UTM

UNIVERSITI TEKNOLOGI MALAYSIA

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PROJECT PROPOSAL

LECTURER: DR.NOOR HIDAYAH BINTI ZAKARIA

[redacted]

NAME	MATRIC NO.
[redacted]	[redacted]
[redacted]	[redacted]
[redacted]	[redacted]

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1.0 Introduction

In today's era, dental clinics have become a location that is frequented by modern people from time to time. In this fast-paced era, busy people prefer efficient appointment management systems that will help them save more time for other things. Traditional methods of appointment scheduling often lead to inefficiencies, inaccuracies, and extreme challenges in maintaining the optimal balance between the availability of dental professionals and the unique needs of patients.

Effective appointment management is the cornerstone of providing quality patient care and maintaining the operational efficiency of a dental office. The sophistication of the appointment management system will affect the patient's experience. In addition, an efficient appointment system can streamline the daily operations of a dental office and reduce the workload of dentists and nurses. Therefore, the development of a dental appointment rescheduling system is an innovative solution. We hope to improve the scheduling process, minimize wait times and enhance the overall patient experience. Indirectly, this will help dental clinics to reduce the burden on staff and increase the number of customers.

2.0 Background Study

Current dental practices are facing challenges in effectively managing appointment schedules, resulting in high patient absenteeism and operational inefficiencies. Current appointment management systems rely on manual processes that inconvenience both patients and clinic staff. The lack of an automated reminder system can lead to missed appointments, which negatively impacts operational efficiency and patient experience. Additionally, clinics' reliance on traditional paper records carries the risk of data entry errors, hindering the seamless management of patient information and treatment plans.

To address these challenges, the Dental Appointment and Rescheduling System proposal aims to introduce a comprehensive solution that transforms clinics into digital platforms. The system combines features such as automated reminders, real-time appointment management, and centralized digital record keeping to systematically address identified issues. The system not only enhances the patient experience by providing convenient and user-friendly appointment booking services but also streamlines clinic operations, reduces

administrative burden, and improves overall efficiency. The integration of user-friendly mobile apps and automation of administrative tasks is expected to modernize the clinic's approach and align it with contemporary healthcare management standards.

This project aims to optimize the operational workflow of the dental clinic, ensuring a seamless, technology-driven approach to appointment scheduling and record keeping. By addressing the core issues outlined in the current system, the Dental Appointment and Rescheduling System aims to increase patient satisfaction, reduce absenteeism, and improve the overall operational efficiency of the clinic, marking an important step in the modernization of dental healthcare management.

3.0 Problem Statement

1. Dental have a high rate of patient absenteeism

   From time to time, patients are not able to be diagnosed at the time they have made an appointment in advance. A significant factor in the occurrence of this problem is due to the lack of an automated reminder system in the clinic. With the busy schedules of modern people and their inability to remember much of what is going on in their lives, patients may forget about scheduled appointments. Without timely reminders, the likelihood that a patient will miss an appointment increases dramatically. This is a serious challenge that can negatively impact a practice's operational efficiency and overall patient experience. The hospital uses the traditional reminder method that is a phone call, and patients may miss appointments because they are in a situation where they cannot answer the phone at the time. Additionally, if the patient provided the wrong phone number, this would result in the call not being answered. All of these scenarios could result in patients not being able to attend their medical appointments in a timely manner.

2. Current appointment management systems are inconvenient for patients

   This problem occurs because of the lack of a digital platform for appointment management, where patients must rely on a traditional manual appointment booking process. Admittedly, this would be time-consuming and inconvenient for people with busy schedules. Without an online appointment management system, patients may face limitations in accessing the clinic's appointment services. An appointment

management system that lacks a digital platform limits patient access to the clinic's appointment services. The current appointment management also doesn't work well with the task of rescheduling or canceling when patients need to change their appointment times.The lack of a user-friendly system that can easily adapt to these changes can lead to frustration for patients who need flexibility due to unforeseen circumstances.

3. Current operational is inefficiencies (Manual Management Processes)

The clinic currently uses manual management processes for record keeping. This leads to inefficiencies in managing patient information, treatment plans, and appointment schedules. Having all tasks performed by humans will increase the management workload for clinic staff and also take up a lot of time performing administrative tasks, which prevents them from focusing on care and other essential operations. As a more serious consequence, the manual transfer of patient information and appointment details from paper records to digital systems poses the risk of data entry errors. Such errors can lead to discrepancies in patient records, treatment plans and appointment schedules, which may affect the quality of care provided.

4.0 Proposed Solutions

To solve the high rate of patient absenteeism problem, we can build an automated reminder system. The digital system specializes in sending reminders via text message, email or notification, providing patients with the flexibility to choose their preferred method of communication. The diversity of reminder channels which includes SMS, email, and notifications bridges the communication gap, accommodates different patient preferences, and ensures strategic, timely outreach prior to scheduled appointments. An integrated confirmation mechanism in the system allows patients to proactively confirm or even reschedule appointments, fostering a more responsive and engaged patient population. Seamlessly connecting patient preferences to proactive engagement and optimizing reminder timing based on analysis of patient behavior further improves effectiveness by selecting intervals at which patients are most likely to engage. In addition, personalized communication adds a touch of specificity to reminders by incorporating details such as appointment type and dentist name. This not only personalizes the interaction, but

significantly increases the likelihood that patients will recognize and remember their appointments. This integrated approach bridges the gap between technology and patient care, not only streamlining the appointment management process, but also helping to improve the overall patient experience.

Besides, we can introduce a digital appointment management platform to enhance the overall patient experience. This user-friendly online platform or mobile app streamlines the appointment process, enabling patients to easily schedule, reschedule or cancel appointments at their convenience. By ensuring accessibility to the online appointment management system, patients have the flexibility to book and manage appointments from the comfort of their home or on the go. Real-time availability updates are seamlessly integrated, bridging the gap between traditional healthcare and modern conveniences, providing patients with timely information to select appointment slots that fit their schedule, thereby preventing conflicts and improving overall convenience. The combination of automated features for rescheduling and canceling ensures efficiency, supported by clear instructions and a user-friendly interface. Emphasizing proactive communication, push notifications via the mobile app allow for timely reminders of upcoming appointments, changes or available slots. This holistic approach not only streamlines the appointment management process, but also marks a significant advancement in providing patients with accessible, efficient and convenient dental care.

In addition, we can shift from traditional paper documents to modern systems that utilize technology to increase efficiency. This includes creating an electronic health record (EHR) system that keeps all patient information, treatment plans, and appointment scheduling in one place. To make the clinic staff's job easier, we use automation to perform tasks such as scheduling appointments. This technology helps staff focus more on patient care and less on repetitive tasks. We also make sure that when information is transferred from paper to digital, we take care to avoid errors. Staff will be trained to make sure everyone is on the same page. We are designing an easy to use system for staff to navigate and manage digital records and we will support them during the transition. Regular checks will be carried out to ensure everything is correct and working well, creating a reliable and up-to-date digital record keeping system. In this way, we are not only modernizing things, but making it easier for everyone to provide quality care to our patients.

4.1 Technical Feasibility Study

The technical feasibility study of the Dental Appointment and Rescheduling System showed that the system is practical and technically suitable. The plan is to use a secure central server and an intelligent way to organize information (RDBMS). Users will have secure logins and the system will ensure that only the right people have access to certain content. We will also be launching an app for Android and iPhone that will allow people to easily manage appointment dates. Automation will help with tasks like scheduling, and strong security measures will ensure that patient information is safe. The system is designed to handle more users as needed, and ongoing support and training will be provided to clinic staff to ensure everyone can use it easily. Overall, the study shows that the system not only meets technical standards, but also makes the clinic's work easier and more efficient.

4.2 Operational Feasibility Study

The operational feasibility study for the Dental Appointment and Rescheduling System shows that the system is very practical and has made the day-to-day work of the clinic much easier. It has simplified the way appointments are managed, reducing the workload of clinic staff and increasing efficiency. The system is easy to use for both patients and staff, and features such as automatic reminders help patients remember their appointments and reduce missed opportunities. Moving from paper to digital records minimizes errors and makes it easier for everyone to access important information. Overall, the system is designed to improve the way the practice operates, making it more patient-friendly and organized.

4.3 Economic Feasibility Study

Estimated Cost		comment
Development	RM	
Software	50000	-
Database	15000	-
Mobile app creation	30000	-
Production	RM	
Implementation	50000	per year
Server Hosting	25000	per year

Table 4.3.1: Estimated Cost

Estimated Benefits		comment
	RM	-
Savings	25000	per year
Reduced Absenteeism	15000	per year
Improved Efficiency	20000	per year
Enhanced Patient Experience	10000	per year

Table 4.3.2: Estimated Benefits

Assumptions	
Discount rate	10%
Sensitivity factor(cost)	0.1
Sensitivity factor(benefits)	0.2
Annual change in production costs	0.05
Annual change in benefits	0.03

Table 4.3.3: Assumptions for 4 years project duration

CRITERIA	YEAR									
	0		1		2		3		4	
1. COST	ESTIMATED	ACTUAL	ESTIMATED	ACTUAL	ESTIMATED	ACTUAL	ESTIMATED	ACTUAL	ESTIMATED	ACTUAL
A. DEVELOPMENT										
Development										
Software	50000	**5000**								
Database	15000	**1500**								
Mobile app creation	30000	**3000**								
TOTAL DEVELOPMENT COST		9500								
B. PRODUCTION										
Production										
Implementation			50000	**5000**	5000	**5250**	5250	**5513**	5513	**5788**
Server Hosting			25000	**2500**	2500	**2625**	2625	**2756**	2756	**2894**
ANNUAL PRODUCTION COST				7500		**7875**		**8269**		**8682**
PRESENT VALUE (PV)				6818		**6508**		**6212**		**5930**
ACCUMULATED COST				**16318**		**22826**		**29039**		**34969**
2. BENEFIT										
Benefit										
Savings			25000	**5000**	5000	**5150**	5150	**5305**	5305	**5464**
Reduced Absenteeism			15000	**3000**	3000	**3090**	3090	**3183**	3183	**3278**
Improved Efficiency			20000	**4000**	4000	**4120**	4120	**4244**	4244	**4371**
Enhanced Patient Experience			10000	**2000**	2000	**2060**	2060	**2122**	2122	**2185**
ANNUAL BENEFIT				**14000**		**14420**		**14853**		**15298**
PRESENT VALUE (PV)				**12727**		**11917**		**11159**		**10449**
ACCUMULATED BENEFIT				**12727**		**24645**		**35804**		**46252**
GAIN/LOSS				**-3591**		**1818**		**6765**		**11284**
PROFITABILITY INDEX	**1.19**									

Table 4.3.4: Cost-Benefit Analysis(CBA) Calculation

Tables above show how to calculate Cost-Based Analysis(CBA).The project is expected to incur development costs of RM 9,500 and production costs over a period of 4 years. Benefits, including savings, reduced absenteeism, increased efficiency, and improved patient experience, accrue to RM 46,252. Based on the cost-based analysis table above, we can conclude that this is an excellent and profitable system. This is because the profitability index is greater than 1 which is 1.19 which indicates that the system is highly profitable and can generate huge profit and revenue for the company. Although during the first year we recorded a loss of RM3591, we eventually were able to garner up to RM1818 of profit during the second year of our business operation, and gradually increase until a record of RM11284. Therefore, this system will generate huge revenue and profit.

5.0 Objectives

Among the objectives of the proposed system in order to minimise patient waiting time and maximise dentist and staff utilisation during peak hours in the clinic are:

- To develop a user-friendly appointment platform for patients, enabling them to schedule, reschedule, view or cancel appointments easily
- To record the details of patients who make appointments based on date and day
- To notify and remind patients to reduce the number of missed appointments
- To improve clinical staff productivity and avoid delays in finding patients information
- To record the patient's condition, history, perception and private details for further better treatment plans in the future
- To help patients to find out the total cost of dental fees accurately and a summary of dental billing

6.0 Scope

The dental appointment and rescheduling system is a system created to enhance patient experience with care and simplify staff burden in managing patient information. This system will be created to help users book a dental appointment effortlessly within just a few minutes, without the need to go to the clinic to book physically, avoid queuing, and reduce waiting time. This system is also designed to be integrated with a calendar system to help users keep track of their appointments with automated notifications and reminders, to reduce the number of missed appointments. In this system, there are three types of stakeholders: the patients, the dentist or staff, and the administrator. Each of the stakeholders will have different functions and usability.

Patients:

In this system, patients are allowed to update their dental appointment and reschedule their booking time easily. Patients are also allowed to access and update their own personal information, such as contact number, email and address effortlessly. In addition, they are able to determine the availability of time slots of their own personal dentist online without the need of going to the clinic physically. They are also allowed to view their payment status and distinguish the total cost of dental fees accurately as well as a summary of dental bill receipt.

Dentist/Staff:

This system allows dentists/staff to access and update their own personal information, such as contact number, email, address and position they hold. Besides, they are also allowed to view and modify the details of the patient's information and appointments. Not only does this system help staff to display the list of total number of patients who made an appointment based on that day and date by the current month, but also a summary report of patients' after-visit. Dentists are also able to find patients' condition progress according to the patients' visitation for the current month easily.

Administrator:

Administrators are able to do actions on the system which is similar to the dentist/staff like registration, accessing and updating patients' information and dental records. Administrators can also help in registration, access and modify dentist/staff private information. On the contrary, neither dentist nor staff can access and modify each other's private information among themselves. Besides, administrators are able to display the total number of dentist/staff workers in the clinic as well as their current active status. Generally, administrators can do all the actions on the system since the administrator is a vital user and has the highest authority in controlling and running the system.

7.0 Project Planning

7.1 Human Resource

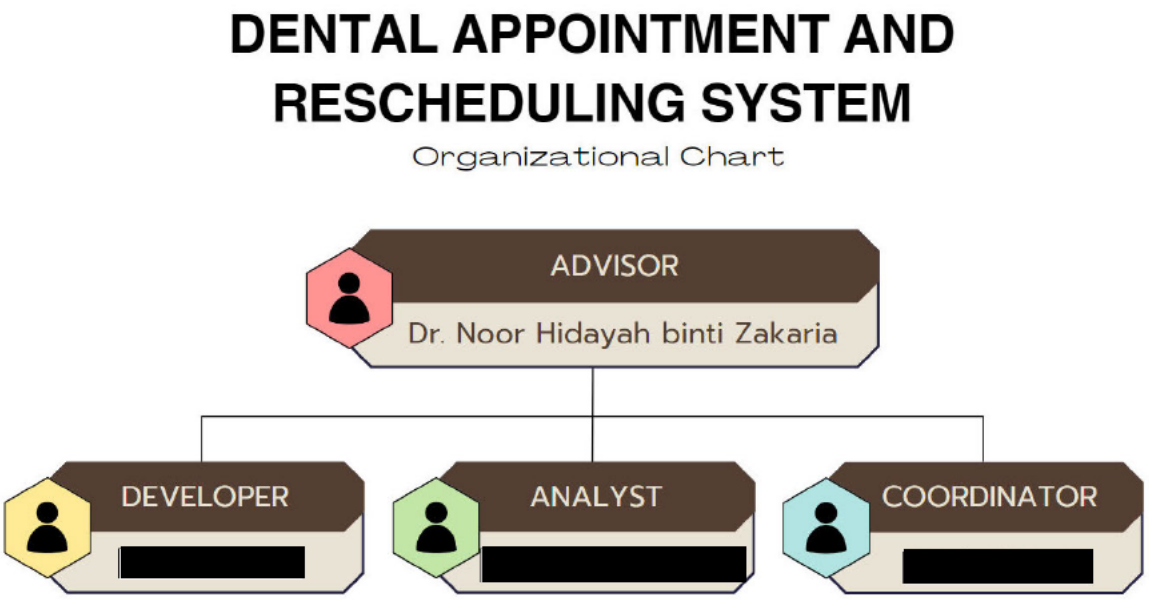

Figure 7.1 Human Resource for Dental Appointment and Rescheduling System

Figure 7.1 is an organisational chart that provides a visual representation of the structure of our group organisation with the roles assigned to each team member.

7.2 Work Breakdown Structure (WBS)

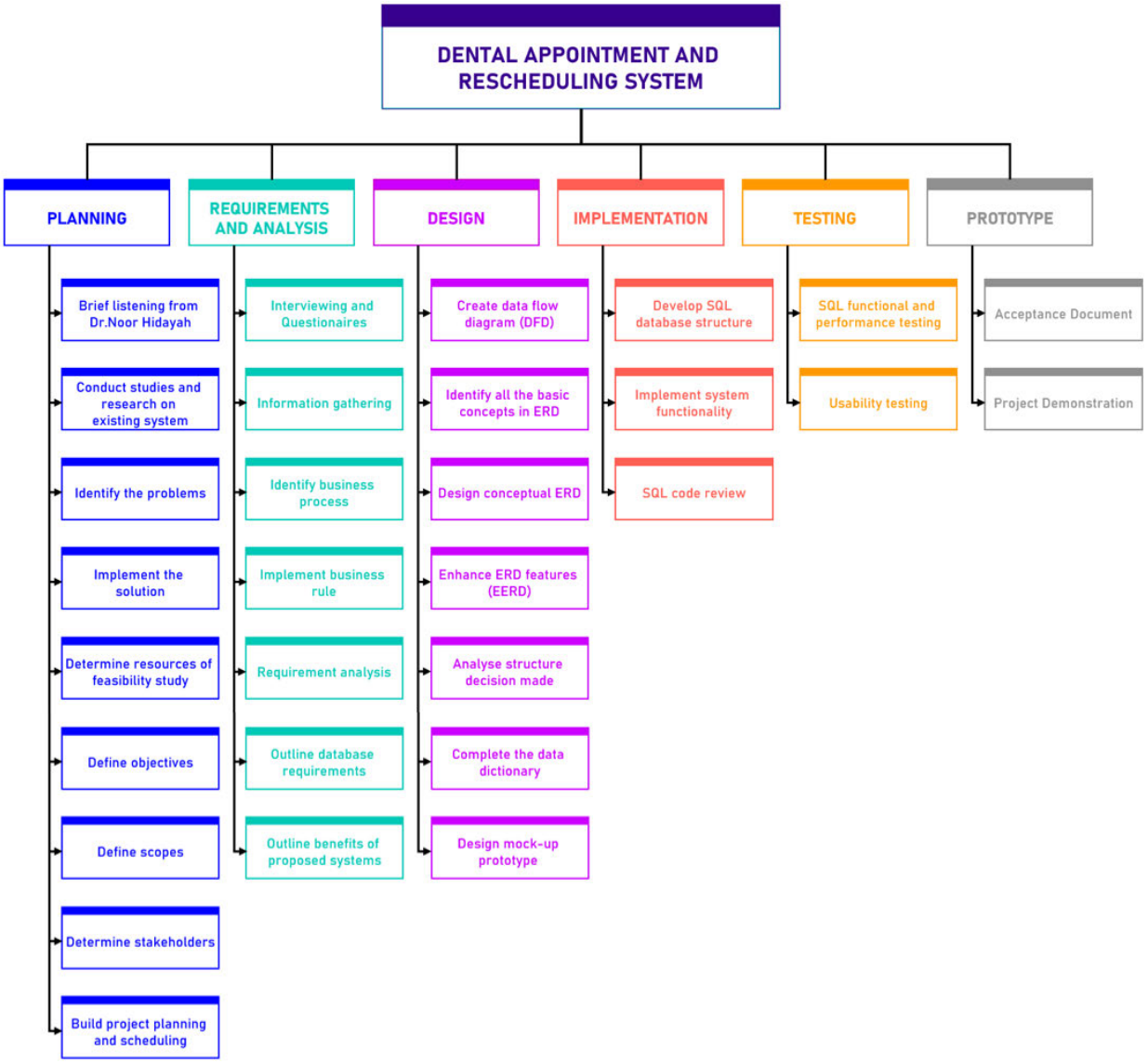

Figure 7.2 Work Structure Breakdown for Dental Appointment and Rescheduling System

Work breakdown structure (WBS) is a roadmap that shows the connections between the objectives, tasks, and measurable milestones. It is mainly used to list out all the project tasks that need to be accomplished according to assigned roles and responsibilities, organise all the subdivided subtasks into multiple levels and display the tasks hierarchically, in order to create a more manageable project plan. Besides, WBS helps in defining a project schedule with the aim of developing a timeline for the duration

of the project, which is a Gantt Chart. WBS also helps in tracking the progress of the project so that our project can be completed faster and more efficiently within the allotted time.

At the topmost level of WBS is our final deliverable, which is also the project system. Next, beneath it is the first level of WBS, which contains 6 elements and each of these elements are the project phases based on System Development Life Cycle (SDLC). These elements include planning, requirements, analysis, design, implementation and testing, and demonstration. The purpose of this level is to provide a broad overview of the entire project and to help us understand the major components and objectives without going into details. On the second level are the subcategories, which contain a more detailed presentation of the components of each major phase of the first level.

7.3 Gantt Chart

Gantt Chart is used to manage and plan our project duration schedule. Gantt Chart assists us in time management as well as monitoring the project progress by showing us when each task starts and finishes, in order not to delay and ensure tasks are on track. It also provides a clear overview of the timeline, tasks and who is responsible for each task. Thus, boost up the team productivity and efficiency in completing the project. According to the chart below, a two-dimensional Gantt Chart is used in which the parallel bars represent the tasks' accomplished level based on the timeline.

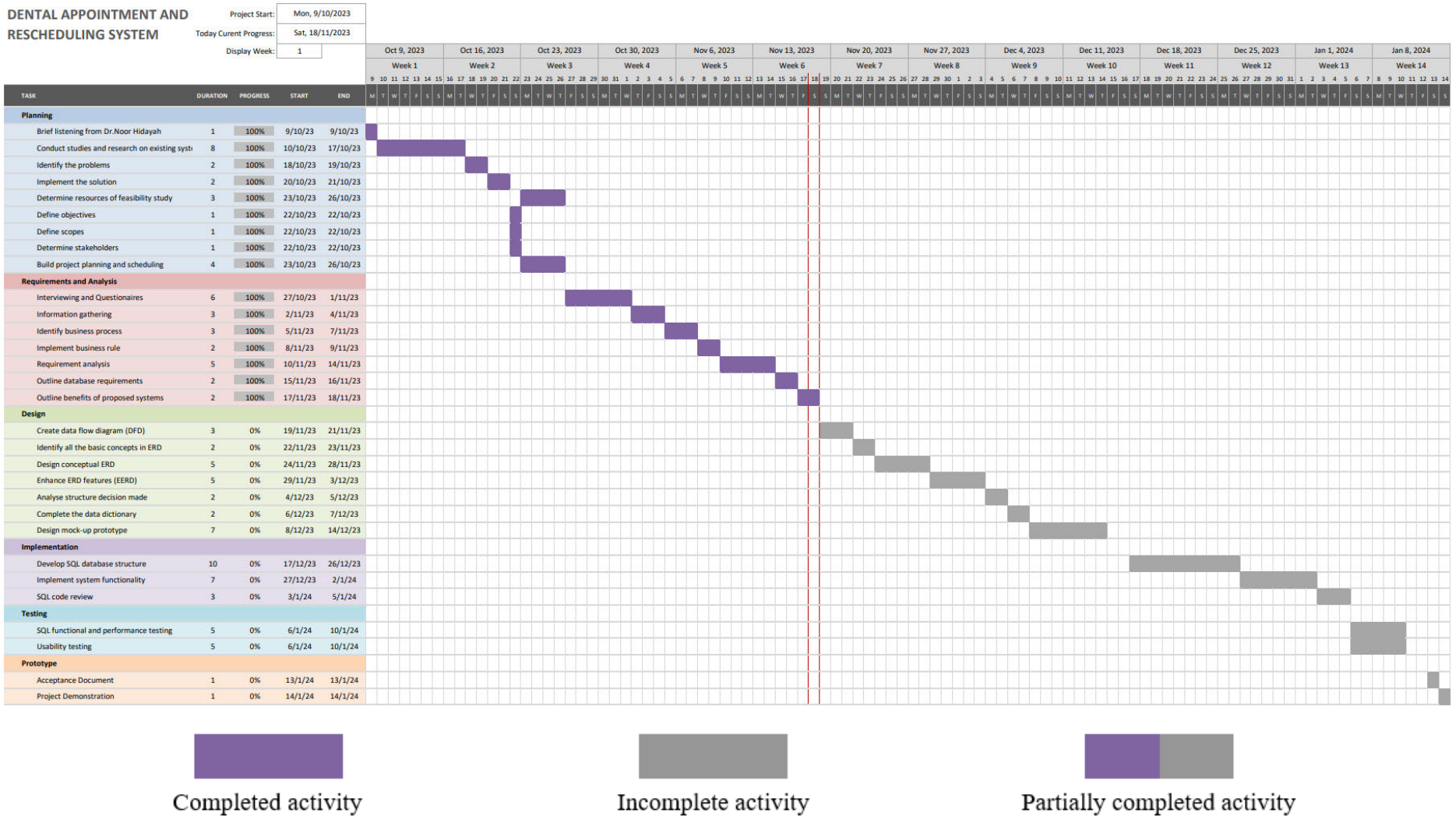

Figure 7.3 Gantt Chart for Dental Appointment and Rescheduling System

File Link (Zoom In): (Gantt Chart for Dental Appointment and Rescheduling System)

8.0 Requirement Analysis (based from AS-IS analysis)

8.1 Current business process (scenarios, workflow)

Patient

1. **Booking appointment**

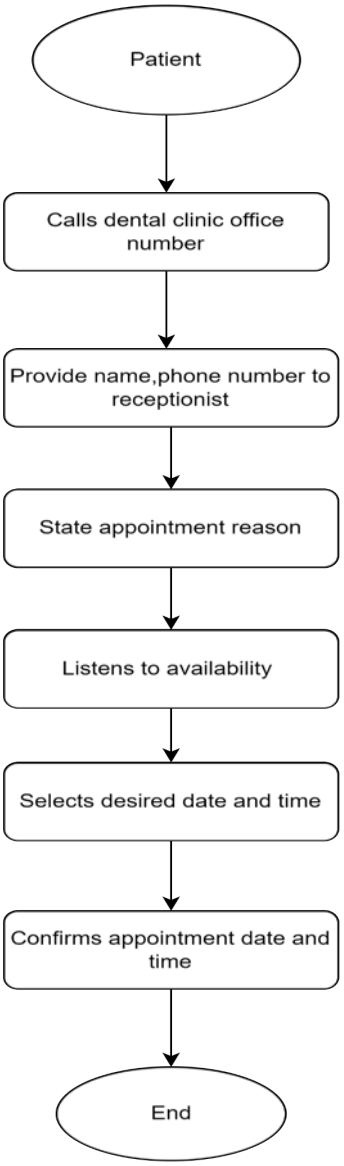

Diagram 8.1.1: Patient Booking Appointment Process

The patient books an appointment by calling the dental clinic office number first. Upon connecting with the receptionist, they provide their name and phone number, followed by stating the reason for their visit. Attentively, the patient listens as the receptionist

communicates the available dates and times for scheduling. After considering the options, the patient verbally selects a desired date and time that aligns with their schedule. To confirm the appointment, the patient verifies the chosen date and time with the receptionist, ensuring a seamless and well-coordinated scheduling experience. This is the basic flow of patients booking appointments.

2. **Checking appointment**

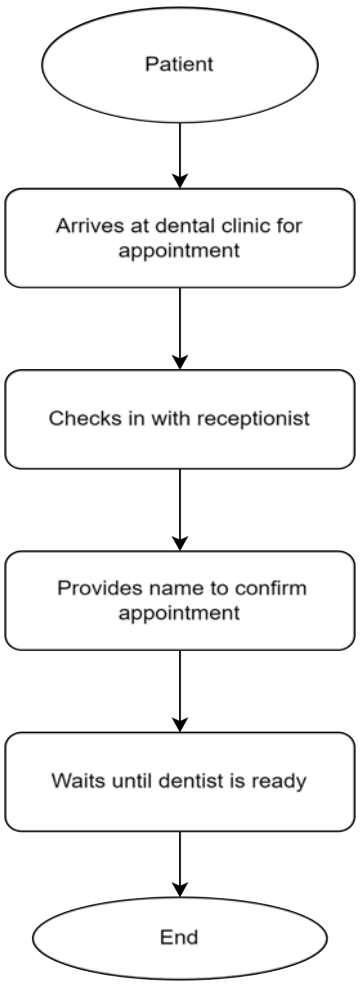

Diagram 8.1.2: Patient Checking Appointment Process

Upon reaching the dental clinic for their scheduled appointment, the patient proceeds to the front desk where they check in with the receptionist. They provide their name to confirm the details of their appointment. Following check-in, the patient takes a seat in the lobby, waiting until the dentist is ready to begin their treatment. Therefore, this is the basic flow of patients checking appointments.

Receptionist

1. Booking/scheduling appointment

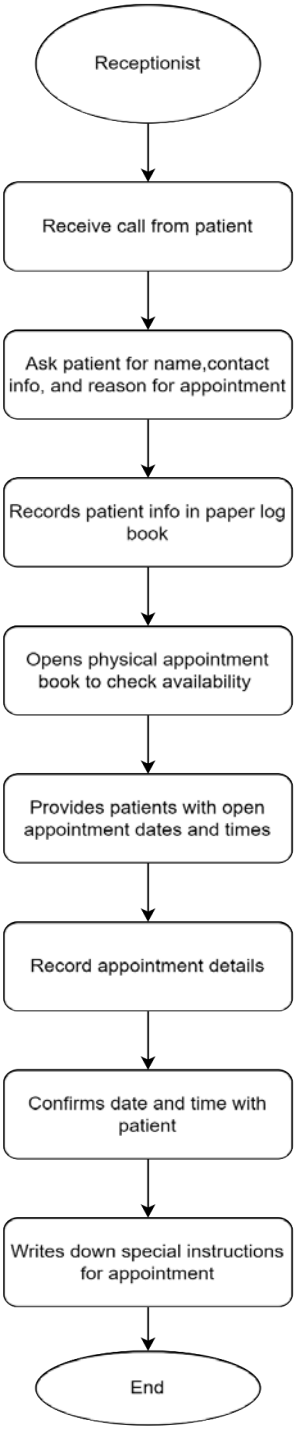

Diagram 8.1.3: Receptionist Scheduling Appointment Process

When a patient reaches out to schedule an appointment, the receptionist receives a call or in-person request from the patient. The receptionist gathers essential details such as the patient's name, contact information, and the reason for the visit. They write this information in a paper log book and check the available dates and times in the physical appointment book. After that, they tell the patients about open slots and note down the chosen date and time in the book. After confirming this with the patient, any special instructions for the appointment are written down. It ensures a comprehensive and organized approach to managing patient schedules at the clinic.

2. Checking appointment

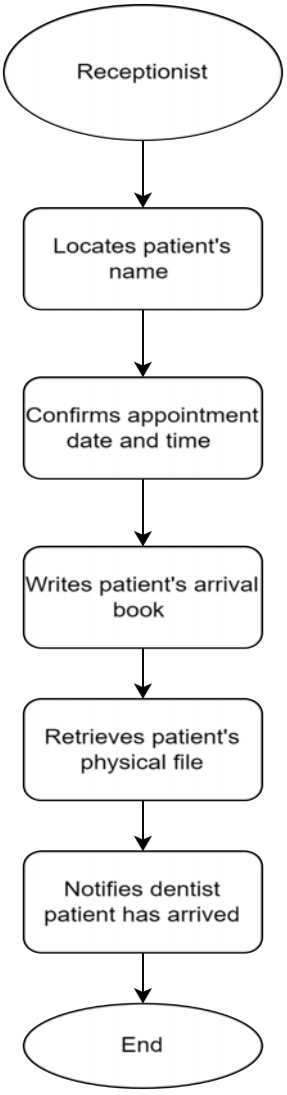

Diagram 8.1.4: Receptionist Checking Appointment Process

The receptionist finds the patient's name in the appointment book and checks the date and time of their appointment. They then confirm this with the patient by talking to them. After that, the receptionist writes down the time the patient arrives in the appointment book. They also retrieve the patient's physical file and notify the dentist that the patient has arrived. This is the basic flow of receptionist checking appointments.

3. Entering patient information into the system

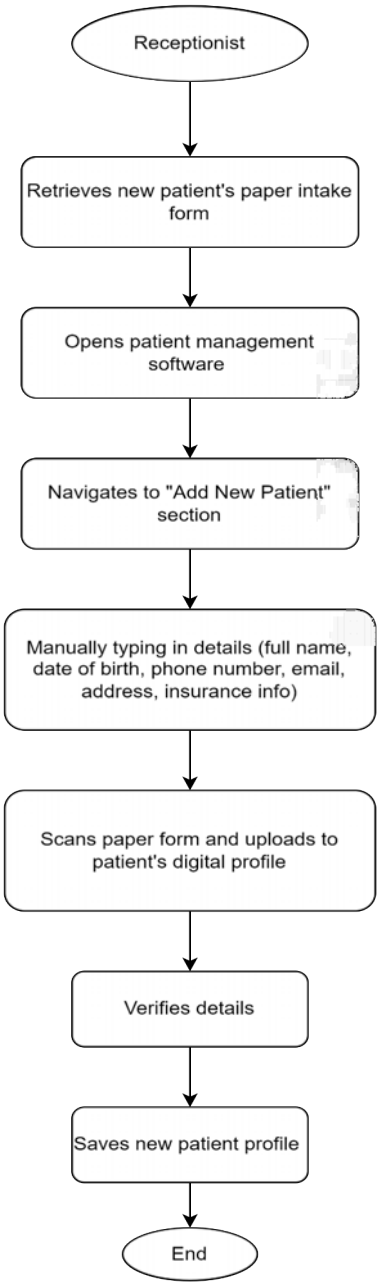

Diagram 8.1.5: Receptionist Entering Patient Info Into System Process

The receptionist retrieves and manually enters a new patient's information from a paper intake form into the computer system. This includes details such as the patient's full name, date of birth, contact information, address, and insurance details. The receptionist also scans and uploads the paper form to the patient's digital profile for record-keeping. After ensuring all details are accurate, the new patient profile is saved in the system.

Dentist

1. **Scheduling appointment**

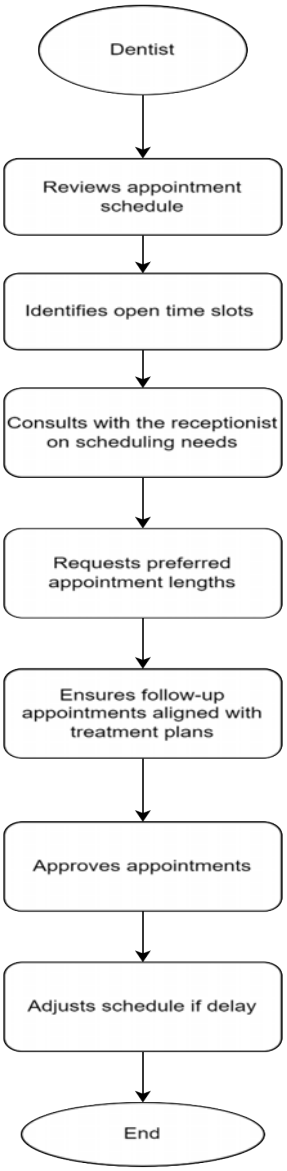

Diagram 8.1.6: Dentist Scheduling Appointment System

The dentist manages the scheduling of appointments by reviewing the appointment schedule in a paper book or calendar. They identify open time slots and collaborate with the receptionist to address scheduling needs, considering the preferred lengths for various procedures. Ensuring alignment with treatment plans, the dentist approves appointments scheduled by the receptionist. In cases of delays or the need for additional time, the dentist flexibly adjusts the schedule to accommodate the necessary changes.

2. **Managing patient information**

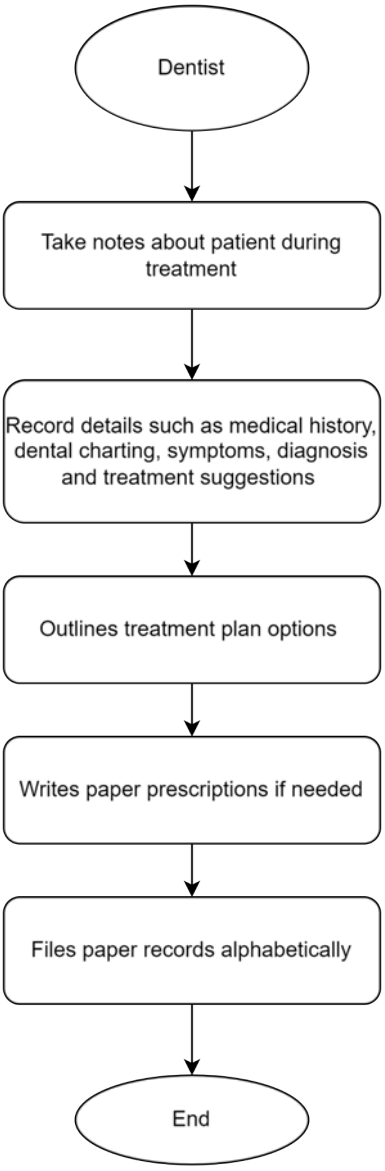

Diagram 8.1.7: Dentist Managing Patient Information System

The dentist takes handwritten notes during treatments and records patient details in a paper file, covering medical history, dental charting, symptoms, diagnosis, and treatment recommendations. Treatment plan options are outlined in the file, and prescriptions, if needed, are handwritten. The paper records are alphabetically filed for efficient organization in a cabinet.

9.0 Transaction requirement (data entry, data update/delete, data queries)

9.1 Data Entry

1. Enter the details of patients personal information, such as name, identification number, contact number, email and address for new patient records creation.
2. Enter the details of dentist/staff personal information, such as name, identification number, contact number and address for new records creation
3. Enter the details of dental appointment booking with specifying date and time.
4. Enter the details of the patient's dental condition.
5. Enter the payment details according to the patient’s treatment and dates.

9.2 Data Update/Delete

1. Update/Delete the details of the patient's information.
2. Update/Delete the details of dentist’s or staff’s information.
3. Update/Delete the details of the patient's appointment booking schedule.
4. Update/Delete the status of the patient's dental records.
5. Update/Delete the availability of time slots of each dentist or staff.
6. Update/Delete the cosmetic dental services provided in the clinic.
7. Update/Delete the payment status referring to the patient’s treatment and date.

9.3 Data Queries

1. Display the list of patient’s information.
2. Display the list of dentist’s or staff’s information.
3. Display the patient’s past and upcoming appointment booking schedule.
4. Display the patient’s dental records history.
5. Display the attendance list of each dentist or staff.
6. Display the availability of time slots for dentist appointments.
7. Display the availability of time slots of each dentist or staff.
8. Display the associated fees based on the selected cosmetic dental services.
9. Identify and display the status of total unpaid fees according to the patient’s treatment and dates.
10. Identify and display the status of total paid fees referring to the patient’s treatment and dates.
11. Display the dental treatment bills receipt or invoice.

10.0 Benefit and Summary of Proposed System

The proposed system will digitize key workflows like appointment booking, reminders, and patient records management. This is expected to improve efficiency, accessibility, and organization compared to the current manual paper-based processes.

The new system will include features such as online booking, reminders, and digital patient profiles, as well as treatment plans. This will reduce administrative burden and data eros, freeing up staff time to focus on patients. This new system will integrate scheduling, records, and billing into a single platform. Strong reporting will provide valuable data insights to optimize operations.

All in all, the digital system enhances both patient and clinic staff experience. It aligns operations with modern healthcare practices and positions the clinic for improved quality of care as it continues to grow.

Patient's benefits:

- Increase convenience through online booking
- Reduce waiting times
- Automated reminders decrease missed appointments
- Access to health records provides transparency
- Improve communication with clinic staff

Receptionist's benefits:

- Automated scheduling saves time
- Digital records eliminate manual filing
- Increase efficiency through streamlined workflows
- More accurate patient information and treatment tracking
- Better coordination with dentists

Dentist's benefits:

- Easy access to complete patient histories
- Less redundant paperwork with digital records
- Fewer missed appointments through reminders
- Analytics provide operational insights
- More time for patient care rather than administration

11.0 Summary

Our group has gained a deeper understanding of the functioning of the current system by completing this dental clinic database requirements document. We have mapped out manual workflows such as appointment booking, patient check-ins, and record management, which has given us valuable insights into the complexity of the processes involved.

By documenting key details like business rules, data requirements, and transaction needs in the current system, we have collected the necessary data for the AS-IS analysis. This analysis has helped us determine the purpose and business needs that drive the existing workflows.

The creation of diagrams, such as workflow, has been instrumental in identifying logical gaps and flaws in how data is currently handled in the system.

Overall, this requirements-gathering process has provided us with a comprehensive understanding of the clinic's current database system. The extensive analyses and thorough documentation have given us ideas on how to improve the existing workflows and data practices. This experience has given us a solid foundation to design an enhanced database system that can better support the clinic's operations and meet the needs of its end users. The insights gained from this process will serve as a guide as we work towards building a more streamlined platform.