Efficiency and performance boost on nurses in Dental Management System

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Declaration

The project submitted herewith is a result of my own efforts in totality and in every aspect of the project works. All information that has been obtained from other sources has been fully acknowledged. I understand that any plagiarism, cheating or collusion or any sorts constitutes a breach of TAR University College rules and regulations and would be subjected to disciplinary actions.

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Bachelor of Information Technology (Honours) in Software Systems Development

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Chapter 1

Introduction

Chapter 1 Introduction

1 Introduction

TAR UC DENTAL MANAGEMENT SYSTEM (DMS) is an application system that is designed for dental clinics to support dentists and nurses to record patient' and staff' details, arrange appointments and manage the dental information.

In the 21th century, technologies have been improving rapidly and most of the dental clinics in Malaysia have started to implement Dental Management Systems in order to help increase the efficiency of their dental clinic, but there are still some traditional dental clinics that operate through paper works manually and also through human efforts. While still implementing the traditional ways, mistakes or accidents might lead to these paperwork where there will be no backup of their important data, which will cause delay in the operating flow of the dental clinic and also decrease in efficiency. Paper documents will be taking up a significant amount of space from the storage, and this will cause them to have a lack of storage space because the amount of paper will be increasing day-by-day (Melo, November 12, 2019).

The best way to overcome the issues is by implementing the technology allowed which will help to reduce human efforts, increase the efficiency of staff and also to produce greater productivity than before. Paper documents will automatically be eliminated and will be replaced by electronic documents where it will help to save time and space. This will help to reduce human error, save resources of the company and also reduce environmental damage such as using too much paper which will lead to chopping down of trees. By implementing electronic documents, the documents will be able to be retrieved if any accidents happen and will be more secure than using paper documents. Hence, the important data of the dental clinic will then be secured by implementing technology into their system.

In this era, implementation of technology into business has become a very common factor, where traditional dental clinics will be required to keep track with others by implementing these technologies. The implementation of technology will help to speed up their work flow, ease and decrease the efforts that are needed to do their work compared to before. Therefore, we have decided to develop a new dental management system for the dental clinic to assist

dentists and nurses to increase their efficiency and workflow, and also help to secure every important data of staff and patients.

1.1 Objective

The proposed project is to develop a TAR UC Dental Management System (DMS), which will allow users to install the system in their electronic devices such as laptop, desktop and smart tablet. First of all, the project will try to improve the workflow of dental clinics of dental and nurse, which are able to reduce or remove unnecessary steps to perform a task. The steps and procedures for users to do a task will be shortened by implementing a better and user-friendly interface for the system. Furthermore, it also helps the dental clinic to help prevent and reduce data losses such floods, increase data consistency and accuracy. By using this system, paper works documents and details will be converted and transferred to electronic documents for higher efficiency in searching and safety in terms of data. The technologies that have been chosen as the purpose of creating the system are ASP.net and Visual Studio.

The objective of the proposed system are :

1. To protect and secure data for future use.
2. To enhance user experience and satisfaction such as ease the work of the user.
3. To provide an interface for user operating purposes.
4. To reduce the steps required to perform tasks.
5. To eliminate the non-environmental friendly paper documents.
6. To increase the efficiency of users.
7. To help save storage spaces of the dental clinic where paper documents will be eliminated.

1.2 Background

Some of the dental clinics are still using the traditional way of operating the clinic which is a manual paperwork system to record important data such as patients and staff information, and also medical records of patients. Furthermore, patients of the dental clinic will have a long queue due to staff having to write everything using paper, as well as dentists will have to record everything through paper.

As has been said, dental software is one of the best practice management systems that helps in automating the entire clinic(Kumar, 24 December 2019). One of the most important parts in terms of workflow is speed, where human efforts should be reduced in order to increase productivity and efficiency. Therefore, a dental management system has been introduced to help speed up the process of the dental tasks such as recording patient's information. In the modern world of today, the faster the workflow, the more efficient a business is. The system will be able to help minimize and reduce the steps needed to complete tasks for users. Because speed will help to improve customer satisfaction, if the business does things quickly, the customer satisfaction goes up and up (Bechervaise, 31 May 2017).

Moreover, data accuracy will improve the decision making process which is an important factor for dental clinics while treating patients. Since information is essential in business, accurate and reliable data is an essential tool you can use to base your decisions on (Roberts, 27 October 2019). It will increase the efficiency due to time saved and reduce the possibility of data errors, as the decision making process is reduced. Data accuracy will lead to lower cost because data errors are extremely costly, but the risk is far more than just losing money (Roberts, 27 October 2019). Data accuracy has become paramount for their success since modern dental clinics use business strategies that include artificial intelligence. Data accuracy is very important due to every person having different allergies and some medications consist of ingredients that certain patients might be allergic to, if the information is not accurate enough, it might harm the patients' health.

The proposed system will be targeting these traditional dental clinics that are still utilizing the traditional way of operating their business. This system will help to benefit 3 parties which are users, patients and dental clinic management. With the implementation of this system, users will be able to find and retrieve any information easily, the chances of missing

documents will be highly reduced and also the accuracy of the data will be increasing a lot compared with paper documents. A simple, clean and user-friendly interface will be provided in the system to help ease the work of users so that no training will be required which means it will save a lot of time. Users will then be able to complete the tasks through the dental management system without any problem faced unless there are errors occurring in the system.

1.3Advantages and Contributions

I. Data will be secured without losing accuracy and consistency

The system will be providing higher accuracy and consistency data for the workflow. Users will be able to view the information through different devices. The data will also be secured and backed up to prevent any data losses caused by any natural disasters and any accidents made by the users. Businesses such as dental clinics heavily rely on the data and information of patients. Hence, managing the data properly is very important and preserved for the sake of dental clinics and patients. Data will help to understand and improve business processes so it will help to reduce time wasted and money wasted. Other than reducing time and money wasted, we should also aim to eliminate errors like data inaccurate of a patient's appointment details.

II. Increase efficiency and speed up time completion of tasks

By implementing a system, it would help the staff to reduce their human efforts as well as the amount of time taken to complete their tasks due to all of the manual paper documents. An interface will be implemented which allows for staff to have a better view and ease their job, which will lead to increased efficiency and productivity. With the simplicity of interface, users will be able to complete their task faster and with fewer steps. They would also be able to memorize the functionality of the interface easily and be able to perform more efficiently.

III. Better appointment functionality

Everything appointment details will be recorded through the system rather than using paper to record it. Nurses will be able to have a better view about the availability of the appointment date and time slot, which would allow them to make any appointment or reschedule appointments due to better view through the system. They do not have to find it one by one through their paper documents since every appointment details will be stored in the system. It will also be able to inform the users when the appointment is near.

IV. Better dental system to operate the dental clinic

The proposed system will assist the dental clinic and their staff to operate the clinic better and more swiftly compared to manual paper documents. The system will be user-friendly and easy to use, where no training will be required due to the simplicity of the system itself, which will help to reduce time wastage on training. This will enhance the user experience and satisfaction towards the system. This would help them to increase the productivity and efficiency of operating the dental clinic, and also help them to have a better system to operate with. The workflow of the dental clinic will be much better and smoother with the help of the dental management system.

1.4 Project Plan

1.4.1 Project Scope

The project is given in figure 1.4.1.1

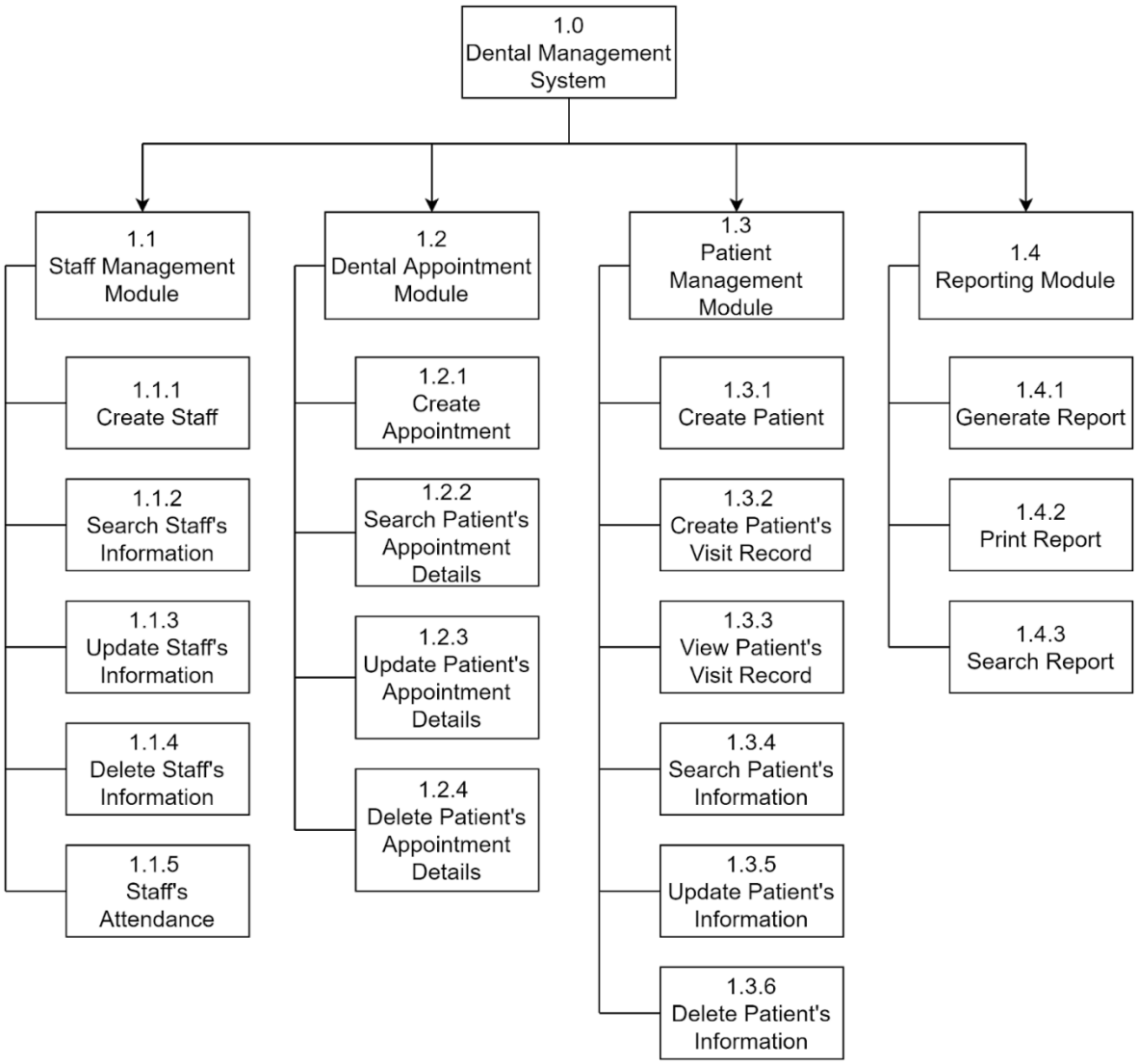

Figure 1.4.1.1 - System Hierarchy Chart

1.4.2 Functional Requirement

1. Dental appointment module

a. Create appointment

Nurses and admin will be allowed to create a new appointment after confirming with the patients, there will be fields that are required to be filled in such as patient's name, patient's contact number, appointment time & etc before being able to create and book an appointment in the system.

b. Search patient's appointment details

Nurses and admin will be able to search the patient's appointment through their given appointment time, date, contact number or name to retrieve the appointment details.

c. Update patient's appointment details

Nurses and admin will be able to change the patient's appointment details such as their appointment date and time.

d. Delete patient's appointment details

Nurses and admin will be able to delete the selected patient's appointment details through this module, to avoid any space wasted on these unvisited data.

2. Patient management module

a. Create patient

Nurses and admin will be able to create new patient's information according to their identification card and information told by them, it will contain information such as their name, contact number, identification card number, address, etc.

b. Create patient's visit record

Nurses and admin will be able to create a patient's visit record for new patients to track whether they are absent or present on their appointment date, their last visit to the dental clinic and also what they have diagnosed about their teeth condition during their last visit.

c. View Patient's Visit Record

Nurses and admin will be able to view the previous visit details of the respective patient that have been recorded into the system.

d. Search patient's information

Nurses and admin will be able to search the patient's information through their name, identification number or contact number.

e. Update patient's information

Nurses and admin are allowed to edit the patient's information such as their contact number and identification number.

f. Delete patient's information

Nurses and admin will be allowed to delete any old patient's information that has already done any treatment or non-visiting patients.

1.4.3 Non-Functional Requirement

1. **Usability**

   The system has implemented a user-friendly and clean interface which will allow the user to use it with ease without any training required. It will serve as a user-friendly interface.

2. **Availability**

   The system will be able to install and access through any device such as laptop, desktop and smart tablet. It will also be accessed any time by users that it is needed to utilize the system.

3. **Accuracy**

   The system will produce accurate and consistent information and data across the whole system.

4. **Recoverability**

   Data will be backed up in a secured place such as cloud storage to prevent data losses and allow the users to perform data recovery in the system.

1.5 Project Milestone

The Project Milestone is given in table 1.5.1 .

Milestones	Milestone Goals	Deadline
Task Distribution	Title and task distributed among team member	28/2/2021
Chapter 1: Introduction	Determine the project scope for the project	29/3/2021
Chapter 2: Research Background	To investigate the research background of current project	12/4/2021
Chapter 3: Methodology and Requirement Analysis	Examine the requirement needed for the project	25/6/2021
Database Design	Rough database design for the system	28/6/2021
Chapter 4: System Design	To produce a design for the system	5/7/2021
Develop System	Start developing the system that is proposed earlier	7/7/2021
System Checking	Eliminates the error of the system	15/8/2021
System Preview	Presenting the system that is developed	27/8/2021

Table 1.5.1 - Project Milestone

1.6 Project Team & Organization

Project team and organization is given in table 1.6.1

System and Subsystem	Soon Yi Hong	Kelvin Lim Ding Qi
Staff Management Module		
Create Staff	X	
Search Staff's Information	X	
Update Staff's Information	X	
Delete Staff's Information	X	
Staff's Attendance	X	
Dental Appointment Module		
Create Appointment		X
Search Patient's Appointment Details		X
Update Patient's Appointment Details		X
Delete Patient's Appointment Details		X
Patient Management Module		
Create Patient		X
Create Patient's Visit Record		X
View Patient's Visit Record		X
Search Patient's Information		X
Update Patient's Information		X
Delete Patient's Information		X
Reporting Module		
Generate Report	X	

Print Report	X	
Search Report	X	

Table 1.6.1 - Project team and organization

1.7 Chapter Summary & Evaluation

This chapter is focusing on the objective and problems of this project that have to be achieved. Problems have been stated out in the project background that have to be solved. Objectives have been listed out that are to be achieved in this chapter. Furthermore, the scope for each member has been identified clearly. The project plan will be serving as a purpose for increasing the productivity and efficiency of the project proposed system. TAR UC Dental Management Systems (DMS) have been developed to improve the quality of life for the nurse and dentist. Hence, the problem faced will be solved and objectives stated will be achieved after the system has been developed.

Chapter 2

Literature Review

Chapter 2 Literature Review

The company background, project background, literature review, feasibility study of the project will be included in this chapter. The literature review in this chapter will be focused on Dental Management System (DMS).

2.1 Company Background

According to (TARUC, 2018), Tunku Abdul Rahman University College ('TAR UC') which was formerly known as Tunku Abdul Rahman College ('TAR C'), is a premier institution of higher learning in Malaysia that was established in 1969 by the Malaysian Chinese Association (MCA) to provide tertiary education opportunities as well as quality education for young Malaysians. The college started with a single campus in Setapak, Kuala Lumpur which is also known as the main campus of TAR UC. Subsequently, another 5 branches have been established in Penang, Perak, Johor, Pahang and Sabah. TAR UC offers programmes at pre-university, diploma, Bachelor's degree and postgraduate levels that are widely recognized by the academia and industries for their depth and breadth of scope and academic rigor. Today, TAR UC has a student population of about 28,000 including international students for more than 20 countries enrolling in more than 120 programmes over a wide range of disciplines from foundation and A Level to accountancy, finance, business, economics, engineering, built environment, applied sciences, ICT as well as mass communication, creative arts, social science and hospitality management. These programmes are conducted by 7 faculties and 1 centre namely Centre of Pre-University Studies, Faculty of Accountancy, Finance and Business (FOFB), Faculty of Applied Sciences (FOAS), Faculty of Computing and Information Technology (FOCS), Faculty of Engineering and Technology (FOET), Faculty of Built Environment (FOBE), Faculty of Communication and Creative Industries (FCCI) and Faculty of Social Science and Humanities (FSSH). In addition, there is also the Centre for Postgraduate Studies and Research that focuses on research. TAR UC Main Campus in Kuala Lumpur sits on a piece of 186-acre land and the main campus is an iconic landmark for its architectural feat in blending historical buildings with modern structures as well as the verdant greenery. Meanwhile, the branch campuses in Penang, Perak, Johor and Pahang are purpose-built, complete with state-of-the-art infrastructure and facilities for learning and teaching. TARUC is one of the oldest institutions of higher learning in Malaysia with more than 190,000 students having passed through its doors.

The University College primarily targets students who have just finished their SPM, STPM, A-Level or Diploma, from other institutions or schools. A lot of teenagers as well as adults are facing oral and teeth problems such as pain in the gum area and decaying of teeth. Until now, there have been tons of students and teachers visiting the dental clinic of TAR UC due to their teeth condition and pain. System of the TAR UC dental clinic must change in order to gain competitive advantage as well as increase in the student population.

The current system used in managing the dental record and appointment record of patients is not computerized, but rather in a traditional way with writing everything on paper, which is very ineffective and inefficient due to delay in completing the tasks as well as information not secured enough. It has been carried out manually by writing every record and information through paper, which would waste a lot of resources and the time of the clinic staff, for arranging or rescheduling appointments, as well as recording every single important information and details about the process through paper.

2.2 Project Background

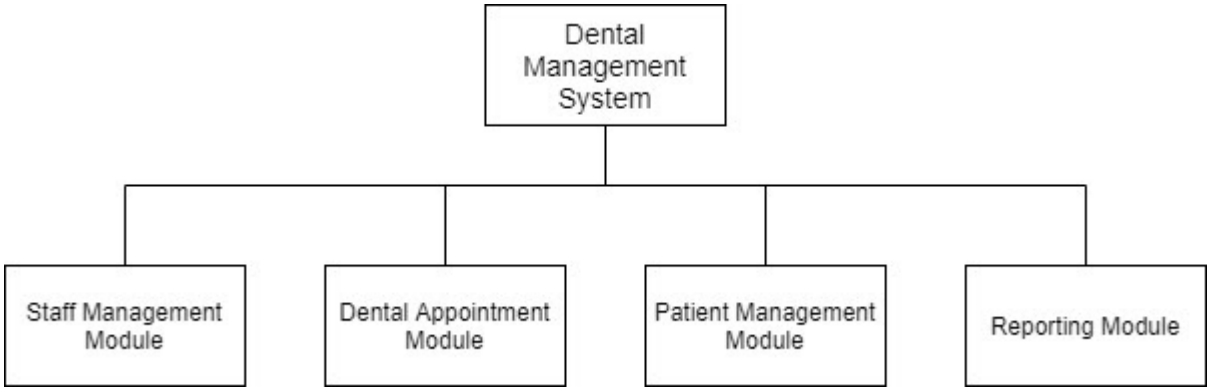

Figure 2.1 - Overall structure diagram for Dental Management System

In figure 2.1 the legacy of the dental management system exists in manual operation which is a traditional way, where the dental clinic staff need to record and manage everything by writing it on paper. The staff will be required to find the respective document through tons of paperwork in order to make any changes on the wrong information. However, it would be difficult for the staff to find the patient's appointment document and reschedule it one by one, due to the amount of paper increasing day by day. In fact, there might not only be one patient per day but more than 20 patients per day, which will lead to delay in finding all these documents one by one since all of them might not be kept in the same drawer. It will be wasting a lot of time just by finding all these documents one by one. Moreover, if there are new patients, it might take up more time than existing patients due to there being lots of information they would need to record down through paper. Sometimes it might be hard to find all these different documents compared to using a computerized system, this would slow down the workflow and productivity of the dental clinic and might cause huge delays in completing the tasks. The legacy system has zero tolerance towards error as staff have to write down all the important information and details if they have made any errors. They would be stressed out if any important paper documents went missing due to not having any backup and might be difficult to find it back since paper is easy to crush. This would increase their workload and might stress them out. It is not a healthy environment for them to work in.

As the implementation of the new dental management system, the dental clinic will be having their own computerized system and mobile application mainly for staff only which will allow them to access anytime and anywhere in order to perform their tasks accordingly through the system. With this new dental management system, staff would be able to record

any important information and details easily rather than wasting their energy and time to find it one by one. They would be able to manage these data easier since the system will help them to categorize it accordingly, as well as be able to back up these so that it would be able to be retrieved back if it went missing. Such operations are managing staff and patients accounts such as Create, Read, Update, Delete (CRUD) and Search operations. Furthermore, managing dental appointment details like Create, Read, Update, Delete (CRUD) and Search operations, such as recording their appointment date and time. Lastly, it is managing reports which will perform Generate, Print and Search operations, which is important for the dentist to look at these reports when they require it.

2.3 Literature Review

Most of the business sectors these days have been starting to implement information technology into their business sectors to assist and improve their businesses in order for them to survive and compete in their own market as the competitiveness in the market will grow significantly day by day. For example, information technology will be providing the users with real time and accurate information compared to human efforts, as well as increase in work efficiency and productivity which will help the business sectors to save their time on decision making. The current system used to operate the dental clinic is not secure enough and not well-organized enough due it have to be done manually by writing and organizing it manually. This private information and data might be lost due to any human error or natural disaster such as floods. An implementation of the dental management system will be important due to there being a database to store all this private information and data of the dental clinic. Database proves that it is effective for dental clinics as it helps to store all the important information which will provide accurate data and information for any decision making. With the help of information technology, the private information and data of the dental clinic will be more secure and the information will be more well-organized.

Firstly, the amount of paperwork and workload will be reduced due to the staff not having to do it manually. This would allow the staff to utilize their time on focusing on something more important rather than wasting time on completing the paperwork manually. The staff will have to record every information and details manually through an old paperwork system such as writing it down on paper without the help of a computerized system, this might cause them to make some mistakes on the paperwork since human errors are hard to prevent and data will be hard to track back as well. If any of these important documents are lost, it would be very troublesome for the staff due to not having any backup of those documents. The writings of other staff might also be hard to read by some staff since everyone has their own way of writing, this might cause some headache and delay to the staff as well.

With the implementation of the dental management system, it will solve most of the problems that have been stated above, as well as assisting the staff in managing all this information and records well such as managing staff and patient details, arranging appointment schedules and managing reports. The dental clinic staff will be benefited by the implementation of the dental management system where their amount of workload and paperwork will be reduced

so that they will not be stressed out easily, as well as increase in efficiency and productivity. From the business perspective, this system will help to improve efficiency and help to save lots of time due to recording any information or arranging any appointments will be easier and faster with the help of computerized systems, as well as reports will be generated automatically. It would then improve the population of patients and will attract more potential patients to visit our dental clinic due to the speed and quality of our service.

Management Information System (MIS) involves processes, people and technology in an organizational context. The ultimate goal of the use of Management Information System (MIS) is to increase the value and profits of the business. Management Information System (MIS) is the most suitable computerized system for our dental clinic to help benefit our dental clinic in terms of efficiency and accuracy of data. The figure below is a model of the Management Information System (MIS).

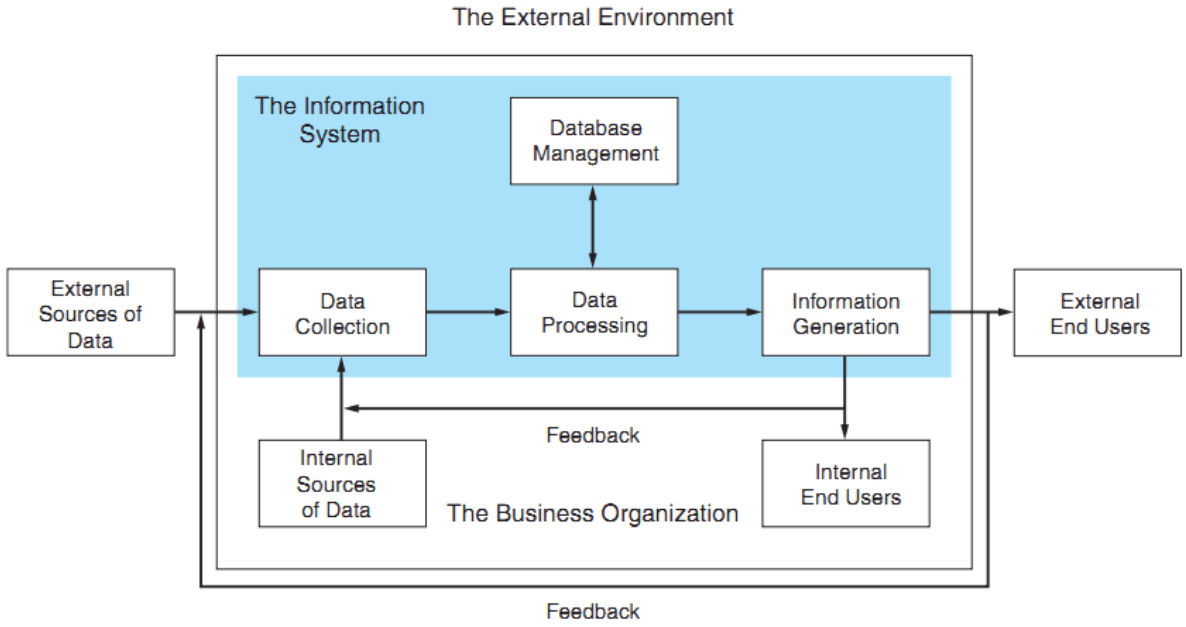

Figure 2.2 - The Model of MIS

2.4 Feasibility Study

2.4.1 Economic Feasibility

The Dental Management System (DMS) will be designed and developed on the existing hardware, which would require no cost for buying and installing the Dental Management System (DMS). The software that we will be using is free of charge as well, where no cost is needed for the software itself. This would help to save costs without needing to buy any new software or hardware to develop the Dental Management System. Therefore, it is economically feasible for this project.

2.4.2 Operational Feasibility

The Dental Management System (DMS) is implemented to aid the dental staffs in managing the data of patients and their own staffs, as well as allowing the staffs to access the system at anywhere and anytime for any rescheduling of patient's appointment, editing and managing of patient's or staff's details immediately in case they are afraid that it would be forgotten by them to make any important changes. Users would simply just need an internet connection and their own respective devices such as smartphones, tablets or computers to access the system. Before being able to make any changes of the data through the system, users will be required to sign into the system with their respective account. After they have successfully signed into their own account, they will then be allowed to make any changes required. The users will be able to create new appointments or modify any existing appointments, as well as be able to view and modify the details of their patients or staff immediately. This would help the users to save their time without having to go back to the dental clinic to make any changes and increase efficiency where they do not have to wait till the next order to make any changes needed or some might be a little forgetful, which then they will forget to make any changes required.

Moreover, with the implementation of Dental Management System (DMS) to minimize human error and help to prevent data getting lost from natural disasters. The cost for personnel will be reduced as well as staff will not require to work overtime as well as will not require to hire more staff in helping to manage the data and patients of the dental clinic. The GUI of the Dental Management System (DMS) will be very user-friendly and easy to learn about how to use the system. Therefore, in the long run, the project is operationally feasible.

Last but not least, the developer will be developing the system with the help of computer as well as a few different software which include Microsoft Visual Studio, ASP.net and MySQL.

2.4.3 Technical Feasibility

For the technical aspect, the Dental Management System (DMS) will be designed through ASP.net, and the software that has been chosen that will be used is Microsoft Visual Studio. The database of the system that will be used is MySQL which will help to store all of the important information. The hardware that will be used to develop the DMS are computers and laptops. For the users, they will be able to access and utilize the system with their personal devices such as desktop, laptop and mobile devices including tablets.

Development Tools and Minimum Requirements	
Hardware	Software
Mobile Devices • Android version 4.1 and above • Minimum of 1GB RAM • Able to connect Wi-Fi • Storage space of 2GB available **Desktop/Laptop** • Windows 7 and above • Minimum of 2GB RAM • Able to have Internet Connection • Storage space of 4GB available	• Microsoft Visual Studio • MySQL (Database)

2.5 Chapter Summary and Evaluation

This chapter provided a description of the organization background as well as the project background. The use of Management Information System (MIS) has been discussed, as well as the importance of implementation of information technology into the business sector. For the organization background, the history and any information regarding the organization has been clearly stated above. Moreover, the project background has been stated clearly as what the existing operation is and what is needed to help improve the operation of the entire dental clinic.

Furthermore, in the literature review above, the disadvantages of continued use of the existing system and the problems faced in the existing system have been stated clearly. The solution for this has been stated above and why it is a must to have a change for the way the dental clinic is operating. Besides, the economic feasibility, operational feasibility and technical feasibility have been stated above as well. In the economic feasibility, the procurement of a new system is suggested as well as the cost for designing, developing and implementing the new system have been stated. In operational feasibility, the benefits of implementing the Dental Management System and procedure of how to use the system has been studied and stated above. For instance, reduce the amount of workload and paperwork, reduce human effort, higher accuracy of data, etc. In technical feasibility, the development team has chosen the software and hardware that they will be using, together with the project supervisor in guiding and helping with the perspective of users. The development tools and minimum requirements of hardware have been stated clearly as well.

Lastly, the project should be able to carry out smoothly as the research of the system has been done thoroughly, and with the cooperation between the development team as well as the project manager.

Chapter 3

Methodology and Requirements Analysis

3 Methodology and Requirements Analysis

This chapter will be discussing the methodology used in this project, requirement gathering techniques such as fact gathering and fact recording, requirements analysis such as project scope, development environment and operation environment, as well as functional and non-functional requirements to propose all of the requirements for this project.

3.1 Methodology

The problems that users are facing are that the way of operating the dental clinic is still in the traditional and manual way of operating things, and it is not computerized which will then involve lots of manual processes. This will affect the efficiency and accuracy of the entire process. Besides, more staff would be needed if this way of operating continues, as well as a huge amount of workload and paperwork needed to be done. Users will be looking forward to changing the entire process into a computerized system to help solve these problems that they have faced while using the old system in managing patients' and staffs' data and handling the works of the dental clinic.

The selected development model for this Dental Management System (DMS) will be the Waterfall model. This model has been selected because it is a straightforward process for implementing a new project. The process will be divided into 6 different phases, which are requirements, analysis, design, coding, testing and implementation. The requirements of the Dental Management System (DMS) are very well known, clear and fixed. This model will allow for departmentalization and managerial control, it is simple to understand and easy to use as well. Besides, it will be much easier to manage due to the rigidity of the model where each phase will have its own specific deliverables and a review process, where phases are processed and completed one at a time. The figure below shows the process of the Waterfall model.

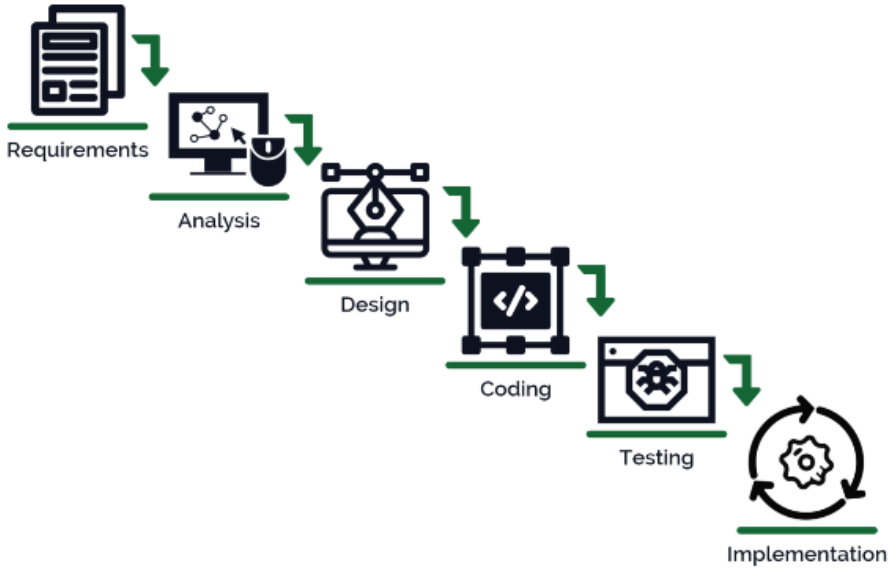

Figure 3.1 - The process of waterfall model methodology (ZULQADAR, FEB 12, 2019)

3.1.1 Fact Gathering

The first fact gathering technique used in this project is interviews. Interviews will allow the programmers to know more clearly about the user's thoughts and feelings of their current system. The obtained information will be more useful as it will then be able to apply into the new system and improvement will be made. This is important since users will be the one operating the system instead of the developers. Therefore, the user's opinion is very important in this project. Furthermore, interviews are designed to collect a richer source of information from a small number of people such as Preferences, Opinions, and Knowledge (Tech, Sep 21, 2018). In the article, interviews have been shown to help explain, better understand, and explore research subjects' opinion, behaviour, phenomenon, experiences, etc. There will be a few open-ended questions prepared to obtain a better understanding and clearer feedback from users. For now, online interviews will be conducted due to a serious pandemic that is happening right now which is Covid-19. We will be following the rules and regulations that have been set by the government during the Movement Control Order (MCO), in which close contact will be prevented. With the help of online interview sessions, developers will be able to obtain useful information from users without violating any rules of the MCO, which will help to reduce the risk of getting infected by Covid-19 for both the interviewees and interviewers.

Secondly, the fact gathering method that will be used in this project is literature review. Literature review is performed on a similar system. With literature review, it will aid us to justify our methodology. Plato is the chosen organization which offers a Clinic Management System as a solution which is similar to our project Dental Management System (DMS). It has been selected to serve as a purpose such as source and example for our project. After studying what Plato company offers, we will have a better understanding about their solutions that we will be able to acquire to improve our project. Module and interface will be taken from their offered solution for the purpose of referencing. With the use of literature review on similar systems, we will be able to obtain various techniques and ways that a system will be developed. The proposed system is better and polished compared to the current system that the dental is utilizing. A sample of the interview question can be referred to appendix 1 below in Appendices.

3.1.2 Fact Recording

1. Use Case Diagrams

Relationships between the use cases, systems, and actors are shown in the use case diagram. The relationship between actors that are involved in the Dental Management System will be shown. Use case diagrams are able to state and show clearly where users interact with the system. Moreover, requirements of the system will be able to be captured through the use case diagram. By using use case diagrams, the interactions and relationships between the system and users will be able to be shown visually.

2. Activity Diagram

Activity diagram is an advanced version of flowchart that models the flow from one activity to another activity (VISUAL PARADIGM, 2020). It models how a collection of use cases coordinate to represent business workflows can be achieved by using activity diagrams. Activity diagrams will be able to show us how the activities are coordinated to provide a service which can be at different levels of abstraction in this project. With the existence of activity diagrams, developers will have a better and clearer understanding of the workflow of the system which consists from one activity to another activity.

3.2 Requirements Analysis

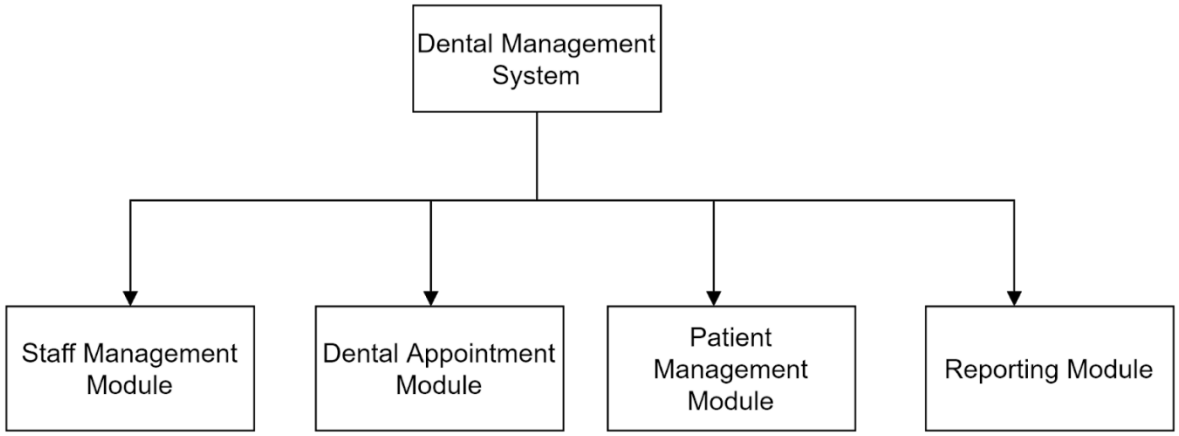

Figure 3.2 - Overview of Dental Management System

3.2.1 Project Scope

Dental Appointment Module	This module allows nurses or admins to manage appointments of patients, it will allow the users to perform tasks such as create appointments, search patient's appointment details and update patient's appointment details. The patient's appointment details can be searched by criteria such as date categorized by module.
Patient Management Module	This module will allow the nurses or admins to manage patient's visit details. Users will be able to perform various tasks such as create, search, update, delete patient information, as well as create a patient's visit details which will consist of the patient's diagnosis, medicines given, etc.

3.2.2 Development Environment

The software tools and hardware used in the project development will all be listed below :

1. Microsoft Visual Studio

   Microsoft Visual Studio is an Integrated Development Environment (IDE) offered by Microsoft. Developers will be utilizing this software to help develop the Dental Management System (DMS) in this project. The language used is also supported by Microsoft Visual Studio such as VB.NET or C#. Furthermore, there is a version of Visual Studio which is Microsoft Visual Studio Community which is an open source software.

2. MySQL (Database)

   It is an open-source software developed by a famous company which is Oracle Corporation. MySQL is a relational database management system which is based on structured query language in short SQL. It will help to serve the purpose of database management in this project. Which will be able to store every single data and manage them in real-time.

3. Programming language

   The programming language that is used in this project will be listed below :

   - HTML5
   - SQL
   - VB.NET

4. Draw.io

   Draw.io is a solution offered to developers to use drag-and-drop functionality to create diagrams. The diagrams that have been designed and used in this project are being created with the help of draw.io such as UML class diagram and Entity Relationship Diagram (ERD). It offers users both choices which consist of web-base or download as software. It also enables users to add toggle layers with customizable URLs and align texts within the designed shapes. The most convenient part is that the diagram designed and created can be downloaded directly from the web-base or copy as an image and paste it in the documents.

5. Visual Paradigm Online

Visual Paradigm Online is a free online drawing software developed for the community. This software contains various shapes and diagrams, which can be created easily. This software also ensures the correctness of our work by presenting only the legitimate elements allowed to be created. The diagram needed to develop this system can be created with ease and professionally.

6. Microsoft Office 365

There is a variety of software provided in this microsoft office package which consists of Microsoft Word, Microsoft Excel, Microsoft PowerPoint, Microsoft Outlook, Microsoft Publisher & Microsoft Access. The software used in this project is Microsoft Word, which allows us to create our project documents and save it for future use. It has features which will make our documents look more professional. It has been chosen as our document software because it has a user-friendly interface and it is easy to understand and operate without any training needed. Document can be trimmed and beautified with the help of Microsoft Word.

7. Operating System: Microsoft Windows 10 Home

8. Hardware

- Processor: Intel I5-8300H@2.30GHz x64 Processor
- Memory: 8GB DDR4 2666MHz RAM
- HDD: 1TB 7200rpm & 500GB M.2 NVMe PCIe SSD

3.2.3 Operation Environment

Development Tools and Minimum Requirements	
Hardware	Software
Mobile Devices • Android version 4.1 and above • Minimum of 1GB RAM • Able to connect Wi-Fi • Storage space of 2GB available **Desktop/Laptop** • Windows 7 and above • Minimum of 2GB RAM • Able to have Internet Connection • Storage space of 4GB available	• Microsoft Visual Studio • MySQL (Database)

3.2.4 Non-Functional Requirement

1. Usability

The Dental Management System should be easy to understand and use without any training needed. Only users with correct credentials and successful verification are allowed to access the system. Users shall be able to operate the system without any struggle. The credentials will be applied to the user's account when the admin is creating an account for the user. After successful registration, the user's credentials will be compared with the one stored in the database every time they login into the system. Any incorrect identification or authentication should strictly be rejected and restricted to access the system.

2. Recoverability

The data of the system will be backed up and stored in other locations such as clouds to prevent data losses and allow us to recover any data loss. Since it is a system for dental clinics, it will consist of lots of private data and information of the clinic as well as patients data. Every detail will be very crucial as the information will include patient’s details and staff’s details, it also includes patient’s allergy to any substances or medicine as well as diagnosis of patients. The data in the Dental Management System is very important because it will harm patient’s safety or health. So, it must be kept safe and any lost data should be able to be restored.

3. Accuracy

The system should be able to provide accurate and consistent data across the system. The Dental Management System involves many important functions and critical information such as patient's appointment. Therefore, the system must be below 1% error rated in terms of system reliability. For example, the appointment functions should provide accurate and real-time information when users are about to perform any action through the function. Due to the appointment modules are not related to only the user but as well as the patient and dentists of the dental clinic.

4. Availability

The Dental Management System should be available 24/7 for the users because the system has many important functions that the users need. The system should be able to be installed in any devices such as desktop, laptop, smartphone or tablet. Furthermore, users should be granted access to the system at any time and anywhere with Wi-Fi or cellular data. Every data will be able to view or make changes by the users without any restrictions such as location restriction. Due to this, the users will have to perform any actions through the system at any time if there are changes needed to be made immediately. So the availability of the system is very critical and important to users without causing any inconvenience for the users.

3.2.5 Functional Requirement

1. **Dental Appointment Module**

    a. **Create Appointment**

    Nurses and admin will be allowed to create a new appointment after confirming with the patients, there will be fields that are required to be filled in such as patient's name, patient's contact number, appointment time & etc before being able to create and book an appointment in the system. After successful booking, the time slots will not be available for other patients and the details will be stored in the database.

    b. **Search patient's appointment details**

    Nurses and admin will be able to search the patient's appointment through their given appointment time, date, contact number or name to retrieve the appointment details. The information should be shown to the users when any information matches the search criteria of the users or similar information. If not, the system will show empty results instead.

    c. **Update patient's appointment details**

    Nurses and admin will be able to make changes to the patient's appointment details such as their appointment date and time. Information that is incorrect can be modified and updated in this module. Users will be able to fix any incorrect information stored into the system previously.

    d. **Delete patient's appointment details**

    Nurses and admin will be able to delete the selected patient's appointment details through this module, to avoid any space wasted on these unvisited data. The appointment details will then be completely removed from the system.

2. **Patient management module**

    a. **Create patient**

    Nurses will be able to create new patient's information according to their identification card and based on the information told by the patient, it will

contain information such as their name, contact number, identification card number, address, etc.

b. Create patient's visit record

Nurses and admin will be able to create a patient's visit record for new patients to track whether they are absent or present on their appointment date, their last visit to the dental clinic and also what they have been diagnosed with about their teeth condition during their last visit.

c. View Patient's Visit Record

Nurses and admin will be able to view the previous visit details of the respective patient that have been recorded into the system. An excel file will then be created and details will be generated, all of the previous visit details will be shown in the excel file.

d. Search patient's information

Nurses and admin will be able to search the patient's information through the criteria such as identification card, name or patient's contact number. The information should be shown to the users when any information matches the search criteria of the users or similar information. If not, the system will show empty results instead.

e. Update patient's information

Nurses and admins are allowed to make changes to the patient's information such as the patient's name, address, contact number, etc. Information that is incorrect can be modified and updated in this module. Users will be able to fix any incorrect information stored into the system previously.

f. Delete patient's information

Nurses and admin will be able to delete any old patient's information that has already done any treatment or non-visiting patients. Their information will be removed from the system if the information has been successfully deleted.

3.2.6 Use Case Diagram

The use case diagram for the Dental Appointment Module is shown in Figure 3.3 while the use case description of each use case is shown in Table 3.1, 3.2, 3.3.

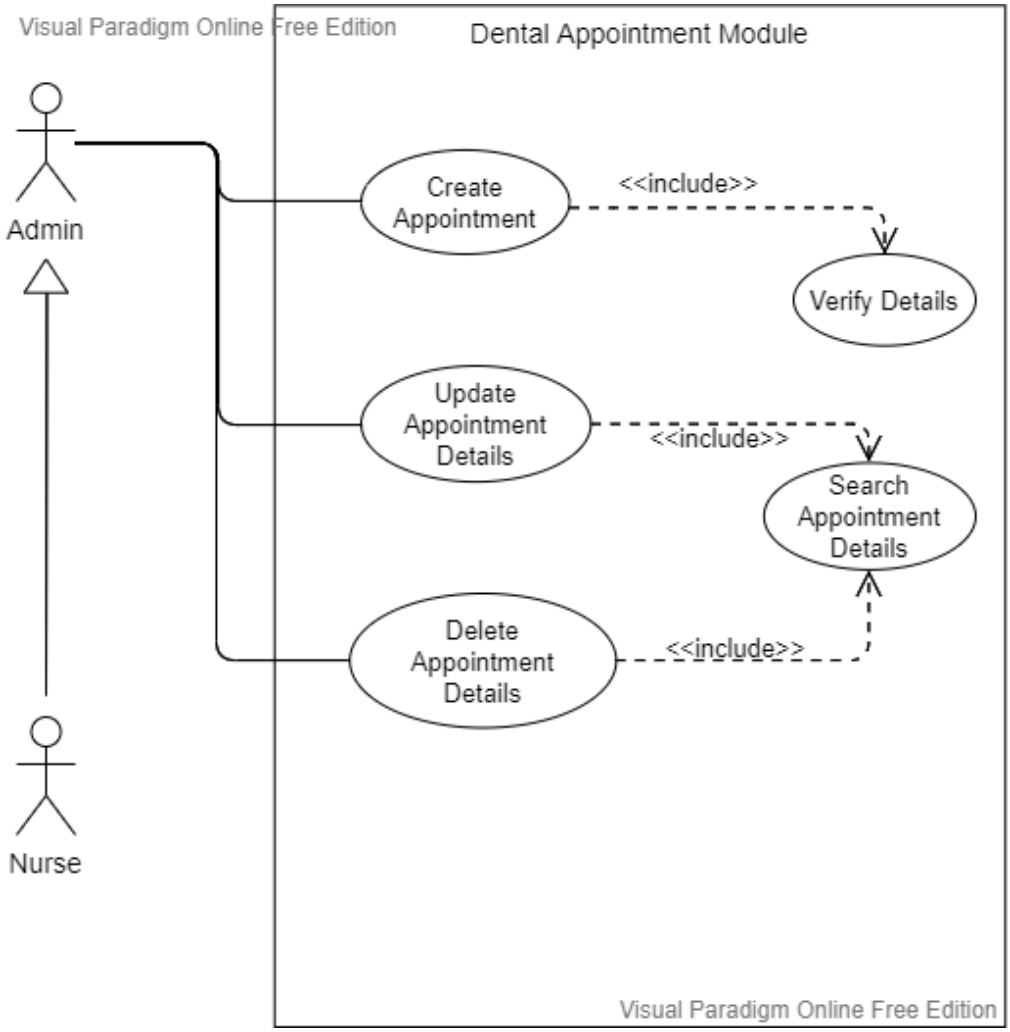

Figure 3.3 Use Case Diagram for Dental Appointment Module

Use Case	Create Appointment
Brief Description	This use case allows the admin to create new appointments and add them into the system.
Actor	Admin, Nurse
Precondition	Valid user credentials and identity
Main Flow of Event	
Actor Action	**System Response**
	1. Display instruction and required field for appointment details.
2. Enter details into the required field.	3. Validate details provided by the user.
	4. Display available date and time slots for appointments.
5. Select the available date and time that is requested by the patients.	6. Validate date and time selected by the user.
	7. Details validated and shows a successful message.
Alternative Flow	A1.Step 3 : Incorrect details provided by the user. A1.Step 4 : Shows an unsuccessful message, system brings user back to step 2. A1.Step 6 : Incorrect date or time selected by the user. A1.Step 7 : Shows an unsuccessful message, system brings user back to step 5.
Post-Condition	System adds appointment details into the database.

Table 3.1 Use Case Description for Create Appointment

Use Case	Update Appointment Details
Brief Description	This use case allows the admin to update existing appointment details.
Actor	Admin, Nurse
Precondition	Valid user credentials and identity
Main Flow of Event	
Actor Action	**System Response**
	1. Display instructions and request for search criteria.
2. Select search criteria.	
3. Enter details based on the search criteria.	4. Validate entered details with database and request for new appointment details.
5. Enter new appointment details.	6. Validate new appointment details.
	7. New appointment details validated, then display a successful message.
Alternative Flow	A1.Step 4 : Appointment details not found in the database. A1.Step 5: Shows an unsuccessful message, system brings user back to step 2. A1.Step 6 : Incorrect details provided by users. A1.Step 7 : Shows an unsuccessful message, system brings user back to step 5.
Post-Condition	System update new appointment details into database.

Table 3.2 Use Case Description for Update Appointment Details

Use Case	Delete Appointment Details
Brief Description	This use case allows the admin to delete existing appointment details.
Actor	Admin, Nurse
Precondition	Valid user credentials and identity
Main Flow of Event	
Actor Action	**System Response**
	1. Display instructions and request for appointment ID or appointment date.
2. Enter the appointment ID or appointment date.	3. Validate appointment ID or appointment date with database and show confirmation message.
4. Provide confirmation.	5. If confirmed, show the deleted successful message.
Alternative Flow	A1.Step 3 : Appointment details not found in the database. A1.Step 4: Show unsuccessful message, system brings user back to step 2. A1.Step 5 : If not confirmed, cancel the process.
Post-Condition	System delete appointment details from database.

Table 3.3 Use Case Description for Delete Appointment Details

The use case diagram for the Patient Management Module is shown in Figure 3.4 while the use case description of each use case is shown in Table 3.4, 3.5, 3.6.

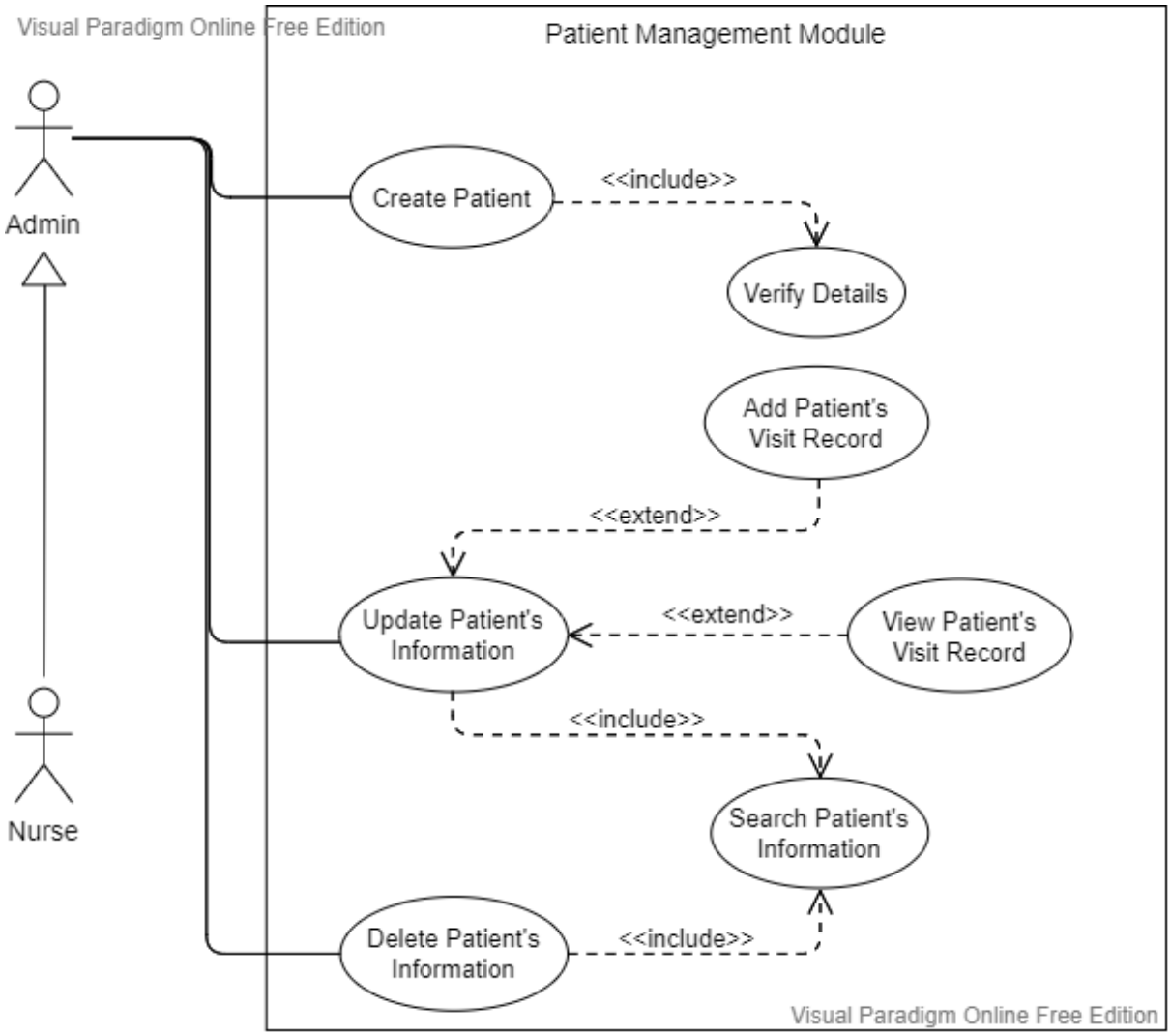

Figure 3.4 Use Case Diagram for Patient Management Module

Use Case	Create Patient
Brief Description	This use case allows the admin to add new patients into the system.
Actor	Admin. Nurse
Precondition	Valid user credentials and identity
Main Flow of Event	
Actor Action	**System Response**
	1. Display instruction and request for required patient details field.
2. Enter details into the required field.	3. Validate details provided by the user.
	4. Details validated and shows a successful message.
Alternative Flow	A1.Step 3 : Incorrect details provided by the user. A1.Step 4 : Shows an unsuccessful message, system brings user back to step 2.
Post-Condition	System adds patient details into the database.

Table 3.4 Use Case Description for Create Patient

Use Case	Update Patient's Information
Brief Description	This use case allows the admin to update existing patient's information.
Actor	Admin, Nurse
Precondition	Valid user credentials and identity
Main Flow of Event	
Actor Action	**System Response**
	1. Display instructions and request for action.
2. Provide action.	3. If action is to update patient details, request for patient's name or identification card number.
4. Enter the patient's name or identification card number.	5. Validate patient's name or identification card number with database and request for new patient details.
6. Enter new patient details.	7. Validate new patient details.
	8. New patient details are validated and show a successful message.
Alternative Flow	A1.Step 3 : If action is to view the patient visit record, an excel file will be generated. A1.Step 3 : If action is to add a new patient visit record, request for patient visit details. A1.Step 5 : Patient's details not found in database. A1.Step 6: Shows unsuccessful message, system brings user back to step 4. A2.Step 7 : Incorrect details provided by the user. A2.Step 8 : Shows an unsuccessful message, system brings user back to step 6.
Post-Condition	System update new patient details into database.

Table 3.5 Use Case Description for Update Patient's Information

Use Case	Delete Patient's Information
Brief Description	This use case allows the admin to delete existing patient's information.
Actor	Admin, Nurse
Precondition	Valid user credentials and identity
Main Flow of Event	
Actor Action	**System Response**
	1. Display instructions and request for patient's name or identification card number.
2. Enter the patient's name or identification card number.	3. Validate patient's name or identification card number with database and show confirmation message.
4. Provide confirmation.	5. If confirmed, show the deleted successful message.
Alternative Flow	A1.Step 3 : Patient's details not found in database. A1.Step 4: Show unsuccessful message, system brings user back to step 2. A2.Step 5 : If not confirmed, cancel the process.
Post-Condition	System delete patient details from database.

Table 3.6 Use Case Description for Delete Patient's Information

3.3 Chapter Summary and Evaluation

During the preparation of this chapter, we have faced difficulties in choosing the appropriate and suitable methodology for our project. After a long and decisive discussion with my team member, the Waterfall methodology has been chosen. The reason for choosing it is because it will fit better with our project compared to other methods. With the characteristics of a streamline waterfall, it suits better with small and unchanging projects which suits our project. In this chapter, it has defined requirements including function and non-functional requirements. Thus, we will be able to proceed to the next step which is System Design since the requirement has been clearly defined.

Chapter 4
System Design

4 System Design

In this chapter, the detailed system design of the Dental Management System will be shown and described through the aids of various diagrams.

4.1 Data Design

4.1.1 Class Diagram

The class diagram will be describing the structure of the Dental Management System by showing the classes, attributes, functions and the relationship between objects.

Figure 4.1 shows the class diagram of the Dental Management System.

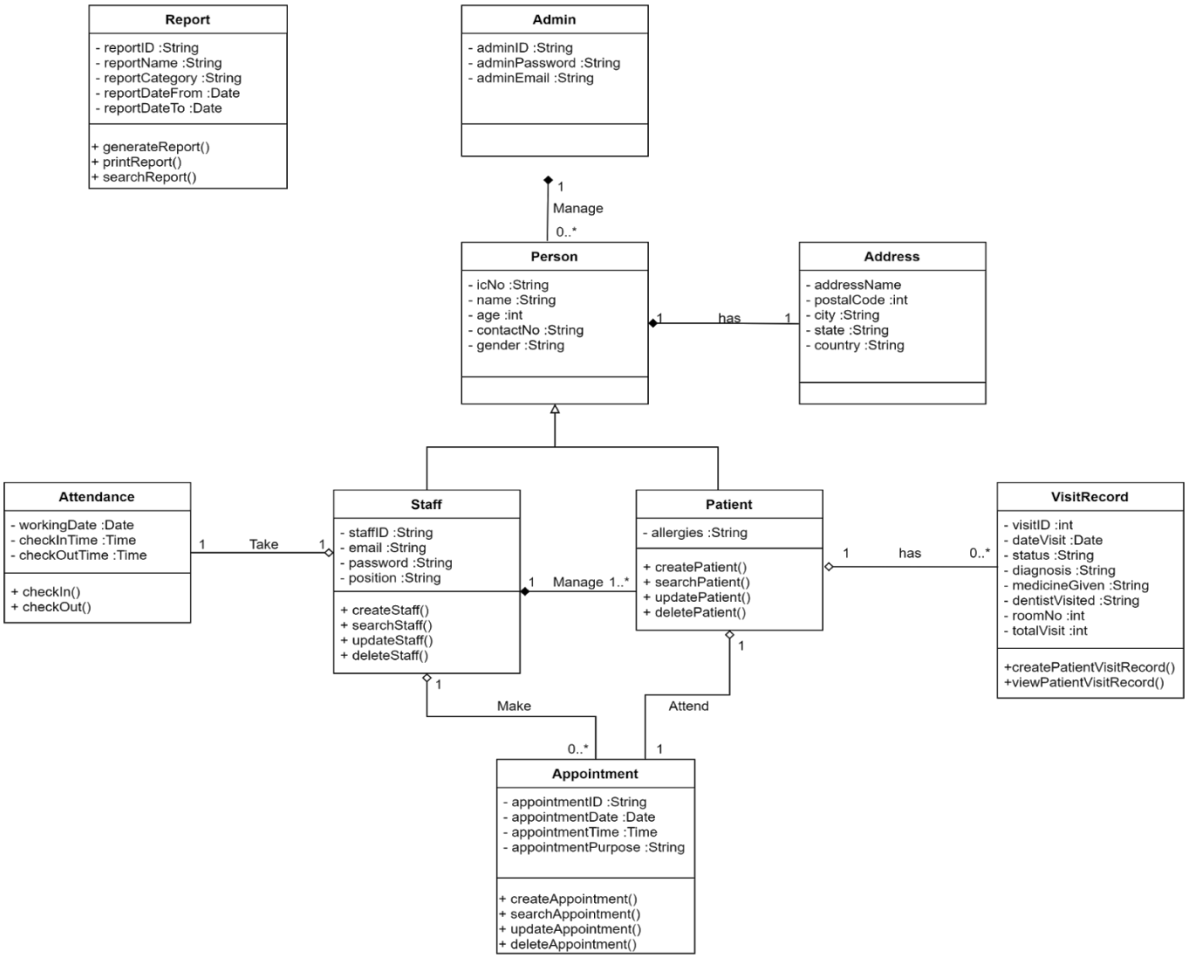

Figure 4.1 Class Diagram of Dental Management System

4.1.2 Entity Relationship Diagram (ERD)

The entity relationship diagram below (Figure 4.2) shows the Dental Management System's entities and the relationship between the entities.

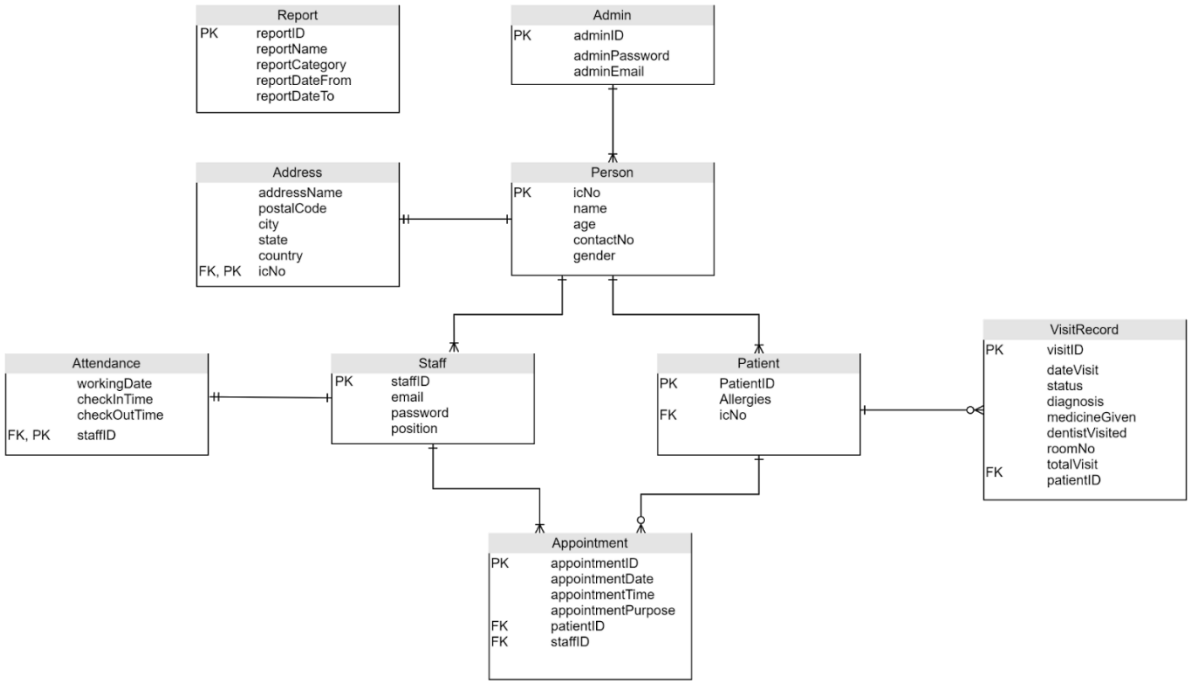

Figure 4.2 Entity Relationship Diagram (ERD) of Dental Management System

4.1.3 Data Dictionary

The table below will be showing the data dictionary that will be used in our Dental Management System module. The entities included are report, admin, address, person, attendance, staff, patient, visit record and appointment.

Entity Name	Attributes	Data Type	Description
Report	reportID (PK)	Varchar(10)	Unique ID for Report, auto increment
	reportName	Varchar(100)	Name of report. Eg. May 2020 Attendance Report.
	reportCategory	Varchar(50)	Report category. Eg. Attendance
	reportDateFrom	Date	Date range from.
	reportDateTo	Date	Date range to.

Entity Name	Attributes	Data Type	Description
Admin	adminID	Varchar(10)	Unique ID for Report, auto increment
	adminPassword	Varchar(50)	Password of admin.
	adminEmail	Varchar(100)	Email of admin.

Entity Name	Attributes	Data Type	Description
Address	addressName	Varchar(100)	Address name.
	postalCode	integer	Postal Code of address.
	city	Varchar(50)	City of address.
	state	Varchar(50)	State of address.
	country	Varchar(50)	Country of address.

Entity Name	Attributes	Data Type	Description
Person	icNo	integer	Identification Card Number
	name	Varchar(100)	Person's name
	age	integer	Person's age
	contactNo	integer	Person's contact No Eg. +60(**177777777**)
	gender	Varchar(50)	Person's gender

Entity Name	Attributes	Data Type	Description
Attendance	workingDate	Date	Date of working
	checkInTime	Time	Time of check in
	checkOutTime	Time	Time of check out

Entity Name	Attributes	Data Type	Description
Staff	staffID	Varchar(10)	Unique ID for Report, auto increment
	email	Varchar(100)	Staff's email
	password	Varchar(50)	Staff's password
	position	Varchar(50)	Staff's position Eg. Dentist

Entity Name	Attributes	Data Type	Description
Patient	allergies	Varchar(100)	Patient's allergies

Entity Name	Attributes	Data Type	Description
VisitRecord	visitID	Varchar(10)	Unique ID for Report, auto increment
	dateVisit	Date	Date that patient visited.
	status	Varchar(50)	Status of the visit
	diagnosis	Varchar(100)	Diagnosis of patient
	medicineGiven	Varchar(100)	Patient's medicine
	dentistVisited	Varchar(100)	Dentist related
	roomNo	integer	Room number

Entity Name	Attributes	Data Type	Description
Appointment	appointmentID	Varchar(10)	Unique ID for Report, auto increment
	appointmentDate	Date	Date appointment made
	appointmentTime	Time	Time appointment made
	appointmentPurpose	Varchar(100)	Purpose of appointment

4.2 Process Design

4.2.1 Activity Diagram

a. Create Appointment - Patient appointment details

This process allows the admin to create appointments for the patient. The details required are appointment date, appointment time, appointment purpose, and etc. The activity diagram of this function is shown below in figure 4.3.

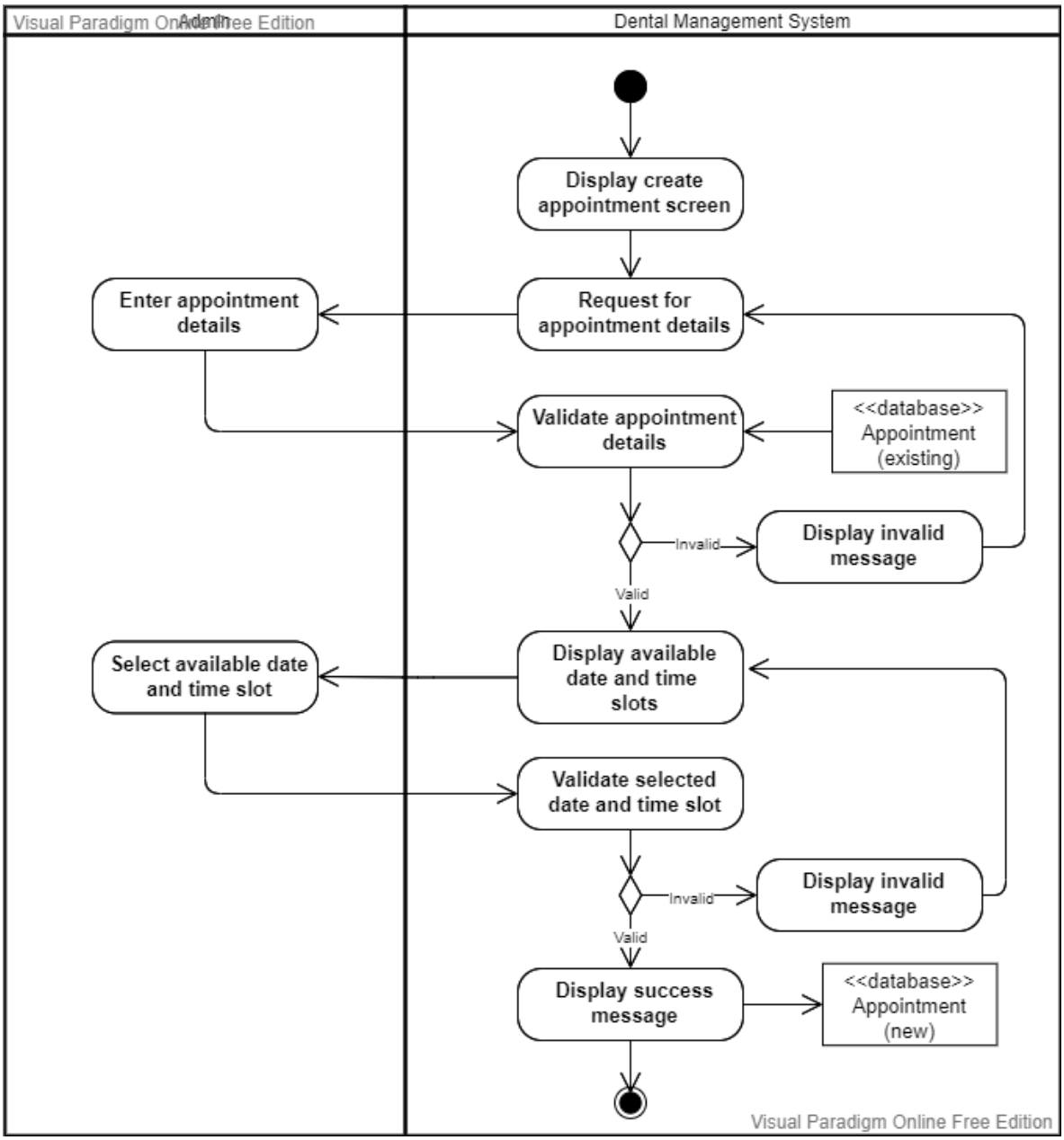

Figure 4.3 Activity Diagram for the function Create Appointment

b. Update Appointment Details

This process allows the admin to manage the existing appointment details of patients where they will be able to update or make changes to the existing appointment. They will be allowed to make changes of the appointment date, appointment time, and etc. The admin will be able to use the search function in this process. The activity diagram of this function is shown below in figure 4.4.

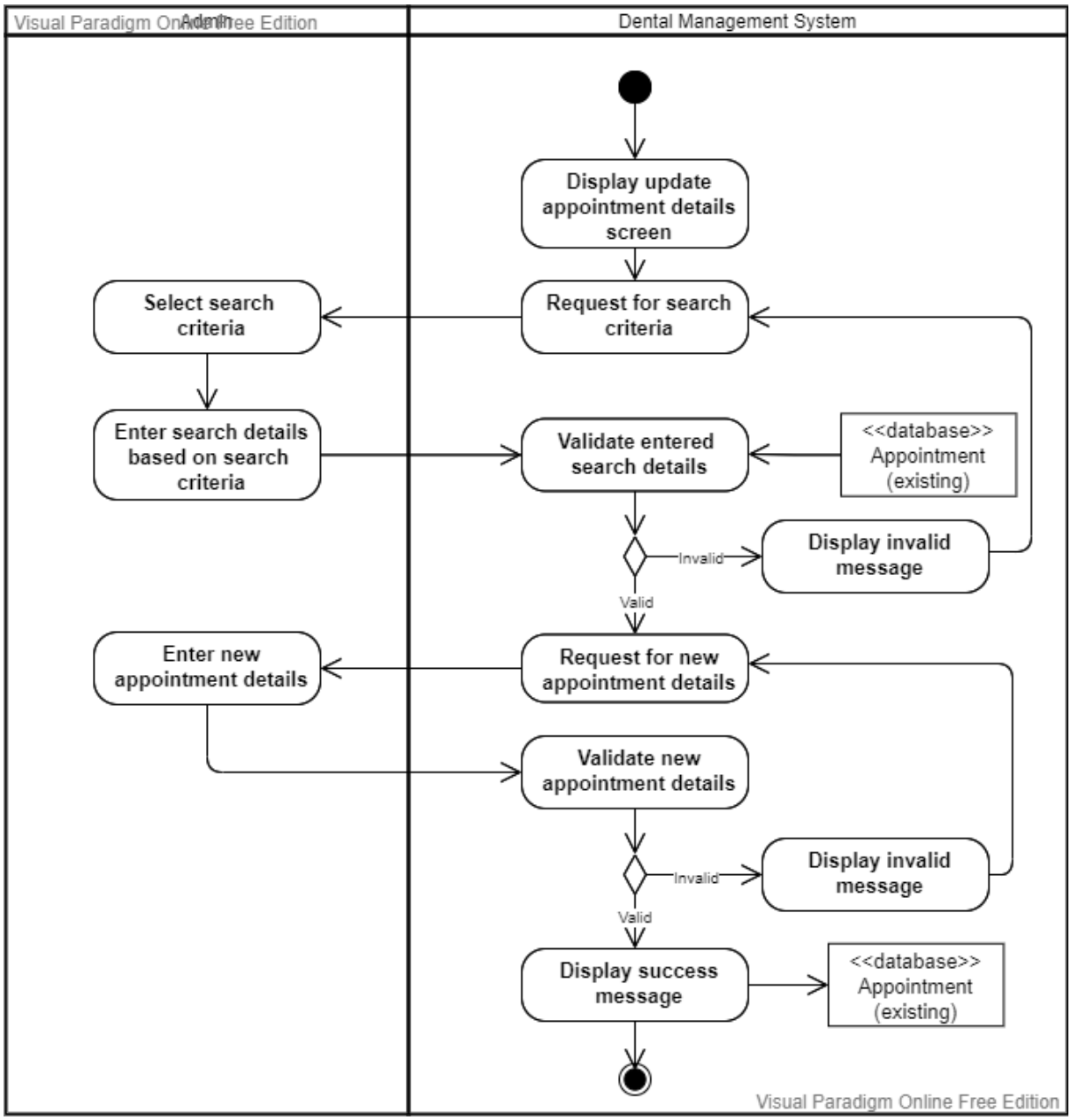

Figure 4.4 Activity Diagram for the function Update Appointment Details

c. Delete Appointment Details

This process will allow the admin to delete appointment details of the patients that did not attend the appointment and are not contactable afterwards. The admin will be able to use the search function in this process to find the respective appointment details that they wish to delete. The activity diagram of this function is shown below in figure 4.5.

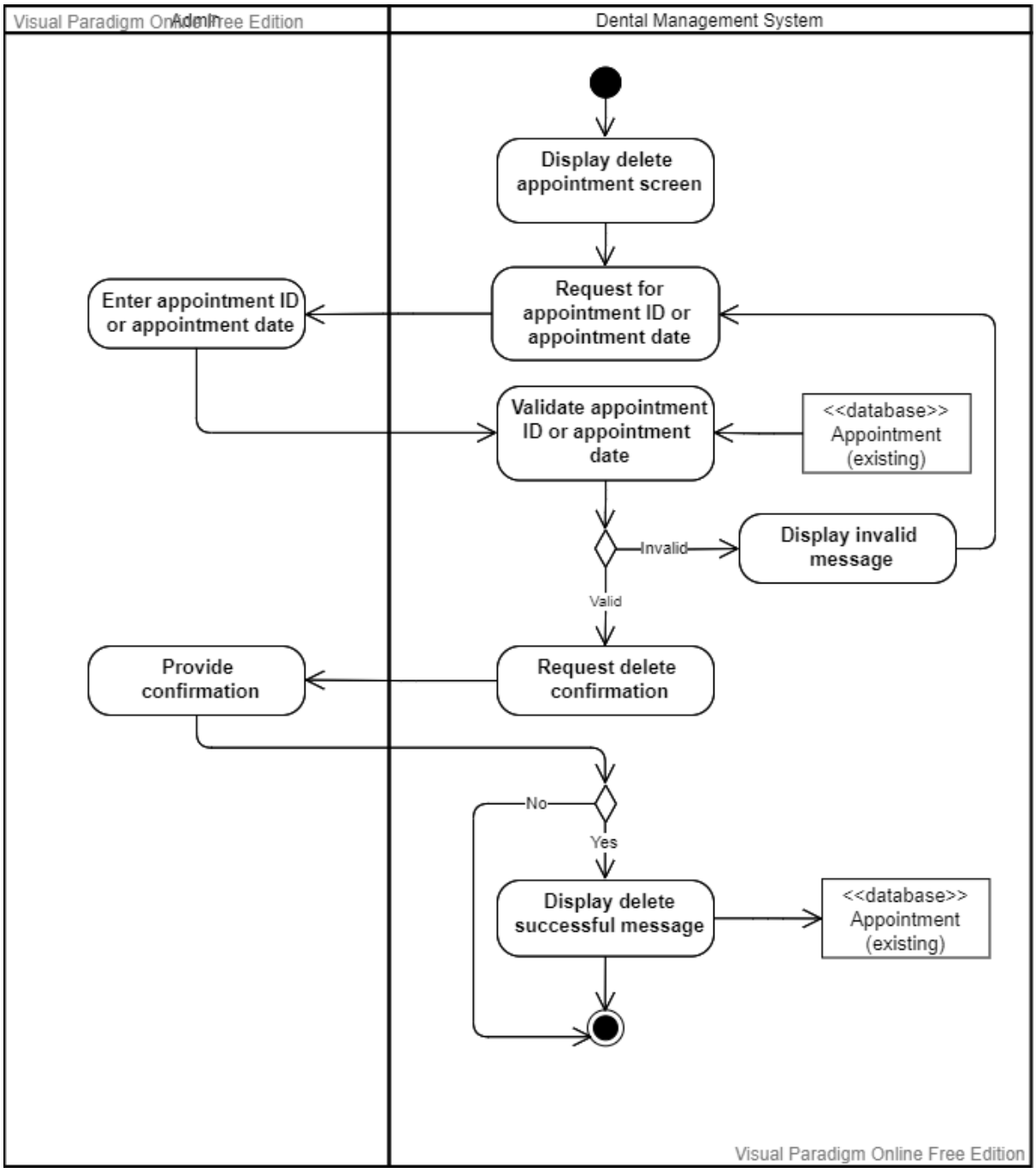

Figure 4.5 Activity Diagram for the function Delete Appointment Details

d. Create Patient - Patient details

This process will allow the admin to create new patient details where they will be allowed to add new patient details such as identification card number, name, contact number, and etc. The activity diagram of this function is shown below in figure 4.6.

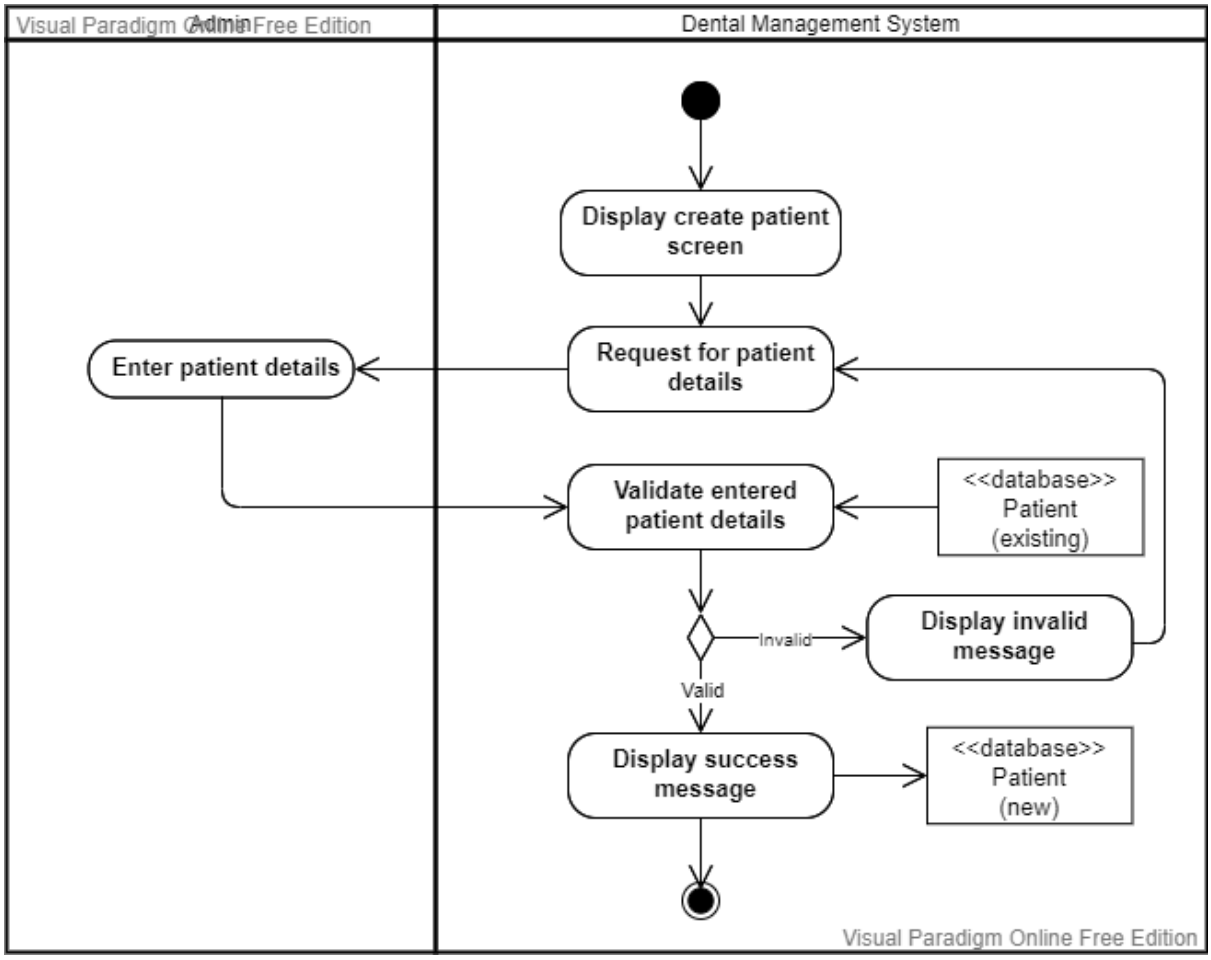

Figure 4.6 Activity Diagram for the function Create Patient

e. Update patient's information

This process allows the admin to update the existing patient's details such as their identification card number, contact number, name, and etc. They would be able to use the search function in this process, as well as adding a new patient visit record in this process. The patient visit record will include visit id, date visit, status, diagnosis, medicine given, dentist visited and room number. The activity diagram of this function is shown below in figure 4.7.

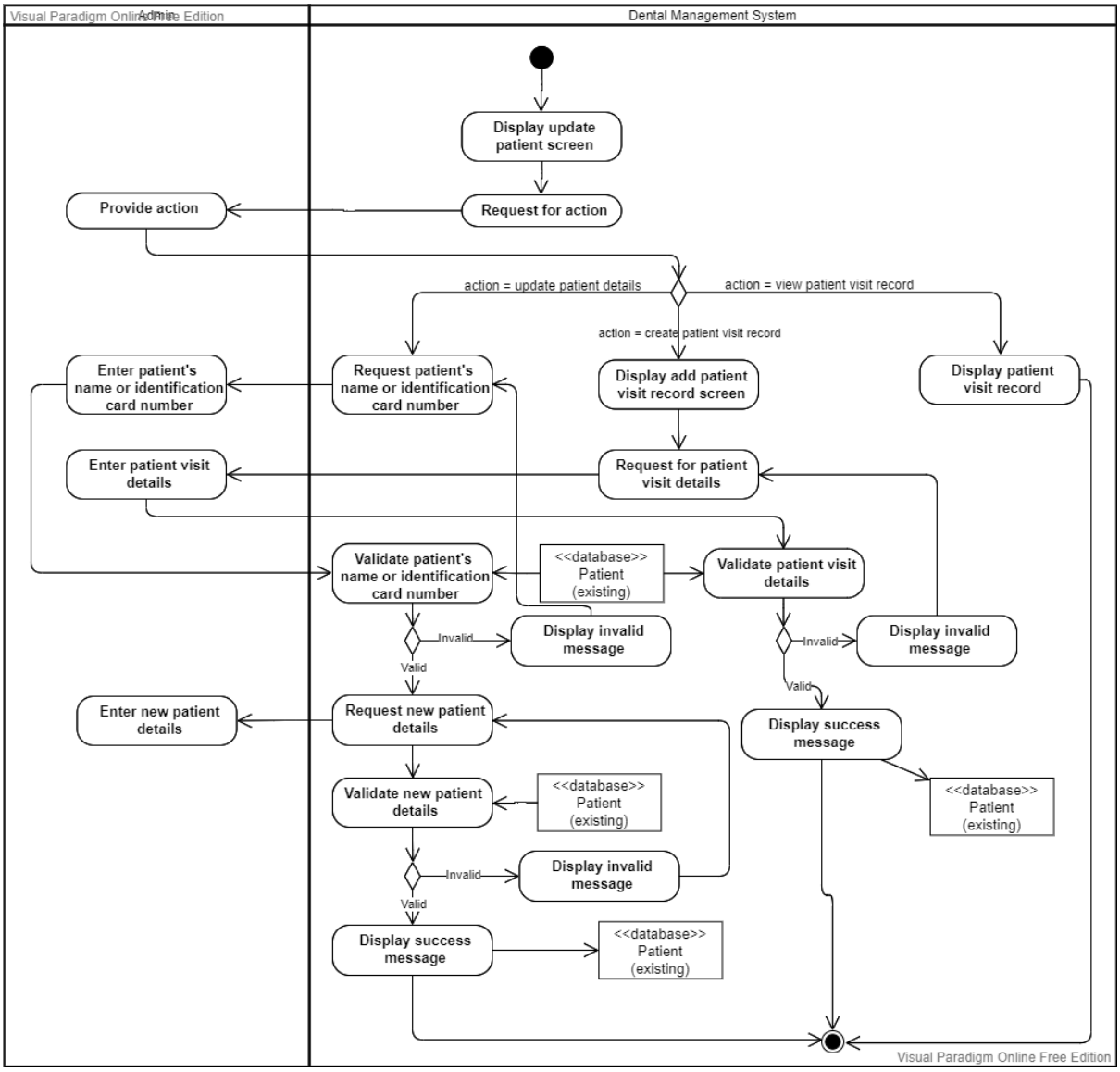

Figure 4.7 Activity Diagram for the function Update Patient's Information

f. Delete patient's information

This process will allow the admin to delete patient's information of the non-visit patient or patient that have already finished their required dental services such as braces. The admin will be able to use the search function in this process to find the respective patient details. The activity diagram of this function is shown below in figure 4.8.

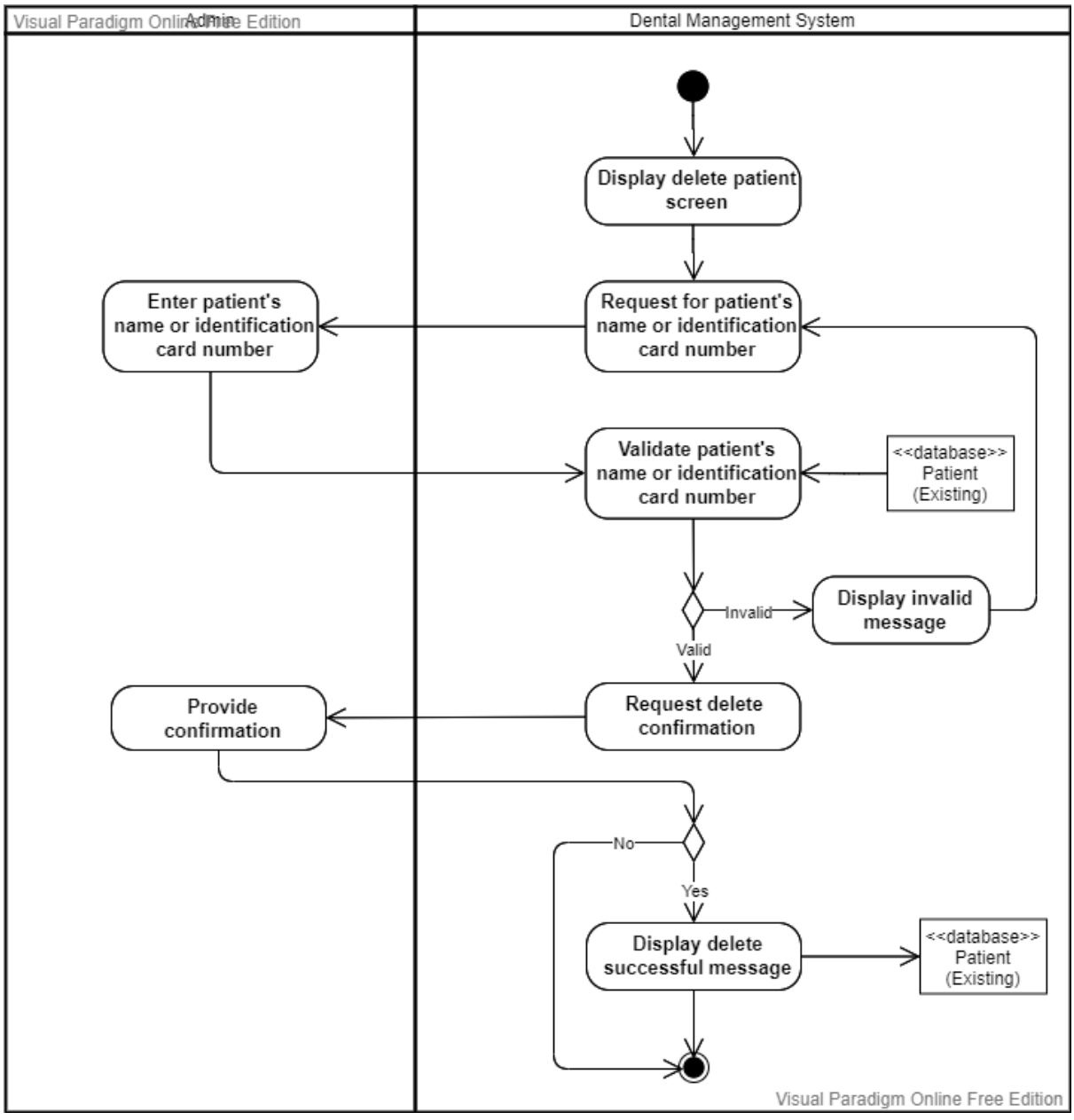

Figure 4.8 Activity Diagram for the function Delete Patient's Information

4.3 Security Design

1. **Login**

The Login UI will display the username and password field for the user to fill in. Users will then be able to login into their respective account through email and password. The password length is fixed which requires a minimum of 8 characters and must consist of at least one uppercase, one lowercase character and one special character. Input mask will be implemented in the password field, the characters of the password will be showing "********" instead of their actual password characters to prevent their password from being exposed. The user's email will act as the username of their account and their identification card number will act as the user account default password. The user can change their password after the account has been successfully created. A valid credential and identification is a must to access the system.

2. **Password Recovery**

Password recovery functions have been implemented to assist and allow the users to recover their forgotten password. Users will be able to perform this function by clicking on the hyperlink placed below the login button in the login page. The "Forgot password" hyperlink is coloured in blue and underlined to help users to know that it is a clickable word. After clicking the hyperlink, users will be directed to the password recovery page. There will be necessary fields and valid information required for the users to fill in, so the system will only be able to send a confirmation email to the user mailbox. Password recovery tasks can only be continued if the user has clicked on the confirmation email that has been sent to their mailbox.

3. **Admin Role**

The admin role will have the ability to create staff accounts, update staff accounts or delete staff accounts. The staff account role which is dentist and nurse will be strictly prohibited from accessing the module. Only the admin will be able to access the page in order to prevent staff from simply accessing the page that is out of their power. In the future, new modules which will allow respective roles user to access, thus having an administrator role will help to limit and control the role privileges of accessing their respective module.

4.4 User Interface Design

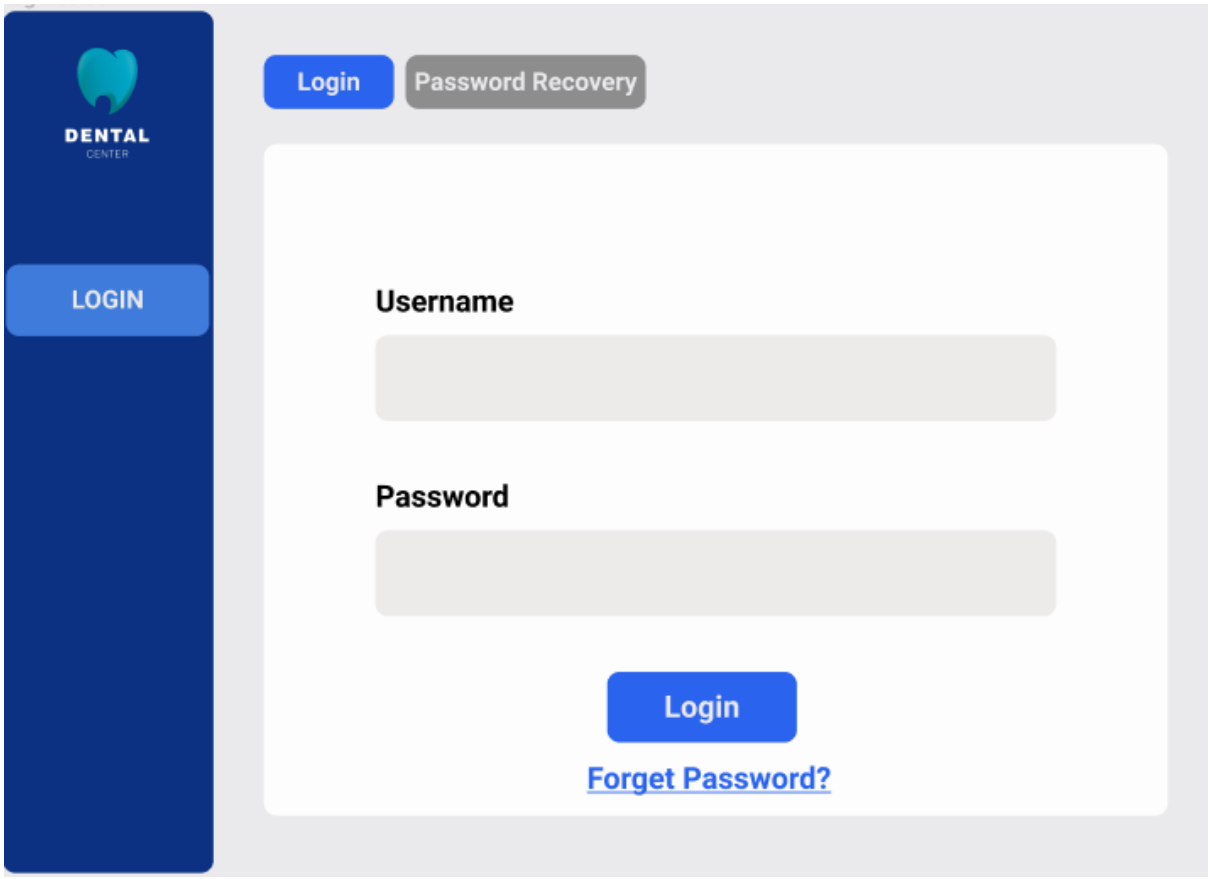

Figure 4.9 Dental Management System Login Page

This is a login screen, where users will be required to login into the system before being able to access the system. The system will allow the user to access the system only if they have entered the correct username and password. Else, access to the system will be denied and will prompt the user to enter the correct details.

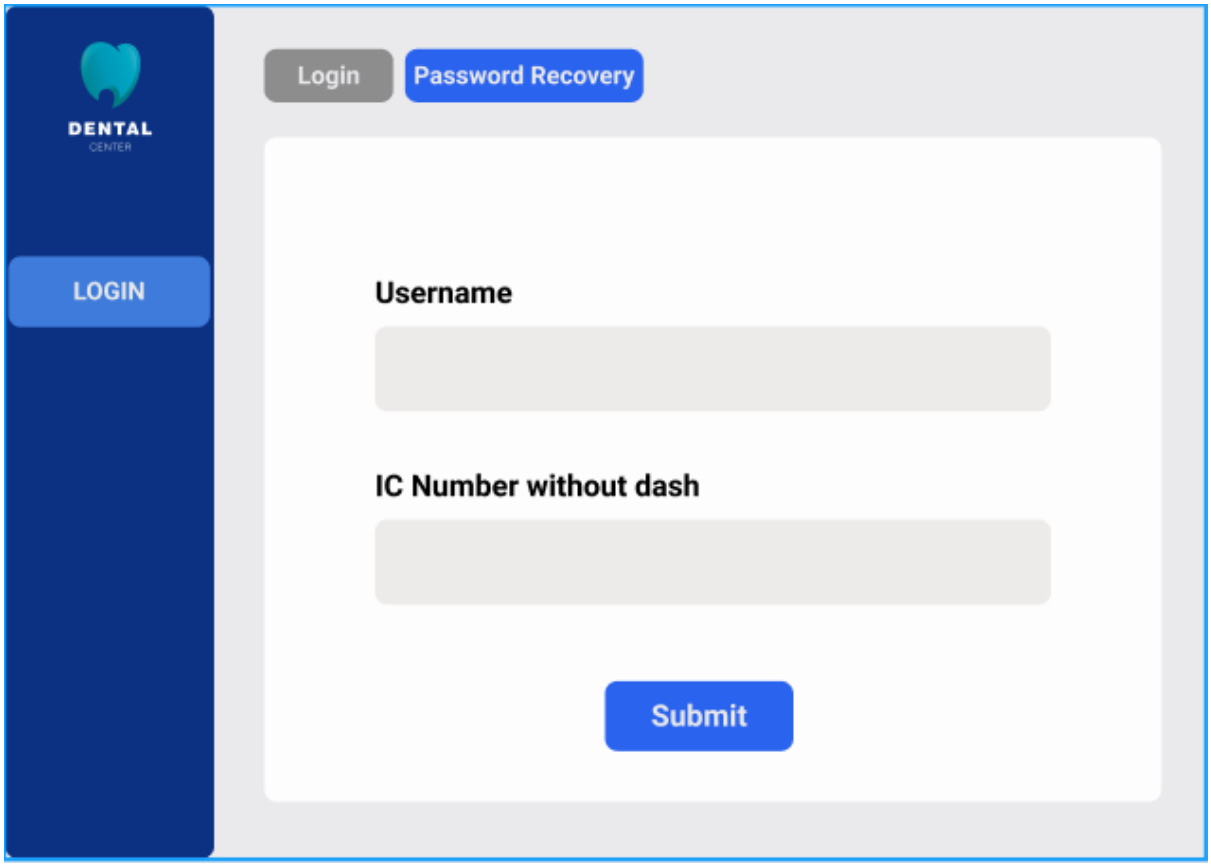

Figure 4.10 Password Recovery Screen

This is a password recovery screen, where users will be able to perform password recovery of their forgotten passwords by entering their username and identification card number. The system will then send a confirmation email to their respective email address that matches the user account. After the confirmation link has been clicked, they will only be able to continue the process of password recovery to prevent unauthorized users from accessing the system.

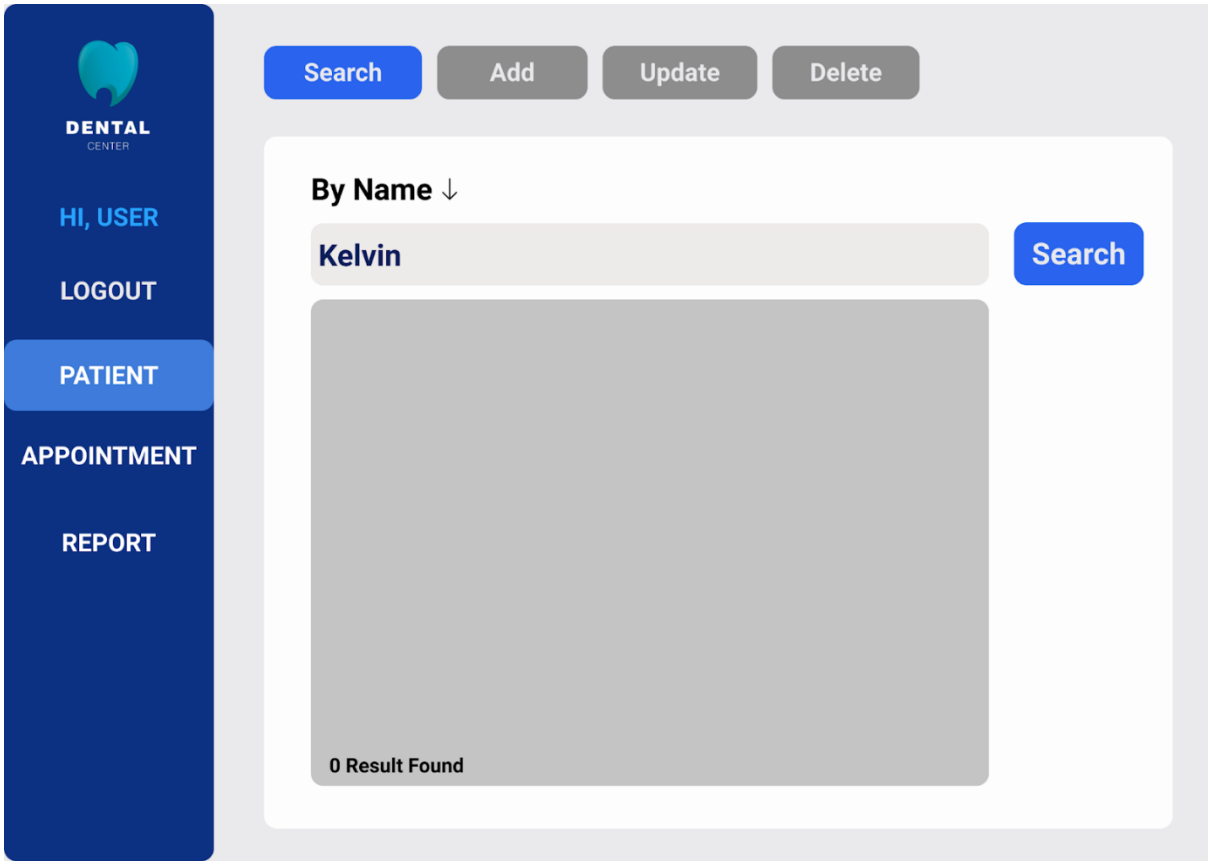

Figure 4.11 Search Patient Screen (Empty result)

This is a Search patient screen, where the staff will be able to search patient details through different criteria such as name or identification card number. If there are no results found, a grey background will be shown and a “0 Result Found” text will be displayed at the bottom of the grey background.

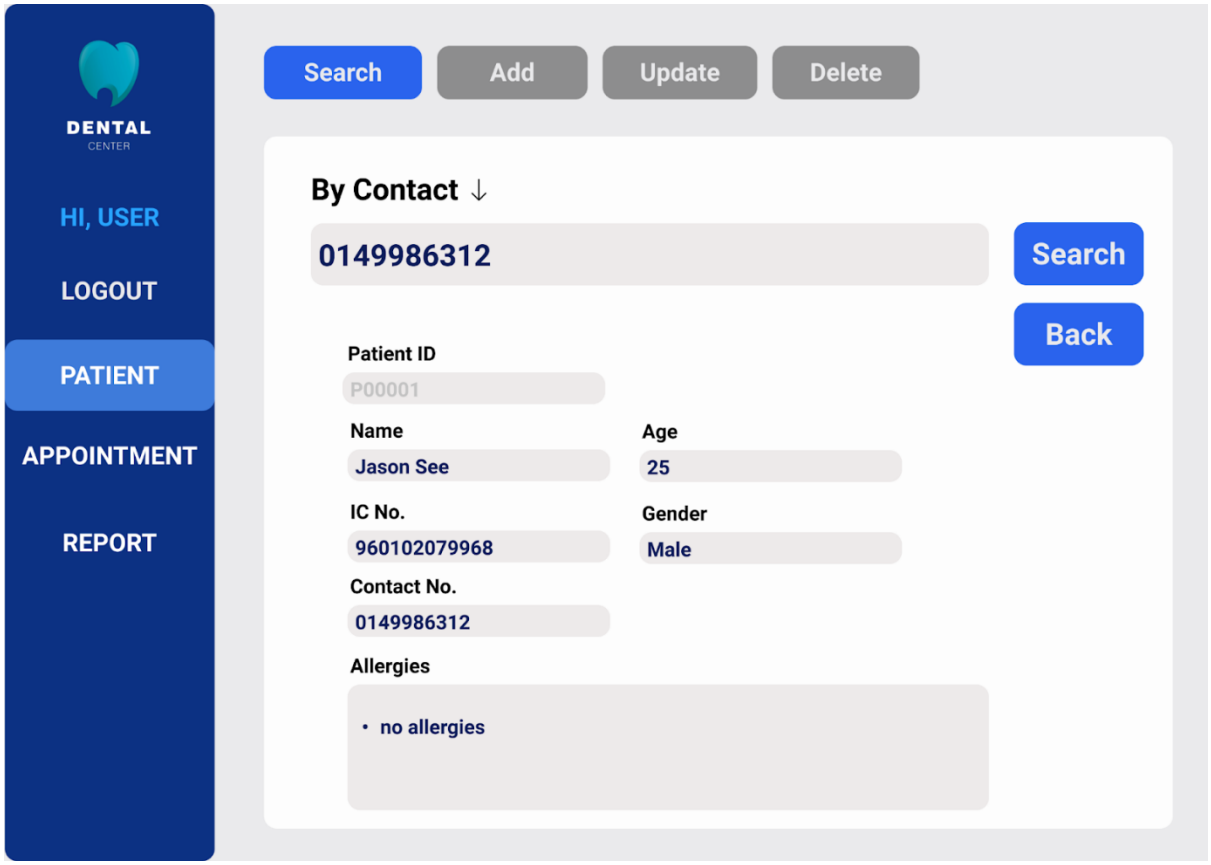

Figure 4.12 Search Patient Screen (With result)

This is a Search patient screen, where the staff will be able to search patient details through different criteria such as name or identification card number. If results have been found, the respective patient details will be displayed on the screen after clicking into it.

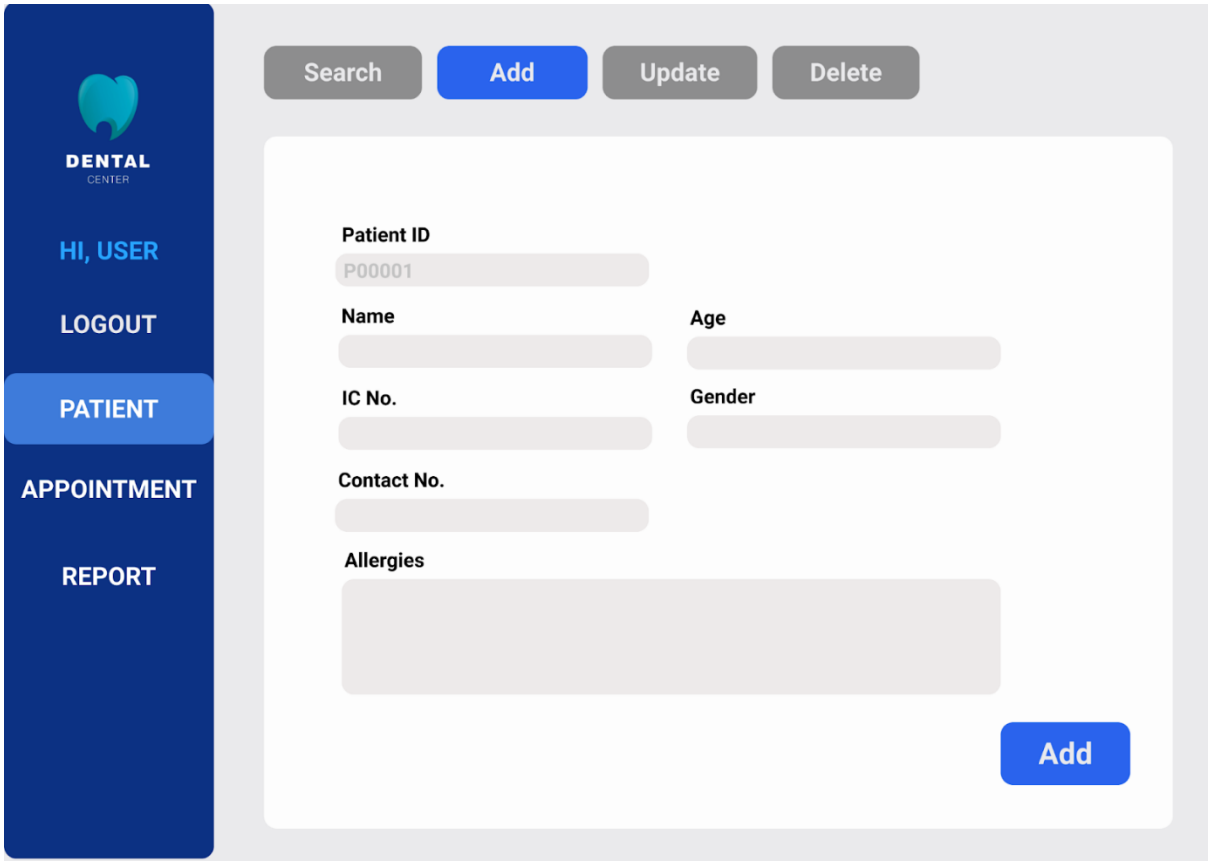

Figure 4.13 Create Patient Screen

This is a Create patient screen, where patient details will be added after filling in all the required fields and clicking on the add button. The details that have been filled in into the required fields will first be validated before being able to successfully be added into the system. The patient ID will be auto generated and incremented, which the staff does not require to fill in themselves.

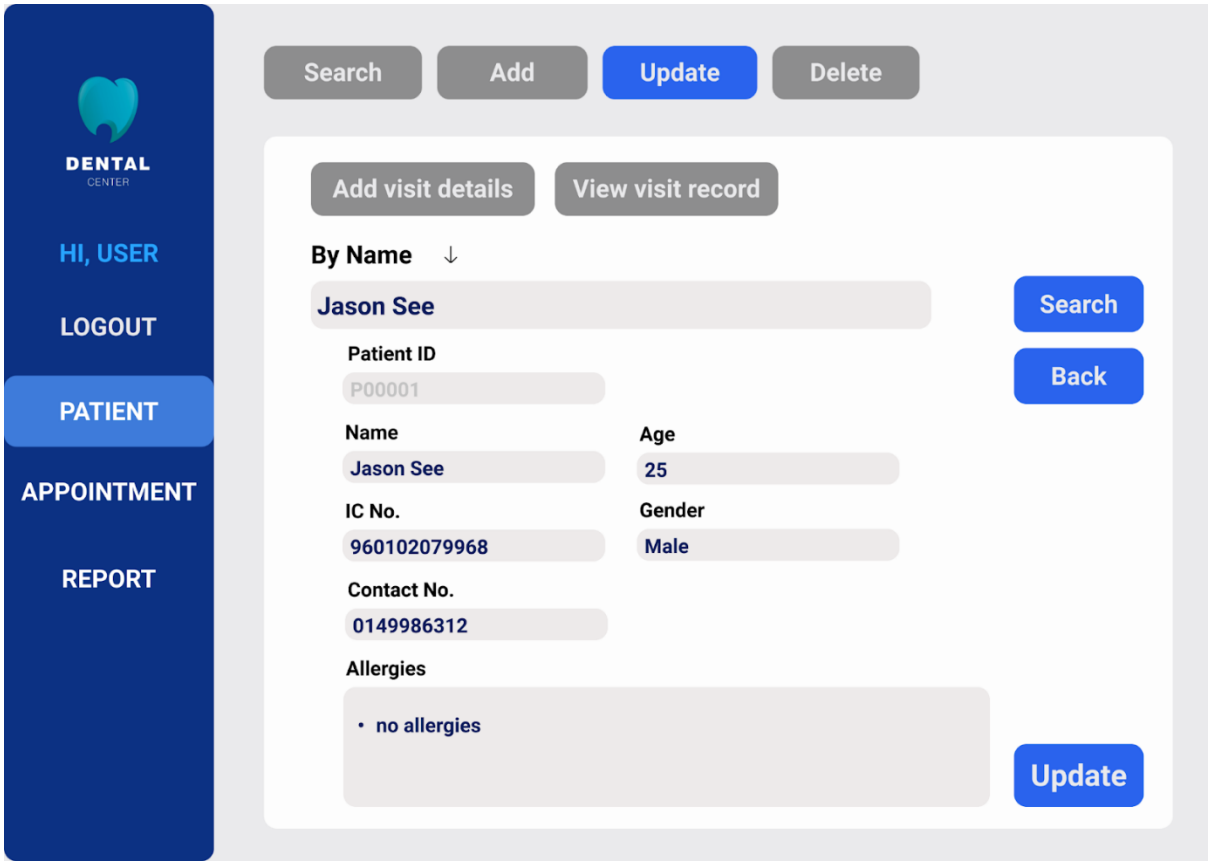

Figure 4.14 Update Patient Screen

This is an Update patient screen, where the staff will be able to make any necessary changes to the existing patient details. The new details that have been entered into the required fields will first be validated before being able to successfully update it into the system. Some fields such as age and identification card number are not changeable.

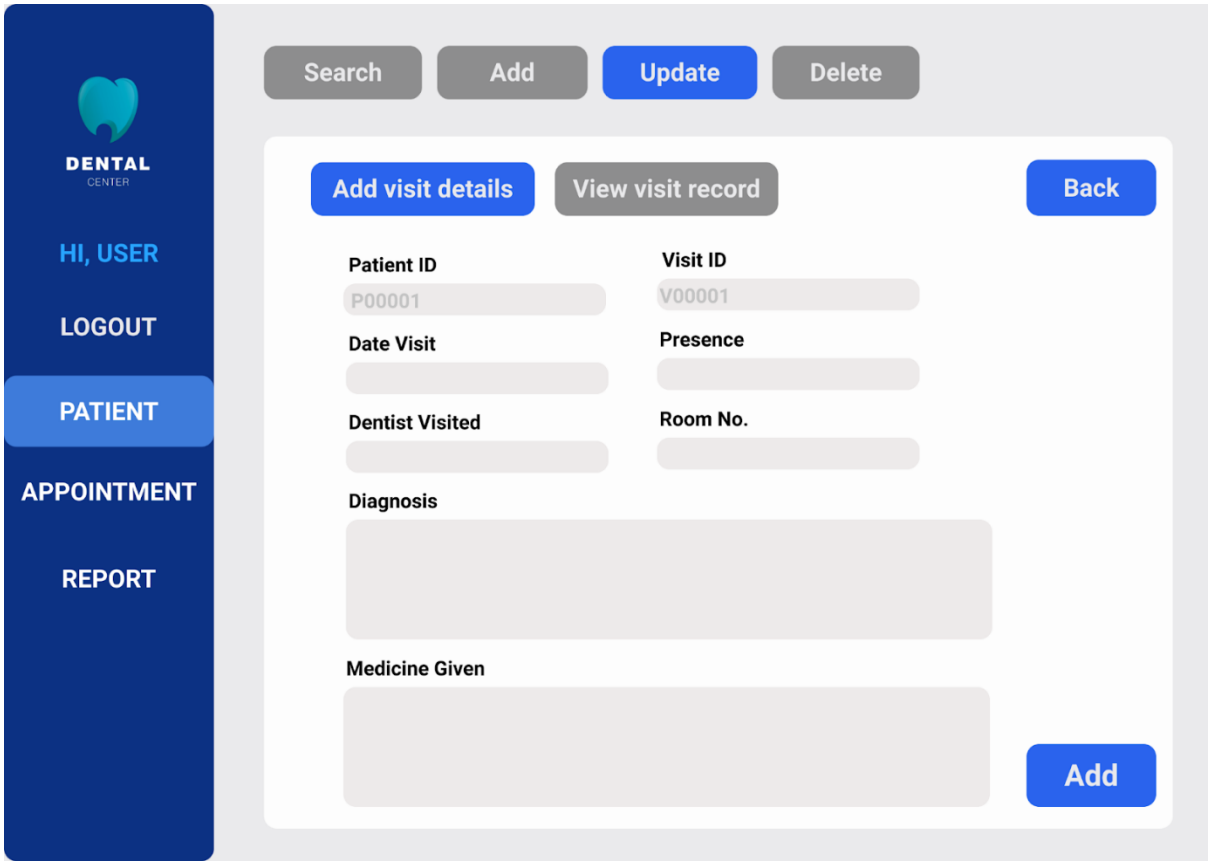

Figure 4.15 Create Patient Visit Details Screen

This is a Create patient visit details screen, where the visit details of the patient after every appointment will be able to record through this screen. The required fields must be filled in and validated in order to successfully add the details into the system. The visit ID will be auto generated and incremented where the staff do not have to fill in themselves.

Patient Visit Record		Visit ID	Date Visit	Presence	Dentist Visited	Room No.	Diagnosis	Medicine Given
Name :	Jason See	V00001	25/5/2021	Present	Dr. Soon Yi Hong	102	Swollen Gum	Pain Killer
Patient ID :	P00001	V00002	28/5/2021	Present	Dr. Kelvin Lim Ding Qi	101	Swollen Gum treated with applying H	Antibiotics, Oral Rinses
IC No. :	960102079968							
Contact No. :	0149986312							
Age :	25							
Gender	Male							
		Total Visit						
		2						

Figure 4.16 View Visit Record Screen (Excel)

This is a view visit record screen, an excel file will be shown after users click on the view visit record button. The patient visit record will include the patient details, the patient visit details as well as total number of visits by the patient. The text of the visit details have been coloured differently to help the user identify each of them easier

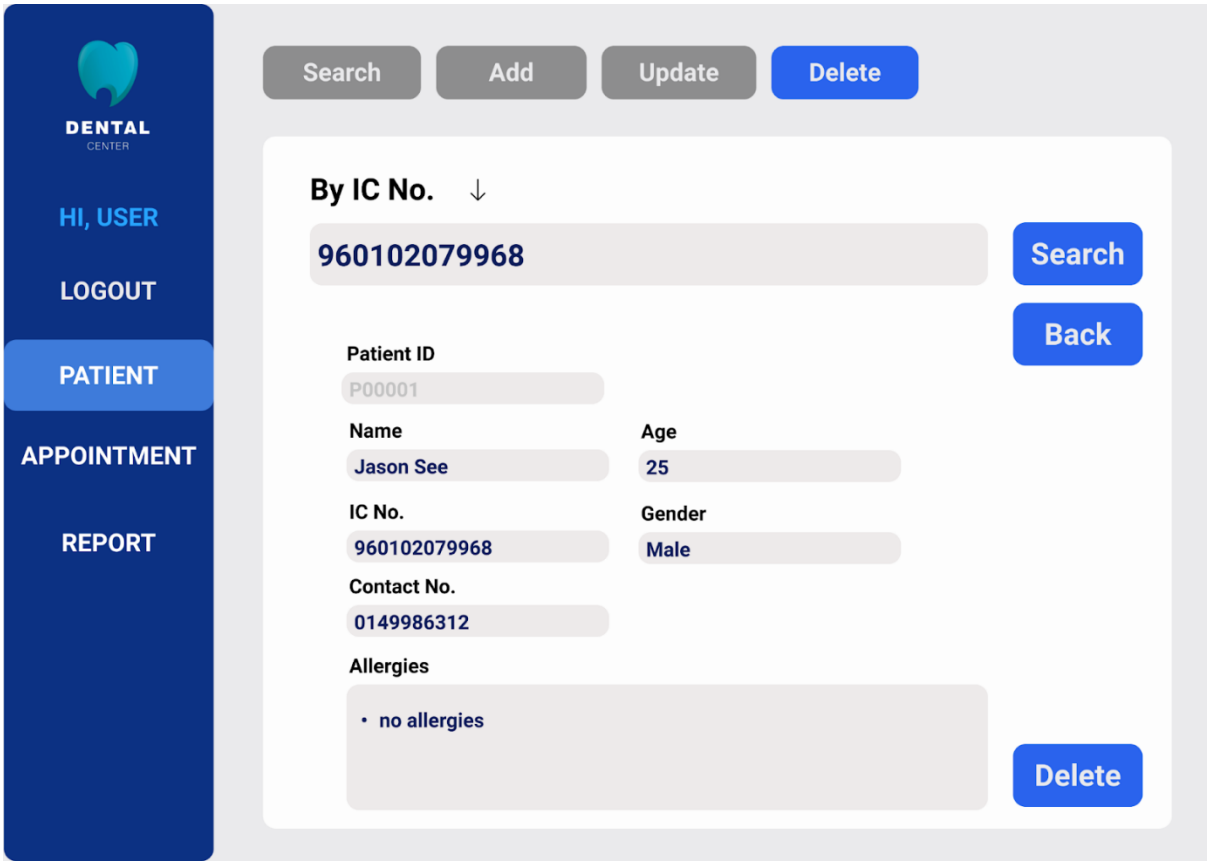

Figure 4.17 Delete Patient Screen

This is a Delete patient screen, where existing patient details will be able to delete by clicking on the delete button. The staff will be able to perform a search criteria through the patient's name or identification card number to find the patient details that need to be deleted. A confirmation message will be shown after clicking on the delete button to prevent any accidental details loss caused by human error.

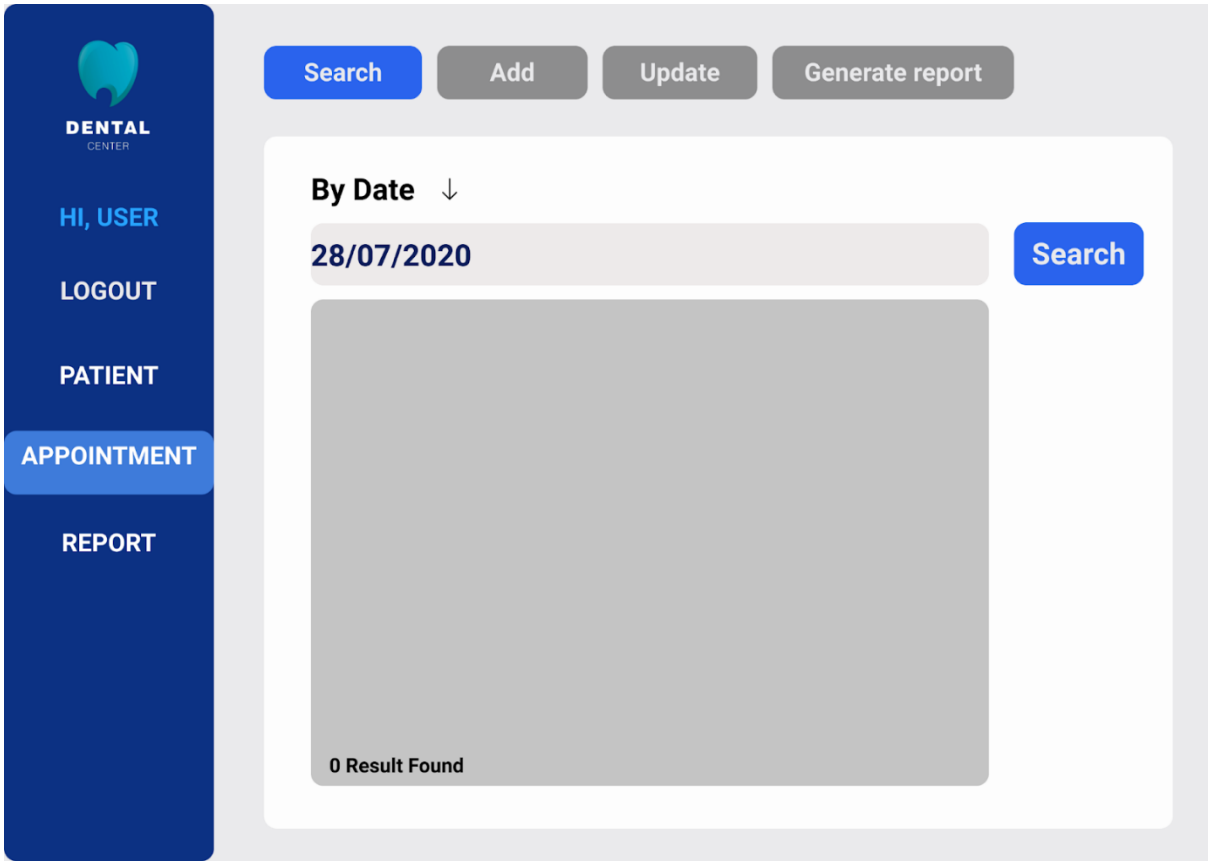

Figure 4.18 Search Appointment Screen (Empty result)

This is a Search appointment screen, where the staff will be able to search the appointment details through different criteria such as date and appointment ID. If there are no results found, a grey background will be shown and a “0 Result Found” text will be displayed at the bottom of the grey background.

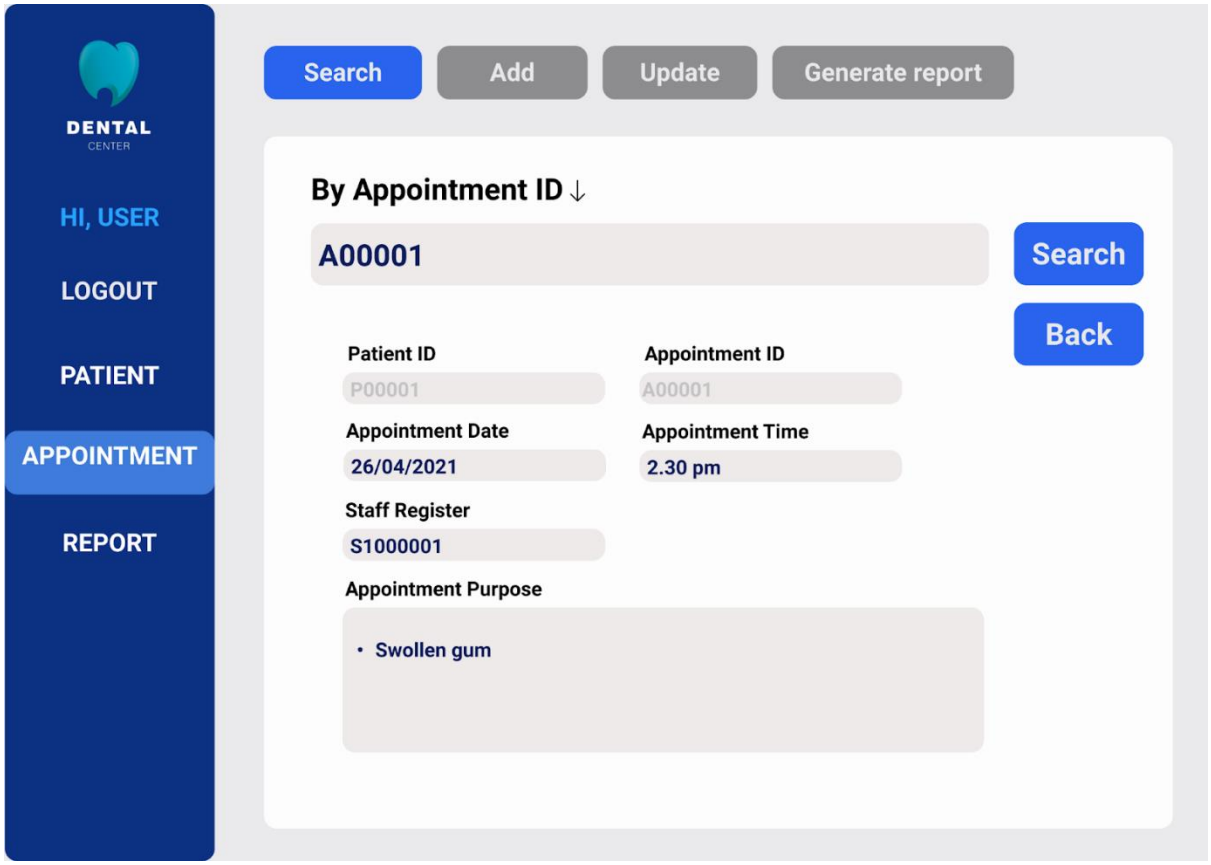

Figure 4.19 Search Appointment Screen (With result)

This is a Search appointment screen, where the staff will be able to search patient appointment details through different criteria such as date and appointment ID. If results have been found, the respective appointment details will be displayed on the screen after clicking into it.

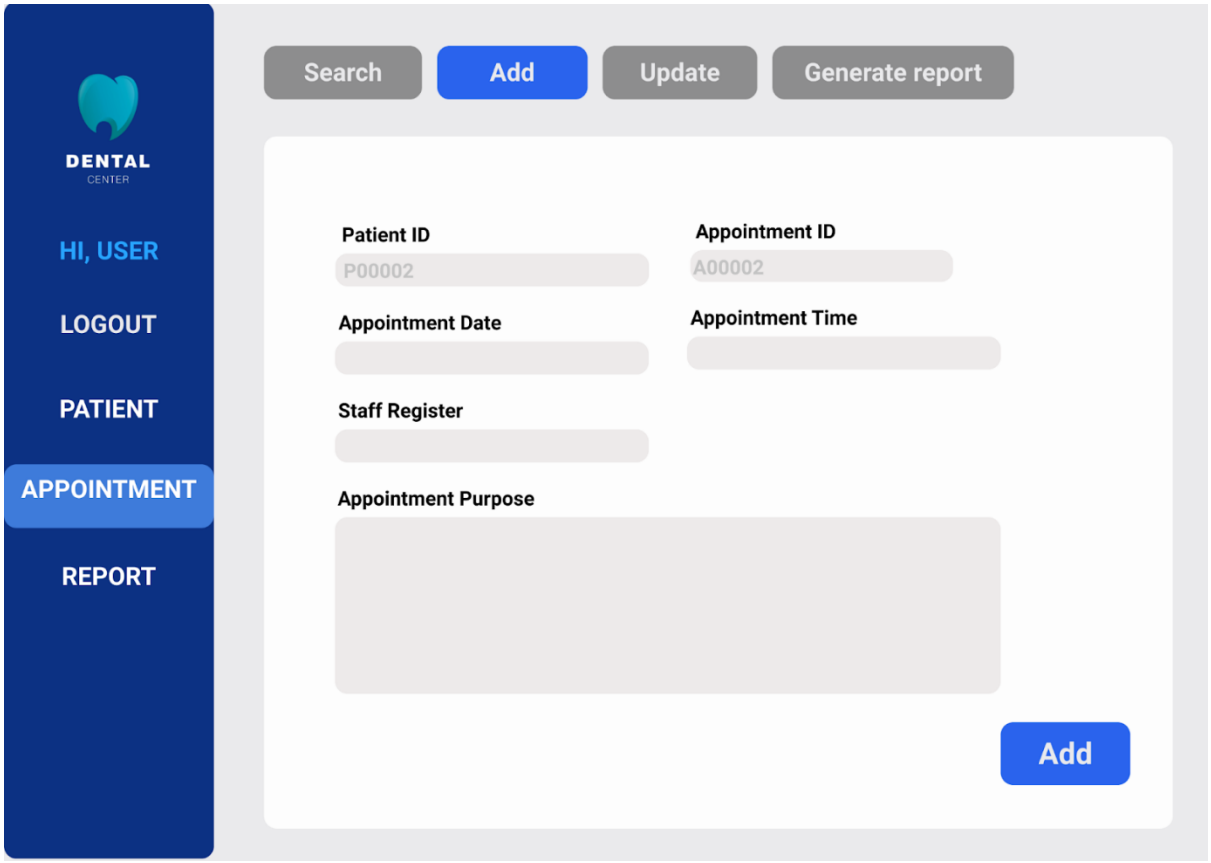

Figure 4.20 Create Appointment Screen

This is a Create appointment screen, where appointment details will be added after filling in all the required fields and clicking on the add button. The details that have been filled in into the required fields will first be validated before being able to successfully add it into the system. The appointment ID will be auto generated and incremented, which the staff does not require to fill in themselves.

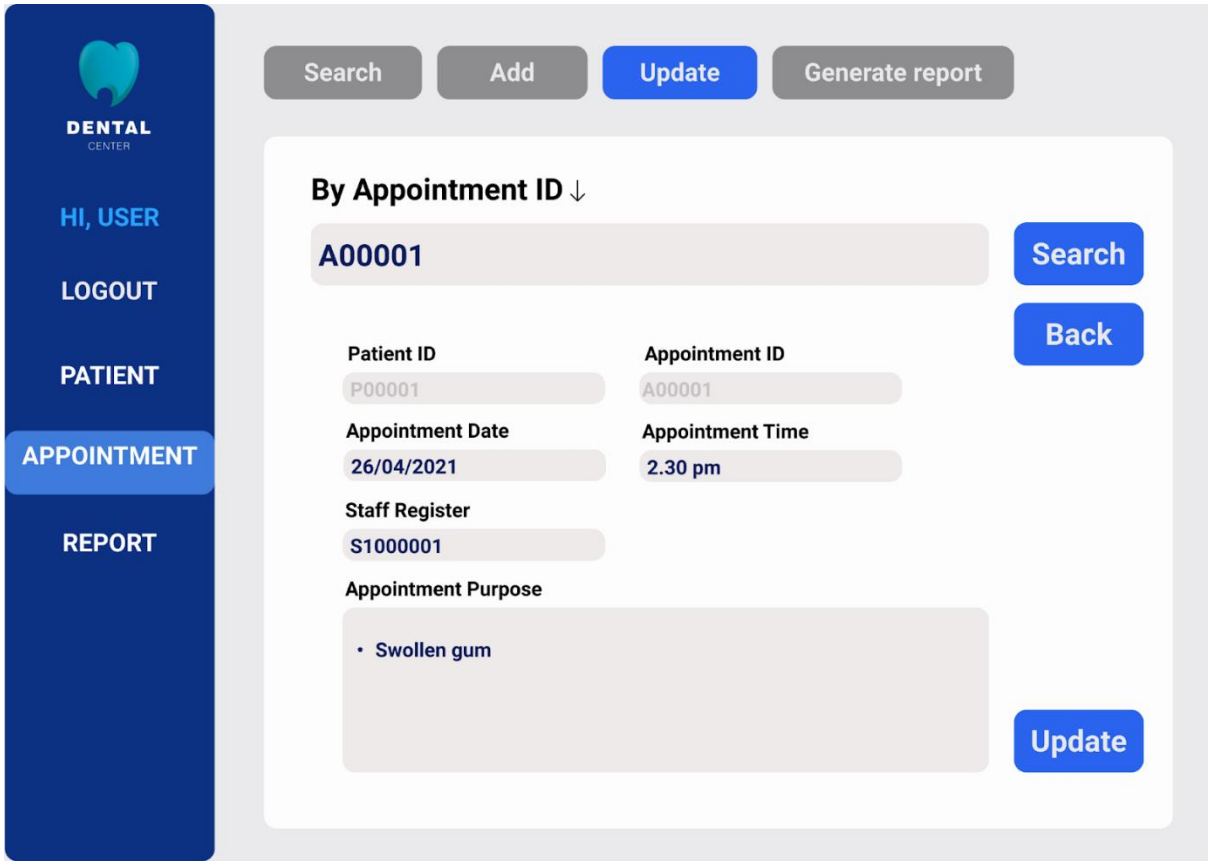

Figure 4.21 Update Appointment Screen

This is an Update appointment screen, where the staff will be able to make any necessary changes to the existing appointment details. The staff will be able to perform a search criteria through the patient's date or appointment ID to find the appointment details of the respective patient that is required to make any necessary changes.

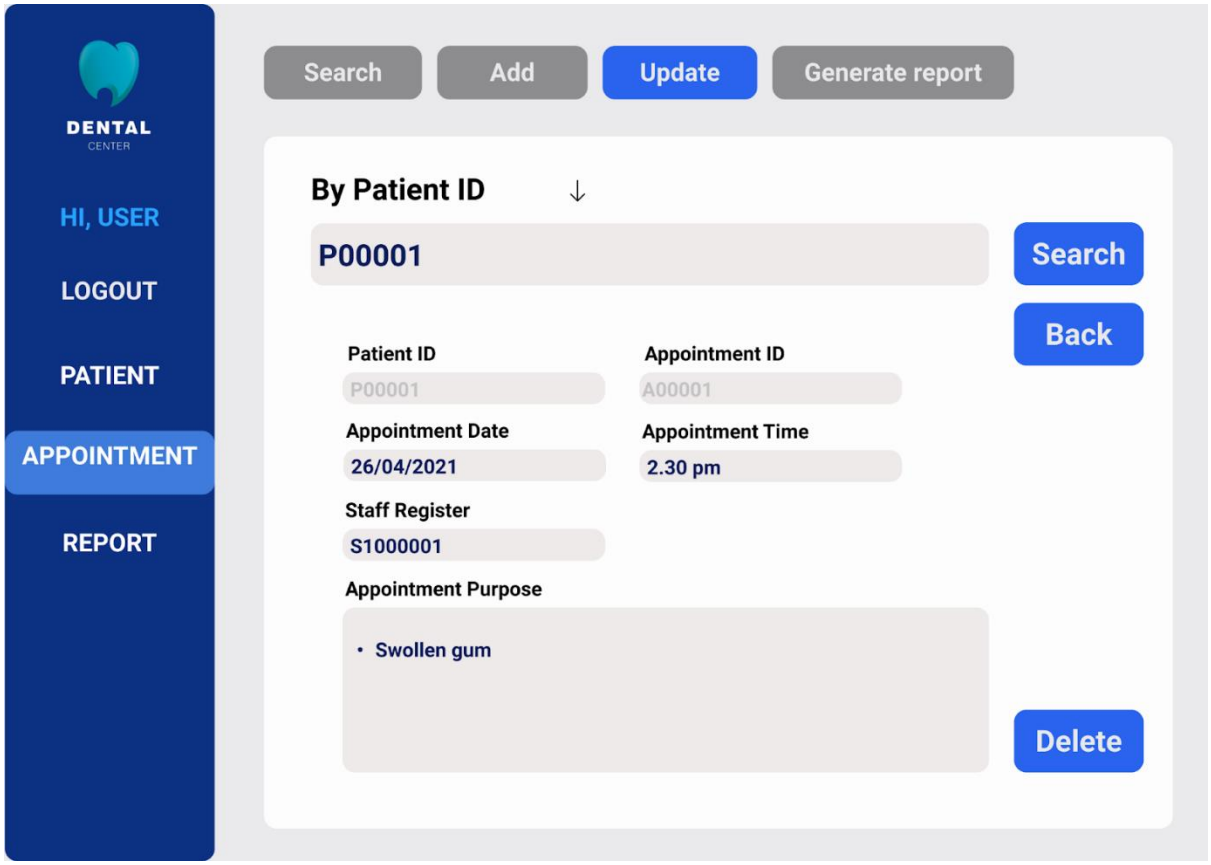

Figure 4.22 Delete Appointment Screen

This is a Delete appointment screen, where existing appointment details will be able to delete by clicking on the delete button. The staff will be able to perform a search criteria through the appointment ID, patient ID or appointment date to find the appointment details that need to be deleted. A confirmation message will be shown after clicking on the delete button to prevent any accidental details loss caused by human error.

4.5 Chapter Summary and Evaluation

This chapter consists of Class diagram, Entity Relationship Diagram (ERD), Activity diagram, data dictionary, security design and user interface design of the system. The class diagram will be able to show the relationship between class and object. Moreover, Entity Relationship Diagram (ERD) will show the relationship between entities in the database. With the help of the data dictionary, database entity and field have been described with detailed explanation, meaningful data attributes and suitable data type. Activity diagram shows the activity flow of the module function. Security design will describe the security features used in the Dental Management System. Last but not least, the user interface design will be showing the Dental Management System UI that we have designed together with the explanation.

The problems occurred during the design phase as we have noticed that some of the functions are missing and changes that are needed to be made, and will be added significantly throughout every chapter. With the help of Draw io and Visual Paradigm Online, our team has been able to make changes to the diagrams at ease.

References

1. Green, D. , October 26, 2015. The Importance of Simplicity in User Interface (UI) Design. , viewed on 24 April 2021, https://einsights.com/the-importance-of-simplicity-in-user-interface-ui-design/

2. Bechervaise, C., May 31, 2017. You Snooze You Lose: Why Is Speed Important In Business?, viewed on 24 April 2021, https://takeitpersonelly.com/2017/05/31/you-snooze-you-lose-why-is-speed-important-in-business/#:~:text=For%20starters%2C%20speed%20refers%20to,out%20products%2C%20and%20so%20on/

3. Roberts, C., October 27, 2019. 5 Reasons Why Data Accuracy Matters for Your Business., viewed on 25 April 2021, https://chrisrob978.medium.com/5-reasons-why-data-accuracy-matters-for-your-business-b490d5e20bf1#:~:text=Data%20Accuracy%20Enables%20Better%20Decision%20Making&text=If%20data%20quality%20is%20high,any%20risks%20along%20the%20way/

4. Kumar, N., December 24, 2019. What Are the Benefits of Dental Management Software?, viewed on 25 April 2021, https://neeraj24188.medium.com/what-are-the-benefits-of-dental-management-software-27ca5aeb6795

5. Tech, V, Sep 21 2018, Research Methods Guide: Interview Research, viewed on 16 june 2021, https://guides.lib.vt.edu/researchmethods/interviews/>

6. Visual-Paradigm, n.d, What is Activity Diagram?-Visual Paradigm, viewed on 18 june 2021, https://www.visual-paradigm.com/guide/uml-unified-modeling-language/what-is-activity-diagram/

7. ZULQADAR, A., Feb 12 2019, SDLC Waterfall Model: The 6 phases you need to know about, viewed on 16 june 2021, https://rezaid.co.uk/sdlc-waterfall-model/

8. Jaiganesh, Periyasamy, Apr 2013, What is Waterfall model and list its advantages, disadvantages, viewed on 16 june 2021, http://jobsandnewstoday.blogspot.com/2013/04/what-is-waterfall-model.html

9. Visual-Paradigm Online, n.d, Free Visual Paradigm Online, viewed on 18 june 2021, https://online.visual-paradigm.com/diagrams/solutions/free-visual-paradigm-online/

Appendices

TAR UC Dental Management System
Interview Questions

Date/Time : 31/05/2021 (Tuesday) at 11.00a.m.
Location : Google Meet - Online (https://meet.google.com/fuo-bvhu-kbx)
Interviewee: Project Manager, Soon Yi Hong & Assistant project manager, Kelvin Lim Ding Qi
Purpose: This interview is to aim to understand how the existing system works and the problems faced by the end users of the system. It also aims to understand what the end users need in their new system and user's expectations on the new system.

1. **How long have you been using the current Dental Management System?**
2. **Do you think there is any inconvenience while using the current Dental Management System? How will the system cause you guys to feel inconvenient?**
3. **What are the problems faced while using the current Dental Management System?**
4. **How does the current Dental Management System perform during the work process? Explain in detail.**
5. **Do you think that the current system is easy to operate? If no, state the reason.**
6. **What are the most common mistakes made while using the current Dental Management System?**
7. **What are the major concerns that you have while using the current system?**
8. **What process is involved in the current Dental Management System? Explain the functions and features as well.**
9. **Who will be allowed to access the system and the features provided? State clearly.**
10. **What improvements or changes would you like to see in the new system? Please note down clearly any additional features or functions to add into the system, as well as any changes needed to make to the features or functions.**

Appendix 1 – Interview Question Sample