Online Appointment System for Dental Clinic Services

A Capstone Project & Research 1

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In Partial Fulfillment of the Requirements for the Degree of

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Department of Information Technology

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APPROVAL SHEET

This Capstone Project 1 entitled, ***"Online Appointment System for Dental Clinic Services",*** prepared and submitted by Christopher M. Lim, Jerald C. Arguelles, Rommel T. Gragasin , Christian V. Gutierrez in partial fulfillment of the course requirements for the degree of BACHELOR OF SCIENCE IN INFORMATION TECHNOLOGY, has been examined and recommended for acceptance and approval for Oral Examination.

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Foremost, we want to offer this endeavor to our GOD Almighty for the wisdom he bestowed upon us, the strength, peace of mind and good health in order to finish this research.

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To our parents whose does not stop giving support to finish this capstone, to their sacrifices to make our lives better, also to the people who does not stop trusting and helping us.

ABSTRACT

The researchers hope to develop an Online Appointment System that can be used as a new platform for the dental clinic, which is currently old fashioned and still uses a "walk in." The goal is to create a modern website that can be utilized as a new platform for the dental clinic. The researchers want to learn about the dental clinic's needs and wants, and they believe that by creating an Online Appointment System, they will be able to improve the effectiveness of the system's flow, as well as create a better, more reliable, and database record of the patient, which will help the dental clinic's staffs be more productive at work. On the patient's side, the patient will save time in scheduling an appointment.

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CHAPTER I

INTRODUCTION

PROJECT CONTEXT

For most people, time can be a precious thing, and so one has to use it wisely. Managing one's time can be a tedious task when it comes to using it sensibly and making sure that the time spent is for a productive thing. This is essential for an establishment that caters to many people throughout the day, as it is beneficial for both the establishment and the customer to have good time management so that the time that would be wasted will be used for other things. A Dental Clinic would greatly appreciate this kind of smooth workflow when it comes to catering to its patients every day. This is where the appointment will aid both the Dental Clinic and its patients in ensuring the best customer experience. The traditional walk-in method for setting an appointment to a local establishment, specifically a dental clinic, that we have been using before the technological revolution has been declining since we have entered the year with a pandemic on our side. This makes the online appointment system a great thing to have because having the convenience of setting an appointment at home without going to the clinic will benefit the patient and the dental clinic to lessen the transmission of the virus and overall to make the appointment of the patient to the dental clinic a smooth ride while still following the health and safety protocols.

As a result, the researchers hope to create an Online Appointment System for Dental Clinic that will improve patient satisfaction and reduce overbooking by providing a system that will record the entire patient's dental information in a secure database that will be easily accessible to the dentist and dental staff. This methodology aids in the reduction of issues that can arise while utilizing the old way. The crucial thing is that data recording and retrieval will become easier. Dentists and dental staff can use this system to keep track of patient records and appointments. Patients have the option of choosing which dentist they want to see. The system also has a function that allows patients to be notified through email after registering on the website, and it helps to avoid scheduling duplicate appointments. Patients may see which dentists are available and when they are available to arrange an appointment. Dentists can also use the system to log in and see a list of their patients as well as their upcoming appointments. The system also allows dentists to log in, see the list of patients and view their upcoming appointments.

PURPOSE AND DESCRIPTION

The purpose of this project is to develop a web-based appointment system that is reliable and easy to use. The project will be designed and developed by the researchers for the patient, admin and dental staffs for an easy appointment on the dental clinic.

The proposed project will aid the dental clinic on avoiding overbooking and crowded patients on the dental clinic. The project will also help the staffs on managing the appointment of the patients for better accommodation and to lessen the pressure on the dental staffs and to have a safe workplace during this pandemic.

OBJECTIVES

The main objective of this online appointment system is to create an alternative for traditional “walk in” system of the dental clinic and make ease for the patient to see the current schedule and dentists information online.

Specifically, the study aims to achieve the following objectives:

1. To design an online appointment system for dental clinic that handles the following:
    - The Patient Personal info and data including the Appointment Record.
    - The Patient Personal Request on Doctor.
    - The Secrecy of Personal Data of Patient.

2. To have a notification that in which the patient will be able to see their upcoming appointment at the dental clinic.
3. To lessen the physical contact for making appointment from their doctor.
4. To provide a web system for the dental clinic that we choose and make the appointment at ease of access to navigate for the admin and the patient.

SIGNIFICANCE OF THE STUDY

This section gives importance in this study to the following beneficiaries:

For Patient – The system will allow the patient to easily make an appointment without going to the dental clinic beforehand.

For MMA Dental Clinic – The study will offer the dental clinic an online appointment system.

For Future Researchers – The study will give information to the future researchers and to have an idea of what to improve and innovate.

SCOPE AND LIMITATIONS

This study aims to make a system that will adjust based on what time the dental clinic operates and the time of the dentists work schedule. The system will only handle the online appointment system of the dental clinic for a smooth handling of patients that will come to the dental clinic based on the appointed time they chose from the website.

- The Appointment Scheduling sub-module would prepare and maintain the schedule appointment of dental clinic services
- Any user type, like Patients, Dentists and Staff could login into the system by providing username and password.
- In this System, the Staff would act like admin of the system; they could manage all internal system that some are not accessible from Patients and Dentists.
- The System has a Scheduling Platform that show the doctor's appointments by days to Weeks; it basically shows all the appointment in the dental clinic the information given by the Staff.
- The System has an Email notification for the users to be able to inform that their Schedule in the Appointment is approaching.

The study will be limited to the following; the system has no control if the patient does not come to the appointed time they registered through the website. The system has no payment method and it requires an internet connection to access the website.

OPERATIONAL DEFINITION OF TERMS

In order to provide better understanding in this study, the researchers interpreted the following operational terms:

.COM. A domain suffix used to identify a commercial-related website on the Internet. It is the most used type of domain suffix on the Internet.

CSS. An acronym for "Cascading Style Sheet." The layout of Web pages is formatted using Cascading Style Sheets. They can be used to define text styles, table sizes, and other characteristics of Web pages that were previously solely defined in the HTML of the page.

Database.A structured collection of information or data that is usually saved electronically in a computer system.

Dental record. Records created during a dental exam and documenting the condition of a patient's teeth.

Email Notification. A message delivered to your subscribers informing them of changes or upgrades to your website or service, such as new items, features, or scheduled website maintenance, etc.

HTML. The HyperText Markup Language (HTML) is a set of markup symbols or codes that are added into a file for Internet display. The markup instructs web browsers on how to display the content and graphics on a web page.

MySQL. SQL (Structured Query Language) is a relational database management system. Data warehousing, e-commerce, and logging applications are just a few of the uses for the application.

Online Appointment. A Web-based application that allows users to book appointments and reservations online from any Web-connected device in a convenient and safe approach.

PHP. A popular open source general-purpose scripting language that is well-suited for web injects in HTML.

PHPMyAdmin. A free web application that provides a user-friendly interface for dealing with MySQL databases.

Registration. The act or practice of recording information about something into a public record book or system.

Web-Based. Associated to or involving the Web (the internet's system of linked documents).

CHAPTER II

REVIEW OF RELATED LITERATURE

Appointing for the dentist on a specific time is now a normal part of flow on dental clinics. The pandemic has made a drastic change on the world and because of this most of the things people do have changed and so does the health care especially the dental clinics. The following review of literature shows how the appointment affects the dental clinic and its patients, discusses general and specific solutions and concludes that online appointment is relevant during this pandemic and for the future.

Defining the Problem

According to Inglehart, Lee, Koltuniak, Morton, & Wheaton (2016) spending time in waiting rooms prior to dental visits is not uncommon for dental hygiene patients. Long waiting times prior to a scheduled dental appointment have a negative effect on patients' satisfaction with their visit, the evaluations of the patient-provider relationship and the patients' intentions to return.

This study by Ramli and Zahilah (2017) explains that the current manual method giving problems to clinic’s staff, doctors and patients. The result from using current manual method is the long queuing time for the patients. As for the patients, they need to follow the Dental Clinic procedure for the first dental treatment. Even after they are given the follow-up appointment date, they are not able to choose their own preferred time. The

current manual method is also insufficient for the management team as the doctors and staff facing problems with managing patient appointment schedule (p.1)

The ClearDent (2020) stated that a full schedule does not always translate to productivity and profitability. The goal of an efficient schedule is to run the dental clinic smarter not harder, maximizing time and revenue. A well-managed appointment scheduling system allows you to anticipate, prevent, and react to unexpected changes while minimizing the impact to both the team and patients.

According to Hu, Xu, Li and Che (2020) patients' no-show behaviour is a prevalent issue and challenges hospital appointment system management. Medical appointments prevent other patients from using scheduled medical resources (e.g., a doctor's attention). When no-show behaviour happens and then the medical appointments fail to be rescheduled in the short term, medical resources are wasted and service delivery is interrupted. Hence, from perspectives of sustainable medical services and operational efficiencies, managing patients' no-show behaviour is essential. In practice, hospitals have tried to implement several interventions (e.g., overbooking, telephone reminders), yet no-show problems persist and substantial benefits are not yielded. For example, overbooking does not reduce the number of no-show behaviour and may result in scheduling collision, longer patients' waiting time and doctors' working time. Thus, identifying the determinants of patients' no-show behaviour could increase the accuracy

of predicting no-show behaviour and provide explicit references for designing interventions.

Taveira-Gomes stated (2017) that the task of scheduling patients requires not only appointment time, but also shifting the doctor focus from the realm of case-based clinical problem solving, to the realm ofresource planning problems. Shifting between disparate problem realms, taking decision in short time, and the lack of adequate information, increases the odds of poor scheduling decisions, despite the cost imposed by such cognitive effort. Transferring the scheduling responsibility from the doctor to an intelligent and trained agent would keep the doctor focused on case-based clinical problem solving, lessen the doctor cognitive load, and potentially result in near optimal schedules, less prone to put both doctor and patient under the pressures of unmet time constraints.

In addition, Hoseini (2017) stated that designing a good appointment system is just one feature of the appointment planning system in which problematic scenarios, such as no-shows, cancellations, and walk-ins should be taken into account. The provider may want to use different strategies to handle these issues to minimize risks and maximize profit. The appointment planning is the process of reconciling supply (available appointment) and demand (routine patient and urgent patients), where the provider should choose the general setting of an appointment system, such as number of available slots, maximum allowable overtime hours, acceptable waiting times, etc.

While planning is limited to the general setting of the appointment system,appointment scheduling refers to assigning patients to available slots based on daily demand. However, the daily demand is uncertain; in primary care, most of the patients require services that can be performed within a fixed length of time whichallows providers to divide their time into evenly devised time slots. In contrast,in a primary care environment, there are unscheduled encounters like no-shows,unpunctuality, late cancellation, and walk-ins which cause more uncertainty topatients scheduling. Therefore, many strategies have been developed to handlethese uncertainties, such as block-booking, patient classification (age, disease type,socioeconomic level, etc.) and reserving slots, to name a few. In addition, the scheduleitself can be static or dynamic, which affects the scheduling manner and assumptions.In the static case, the schedule is set before the beginning of the session usuallythe morning of, while in dynamic case, the schedule can be revised based on newappointment requests, walk-ins, and delays.

Importance of Appointment and Why It Matters

The LocalMed (2020) stated that technology has, is, and will continue to change the way dental practices provide care, connect with patients, and manage every aspect of their business. Both hardware and software are providing dentists with new capabilities in the breadth and quality of care they provide while also enabling them to manage their practices with greater insight and efficiency than ever before. One of the significant solutions now available to dental practices is the ability to offer real-time online

scheduling to their patients using robust, innovative tools. Patients clearly prefer having the ability to schedule their own dental appointments vs. being required to contact their dentist to set an appointment. In a recent survey, 77% indicated this as their preference. Significantly, 70% of patients also indicated they would be more likely to choose a provider that offers them the ability to schedule, change, and cancel their appointments online.

Liu, Van De Ven, and Bo Zhang (2019) stated that appointment scheduling is a common tool used by service firms (e.g., tech support, beauty services and healthcare providers) to match their service capacity with uncertain customer demand. With the widespread use of Internet and smartphones, customers often resort to online channels when searching for information and reserving services. To keep up withcustomers' preferences and needs, many service organizations have developed online appointment scheduling portals. The interfaces of these online appointment booking systems vary. Some are more towards oneshot offering, i.e., a single list of available appointments are shown on a single screen for customers to choose from. Others offer a small number of options to start, and customers must press "more" or "next" to view additional appointments that are available. This way of scheduling resembles the traditional telephone-based scheduling process, in which the scheduling agent may reveal availability of appointment slots in a sequential manner. Such a sequential way of displaying options is often seen on mobile devices with a small screen as well.

According to Akinode and Oloruntoba (2017) patient appointment with the Doctor is one of the clinical services that have been automated. Healthcare providers are motivated to reduce operation cost while improving the quality of service. This has given rise to preventive medicine in order to avoiddisease, lessening the demand for emergency department and hospital stays for sick people. The importance of Patient Scheduling cannot be underestimated in the health care delivery landscape. Patient scheduling is a complex process that perform a crucial role in health care. Patient scheduling performs several functions, from allocating resources to patients in need of exams and allocation of surgery rooms to on-demand appointment scheduling with Family Doctors working at Primary Care clinics. A good appointment scheduling system encourages patient and physician satisfaction, and as such, is an important component of healthcare

Cara (2017) stated that the accessibility to services of web clinic is of utmost importance for success of any companies. Internet is a great way to make a clinic known to a large number of people that might potentially be interested in the services that the clinic might provide. Therefore, a creation of a website that would provide different information about the clinic and allow the management and scheduling of appointments online might benefit in many ways to an existing clinic

The Goal and What the Future Holds

The Online Appointment System that is now used by many people will still be relevant after this pandemic ends because of its convenience and ease of access to the patient of the dental clinic and outsider who are also using the Online Appointment System. The literature reviewed in this research defines the overall problem and offers insight and feedbacks on appointment for dental clinics. Further research for this topic is welcome and recommended for the overall improvement of how online appointment will affect the people living on the present and tomorrow.

CHAPTER III

METHODOLOGY

A. TECHNICAL BACKGROUND

The dental clinic's current appointment system is operated manually by the personnel. The dental clinic is still using the old "walk in" method, which has difficulty accommodating multiple patients at the same time, and having another system would be a huge assistance in relieving the strain on the dental clinic's staff.

The dental clinic will need to obtain a computer, laptop, or mobile device, as well as an internet connection, in order to see and manage the suggested system during its implementation. Using an online appointment system and utilizing technology in data and appointment processing, the medical clinic will be able to process patient information and preserve records more efficiently.

The Rapid Application Development will be used in the development of the Online Appointment System for Dental Clinic Services specifically for MMA Dental Clinic.

B. Research Design

This chapter describes and discusses the researchers approach and technique in performing the studies.

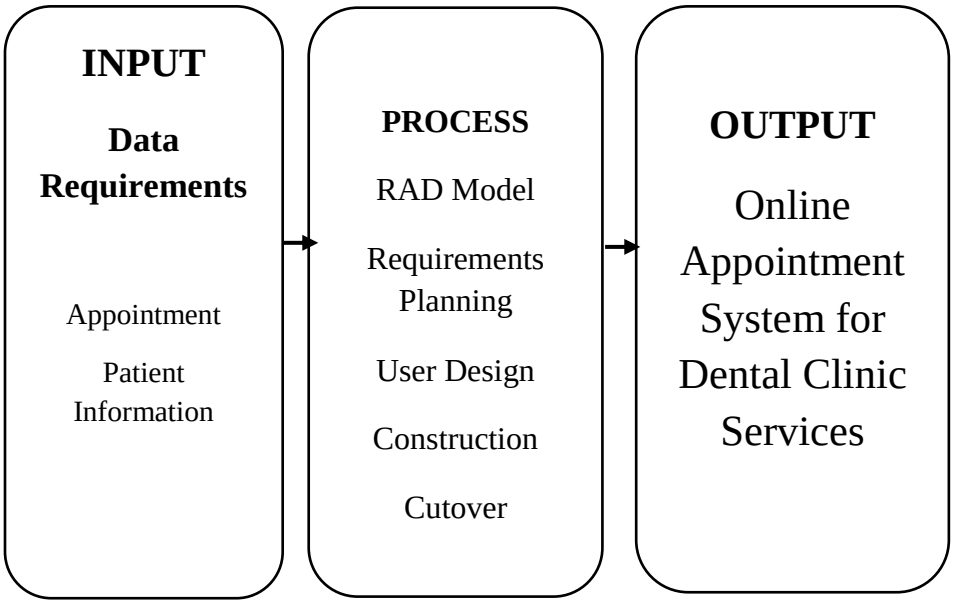

Figure 1: Conceptual Framework

Figure 1 depicts the proposed system's conceptual framework. The flow and process information are shown in the Input-Process-Output (IPO) paradigm. The researchers picked the RAD (Rapid Application Development) model from the System Development Life Cycle (SDLC) because it allows them to swiftly make several iterations and upgrades to software without having to restart the development schedule from the beginning.

C. Methodology of the Study

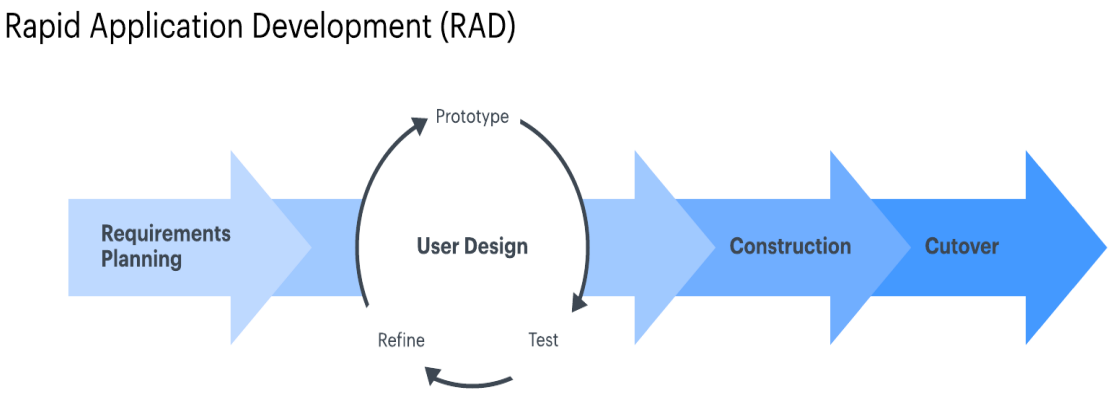

Figure 2: RAD Model

The rapid project turnaround of the RAD technique makes it an appealing option for developers working in a fast-paced environment like software development. The focus of RAD on eliminating the planning step and maximizing prototype development allows for this rapid pace.

Requirements Planning- In this stage, the researchers gather all necessary data from the dental clinic in order to analyze and develop a plan for how the web system would work.

User Design – The second stage will allow the researcher to construct a design based on the results of the researcher's analysis and idea. The frontend and backend will be planned and designed with the cooperation of the dental staff feedback in mind.

Construction – The third stage allows the researchers to put the system design they produced into action. The state of construction will determine how the online appointment system will be developed; however, the construction will be dependent on the feedback of the dental staffs to maximize the idea of the researchers. Only a few suggestions will be made by the researchers in order to meet the needs of the dental clinic.

Cutover – The fourth stage allows the researcher to test the online system that has been constructed before it is made public, as well as diagnose the results of the dry run. Potentially additional debugging and other improvements to the web system is expected.

D. Requirements Analysis

Research Instrument

The researcher analyzes the data acquired for the aim of gathering and analyzing it, based on the responses of the staff and dentists who responded to our survey questions, as well as other personnel. The researcher will examine each survey response in order to obtain the best feasible web system outcome. The approaches that the researchers have conducted are listed below:

Brainstorming - in order to properly implement the system, the researchers discussed various ideas and thoughts in relation to the proposed project.

Interview – the researchers interviewed the dental staffs to gather necessary data that are needed to develop the online appointment system. Included below are the interview questions that the researchers used in order to have an interview with the dental staffs.

E. Requirements Documentation

The specifications of the hardware, software and user requirements specified for this project that will be used by the researchers to develop the system are listed in the tables below.

Hardware

The researchers presents the minimum hardware resources necessary for the utilization of the development of the system on table 3.

Hardware Equipment	Requirements
Processor	Intel Dual Core or Higher Processor
RAM (Memory)	2GB RAM or higher
Hard Disk Drive	60 GB Disk Space
Power Supply	At least 500W
Keyboard & Mouse	With USB port
Monitor	At least 14’ inches width

Table 1: Hardware Requirements

Software

The software development tools used by the researchers in this project are presented in Table 4.

Software Tools	Requirements
Source Code Editor	Visual Code Studio
Operating System(OS)	Windows 10
Browser	Browser that supports HTML5
Database	MySQL

Table 2: Software Requirements

Client PC (MMA Dental Clinic) Requirements

The specifications needed by the Client PC of the Dental Clinic to be able to run the Online Appointment System.

Client PC	Requirements
Operating System(OS)	Windows 10
Browser	Browser that supports HTML5
Database	MySQL

Table 3: Client PC Requirements

F. Design Software, Systems, Products, and/or Processes

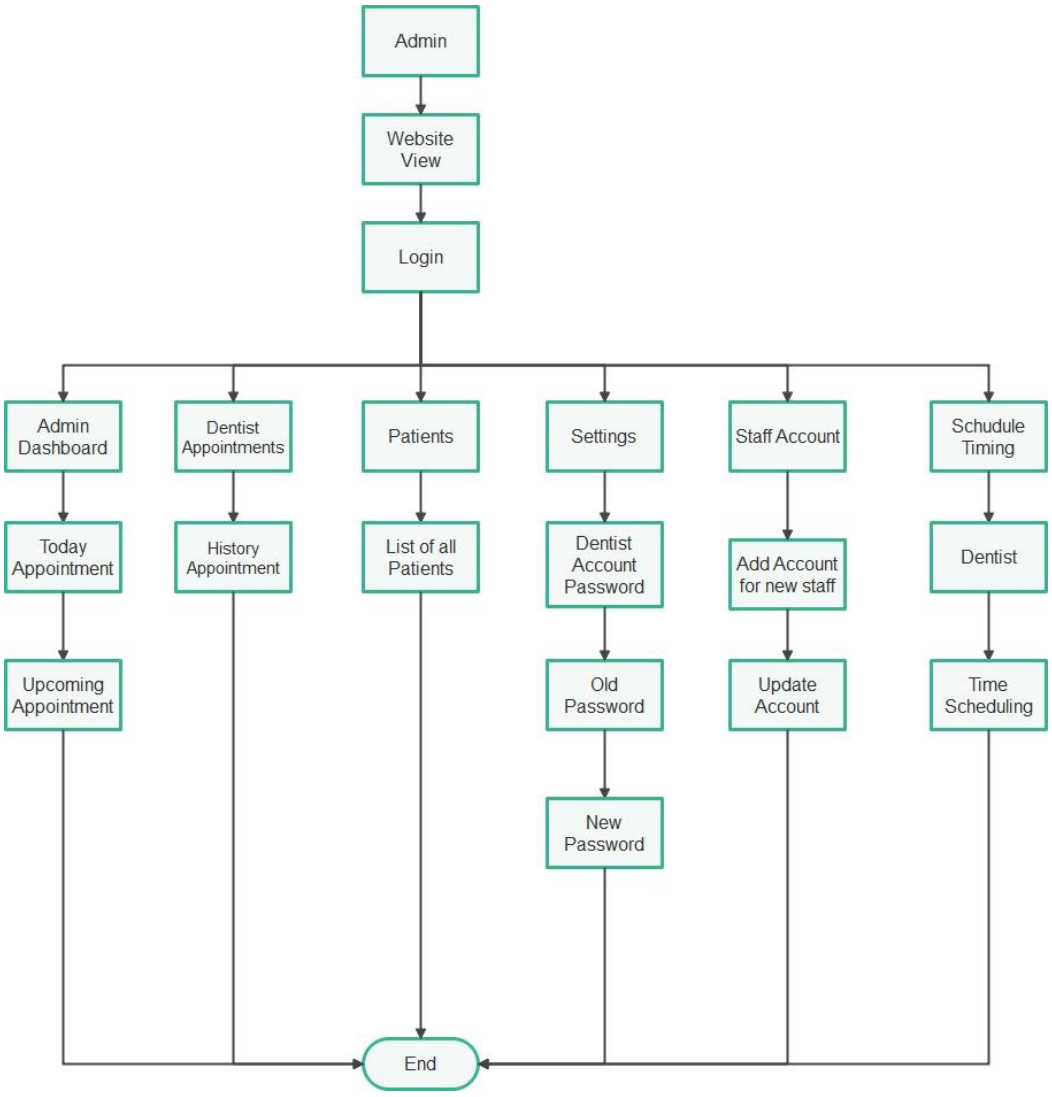

Figure 3: Admin Module

Figure 3 Description:

The admin opens the website

The admin will login through admin login form

The sidebar of admin dashboard displays the main dashboard, appointments, dentists, patients, settings, staff account and schedule timing.

The dashboard of the admin will display the dentists list, patients list and appointments list.

The Appointments shows the dentist name, their specialty, patient name, appointment time and the status of the appointment.

The patients tab will show the list of all the patients who have made an account on the dental clinic

The settings tab will show the change of account password in case the dentist wants to change the password of the dentist account.

The Staff Account tab will show the add account for new staff in case the dental clinic adds another dentist or staff and the update of account is also included here.

The Schedule Timing will show the availability of the dentist for the day or upcoming days and the admin can control the availability.

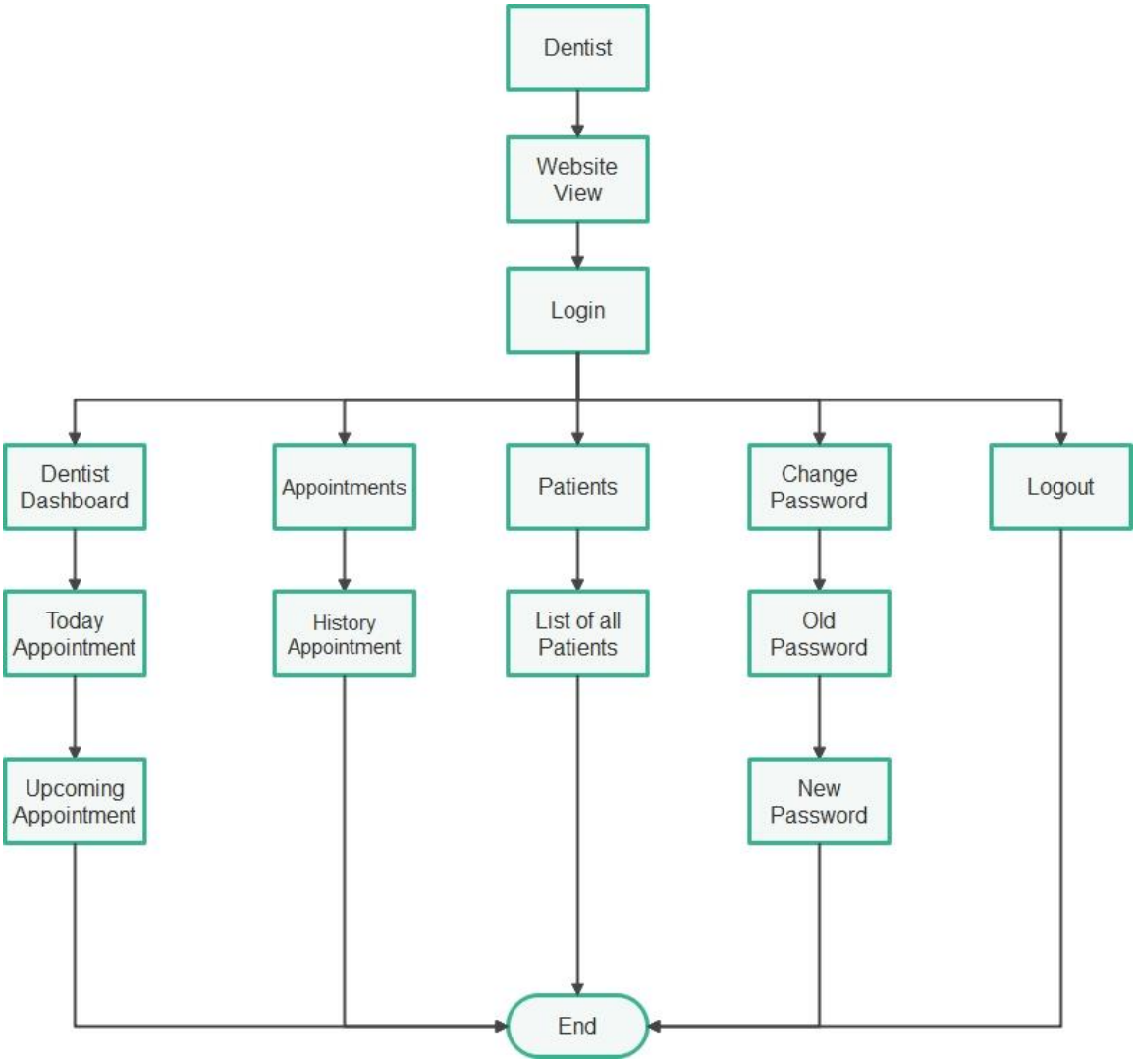

Figure 4: Dentist Module

Figure 4 Description:

The dentist will view the website

Upon logging in, the dentist will see the dentist dashboard, appointments, patients, change password and logout.

On the dentist dashboard, the dentist will be able to his/her today and upcoming appointments

On the appointments tab, the dentist can see all the appointments from the first patient he/she appointed when the system was used up to the latest patient.

On the Patients tab, the dentist can see all the patient from the first patient when the system was used up to the latest patient.

On the Change Password tab or rather the dentist account, the dentist can change the password if the dentist wishes to use it.

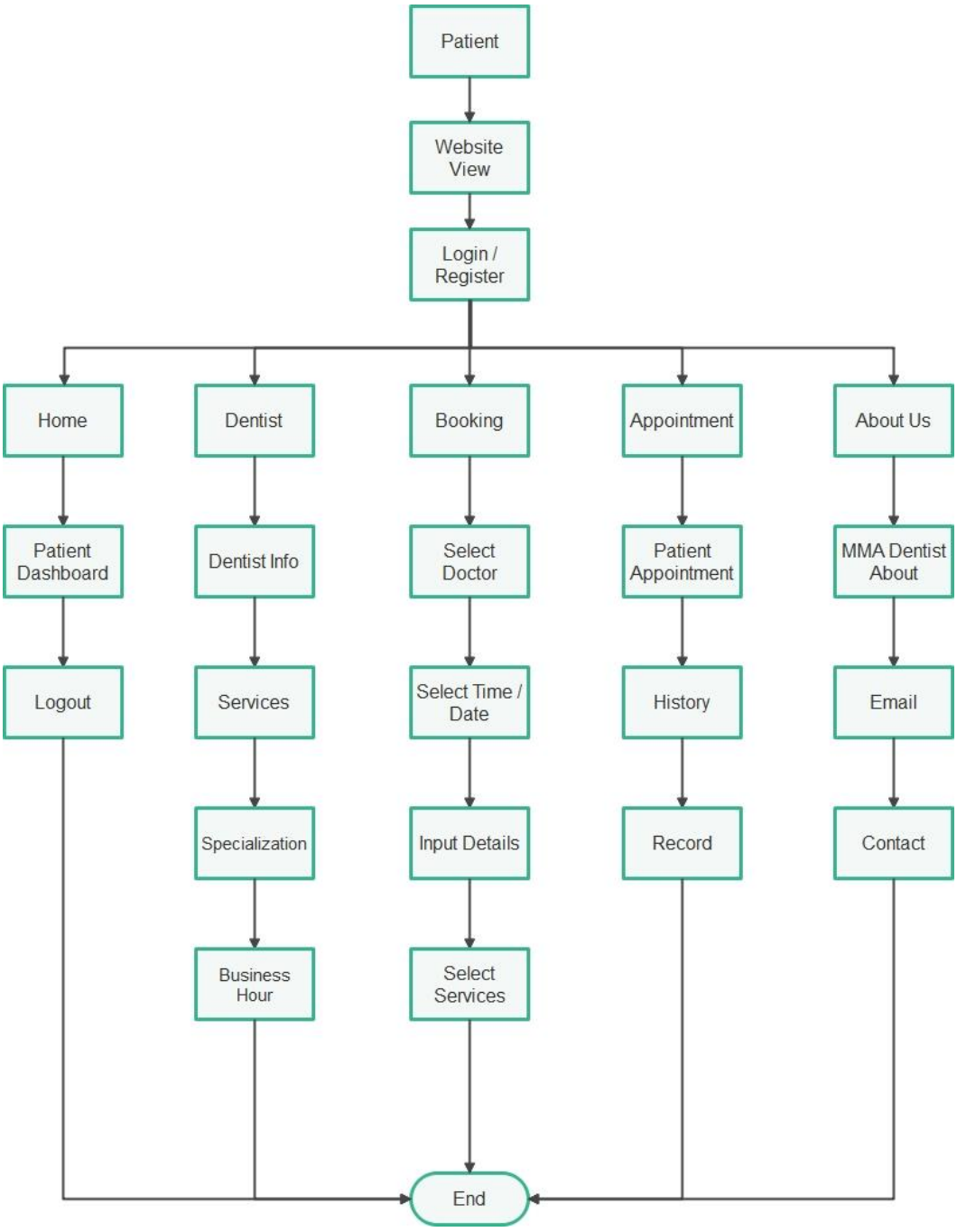

Figure 5: Patient Module

Figure 5 Description:

The patient will view the website

Upon visiting the website the patient will register for an account if the patient is a first time user

The patient will login whether the patient is a first time user or an existing user

The patient will see the Homepage, Dentist tab, Booking tab, Appointment tab, and the About Us

On the homepage, the patient will see the patient dashboard where they will see their upcoming appointment or none if the patient is a first time user.

On the dentist, this will show the dntist info, services and the specialization of each dentist of the dental clinic.

On the booking, this will show select doctor, the date and time that the patient can choose and the patient appointment form that the patient will need to fill up in order to make an appointment on the dental clinic

On the appointment, this will show the latest patient appointment, appointment history, and the appointment record.

On the about us are the history of the dental clinic and the contact information of the clinic

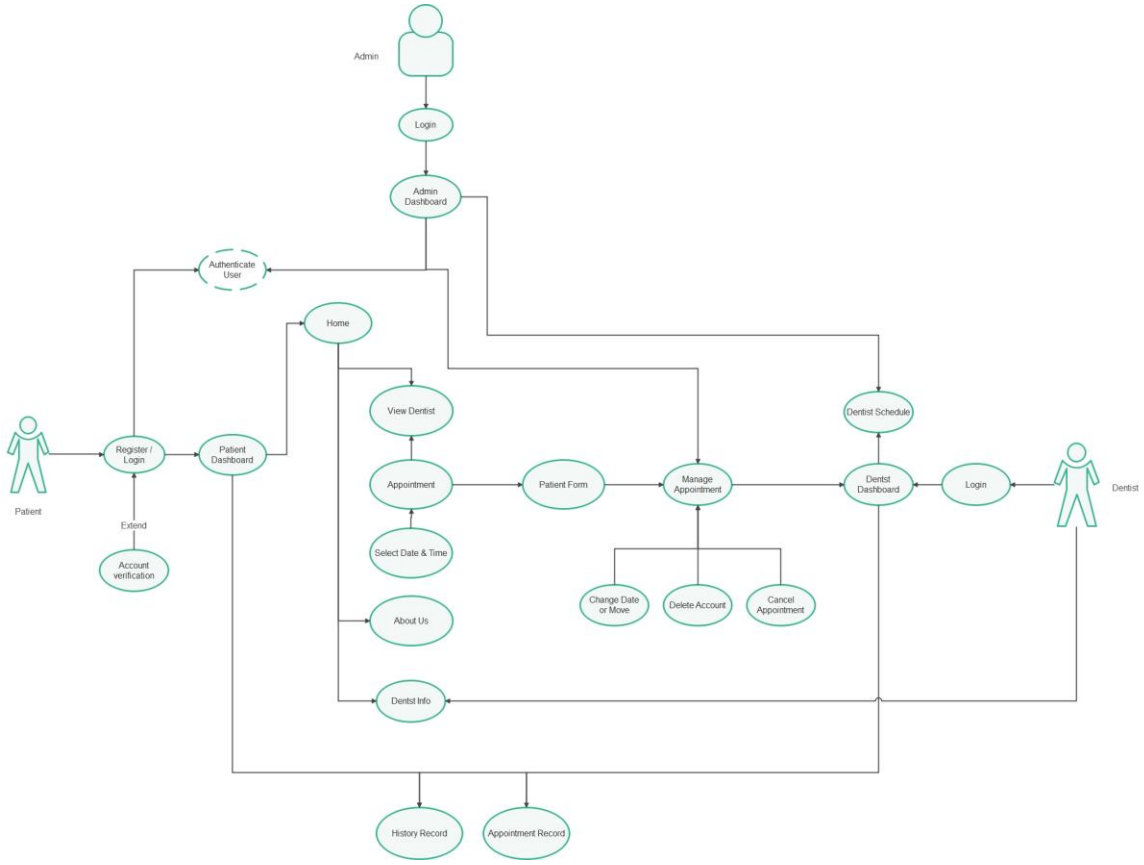

Figure 6: Unified Modeling Language Diagram of MMA Dental Clinic

The figure above shows the relationship between the three persona that is involved in the website which is the Patient, Admin and the dentist. It shows the connection or how does our system work flow works.

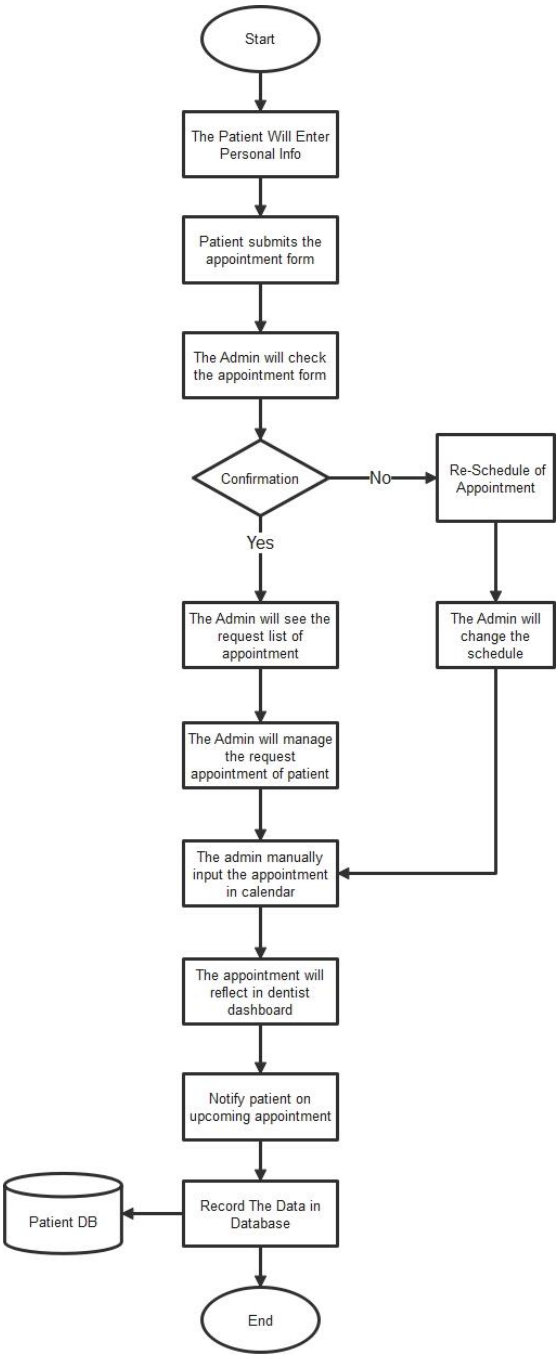

Figure 7: Admin Process of Approved Appointments

G. Development and Testing where applicable

System Testing

The first step of the testing phase, in which after the system is working as expected, it can now be used for a brief testing whether the system have met its goal as an appointment system. The researchers will also show the system for the independent testers to see if the system has bugs or error.

Acceptance Testing

The second and ant the last step of the testing phase is carried out to see if the system is ready for release. This will also present to the client the changes that happened during the development and testing period and to see if the system that the researchers made has met the client's needs. Once the system has passed, this phase will be completed and the system can now be rolled into production.

H. Description of the Prototype

In this phase, the researchers will present the initial report layout and screen forms of the proposed system.

Admin Module Prototype

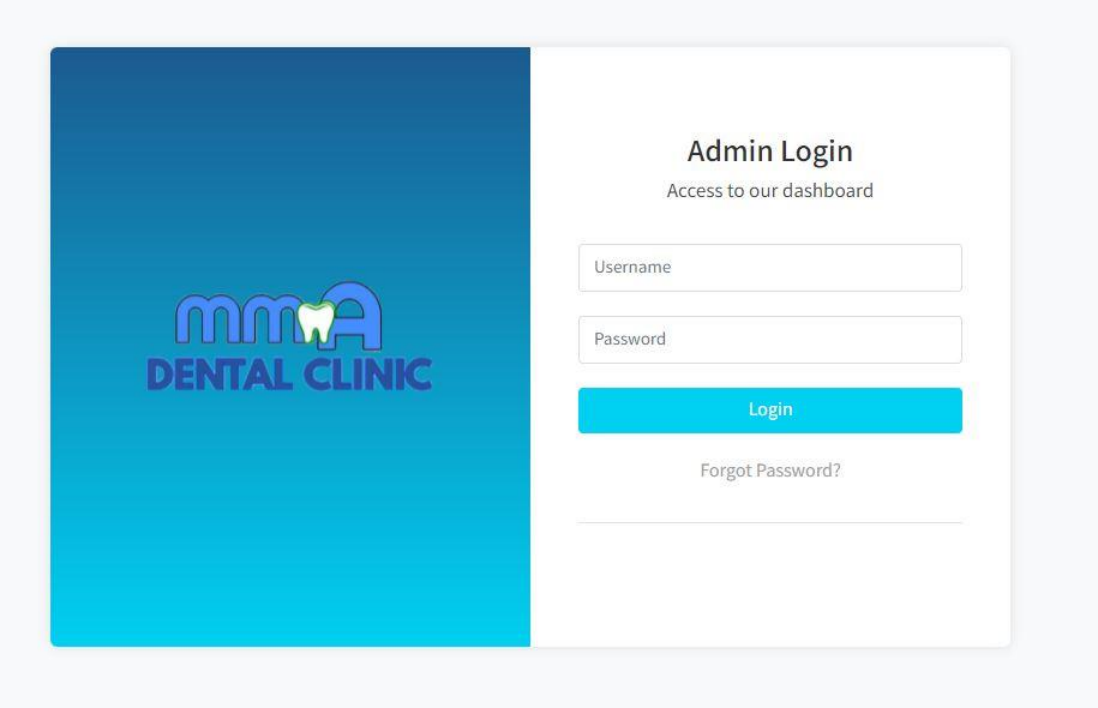

Figure 8: Admin Login

The figure above shows the admin login form of the MMA Dental Clinic Website

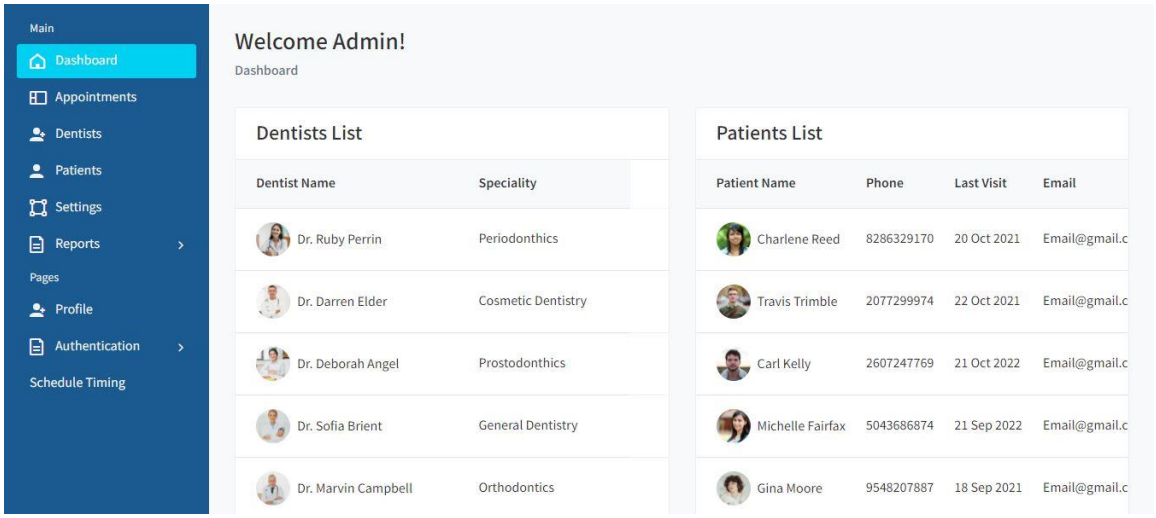

Figure 9: Admin Dashboard

The figure above shows the dashboard of the admin once the admin has successfully login. The admin has the access to all the website's features and function and the admin will also be able to maintain the website.

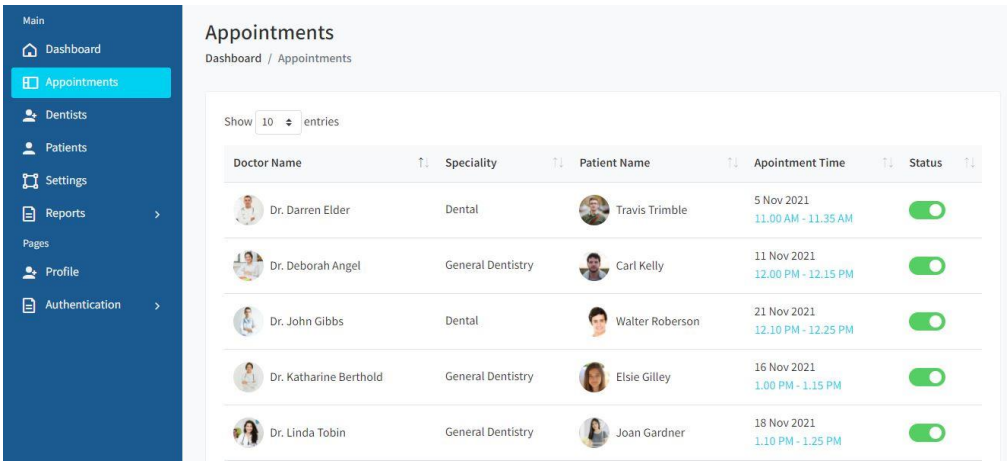

Figure 10: Admin Appointments

The figure above shows the appointment list of the dentist.

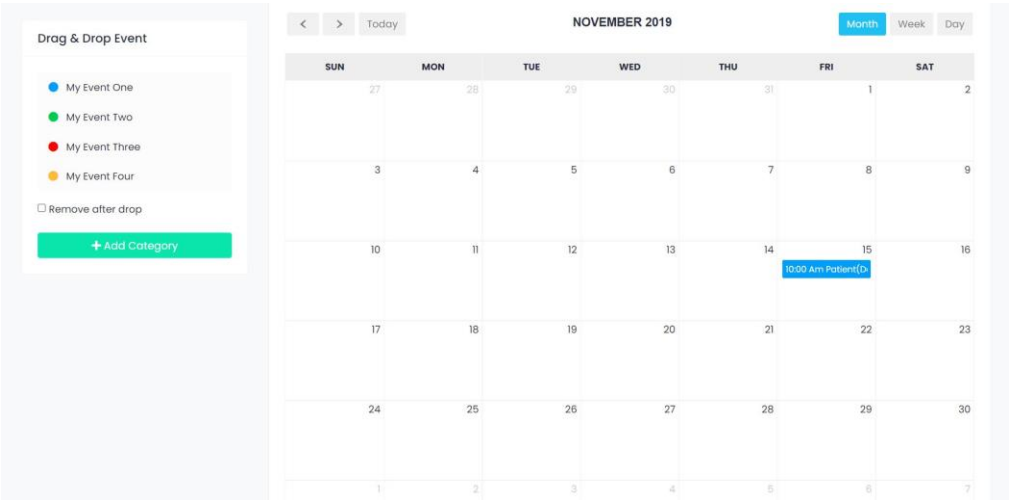

Figure 11: Admin Calendar

The figure above show the calendar of the admin in which the admin can place the approved appointments to the calendar and it will be reflected on the specific dentist's calendar.

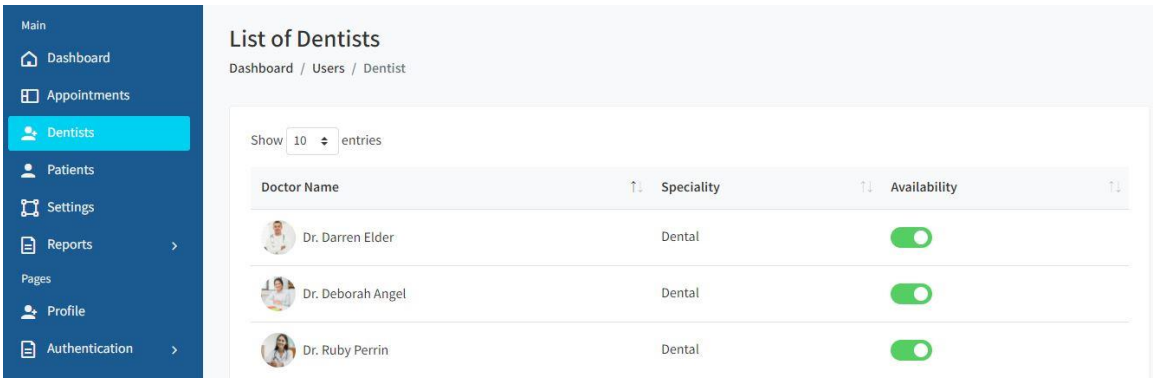

Figure 12: Admin Dentists

The figure above shows the lists of the dentists, their specialties and their availability on the dental clinic.

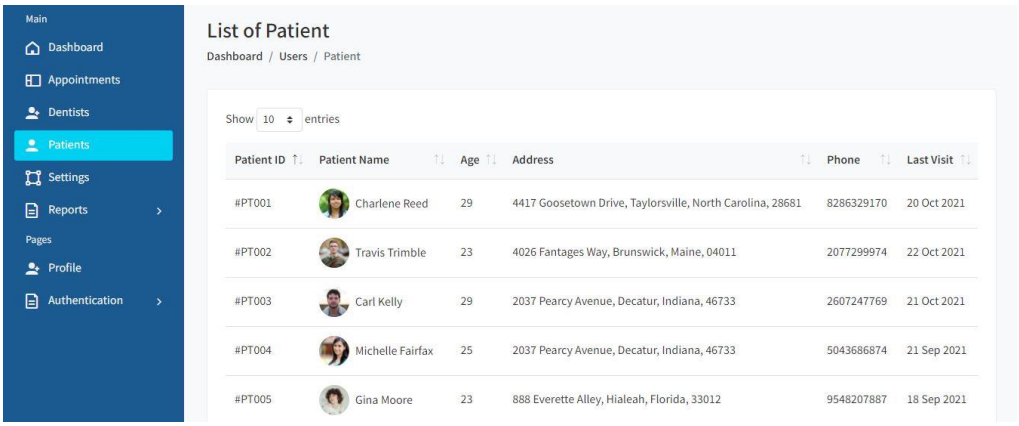

Figure 13: Admin Patients

The figure above shows the list of the patients, their patient ID, age, address, phone and their last visit.

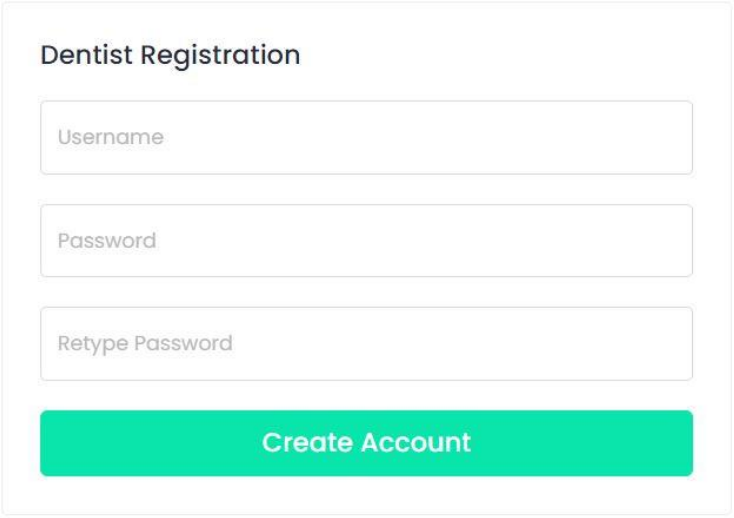

Figure 14: Admin Add Staff Account

The figure above shows the registration of the new the dentist that the admin will create an account.

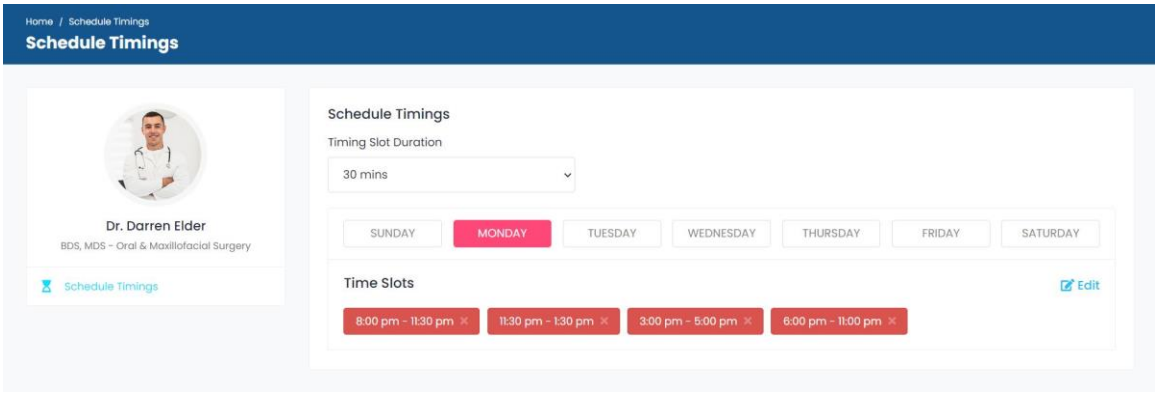

Figure 15: Admin Schedule Timing

The figure above shows the schedule timing of each Dentist.

Dentist Module Prototype

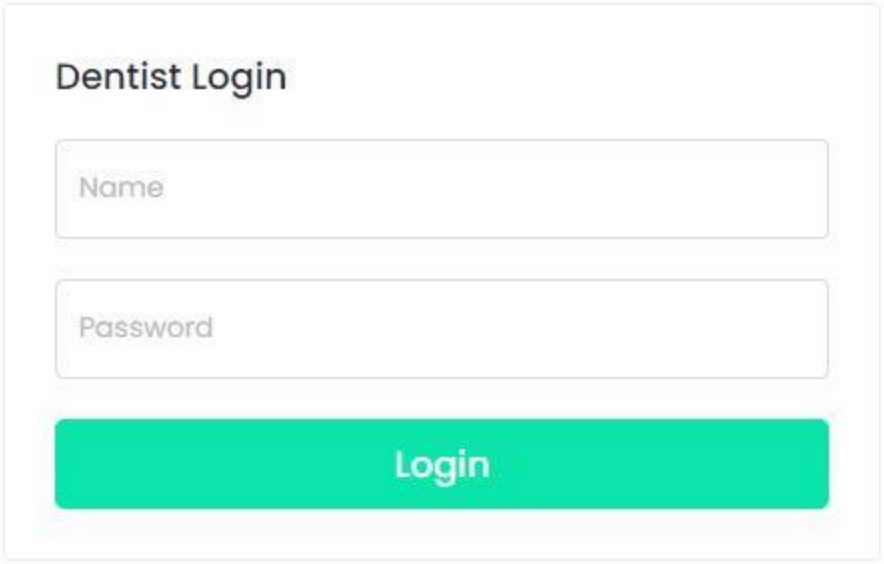

Figure 16: Dentist Login

The figure above shows the dentist login form.

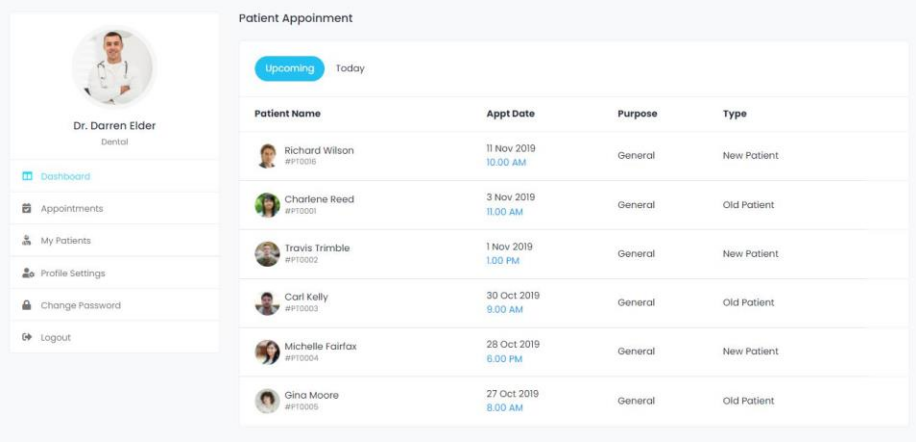

Figure 17: Dentist Dashboard

The figure above shows the dentist dashboard. The dashboard includes the name of the dentist and the scheduled upcoming appointment of the dentist to its patients.

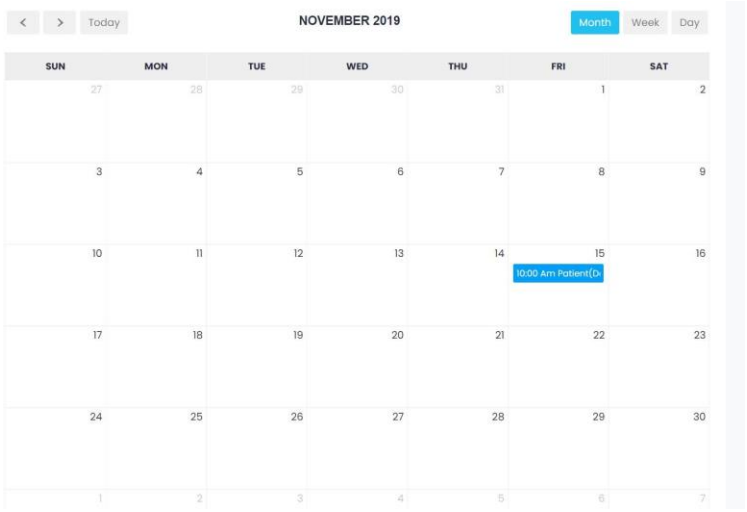

Figure 18: Dentist Calendar

The figure above shows the appointed time of the patient when the time of the appointment has been approved by the admin.

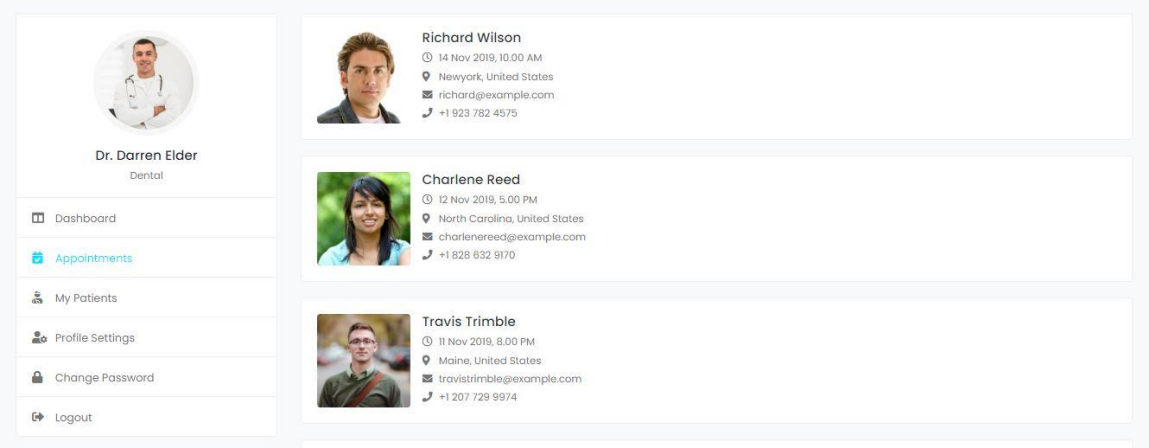

Figure 19: Dentist Appointments

The figure above shows the appointments the dentist have made in the past.

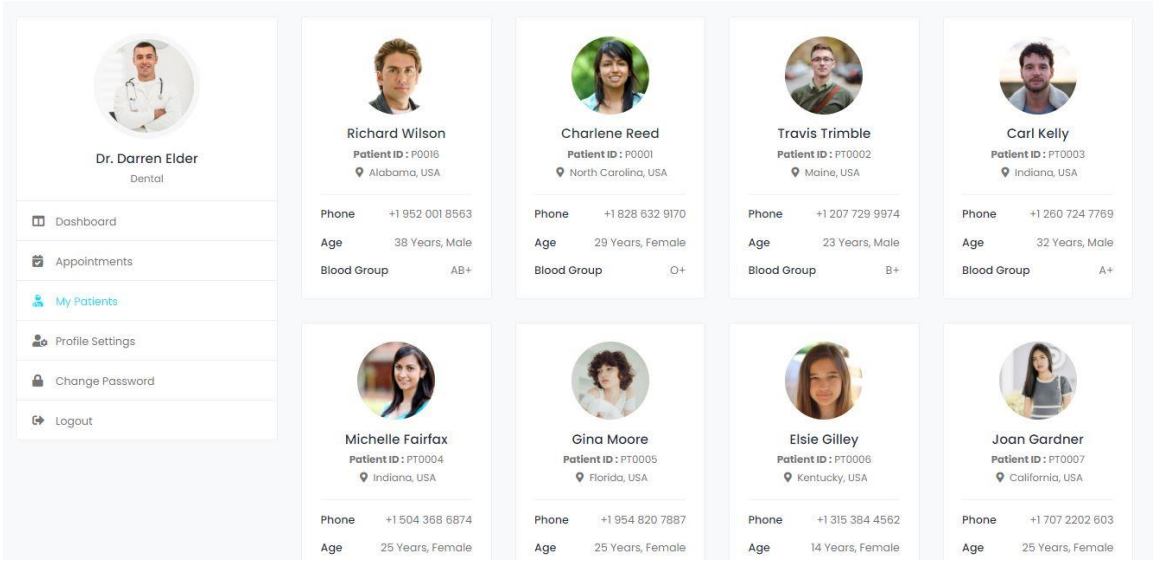

Figure 20: Patients of the Dentist

The figure above show the patient's information and its patient ID.

Patient Module Prototype

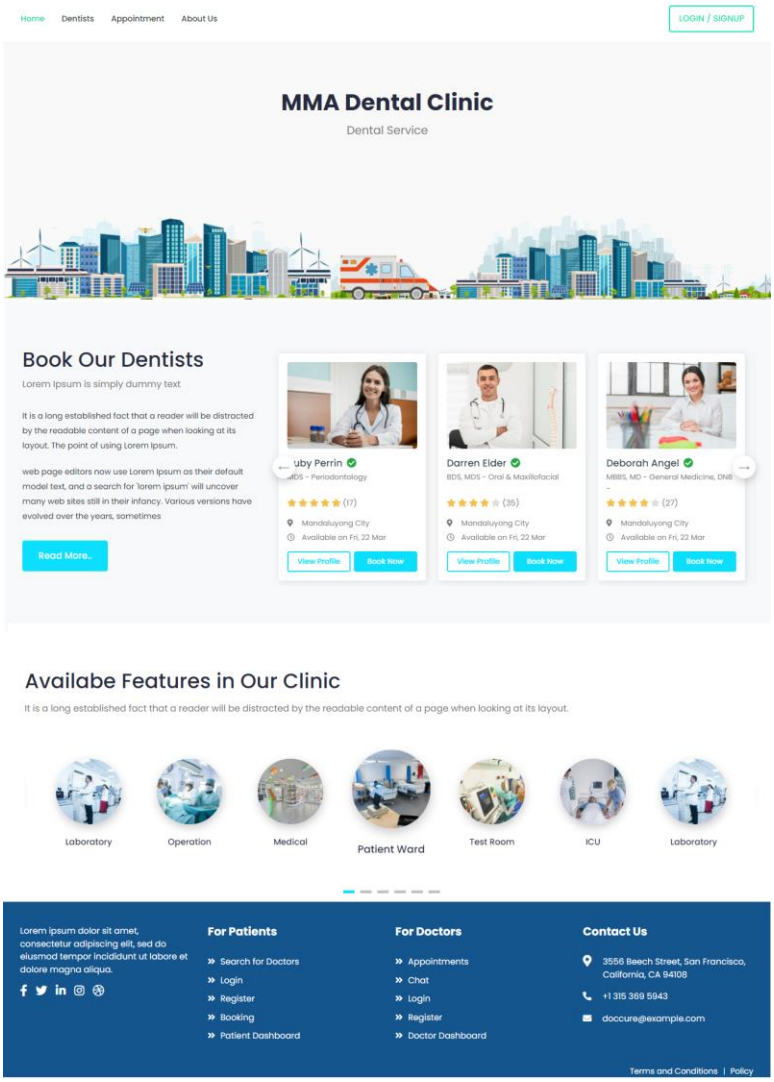

Figure 21: Homepage

The figure above shows what the patient will see when they visit the website for the first time. It includes the Dentist's information, features of the clinic and a description of the dentists.

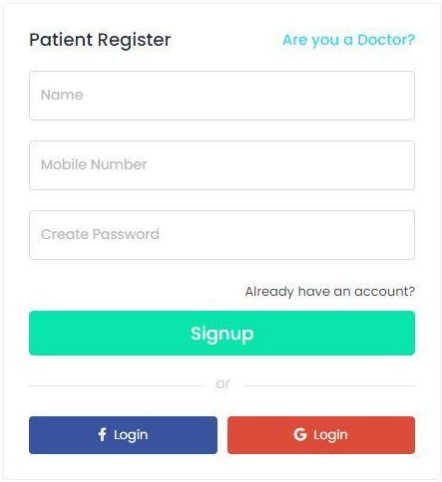

Figure 22: Patient Register

The figure above shows the patient registration form before they can appoint for the dental clinic

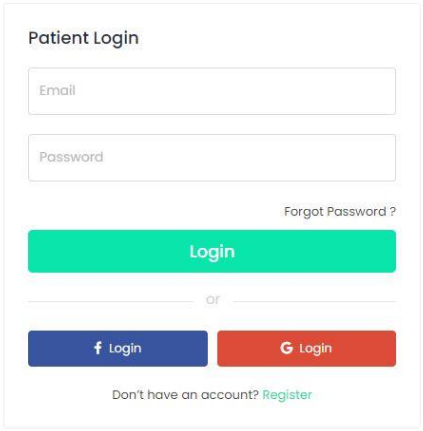

Figure 23: Patient Login

The figure above shows the patient login after the patients have created their respective accounts.

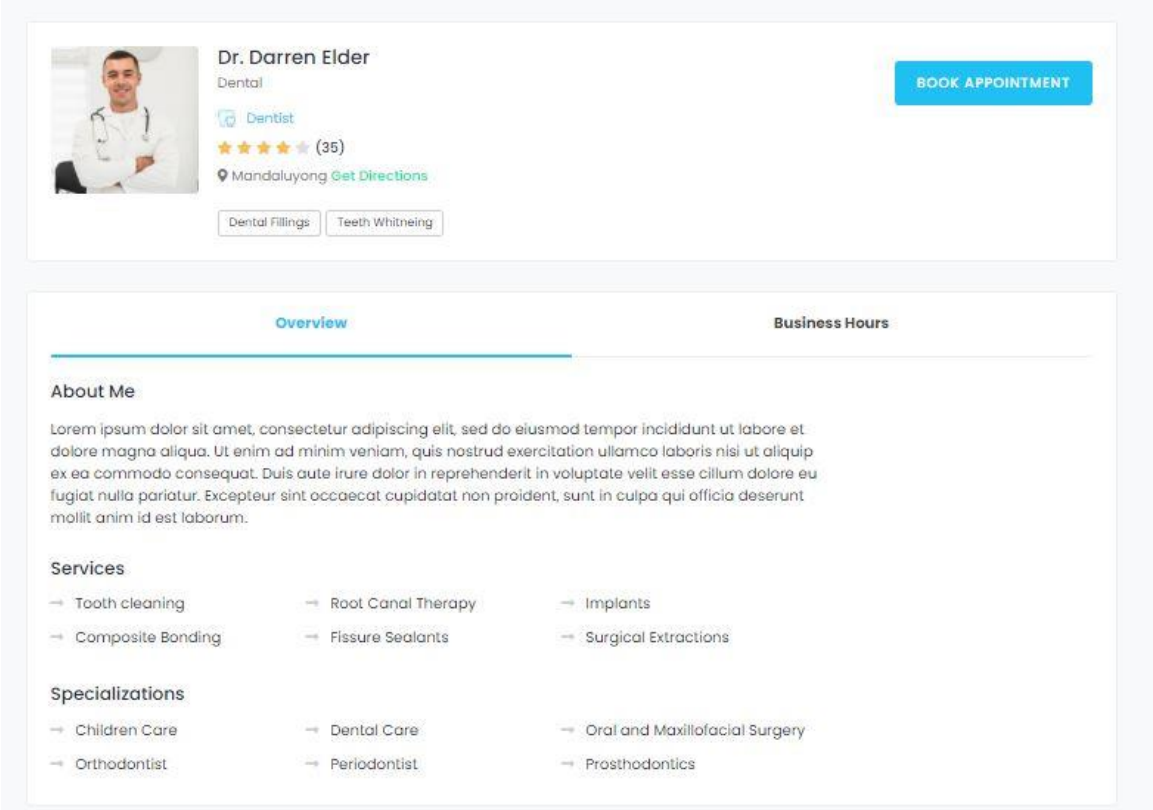

Figure 24: Dentist Profile

The figure above shows the dentist profile in which the patient will see the information about the dentist. The patient can also click the book appointment button after they have decided for the dentist.

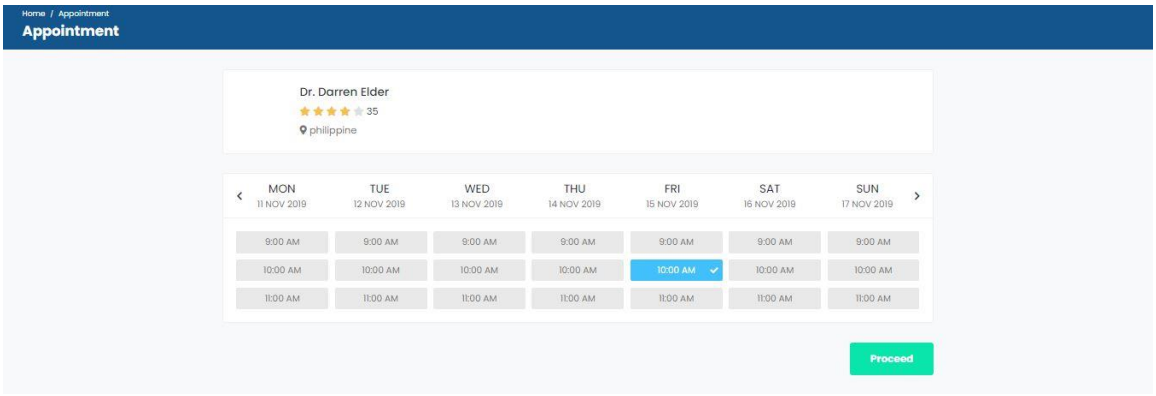

Figure 25: Dentist Schedule

The figure above shows the schedule of the dentists for the upcoming days, the patient cannot click the time that has been reserved by other patients

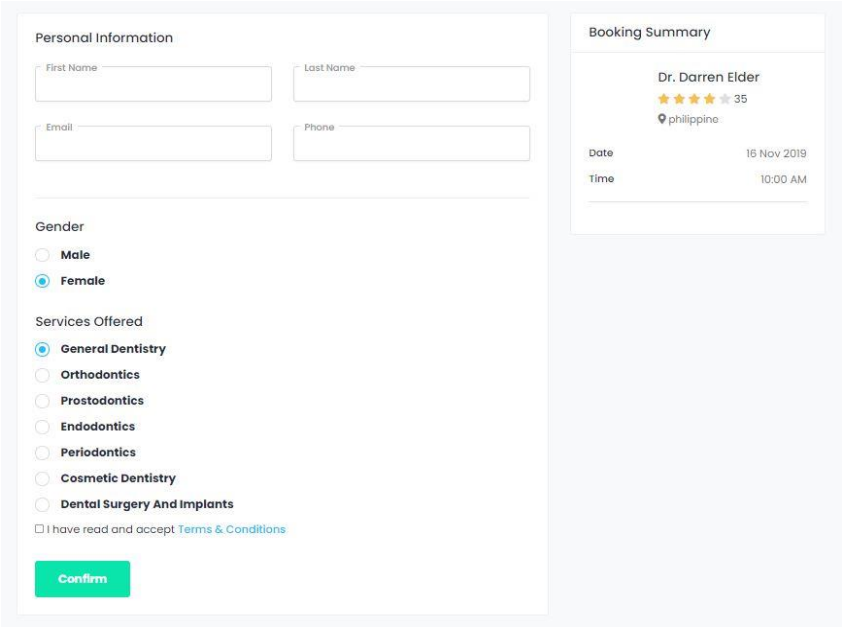

Figure 26: Patient Appointment Form

The figure above shows the appointment form that the patient will fill up in order to make an appointment on the dental clinic.

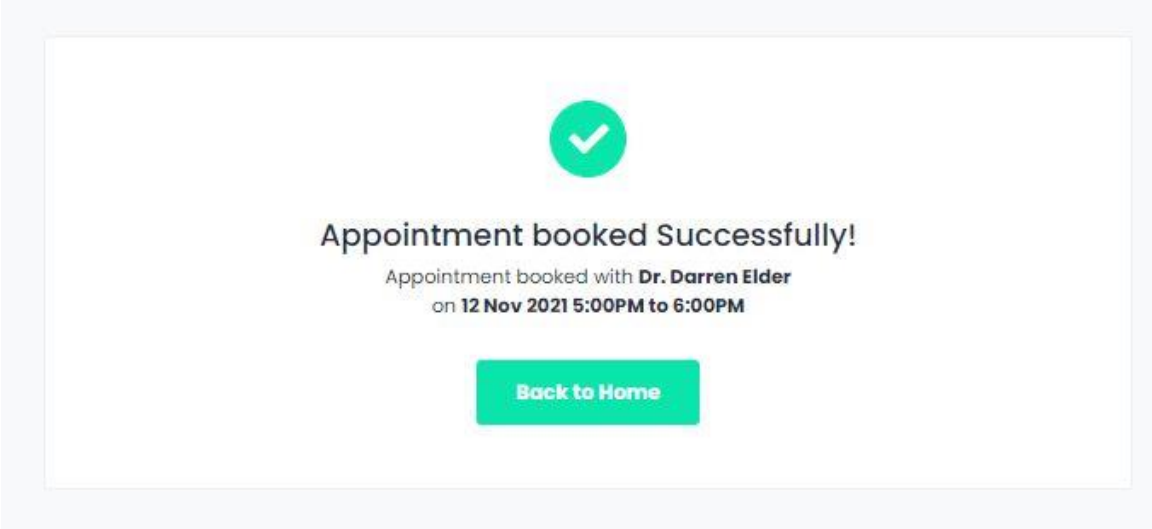

Figure 27: Patient Successful Appointment

The figure above shows the successful appointment after the patient has completed the fill up form.

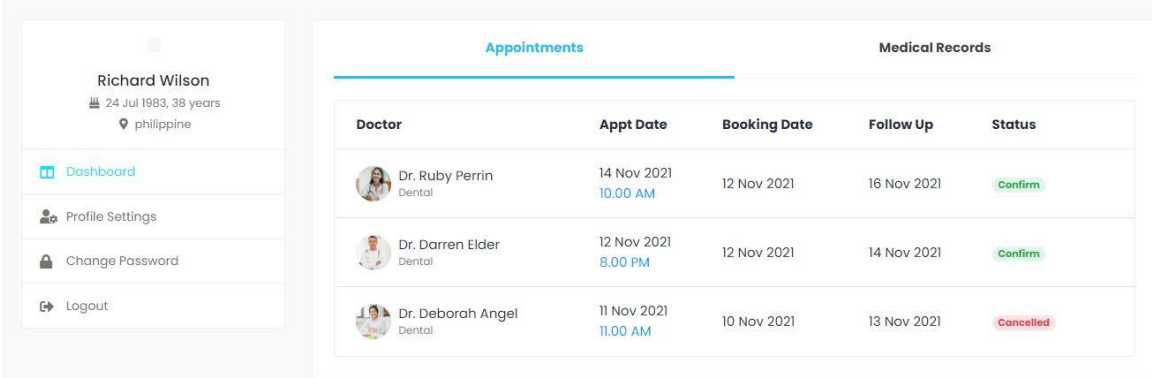

Figure 28: Patient Dashboard

The figure above shows the dashboard of the patient after they have completed the appointment on the dental clinic. They can see the dentist's name, appointment date, booking date, follow-up if there is any and the status of the appointment.

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