

The module integrates seamlessly with the scheduling system to automatically pull appointment details for patients and apply the reminder rules without manual entries. This ensures accuracy and ease-of-use. From the patient's perspective, facilities for rescheduling or canceling appointments directly through the notification messages add convenience. Overall, the automated notifications significantly reduce reliance on manual efforts for sending updates, improving productivity for the clinic. Technically, building callable interfaces to email and SMS gateways using custom arguments will enable meeting solution requirements.

Digital Patient Records Module

Consolidating patient records into standardized digital profiles eliminates fragmented information storage across various notebooks, files, or paper sources. This digital management module allows creating customized files for each patient containing demographic details, historical consultation data, treatment details, medical reports, and more. Structured sections organized by information categories enable systematic storage that is also scalable. Role-based access for staff ensures that only authorized personnel can access patient records, preserving confidentiality. Authentication protocols further safeguard sensitive data.

The in-system access interface offers quick updating and retrieval of records, minimizing delays compared to manual file keeping. Backup mechanisms like data warehouses or repositories guarantee the prevention of data losses that may occur due to misplaced physical files. Technically, the solution employs systematic database modeling approaches, data normalization principles, and other techniques to create unified data environments with relational mapping between patient-consultation entities and associated diagnosis/treatment codes for standardized capture.

Feedback module

Enabling seamless feedback channels is crucial for understanding patient perspectives and identifying areas for service improvement. The proposed solution offers simple interfaces tailored to open-ended or rating-based question types that patients can easily navigate post-consultation. The submission mechanism instantly collates inputs into a central repository. Automated analytics help extract holistic or granular insights from the data through metrics for satisfaction trends, complaint volumes, or experience quality covering various clinic interaction points.

Reporting modules track metrics over time, helping identify which processes need enhancement, whether appointment scheduling, treatment delivery, or patient interactions. The technical architecture encompasses front-end form creation, data ingestion pipelines to data lakes, and business intelligence services for flexible analysis. Security configurations uphold anonymity, allowing transparency without compromising patient privacy. The system effectively captures patient sentiment with minimal manual intervention, aiding data-driven decision-making.

Enhanced Data Analytics Module

The proposed implementation of an enhanced data analytics module ties directly to the outlined objective of institutionalizing comprehensive analytical capabilities, leveraging the wealth of operational and patient data within the clinic systems to drive visibility into performance improvement areas. By consolidating dispersed information streams into a centralized data warehouse architecture, state-of-the-art business intelligence techniques can be employed through customized dashboards to elucidate trends, patterns and thresholds across pivotal metrics pertaining to treatment efficacies, patient outcome variances, resource allocation rationalization, appointment wait times and patient satisfaction scoring with a granular approach that facilitates drilling into reports for deeper insights.

The automated generation of alerts around critical levels combined with flexible filters across key parameters provides a sound framework upon which data-driven decision capabilities can rest to serve administrative insights. From a patient impact standpoint, systematically addressing the surfaced improvement areas catalyzes incremental upgrades. While BeautifulSoup financial returns are foreseeable over suitable horizons, some lead time for information discipline establishment among staff deserves incorporation. With concerted focus, adopting this analytics-based approach to performance assessment serves as a prospective pathway.

4.2 Feasibility Study

Technical Feasibility

The technological solutions proposed utilize well-established and widely-adopted web and mobile platforms, lending confidence in their viability for development. By leveraging existing APIs and interfaces offered by SMS, email, and cloud hosting providers, the required integrations to enable appointment reminders, storage scalability, and other functionalities carries low complexity. Basing the front and back-end system components around mainstream stacks like ReactJS, MongoDB, and containerized deployment via Docker also promotes interoperability and technical accessibility. Additionally, our design considerations around reusability, modularity (via microservices), and security standards conformity further reinforce the technical soundness. Therefore, with due accommodation for refinement through prototyping, technical risks are markedly low for the solution pathways.

Economic Feasibility

By strategically incorporating open-source technologies and configurable cloud infrastructure services rather than relying on fixed on-premise servers or licensing costs, the solution aims to optimize budgetary expenditures in a scalable manner. Usage-based pricing models around communication channels like SMS and email further allow cost variability to map actual activity patterns rather than overprovisioning. There is cognizance that development work requires suitable resourcing and that expanding client base and solution sophistication over time would raise recurring cloud utilization charges. However, mitigating existing manual costs around records handling and building data capabilities to enhance patient value and experiences can off-balance the incremental solution investments.

Operational Feasibility

The workflow continuity, infrastructure integration, change enablement aspects, and cyclical refinement possibilities considered in the solution framework directly address boosting adoption and day-to-day viability. Upholding current clinic processes while infusing digital enhancements and self-service interfaces aims to smoothen role transitions and system acceptance. The cloud's inherent scalability lends operational latitude to accommodate rising user loads as clientele expands. Similarly, structured testing and version control through the development lifecycle enhances field reliability and support readiness. The API-connected configuration plus access provisioning based on user personas diminish change friction and foster usage clarity. Regular prototyping cycles and modular architecture allow incorporating feedback, underpinning flexibility.

5.0 Objectives

- To design a dedicated system module for physiotherapists to view, document, and manage patients' dental histories efficiently
- To develop and implement a user-friendly appointment booking system that enhances scheduling efficiency for both clinic staff and patients
- To design an automated appointment reminder module to notify patients in advance about their upcoming appointments
- To establish a structured feedback collection system to gather feedback from patients regarding their overall satisfaction with the clinic's services.
- To generate analytical tools within the system to produce comprehensive reports on clinic performance and patient outcomes,

6.0 Scope

6.1 Project Scope

We are developing a system that can easily help the clinic staff to update the patient's information and automate the appointment scheduling and reminder system. The system will require users, medical therapists and patients, to register accounts using their email addresses to ensure secure access to the system.

Two primary user types are identified within the system: medical therapists and patients.

For Medical Therapists:
Medical therapists using the system will have access to features allowing them to efficiently view and record patient medical histories, manage appointment schedules, the elimination of manual data entry for patient records, and access the feedback form. The system will include modules for seamlessly updating patient records, ensuring accurate and up-to-date information. Appointment reminders will be automated, enhancing patient engagement throughout their treatment course.

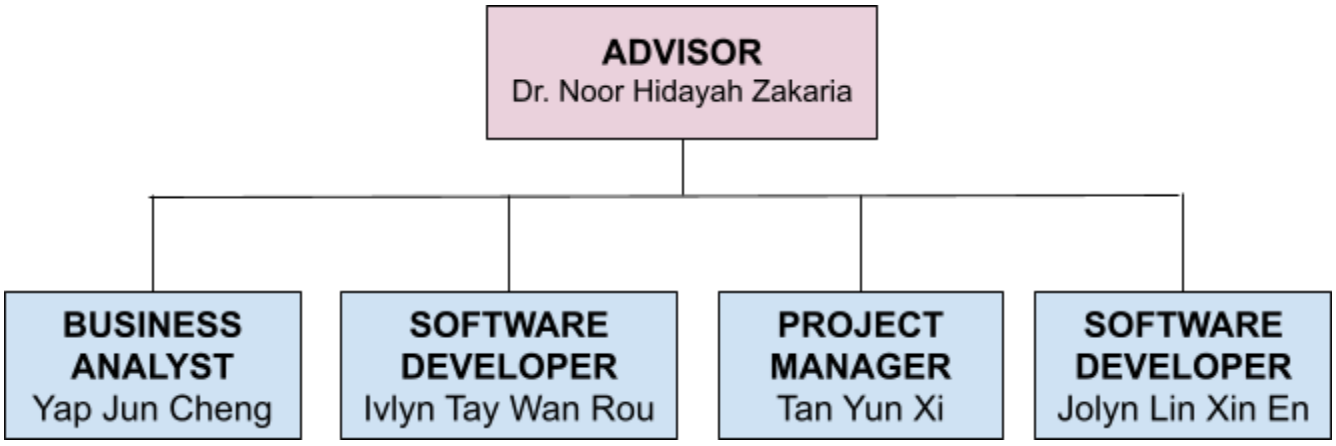
For patients:
Patients using the system will have the ability to provide valuable feedback through an accessible form within the system. This feature aims to gather valuable insights on their experience, allowing the clinic to continually improve its services. The system will automatically send appointment reminders to patients, enhancing communication and reducing the likelihood of missed appointments. Reminders may be delivered through various channels such as email or SMS, based on patient preferences.

6.2 System Boundaries

This system will include patient information management which allows the medical therapist to upload and update patients information, automated appointment scheduling and appointment reminder system to allow the clinic staff to efficiently manage the booking of medical therapist appointments. Lastly, the system provides the feedback submission through which patients can submit feedback through an accessible form within the system, contributing to continual service improvement and enhancing the patient experience.

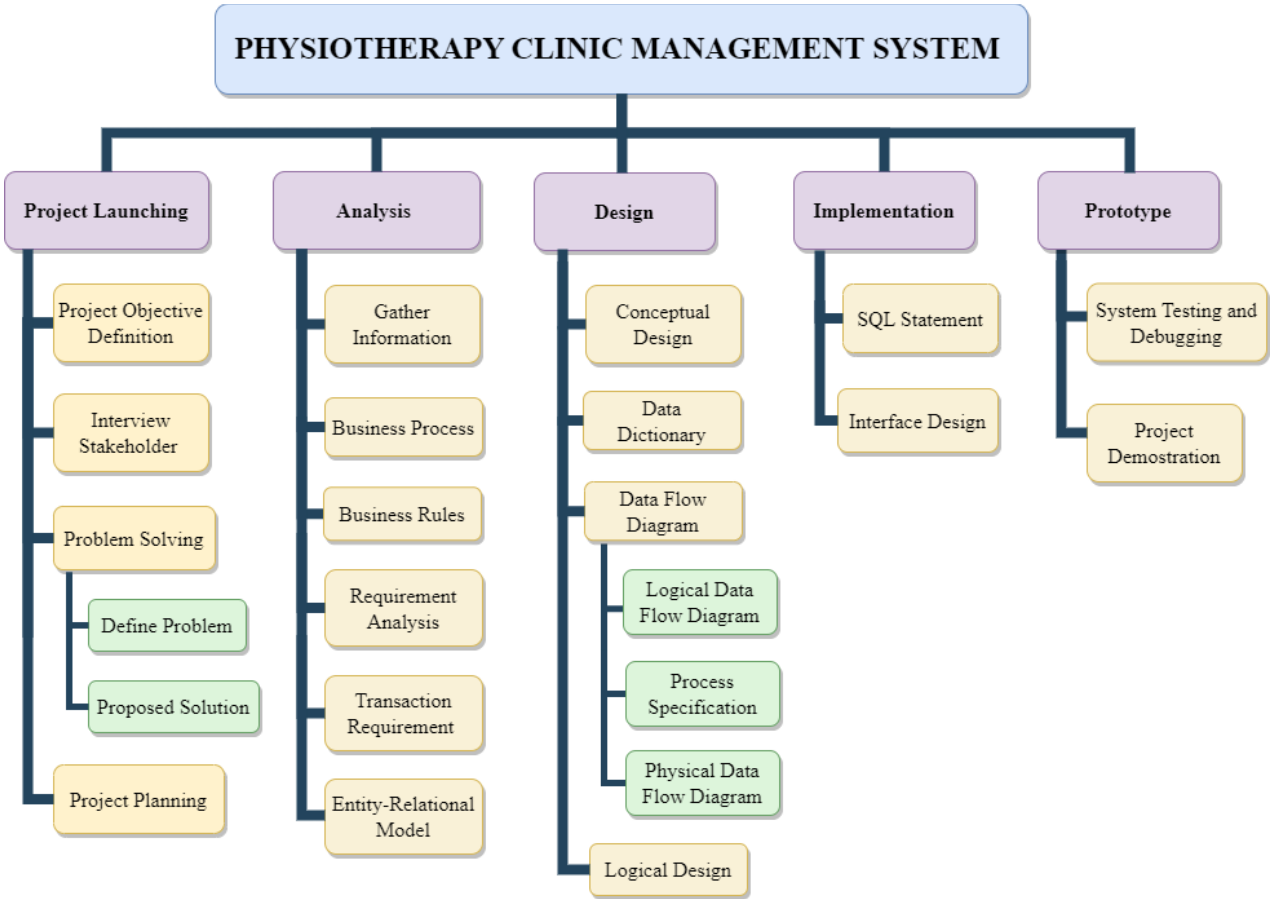
7.0 Project Planning

7.1 Human Resource



Role	Person In Charge	Responsibility
ADVISOR	Dr. Noor Hidayah Zakaria	• Review the progress of the project • Offer guidance to enhance the project
PROJECT MANAGER	Tan Yun Xi	• Create a detailed project plan • Define roles and responsibilities for each member • Monitor project work
SOFTWARE DEVELOPER	• Ivlyn Tay Wan Rou • Jolyn Lin Xin En	• Develop data • Conduct system testing • Fix bugs
BUSINESS ANALYST	Yap Jun Cheng	• Analyze data requirements • Conduct feasibility studies • Gather feedback from stakeholders

7.2 Work Breakdown Structure (WBS)



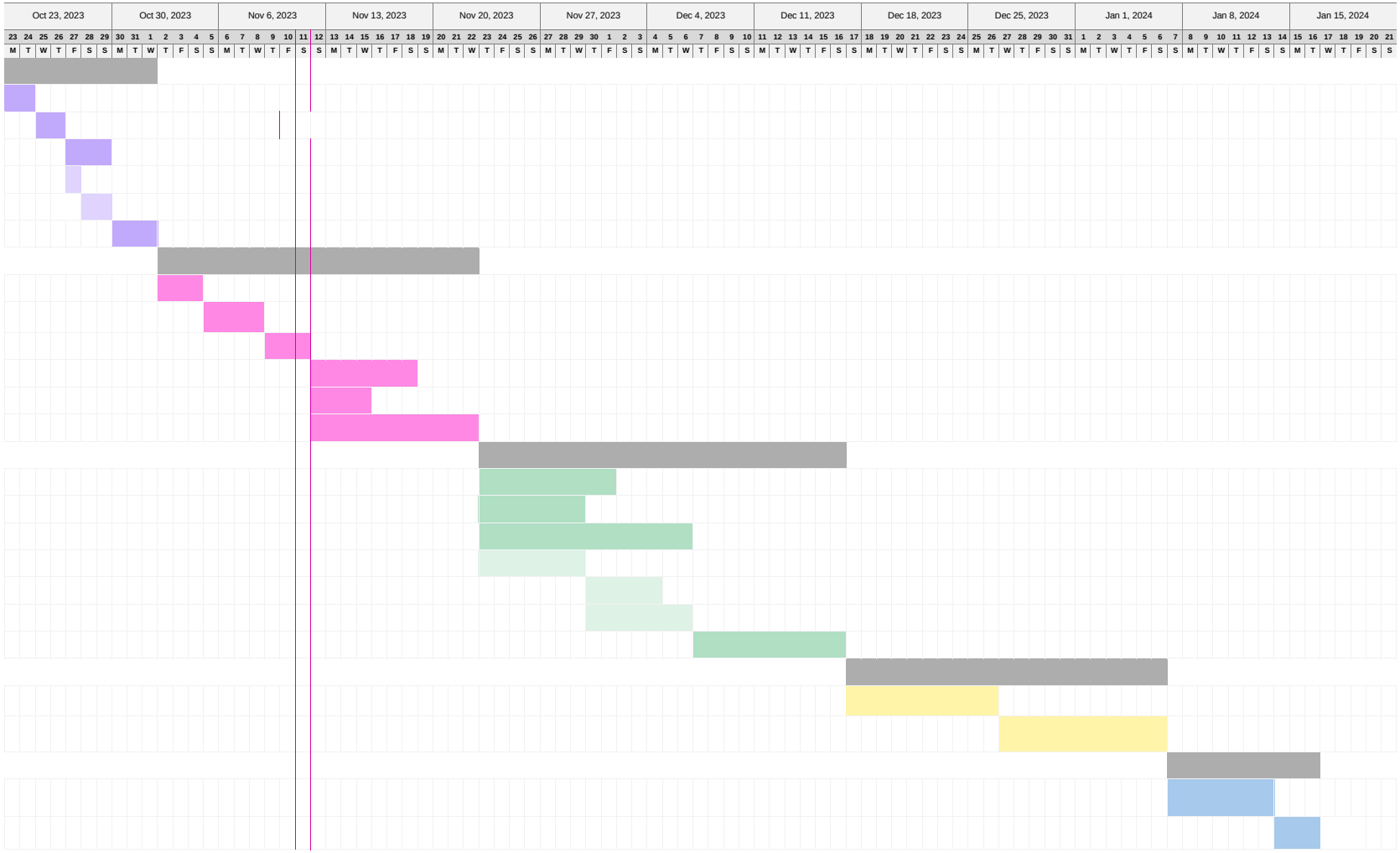
7.3 Gantt Chart

Physiotherapy Clinic Management System

Project start: **Mon, 23/10/2023**

Display week: **1**

TASK	DURATION	START	END
Project Launching	10 days	23/10/23	1/11/23
Project Objective Definitio	2 days	23/10/23	24/10/23
Interview Stakeholder	2 days	25/11/23	26/11/23
Problem Solving	3 days	27/11/23	29/11/23
Define Problem	1 days	27/10/23	27/10/23
Proposed Solution	2 days	28/11/23	29/11/23
Project Planning	3 days	30/10/23	1/11/23
Analysis	21 days	2/11/23	22/11/23
Gather Information	3 days	2/11/23	4/11/23
Business Process	4 days	5/11/23	8/11/23
Business Rules	3 days	9/11/23	11/11/23
Requirement Analysis	7 days	12/11/23	18/11/23
Transaction Requirement	4 days	12/11/23	15/11/23
Entity-Relational Model	11 days	12/11/23	22/11/23
Design	24 days	23/11/23	16/12/23
Conceptual Design	9 days	23/11/23	1/12/23
Data Dictionary	7 days	23/11/23	29/11/23
Data Flow Diagram	13 days	23/11/23	6/12/23
Logical Data Flow Diag	7 days	23/11/23	29/11/23
Process Specification	5 days	30/11/23	4/12/23
Physical Data Flow Di	7 days	30/11/23	6/12/23
Logical Design	10 days	7/12/23	16/12/23
Implementation	21 days	17/12/23	6/1/24
SQL Statement	10 days	17/12/23	26/1/24
User Interface Design	11 days	27/1/24	6/1/24
Prototype	10 days	7/1/24	16/1/24
System Testing and Debugging	7 days	7/1/24	13/1/24
Project Demostration	3 days	14/1/24	16/1/24

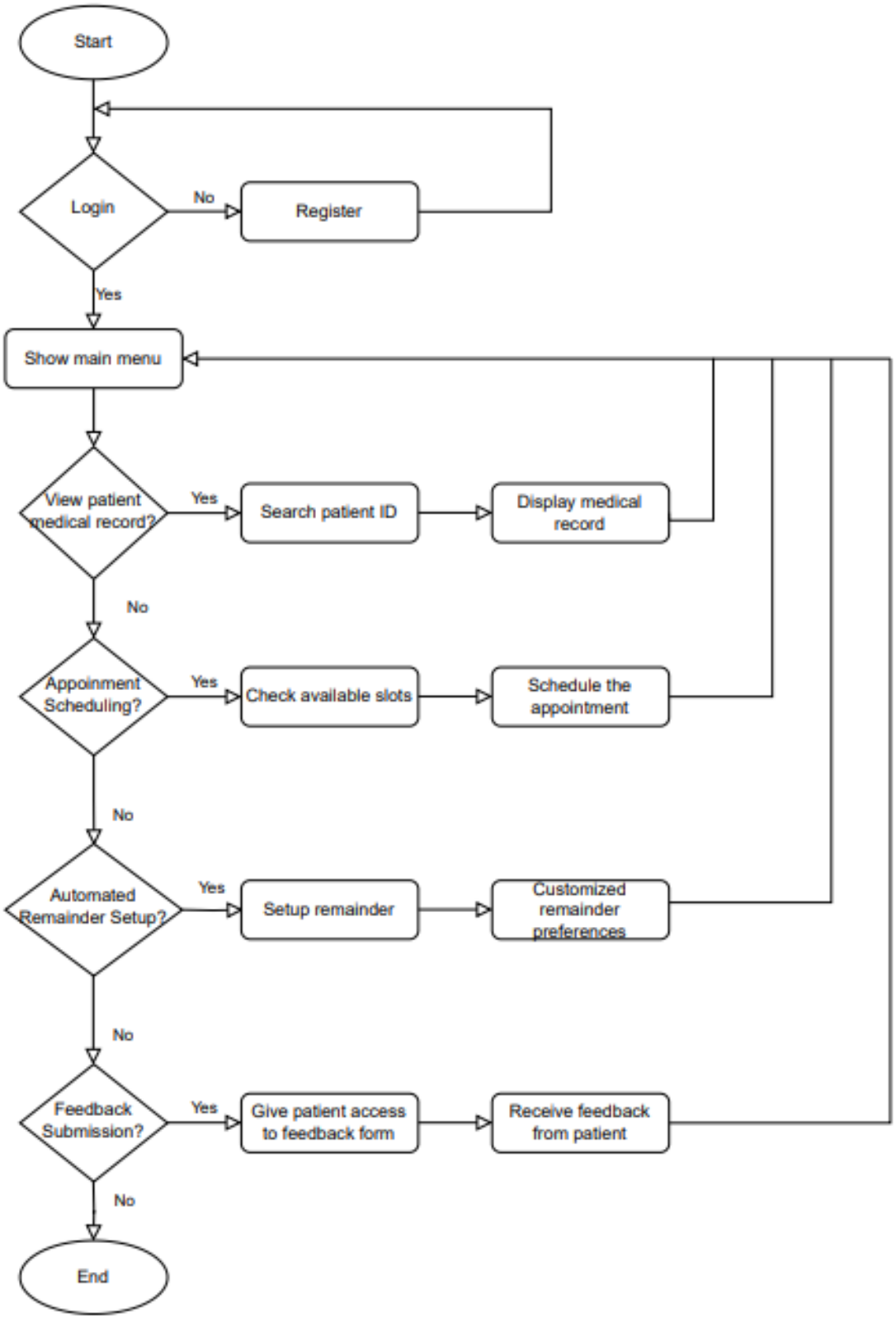


8.0 Requirement Analysis (based from AS-IS analysis)

8.1 Current business process (scenarios, workflow)

Here are the scenarios and workflow of current business process for stakeholder:

1. Login to the system
2. Show main menu
3. View Patient Medical History
    a. Search patient ID
    b. Display medical record
4. Appointment Scheduling
    a. Check the availability slots
    b. Schedules the appointment based on the available slots
5. Automated Reminder Setup
    a. set up automated reminders for the patient
    b. customize reminder preferences (e.g: email, Whatsapp, SMS)
6. Feedback Submission
    a. Patients need to fill in the feedback form manually
    b. Receive feedback from patient by collecting the form



AS-IS System Workflow

8.2 General Requirement

8.2.1 Performance

I. The system should provide quick response times for retrieving patient records, ensuring that stakeholders can access medical information efficiently.

II. The system should enable rapid and efficient appointment scheduling, minimizing the time taken to check slot availability and finalize appointments.

III. The automated reminder system should deliver notifications promptly, ensuring timely alerts for patients without delays.

8.2.2 Security

I. Patient information stored in the system should be encrypted, ensuring the confidentiality and integrity of sensitive health records.

II. Role-based access controls should be implemented, ensuring that only authorized personnel (clinic staff) have access to specific functionalities and patient data.

III. The system should implement robust data backup and recovery mechanisms to protect against data loss and ensure the continuity of services.

9.0 Transaction requirement

9.1 Data Entry

- Enter the information of patients
- Enter the date and time for appointments
- Enter the details of the treatments
- Enter the referral doctor of the patients

9.2 Data Update/Delete

- Update/Delete the information of patients
- Update/Delete the scheduled appointments
- Update/Delete the details of the treatments
- Update/Delete the referral doctor of the patients
- Update/Delete the patient feedback

9.3 Data Queries

- List details of information of patients
- List details of scheduled appointments
- List details of patients' appointment history
- List details of patient feedback
- Identify the patient id and name
- Identify the appointments made by the patients
- Display the patients' information
- Display the patients' treatment history

10.0 Benefit and Summary of Proposed System

Physiotherapy Clinic Information Management System is the system that we proposed to achieve complete automation of the clinic's daily functions in order to improve the work efficiency of the clinic. We decided to propose this system because we observed some problems faced by the clinic staff and patients. For instance, the staff can only remind their patients of the upcoming appointment by sending emails. It is not convenient especially for the patients who seldom check their email such as the elderly. Based on the problems faced by our stakeholders, we suggested several useful functions to be included in this system to overcome the problem and make our objectives come true in our project. These functions bring benefits for the users using this system.

Clinic staff benefits:

From the proposed system, the staff can clearly and efficiently manage patient appointments and treatment schedules. The automated appointment reminder system ensures timely alerts to patients, overcoming the limitation of relying solely on email notifications. Additionally, the system enables staff to access and update patient records seamlessly, reducing the administrative burden associated with manual data entry. This functionality not only enhances the clinic's operational efficiency but also contributes to a more organized and effective patient management process.

Patient benefits:

Patients benefit from the proposed system through improved accessibility and communication. The introduction of alternative channels for appointment reminders, such as SMS notifications, caters to individuals who may not frequently check their emails, particularly the elderly. The user-friendly interface

makes it easier for patients to interact with the system, providing a more convenient and streamlined experience. Moreover, the system empowers patients to submit feedback effortlessly, fostering a patient-centric approach to healthcare services and ensuring continuous improvement based on their valuable insights.

In summary, the Physiotherapy Clinic Information Management System is designed to address the challenges faced by clinic staff and patients, enhancing overall work efficiency and patient experience. The proposed functionalities not only streamline clinic operations but also prioritize accessibility and communication, ultimately contributing to the improvement of healthcare services in the clinic.

11.0 Summary

The proposed Physiotherapy Clinic Information Management System at UTM is a comprehensive solution designed to tackle the clinic's primary operational challenges. It focuses on four core areas: an advanced Appointment Reminder system, Digital Patient Records, a Feedback mechanism, and an Enhanced Data Analytics module. Currently, the clinic grapples with an inefficient appointment reminder system, labor-intensive manual patient data handling, a lack of digital avenues for patient feedback, and intermittent system slowdowns causing workflow disruptions. By addressing these pain points, the system aims to streamline processes, diminish operational risks, and elevate patient care and satisfaction.

This innovative system signifies a modern, data-driven approach to healthcare management, providing solutions crafted with the future in mind. By uniting structured, effective communication, advanced record-keeping, patient service enhancement, and insightful data analysis under one umbrella, the proposed system goes beyond mere operational efficiency. It elevates the clinic's commitment to quality patient care and positions the facility as a champion of technological adaptation in healthcare. Additionally, the system's emphasis on cost-effective open source technology ensures an affordable solution that is within reach for most medical practices. Furthermore, by conducting feasibility studies, the team underscores their commitment to thorough preparation and strategic planning. This project is ground-breaking and sets an inspiring example for comparable facilities to digitize their operations, promoting streamlined service, improved patient satisfaction, and informed decision-making within the complex ecosystem of healthcare.

The upgraded Appointment Reminder system aims to prevent missed appointments through timely and effective patient communication. Transitioning to Digital Patient Records will replace outdated manual

methods, ensuring efficiency, security, and accessibility of patient data while minimizing paperwork. Introducing a Feedback mechanism allows the clinic to capture vital patient experiences, paving the way for continuous improvements in care quality. Lastly, the Enhanced Data Analytics module empowers decision-making, optimizing clinic operations and service delivery.

Feasibility assessments encompass technical, economic, and operational aspects. Leveraging established communication platforms and cost-effective open-source technologies ensures affordability without compromising performance. A meticulous approach to operational integration seeks to minimize disruptions during implementation.In essence, this proposed system promises a transformative shift toward efficiency, superior patient care, and data-informed decision-making. It signifies the clinic's commitment to embracing technological advancements and adapting to a modern healthcare delivery model. This forward-thinking initiative sets a commendable example for similar healthcare institutions grappling with operational challenges, encouraging them to consider digital transformation for improved outcomes.