Iraqi Kurdistan Region
University of Salahaddin-Erbil
College of Engineering
Department of Software and Informatics

Dental Clinic Management System

A Project Submitted to the Department of Software and Informatics Engineering
University of Salahaddin-Erbil
In the Partial Fulfillment of the Requirement for the Degree of Bachelor of Science
in Software Engineering

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ABSTRACT

(Consists of one page)
Abstracts must show the project in summary statement including Purpose, Method, Findings, result and conclusions.

Purpose example: This project is aimed to measure the ease use of a network diagram software particularly to help users to create a network diagram for multiple reasons. This is to find out whether the software can save them more time and money by reducing the effort to manually graph out a network diagram. The aim of this project is also to find out if this software can help them learn more about the general aspects of computer networking. For example, the devices, the physical or logical aspects of a computer network, as well as network topologies.

Method example: A set of questionnaire will be made and then distributed to students of University Industry Selangor. Questions covered will be how fast they can easily learn the use of this software, can they understand most of its functions and whether from their experience, they can gain more knowledge of basic networking. Number of students will be from 10 to 30 and will be comprising of any students in Unisel. Results of the questionnaire will be used as data to form a statistical analysis of how fast the participants can learn how to use the software.

Findings example: Results can show whether this software is useful to help university students learn and gain more knowledge of computer networking. Thus whether the software should be used or implemented in the university.

Research Implication example: From this project, we may have a better understanding on how software introduced will easy for them to use and how

technology can help students learn faster. Maybe from this research, future education may include more of automated technology to make learning easier.

Conclusion example: By using this software, users can create a better looking diagram easily and even help them plan a good layout before implementing a real physical network.

DEDICATION

Our parents who have taught us the way of live, brothers, sisters, and our supervisor who tell us science with all other teachers, and our dear friends that help us in preparing this project, and those who want to learn.

I certify that the engineering project titled " **Dental Clinic Management System** " was done under my supervision at the department of Software and Informatics Engineering, College of Engineering, Salahaddin University – Erbil. In the partial fulfillment of 'The requirement for the degree of Bachelor of Science in Software and Informatics Engineering'.

Supervisor

Signature:

Name: Hanan Kamal AbdulKarim

Date: / /

LIST OF CONTENTS

CHAPTER ONE

1 INTRODUCTION

This project is a management system for an existing dental clinic in Erbil,
It is very important to have a software system for a clinic, which affects their management level, most of the clinics nowadays are turning into a digitize system. Because, it will be good in their business profit too.

[2]Some dental clinics still use the old traditional management system, they store the patient's information on a piece of paper, store them in files, arrange the files manually, and retrieve them when needs. These are the normal process related to patients' information of the old management system. [3]so, to eliminate and in some cases reduce the difficulties of the old management system which are using a lot of paper to record, manually store and retrieve the file which consume much effort and time, and no backup if the record being destroyed physically.
With the technology that we learned till this moment, there is a solution to overcome the problems of the old management system. The solution is a web-based system that can assist its user in managing their clinic in a better and efficient way. To support the statement, we propose a system named Dental Clinic Management System (DCMS). The DCMS will be used by 2 user categories which are dentist, and receptionist. The main objective of the DCMS is to overcome the problem faced by most dental clinic out there and help them to gain more profit on their business.

[1] Dental clinic management system plays an essential role for the ease of the dentist's daily work. Providing an efficient system to better perform the dentist's activities, which makes it much easier than working on a paper based one, which requires hard work and it is more time consuming.

1.1 BACKGROUND

Every dental clinic needs a management system nowadays, every clinic has different needs and information to be stored, therefore we designed exclusive system for the clinic after collecting the requirements from the dentist.

It's designed to be flexible for storing the dentist's past data.
The aim is to automate its existing manual system by the help of computerized equipment and full-fledged computer software, fulfilling their requirements, so that their valuable data can be stored for a longer period with easy accessing and manipulation.

The system provides the ability to add patients and their information like
Patient id, address, phone number and more. Also, many appointments for each patient with the situation they have. Plus, specifying which tooth and what tools and materials were used during the appointment and also being able to print the medicine which the dentist writes for the patient. The receptionist can add the patients and their appointments and then the doctor will add additional information about the appointment.
Basically, the project describes how to manage for good performance and better services for the dentists.

1.2 PROBLEM STATEMENT

The system will be used as follows:

1. **Patient initiates the Appointment:**
    - The patient contacts the dental clinic to schedule an appointment.

2. **Registration for First-Time Patients:**
    - If it is the patient's first visit to the clinic:
        - The receptionist assists the patient in registering by collecting essential information such as the patient's full name, address, contact details, and gender.

3. **Appointment Scheduling for Returning Patients:**
    - If it is not the patient's first visit:
        - The receptionist directly sets an appointment for the patient based on their existing records.

4. **Appointment Confirmation:**
    - The receptionist confirms the appointment date and time with the patient, ensuring it suits both parties.

5. **Patient's Arrival:**
    - On the scheduled appointment day, the patient arrives at the dental clinic at the designated time.

6. **Dental Treatment:**
    - The patient is attended to by the dentist, who will provide the necessary treatment.
    - During the appointment, the dentist records detailed information about the treatment, such as:
        - The patient's dental situation.
        - The specific tooth or area of focus.
        - The tools or equipment used during the treatment.
        - Any X-rays or diagnostic images taken during the appointment.
        - Prescription of medications, if required.
        - If necessary, the dentist can print out the prescription for the patient.

7. **Billing and Payment:**
    - After the completion of the dental treatment, the patient is directed back to the reception area.
    - The receptionist generates the bill for the appointment, which includes the cost of the treatment.
    - The patient settles the bill by making the payment, through cash.

8. **Next Appointment Booking:**
    - If necessary, the patient can book their next appointment with the receptionist, based on the dentist's recommendation and availability.

1.3 AIMS AND OBJECTIVES

The main objective of the Dental Clinic Management System project is to manage the details of Dental Clinic, Patient, Appointment. The project is totally built for administrative end and thus only the dentist and the receptionist are guaranteed the access. The purpose of the project is to build an application program to convert the paper-based system into a software system due to the digital transformation of the world, which reduces the manual work for managing the Dental Clinic. It tracks all the details about the Patients and Appointments. Which makes the work of the dentist much easier by having everything automated, organized and time effective, plus the reliability the system provides.

Functionalities provided by Dental Clinic Management System are as follows:

1- Provides the searching facilities based on various factors. Such as Patient and Appointment, by the patient's name, id and phone number.
   And filtering the appointments by date.
2- Increases efficiency of managing the Dental Clinic, by providing lists for selecting data rather than writing the information over and over.
3- More organized and readable, everything has its dedicated place.
4- Aesthetic and user-friendly system.
5- It deals with monitoring the information, adding, deleting and updating of Records is improved which results in proper resource management of Dental Clinic data.

6- More space for storing patient's information and appointment details.
7- Ability to print the medicine which the dentist writes for the patient.
8- Secured system, the dentist and the receptionist have to login.
9- Elimination of user mistakes, by implementing restrictions and constraints.

1.4 CHAPTER SUMMERY

List brief description about the content of this project upcoming chapters.

CHAPTER TWO

2 METHODOLOGY

First step of this project was requirement gathering through meetings with the dentist, we collected all the necessary information from the dentist, then we analyzed the requirements and planned what tools, languages, frameworks to use. And scheduled our tasks for three months. Then we started ER design and creating the front-end design and sketches, we checked them with the dentist. After The having the approval, we started implementing and testing.

2.1 SOFTWARE MODEL

[4] It means verification and validation and the life cycle of the v model is a sequential path of the execution of the process. Each phase must be completed before the next phase begins. The testing of the product is planned in parallel with corresponding phase of development.
It should be used for small to medium size projects. where requirements are clearly defined.

V MODEL PHASES

1. Requirements.
2. The high level Design.
3. The low level Design.
4. Implementations.
5. Coding.

1. **Requirements**

   In this model the requirements are gathered before its development and a system test plan is created. The plan test focuses on meeting the functionality specified in the requirements gathering.

2. **The high-level design (HLD)**

   It focuses on system architecture and design. And provides overview of the solution, platform system, product and services/process.

   An integrated test plan is created here as well as in order to test the pieces of the software system ability to work together.

3. **The low-level design (LLD)**

   the actual software components of software are designed. It defines the actual logic for each and every component of the system. Component test are created in this phase as well.

4. **Coding and Implementation**

   It is the phase where all the coding takes place. Once coding is completed, the path of execution up the right side of the v where the test plans developed earlier are now put to use, t his is at the bottom of the v-model.

   In This module design is converted into code by developer.

5. **Unit Testing:** eliminate bugs at code or unit level.
6. **Integration testing:** This test verifies the communication of modules among themselves.
7. **System Testing:** It tests the functional and non-functional requirements of the developed application.
8. **User Acceptance Testing (UAT):** UAT verifies that the delivered system meets user's requirement and system is ready for use in real world.

ADVANTAGES:

1. Simple and easy to use.
2. Work well for small projects, where requirements are easily understood.
3. Testing activities like planning, test design happens well before coding, this saves a lot of time.
4. Provide a structured way of doing things.
5. Time spent early in software development cycle can reduce cost at later stages.
6. Emphasize planning to verifications and validations of the product in early stages of the development.

DISADVANTAGES:

1. Very rigid and least flexible.
2. Might be difficult to foresee all the risks which will come in later stage of development.
3. Software is developed during the implantation phase, so no early prototypes of the software are produced.
4. If any change happens, then the test requirement documents has been updated.
5. Not suitable for complex and object-oriented projects.
6. Need crystal clear requirements.

So, in V Model, High confidence of the costumer is required since no prototypes are produced. There is a very high risk involved in meeting expectation.

2.1.1 REQUIREMENT GATHERING AND ANALYSIS

During the Requirement Gathering and Analysis phase, we followed a formal process involving meetings and phone calls to gather the necessary requirements. Here is an updated breakdown of the steps we took:

1. Initial Contact:

- We initiated contact with the customer through a phone call to establish communication and gather an overview of the system requirements.

2. Detailed Requirement Gathering:

- While the initial conversation provided an overview, we recognized the need for more specific details to ensure customer satisfaction with the final result.
- To address this, we arranged a face-to-face meeting with the customer to delve into the smallest details of their requirements.
- During this meeting, we actively listened to the customer and documented their inputs carefully.

3. Document Analysis:

- In addition to the in-person meeting, the customer also provided us with documents that contained information about how they currently record patients' information.
- We thoroughly analyzed these documents to gain a comprehensive understanding of their existing processes and identify areas where improvements could be made.

4. Requirement Analysis:

- With the gathered information and document analysis completed, we performed a comprehensive analysis of the requirements.
- This involved identifying any gaps, conflicts, or ambiguities in the gathered information and clarifying them with the customer through further communication.

5. User Interface Planning:

- Based on the analyzed requirements, we proceeded to plan how the user interface (UI) of the system would look and function.
- Our objective was to create a user-friendly interface that would meet the customer's needs and expectations.

6. UI Plan Approval:

- Once the UI plan was sketched, we presented it to the customer for approval.
- We ensured that the plan aligned with the customer's vision and requirements, incorporating any feedback or suggestions they provided.

By following this formal process, we aimed to gather and analyze the requirements effectively, ensuring a thorough understanding of the customer's needs and obtaining their approval for the planned user interface.

2.1.2 SOFTWARE DESIGN

During the design phase of the dentist clinic system, several design tools were employed to highlight different aspects of the system. These tools played a crucial role in visualizing and organizing various components of the system. The following design tools were utilized:

In the database design phase of our dentist clinic system, we used a tablet to sketch out the Entity-Relationship (ER) diagram. This allowed us to brainstorm and visualize the entities, attributes, and relationships that would comprise the dental clinic's database. By utilizing a combination of sketching on a tablet and the PHPMyAdmin Designer, we were able to visualize, design an efficient and well-structured database for our dentist clinic system, and established the necessary relationships between tables, ensuring proper data organization and integrity within the database.

While designing the dentist clinic system, great emphasis was placed on ensuring user-friendly design, clarity, and ease of use. Key aspects considered in this regard include:

1. Intuitive User Interface:
   - The user interface (UI) was carefully designed to be intuitive, visually appealing, and easy to navigate.
   - Clear and consistent labeling and icons, logical placement of functionalities, and intuitive interaction patterns were incorporated to enhance the user experience.

2. Human-Computer Interaction Methodologies:

- Human-computer interaction methodologies, such as usability testing, was leveraged to test the usability of the system.
- Iterative design processes allowed for continuous refinement and improvement of the system's usability and user satisfaction.

By incorporating these user-friendly design principles and methodologies, we aimed to ensure that the dentist clinic system provides an intuitive and seamless experience for the clinic staff.

2.1.3 IMPLEMENTATION

1. Database Connectivity:

In order to establish a reliable and efficient connection between the software and the database, we utilized PDO (PHP Data Objects) connection. PDO is a PHP extension that provides a consistent interface for accessing various databases, including MySQL, PostgreSQL, SQLite, and more. By using PDO, we ensure flexibility and compatibility with different database systems, allowing for seamless integration and easier maintenance.

2. Security Measures:

Protecting sensitive data and ensuring the security of the software is of paramount importance. Therefore, we implemented session management techniques to enhance the security of the application. Sessions provide a way to store and manage user-specific data securely on the server-side.

By using sessions, we can achieve the following security measures:

- **User Authentication:** Implementing a robust authentication mechanism to verify the identity of users accessing the software.[10]
- **Access Control:** Enforcing proper authorization and access control policies to restrict unauthorized users from accessing sensitive information or performing unauthorized actions.[8]
- **Data Protection:** Encrypting sensitive data, such as passwords, before storing them in the database to prevent unauthorized access and data breaches.[9]
- **Session Management:** Employing secure session handling techniques to protect against session hijacking and session fixation attacks.[11]
- **Input Validation:** Implementing strict validation for user input.[12]

3. Compatibility with Windows and macOS:
The dentist clinic system was designed to be compatible with both Windows and macOS operating systems, allowing users to access and utilize the software seamlessly on these platforms.

In our project, we employed a range of tools and technologies to facilitate the development and implementation process. [13] The programming languages and tools utilized include HTML, JavaScript, CSS, PHP, Bootstrap, jQuery and SQL, the selection of these was based on their widespread usage, extensive community support. These tools provided a robust foundation for developing a functional and user-friendly web application. And also, were selected based on their advantages, such as ease of use, reliability, security features, and compatibility with the target operating systems. By utilizing PDO for database connectivity and implementing session management techniques, we prioritized data integrity, security, and user privacy.

1. HTML: Used for structuring the content and creating the layout of your web application.
2. JavaScript: Provided interactivity and dynamic functionality, enhancing the user experience.
3. CSS: Controlled the visual presentation of your web application, ensuring consistency and appealing design.
4. PHP: Served as the server-side scripting language, processing user requests and generating dynamic content.
5. MySQL: Used as the database management system (DBMS) for efficient data storage and retrieval.
6. PHPMyAdmin: A graphical user interface tool for administering and interacting with the MySQL database.
7. Bootstrap: A library for front-end development, offering pre-built components and responsive grid systems.
8. Printer: Used for producing hard copies of important documents to facilitate collaboration and record-keeping.
9. LAN cables: Used for establishing local area network connections between laptops, enabling seamless communication and data sharing among team members.

2.1.4 TESTING

[6] Software Testing is a method to check whether the actual software product matches expected requirements and to ensure that software product is Defect free.

The purpose of software testing is to identify errors, gaps or missing requirements in contrast to actual requirements.

For our system we used the below mentioned tests:

Integration testing: This test verifies the communication of modules among themselves. For example, we tested the signup and login functionality. [4]

System testing: verifies that an application performs tasks as designed. It's a type of black box testing that focuses on the functionality of an application rather than the inner workings of a system. [7]

Security Testing: is a type of Software Testing that includes testing for authentication, authorization, data protection, and resistance to security threats, Well-tested products are reliable. They ensure that the tested system doesn't contain potential vulnerabilities that can put end users and system data at risk of potential threats. [5]

User Acceptance Testing (UAT): UAT verifies that the delivered system meets user's requirement and system is ready for use in real world. [4]

CHAPTER THREE

3 ANALYSIS AND DESIGN

This chapter will demonstrate the Entity-Relationship (ER) diagram and the use-case diagram of the dental clinic management system.

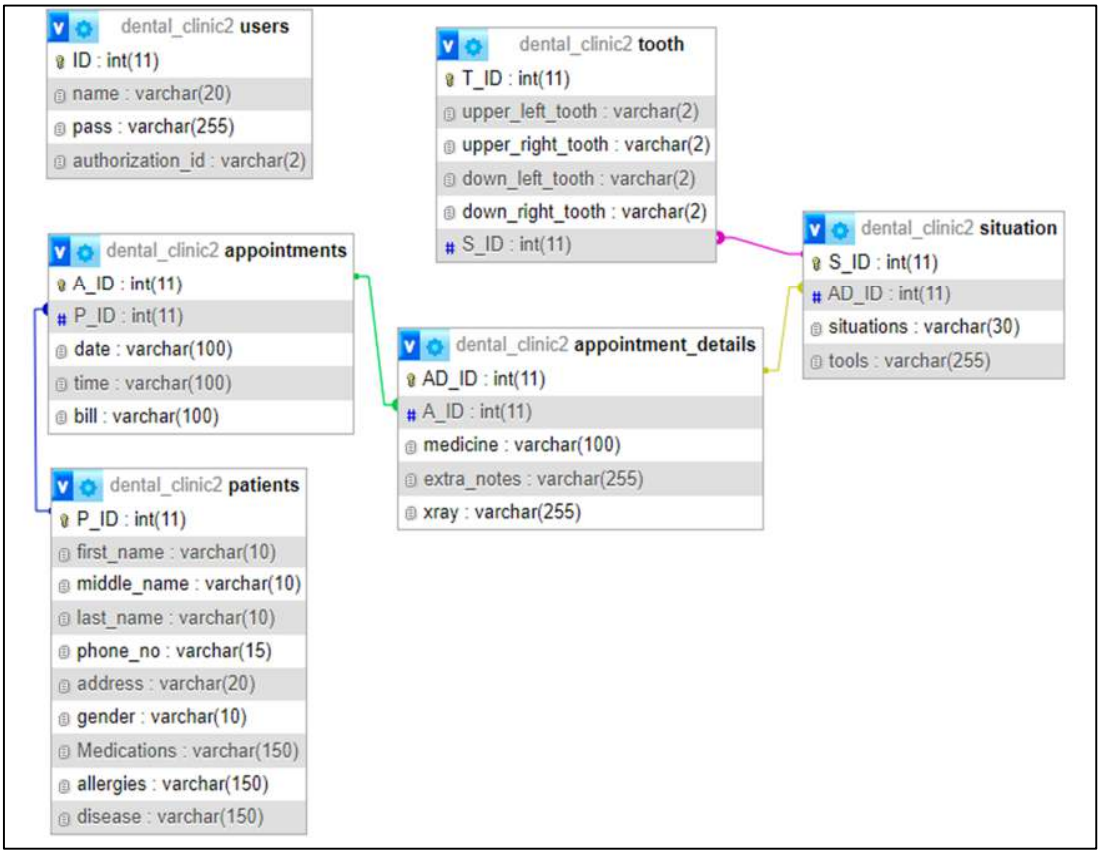

Figure 3.1: project ER-Diagram

According to Figure 3.1, it presents the ER diagram of our system.

The "users" table has the attributes related to the end users of the system such as ID, name, password, and authorization_id, which indicates the user's authorization level.

Additionally, we have the "patients" table, designed to store information about registered patients. This table includes attributes such as patient id (primary key), first name, middle name, last name, phone number, address, gender, medications, allergies, disease.

And in relation with the "patients" table, we have the "appointments" table, responsible for recording each patient's appointments. This table includes attributes such as appointment id (primary key), patient id (foreign key), date, time, and bill. The date and time attributes are represented as varchar data types in the database, but we have designed the corresponding input fields to accept date and time values.
The relationship between the "patients" and "appointments" tables follows a one-to-many association.

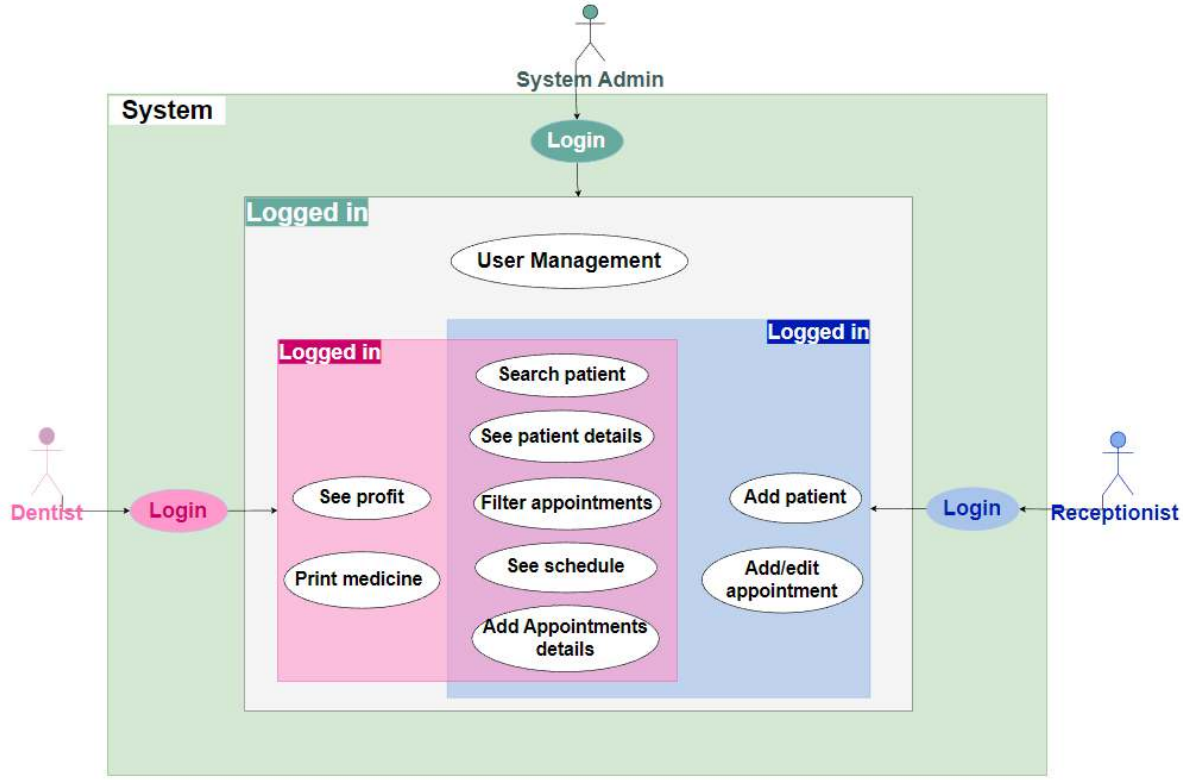

Figure 3.2: Use-case diagram

According to Figure 3.2, the use-case diagram illustrates the various authorization levels within the system. The diagram explicitly highlights three distinct authorization levels, namely the system admin with authorization level 1, the dentist with authorization level 2, and the receptionist with authorization level 3.

The system admin has full access to the system, and can do user management tasks like view the system's current users, create a new user, delete user, edit user name, and change password of a user.

Both the dentist and the receptionist share certain privileges, such as the ability to search for a patient using their name, phone number, or other relevant criteria. Additionally, they are granted access to patient details,

schedule page, and the ability to filter appointments within the schedule based on date and time. Furthermore, they can add appointment details.

Distinguished from the receptionist, the dentist has additional capabilities, including the ability to review monthly and yearly profit statistics and the option to print medicine.

Conversely, the receptionist is empowered to add new patients to the system and create corresponding appointments for them. Moreover, the receptionist is granted the authority to modify these appointments as required.

CHAPTER FOUR

4 RESULTS AND DISCUSSIONS

This chapter will present the results and the final appearance of our project, starting with the login page where users will enter their username and password.

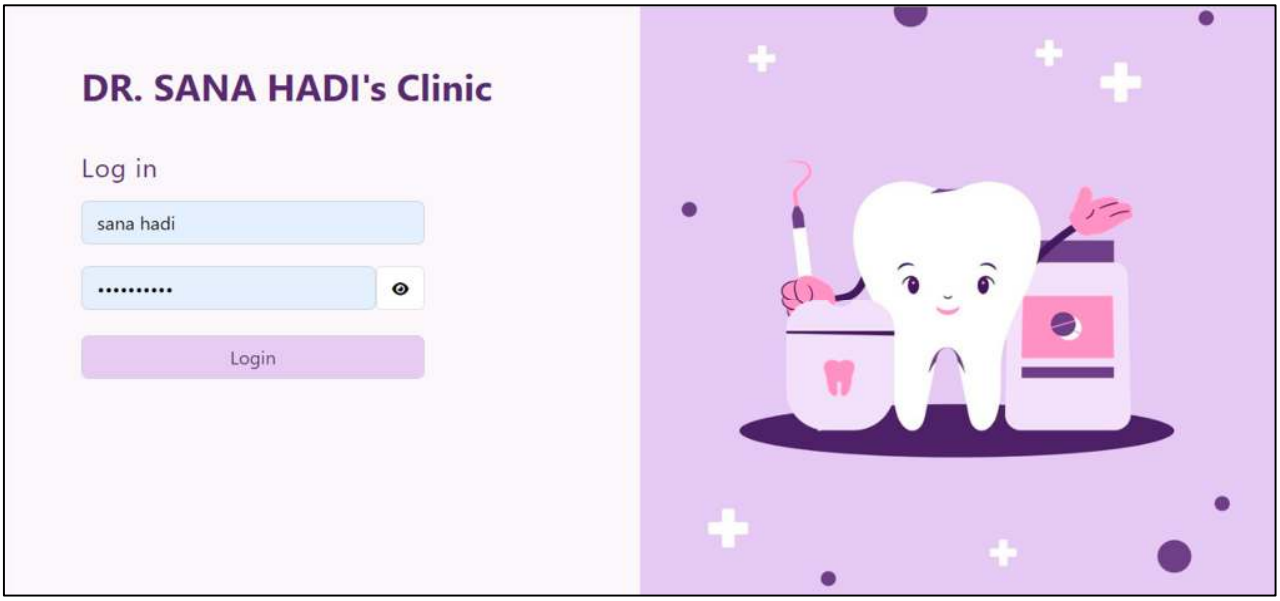

Figure 4.1: Login-Page

After logging in, the dashboard page will appear. Dashboard page will show that specific day's appointment like shown in the figure 4.2.

Figure 4.2: Dashboard-Page

In all the pages of our project, we have a header that allows seamless navigation between different pages. By clicking on the "Patients" option in the header, users can access the Patients page, as shown in the figure below:

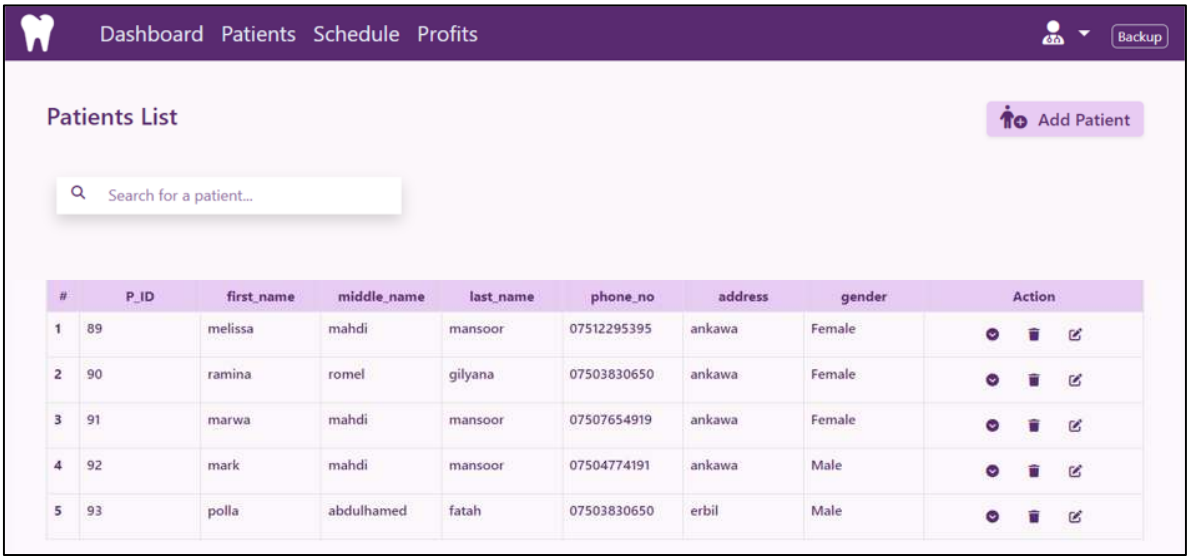

Figure 4.3: Patients-Page

With patients page you can search for patients either by their name, id or Phone number like figure 4.4.

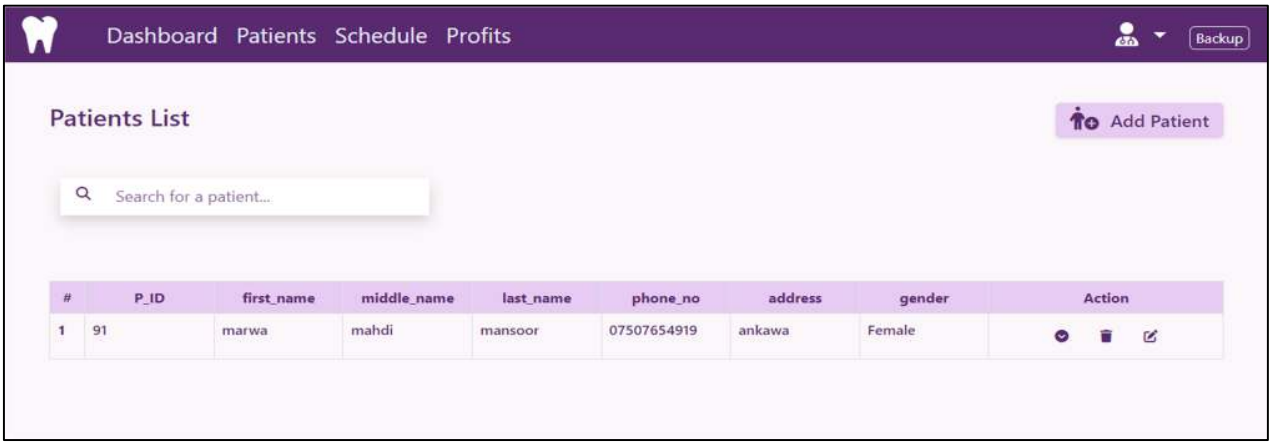

Figure 4.4: Patients-Page-searching

Users have the ability to **add**, **update**, and **delete** patients as illustrated in the figures below:

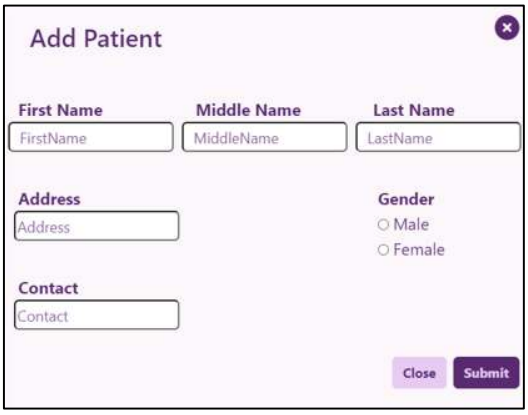

Figure 4.5: Add-Patient

Figure 4.6: Update-Patient

This will apear after clicking the trash-icon:

Figure 4.7: Delete-Patient

This icon in patients page, will lead us to another page which is the patient's profile, contains additional patient's information and all appointments of that patient. Like shown in figure 4.8.

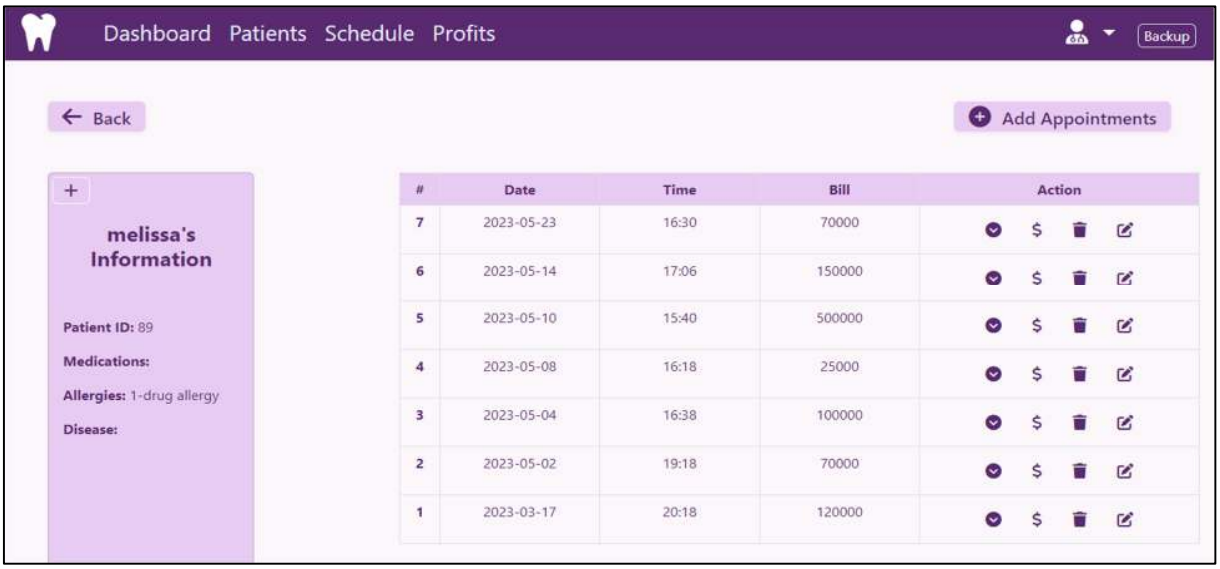

Figure 4.8: Patient-profile

With Patient-profile page you can **add**, **Update**, **Delete** Appointments and **add** bill, like figures below:

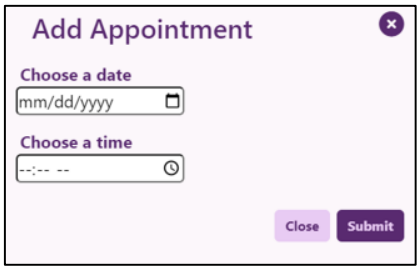

Figure 4.9: Add-Appointment

Figure 4.10: Update-Appointment

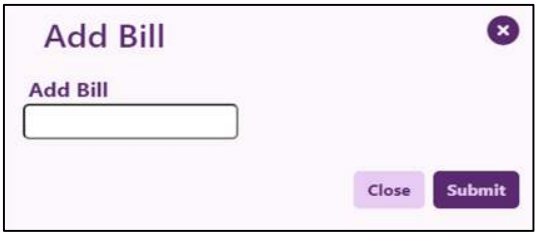

Figure 4.12: Add-Bill

Figure 4.11: Delete-Appointment

You can also **add** additional information of the patient in Patient's profile page like figure 4.13.

Figure 4.13: Add-details

Again, with this icon in Patient's profile page, will lead us to another page which is the Appointment details page, that contains information about that specific Appointment. Like shown in figure 4.14.

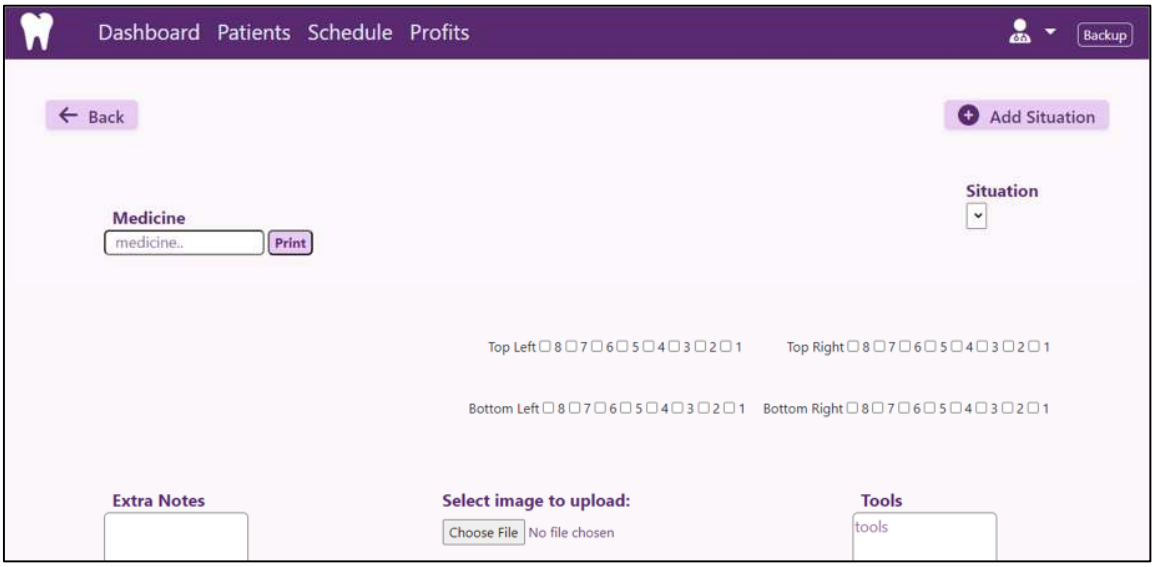

Figure 4.14: Appointment-details Page

In the page above the dentist will add all the information needed, like situation, teeth, tools used, medicine, Xray and any other Extra notes.
Adding all these information is illustrated in the figures below:

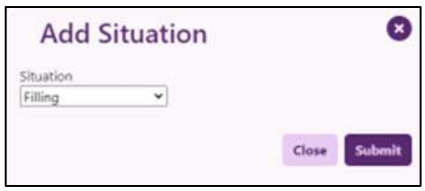

Figure 4.15: Add-Situation

Figure 4.16: Add-Appointment info

You can also add another situation for the same appointment and it would look like figure 4.17.

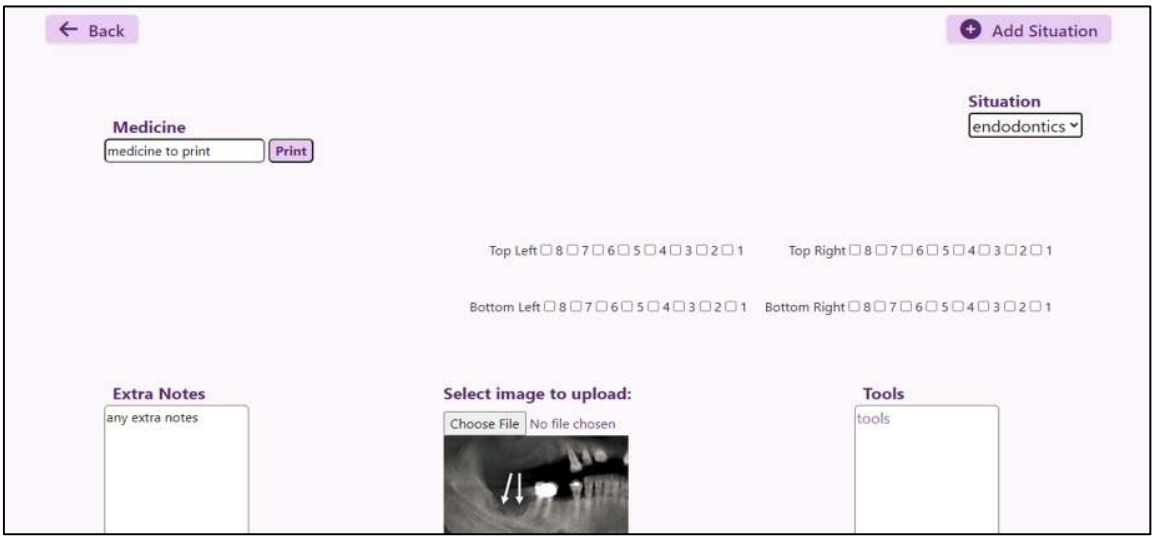

Figure 4.17: Adding another situation

Here as you see you can select another situation and the teeth with tools would be different for each situation, you can select different teeth and tools. But the medicine, Xray and Extra notes are the same for the specific appointment.

Now if you want to see all the appointments of the clinic, you will click the schedule button in header and the schedule page will appear like figure 4.18. With this page you can filter the appointments by date.

#	P_ID	first_name	middle_name	phone_no	date	time
1	93	polla	abdulhamed	07503830650	2023-05-14	12:42
2	92	mark	mahdi	07504774191	2023-05-23	18:00
3	92	mark	mahdi	07504774191	2023-05-13	22:28
4	91	marwa	mahdi	07507654919	2023-04-04	19:43
5	90	ramina	romel	07503830650	2023-05-23	14:00
6	90	ramina	romel	07503830650	2023-05-15	14:25
7	89	melissa	mahdi	07512295395	2023-05-23	16:30

Figure 4.18: Schedule-Page

You can also preview monthly and yearly profits, illustrated in the figures below:

Figure 4.19: profit page

Figure 4.20: selected Month and Year

Lastly, we have a backup button and a user profile button as shown in figure 4.21.

With backup button the data would be backed up and the user profile button have “logout” and “about users” options.

The “about users” option is only available for the system admin.

In addition to the backup button, the system does automatic backup every week.

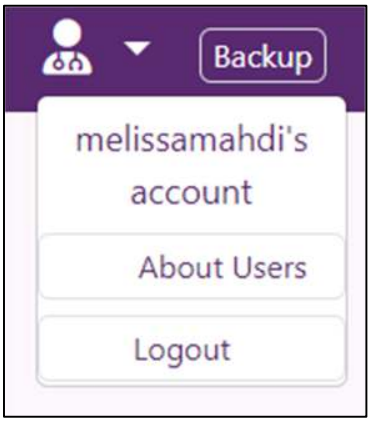

Figure 4.21: Backup-UserProfile

Clicking “About Users” option would lead us to another page which includes users’ information. The figure below shows the page:

Figure 4.22: Users-Page

With this page you can **add** user, **change** username and **change password** of the users like figures below:

Figure 4.23: Add-User

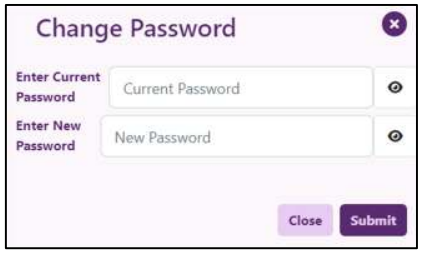

Figure 4.24: Change Password

Figure 4.25: Change Username

CHAPTER FIVE

5 CONCLUSION AND RECOMMENDATIONS

The conclusions of the project should be briefly presented in this chapter. Note that the conclusion is not an abstract, it should NOT summarize the whole project. It should conclude the main findings and link them to the objectives of the study.

REFERENCES

[1] Scribd. “Dental Clinic Management System | PDF | Software Testing | Relational Database”.

[2] “DENTAL CLINIC MANAGEMENT SYSTEM’. By. Hassan Bin Ahmad. A project paper submitted to the University Malaysia Pahang.

[3] LovelyCoding.org. “Dental Clinic Management System”.

[4] V-Model in Software Testing.

[5] Hamilton, Thomas. “What Is Security Testing? Example,” April 30, 2020.

[6] Hamilton, Thomas. “What Is Software Testing? Definition,” January 2, 2020.

[7] Software Quality. “What Is System Testing? – TechTarget Definition.”

[8] Security. “What Is Access Control?”

[9] “Polar Security - How to Protect Sensitive Data.”

[10] Security. “What Is User Authentication?”

[11] “Session Management - OWASP Cheat Sheet Series.”

[12] “Input Validation - OWASP Cheat Sheet Series.”

[13] “Web Development.” https://www.w3schools.com/whatis/.